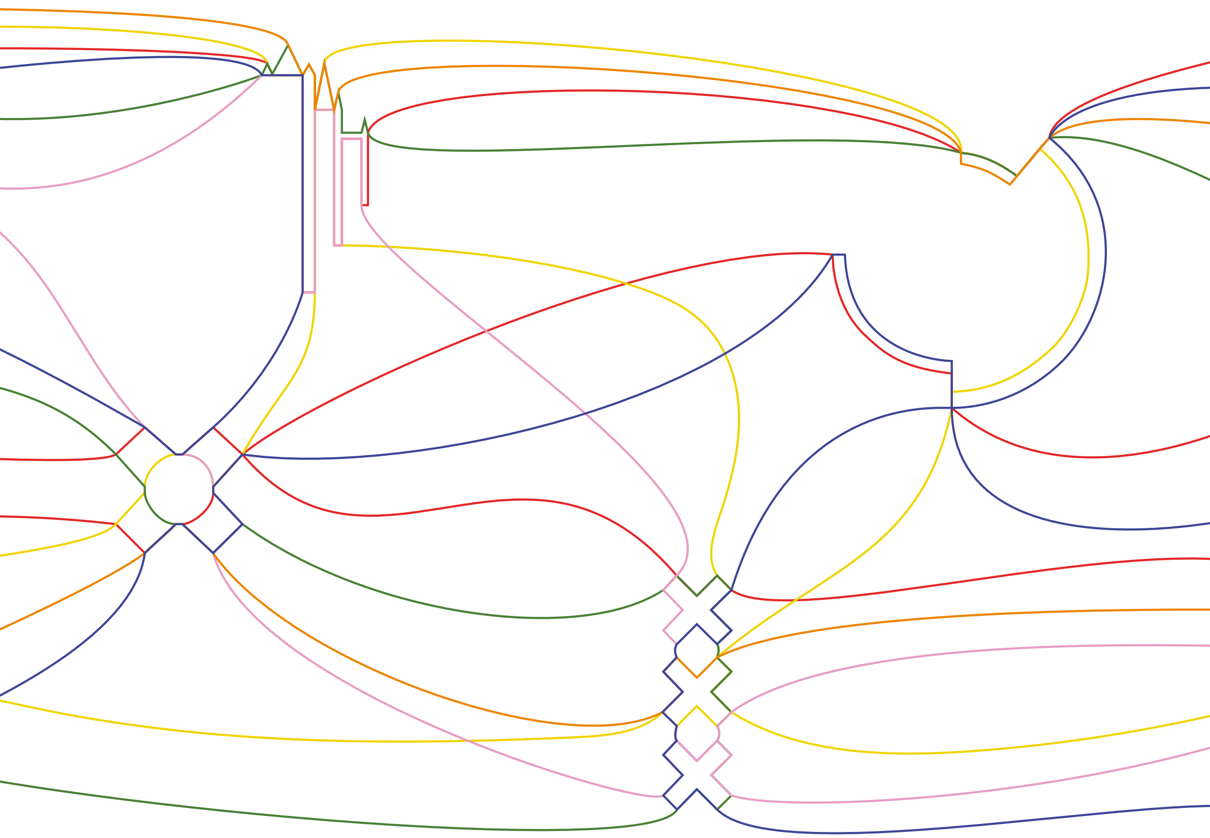
Karel Van den Berghe

Planning the Port City

A Contribution to and Application of the Relational Approach, Based on Five Case Studies in Amsterdam (The Netherlands) and Ghent (Belgium)



PhD series

//IN/
PLAN/
/NING

FACULTY OF ENGINEERING AND ARCHITECTURE

GHENT UNIVERSITY

De havenstad plannen. Een bijdrage tot en toepassing van de relationele aanpak, gebaseerd op vijf casestudies in Amsterdam (Nederland) en Gent (België)

Planning the Port City. A Contribution to and Application of the Relational Approach, Based on Five Case Studies in Amsterdam (The Netherlands) and Ghent (Belgium)

Karel Van den Berghe

Promotoren: prof. dr. ir. L. Boelens, dr. W. Jacobs
Proefschrift ingediend tot het behalen van de graad van
Doctor in de stedenbouw en de ruimtelijke planning

Vakgroep Civiele Techniek
Voorzitter: prof. dr. ir. P. Troch
Faculteit Ingenieurswetenschappen en Architectuur
Academiejaar 2018 - 2019

UNIVERSITEIT
GENT

ISBN 978-94-6355-153-3
NUR 903, 905
Wettelijk depot: D/2018/10.500/71

Supervisors

Prof. dr. ir. Luuk Boelens, Ghent University EA
Dr. Wouter Jacobs, Erasmus University Rotterdam

Members of the Examination Board

Prof. dr. ir. Luc Taerwe (former dean), Ghent University EA (chair)
Prof. ir. Filip Boelaert, Ghent University EA (secretary)
Prof.dr. ir. Luuk Boelens, Ghent University, EA (supervisor)
Dr. Wouter Jacobs, Erasmus University Rotterdam (supervisor)
Prof. dr. Arnoud Lagendijk, Radboud University Nijmegen
Dr. Larissa van der Lugt, Erasmus University Rotterdam
Prof. Daan Schalck, Ghent University RE
Prof. dr. ir. Ellen van Bueren, Delft University of Technology
Prof. dr. Frank Witlox, Ghent University WE

Word count: 129050

Voorwoord

Alhoewel de kans groot is dat u, welgekomen lezer, dit leest als eerste wanneer u dit (e)boek opent, is dit voorwoord als laatste geschreven. De grote finale, de apotheose, het moment om (even) stil te staan in deze eeuwigdurende ratrace. Dus beste lezer, wees kritisch, laat u dus niet beetnemen, *'Ceci n'est pas un avant-propos'.*

Het is een feit dat dit doctoraat maar eentje is bij de hoop die wij, als academische samenleving, letterlijk dagelijks uithoesten. Een fabriek van kennis die de (e)bibliotheken van deze wereld als een hongerig monster blijven voeden. Zo kan dit doctoraat verder gerelativeerd worden. Waarschijnlijk zullen slechts een handvol mensen dit onderzoek ter harte (volledig) lezen, laat staan gebruiken. Het formaat van dit manuscript is daarenboven van de oude stempel. Geen flitsende moderne bundel van losstaande academische papers, aan elkaar gelijmd, klaar om snel verorberd te kunnen worden, abstract en conclusie lezend, misschien een snelle scan middenin. Niet zo hier, het boek is een boek volgens de academische traditie.

Ook al was dit niet echt een keuze, meer een vanzelfsprekendheid, ik ben toch wel blij dat mijn manuscript een 'echt' manuscript is. Er is ruimte en vooral veel (te veel) tijd besteed om zo goed en zo slecht mogelijk de persoonlijke jarenlange uitgedachte en uitgewerkte theoretische en empirische lijn op te bouwen en uiteindelijk, via allerhande hersenkronkels, neer te zetten.

Daarin schuilt toch een soort van trots. Dit is niet zomaar een boek. Velen die mij voorgegaan zijn, zullen dit beamen. Een doctoraat is een stuk jezelf. Vrij ingevuld naar Paasi, *A PhD conditions and is conditioned by the writer*. Met andere woorden, ik heb het doctoraat geschreven, maar het heeft op een of andere gekke manier ook mij veranderd. Ik ben niet meer dezelfde persoon als toen ik hieraan begon. Daarom, in alle bescheidenheid, durf ik toch wel stellen dat een doctoraat sterk afwijkt van andere jobs. Een keuze die iedereen heeft na zijn masteropleiding(en), maar een keuze van wie weinigen, ik toch destijds, beseffen welke grote gevolgen het heeft. De vier voorbije jaren ben ik een soort van brainwash ondergaan, waarbij ik naadloos moeilijke woorden en ideeën, op zijn minst dubbelzinnig van betekenis, aan elkaar weef of op papier zet, ze meestal nog begrijp ook, of dat toch pretendeer en vooral mezelf wijsmaak, en daarenboven in de meeste gevallen nog in slaag om het academisch internationaal groepje, dat ik intussen al goed ken, het is trouwens echt een heel kleine wereld aan de academische 'top', kan overtuigen. De voorgaande ellenlange zin is een lichtend voorbeeld van de ondergane brainwash.

Persoonlijk was het best een zware beproeving. Alleen het neerpennen heeft ongeveer tien maanden full time bibliotheek-terugtrekking gekost. Het is nooit een 9 to 5 geweest, verre van; de tegenwoordig mainstream burn-out stond altijd om de hoek te wachten. Dit is echter ook relatief. Ik heb geleerd dat je een doctoraat zo zwaar maakt als je zelf wilt. Eigen schuld dikke bult. Doe mor geweune deure; want anders dan bij een regulier examen, is er voor een doctoraat geen boven- of onderlat. Natuurlijk zijn er standaard minima, zoals het aantal te bekomen academische papers, maar dat blijft relatief. Kwaliteit is moeilijk kwantitatief te meten.

Waarom denk ik dan dat mijn doctoraat geslaagd is? Waar ligt dan de zelf gelegde lat? Simpel, ik denk gewoon anders. De essentie. Mijn promotor Wouter verwoordde het mooi: "*Academia is a world that doesn't exist. Once you have been there, it will change your way of thinking forever. No joke. That's the ticket. Called PhD.*" Of in andere woorden: een transformatie onderga je. Tot het bittere eind, met een problematische spellingscheck en drukproces erbovenop. Net zoals ik ondervond als klassiek opgeleid pianist tijdens mijn jazz-lessen samen met Amule; tijdens mijn doctoraat heb ik voor een groot deel moeten afleren wat ik al wist en hoe ik onderzoek doe, dit om een volledig nieuwe manier van denken op te bouwen. Het gekke is dat ik eigenlijk het eerst afgeleerde, grofweg de geografische positivistische ik, plots weer begon te plaatsen en te gebruiken in het nieuwe denken, als kritische planner, of zoiets.

Dit doctoraatsonderzoek reflecteert dus voor een groot deel mijn persoonlijke 'dualiteit', de geograaf en de ruimtelijke planner. En ook die andere dualiteit, boer en bourgeoisie. Al klopt dit eigenlijk niet meer, want ze zijn gemerged. Dit (academisch) verpoppingsproces had ik nooit alleen kunnen doen. Veel dankwoorden beginnen met het volgende stuk, dus excuseer me voor het voorgaande. Ik bedank ter harte mijn promotoren Luuk Boelens en Wouter Jacobs. Ik vermoed dat ik niet altijd de makkelijkste was. Al is het eigenlijk niet echt een vermoeden, want soms zeiden jullie dit gewoon. Ik was soms koppig, maar laat me het eufemistisch 'kritisch' noemen. Excuses en rustiiiig. Ik weet dat jullie hebben moeten trekken en sleuren; een occasionele vlammende mail of roodgloeiende track-changed document op zijn weg. Vreemd, maar eigenlijk toch bedankt! Echter, vergeet niet dat jullie twee soms ook niet altijd eenzinnig waren, al denk ik eigenlijk dat dat vooral kwam omdat ik jullie niet altijd begreep/begrijp. Niettemin, het is jullie verdienste dat dit doctoraat gelukt is. Ik hoop dat jullie tevreden zijn met wat er ligt, al weet ik dat jullie steeds verbetering mogelijk achten. Laat me toe dit niet na te laten.

Eerlijk is eerlijk, ik heb het toch ook wel echt goed gehad tijdens mijn doctoraat. Ik heb de wereld rond gereisd, handelend volgens de welgekende formule congresje-plus-rondreisje, soms zelfs leidend tot een reünie van mijn vorige verpoppingsperiode, met mijn Erasmus-vrienden. Dank Wouter om me mee te nemen en te introduceren in deze congreswerelden en me in contact te brengen met veel van mijn academische 'helden', mocht je nog mijn gezichtsuitdrukkingen herinneren toen tijdens AAG. Niet alleen professioneel betekende het enorm veel voor mij, ook persoonlijk heb ik geluk gehad tijdens congressen, zie de laatste persoon die ik bedank. Ik vond het ook al snel leuk om meer te doen dan de essentie: presenteren tijdens en bijwonen van sec paper sessions. Mede door collega's, sloot ik algauw aan bij social events en dineetjes. Ik had het zo naar mijn zin dat ik me al in mijn tweede jaar kandidaat stelde voor de Young Academics van de Association of European Schools of Planning (YA AESOP). Verkozen werd ik in mijn tweede 'ambtsjaar' zelfs president van de YA AESOP en kreeg ik een zetel in de Executive Committee van AESOP. Zodoende mocht ik onder andere het YA-congres openen met een hip praatje en ons – 'de leiders van morgen' - vertegenwoordigen op allerhande internationale events. Leuk leventje. En het leverde me een vriendengroep op voor het leven, soms zelfs resulterend in een mooie paper. Thanks Aoifa (slaughtering and poke ma hook), the German twin Lukas and Fabian, Jannes, Christian, Simone, Feras, Nadia, Ender, Lauren, Mo, Dana, Anna, Federico, Paulo, Zorica, Ela, Daniel and Joana, among others.

Het leuke aan het meelopen in academische organisaties, is dat je zo ook die andere kant van de academische medaille leert kennen, best te vergelijken met een gemiddelde kindergroep qua animo en tactieken. Een wereld ging open. Ik vermoed overigens dat opleidingsniveau niet echt lineair verloopt, maar eerder in een soort van hoefijzer. Persoonlijk relativeren heet dat.

Zoals kinderen in Vlaanderen worden aangeleerd via populaire stripverhalen, professoren zijn verstrooide mensen. Klopt als een bus. Weet dat een universiteit binnen de vijf minuten zou stoppen met bestaan als men het secretariaat zou afschaffen. Heel veel dank gaat dan ook uit naar de vele secretaressen die me professioneel en ook occasioneel persoonlijk hebben bijgestaan: Anne-Marie, Els, Maja, Marlies, Nancy, Manja en Geeta.

Zoals proces en plan niet van elkaar los kunnen gezien worden, kan ik mijn doctoraatsopleiding natuurlijk niet los zien van mijn onderwerp. De wereld van havensteden is er een die ik nog steeds indrukwekkend vind. Professor Georges Allaert gaf ons altijd mee dat ruimtelijke planning geen geld heeft, daarom genoodzaakt meestal (positief) repressief is, bijgevolg weinig geliefd en zich uiteindelijk telkens ergens middenin polariserende standpunten bevindt. Resultaat: en-en, alhoewel net dat ook soms een sterkte kan zijn, vind ik persoonlijk. De metafoor België is hier op zijn plaats. Maar tegelijkertijd, wat is Nederland mooi.

Binnen de context van havensteden is het anders. De ondertoon is overwegend positief; er is gewoon veel mogelijk, of dat gevoel heb ik toch. Veel kansen om te zoeken naar win-wins, echt leuk als ruimtelijke planner. Neem daar dan nog bij dat net in de Belgisch-Nederlandse delta *éé*n van de grootste concentraties aan ‘relevante’ havensteden liggen; qua onderzoeker zit je gebeiteld. Het is misschien daarom dat de Afdeling Mobiliteit en Ruimtelijke Planning, waar dit onderzoek is uitgevoerd, al decennialang mee heeft gedacht en beleidsmatig gewerkt aan vele havensteden. De havenstad Gent zou er niet uitzien zoals die er is vandaag zonder de AMRP. Het is dan ook een eer dat dit onderzoek in dit rijtje (eventueel) mag bijgezet worden. Wat de AMRP is voor de (Zeeuws-)Vlaamse havensteden, is de onderzoeksgroep Urban, Port and Transport Economics (UPT, aka RHV) voor de Nederlandse. Gezien ik onderzoek deed in Gent en Amsterdam, mocht ik van en begeleid door Wouter en Larissa, en gesteund door een gulle beurs van het FWO, zes maanden onderzoek doen in Amsterdam, vanuit de Erasmus Universiteit in Rotterdam. Bedankt Bart, Frank, Martijn, pingpongers Jan-Jelle, Martijn en Jeroen en in het bijzonder mijn ‘the office’-groepje Onno (‘What a Day’) en Eri (‘calimero’). Ook dank aan de TUDelft waar ik op dit moment mag werken als post-doc, en in het bijzonder aan Tom en Ellen voor het warme welkom in jullie team.

Zoals de kleine prins ons vertelt, moet de geograaf op ontdekking gaan. Grote dank daarom aan de havenbedrijven van Amsterdam, Eduard de Visser en Micha Hes, en van Gent (intussen North Sea Port), in het bijzonder CEO Daan Schalck. Ook dank aan de gemeentediensten van Gent en Amsterdam. Ook belangrijk natuurlijk was de positieve medewerking van verschillende organisaties en bedrijven in Gent en Amsterdam, van multinational tot lokaal bedrijfje, en in het bijzonder Professor Wim Soetaert. Bedankt ook aan mijn examencommissie om dit werk kritisch te evalueren. Het is een grote eer.

Een planner streeft ernaar om impact te hebben op zijn omgeving, dit algeheel, en ten goede trouw, strevend naar verbetering. Hoe verbetering ingevuld wordt en waarom het ene idee uitgevoerd wordt, en het andere niet, is trouwens de essentie van dit doctoraat. Veel discussies hierover, maar eigenlijk vooral toch over koetjes en kalfjes, zijn er gehouden met collega's, dank voor het deugddoende gezever, Thomas, Barbara, Els, Suzanne, Peter, Koos en in het bijzonder kantoortennissers en –tikkertje-enthousiastelingen doctor Jones en Samuel. Ook dank aan het van ambitie uitpuilende, maar in realiteit niet meer dan café-gaand urbanistisch filosofisch groepje Stadt (met een t). Wat zijn we mooi met ons drie, Judith en Ward. Great minds freak out alike. Dank ook aan Valuable Tits en aan Gentse voetbaltrots Thor, excuses dat ik er niet meer bij kon zijn.

Last but not least, mijn (schoon)familie. Woorden zijn uiteindelijk maar woorden, daden doen ertoe. Ik kan nooit genoeg mijn ouders bedanken, voor alles, maar ook echt alles. Dit doctoraat is een grote welgemeende bedanking naar jullie. Mijn zus Hanne is al heel mijn leven de grootste steun, en ontvanger van mijn zever, die ik kan wensen. Je bent de beste zus in de wereld, en wat is het mooi toch dat jij, als geograaf nota bene, ook doctoreert. Als grote broer ben ik o zo trots. Team VdB's en co.

Eline, mijn lieve schat, jij bent het beste dat me overkomen is, vanaf de seconde we mekaar zagen daar in Rotterdam in de 'onderzeeduikbootloods', of zoiets. Wunderbar! Wij als legal aliens, jij als Vlaamse Nederlander en ik als Nederlandse Vlaming, doen het toch zo goed samen. Aan welke kant van de grens we ook wonen, mijn thuis is waar jij bent.

Uit zelfkennis weet ik dat velen van jullie, lezers, enkel dit voorwoord zullen lezen; misschien hoogstens nog eens scrollen of bladeren en wat prentjes kijken, ze zijn mooi hoor. Maar geloof me, lees verder, het is een interessant boek. Nou ja.

Love the lu,
Karel Van den Berghe
September 2018; Vlazjele-Gent-Breskens-Rotterdam-Delft-Roosendaal

Tout m'intéresse, tout m'étonne

Table of contents

List of Figures

List of Tables

Summary

Ports have historically played a key role in the economic development of their host cities and regions. However, since the second half of the 20th century, their historical connection came under pressure. Traditional port functions (e.g. logistics and shipbuilding) moved out of urban centres to newly created blue water areas downstream or into the hinterland. These port areas have expanded significantly during last half century. Ports and cities grew apart, not only physically, but also socially, culturally and institutionally. This evolution is related to the increasing globalisation of the economy, characterized by increasing trade volumes and capital, but also by a shift of regulating arrangements and decision power from the national scale to the international scale. However, at the same time, the economy also became more regionalized, whereby innovation and its competitiveness and economic growth is predicated upon locally and/or regionally networked clusters of public and private actors that are globally organised and active within global production networks. The simultaneous globalization and localisation created a 'glocal' regional world whereby globalized regions increasingly compete with each other.

Within the port-city interface literature, the first globalization movement is being recognized, studied and acted upon. Indeed, the concept of the port-city interface was namely introduced during the 1980s to understand contemporary transformations at the urban waterfront. It was based upon the observation that port and urban economies became increasingly disconnected and consequently a geographical land-use disruption manifested itself in port cities. As such, the port-city interface became a developer's window of opportunity for urban renewal in port cities around the world.

However, perceiving the port-city interface only in terms of land use or spatial conflict neglects that the port-city interface is also an interactive economic system composed of different locally and regionally networked clusters defining the economic growth of both the globalized port and urban economy, hence our proposition. Understanding the port-city interface as such implies the existence of positive and negative feedback loops between local/regional/(inter)national port activities, urban activities and their embeddedness within the local, regional and global geographies. These interactions transcend administrative boundaries and the use of land. Therefore, we need to take into account the various coupling mechanisms creating different relationships within, without and towards this system. More specifically, we need to accept that particular forms of coordination and relational ties with a stake in the port-city interface operate and are articulated at various spatial levels of aggregation, from the local to the global. Consequently, every port-city interface is unique, as juxtaposed with the Anyport (- city interface) Model.

This creates a challenge for planning the port-city interface through which, on one hand, the global and local economies and, on the other hand, the maritime and urban economies are or need to be coupled. The main research question is therefore '*How to plan the port city?*'.

However, before we can formulate an answer to this question, first we need to better understand the port-city interface. The lion's share of this dissertation, therefore, guides us to better understand the port-city interface. This requires both theoretical as well as empirical work. This dissertation proposes a relational approach to the port-city interface. A relational approach allows us to focus on how the development of port cities is constituted through dynamic actor-relational practices and processes across territorial scales and along different institutionalised structures. By combining the relational approach with causal theory and system theory, we will argue for a relational approach within a flat and deep ontology (chapter 2). This will result in a three-step conceptual framework that operationalizes the relational approach, allowing the researcher to develop a multi-level systematic evolutionary approach. The conceptual framework guides both the empirical as well as the analytical part of this dissertation research. In step 1, we analytically stop time to identify and visualize the relational geometry. The relational geometry is a crystallization of the structural capacities of and interactive power relations between local and non-local actors, tangible and intangible assets, and formal and informal institutional structures. Step 2 focuses on the causal mechanisms that explain the existing relational geometry. This part of the research is based on the core of this dissertation, namely our analytical framework that is capable of detecting and analysing the coupling mechanisms and their different forms. We identify three emergent coupling mechanisms: tactical, strategic and structural. Tactical coupling deals with tactics and is characterized in general by an explanatory 'nature.' In other words, it explores the possibilities. Strategic coupling deals with relational processes that create more enduring outcomes or effects. Structural coupling is the most fundamental coupling. While tactical and strategic coupling are wholly controlled by the participating actors, structural coupling is not. Hence, while tactics are instrumental to profound strategies articulated in deliberate collective actions and governance, eventually these can result in more fundamental emergent effects. Structural couplings occur if a system presupposes certain features of its environment on an on-going basis and structurally relies on them. For all these three coupling mechanisms, we appoint three forms: discursive, physical/material and institutional. Step 2 distinguishes the causal processes from the less-relevant background conditions. Based on this, we can move to step 3, in which we analyse the emergent powers that are enabling the coupling mechanisms and, in the end, explain how actors possessed agency.

Our empirical work focusses on five port-city interfaces in the port-cities of Amsterdam (The Netherlands) and Ghent (Belgium). In both Amsterdam (chapter 4) and Ghent (chapter 5) we focus on the steel manufacturing sector and the biobased sector, while in Ghent we also focus on the car manufacturing sector. We chose Amsterdam and Ghent because they feature these three different economic sectors, and because we are particularly interested in, and in search of, the port-city interface of manufacturing economies, in light of the ongoing 'industrial renaissance'. Within The Netherlands and Belgium, both Amsterdam and Ghent are particularly interesting as they have a rather industrialized maritime economy on one hand and a well-developed urban economy on the other hand, heightening the chances of finding and examining the port-city interface.

Our first step has been applied to all five intrinsic case studies. In order to make this possible, we have developed a database model and a visualization methodology capable of identifying and visualizing the relational geometry of the port-city interface. The results show a great diversity and demonstrate that every port-city interface is unique, as juxtaposed with the Anyport (-city interface) Model. All five case studies are good examples of the reciprocal glocal interplay between global economic production networks; regulations and settings; and local and regional network relations. Following analytical limitations only for the biobased sector, we performed the second and third step of our conceptual framework. Indeed, a critical point is that the further back in time, the less likely it is that a polyphony of 'voices' can be found. That is because people make career changes, become more selective in their memories or simply have passed away, and hence a satisfying reconstruction of the causal coupling mechanisms and the analysis of agency is more difficult to achieve. Following that the biobased sector in both Amsterdam and Ghent is relatively recent, these two case studies demonstrate the value of our approach. The cases show whether the structural coupling of the biobased sector becomes gradually discursively, physically/materially and institutionally reflected. This approach also demonstrates how and when both public and private actors possessed agency and were able to influence and construct the development agenda of the port-city interface.

Next to performing our step 3, we will answer the research question '*How to understand the port-city interface?*' (chapter 6). Hereby we reflect on all our five case studies. We will explain that only two of our five case studies can be regarded as a port-city interface in accordance to our proposition, and briefly explain this in more detail.

Eventually, in our conclusion chapter 7 we will answer our main research question 'How to plan the port city?'. We will argue that, in reference to the simultaneously globalization and localisation, the port-city interface is more important than ever, and that both the port authorities as well as the urban governments should recognize this. We will explain that the port-city interface should not be governed to maintain and prevent the conflict between port and urban land use, but should, in contrast, be of high added value for both the urban and maritime economy in light of its social and economic growth. However, before planning policy is capable of doing this, our results show foremost that the existence of a port-city interface differs not only between port cities, but also within port cities. In other words, knowing if a port-city interface exists within a certain port city requires detailed quantitative and qualitative research capable of understanding and analysing the structural and strategic conditions per port city and per economic sector to be taken into consideration.

Samenvatting

Zeehavens hebben historisch gezien altijd een sleutelrol gespeeld in de economische ontwikkeling van hun (stedelijke) omgeving en regio's. Echter sinds de tweede helft van de 20ste eeuw staat de historische nauwe band tussen stad en haven sterk onder druk. Traditionele havenfuncties zoals goederenoverslag of scheepsbouw zijn verdwenen of verhuisden weg van hun stedelijke locatie naar beter bereikbare gebieden stroomafwaarts of naar het hinterland. Dit zorgde ervoor dat havens en steden niet alleen ruimtelijk, maar ook meer en meer sociaal, cultureel en institutioneel uit elkaar groeiden. Deze evolutie is mede een gevolg van de groeiende globalisatie van de economie en de daaraan gelinkte stijgende handels- en kapitaalvolumes. Deze toenemende globalisatie is gedirigeerd door toenemende regelgevende globale structuren zoals de Europese Unie. Echter, naast deze globalisatie van de economie, werd de economie ook toenemend lokaal en regionaal. Dit komt omdat meer en meer de economische groei en het concurrentievermogen bepaald wordt in hoeverre succesvolle economische clusters zich ontwikkelen en hoe deze kunnen concurreren op globaal niveau. Kortom, naast globalisatie is er even sterk een gerelateerde lokalisatie gebeurd van de economie, een glokalisatie of een regionale wereld dus.

In de havenstadliteratuur is vooral het globale verhaal leidend. Meer zelfs, het concept van het raakvlak tussen haven en stad (eng.: Port-city interface) kent zijn oorsprong precies in de observatie dat de haven- en stedelijk economie uit elkaar aan het groeien waren ten gevolge van de globalisatie effecten. Ruimtelijk gezien waren deze effecten duidelijk merkbaar in vele havensteden door de braakliggende zogenaamde 'waterfront' gebieden, de gebieden dus waar de voormalige arbeidsintensieve havenactiviteiten gesitueerd waren en in stijgend tempo wegtrokken. Algauw werden deze braakliggende gebieden in havensteden rondom de wereld snel een favoriet aandachtspunt voor residentiële en urbane vastgoedontwikkelaars gezien hun centrale ligging.

Het bekijken van de havenstad interface op vlak van landgebruik en functies is echter een incompleet beeld van de havenstad interface. De havenstad interface is namelijk in de eerste plaats een interactief economisch systeem bestaande uit regionaal verankerde globaal concurrerende economische netwerken. Vertrekkende vanuit deze propositie, argumenteren we in deze dissertatie dat men daarom ook rekening moet houden met de bestaande positieve en negatieve feedback mechanismes die zich constant manifesteren tussen de lokale/regionale/nationale/internationale maritieme en urbane economische processen. Dergelijke interacties gaan (ver) voorbij de louter administratieve of landgebruik grenzen van stad en haven. De havenstad is namelijk een open systeem waarbij niet enkel intern, maar ook vanuit en naartoe verschillende koppelingsprocessen zich manifesteren op verschillende niveaus, van het lokale tot het globale.

Dit creëert een uitdaging voor het plannen van de havenstad. Enerzijds zijn economische activiteiten toenemend globaal geworden, anderzijds is het succes van dit net afhankelijk van hoe goed de lokale en regionale economische clusters presteren en zich innovatief blijven ontwikkelen. De hoofdvraag van deze dissertatie is daarom: '*Hoe moet men de havenstad plannen?*'.

Echter vooraleer we een antwoord hierop formuleren, moeten we in de eerste plaats beter de havenstad interface begrijpen. Het leeuwendeel van dit onderzoek probeert daarom een antwoord te vinden op de vraag: '*Hoe moeten we de havenstad interface begrijpen?*'. Om dit te doen, hebben we zowel theoretisch als empirisch onderzoek nodig. Theoretisch en methodologisch stelt deze dissertatie voor om een relationele aanpak toe te passen op de havenstad interface. Een relationele aanpak is het best geplaatst om te achterhalen hoe de ontwikkelingsagenda van havenstad interface wordt vormgegeven vanuit verschillende dynamische actor-relationele processen, dit binnen verschillende institutionele niveaus. In het theoretische hoofdstuk 2 zullen we daarom de relationele aanpak combineren met systeem theorie en met causale theorie. Dit leidt tot een vlakke en diepe ontologie. Het theoretische hoofdstuk eindigt met ons conceptueel kader dat ons empirisch onderzoek zal structureren. Dit conceptuele kader bestaat uit drie stappen. In stap 1 stoppen we analytisch de tijd en identificeren en visualiseren we de relationele geometrie van de havenstad interface. De relationele geometrie is de kristallisatie van de structurele capaciteiten en interactieve machtsrelaties die bestaan tussen lokale en niet-lokale actoren, materiële en immateriële activa, en formele en informele institutionele structuren. Stap 2 gaat de diepte in en gaat na wat nu precies de causale mechanismes zijn die de geobserveerde de relationele geometrie in stap 1 verklaren. Deze stap 2 is gestructureerd volgens de kern van dit doctoraat, namelijk ons analytisch kader. Het analytisch kader legt uit hoe we emergente causale processen en hun verschillende vormen kunnen onderscheiden en analyseren in referentie tot elkaar. Eens dit duidelijk is, gaan we over tot stap 3. In stap 3 gaan we na hoe de causale mechanismes zijn ontstaan. Hierbij kijken we vooral naar de verantwoordelijke actoren en omstandigheden. Hier gaan we vooral na hoe het komt dat de relevante actoren in staat waren de nodige koppelingsmechanismen te laten gebeuren. Het begrijpen van het hoe en waarom is relevant om mee te nemen naar de planningspraktijk van de havenstad.

Het empirisch werk concentreert zich op vijf havenstad interface casestudies in de havensteden Amsterdam (Nederland) en Gent (België). Zowel in Amsterdam (hoofdstuk 4) als in Gent (hoofdstuk 5) focussen we op de staal- en de biobased sector, terwijl we in Gent ook focussen op de automotive sector. Amsterdam en Gent, maar ook deze drie verschillende economische sectoren, zijn gekozen omdat we in het bijzonder geïnteresseerd zijn in en op zoek zijn naar de havenstad interface van industriële economieën. Binnen Nederland en België zijn vooral Amsterdam en Gent interessant omdat ze enerzijds een vrij geïndustrialiseerde maritieme economie hebben en anderzijds een goed ontwikkelde stedelijke economie, waardoor de kansen om de havenstad interface te vinden en te onderzoeken toenemen.

Stap 1 is toegepast op alle vijf de intrinsieke casestudies. Om dit mogelijk te maken, ontwikkelden we een databasemodel en een visualisatiemethodologie waarmee de relationele geometrie van de havenstad interface kan worden geïdentificeerd en gevisualiseerd. De resultaten laten een grote diversiteit zien en tonen aan dat elke havenstad interface uniek is, dit in tegenstelling met het Anyport(-city interface) model. Alle vijf de cases zijn goede voorbeelden van de wederkerige 'glocal' wisselwerking tussen globale economische reglementeringen en productie-netwerken en lokale en regionale cluster netwerken.

Wegens analytische beperkingen hebben we alleen voor de biobased sector stap 2 en stap 3 van ons conceptuele kader uitgevoerd. De reden is immers dat hoe verder terug in de tijd, hoe minder waarschijnlijk het is dat er een polyfonie van stemmen kan worden gevonden, omdat mensen van carrière veranderen, selectiever worden in hun geheugen of zijn overleden, en waardoor vervolgens dus een tevredenstellende reconstructie van de causale koppelmechanismen en de analyse van macht niet kan worden bereikt. Doordat de biobased sector in zowel Amsterdam als Gent relatief recent is, tonen deze twee casestudies de waarde van onze relationele aanpak aan. De cases laten zien hoe, of hoe niet, de structurele koppeling van de biobased sector geleidelijk discursief, fysisch/materieel en institutioneel wordt vertaald. Het laat ook zien hoe en wanneer zowel publieke als private actoren macht bezaten en in staat waren om de ontwikkelingsagenda van de havenstad interface te beïnvloeden en te bepalen.

Terwijl we eerst stap 3 uitvoeren, formuleren we in het discussiehoofdstuk 6 op basis van ons empirisch onderzoek een antwoord op de vraag: '*Hoe moeten we de havenstad interface begrijpen?*'. Hierbij reflecteren we op de vijf casestudies. We zullen uitleggen dat enkel twee van de vijf kunnen gezien worden als een havenstad interface, bekeken als een interactief economisch systeem. Om dit verder uit te leggen, bediscussiëren we de vijf interfaces.

Uiteindelijk is het mogelijk om in ons concluderend hoofdstuk 7 een antwoord te formuleren op onze hoofdvraag '*Hoe moet men de havenstad plannen?*'. Gebaseerd op onze resultaten, zullen we argumenteren dat in referentie tot de glokalisatie van de regionale havenstad economie, de havenstad interface belangrijker is en dat zowel de havenautoriteit als de stedelijke beleidsmakers dit moeten onderkennen. Dit betekent dat de havenstad interface niet moet gepland worden om het (landgebruik) conflict tussen haven en stad te beheersen, maar net in tegenstelling in de wisselwerking grote kansen liggen om zowel het sociale als economische functioneren van de maritieme als stedelijke economie te verbeteren. Maar wat vooral belangrijk is, is dat vooraleer beleidsmakers specifieke beleidsmaatregelen kunnen formuleren hiervoor, men vooral eerst moet beseffen dat er niet een maar meerdere havenstad interfaces bestaan, dat deze uniek zijn en dat het begrijpen van dit inhoudt dat men kennis heeft van de relevante actoren en omstandigheden.

CHAPTER 1

Introduction

"Make trade, not war, Mr President"

(Tweet from European President Donald Tusk (@eucopresident) to American President Donald Trump (@realDonaldTrump); 14 March 2018)

1.1

Introduction

This tweet from European president Donald Tusk came as a reaction to the announcement of American president Donald Trump on the 1st of March, 2018, to put import tariffs of 25% and 10% on the import of steel and aluminium respectively. Trump argued that, because of unfair foreign competition, steel imported to the USA was too cheap and therefore threatened thousands of jobs in the American steel sector, caused negative trade balances between the USA and the EU, Canada, Mexico and China, amongst others, and put the national security of the USA in 'danger'[1] (Restuccia & Behsudi, 2018).

The announcement of the American president was directly met with concerns by the management of TATA Steel Ijmuiden (see chapter 4), Netherlands' largest steel mill, and by the management of ArcelorMittal Ghent (see chapter 5), the largest steel mill in Belgium. In a newspaper article on the 2nd of March, TATA Steel Ijmuiden director Theo Henrar argued that the possible import tariffs would be very harmful for his steel mill because it exports half a billion euros of steel to the USA annually (De Waard, 2018). Moreover, many of the exported steel types are innovative in terms of strength and lightness and, following their patents, can only be produced in Ijmuiden. These types of steel are used by American companies such as Crown or Ardagh to produce packages for the food sector. Hence, opposite of what the American government argues, the USA is the highest profit-making export market for TATA Steel Europe, and that steel is not dumped; quite the contrary (De Waard, 2018; Koot, 2018).

These two opposite arguments led to a chain of reactions. As explained in the interview, Theo Henrar called Dutch minister of economy Kaag and Prime Minister Rutte with his concerns. He also said he would meet American ambassador in The Netherlands Pete Hoekstra on Monday, the 5th of March, to prevent these import tariffs from being implemented (De Waard, 2018). Similarly, in Belgium, Flemish minister president Geert Bourgeois and Belgian prime minister Charles Michel stated on the 2nd of March that the import tariffs would seriously harm the Flemish and Belgian economies, (cf. in particular steel mill ArcelorMittal Ghent) and they insisted that the European Commission should react appropriately (Knack, 2018). Therefore, also on the 2nd of March, European commission chairman Jean-Claude Juncker stated that the European Union would react strongly (European Commission, 2017b). In the following days and weeks, European Commissioner for Trade Cecilia Malmström first travelled to Washington DC and, on the 10th of March, held a meeting with Japan and the USA in Brussels to convince the USA to alter its policy (European Commission, 2018). In the next days, Europe increased its pressure by publishing a list of counter measures. If import tariffs on steel and aluminium would be implemented, the EU would "hit back" with import tariffs on American products such as Harley-Davidson motorbikes, Kentucky bourbon and bluejeans; not surprisingly, products made in Republican stronghold areas (Eddy & Bray, 2018;

1 By stating that it is for reasons of national security, US law allows that the president solely can impose restrictions.

Oliver, Hanke, & Von der Burchard, 2018). This threat came accompanied by the tweet of EU president Donald Tusk, as shown at the beginning of this chapter. On the 22nd of March, 2018, the European diplomacy efforts – together with those of Canada and Japan, amongst others – led the USA to eventually only temporally implement import tariffs for steel imported from China (around 26% of total steel imported by the USA). The USA and Europe argued that especially China's subsidies to its steel mills are creating low-quality, artificially cheap Chinese steel that is being dumped on foreign markets (Buncombe, Wilts, & Stone, 2018; Restuccia & Behsudi, 2018).

This discussion is and always will be ongoing. However, what does this illustration tell us about the port-city interface, except that the 'America First' message of Donald Trump is more than just a political message? It tells us two things. First, it tells us that the American president apparently (still) has the agency – understood as the capacity to act – to alter and counter (explicitly) the globalization policy that has characterized and formed the social and economic structural spatial-temporal fix or modes of regulation of the current capitalist production system (Brenner, 2004; Jessop, 2002; Sheppard, 2002). On the other hand, it shows neither the director of TATA Steel Ijmuiden or ArcelorMittal Ghent, nor the particular port authorities, mayors or the Flemish, Belgian on Dutch (prime) minister have the agency to counter the USA. Instead, the European Commission or president, since the establishment of European Coal and Steel Community (ECSC) (Schuman, 1950), is positioned best to fulfil this task.

Second, the illustration on the one hand shows us how the economy is not a rational truth or exact science, but foremost a social construct. On the other hand, and related to the former,it shows the (geo)political and economic importance of the manufacturing industry – in this case, the steel manufacturing industry. Although making 'basic' steel can be performed almost all over the world by now, the steel sector is highly competitive in search of lighter and stronger types of steel (Lemmens, 2017), as well as environmental efficiency. The necessity of the USA to import these innovative steel types, and its incapability to research and develop these on its own, led to the argument that its national security is threatened on the long term (Restuccia & Behsudi, 2018). Thus – although steel is traded, regulated and produced on a global level within different global production networks (cf. Dicken, Kelly, Olds, & Yeung, 2001) – its competitiveness is largely determined on a regional or local scale (cf. patented steel types TATA Steel Ijmuiden). Indeed, the world became 'regionalized' and regional economies increasingly compete with each other (cf. Storper, 1997). This claim is backed up by the extensive literature on clusters, cluster/industry lifecycles, industrial districts, (territorial) innovation etc. (Bathelt, Malmberg, & Maskell, 2004; Lagendijk, 2006; Moulaert & Sekia, 2003). In other words, even for the largest corporate companies, innovation (cf. Schumpeter, 2003 [1943]) is achieved within regional networks of local and non-local actors, tangible and intangible assets, and formal and informal institutional structures (Boschma, 2005; Frenken, 2006; Yeung, 2005). Due to the regional, national and international importance of the manufacturing industry, in 2014 the European Commission called all its member states to an 'Industrial Renaissance'[2], urging them to recognize the importance of the industrial sector for the performance

2 A.k.a. the Third Industrial Revolution (Rifkin, 2011) or the Fourth one (WEF, 2016).

of its overall economy (Ronse & Van de Cloot, 2017) and to raise the average industry's share in Europe's GDP to 20%, which was around 15% in 2014 (European Commission, 2014).

Summarized, on one hand, the economy became increasingly global in scope[3]. On the other hand economic activities and its governance (Harvey, 1989b) became increasingly local and regional, thus creating a regional world (cf. Storper, 1997). This twin process is better known as 'glocalisation' whereby institutional regulating arrangements shifted from the national scale both upwards to international scales (cf. agency of the EU) and downwards to the scale of the local or regional configuration, redrawing institutional landscapes (Martin, 2005 [2000]). On the other hand, economic activities became simultaneously more localised/regionalized (cf. regional world) and transnational (Brenner, 2004; Swyngedouw, 2004), the latter due to increasing influence of the global corporate world (Taylor, 2016). This glocal process explains why a decision made in Washington DC has a direct influence on the economy of Ghent or Amsterdam, and why subsequently these (local) economic actors and politicians couple 'back up' to their political representatives, in turn coupling back up to the European level. In the (socio)economy, there is thus 'no truth', 'rational' (in terms of production standards) or 'free market' (in terms of innovation, for example). All these are decided and changed in a continuous game of powers. This game is never ending but, in reference to glocalisation, increasingly played on the highest institutional levels, interfering with the increasing globalized corporate powers. These create the 'playing field' (what is referred to as globalization) in which regional economies compete with each other and, through their different couplings, ultimately try to change the playing field in their favour.

This has far-reaching consequences for the realm of the local and regional economy and its planning today. Indeed, no matter how 'innovative' or 'sustainable' a regional economy or industry is or strives to become, if national or (most likely) global regulations change (cf. discussion regarding the Paris Agreement 2020) (van Bueren & ten Heuvelhof, 2005), particular markets are closed (cf. import tariffs), commodity or fuel prices fluctuate (cf. American soybeans or shale gas), or foreign (state owned) companies or venture capital holdings perform a strategic acquisition of (foreign) regional/national leading firms in order to copy and paste its R&D or split it and make short term financial gains respectively (cf. Unilever), a regional/national economy which is built on a long time of innovation, embeddedness and other local geographical economic factors, can be hurt or even destroyed in a very short time. On the other hand, if a region is not able to innovate and remain competitive (cf. regional world), it jeopardizes its future. Hence, exactly this contradiction and potential conflict between the global and local level implies a challenge for regional economic development.

Therefore, in this dissertation we will focus on the port-city interface. Indeed, considering the increased relevance of industrial/manufacturing innovation, R&D and performance for regional, national and international competing economies, as well as the (global) interwoven institutional levels, trade and transport networks, and corporate powers at work, the port-city interface is arguably a

3 World exports of manufactured goods (e.g. machinery, fuels, and agricultural goods) increased from 8 to 11 trillion US dollar between 2006 and 2016 (WTO, 2018).

well-chosen research subject. There are not many places where all these factors and power relations (geographically and conceptually) come together. However, the consequences of glocalisation for the economic port-city interface are little recognized and, consequently, not being considered in the policy of the port-city interface.

1.2

The port-city interface and problem statement

As a concept, the port-city interface is over three decades old and was introduced during the 1980s to understand contemporary transformations at the urban waterfront. It was based upon the observation that port and urban economies had become increasingly disconnected (Hayuth, 1982). The introduction of the concept (e.g. the port-city interface model by Hoyle (1989)) at the time built upon earlier conceptions within geographical literature on the evolution of ports; most notably James Bird's classical Anyport Model (1963). It deviated from studies that addressed the role of port cities as transport gateways and trading hubs in shaping urban fortunes (for an overview see Ng et al., 2014). As containerization and automation decreased demand for manual labour, and as port-industrial activities increasingly became incompatible with inner-city waterfront locations, a disruption was identified in a once symbiotic relationship. This manifested itself in the interface of ports and cities. Indeed, the port-city interface became a developers' window of opportunity for urban renewal, arguably starting in Baltimore (Harvey, 1989a) and Boston (Bruttomesso, 1993) and having subsequently its resonances in New York, London (Fainstein, 1994) and other parts of the world (Norcliffe, 1981).

Waterfront redevelopment became a real planning concern in many places across the world (Hein, 2013). However, transport and economic geographers formulated a critique to this 'dual' and 'universal' (cf. any port) biased view on port cities and called for a reconnection between port geography and (urban) economic geography (see Ducruet, 2011; Hall & Hesse, 2012; Hall & Jacobs, 2012). The critique is at least fourfold. Firstly, although warehouses and transhipment quays became obsolete in city cores, this did not at all imply an end of distribution and trade activity. Large-scale warehouses moved to greenfield locations in the hinterland of port cities, while cargo handling terminals moved to sites with blue-water access, rescaling the port-city interface to the region, yet with major cargo handling still moving through primary ports (Notteboom & Rodrigue, 2005).

Secondly, much of the policy discourse and academic studies have focussed on only one element of the interface, namely the "geographical [...] area of transition between port land uses and urban land uses', more known as the 'waterfront'" (Hoyle, 1989, p. 429). This (urbanist) view on the waterfront can in this regard be seen as an example of 'a parochial view'. By applying such perspective, one ignores that the port-city interface is "an interactive economic system" (Hoyle, 1989, p. 429). This perspective is 'holistic', one could argue. Indeed, there is no separate cultural, social, political, economic or institutional port-city interface. These different aspects are at all tiime interrelated, they condition the system and at the same time are conditioned by the system. Understanding thus the port-city interface as such implies the existence of positive and negative feedback loops between local/regional/(inter)national broad understood port activities, urban activities and their embeddedness within local and regional areas. These interactions transcend administrative boundaries and the use of land (cf. OECD, 2014; Slack, 1989).

Defining the port-city interface purely in terms of (in-)compatible land uses fails to account for how, for example, specialized business services in the city connect with port and shipping operations through all kinds of transactions, e.g. finance, risk management, etc. (Jacobs, Ducruet, & De Langen, 2010; Zhao, Xu, Wall, & Stavropoulos, 2017), and how entrepreneurship and start-ups related to maritime activity are facilitated by dynamic urbanization externalities (Hall & Jacobs, 2012; Witte, Slack, Keesman, Jugie, & Wiegmans, 2017).

Thirdly, one needs to take into account how innovations redefine the way logistics and production networks are organised and how these impact upon globalized metropolitan regions (Beyers & Fowler, 2012; Hall, 2009; O'Connor, Derudder, & Witlox, 2016). Hence, increasingly localised and regional economies' competitive strength is partly determined by their R&D, which, related to academic universities or (semi-)public science parks, tend to be of urban character (Norcliffe, 1981).

These three points are congruent to a fourth, more general critique, which concerns the lack of theoretical and empirical understanding within the studies on the port-city interface of how actors possess agency capable of coupling the various logics that drive both port and urban development into effective policy and planning (Jacobs & Lagendijk, 2014; Jacobs & Notteboom, 2011).

In light of the illustration in our introduction, these four critiques bring us to our main problem statement: namely, that the port-city interface literature is not capable of explaining local or regional development with a rich understanding of the wider (economic, political, social) environment (Bhaskar, 2008 [1975]; Harvey & Reed, 1997; Sayer, 2000), for example ('macro') market forces (Lagendijk, 2006; Lagendijk & Pijpers, 2013).

This leads to the following proposition: if we accept that the port-city interface is an interactive economic system, we are required to take into account the various coupling mechanisms creating different (inter-)relationships within, without and towards this system. More specifically, we need to accept that particular forms of coordination and relational ties with a stake in the port-city interface operate and are articulated at various spatial levels of aggregation, from the local to the global. Consequently, every port-city interface is unique, as juxtaposed with the Anyport (-city interface) Model (cf. Hall & Jacobs, 2012).

This dissertation proposes a relational approach to the port-city interface. A relational approach allows us to focus on how the development of port cities is constituted through dynamic actor-relational practices and processes across territorial scales and along different institutionalised structures (cf. Storper, 1997).

1.3

Research objectives and outline of the book

This dissertation aspires to contribute to the study and planning of the port-city interface. In this light, our main research question is: *How to plan the port city?*.

Answering this question requires both theoretical and empirical work. First, the objective of chapter 2 is to make a theoretical contribution to the relational approach. By combining the relational approach with system theory and causal theory, we will argue for a relational approach within a flat and deep ontology. For our theoretical chapter, the main research question is: *What theories and concepts can help us to apply a relational approach?*. Central concepts here are the relational geometry, emergence and causal coupling mechanisms. The theoretical chapter will present the core of this dissertation, namely our analytical framework capable of analysing the different emergent coupling mechanisms and their different forms. It ends with our 3-step conceptual framework.

Second, before we can apply a relational approach on our case studies, we have to be able to apply the relational approach to the port-city interface. Hence, for our methodological chapter 3, the research question is: *How to operationalize the relational approach?.* We will combine extensive and intensive research methods, allowing us to align our research methodology with the ontological and epistemological premises of the conceptual framework. Step 1 explains how to operationalize the relational geometry. For this, we will propose a methodology and database model capable of visualizing the relational geometry of the port-city interface of a particular economic sector. Step 2 operationalizes our analytical framework and makes it possible to identify and analyse the different causal coupling mechanisms. Building further on step 1 and step 2, step 3 explains how one can analyse how actors possess agency capable of (re-)formulating policy agendas.

The lion's share of this dissertation is the empirical work. We apply our conceptual framework on five case studies in two port cities, namely Amsterdam (The Netherlands) and Ghent (Belgium). We have chosen Amsterdam and Ghent for several reasons. First, of all ports in Belgium and The Netherlands, both Amsterdam's and Ghent's shares of added value are relatively more industrial (Figure 1.1). Zeeland Seaports (which is since the beginning of January 2018 merged with the Port of Ghent into the North Sea Port – see chapter 5) has a more industrial profile, but because it is a combination of the ports of Flushing and Terneuzen, it lacks an important host city, at least in comparison with Amsterdam and Ghent.

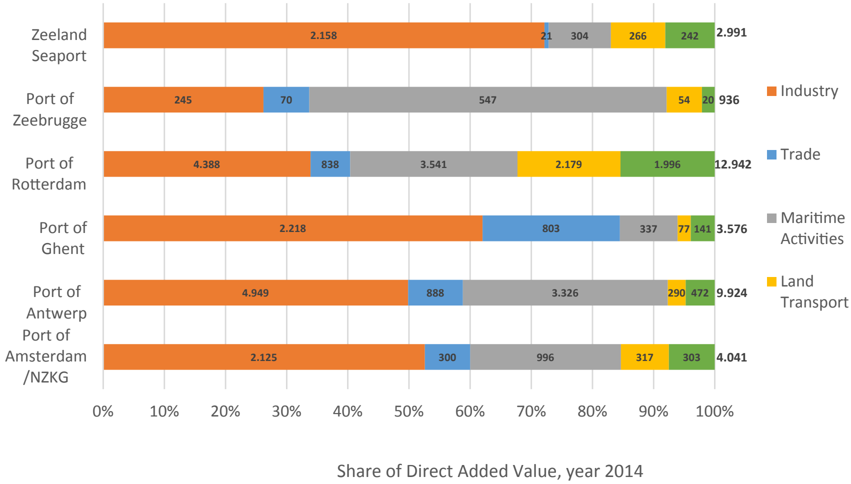


Figure 1.1 The shares of value added by activity for ports in the Eurodelta, year 2014. Own calculations based on (Merckx & Neyts, 2015; RHV, 2015; Van Gastel, 2016).

In search of the port-city interface, understood thus as an interactive economic system (Hoyle, 1989, p. 429), our hypothesis is that the chance of finding and analysing the port-city interface, in regard to the problem statements formulated before, is higher for both Amsterdam and Ghent, due to the relative balance (at least at first sight, as we will explain) between port and city (cf. Ducruet & Lee, 2006). Next, both have a similar urban and governance structure. They have a well-established urban region, and both the port authorities of Amsterdam and Ghent have a landlord governance model with a corporatized structure in which the city of Amsterdam and the city of Ghent each act as the sole or most important shareholder (Havenbedrijf Amsterdam NV, 2017; Havenbedrijf Gent NV, 2017a). In both Amsterdam (chapter 4) and Ghent (chapter 5) we will analyse the steel manufacturing and biobased sector, and the car manufacturing sector in Ghent, as well.

After our theoretical, methodological and empirical part, we move to the second part of this dissertation: the discussion and conclusion. However, before we can answer our main research question, and in reference of our fourth critique, first we have to understand how the development agenda of the port-city interface is being formed. Therefore, in our discussion chapter 6, the first research question is: *How do actors possess agency to influence and construct the development agenda of the port-city interface?*. This research question will be based on the empirical research of our biobased case studies in Amsterdam and Ghent.

Next, in the discussion chapter we will couple back to our proposition stating that the port-city interface is an interactive economic system. The research question hereby is: *How to understand the port-city interface?* To critically answer this question, we will take all our case studies into account and reflect upon these.

In our conclusion, chapter 7, we will first reflect on the theoretical and methodological approach and on our empirical work. After this, we will answer our main research question.

To summarize our 'itinerary' of research questions, Figure 1.2 presents the research framework and structure of this dissertation.

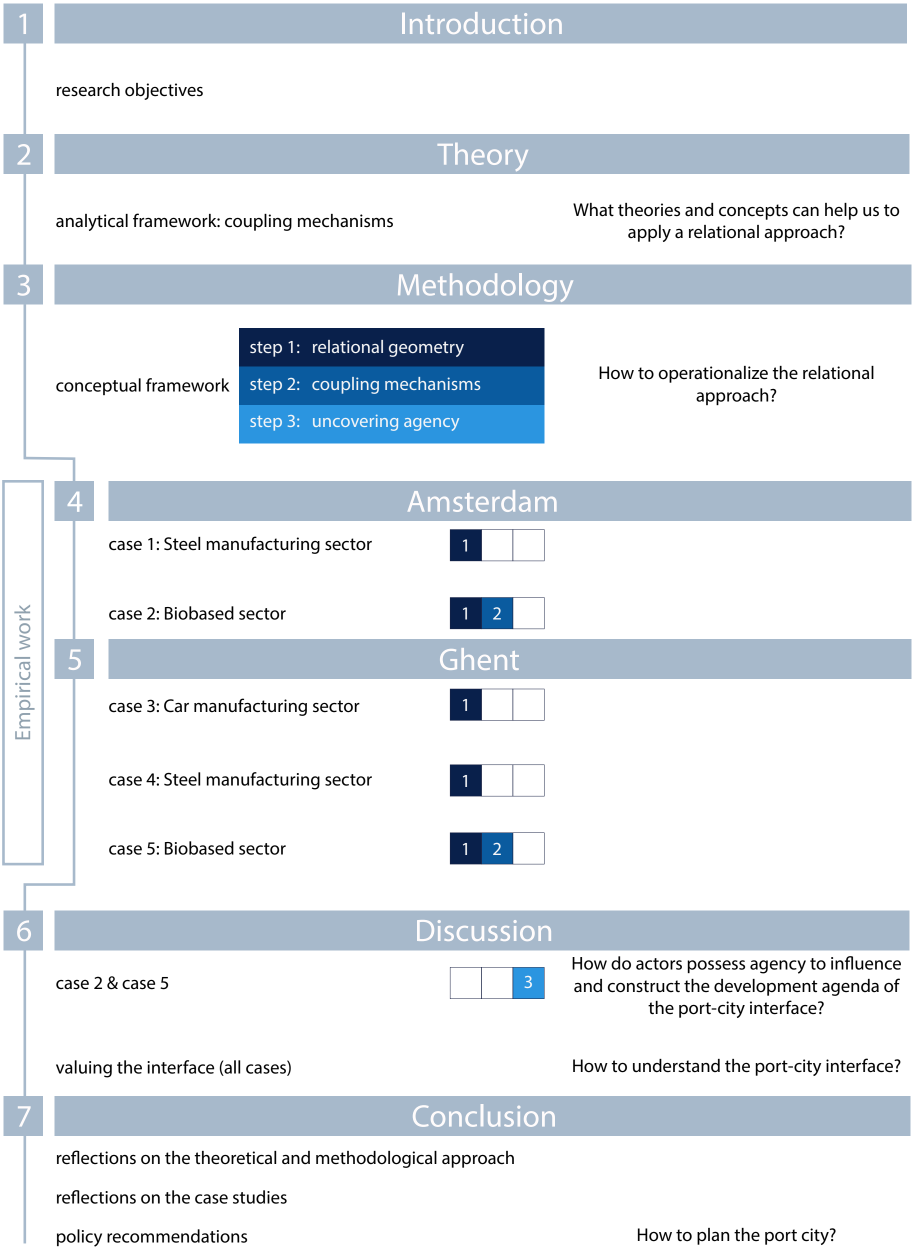


Figure 1.2 Research framework and structure of this dissertation.

CHAPTER 2

Coupling Mechanisms

"If we recognize that theories themselves are tools for specific purposes, progress in these fields will come from making relational theories more specific in terms of the questions they ask and the answers they provide. This is to argue not for a piecemeal approach, but for the need to develop theory that is more problem driven and focused on identifying causal economic mechanisms and processes."

(Sunley, 2008, p. 20)

In this chapter, we look at theories and concepts that will help us to understand the negative and positive causal feedback loops between port activity and the wider urban-economy, explaining the existence of the port-city interface. This requires that we focus on the existing dynamic and manifold of relations, but also that we take into account the particular institutional and economic context.
Such perception gives us a starting point to examine how actors gain agency and how the development agenda of the port-city interface is constructed.

This chapter is structured as follows: In the first section, 2.1, a brief overview is given of the origins of the relational approach. In the second section, 2.2, we critically assess the relational approach and highlight the pitfalls of it, while arguing for a relational approach following a flat and deep ontology (2.3). Next, we briefly focus on agency, section 2.4, laying the ground for our final section, 2.5, in which we develop our analytical framework focussing on emerging coupling mechanisms.

2.1

The origin of the relational approach

Within geography, arguably, one can distinguish several approaches that altered our perspective of space and influenced how we research. Following Bathelt and Glückler (2003) and Paasi (2010), we distinguish landscape research, spatial science and the relational turn. Before we start, we want to stress that such classifications are always wrong, arbitrary and subject to rejection and discussion (Scott, 2000). The common rationalist assumption is that scientific knowledge is, or ought to be, characterized by a trajectory of progress leading steadily onward to ever more accurate representations of reality. However, many scholars have stressed that knowledge is socially situated and immanent (Barnes, 1996; Latour, 1991). History cannot be read structurally because we inevitably project our own consciousness onto the past (Foucault, 1972 [1969]). Hence, a classification can be made by an internal commentator, benchmarking the structure of a given discipline against a particular set of (mostly the commentator's) research activities. Another viewpoint is the one of the observer outside the discipline, interested to see how the particular discipline matches with some abstract normative epistemology. Obviously, these two viewpoints often overlap. This paragraph is structured along the transitions that occurred between the three mentioned mainstreams (Bathelt & Glückler, 2003).

First, following the increasing application of mathematics, the older holistic 'traditional' landscape research moved towards spatial science (Bathelt & Glückler, 2003). Landscape research was criticized for its lack of a sound epistemological basis and for having a largely ideographic, descriptive, holistic, and naturalistic program. Therefore, following the works of, for example, Haggett, Cliff, and Frey (1965), a new paradigm was developed within geography in the 1950s and 1960s: spatial science (Cox, 2014), also known as 'the quantitative revolution' (Barnes, 2001; Bird, 1989). In this paradigm, on the one hand the mere description was replaced by analytic explanation and on the other hand the naturalistic conception of space as a particular landscape was replaced by an abstract conception of space as a formal geometry (Bathelt & Glückler, 2003). Geography during this epoch 'returned' to an Enlightenment view, using positivist methodologies in order to seek

certainties and foundations (Hubbard & Kitchin, 2010; Murdoch, 2006). Referring back to earlier contributions of the theorization and conceptualization of locational patterns of Weber, Von Thunen or Christaller (cf. Berry, 1964a), the main goal during the epoch of spatial science is/was to calculate and measure the factors that explain location patterns and movement patterns (Murdoch, 2006).
As explained by Haggett et al. (1965), depending on the case study, a researcher should apply different techniques (Bennet, 2009, p. 306). Especially the work of Walter Isard (1956) contributed to the popularity of the new discipline of spatial science (Bennet, 2009; Bunge, 1966). Hence, going from deduction to induction, while using the point of view of the 'homo economicus', the goal of spatial science was to develop abstract universal models applicable to all kinds of case studies (Bathelt & Glückler, 2003). In a reciprocal way, these case studies were used to improve the abstract models. As such, one believed that every new observation brought us closer to understanding reality, echoing Locks, Humes and Berkeley's paradigm of empiricism.

This transition from landscape research to spatial science changed our idea of the region. Within landscape research, the region is seen as a construct. This implies that, in order to understand the region, one has to search for formal/homogeneous ('natural' or 'geographical') regions (Paasi, 2010). Examples of these are 'the coastal region', based on the littoral zone (Van den Berghe & De Sutter, 2014b), or 'climate zones', such as the Köppen climate classification. Once constructed, these regions were represented by scholars as bounded, contiguous entities, divided into smaller regions, or as part of larger units. Such approach holds a strong deterministic perspective, implying one does not know the end result before the research starts. In other words, one creates the region through the process of research (Bathelt & Glückler, 2003). For many today, this approach is still a synonym for geography, at least for physical geography (Bennet, 2009).

Following the transition towards spatial science, the perception of the region being a construct shifted toward the perception of the region as a 'given'. This perspective emerged along with the broader upcoming of applied research, influencing geography in many ways, not the least of which was economic geography (Scott, 1998). The rise of applied research was amplified by the demand for applied research and, due to institutional arrangements such as the 'Europe of regions', translated into statistical areas (NUTS) (Paasi, 2010). Hence, research was no longer concerned with the construction of the region as a result, but started from the region as a given. Nonetheless, in this case, the region (e.g. statistical areas) is also constructed by someone for some reason; the region as a spatial frame for research is not questioned and plays only second fiddle.

During the 1980s and 1990s, the quantitative revolution was revived. Following the work of economist Krugman (1991), the so-called 'Geographical Turn' occurred within economics, 'discovering' geography (Fujita, Krugman, Venables, & Fujita, 1999). As argued by Boschma and Frenken (2006), the latter 'turn' fits within the regional science tradition of geography in which the region is a given (cf. Berry, 1964b; Haggett et al., 1965). Hereby, one starts from the neoclassical assumptions of utility maximization and the 'representative agent' (cf. homo economicus), with model conclusions derived from equilibrium analysis, similar to neoclassical economics (Fujita et al., 1999; Krugman, 1991). The ultimate purpose of statistical testing and theory-building is the construction of predictive spatial models (Hubbard & Kitchin, 2010). Later, this turn towards positivist spatial science became best known as New Economic Geography (NEG), 'new regional science' or 'geographical economics' (Brakman, Garretsen, & Van Marrewijk, 2001; Martin, 1999; Peet & Thrift, 2001 [1989]).

Before this revive, during the 1960s, the quantitative revolution was already criticized (Barnes, 2001; Bird, 1989). Moreover, in 1963, when most of geographical research had not yet adapted a more positivist approach, Burton had already claimed that the quantitative revolution within geography was over (Burton, 1963). Others joined him and stated that the end of the quantitative revolution came with the publication of David Harvey's (1969) book *Explanation in Geography* (Bennet, 2009). However, one can state that, until today, a large part of geography remains in the grip of a strong positivist view which seeks certainties and foundations (Hubbard & Kitchin, 2010). As argued by Peter Gould (1979) – while referring to the older book of Richard Hartshorne's *The Nature of Geography*, in which Hartshorne during the 1930s tried to define the subject of the field geography – the epistemology of geography during the quantitative revolution got trapped within naïve realism (Bryant, Srnicek, & Harman, 2011), considering the world to be simply and essentially what it was. Indeed, already during the 1930s, 'godfather' Hartshorne argued that geography should have no truck with change, time, sequence and dynamics. Geography should concern itself with a chronological approach, addressing areal differentiation as it existed at one instant in time (Hartshorne, 1939). In other words, this idea states that geography should connect more to other disciplines as geology, meteorology or physics, following the underlying goal to become a 'real' science itself. Nonetheless, physical geography succeeded best in this move, and the consequences for the field of geography were considerable (Gould, 1979, p. 141). For many, due to this move towards positivism, geography lost its legacy as a real (theoretical) science, only being a net-importer of theories and concepts from other disciplines, without creating them on their own. As a consequence, many universities like Harvard (in 1948), Yale and Stanford skipped human and economic geography out of their curriculums (cf. Smith, 1987), arguing it was not a real, exact science (e.g. physics), nor a theoretical science (e.g. philosophy).

Although critiques on the quantitative revolution are older, perhaps the most profound critique on the quantitative turn is the (as is being coined today) 'relational turn' within geography[4] (cf. Amin & Thrift, 2000; Barnes, 2001; Bird, 1989; Boggs & Rantisi, 2003; Martin, 2005 [2000]; Murdoch, 2006). The 'start' of this relational turn lies, arguably, in the 1980s with the inductive work of Doreen Massey (1978, 1979) on the undemocratic spatial concentration of power in Greater London Authority and the South East of England, and the deductive work of Nigel Thrift (1983; 1981) following ideas from the origin of linguistic and sociological post-

4 The debate between spatial science and relational ideas within geography eventually became 'a debate among deaf' (Martin, 2003). However, an important remark is that this debate among deaf did not occur everywhere and it differs strongly among different countries. Within the Anglo-American world, strong discussions exist between the positivist and relational authors (Berry, 1974; Harvey, 1975). However, in Belgium, for example, the two have come together and co-exist under the name of 'the new orientation geography' (Kesteloot & Saey, 2003; Saey, 1971; van Meeteren, 2016).

structuralist paradigm. First, Doreen Massey, trained as a (positivist) mathematical economic researcher, developed a critique on positivist ideas. Already in the 1970s, she attacked the notion of a completely autonomous, ahistorical, ideology-free location theory (M eegan, 2017). In her paper ‘What sense a regional problem?’ (1979)[5] and her related book ‘Spatial Divisions of Labour’ (1984) Massey highlights the increasing importance of the spatial structures of the production of firms and sectors in which relations of ownership and control are being stretched out over space and conception geographically separated from production (e.g. R&D). All these spatial structures shape uneven development and are constructed and reconstructed over time with rounds of waves of investment, interacting with previous rounds. Investments incorporate social relations of production (e.g. ownership, control, function and status) embodied in spatial structures of production. Hence, it is a geography of power relationships (Meegan, 2017). Therefore, she and her co-authors argued for a fundamental rethinking of the nature of and approach to urban and regional research. In their view, geography had suffered from compartmentalization into economic, social and political geography. This offered an opportunity for contemporary geography to unit again. This uniting should centre around the notion of space, acting as a fundamental, unifying theme for analysing the operation and effects of economic, social and political processes (Massey, Minns, Morrison, & Whitbread, 1976). In this case, research should explore the influence of space on the processes being analysed (Meegan, 2017). In retrospect, Massey’s work, in essence, was one of the first that criticized the dominant naïve realism approach (cf. Bryant et al., 2011) in (economic) geography. In her critique, she increasingly used relational anti-realist post-structural notions on meaning and production of places. Therefore, her work, “transformed the field… and triggered one of the sharpest paradigmatic shifts in contemporary economic geography” (Barnes, Peck, Sheppard, & Tickell, 2007, p. 1).

Second, within three consecutive papers, Thrift (1990, 1991, 1993) attempted to reconstruct ‘traditional regional geography’ to “treat people as agents, places as contexts, and causality as an iterative procession of fast-moving actions and slower-moving structures of interactions” (Thrift, 1991, p. 456). In this sense, Thrift praises the post-structural ideas to let geographers realize that the contemporary conception of people was incomplete. As such, he argues that places have to be seen as sources of identity, and that causality cannot be seen separate from problems (Pred, 1986; Sayer, 1989; Thrift, 2014 [1986]). In these papers, Thrift points out that he has a deep disenchantment with most postmodernist and post-structuralist literature. Although he has respect for those writings, which is illustrated by the attempt he makes to incorporate the ideas within geography, he criticises the overstressing on the “new this, new that, post this, post that, etc.” (Thrift, 1991, p. 457). As he continues, in essence his critique lies on the insertion of ‘locality’ into the debate on postmodernism. By then, and arguably still today, the common idea was that “locality/space = difference = postmodernism” (Thrift, 1991, p. 459). However, as such, subjects, or their reality, are denied, and as such “subjects become, at best, driftwood, surfacing every now and then from rivers of discourse and lakes of textually” (Thrift, 1991, p. 459). Therefore, Thrift (1991) calls for a (in retrospective avant-la-lettre) ‘post-post-structuralism’ within geography. Such an approach combines structuralist, positivist and post-structural elements. In this

5 Foremost this applies to the Anglo-American dominated field of geography. In this respect, Massey’s ideas are similar to the work of the French philosopher Henri Lefebvre (1974 [1991]).

respect, he criticizes that "[t]he 'textual turn has led to far too many rehearsals of arguments which go like: (i) an attack on Cartesian or Cartesian-influenced theory; (ii) some ambitions to 'deconstruction'; (iii) a few allusions to an all-purpose foil like 'the other' and; (iv) a call for 'a politics of difference'. It is all much too safe and antiseptic" (Thrift, 1991, p. 459). As argued by Paasi (2010), what Thrift essentially tried to achieve is the change of perception of the region as 'the region as a given' towards 'the region conditions and is conditioned by politics, culture, economics, governance and power relations'.

2.2

The relational approach in perspective

Subsequently, during the 1990s, 2000s and 2010s, relational approaches became increasingly influential, living up to the statement that economic and human geography was experiencing a 'relational turn' (Lagendijk, 2006; Storper, 1997; Sunley, 2008; Yeung, 2005). As already explained briefly in former paragraph, the relational approach represents the confluence of a number of strong streams of ideas and advocated by many (leading) authors within economic geography, human geography and more recently within spatial planning, as well.

The popularity of the relational approach is illustrated by the numerous (mostly self-claimed) 'turns' or 'new approaches' launched in the last few decades[6]. While all are fully enthusiastic, they often represent superficial attempts to embrace or adapt theoretical thinking from neighbouring social and economic sciences (Jones, 2009; Scott, 2000; Varró & Lagendijk, 2013). Indeed, one of the central problems with these waves or turns is that they often result in a premature ditching of some of the valuable ideas and concepts of earlier approaches (Sunley, 2008), making the relational approach a 'stretched concept' resulting to situations reminiscent of a Babylonian confusion (Hout, 1996; van Meeteren, Poorthuis, Derudder, & Witlox, 2016).

The central issue nourishing the confusion around the relational approach is how one applies the term 'relational', understood as 'pragmatic' or merely 'philosophical'. The former stems from economic sociology, while the latter is linked to post-structuralism (Sunley, 2008).

First, within economic sociology, the work of Granovetter (1985) can arguably be seen as the starting point. He argued that social networks (friendship, trust, goodwill) sustain economic relations and institutions. Hereby, for the first time, a difference was made between informal 'arm's length'-relations and more embedded relations that are used to transfer knowledge and learning across a firm's boundaries (Uzzi, 1999).

6 For an extensive overview, see Hassink, Klaerding, and Marques (2014) explaining the main theoretical links between the different 'relational turns', such as Relational Economic Geography (REG) (Bathelt & Glückler, 2003), Geographical Political Economy (GPE) (MacKinnon, Cumbers, Pike, Birch, & McMaster, 2009; Pike, Birch, Cumbers, MacKinnon, & McMaster, 2009), Evolutionary Economic Geography (EEG) (Boschma & Frenken, 2006; Boschma & Martin, 2010) and Institutional Economic Geography (IEG) (Amin, 1999; MacLeod, 2001; Martin, 2005 [2000]).

This specific form of relationalism became eagerly adopted within economic geography. The seminal work is the work of Storper (1997) with his holy trinity[7]. The role of context-specific institutions and social interactions is central. Storper's main thesis is that dynamic regions possess not only localized input-output links that constitute webs of user-producer or input-output relations, but also untraded dependencies that lead to organizational and technological dynamism (cf. the 'local' process of glocalisation). This led to the first so-called 'turn' within geography, namely the 'institutional turn' (Amin, 1999). The core argument hereby is that tacit knowledge and mutual understanding of practices (cf. innovation) are strongly dependent on trusting and localized – embedded – interpersonal networks (Malmberg & Maskell, 2002). The transformation of economic landscapes was explained by an analysis of how institutions change along a path-dependent trajectory. 'Institutional thickness' became a central concept. Institutional thickness refers to a presence of a variety of economically active public, quasi-public and private organizations, and the formation of bottom-up regional coalitions (cf. assemblages (Allen & Cochrane, 2010)) engaged in strategic formations (Amin & Thrift, 1995a). It is through this collective networking and strategy formation that regions manage to nurture diffused entrepreneurship supporting collective learning and to strengthen the regional position in wider global production chains (Amin & Thrift, 1995b; Lagendijk, 2006), following the renegotiation of powers that has taken place between central national governments and key regions (cf. glocalisation) (Allen & Cochrane, 2010; Swyngedouw, 2004).

The key insight from 'institutional thickness' is that it added 'strategy' to the analysis of regional development. However, the question remains how such local forms of governance relate to broader, national and global structures (Lagendijk, 2006). Indeed, the focus on the institutional thickness became criticized for exaggerating the collaborative and cooperative nature of successful urban and regional economies (MacLeod & Goodwin, 1999; Sunley, 2008). Consequently, they were guilty of spatial fetishism, in which regions are treated as unified, coherent and independent acting and learning entities (Cumbers, MacKinnon, & McMaster, 2003). A second critique is that by taking the role of institutions central in analysing place- and time-specific socio-economic development, a shift occurred from spatial processes of industrialization to localized processes of innovation. In other words, a shift occurred from a focus on macro-meso processes, whereby one perceives the economy as being constituted by functional-regulatory phenomena, to a focus on meso-micro processes, focussing on agency, action, interaction, communication and reflexivity (Lagendijk, 2006). While doing so, studies neglected or underestimated the inevitable systemic impacts of capitalist pressures and market forces influencing a firm's behaviour. Nonetheless, (regional) 'relational assets' and 'strong ties' are key to regional economic growth (Overman, 2004), yet they are rarely an adequate explanation of uneven economic development (MacLeod, 2001; Sunley, 2008).

Second, partly following these critiques on the limited scope of relational governance, but foremost induced by advocates stating that 'relational' should be a

7 Porter (1990; 1998) developed his 'diamond' with four related pillars to explain cluster and regional development. Arguably, this work is more situated within a positivist approach, rather than a relational approach, focusing foremost on clear delineated variables to formulate – and compare - strategies.

synonym for reciprocal relations, networks, and connections of all types (Grabher, 2006), the 'relational approach' became broadened and, more 'ontological' (Sunley, 2008). This view entails that all (social, economic, institutional, etc.) phenomena (e.g. regions) should be explained by their interactions (Allen, Massey, & Cochrane, 1998; Massey, Allen, & Sarre, 1999; Paasi, 2010). Relations are understood as being dynamic, unfolding processes, contrasting with static ties between inert substances. Actors, between which these relations exist, are then seen as not preconstituted or self-subsistent (Emirbayer, 1997).

This broader usage of relationism gained popularity within geography, largely due to enthusiasm from the influence of actor network theory (ANT) (cf. Latour, 1996). ANT emphasises the construction of diverse, heterogeneous networks involving both human and nonhuman actants, as well as discourses (cf. Boelens, 2010; Rydin, 2010), techniques and technologies (Murdoch, 1998, 2006). ANT was welcomed particularly because it could bridge the 'debate among the deaf' that existed between the realist scholars (positivist geographers) and the anti-realist (Bryant et al., 2011) geographers (post-structural geographers)[8]. In other words, ANT had the potential to interweave notions of territoriality and relationality (Lovering, 2001 [1989]; Martin, 2003).

However, relational geography quickly evolved towards a 'network version of relationism' (Sunley, 2008; Varró & Lagendijk, 2013). Indeed, the 'local' and 'territorial' became gradually replaced by notions as 'relational proximity'. This assumption rejects the idea that the local is the source of localized competitive advantages, but instead states that networks are the source of competitive advantages (Amin & Thrift, 2002). Latter contrast thus the scalar or territorial logic with the topological or relational logic. As such, a place (Castells, 1996), for example the city, is seen as a nexus of economic practices (Amin, 2002, p. 393), offering a "a new kind of urbanism" (Amin & Thrift, 2002, p. 4).

Increasingly, the relational approach was stretched and all sorts of networks were studied (Dicken et al., 2001). Moreover, Bathelt and Glückler (2005) argued that all forms of resources are relational because of their contextual and interactive nature. However, such stretching of a relational approach generates confusion as one does not know what kind of relations, links or phenomena are included, or if everything is included (Castree, 2003; Lagendijk & Boekema, 2008; Sunley, 2008).

Moreover, by focussing on relational networks as the causal mechanisms explaining the empirical changes one observes (Dicken et al., 2001), one risks neglecting all phenomena with an indirect association to networks or flows (Lagendijk & Boekema, 2008). This holds important ethical consequences. While Dicken et al. (2001) suggested that a network approach heightens our ethical sense by connecting local outcomes with global issues, others have warned that a sense of an endless network decreases the direct involvement and sense of responsibility (Hughes & Reimer, 2004). Indeed, the network metaphor (implicitly) attaches a positive association to relational socio-economic 'constructions', such as cooperation, self-organization, knowledge development, decentralization, flexibility, etc. Hence, ideas as 'the creative city' became quite popular (Florida, 2003; Glaeser, 2011).

8 See footnote 4

However, it is now widely recognized that, once these ideas were translated to policy, they had important long-term consequences such as gentrification or segregation (Bontje & Musterd, 2009; Musterd, 2006), this even recognized by Florida (2017) himself. Indeed, the question remains in how far such relational phenomena such as knowledge or ‘soft skills’ (Thrift, 1998) are leading principles in the modern economy (Sunley, 2008, pp. 8-9). Moreover, a pitfall is that, by having a preference on these, one neglects and underestimates the centralized power and decision making of (hierarchically structured) multinational leading firms, the financial performance and shareholder value subordinating employment to profit and the increasing dominance of equity capital in most industrial economies; all in fact undermining the ‘essential’ relational constructions seen as ‘vital’ for a competitive economy (Phelps & Waley, 2004; Sunley, 2008).

In this respect, many network approaches have focused on identifying immediate observable networks and have simultaneously gradually frozen out structural inequalities, macro-institutional factors and competitive economic dynamics (Peck, 2005; Sayer, 2001). Indeed, much relational work focusses on how microscale social networks (cf. ‘follow the actor’ Latour (2005)) are performed and sustained (Lagendijk, 2006; Yeung, 2003).

However, such view neglects some key insights from the ‘older’ relational institutional approaches. Although networks are useful to understand how institutions are reproduced in action, institutions have a large degree of stability (Harvey, 1996; Scott, 2004). Formal and informal institutions provide stability by restricting possibilities, garnering common understandings and guiding action. Through their endurability and framing, institutions influence the action of actors and their networks and determine the path- and context-dependent nature of economic development (Amin, 1999). Hereby, one may not make the same mistake as with networks by eliding institutions with (independent) behaviour. Rather, institutions should be seen as sets of social rules and conventions that are constituted by habits and that provide structure to social interactions (Hodgson, 2003).

For example, although personal ‘tacit’ relations are important, they should be seen together with, rather than separate from, other regularities in behaviour and the norms that determine and shape them. One cannot understand economic development simply by tracing networks and examining interpersonal relations, since economic development is strongly based on everyday routine practices (Sunley, 2008). Although important, a firm’s or region’s competence cannot be reduced to interpersonal relations, because they vary strongly according to their institutional context (Bathelt & Glückler, 2005).

Thus, the question is why the second network relational approach did not incorporate, or even disputed, insights from the ‘older’ institutional relational approach. Otherwise stated, why did many network approaches fail to incorporate the rather fixed meanings of regions and economic markets within their research, and thus fail to bridge the debate among the deaf? As explained by Sunley (2008) and Varró and Lagendijk (2013), one of the main reasons for this is the adaption of the (sociological) concept of ‘flat ontology’ (cf. DeLanda, 2002) within relational geography by Amin (2002, p. 385), proposing a topological and non-territorial ontology[9]. Consequently, flat ontology became a way to discard "the centring essentialisms[10] that infuses not only the updown vertical imaginary, but also the radiating (out from here) spatiality of horizontality" (Marston, Jones, & Woodward, 2005, p. 422), hence creating 'a geography without scale'[11], aiming to challenge the hierarchical scale. As such, it was claimed that the relational approach was able to contrast essential approaches (Marston et al., 2005).

However, while some versions of relational geography ostensibly deny essentialism, they actually imply and assume that social relations can be seen as networks having essential characteristics, such as impermanence, self-organization, and fluidity (Harvey & Reed, 1997; Sunley, 2008). Hence, instead of being a 'check' in order to avoid essentialism, flat ontology became a synonym for an essential 'flatland' (Escobar, 2007) or 'flat-pack geography' (Allen, 2011), therefore becoming an 'empty ontology' (Jones, 2009). First, this bears the risk of the 'non-territorial trap' (cf. Agnew, 1994; Brenner, 2004) by which all (presumed essential) non-relational entities are conveniently displaced or avoided (Jones, 2009, pp. 494-495). Thus, the paradox is that one of the basic claims of the networked relational approach to avoid essentialism is, in fact, one of its key characteristics. (Sunley, 2008). Second, such 'flat' holds an important risk that one will follow a 'thin description' of what lies before us (Geertz, 1973; Ryle, 2009 [1971]). In other words, the risk is that what is observed is taken for granted because, the most obvious relationships are laid out before us (Allen, 2011, p. 156).

Therefore, instead of an essential flatland, flat ontology should imply that scale, in itself, has no essential explanatory power; however, at the same time, it does not exclude that scalar concepts remain indispensable, in that they allow us to identify and distinguish the logics between processes and properties at different levels (Latham, 2002; Sayer, 1997). A relational approach, understood as such, bares the potential to bridge territorial and relational aspects. In other words, it combines insights from the institutional as well as from the networked relational approach.

2.3

A flat and deep ontology

The challenging task is thus to understand local development with a rich understanding of the region and an equally rich understanding of the wider environment (Bhaskar, 2008 [1975]; Harvey & Reed, 1997; Sayer, 2000). A relational perspective hereby should be a 'backward', 'forward' and 'lateral' relational approach. Hereby, phenomena (e.g. relational proximity, institutional thickness,

9 This is rather remarkable as this idea contrasts with his earlier institutional work and also with the even older ideas of his multiple co-author Nigel Thrift (1990, 1991, 1993), calling for a 'post-post-structuralism' new regional geography, avoiding that 'subjects become driftwood' (cf. Sunley (2008)), see 2.1.

10 Essentialism suggests that complex realities of any sort are ultimately reducible to simpler, essential realities (Paasi, 2010).

11 In a reflecting paper, Jones, Woodward, and Marston (2007) argued they never insisted to erase geographical scale as (explicitly) stated in the title of their 2005-paper.

market regulation) are not endowed with inherent properties. Instead, they are first analysed backwards, taking into account their particular contexts; second, forward to examine strategic performance; and third, laterally to understand their conjunctions with other regional characteristics and assets (Lagendijk, 2006, p. 396; Lagendijk & Pijpers, 2013). This prevents us, on the one hand, from an essentialist position, and, on the other hand, from an empty ontology, as it does not take the 'micro', 'meso' or 'macro' perspective as privileged or given, but rather in relation with each other.

The concept of emergence stands central in understanding the relation between these different levels of analysis[12] (Lagendijk & Boekema, 2008, p. 928). "Emergence describes the significance of relations between properties at multiple levels of analysis and argues that higher-level properties emerge from the interactions of individuals in a complex system and exhibit their own dynamics" (Holland, 1998; Sunley, 2008, p. 14). These relationships do not only happen upward, but also have downward causation "in which an emergent higher-level property or pattern begins to cause effects in the lower level, either in the component entities or in their patterns of interactions" (Hodgson, 2003; Martin & Sunley, 2007; Sawyer, 2001; Sunley, 2008).

An emergent property is thus a relational property that has the generative capacity to modify the powers of its constituents in fundamental ways, but is not simply reducible to the actions of and properties possessed by their constituent individual parts (de Haan, 2006). The relation between the two is thus asymmetrical (Bhaskar, 2008 [1975]). Hence, it is possible to perceive spatial forms such as regions, clusters or states not simply as aggregates or having inherent properties, but as emergent relational forms, which allows us to identify and distinguish the processes between properties at different levels (Sunley, 2008). In other words, scalar processes are co-constituted so that the local is not distinct from the global, and vice-versa (Mansfield, 2005). This fits well with the relational approach according to Yeung (2005, p. 48): "A relational approach to regional development seeks to identify the complex relational geometry comprising local and non-local actors, tangible and intangible assets, formal and informal institutional structures, and their interactive power relations."

Identifying the complex relational geometry is useful to understanding multi-level emergent relational properties – upward/forward, downward/backward and lateral. It is able to interweave notions of territoriality and relationality (Martin, 2003) and is able to learn from important institutional aspects of economic development (Lagendijk, 2006). As such, the concept of relational geometry does not fall into the 'micro sociological' trap (Archer, 1982).

However, it remains vague in its vocabulary and what to look for (Sayer, 2010 [1984]). Therefore, there is still more concretisation necessary to really allow a relational approach to deliver its potential. Indeed, although it is important to understand how everything is constructed, one needs to also understand why economic processes occur (cf. Allen, 2011, p. 156). Otherwise, the relational approach remains too

12 The term 'emergent' was introduced in 1875 by the philosopher George Henry Lewes in the context of a discussion of joint causes and their effects (DeLanda, 2011, p. 382).

abstract and fails to identify the purely incidental and contingent relations from those that are consequential and causal.

The analysis of relations should therefore be integrated with causal theory (Powell & Smith-Doerr, 2005; Stinchcombe, 1990), making it able to detect the important conditions and causal mechanisms that have significant effects from those that do not (Sayer, 2010 [1984]). Tilly (1998, 2001) argued that precisely the point of relational work is to identify 'causal mechanisms' that are operative in particular places (Somers, 1994; Sunley, 2008).

This creates, however, an analytical problem. Focussing on causal mechanisms implies that it is inevitable that distinctions between background conditions and causal processes will have to be made. Such perspective 'clashes' with the second form of the relational approach described above. Indeed, if one considers all networks (potentially) open and endless without boundaries, then it is impossible (for research goals) to stabilize the world and to develop models for our understanding of how it works. In other words, in order to perform analysis, one needs analytical devices and operation procedures, accompanied by some structure or theory having at least some assumptions or ideas of how change occurs, where change is going on and concrete manifestations of processes (Thompson, 2003). In this sense, the question is not whether our theoretical assumptions are correct, but whether our theory can offer us an answer to our conceptual problems. Thus, although disruption, instance, peculiarity and complexity are key features of relational geography (Lee, 2002), we nevertheless require some analytical stability that we can use as a starting place for understanding (the causes of) particularity (Sunley, 2008, p. 16). Therefore, "what is ultimately amounts to is a methodological imperative to 'interrupt time'; to stop the flow of history. [...] this means there must be a difference between evolutionary time [(which is continuing)] and analytical time" (Thompson, 2003, p. 230).

To identify causal mechanisms, we thus have to 'stop the time' (Somers, 1994). Only then can we explain how they work and the conditions under which they were activated. Causation is hereby not understood as within the positivist or 'successionist' view, whereby one tries to prove causation by gathering data on regularities and repeated occurrences. The latter view is misguided because consistent regularities can only happen in 'closed systems'. Within a closed system, the object's causal power is stable (the intrinsic condition) as well as all other external conditions in which it is situated (the extrinsic condition) (Bhaskar, 2008 [1975]). In other words, if A then B within C (Figure 2.1 left) (Pratt, 2009). However, such closed system conditions do not occur in the real social world, only within artificial experiments (Bathelt & Glückler, 2003; Sayer, 2010 [1984]). The social world is 'open' and the same causal powers can produce different outcomes (cf. the principle of contingency (Martin & Sunley, 2015; Oyama, 2000; Sayer, 2000, 2010 [1984]). Likewise, different causal powers can produce the same result. Events are thus dependent on contingent conditions because other mechanisms can trigger, block or modify the mechanism observed, leading to different outcomes (Figure 2.1 right) (Sayer, 2000).

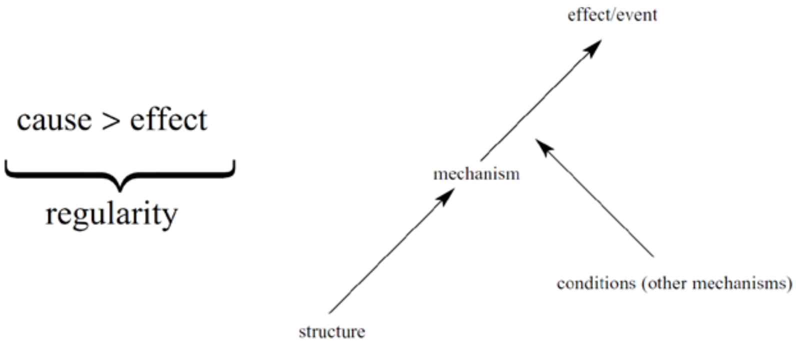


Figure 2.1 A positivist view of causation (l) versus the principle of contingency focussing on mechanisms (r) (Sayer, 2000)

Moving backward in time implies that the explanation depends on identifying the causal mechanisms, how they work, if they have been activated (or blocked or modified) and under what conditions. Likewise, moving in the other direction, explaining why a certain mechanism exists, involves discovering the nature of the structure or object which possesses that mechanism or power. For example, the power of a police agent to arrest someone depends on the legal structure that is accepted by the government to be legitimate, both in terms of the role of the agent as on the crime committed. Another example is existing price mechanisms. Price mechanisms, being created to connect millions of economic agents who have no direct communication with each other, are mostly presented as a simple negative relationship between demand and supply, but in fact also depend on the mobility of capital, the mobility of labour and resources, transportation costs, regulation systems (e.g. social house rent), and the structures of competitive relations (e.g. oligopoly) between profit-seeking firms producing for markets (Sayer, 2000). The structure or object thus explains the existing mechanism one focusses on.

Hence, we are able to combine a multi-level with a spatial-temporal approach. Indeed, while a relational geometry offers us a non-essential flat ontology, focussing on causal mechanisms offers us ontological depth. In other words, relational geometries emergently arise from and influence the working of mechanisms, this within geo-historical contexts. To understand this, one needs to go back and forth into (analytical) time to understand the conditions that coupling mechanisms were contingent upon, how and why they were activated or modified by other coupling mechanisms (within their respective relational geometries), and what effect it had on the present relational geometry (Sayer, 2000, p. 15).

2.4

Geographies of power

Before we develop our analytical framework, first we have to elaborate on the concept of agency. If we plea for an ontological multi-level (but flat) and 'deep' relational approach focusing on the causal coupling mechanisms, we need to understand how such couplings can occur. A coupling mechanism occurs when two or more objects, which are contingently related in the sense that each could exist without the other, are brought into contact and interact (i.e. causally influence one another) (Sayer, 2000). This implies the (sometimes unequal or unbalanced) cooperation between two or more groups of actors/actants in light of a common objective (Yeung, 2009).

To make such cooperation possible, agency stands central, here understood as the capacity to act in a given environment (Hewson, 2010), or the capacity to produce an effect through a coupling mechanism. This capacity follows the power of an actor or object (actanct) (Boelens, 2009b, 2010; Boelens & de Roo, 2014). However, how one defines power, and thus agency, is not straightforward. The perception of power is as old as the discussion regarding the relational approach we discussed before. Moreover, the discussion about the socio-spatial theorizing of the sociological discussion of power within geography arguably stands central within the upcoming of the relational approach (e.g. Allen et al., 1998; Harvey, 1989a; Massey et al., 1999; Soja, 1989). Most known and cited within this discussion is the book of John Allen's 'Lost Geographies of Power' (Allen, 2003). Allen distinguishes three broad spatial conceptions of power.

The first one is 'power in things'; that is, power as seen in a centred capacity, an effect of resources and abilities that can be held or possessed by some agency somewhere. Power, in this sense, exists in 'potentia' (i.e. in reserve), which may or may not be mobilized to produce an effect (Isaac, 1987). Power is seen as possessed by objects, and contingently exercised, with effects depending on contexts in terms of other objects and their respective powers. If exercised, power radiates out from one or many centres, structuring as such geographical space. As theorized by Weber (1978), this radiation is asymmetrical. More recently, this asymmetrical radiation of power is refined by Brenner (1998) and Swyngedouw (2000) among others, who developed a multi-scalar, multi-level tangled geography of governance and power (Allen, 2003, p. 35; Sayer, 2004).

Allen (2003), however, rejects this idea of power, because it follows the idea that scalar units exist, which, if one follows the 'second version' of the relational approach as described before, is false. In other words, 'power in things' is parallel to the concept of 'institutional thickness', recognizing that scalar units do matter.

The second one is 'power from collective action'. Rather than a capacity, power is but a medium or product entirely dependent on the mobilization. Power is thus produced by the mobilization of resources. Power is a process (Giddens, 1979). Following the advances of networked relational thinking, power is transmitted through the open and 'endless' networks of social interaction. Hence, 'the power of flows takes precedence over the flows of power' (Castells, 1996, p. 469).

Although Allen (2003) states that such a networked version of power is spatially more suggestive than power as capacity, it still does not allow us to see how space is constitutive of various modalities of power. For Allen, resources or flows can travel, but power does not because power is not a thing or attribute.

Therefore, the third version of power according to Allen (2003, p. 63) is 'power as an immanent force'. An immanent force is understood as a set of complex and diverse techniques implicated in every social situation, and inseparable from their effects. Derived from Foucault (1975), power as an immanent force suggests the interplay of forces within a particular spatial-temporal setting, in which there are no linear causal relationships and power works with the complicity of subjects (Flyvbjerg, 1998; Huijs, 2011). Hence, power can only exist at work, not in 'potentia' (power in things) or latent as something traceable to origins (power from action) (Deleuze, 1995). Hence, power can only be understood while it is working (Allen, 2003; Sayer, 2004)[13].

This third version is favoured over the two first according to Allen (2003), but needs further elaboration. His critique is that these accounts on power remain focussed on the micro-level of subjects (e.g. the prison), but do not attempt or succeed to extrapolate these ideas to macro-level phenomena. According to Allen, the question of power and spatiality has to be addressed. The latter is understood as the 'reach' of power. Therefore, Allen distinguishes several 'forms or types of power', each with their own spatiality, or proximity (cf. Latour (1986) and translation and mobilization through statistics, numbers, judgements, etc.). This forms the essence of the work of Allen (2003), namely that this translation and reproduction is essentially spatial. Different forms of power have different proximities and reach, hence together the 'geographies of power'. He defines power then "as a relational effect of social interaction which may bridge the gap between here and there, but only through a succession of mediated relations.[...] Power is inherently spatial and spatiality is imbued with power." (pp. 2-3). Regarding their spatiality, Allen distinguishes domination, authority, seduction, manipulation and coercion as different forms of powers.

While the addition and ideas of Allen on the spatiality of power are important, his distinction of power in things and his preference for relational power at work poses some analytical problems. Indeed, and similar to the critique on the second form of the relational approach, if power lies purely in relational associations, where can we then look for causal influence and the exercise of powers? (Sayer, 2004; Sunley, 2008). To answer this question, Sayer (2004, p. 266) in reference to Allen (2003) does not choose the first, second or third 'version' of power, but he interweaves the three versions of power through the notion of 'emergent powers'. Power as such is understood as causal power that is dependent on, but irreducible to, its constituent elements. As he explains, this is similar to water that has emergent power from its constituents, hydrogen and oxygen (Bhaskar, 2008 [1975]).

Emergent powers implies thus that one cannot describe power without seeing it in reference to its constituent elements (Fairclough, Jessop, & Sayer, 2003). This 'split' is, however, what Foucault and Allen attempted in the first place; namely the attempt to rid our conception of power from its normative qualities by reducing it to only the description of power. However, Sayer (2004, p. 266) argues this is, in fact, impossible. If one describes the world, the normative content of power is

13 Note that a similar discussion exist(ed) within fundamental theoretical physics during the 1920s between Niels Bohr (quantum mechanics) stating that there are limits to the precision in which quantities can be known following the observer effect, and Albert Einstein (theory of relativity) who believed in a 'theory of everything' and that fundamentally 'the world' is structured following strict rules, hence there is no uncertainty. Einstein, together with Leopold Infeld, published these ideas in reaction to the 'Copenhagen School' within their book 'The Evolution of Physics' (Einstein & Infeld, 1966). For a recent biography of Einstein, reflecting on these (philosophical) debates between Einstein and Bohr, see Isaacson (2007).

never (wholly) separable from the positive. In other words, it is impossible to fully objectively define and describe, for example, ‘domination’ or ‘authority’. Therefore, power will always be ambiguous and combine subjective feelings with objective ‘data’. For example, if one refers to someone or an institution as ‘powerful’ or ‘dominant’, this is not only merely to express a subjective feeling (‘I think so’), but also to imply features that supposedly belong to them or those objects themselves. It is thus difficult to appoint and subsequently describe the subjective and objective aspects of power, and the two should be viewed together (Collier, 1994, 2003). Indeed, if power is only a relational effect and not related to the objects or persons, we are denied important descriptive information that lies at the base of ‘how we feel about persons or objects’, both positive and negative (Sayer, 2004). Hence, power is emergent.

This brings us back to the geographies of power. All material phenomena must have spatial extension and be spatially located. Space does not exist apart from objects, but is (emergent) constituted by them. If the exercise and effect of causal powers is always dependent on their objects, space indeed makes a difference following the particular powers of the objects that constitute it (Sayer, 2000, 2004). At the same time, there is ontological depth. Thus, power relations are not only constituted through spacing, but also through timing. For example, governance (the act of a government) operates not only through direct influence from agents at time t1 in place p1, but also through the independent activation of similar causal powers dating from time t-1 in other places, formed by earlier influences located in p1 (Sayer, 2004, p. 267). For example, the susceptibility of students to grades is formed not only by direct influences such as exams, but also by prior internalized and independently operating forms of work (e.g. minimum requirements to enter a university or to apply for a job), which sensitize them to such pressures.

The spacing and timing implies also that all social objects (relations, institutions, structures, etc.) are spatially flexible in that they can retain their identity in a range of different spatial forms. For example, a labour market, a region, a cluster, a community, etc. can take many different spatial forms. If power does not exist apart from objects, this also means power is spatially flexible; the main message of Allen (2003), who proposes to distinguish and examine different modalities of power.

However, at some point, one always runs up against ontological limits if one remains on an abstract level of analysis without moving to more concrete levels. Spatial flexibility, and thus also power, can never be captured in a limited number of forms. One may never forget that spatial theory thus can only make vague allusions of spatial-temporal phenomena, and only concrete analyses can hope to say more. Hence, we arrive again at the critique on the networked relational approach in which it tends to be applicable for microsociology, or in this paragraph applicable for the analyses of the micro-physics of power (e.g. prison), but it fails to provide an extensive view of power or space (e.g. topological space) on a macro scale, as this is impossible following the spacing and timing of relations (Sayer, 2004).

Summarized, power, and the agency one obtains hereby to act or to make a coupling mechanism succeed, is an emergent relational effect that one can observe, however, only in relation to its constituent elements. This idea resembles the ideas of Giddens (1984), Healey (1992) or Jessop (2001a), thinking about the relation between structure and agency. However, the difference hereby is, first, the ontological depth following power as an emergent relational effect, and, second, the call to combine the subjective with the objective. Otherwise, by preferring content, one would fall into the trap of favouring structure above agency (Beauregard, 2012, p. 485).

2.5

The analytical framework

This brings us to our analytical framework. A flat and deep ontology creates a two-step iterative and reflexive 'methodology' (Martin & Sunley, 2015; Pratt, 1995; Yeung, 1997). On the one hand, we have to be able to understand the existing multi-level relational geometry; on the other hand, we have to be able to understand the evolutionary coupling mechanisms that explain why we observe these relational geometries, and vice versa.

However, this remains largely descriptive and provides little guidance on where to start, what should be left out and where to stop (Lagendijk, 2006; Sunley, 2008). If we focus on causal mechanisms, the challenge is to define the correct level of abstraction (Sayer, 2010 [1984]). The latter is achieved when a theoretical object or concept is created that allows the necessary conditions of the causal power of that object to emerge with as little noise as possible. In other words, if one can isolate the necessary properties of a theoretical object. Thus, on the level of abstraction where the properties of the object in consideration are emergent. The more precisely one is able to do this, by shedding away the unnecessary properties, the more closely this abstraction corresponds to empirically identifiable phenomena (Beauregard, 2012; van Meeteren, 2016). Prescribing such a systemic methodology is, in fact, 'un-Foucauldian' as "…to do so would afford a particular position the status of truth in a perspective where truth is always conditional" (Armstrong, 1997; Gilbert, Cochrane, & Greenwell, 2003, p. 792; Huijs, 2011). Hence, before we discuss the used distinctions, it is important to stress that every distinction made, is a choice specific to particular research frames and open to revision and rejection. This is, however, an inevitable step if we want to distinguish background conditions from causal processes (Sunley, 2008, p. 16).

First, we attempt to specify the different 'emergent mechanisms'. The most obvious way to do this would be to group the emergent effects according to their geographical scale. For example, as explained by these (very rudimental) illustrations: a firm is emergent of the different people and activities that happen there; a cluster is emergent of the coupling between the different firms and their infrastructure; a port is emergent of the different clusters and all available infrastructure; a city is emergent because of the activities, the build environment and (urban) culture; and an economic sector is emergent of all similar relevant products, trade activities and (global) production networks, hence (partly) explaining the emergence of capitalism.

However, such specification would always be disputable and vague because it depends on the level one analytically steps into it. Indeed, there is always a level above or below 'micro', 'meso' or 'macro' (understood as effects). Therefore, it is better to distinguish the different emergent causal mechanisms instead of their observed effects. As such, the distinction of coupling mechanisms is independent on its effects and 'macro', 'meso', 'micro' (understood as emergent) become flexible terms according the research subject. However, this does not imply the mechanisms themselves stand loose from their objects and structures. We are dealing here with the distinction of coupling mechanisms, not with the resulting (case particular) effects of the coupling mechanisms themselves[14]. Therefore, we distinguish three coupling mechanisms, which effects are emergent to each other: tactical, strategic and structural coupling. As we will explain, for each coupling mechanism, we distinguish three coupling forms: discursive, physical/material and institutional[15].

First, tactical coupling deals with tactics and is characterized in general by an explanatory 'nature'. In other words, it explores the possibilities. For Silva (2016), discussing in particular tactical urbanism, tactical coupling is short-term and focussed on action. Further reading explains that Silva in fact sees tactical urbanism as a synonym for bottom-up processes resulting in temporary (land) use models, mostly having an informal character. Subsequently, and indeed mostly correct if one follows such reasoning, tactical coupling is short-term in response to further consolidation (read: 'higher level' emergent effects). In particular, the concept is being used to study the bottom-up processes that emerged in the aftermath of the 2008 crises (Silva, 2016, p. 5). However, as such, Silva perceives tactical coupling as an effect instead of a mechanism. While doing so, he narrows tactical coupling down to one possible effect, namely informal 'bottom-up' 'self-organized' short-term land use. We, however, see tactical coupling understood in its merely 'military' definition, namely as tactics[16] (Huijs, 2011), aside from the observed effects one focusses on. Therefore, tactical coupling hereby is understood as the 'testing of the possibilities' (Wohl, 2017). Such tactics might involve the deliberate attempt to convince or block potential opponents ('co-optation', cf. Cox, 1998), to launch marketing campaigns, or might even include blackmailing and bribery. While many tactics are short-term, tactical coupling is not exclusively so. Indeed, tactical coupling can also be middle- or long-term, depending on the goal one is aiming for and the timeframe applied.

14 Note that this can be confusing. We distinguish coupling mechanisms from their effects, but if one subsequently does empirical research, analytically the causal mechanisms are impossible to distinguish from the effects. Therefore, in most cases, the 'word' for the causal mechanism is similar to the effect. An example of this is 'a couple'. It refers both to a mechanism of coupling, and to the effect of that mechanism. Nonetheless, we stress that one must bear in mind that there is a difference between the coupling mechanisms and the effects, and, importantly the effects are particular to the case being considered. If not, the analytical focus will fall too quickly on the effects, hence on the case. This holds the risk that those particular effects then become 'generalized', as explained.

15 Huijs (2011, p. 57) also presents an interrelated three-level framework whereby macro, meso and micro are used to distinguish the emergent mechanisms (note: he does not explicitly mention the concept of coupling mechanisms). Huijs' thesis analyses the policy deadlock of the Amsterdam Airport Schiphol. Hence, because he focusses on the discourse part (cf. Hajer, 1995), he distinguishes only the discursive form of the different coupling mechanisms. Arguably, our framework could be seen as related to Huijs' framework, added with two 'extra' coupling forms.

16 Note that, for example, Hajer (1995) and Huijs (2011) see strategies as a synonym of tactics. However, in our framework, this would be confusing as we see strategic coupling as emergent to tactical coupling. Therefore, we do not use strategy to refer to tactical coupling.

We distinguish three forms of tactical coupling. First, discursive tactics are, for example, endorsements during meetings or conferences (Hajer, 1995; Huijs, 2011). Second, physical/material tactics can deal with the testing the possibilities of a different land use. An example of this, in light of the subject of this dissertation, are 'port celebration days', during which port areas normally restricted for unauthorized people are opened to the public for numerous activities such as running, concerts, exhibitions or ship parades. Another example is the 'living streets' in Ghent, during which streets are transformed into 'street gardens' for a few weeks, inaccessible to motorized traffic (Papa & Lauwers, 2015). Thirdly, when companies, government agencies and knowledge institutes form a consortium (cf. triple helix), for example, to promote a region, they form a tactical institutional coupling.

Second, strategic coupling is a widely used and thought through concept within economic geography. Strategic coupling originally was elaborated by Coe, Hess, Yeung, Dicken, and Henderson (2004) and referred to 'the fitting of regional assets with global production network (GPN) needs'. However, such perception is unsatisfactory because it largely leaves open the question of how and to what extent this happens, both theoretically and empirically (Lagendijk & Boekema, 2008, p. 931). Indeed, strategic coupling in this way is mostly seen as an 'empirical interpretation'. Hence, it takes a substantive concept of assets and needs, endowing them with meaning before examining their mutual relationship. As explained by Jacobs and Lagendijk (2014), although assets of course draw on certain locally available resources and characteristics, they are only contingent. In other words, until articulated within economic processes, assets are only possible services. In reference to tactical coupling (e.g. 'testing of possibilities') in order to retain an emergent relation with it, strategic coupling deals with relational processes that create more enduring outcomes or effects (hence, downwardly influencing the tactical couplings). Therefore, on some level similar to the perception of agency (Sayer, 2000), strategic coupling should be understood as the "overall capacity accumulated within a specific local economy and a specific GPN to align interests and activities, with the aim of improving value creation and value capturing at the local and global level." (Cox, 1997; Jacobs & Lagendijk, 2014, p. 49). This definition of strategic coupling helps us to overcome several pitfalls. First, it helps us to overcome the biased local/global view, because it does not focus on the assets and demands, but on the outcome of interaction and the relational constitution of common strategic projects (Yeung, 2009). Second, strategic coupling is seen as specific, because it is situated within a particular local economy with a particular industrial mix. Hence, such a local economy has a specific demand for production factors and for the supply of specific types of infrastructure. This entails not only that the local economy is specific, but also defines the attraction of particular GPNs to these locations (Jacobs & Lagendijk, 2014). In line with our relational approach, this gives us a 'double-edge' perspective that is able to combine a territorial and relational perspective. On the one hand, a local economy, region, cluster or firm can be understood as a (specific) territorial entity whose main features are derived from local characteristics (e.g. deep water access). On the other hand, these entities are part of (specific) production networks (e.g. container industry) (Jacobs & Lagendijk, 2014; Lagendijk & Boekema, 2008).

Strategic coupling therefore deals with the active creation of agglomeration economies by regionally active agents, eager to improve the regional business environment to attract, retain and nurture regional wealth (Jacobs & Lagendijk, 2014). The 'active creation' is important to stress (Jessop, 2005 [1992]) because it helps to distinguish strategic couplings from the emergent structural couplings we will explain next. To help us hereby, the difference between (internal) 'agglomeration economies' and 'agglomeration externalities' is welcomed (Parr, 2002). While the latter is 'beyond' control of actors, the former is wholly within control of the actors involved, hence active creation or 'strategic coupling'. A first example is economies of scale. The latter is defined as (long-term) cost savings of overall production through horizontal integration. Second, there is economies of scope. The latter is defined as the internalization of the supply of knowledge and other inputs common to two or more production processes and depends on the existence of a shareable resource or input. An example is the shared used of R&D laboratories by two or more firms. Or even a shared office space for numerous start-up firms can be regarded as an example of lateral integration (Parr, 2002).

Similar to tactical coupling, three forms of strategic coupling can be distinguished. First, strategic coupling can be discursive. Such couplings deal with framing (Faludi, 1996) and typically invoke certain discourse, narratives and metaphors about investment objects or places that will align various actors around a common development agenda. Examples are the Dutch 'Mainport' policy, positioning the port of Rotterdam and the Amsterdam airport Schiphol as 'national economic engines' (Huijs, 2011; van Gils, Huijs, & de Jong, 2009). In reaction to its success, more recently the 'Brainport'-policy frames the Eindhoven area as the national cradle of innovation and R&D (Lagendijk & Boekema, 2008), and the 'Greenport'-policy positioning among others the inland port of Venlo as a crucial logistical node for the Dutch horticulture (Raimbault, Jacobs, & van Dongen, 2014). Second, strategic coupling can be physical/material. This form is most (conceptually) known and deals with the provision of infrastructure, the built environment and land use. This can be, for example, the change of (industrial) land use rules to allow further urban residential and office development in Amsterdam (cf. Haven-Stad, see chapter 4) (Savini, Boterman, van Gent, & Majoor, 2016). Another example is the enlargement of (sea)locks in order to facilitate bigger ships and cargo (Vrijsen, 2015). Third, strategic coupling can be institutional. The latter deals with the employment of institutional assets (e.g. tax ruling creating the 'paradise papers') or the possible stretching of institutional arrangements (Martin, 2008), for example, by formalizing and rearticulating specific mandates of (re)development agencies such as port authorities to engage with business (Notteboom, Verhoeven, & Fontanet, 2012). The political formalization of strategic spatial plans within planning systems, for example, is an institutional form of coupling whereby the administrative-territorial aspects of collectively defined goals are combined with discursive and physical aspects (Albrechts, Healey, & Kunzmann, 2003).

Third, structural coupling is the most fundamental coupling. While tactical and strategic coupling are wholly in control of the actors participating, structural coupling is not. Hence, while tactics are instrumental to profound strategies articulated in deliberate collective actions and governance, these can eventually result in more fundamental emergent effects. The concept of structural coupling goes back to the work of Luhmann (2004). Similarly, he distinguishes structural couplings from operative couplings (cf. tactical and strategic, in our words) to distinguish former from ongoing causalities. "Coupling mechanisms are called structural couplings if a system presupposes certain features of its environment on an on-going basis and relies on them structurally" (Luhmann, 2004, p. 382; Van Assche, Beunen, & Duineveld, 2014).

Following this definition, Luhmann argues subsequently that it is possible to perceive the (social) world as the result of structural couplings between different (sub)systems. These systems are, for example, the economy, law or politics. If they structurally couple, they eventually create different forms of regimes, democracies or markets, for example (Van Assche et al., 2014, p. 19). Each system on its own is a structural coupling of subsystems and a system in turn is (potentially) a subsystem of an overarching system. Hereby the emergence between the different 'levels' is also applicable, hence such a systemic view does not ensure nor exclude predefined scalar levels.

By referring to the social world as an example of structural couplings between systems, Luhmann (2004) uses a rather 'omnipresent' example. Although this is correct, one may not forget the other 'less omnipresent' systems, depending on the analytical level one steps into it. Indeed, systems come in different forms and scales – households, firms, industries, production networks, supply chains, clusters, ports, cities, discourses, nations, etc. – each being an emergent overarching structural coupling of its constituent (e.g. 'firm culture', 'national identity'). Moreover, following this reasoning, systems (e.g. firms, institutions, economic sectors) become the basic analytical units that occur amongst couplings (Dicken & Malmberg, 2001; Martin & Sunley, 2015).

Important hereby is that a system is complex and never stable (Nicolis & Prigogine, 1977, 1989). It only can tend or strive to be stable (Woermann, 2016). A system is not permanent, but in 'permanence' (Harvey, 1996). The way systems strive for stability is called 'autopoiesis' (Luhmann, 1986)[17]. Autopoiesis refers to the dynamics of a non-equilibrium system that produces the components that, in turn, continue to maintain the organized structure that gives rise to these components[18], hence the occurred stability (Martin & Sunley, 2007, 2015). For example, a particular localized economy (e.g. Silicon Valley) resulting from the structural couplings of different subsystems (firms, institutions, infrastructure, discourses, etc.) produces components (e.g. decisions, daily behaviours, profits, knowledge, etc.) that serve to reproduce the system itself (cf. the 'Silicon Valley culture'). As such, the system 'communicates' (or tactically or strategically couples) with the outer environments and other systems[19], with the potential that these also become structurally coupled (e.g. medical industry coupled with the IT sector). A household, a firm, fashion/hypes, feminism, modes of regulation, the port, the city, the port-city, the state, etc. are all examples of emergent systems producing components that are used to stabilize themselves. The way they are viewed as system or subsystem, again, depends on the analytical level one steps into' (Martin & Sunley, 2015).

17 Other authors also adapted the original biology concept of autopoiesis (see footnote 18), see Teubner (1987) and Jessop (2001b).

18 Autopoiesis, meaning 'self' and 'creation', was originally introduced in 1972 by biologists Maturana and Varela (1980 [1972]) to define the self-maintaining chemistry of living cells.

19 As such, creating 'local buzz within global pipelines' (Bathelt et al., 2004)

The reason systems are only in permanence follows the 'different speeds' between coupled systems. Structural coupling namely only guarantees (momentary) synchronicity, but cannot lead to synchronization. For example, even if "the legal system is coupled with the political and economic system by highly specific devices (constitution, property, contract), there is no guarantee of time-invariant coordination. There is only the guarantee of sufficient specificity for the systems to surprise each other" (Luhmann, 2004, p. 383). Therefore, understanding systems as a result of structural couplings has to be combined with an equal understanding of the emergent components it produces to maintain itself. Capitalism, for example, cannot be understood without understanding the systemic processes (such as regimes of accumulation, crises, etc.) and the existing structures (such as modes of regulation, the administrative boundaries, etc.). Combined, they define the rhythms and directions of economic changes (Arthur, Durlauf, & Lane, 1997; Tilly, 1984)[20].

As said before, the effects of structural couplings are beyond the control of those involved (Parr, 2002). Within economic geography, studying such external effects goes back to Marshall (1892) who studied the sources of localization economies (better known as MAR[21] externalities). Three externalities can be distinguished. First, independent (possibly competing) firms located close together (later termed as an industrial district or cluster) can obtain (pecuniary) lower freight rates on input and output products. Second, closely located firms can externalize tasks such as engineering or design. Third, such firms experience (non-pecuniary) knowledge spill-overs (Porter, 1990; 1998) because they have information on products, innovation or market intelligence[22]. Silicon Valley is, again, an example of such locational economies. Externalities are linked to economies of scale, however, economies of scoop also generate emergent externalities, called 'urbanization economies' (Parr, 2002), or Jacobs' externalities[23]. Such externalities are related to different and unrelated industries. The concentration of economic activities leads to the availability of a range of municipal services (e.g. a port authority), public utilities, transportation and communication facilities, the existence of a wide variety of business and commercial services, learning and innovation on the long run (Schumpeter, 2003 [1943]), and complementarity in labour supply (Isard, 1956)[24].

Similar to tactical and strategic coupling, three forms of structural coupling can be distinguished. First, a structural coupling can be discursive. In this case, a discourse is 'hegemonic', i.e. most 'believe' the ideas attached to the discourse (Hajer, 1995). For example, capitalism can be seen as hegemonic because people (at least a significant and powerful part of them) believe in marginal economic theory. Second, structural coupling can be physical/material. In this case, the discourse determines physical aspects as the built environment of production (Hollingsworth,

20 There are numerous examples of changes (re)defining the (world) economy (cf. Friedmann & Wolff, 1982; Polanyi, 1963; Wallerstein, 1974).

21 Alfred Marshall, Kenneth Arrow and Paul Romer

22 Such locational economies are of course more articulated prior to telecommunication. However, as showed 'avant la lettre' by the mercantile model of settlement work of Vance (1970) the role of the merchant or wholesaler, as an information broker between centres of supply and demand, is important to understand how entrepreneurial skills and incentives to invest exist and how alternatives are explored and orchestrated (Ng et al., 2014).

23 referring to Jane Jacobs (1969)

24 For a review about MAR or Jacobs' externalities see, for example, Frenken, van Oort, and Verburg (2007) and Glaeser, Kallal, Scheinkman, and Shleifer (1992)

1997). In other words, the discourse becomes spatial-temporal ‘fixed’ (Harvey, 2001; Jessop, 2008). Third, in order to govern the social domain, a discourse can become institutionalized (Flyvbjerg, 2001; Huijs, 2011). For example, the Fordist means of production became regulated under a Keynesian distributed welfare state (Jessop, 2001b; Lauria, 1997).

After introducing and explaining the three different coupling mechanisms and their three forms, we are able to present our analytical framework for analysing coupling mechanisms (Figure 2.2).

Coupling forms

Coupling mechanisms	**Discursive**	**Physical/material**	**Institutional**
Tactical	Endorsements	Temporary change use of the built enviroment	Temporary coalitions
Strategic	Framing	Long term investment projects	Stretching and layering of institutional arrangements
Structural	Hegemonic discourses	Spatio-temporal fix of social systems of production	Regulatory regimes

Figure 2.2 Analytical framework to examine the different coupling mechanisms and their different forms.

The dotted line within the analytical framework represents the difference between the coupling mechanisms in control and beyond control of those involved. This implies that both tactical and strategic couplings are dealing foremost with agency and power relations, while structural coupling should be seen as an emergent effect of those. The different arrows explain the two-way upward/downward relationship that exists between the different emerging coupling mechanisms. Tactical coupling deals with tactics and the exploration of the possibilities. This can emergently evolve into a strategy whereby actors move towards strategic couplings. Once accomplished, they have a downward influence on the possible tactics and thus possibilities. Beyond the will of the ones involved, a structural coupling can occur out of these couplings. Once this occurs, it acts as an overarching effect for both the tactical and strategic couplings that will or will not happen. In other words, the structural coupling is conditioned by the tactical and strategic couplings, but at the same time conditions these (cf. Paasi, 2010).

One final important statement has to be made about our analytical framework. In the current form, we present the framework as ‘filled’, presenting what effects the different coupling mechanisms and their different forms can cause. However, the reader should assess these as only guides. In a way, it explains what kind of effect’ one can assign to the right square. Indeed, as we already mentioned, our analytical framework can be used in different situations, depending on the chosen problem, case study and analytical level one steps into. The leading principle is ‘emergence’. Therefore, our analytical framework is a heuristic framework that allows room for the case to unravel without too much a priori commitments (Huijs, 2011; Stake, 1995). We elaborate on this in the next chapter.

2.6

Conclusion: a 3-step conceptual framework

In this chapter, we first argued for a relational approach following a flat ontology. This enables us to perceive without preference all phenomena at all levels in relation to each other; backward, forward and lateral (Cox, 1998; Jacobs, 2007; Lagendijk, 2006). Hence, we are able to "identify the complex relational geometry" Yeung (2005, p. 48). Importantly, these different levels are not seen as essential phenomena with inherent properties, but as emergent properties. Scalar processes are thus co-constituted so that the local is not distinct from the global, and vice-versa (Mansfield, 2005).

Second, we argued that a relational approach should be integrated with causal theory (Powell & Smith-Doerr, 2005; Stinchcombe, 1990), making it able to detect the important conditions and causal mechanisms that have significant effects from those that do not (Sayer, 2010 [1984]). As such, one is able to combine a flat with a deep ontology, sensitive to the spatial-temporal contexts. The relational approach is, as such, not only epistemological, but also ontological (Jacobs & Lagendijk, 2014; Sunley, 2008). It offers a middle road between 'flow' and 'fixity' (Lagendijk & Boekema, 2008, p. 926). It focuses on the causal mechanisms that explain the existing relational geometry. It also goes in the opposite direction in which one explains the mechanisms in reference to the relational geometry. Central hereby is agency, the capacity to act derived from the (emergent) powers (Allen, 2003). Explaining why certain mechanisms were activated and under what conditions involves discovering the nature of the structure or object that possesses those powers (Sayer, 2000, 2004; Sunley, 2008). It is important to stress that uncovering the mechanisms that produce the emergent effects is different than uncovering universal explanations for the emergence of the effects (Huijs, 2011, p. 14).

At first sight, this creates a two-step iterative and reflexive 'methodology' (Martin & Sunley, 2015; Pratt, 1995; Yeung, 1997), whereby first the relational geometry is identified and, subsequently, the causal mechanisms are examined. However, we add a third one, because it is not enough to explain relational geometries by only analysing the relevant coupling mechanisms. A thorough analysis of the coupling mechanisms is also necessary to really grasp the concept of agency and power. Hence, we end up with a three-step conceptual framework as listed below[25]:

1. Relational geometry. Relational geometry is an analytically stopped spatial-temporal relational multi-level phenomenon crystallizing the power and structural capacities in particular institutions, discourses, actors and their relations. The crystallization is the result of the effect of different coupling mechanisms between different systems. The relational geometry serves as the point of departure that can help to identify the relevant causal coupling mechanisms.

25 similar to Huijs (2011, pp. 85-86)

2 Tracing the effects of coupling mechanisms explaining the relational geometry one focusses on implies a deep ontology. It implies that one is able to distinguish the background versus the causal processes. Different emergent causal couplings and forms exist, understandable in reference to the objects. The emergent result is a relational property that therefore has the generative capacity to modify the powers of its constituents in fundamental ways, but is not simply reducible to the actions of and properties possessed by their constituent individual parts.

3 Uncovering the different coupling mechanisms within the narrative helps us to assess agency and the mechanisms and objects that generate emergent powers at work. Concerning the concept of agency, the challenging task is to explain this concept in reference to tactical couplings, seen as the 'starting point' of the further emergent coupling mechanisms.

This three-step conceptual procedure allows the researcher to develop a multi-level systemic evolutionary (or developmental (cf. Martin & Sunley, 2015) or narrative) approach. It is able to guide both the empirical as the analytical part of research. Step one and part of step two are descriptive, while the rest of two and part three are analytical (cf. in reference to agency). Note that following these three steps does not imply 'a superior research methodology' or 'grant theory'. In contrast, it is an attempt to push the relational approach towards its potential. But foremost, it employs the relational approach that is more problem driven (Sunley, 2008, p. 20). Choices are inevitable and are the subject of the next chapter.

CHAPTER 3

Operationalizing the Relational Approach

In chapter 2 we proposed a conceptual framework that can guide the empirical and analytical parts of the relational approach. We argued that the relational approach applied as such is problem driven and does not attempt to develop theoretical generalization. This has important implications for the research design and the application of case studies. According to the preferred research end-result, three types of case studies can be distinguished (Stake, 1995, pp. 136-139). First, if one has the aim to generalize, the case is of secondary interest, or even (temporarily) absent, and understood as supporting our understanding of something else. The interest is external to the case. This is called an instrumental case study[26]. Second, if the case is the primary interest, the case study is called an intrinsic case study. The case is not used because it represents other cases or because it illustrates a particular problem. The goal is not to understand some abstract construct or generic phenomenon, such as literacy. The purpose is not theory building. Examples are autobiographies or the understanding of the mobility problem of place 'x'. Thirdly, there is the collective case study. It is an intrinsic case study extended to several cases. Case studies are here used to investigate a phenomenon or condition. Individual cases in the collection may or may not be known in advance to manifest some common characteristics. They may be similar or dissimilar, making redundancy and variety equally important.

In this dissertation, we attempt to understand better how actors possess agency capable of coupling the various logics that drive both port and urban development into effective policy and planning. Our goal is to better understand the phenomenon of agency in relation to policy within the particular situation of the port city. We do not attempt to generalize the concept of agency (as, for example, Allen (2003)), nor do we attempt to find a 'universal concept of the port city' (cf. port city models such as the Anyport model (Bird, 1963)). Our goal is to understand agency within the setting of port cities, in contrast to a general definition of the concept of agency within the setting of port cities. Consequently, we follow a problem-driven research design that suits itself well for collective case study. Problem-driven research requires one start with a problem (cf. understanding how actors possess agency within port cities), which then is made tractable in order to find a convincing explanation for the problem under consideration (Howarth, 2010, p. 325).

We thus follow an iterative research process. Our first step is to identify the relational geometry. The identification of the relational geometry of the case studies chosen is, in fact, only instrumental to our main research goal. Indeed, since we do not seek to formulate a new definition of the port city, our first step should a priori be guided by concepts that are 'empirically empty' (Huijs, 2011, p. 88). Remarkably, the critique of the relational approach, that it is too vague and descriptive (Murdoch, 2006; Sayer, 2004, p. 268; Sunley, 2008, p. 8), becomes an ideal starting point. Indeed, the more properties that are used in the definition of concepts, the lower the chance that the results are representative (Sayer, 2010 [1984], p. 162). The concept of relational geometry (Yeung, 2005, p. 48) is all but specific and, in fact,

26 Note that, especially within social sciences, it is almost impossible to generalize. Indeed, "this syndrome [cf. generalization] is especially common in cultural and political analysis where researchers generalize from tiny samples with astonishing disregard for the question of their representativeness. Given that consciousness is so context-dependent [(cf. Orwell, 1949)], it is doubtful whether accurate general statements […] can be derived from limited personal experience or individual case studies" (Sayer, 2010 [1984], p. 162).

just includes everything (Sunley, 2008, p. 12), hence being an ideal starting point for our collective case study. In other words, the identification of the relational geometry of the port city will, in fact, tell us nothing about the port city as a concept in general[27]. Rather, it will help us to understand the port city taken into consideration and will help us to assess the next two steps of our research design.

Indeed, the first step should give us clues on where to look for causal coupling mechanisms, explaining why we observe the particular relational geometry. This second step asks, however, for a different research design. Indeed, while the concept of relational geometry is used to understand the port city better (who or what at this moment), identifying the causal mechanisms can be seen as the 'autobiographical' step to 'trace back the lines' of causation. Following the different types of case studies, this second step asks for an intrinsic case study, whereby the case 'speaks for itself'. This creates a dilemma for our research design. On the one hand, we should be rather vague in our methodology; while on the other hand, we should be specific.

Therefore, as explained by Sayer (2010 [1984], pp. 163-164), one needs a combination of 'extensive' and 'intensive' research designs to overcome this dilemma (Bhaskar, 2008 [1975]; Pratt, 2009; Sayer, 2000). Extensive research is the most common and is concerned with discovering the general properties and patterns (cf. 'traditional geography' and spatial science). In contrast, intensive research is applied to uncover how a causal process works out in a particular case or limited number of cases. These two types of research design ask different sorts of questions, use different techniques and methods, and define their objects and boundaries differently. Extensive methods study similarities and are descriptive of nature. Hence, they lack explanatory penetration. Methods are, for example, statistical analyses. They are replicable and search for regularities. In contrast, intensive methods study causal contexts and have a qualitative nature. They focus on causal explanations of certain objects of events. Methods are interactive interviews and qualitative analyses. It is, as such, very unlikely that the results are 'representative' or generalizable. The research is corroborative, i.e. it searches for evidence that backs up evidence (Sayer, 2000, 2010 [1984]).

Combining extensive and intensive research methods allows us to align our research methodology with the ontological and epistemological premises of our conceptual framework. We have formulated assumptions about reality (flat and deep) and how knowledge is created[28] (Huijs, 2011). Considering our 3-step conceptual framework, this first implies that, for the empirical descriptive part, extensive research methods are preferable. The concept of the multi-level relational geometry leads the way. Its vagueness, however, obligates us to make transparent choices in terms of the variables we apply in order to identify the relational geometry. Therefore, in the first section (3.1), we will explain how we employ the concept of the relational geometry for the port city and what methodology we use. We will explain that we developed a database model for the port cities of Amsterdam and Ghent, which then was used

27 We only can have abstract definitions of the port, city, port economics or port geography (cf. Ng, 2013). As explained before, abstract concepts always run up ontological limits without moving to more concrete levels.

28 Cf. critical realism. For an extensive overview on how continental philosophy has moved from naïve realism, to anti-realism, to critical realism, see Bryant et al. (2011)

to visualize the relational geometry of different economic sectors. Next (3.2), we will explain how we 'dive into the case' and what method we used to construct the narrative of coupling mechanisms. Third (3.3), we will explain how we take a 'step back' in order to understand the concept of agency within port-city interfaces. We end this chapter with a short conclusion (3.4).

3.1

STEP 1: The relational geometry of the port-city interface

A relational geometry is the crystallization of the effects of earlier coupling mechanisms between different systems. A relational geometry is, per definition, always set within one or more structural couplings. These are, for example, territories of regime, states, regions, sectors, etc. These are the result of the coupling of different systems such as law, economy or politics. Hence, it is necessary first in what context one attempts to identify the relational geometry, and second, at what 'moment' the analytical time is stopped.

3.1.1 The structural couplings

Our goal is to identify the relational geometry of the port-city interface, seen as an interactive economic system (Hoyle, 1989, p. 429). We thus depart from two structural coupling effects: the port-city interface and the interactive economic system. We will explain both in following paragraphs.

3.1.1.1 The Port-City Interface

The port-city interface is the result of the structural coupling of the (sub)systems port and city. Port and city can be seen as systems because they are emergent, beyond the willing of the actors involved, following the coupling of several different systems. A city is emergent because of the culture, people, building environment, urban economy, etc. Similarly, a port emerges out of the maritime logistical activities, the cosmopolitan culture, the infrastructure, the economic large-scale sectors, etc. If both are structurally coupled, they become subsystems of the system of the port-city interface. In this case, the port-city interface system will presuppose features of its environment on an ongoing basis, on which they (port and city) rely structurally (Luhmann, 2004). Note that, in fact, the distinction between port and city is not straightforward. Especially historically, it was much more difficult to separate port and city from each other, or even impossible[29]. Indeed, the original meaning of the word 'port' is more or less 'door' or 'gateway'. The port,gateway or harbour in this respect was the embarking place of ships, in many cases directly on the shorelines of cities or in city centres (Burghardt, 1971). Only

29 If one regards the first 'phase' within the port-city interface model of Hoyle (1989, p. 432), one can note how vague and abstract the model is explaining the 'traditional' or 'primitive' port city. The port city in this phase, which overlaps almost the whole history, is no more than just 'two dots' overlapping each other. What this overlap is, why it is not completely overlapped, etc. is not explained. The only explanation is "a close spatial and functional association between city and port", but lacks subsequent refinement.

more recently did the port became a distinct spatial system (cf. Bird, 1963; Hoyle, 1989) following the coupling of systems of economy, law and politics, resulting in a distinct governance model (cf. port authorities), economy (cf. maritime) and land use (cf. industrial and the avoidance of residential land use).

Although ports and cities are open systems, one of the most obvious ways to distinguish them is by their (closed) jurisdictional administrative boundaries, explaining their temporary fix that helps them to stabilize their system. Indeed, although port and city can be defined in many ways (e.g. mobility, economic, culturally, financial, etc.), the jurisdictional boundary is the clearest resulting effect of the coupling of systems as law, economy and politics; there is (in most cases) one central government (cf. city government and port authority), land use model (between port and city, this is clearest in terms of large-scale industrial infrastructure and residential land use) and economy (although closely intertwined, as we will see, this distinction runs broadly between knowledge and large-scale economy).

We start our research by presuming that the port-city interface as a system exists, namely, as 'an interactive economic system'. If so, this implies the system is autopoiesis and generates components in order to stabilize itself. Our research thus focusses on these components and tries to understand them. However, what we expect is that the autopoiesis is 'under stress' or even non-existent. Indeed, earlier research has shown that the port-city interface could be seen as increasingly 'in conflict' (cf. Hesse, 2017; Wiegmans & Louw, 2011). A conflict between the systems of port and city should be understood as a consequence of the 'different speeds' between the coupled or even decoupled systems of port and city. Indeed, structural coupling only guarantees synchronicity, but cannot lead to synchronization (Luhmann, 2004, p. 383). If one detects conflicts (e.g. following broader economic changes), consequently the coupling between systems is under stress with a chance the coupling becomes altered or even decoupled eventually (Arthur et al., 1997; Tilly, 1984). Although we thus presuppose the existence of the port-city interface, we also stress that this systems is (as all systems are) in permanence (Martin & Sunley, 2007, 2015) and can be decoupled.

Following its permanence, the research will start by explaining (at least briefly) the existing systems of port and city taken into consideration. Following the definition of the systems of port and city primarily by their jurisdictional boundaries, at least we should know how they came into existence. Therefore, we will start the identification of the port city with a brief historical perspective, highlighting the most important events in reference to our focus on Amsterdam and Ghent.
After the brief historical perspective, we move to the identification of the contemporary port-city interface. For this, we examine following three variables:

Institutional (port-city) structure. We argued that ports and cities as systems are best regarded following their jurisdictional administrative definition; therefore, we focus first on their institutional structure. The institutional structure will inform us of the geographical scope of (state, region, city, port) agency authority, law enforcement and public policy implementation. However, we have to stress (again) that these boundaries may not be seen as fixed and impermeable. Systems are open and connected to other systems and their environment, so do port and city too. Indeed, institutional structures are by no means a harsh institutional structure that offers only a limited amount of possibilities (e.g. municipality, region, state) (Brenner, 2004; Wachsmuth, 2017), but rather are subject to 'institutional plasticity' (Notteboom, de Langen, & Jacobs, 2013; Strambach, 2010). Originally coming from economic innovation studies, plasticity means that even with a clear structure or path (dependency), many possibilities exists and that within a dominant path of innovation systems, a broad range of possibilities for the creation of innovation exist (Strambach, 2010). Notteboom et al. (2013) have adopted this plasticity to the study of (port) governance, in which plasticity means that actors can succeed in stretching existing institutions and institutional arrangements through deliberate action and flexible interpretation. This can result in municipal expansions, regional planning councils or ad-hoc multilevel public-private partnerships (Wachsmuth, 2017). However, as we will see in our research, within Belgium and The Netherlands, these movements are both followed and countered. Municipal expansion follows, in most cases, an economic-functional logic in which, for example, municipalities expand following suburbanization. Such expansions are clearest in metropolitan city regions, for example in the USA, but also illustrated by the institutionalized (capital) metropolitan areas of London or Paris. In this case, one can argue that the institutionalized boundary adapts to the changed economic-functional boundary. This is different in Belgium and The Netherlands, which are historically characterized by a polycentric strongly interconnected system of many rather small (institutional isolated) cities closely located to each other, as opposed to one dominating metropolitan area (Boelens, 2014; Boelens & Taverne, 2012). In particular for Belgium, following its historical and political context, this has led to a continuing institutional plasticity movements between an 'adaptation' (e.g. merger port authority Ghent and Zeeland Seaports) and 'obstruction' (e.g. expansion metropolitan area of Brussels) of the economic-functional reality and institutional structures. As we will see for Ghent, this leads to different scales of networks, in which more footloose business networks and A(M)PS functions (Sassen, 2000) tend to centralize in Brussels (Hanssens, Derudder, Van Aelst, & Witlox, 2014), as opposed to the more rigid socio-economic networks (e.g. housing and manufacturing), which tend to centrifuge and 'stick' to their (historical) 'home bases' (van Meeteren, Boussauw, Derudder, & Witlox, 2016). This leads to a particular institutional landscape in which many forms of interurban, interregional and international institutional plasticity exists. This in an important context element we have to incorporate in our analysis to understand regional economic development in The Netherlands and Belgium.

Governance structure. This variable will be examined particularly for the ports taken into consideration because it is a leading variable to understand economic development in port areas. The governance structure defines the procedures of setting land-use or shipping tariffs, and defines the regulatory issues, environmental standards and safety measures. It also defines the balance between private and public interests and stakes (Jacobs, 2007). Within Belgium and The Netherlands, port authorities follow a so-called 'landlord' port governance structure (de Langen, 2004; Vlaamse Overheid, 1999). The landlord port model restricts the (public/private) port management to nautical management, infrastructure, land-use planning and the promotion of the port in general. The private sector is responsible for transhipment, industrial functions and requirement, and the entire superstructure. Land is available (in most cases; as we will see, exceptions exist) only for long-term lease and remains in freehold ownership with the appropriate state agency. The port is governed by a port authority, which represents the general interests of the entire port-industrial complex and stimulates internal competition within the complex. The port manager remains neutral and does not compete against the private sector, e.g. by operating terminals. This model has been implemented in the majority of continental West-European ports. Moreover, during the last 20 years, most of these ports have evolved towards semi-public port authorities in which an independent port authority is created using a corporate management structure, however, with only having one or more public stakeholders, for example the (host) city government. However, as explained by Verhoeven (2010), the changing market conditions on one hand, and the socio-economic pressure from their public stakeholders on the other hand, forced many of these 'traditional' landlord port authorities to take a more active role within their port areas. As many port activities became increasingly footloose – in this respect, especially the container maritime industry – port authorities had to find solutions to 'embed' these activities (Notteboom & Winkelmans, 2001). This can be done, for example, by building and upgrading (as fast as possible) the dedicated infrastructure or by incorporating other 'competing' port areas (e.g. Port of Rotterdam acquiring the Port of Moerdijk, or more recently the Port of Ghent merged with Zeeland Seaport). But more and more also by integrating the existing economic activities increasingly (Menzel & Fornahl, 2009). Hence, port authorities are 'tempted' to surpass their rather strict landlord port model to actively invest in public-private partnership (e.g. RDM innovation campus Rotterdam) or to take stakes in activities (Jacobs & Lagendijk, 2014). In order to understand the economic possibilities, one needs to know the property rights as well as the linked land use rules. Property rights define the way the legal control over and access to economic resources (e.g. land) is distributed among society. Although technically a landlord port governance system implies the port authority owns and leases all lands available, this is (almost inevitable) only a general rule. Due to historical reasons, property can be held in private hands, by the state or a combination of both. Second, although in general one can state that land-use rules between port and city differ following the large-scale industrial and primarily residential and offices and services land use, this is again only a general rule.

Socio-economic profile. Before we can move on to our second structural coupling, the economic sector, we need to understand the socio-economic profile of the port city being considered. In other words, we need to know what economic sectors in that particular port city are relevant for further examination. Economic importance can be answered in many aspects.
Both the brief historical perspective as the contemporary three variables used to understand the contemporary port-city interface will be investigated through literature review by desktop research.

3.1.1.2 Economic sector

Similar to the port-city interface, an economic sector can be regarded as an emergent effect following the coupling of technology, specific global production networks and the legal standard, environmental and employment regulations. Simply stated, a sector is a population of firms producing a specific range of potentially or actually competing goods (Hollingsworth, Schmitter, & Streeck, 1994), however it goes further than this. Indeed, following the coupling of other systems, an economic sector should better be seen as a complex social configuration of a historically identifiable productive sphere (du Tertre, 2005 [1995]). An economic sector is therefore identifiable by the specific technology or technologies it applies; the specific demands for labour and skills needed; the different logistical patterns following the specific value chains; and the specific competitive positions firms take within regional or global market arenas (Jacobs, 2007).

Perceiving the economic sector in broader terms helps us to first understand the particular sector better, but also to understand the interplay between the 'global' level of sectors and the 'regional' and 'local' level (Lagendijk, 2006). In other words, we regard 'the market' and how it interferes with the port city. Indeed, many regional development studies tend to follow a 'parochial' view on the region seeing the world only in singular terms, i.e. 'competition within globalization'. However, reality is more complex. The wider economic environment includes global production networks (Henderson, Dicken, Hess, Coe, & Yeung, 2002), complex systems of capitalist institutions and organized markets (Lagendijk, 2006).

These differ per economic sector, are highly social in character (Thrift, 2000) and are infused with (historical) cultural, legal, political and institutional dimensions (Peck, 2005). Indeed, understanding how an economic sector is 'embedded' requires that we explain the sector using a (brief) historical perspective. The sector did not emerge 'out of nothing', but is the result of different causal mechanisms. Although the latter is a subject of step 2 in our conceptual framework, we inevitably cannot explain the presence of an economic sector within a particular setting without a (rather general) historical perspective.

After the brief historical perspective of the economic sector is taken into consideration, we will focus on two variables to explain the contemporary presence of the particular economic sectors.

The industrial regulation. Any existing economic activity is (un)regulated to some level. Almost all economic sectors are influenced by international, national or regional (geo)political regulations. Although it is possible some of these do not exist anymore, they nevertheless can explain contemporary economic activities at a certain place. Consequently, not one economic landscape may or can be perceived as a 'free market', understood as the economic activity following the rational behaviour of fully informed, ideology-free economic agents. Instead, economic markets and individual behaviour are always structured by all kinds of social, economic, cultural and political rules, regulations, subsidies, procedures and conventions. Although sectoral regulations become increasingly internationally organized (e.g. environmental standards, production configurations), their interference with national and regional regulations result in the existence of 'varieties of capitalism' (Hall & Soskice, 2001), influencing the 'neutral' economic space and hence the geographical strategies of firms (Henderson et al., 2002).

The industrial setting. The industrial setting regards the dominant mode of production and technology within a certain sector. In general, the capitalist global economy has moved from a vertical integrated production chain in search of mass production and consumption (so-called Fordism), towards a system focussing on flexible production, innovation and economies of scope (so-called Post-Fordism) (Amin, 1994). However, in reality, industrial settings vary much more, resulting in a mix of different 'agglomeration economies' (Parr, 2002).

These two variables per economic sector will be investigated through literature review by desktop research.

3.1.2 The strategic couplings

Previous paragraphs dealt with the effects of the structural couplings taken into consideration: the port-city interface and the different economic sectors. Within these emergent overarching effects, we seek the effects of the strategic couplings, or in other words, the outcome of interaction and the relational constitution of common strategic projects (Yeung, 2009). This is now possible because we framed our research to a particular port city and to a particular economic sector. Thus, in other words, we now start looking for strategic couplings that occurred (thus their effects) within the setting of these structural couplings.

First of all, we want to stress again that there is a difference between the strategic coupling mechanism and the resulting emergent effect of it, similar to a goal and the causal shot. We defined the mechanism as the capacity to align interests and activities (Jacobs & Lagendijk, 2014). The effect must be interpreted as the strategic, more enduring outcomes of this. Hence, what we are looking for are strategic couplings that succeeded and are crystallized in the contemporary relational geometry of the economic port-city interface. This crystallization can be interpreted as a network of relations between the actors intentionally involved. A relation, as all phenomena, hereby should be interpreted as a relational property that has the generative capacity to modify the powers of its constituents in fundamental ways, but is not simply reducible to the actions of and properties possessed by their constituent individual parts.

Therefore, a strategic coupling occurs between two intentionally involved actors. The overall result is a network. Such networks are, per definition, open and endless. Hence, they are impossible to analyse because one does not know what to include and where to stop. We thus need analytical tools, both for the extend and structure of networks, as well as for the different types of relations.
First, in order to geographically define the relevant extent, Menzel and Fornahl (2009) argue to combine the thematic boundary and the spatial boundary (Figure 3.1). They adapt this to find the relevant cluster. The cluster in this way is interpreted as a relational phenomenon combining spatial and relational aspects (cf. Porter, 1998). Indeed, a cluster is another example of an emergent spatial effect. While the constituting networks underlying this are, per definition, open and endless, a thematic and spatial boundary can be observed resulting in a 'spatial horizon' (Van Der Haegen & van Weesep, 1974) beyond which the influence and relevance diminishes quickly. These boundaries can, however, only be detected empirically, and their observation is always arbitrary. The thematic boundary distinguishes the cluster from other parts of the production and innovation system within its spatial range. The spatial boundary separates the cluster from its industrial environment, which consists of companies and organizations in the same thematic field, but are located elsewhere. Both boundaries are thus intertwined.

The resulting geographic distinction runs along notions as transaction costs (McCann & Sheppard, 2003), cognitive proximity (Maskell, 2001) and other local path dependencies (Martin & Sunley, 2006), creating regional spatial characteristics and eventually geographical separation (Menzel & Fornahl, 2009; Rigby & Essletzbichler, 2006).

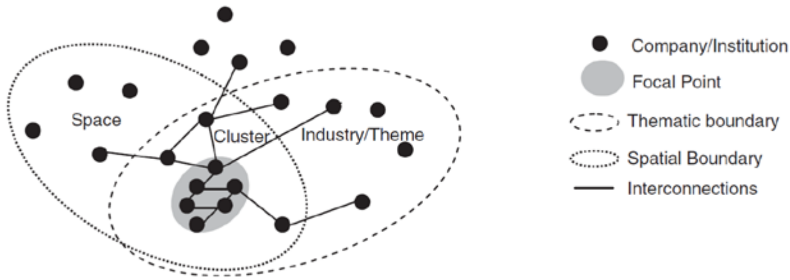


Figure 3.1 The thematic and spatial boundaries defining the relevant cluster (Menzel & Fornahl, 2009, p. 214)

The underlying networks have a structure and hierarchy. These two are correlated and give an indication of the relational differences existing between the individual economic agents contributing to the economic network. Over time, hierarchy, in terms of control or importance, gets crystalized within the structure (Denicolai, Zuchella, & Cioccarelli, 2010). Hence, for example a network can evolve towards a hub-and-spoke structure. Subsequently, research quantifies such hierarchies by applying (social) network techniques in search of centrality or connectivity, for example (Amin & Thrift, 1992; Yeung, 2000).

However, what is often forgotten is that networks not only have different structures and hierarchies, but, one step back, existing networks within a particular economic landscape also come in a variety of 'types' (Giuliani, 2010). Indeed, there is limited analysis on how different types of networks together affect the emergence of successful and vibrant clusters. This is largely due to the fact that disentangling different networks' effect on performance is a difficult exercise (Boggs & Rantisi, 2003). However, as argued by Giuliani (2010, p. 264), if one wants to compare the effects of the positions of firms within different networks, the central issue is not essentially a quantitative one, understood as identifying the different factors and variables, but a more relational qualitative one, in which one assesses the existing different types of networks.

For example, Giuliani (2007) analysed the characteristics of the business and knowledge networks for three wine clusters. The business network is defined as a set of relationships established by firms in a cluster when they interact on issues related to their business. Examples are the trade of inputs or services or membership in the same local consortium. The knowledge network is defined as the network that links firms through the transfer of innovation-related knowledge, aimed at the solution of complex problems. Such a network is thus based on the transfer of knowledge among economic actors (Giuliani, 2007, 2010).

As shown in Figure 3.2, knowledge and business networks are structurally different. The first difference is that business networks are pervasive, connecting in a fairly homogeneous way almost the entire population of cluster firms, while knowledge networks are very selective, not only because they are less dense, but also because the linkages are unevenly distributed across the network (Giuliani, 2007, 2010).

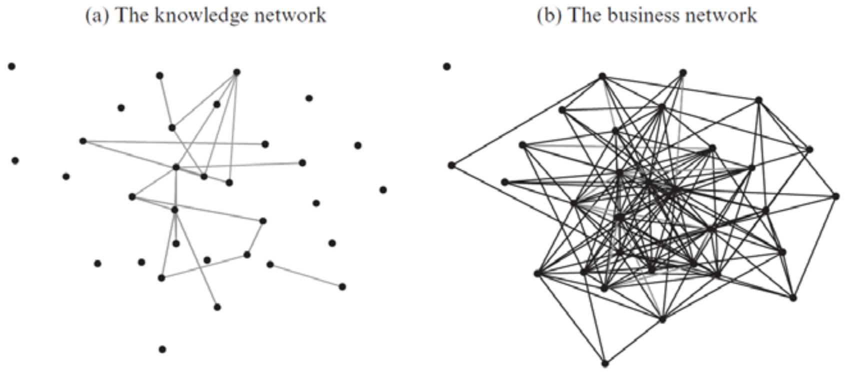


Figure 3.2 The knowledge network and business network in the wine industry cluster of Colline Pisane (Giuliani, 2007)

The structural characteristics of business and knowledge networks vary because they are grounded on differing underlying rationales. Business interactions are favoured by the existence of firms' geographical, sectoral and social proximity in the cluster (Boschma, 2005). Many of these relations are relatively broad and diffuse, sometimes unwanted and often seem of little immediate use (Malmberg, 2003). This differs from knowledge networks, a variable that better explains why firms are heterogeneous in their capabilities and learning processes. Well-connected firms tend to be firms with strong knowledge bases and are seen within the cluster as technological leaders or innovators, having a higher absorptive capacity and more incentive to search for external knowledge. This also implies a greater chance that these firms, due to path dependency, become central nodes within knowledge networks as a hierarchy develops following that firms with a cognitive distance which is not too high, tend to connect easier, creating a self-enforcing effect (Boschma, 2005; Giuliani, 2007, 2010).While Giuliani (2007) focusses on knowledge and the rather broad defined business networks, we attempt to go further to understand the existing networks and their influence on the networks positions and routines of firms. Before we present these different types of relations, we want to stress that these are non-exclusive and correlated. Indeed, similar to the critique on the different modalities of power (Allen, 2003), abstract distinctions always run up against ontological limits without moving to more concrete levels of analysis. Our selection of relational types is, therefore, arbitrary and may not be seen as a generalization of relational types that should be considered. We choose to focus on six types of networks (Table 3.1).

Relational type		Explanation	Examples
1	Input/Output	For the production of goods	grains, diesel, organic waste
2	Energetic	Used as input for support of production of goods	electricity, diesel, heat
3	R&D	The (fundamental) research and development of production of goods or production processes (de Langen, 2002)	processes in (lab-) environments
4	Advanced producer services	Services in support of (maritime) production/transport activities (W. Jacobs et al., 2010)	engineering, IT services, insurance, legal advice
5	Membership/ Association	Organisation in which companies/institutions meet each other (de Langen, 2002)	(association, labour union, chamber of commerce
6	Shareholder	Full or partial ownership of shares	mother/daughter companies

Sources: Kuipers et al. (2015); Vandermeulen, Nolte, and Van Huylenbroeck (2010); annual company reports; company websites; Orbis/Belfirst Bureau van Dijk (Amsterdam/Ghent); Knack Top Trends (Ghent); LISA (Amsterdam)

Table 3.1 The different relations taken into consideration (Van den Berghe, Jacobs, & Boelens, 2018

The physical and linear exchange of (i) commodities and production inputs and outputs through transhipment and cargo handling is one of the main exchange relations within port city regions. It consists of input and output as well as buyer-supplier relationships in which commodities and material goods are exchanged for storage or processing and vertically move down the value chain. Although not mutually exclusive from commodity and production inputs, we also focus on (ii) energetic relations. The energetic relation is perceived as input for the production process and not as input for the production of the product. Next, there are (iii) R&D relations. Although these relations can be fully internalized, we focus in particular on such relations aligned through partnerships, including universities and knowledge institutes. Related to these relations are the (iv) advanced producer services (e.g. IT, legal, and insurance) that can be considered as specialized activities (Jacobs, Koster, & Hall, 2011). We also emphasize the (v) association relations. Associations increase the chance of cooperation, cross-overs and innovation trajectories (de Langen, 2002). Last, we focus on the (vi) shareholder relations. These can go from full ownership to partial shareholders.

We examine the relational geometry of the port-city interface focussing on a particular economic sector. A starting point hereby is to look first for the relevant actors within this sector. This can be done by scanning for the relevant companies according to their main activities. For most sectors we examined, the starting points were rather straightforward because the sector is dominated by one main company (e.g. TATA Steel Ijmuiden, ArcelorMittal Gent, and Volvo Car Gent). This is different for the biobased sectors. As we will explain, the sector is dominated by a cluster, which subsequently was used as starting point to identify the relevant relational networks.

3.1.3 Database model and visualization

We created a database model that is capable of visualizing the relational geometry of the port-city interface. For this purpose we combined nodal (cf. actors involved) and linear information (the strategic coupling effects) within their structural coupling settings: geographical (cf. institutional; port, city or other) and thematic (cf. economic sector). With this visualization, the relational geometry is identified and gives a starting point to examine the causal coupling mechanisms.

For the nodal data, we used several national and international socio-economic databases. For Belgium, we first relied on the Flemish Knack Top Trends database[30]. This database is behind a paywall, but accessible for the Ghent University. Knack Top trends database is based on publicly available sources. Foremost, Knack uses the data of the National Bank of Belgium (NBB), which collects the mandatory corporate annual accounts of each public and private organisation in Belgium every year. The National Bank of Belgium publishes this data themselves in an open-access online database called the 'FOD Economie Kruispuntbank van Ondernemingen (KBO)'[31] however, they only present individual enterprise records, while Knack Top Trends adds a geographical selection tool. Moreover, Knack Top Trends combines the data with corporate annual reports, if available, and collects data themselves if data is missing from their first sources. Next to the geographical selection tool, Knack Top Trends also offers the ability to select companies by their main activity. For our research, this helped us to understand the economic actors of a certain sector active in a certain area (e.g. all firms working in the car manufacturing sector in the statistical area of Ghent). However, an important problem is that many firms have multiple locations, disrupting the data. For example, it is difficult to discern how many people are employed by the Belgian Belfius bank within Ghent because Belfius only hands in its national annual account, not an account per office. Another problem is that firms can change their company name, through a merger or reorganisation for example, making it impossible to compare data on a longer term. For these two problems, The National Bank of Belgium uses a two-step unique key for each unique geographical location of a firm. The first unique key is the so-called 'business number' or 'company number' (ondernemingsnummer), which an enterprise obtains when it registers itself for the first time. This number, which is the same as its VAT number, has a unique geographical location (in terms of latitude and longitude) and refers to the registered headquarters of the company. Next, in Belgium, all fully owned branch locations, thus also the headquarters, are assigned with a unique so-called 'settlement-number' (vestigingsnummer). Assigning the headquarters is mandatory, and, if not clearly mentioned on the corporate website for example, one can get this information by looking for the settlement number that is the same as the business number. This makes it possible to analyse a firm, its different locations and the hierarchy of it, all independent from the company name. Thus, by combining the geographical and sectoral selection tools from Knack Top Trends with the FOD KBO official records, we have a satisfying source to understand regional economic activity. Most companies within Belgium are obliged to send in their annual corporate annual accounts, however exceptions exists for family-owned companies, agricultural associations, public hospitals or schools, or educational institutions (e.g. Ghent University). Foremost for the SME companies (fewer than 50 employees for small companies, and fewer than 200 employees for medium companies), this hinders our research, as these companies are generally family-owned companies. However, these companies are obliged to register their social figures annually (e.g. number of employees, gender, education level, etc.) at the National Social Security Office (RSZ)[32] because that is how their taxes are computed. Knack Top Trends incorporates this data within their online database, offering a relatively complete socio-economic database for Belgium.

30 https://trendstop.knack.be/nl/home.aspx (accessed between 2015-2017)
31 http://economie.fgov.be/en/entreprises/ (accessed between 2015-2017)
32 http://www.rsz.fgov.be/en (accessed between 2015-2017)

For The Netherlands, a similar system exists, however the different databases are more likely to be behind a payment wall. Similar to Knack Top Trends, the online database Company.info[33] and the LISA (Landelijk Informatiesysteem van Arbeidsplaatsen en vestigingen) databank[34] (for a description see van Oort, 2004) offer different selection tools. Both rely on the national chamber of commerce data (KVK), which does not publically publish its collected data (cf. paywall). The Dutch national statistical bureau (CBS) offers socio-economic publications, but only on an aggregated level. Similar to the National Bank of Belgium, the Dutch KVK assigns a unique geographical company number to each enterprise when registered for the first time. However, different from Belgium, the KVK does not assign settlement numbers to the different locations of a same company. Therefore, the LISA databank assigns its own unique number to all these locations. For our research, the biggest problem was that the LISA databank is relatively expensive, especially if one does not have a small geographical focus area. This implied that we started our research in The Netherlands by relying on the Bureau van Dijk database (BvD).

The from origin Belgian Bureau van Dijk[35], recently acquired by the American business and financial service company Moody's Corporation, is a major publisher of business information and specializes in corporate company data, combined with extensive search tools. The BvD database is global in reach and collects data from different sources, such as the Belgian NBB and RSV, the Dutch KVK and annual company reports. For our research, this database is best positioned as it offers trans-regional and trans-national data. Considering our aim is to transact existing institutional boundaries, national collected data hinders us and offers only a limited view. BvD has several online databases. For Belgium, it has an extensive database called BelFirst. Their Amadeus database is a pan-European database, but recently they began merging all their databases into one global database called Orbis. Similar to the NBB, BvD assigns unique numbers to both the enterprise as well as all settlements. For Belgium, it uses the same codes as given by the NBB, but for The Netherlands it has to rely on the codes handed out by LISA. Some countries do not assign such unique codes, forcing BvD to assess their own codes to all these firms. However, the BvD databases offered two major problems for our research. The first one is that the database is not available within the Ghent University. This was one of the reasons that part of the research was conducted within the Dutch Erasmus University Rotterdam[36], which has access to the complete database. A second problem was that the BvD database does not publish the geographical coordinates for Dutch enterprises due to restrictions from LISA. This was solved by first selecting the relevant companies within the Netherlands, resulting in a relatively focused selection, and correlate these with the selection of companies obtained from LISA.

Having these sources finally lined up, we have built our database model of relevant firms and relations, or the nodal table and linear relational table. These two tables are related based on a one-to-many relation (e.g. one company can have mutual relations with other companies) (Figure 3.3).

33 https://company.info/ (accessed between 2016-2017)
34 https://www.lisa.nl/home (accessed between 2016-2017)
35 https://www.bvdinfo.com/nl-be/home (accessed between 2015-2017)
36 September 2016 – February 2017

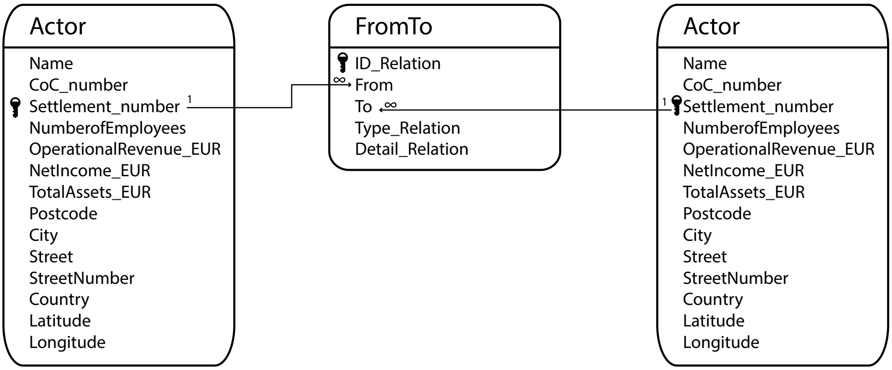


Figure 3.3 The database model design linking the nodal company socio-economic data (tbl_100_Adam_All) with the relational linear data (tbl_01_MainTableFromTo_Adam) using a one-to-many relationship, screenshot from the Amsterdam case study database

The data that can be linked to each economic agent is unlimited. Therefore, we chose to have a combination of geographical data (coordinates), the mere economic figures (in terms of net income or total assets) and the social figures (in terms of number of employees). Using the BvDID_company in combination with the settlement company ID, we are able to figure out which nationality the mother holding has.

Similar, the FromTo relations can be added with several variables. The first important variable is the type of relation existing between two companies (Figure 3.3). This can further be described in detail by financial data (how much value being transferred) or throughput data (how much tonnage), if available. Second, an important variable to add is the main 'cluster' to which the relation belongs. Although we depart from companies having their main activity similar to the economic sector examined (e.g. a car assemblage factory within the car manufacturing sector), all other firms, having another main activity according the socio-economic databases (e.g. a financial holding, allocated to the financial economic sector), can be included as long as that relation is then labelled as 'car sector'. According the thematic and spatial boundary, this allows us to construct the eventual socio-economic cluster, crossing sectoral and institutional boundaries, which consequently can be visualized.

To inform us of the existing relations within the different clusters, we first relied on the described databases, foremost for financial data (e.g. mother/daughter companies or list of shareholders per company) and different research reports. Subsequently, we expanded this with data from websites and annual reports from several firms, university departments or the different consortia within the network.

The database model is constructed using Microsoft Access 2016. This data can be converted and implemented in ArcGIS ArcMAP 10.3. This gives us two linked shapefiles: a point features shapefile and a polyline features shapefile. These eventually are converted to a geographical network (GN). However, the two-dimensional Euclidian visualization gave an analytical problem. As many nodes (e.g. firms) are located at the same place (cf. mother/daughter companies or firms sharing a building) or close to each other (especially within linear port areas), the existing nodes and relations were visually overlying each other or blocking their full extent, making it impossible to find a suitable resolution that could be used for the next step of our empirical research (Figure 3.4).

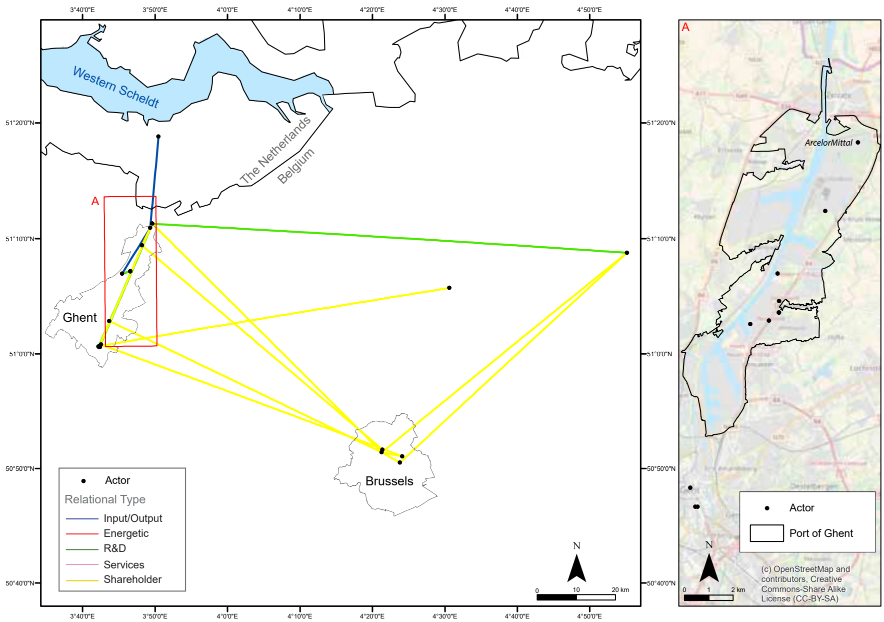


Figure 3.4 The Euclidian visualisation of the steel manufacturing cluster in Ghent, being unsuitable for further analysis.

Therefore, we used the ArcGIS schematics extension[37]. This extension makes it possible to obtain the geographical locational data, ensuring we maintain the *topographical* institutional administrative area in which the firm is located, while being able to represent the *topological* network structure and hierarchy (Figure 3.5). Hence, we are able to visualize the relational geometry of the economic port-city interface per economic sector.

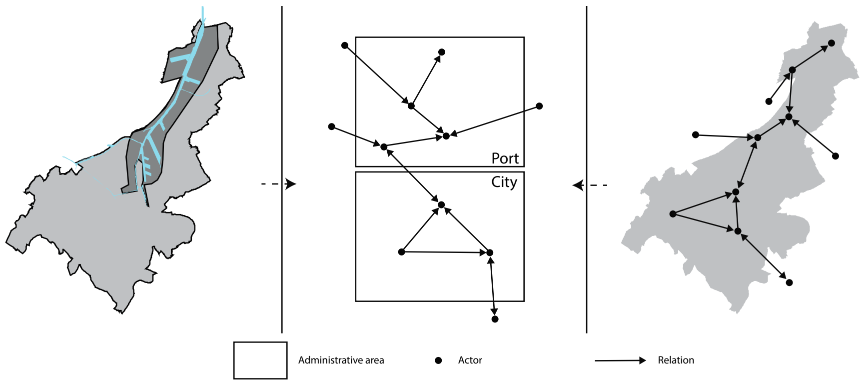


Figure 3.5 Methodology for visualizing the relational geometry of the economic port-city interface, combining the structural and strategic coupling effects

37 http://www.esri.com/software/arcgis/extensions/schematics (version ArcMAP 10.3)

3.2

Step 2: The coupling mechanisms

Based on the crystallization of the effects of the structural and strategic couplings, the relational geometry at a given analytical time 'zero' is identified and visualized. The next step is to figure out what causal coupling mechanisms can explain the existence of the relational geometry. Hereby we go back and forth into time. While the effects of structural and strategic couplings can be examined by desktop research, for tactical coupling this is more difficult. Although sometimes one can find press releases or interviews, for example, most effects of tactical couplings are hard to 'trace back'. Step 2 implies we need intensive research methods to study the causal explanations of the relational geometry. The methods required are qualitative interactive interviews and the research is corroborative (Huijs, 2011; Sayer, 2000).

3.2.1 Tracing tactical couplings

The corroborative character is essential. Indeed, if one attempts to trace back the lines, one will quickly experience a background of a polyphony of voices, structure and agency and a diverse mix of details blurring the causal mechanisms38. Next to this, and even more important, is that one also has to bear in mind that the tracing line has to stop somewhere back into time, because tracing back lines is literally a never-ending story. A beginning is always an ending. In other words, we need a 'temporal boundary', which is arbitrary[39]. Otherwise, tracing lines are always incomplete. There is never one single cause or origin, and no interpretation of history can claim final authority. Hence, a variety of perspectives, backed-up by data and sources as much as possible, is required (Huijs, 2011, p. 90).

What we are doing, in fact, is finding the causal or meaningful effects within our case study research. The question, however, is to determine what is meaningful (Yin, 1981, p. 61). Again, our step 1 is guiding. Indeed, we already know where our tracing line starts/ends (seen from what 'temporal' side you are looking at), because we chose to identify what the relevant causal effects of the strategic and structural couplings are. By subsequently going back into time, we look for meaningful causal tactical couplings that occurred; and going forth into time, as well. This eventually leads to the already identified emergent effects. Meaningful is understood hereby in terms of changes that triggered a set of chain of reactions of feedback loops, eventually resulting in strategic and even structural coupling effects[40] (Huijs, 2011).

Once these tactical events are identified, we are able to categorize them and the strategic and structural couplings identified earlier according our analytical framework. Hence, we have reconstructed the tracing line and the narrative of the case study.

38 "[...] many case studies begin with the naïve assumption that anything might be relevant [...]" (Yin, 1981, p. 60)

39 Flyvbjerg (1998) went back 500 years to establish the historical context of policy making and planning in Aalborg in the 1980s (Huijs, 2011).

40 This is similar to how Latour (1987) described technological innovation (Huijs, 2011).

3.2.2 Interviews

If events cannot be observed by the researcher directly, one needs to rely on others who were directly or indirectly involved. As already said, this best applies to the tactical coupling events, which are, in many cases, not recorded. Therefore, the researcher needs to obtain the descriptions and interpretations of others. Ideally, the other was directly and actively involved in the process. This also means that the longer the tracing line of the particular relational geometry of that case goes back into time, the harder it becomes to find actors who were directly involved. In other words, the longer the line, the more the history is blurred, decreasing possibilities of corroboration.

Interviewing is the most common method of accessing the descriptions and interpretations of others within a particular case setting. Interviewing works as a structuring frame because the interviewer takes up a specific role, as well as the respondent in trying to answer the questions in ways they think is most appropriate (Huijs, 2011).

Therefore, our intensive research in step 2 followed two types of interviews.

First, interviews were used to gain insights in the particular case. Guided by the identified and visualized relational geometry, we selected a group of actors with a higher chance of 'relevance'. In other words, the respondents were purposefully selected, rather than randomly or following their 'geographical' location or specifications. In this first set, the actors were chosen because of their 'overarching' view; in our case, for example, someone from the port authority, the city economic department or an expert who is familiar with both the structural coupling of the port city as well as the structural coupling of the economic sectors chosen in that port city. In one case, we also organized a roundtable at the city economy department of Ghent during which the relational geometries were presented and a broader discussion was organised. All other were face-to-face interviews. These interviews were, at most times, semi-structured because we wanted to let the interviewee speak for him/herself and foremost to learn from them. These interviews started each time with the presentation of the relational geometry visualization. This helped us also to refine or correct mistakes that were made in step 1. Also, it became clear that the visualizations helped to trigger the attention of many interviewees. It showed that the interviewer did not came over 'empty handed', but was prepared. Remarkably, because of this, the interviewee did not felt as if his/her time was wasted. All interviews lasted longer than the standard 30 minutes foreseen by invitation sent a priori. Some interviews lasted 3 to 4 hours. This offered us a very important source of information that we otherwise never would have found.

Second, interviews were used to specifically trace back events that were brought up in the first set of interviews. In many cases, the people selected for our 'exploring' interviews were also the right interviewees who could give us a detailed narrative. Otherwise, within the first set of interviews, a particular person was mentioned who was very much involved with this particular event. This 'snowball technique' (Bryman, 2015) helped us to approach and effectively get into touch with the relevant persons, as we could mention the names and functions of our previous interviewee within our invitation, opening doors that otherwise would stay closed[41]. Especially helpful hereby was that we designed an invitation letter with the logos of the different universities from which the research was conducted (Ghent University and Erasmus University Rotterdam) and the relevant port authority (Port Authority Ghent and Port Authority Amsterdam). For Ghent in particular, the CEO of the Port Authority (Daan Schalck) was willing to sign these invitation letters, helping us significantly. These second set of interviews were more structured, as we knew what we were aiming for. However, still we let the interviewee speak for him/her because it also helped us to corroborate the broader picture towards these specific events obtained by the first set of interviews. In all cases, both interviews assumed the form of narrative interviews tracing back the lines they experienced.

Important to note here is that we also took into consideration the 'memory' of the actors invited. Indeed, people who were involved in the events we were looking for could have changed jobs or be retired, for example. Remarkably, this sometimes happened relatively fast. A line going back for more than 10 years was experienced as already having a critical length. Therefore, while exploring the different economic sectors within the port cities of Amsterdam and Ghent, our second methodological step 'diving into the case' was restricted to two case studies (out of five), namely the biobased sector in Amsterdam and Ghent. In contrast to the other case studies (the car manufacturing and steel manufacturing sector), the tracing line of the biobased sector only started around 10-15 years ago in both Amsterdam and Ghent. Although many actors involved were not involved anymore (retirement, for example) within the firms contacted, we could find someone else who was involved in 'second-line'; for example, someone who worked with the relevant person or who succeeded him/her. For the car manufacturing and steel manufacturing sector, the narrative went back much further. This should be no problem, of course (cf. Flyvbjerg, 1998), but in terms of time and in reference to 'test' our analytical framework (and go beyond the crystallized strategic and structural couplings and extensive research methods), we eventually choose to focus on the biobased sector, which holds much more possibilities to at least approach the relevant tactical events.

Almost all interviews were taped, after asking for permission. Taping has the advantage that it improves the accuracy, as one can rewind. This is especially useful because it does not interrupt the interviewee for note taking. It also has the advantage that the interviewer can be involved in the conversation better and, as such, can even detect more 'sensitive' aspects of the story. Interview ethics were important and the scientific character of the research was guarded at all time. Of course, taping can also have the disadvantage of preventing people from talking more openly. However, we assured each interviewee that the information would always be treated confidential and would only be referred to the interviewee in more general terms, if necessary.

In the end, we conducted 21 interviews. The list of interviews (and presentations) can be found back in the appendices[42].

The last challenge is to construct a relevant narrative using our analytical

41 Only one refused an interview: Chris Linderman, CCO of Simadan Amsterdam

42 Appendix A, Appendix B, Appendix C

framework. In other words, we tried to assemble the jigsaw puzzle. While the interviews offered us a linear line of history, we could tell the story in a structured way by following our analytical framework, linking all relevant events with each other.

3.3

Step 3: Uncovering agency

Once this was done, we could take a step back and look at the broader analytical picture. The first and second step followed an intrinsic case study, whereby the case is of primary interest. For step 2, we focussed on the two biobased cases in Amsterdam and Ghent. In step 3, we are able to assess these two cases together in order to understand, but not to generalize, the phenomenon of agency based on this broader analytical picture. We thus have a collective case study in step 3. What we do is look at the different coupling mechanisms that happened and understand how agency was involved. Agency is hereby understood as the capacity to act in a given particular environment (Hewson, 2010). One can observe an emergent relational effect only in relation to its constituent elements. In this third step, we thus in other words, will try to analyse how actors have gained agency to influence and construct the development agenda of the (biobased) port-city interface and how this resulted in the different emergent effects we observed.

3.4

Conclusion

In this chapter, we operationalized our conceptual framework. We explained that in step 1 we would identify and visualize the relational geometry of the port-city interface per the chosen economic sector. These are our structural coupling effects. We explained that in this step we follow an extensive research method in which we first set the scene and then explain the contemporary port-city interface and chosen economic sector. Next, we are able to identify the strategic coupling effects. We explained that several types of networks exist with different boundaries. By creating a database model and following a particular visualization methodology, we eventually are able to present the relational geometry of the economic port-city interface. The subsequent step 2 identifies the causal coupling mechanisms. In this step, we 'dive into the case' to trace back the line and to discover the relevant tactical couplings not suited for desktop research. Instead, we conducted interviews in two phases, one exploring and one focussed. Due to the 'length' of the tracing lines, the available direct involved actors and the limited time, this second step focusses on the biobased case studies in Ghent and Amsterdam. Once all these different histories are recorded and analysed, in step 3 we construct the narrative using our analytical framework, linking all identified coupling effects with each other. Because we did this exercise for two port-city interfaces, we have a collective case study that we will not use to compare, as such, but to help us understand better how actors possess agency to influence and construct the development agenda of the port-city interface.

The end of chapter 2 and 3 is a turning point in this thesis. We will go now from the theoretical and methodological part to the empirical and discussion part. Chapter 2 provided us an answer to our first research question: 'What theories and concepts can help us to apply a relational approach to the port-city interface?'. Chapter 3 provided us an answer to our second research question: 'How do we operationalize such relational approach?'. In the next two chapters, we will identify and visualize the relational geometries of five port-city interfaces: two in Amsterdam and three in Ghent. Each can be seen as an individual case study and will be structured along the variables as described in step 1. While conducting the empirical research, we choose to restrict our step 2 to the two most interesting case studies in reference to our theoretical and methodological goals, namely the biobased sectors in Ghent and Amsterdam, for reasons we already explained. Therefore, in both chapter Amsterdam and chapter Ghent, the relational geometry and subsequently the causal coupling mechanisms of the biobased sector will be addressed lastly. Subsequently, in chapter 6 we bring these two case studies together in our discussion. In this chapter we first find an answer to the research question 'How do actors possess agency to influence and construct the development agenda of the port-city interface?', which then provides us enough munition to tackle the broader and general question within this thesis, which we will answer while ending this dissertation.

CHAPTER 4

Amsterdam

4.1

A brief historical perspective

Different than for example Utrecht or Ghent, both being centres of the ongoing Christianization that enrolled itself over the Low Countries (Flanders and The Netherlands today) between the 6th and 8th centuries, Amsterdam did not emerge as a cultural and religious city. Neither did Amsterdam emerge as a residence of nobles or kings as, for example, The Hague or Delft, but Amsterdam foremost developed itself as a trade place governed by a civil administration. Around the year 1000, Amsterdam emerged as a small village within marshland at the mouth of the river Amstel within the Southern Sea. To prevent Amsterdam from flooding, a dam was built on the river mouth of the Amstel and along the IJ, which was an estuary of the Southern Sea. Outside this dyke, which is now the Damrak, the port of Amsterdam was established (Kahn & van der Plas, 1999). However, it was not until the 14th and 15th century that Amsterdam began to develop as a relevant port city when it obtained trade privileges and the right to trade toll free. It foremost derived its increasing success from its foreland connections towards the Baltic Sea region. However, it was not until the start of the so-called Golden Age at the end of the 16th century that Amsterdam became an important port city, even on a global scale. Ironically, Amsterdam may have become the leading port city during the 17th century because the leading port city of the 16th century, Antwerp, as well as the cities of Ghent and Bruges within the southern provinces, fell during the Eighty Years' War in 1585 with the occupation of the Spanish Army. The Northern provinces remained independent and became the Republic of the Seven United Netherlands. Within this republic foremost Amsterdam thrived (Boelens & Taverne, 2012). It could thrive because powerful (protestant) families and trade networks moved from Antwerp to Amsterdam and second because the Wester Scheldt, which is the maritime entrance to Antwerp and Ghent, was controlled by the Sea Beggars (Geuzen) and became a trade threshold mostly for Antwerp (Gelderblom, 2000; Israel, 1989). As such, next to the Baltic Sea foreland, Amsterdam expanded its trade network to the Far East during the 17th century. Pushed by organisations like the Dutch East India Company, wealth, stocks and resources accumulated within the port city of Amsterdam, making it one of the two main trade and financial port cities of Western Europe, next to competitor London. Amsterdam became an impressive port city along the IJ-banks.

4.1.1 The Golden and Silver Age

During the Golden Age, the Dutch Republic, with Amsterdam as focal point, thrived in art, science, military and, of course, trade. The city of Amsterdam expanded, resulting in an increase from 30,000 to 210,000 inhabitants in one century.

Figure 4.1 Map of Amsterdam by Florisz van Berckenrode 1625 (Hameleers, 2015)

During the 18th century, sometimes referred to as the 'Silver Age', the port city of Amsterdam consolidated its wealth, but did not experience any important expansions. The top position of Amsterdam ended when the French occupied The Netherlands in 1795, during which time the economy almost entirely stopped and The Netherlands became a puppet state of France. This marked the end of many of the Dutch colonies (except – parts of today known - Curacao, Indonesia, Suriname and Ghana) and the end of the decentralized civil governed Dutch Republic, replaced by the French empire and later the Dutch kingdom, as it still is today (Israel, 1989; Kahn & van der Plas, 1999).

4.1.2 The North Sea Canal and the arrival of Hoogovens

Maritime trade activities rapidly decreased because of the loss of the overseas colonies, the wars between France and England, and due to the obstruction of ships following the siltation of the Southern Sea and the IJ towards Amsterdam. The French occupation ended in 1813. It marked the start of the United Kingdom of the Netherlands[43], encompassing the contemporary The Netherlands, Belgium and Luxembourg together. Both Brussels and Amsterdam acted as the capital cities. Universities were established (or reopened), such as Ghent, Liege, Leuven or Utrecht. Also, the United Netherlands prospered economically. Foremost, the Southern Netherlands (Belgium) were influenced by the Industrial Revolution, where a number of modern industries emerged in Charleroi, Ghent, La Louviere and

43 'Verenigd Koninkrijk der Nederlanden'. The 'United' was later added by historians to distinguish it from the contemporary Kingdom of the Netherlands.

Liege. Consequently, Antwerp emerged again as a major trading port following the import and. export of these industries. To support other port cities, King William I embarked on a program of canal building that saw the creation of Ghent-Terneuzen (see next chapter), Brussels-Charleroi and the North Holland Canal (Kahn & van der Plas, 1999). Latter is 80km long and was built between Amsterdam and Den Helder, enabling ships to reach Amsterdam again. However, soon the canal became insufficient, and ships had to unload their commodities in Den Helder, and consequently transport them to Amsterdam by barges. Therefore, in 1876 the North Sea Canal was opened, connecting Amsterdam directly to the North Sea in Ijmuiden. By doing so, Amsterdam could compete with the port of Rotterdam, which had just recently completed the New Waterway (Koelemaij, 2013). The North Sea Canal has three locks and a depth of 15.10 meters. At the moment, a new larger sea lock is being built with a depth of 18 meters.

After the Belgian Revolution in 1830, Amsterdam obtained trade privilege with the colonies, which, together with the new canals, led to an expansion of economic activities. From 1860, the Industrial Revolution also occurred in The Netherlands, directing people to move towards the cities, making it necessary to expand the city. Also, the Damrak port area and the port area along The IJ became insufficient. The port therefore moved to the East and to the North of the Ij (Carasso-Kok et al., 2004).

The economic and urban expansion endured during the 20th century. An important event hereby is the decision to relocate the main steel production (de Koninklijke Hoogovens) to Ijmuiden in 1918 (see paragraph 4.3). Also trading activities thrived as showed by recent research work (cf. Ducruet, Cuyala, & El Hosni, 2018). The city grew as illustrated by the General Expansion Plan (Algemeen Uitbreidingsplan) in 1934 (Willink, 1998). The plan foresaw new urban expansions and the move and expansion, through sand accumulation, of the port towards the west along the North Sea Canal. However, the economic crisis of the 1930s and the Second World War slowed down the implementation of the plan (Carasso-Kok et al., 2004; Kahn & van der Plas, 1999). During these years, the director-general of the department of Labour, Trade and Entrepreneurship, Hans Hirschfeld, proposed an economic policy change from an open ‘free’ economy towards a more protectionist economy. Similar to many countries during the 1930s, the Dutch government wanted to protect its industry by implementing trade barriers to prevent dumping practices, like the dumping of cheap German steel on the Dutch market. Hirschfeld negotiated with Nazi Germany during the 1930s and succeeded in obtaining a trade agreement in order to prevent, for example, the ‘Hoogovens’ from closure (Huygens, 2009). After the war, together with Albert Winsemius, Hirshfeld was asked by the Dutch government to prepare the Dutch strategy following the announcement of the American Marshall plan in 1947, intended to restore and stimulate economic collaboration in West Europe. Together with the Belgian Prime Minister P.H. Spaak and Luxembourg within the newly created Benelux customs union, Hirshfeld convinced the U.S. to effectively roll out the Marshall plan. For the Netherlands, Hirshfeld and Winsemius focussed foremost in restoring and expanding the petrochemical industry in Rotterdam and the steel manufacturing industry along the North Sea Canal. Also following the ideas of Hirshfeld, Western Germany was included in the Marshall plan, although this was strongly opposed by France, at first. For the Dutch economy, this was important because Rotterdam, as well as Amsterdam and Antwerp, was vital for the import and export of commodities such as coal to the German Ruhr area (Gosman, 2015).

4.1.3 Amsterdam becomes the world port of petroleum

Next to the steel manufacturing sector, Amsterdam also developed as a major petrol trading port and initially a petro-chemical sector, as well. After the Second World War, Amsterdam, similar to Rotterdam and Antwerp, attracted not only the logistical petro-chemical activities, but also refineries and petro-chemical plants. However, as informed during our interview with Micha Hes from the Port Authority Amsterdam, a major fire at the Marbon chemical plant along the Cyprusweg in Westpoort occurred in 1971, killing nine people and initiating drastic policy change[44]. Afterwards, Amsterdam focussed no longer on the attraction of industrial plants, but much more on logistical activities, hence partly explaining why Amsterdam is an important global fossil fuel port today. Indeed, although petrol trade and storage activities have been present in Amsterdam since the 19th century, it expanded quickly, especially after the war during the 1950s and 1960s. As it does not host a refinery, refined oil and petrol is being imported, then stored and blended before it is exported again around the world (Van der Lugt, Witte, De Jong, & Streng, 2016).

4.1.4 A new phase at the port-city interface

Especially during the 1950s and 1960s, the General Expansion Plan from 1934 became realized. Both the port to the west, and the city to the south, expanded. This had two implications. First, an increased socio-economic asymmetry appeared between the declining core municipality and the growing suburban New Towns. By the mid-1980s, the city had lost about 20% of its inhabitants since the beginning of large-scale suburbanization in the early 1960s (Musterd, Bontje, & Ostendorf, 2006). This trend was reinforced by the city's extensive social housing program, and the large-scale construction of owner-occupied housing in suburban New Towns like Almere or Haarlemmermeer. Second, the older, more urban port areas became obsolete as warehouses and industrial areas closed or relocated to the newly constructed port areas in the west. For Amsterdam, examples of such obsolete areas are the north side of the IJ and eastern Amsterdam. However, much changed during the last 15 years. Although gentrification in the city centre can be traced back to the 1980s – for example, in neighbourhoods like Jordaan and De Oude Pijp – a positive net migration with the region and the rest of the country exists only since the 2000s. A growing number of families are staying in the city, and international companies, which often have a global or regional headquarter in the city, bring in or attract expats, all factoring in the ongoing gentrification processes in Amsterdam (cf. Sassen, 2014). Consequently, the A10 ring road, which separates the pre-war and post-war urban fabric, is increasingly seen as a barrier, both physically and mentally, dividing the rapidly gentrifying inner city neighbourhoods from the relatively downgrading garden cities at the peripheral boundary (Savini et al., 2016). Amsterdam's recent socio-economic change has been both produced by and conducive to the city's new approach to urban regeneration and housing development since the mid-1990s until the financial crisis. While during the 1970s and 1980s housing policy was dominated by regeneration programs minimizing residential displacement with a focus on regulated rental housing, since the late

44 In 1970, one of the largest industrial explosion occurred at Marbon Amsterdam, killing nine people and injuring 22. For more information see https://anderetijden.nl/aflevering/623/Marbon

1980s housing policy has shifted from a focus on general housing provision to the provision of owner occupied dwelling, particularly after the housing memorandum of 2001 (van Kempen & Priemus, 2002). Consequently, large subsidies for social housing construction were cut and new provisions to expand mortgage lending were introduced (Aalbers, 2011). At the same time in the 1990s, housing associations were partly deregulated and expected to act ‘entrepreneurially’ (Harvey, 1989b) to cover the costs of social housing (Gruis, 2005). These institutional changes were felt strongly in Amsterdam, where domestic and foreign demand for housing has steadily been increasing since the late 1990s, and where the municipality became geared towards accommodating this demand for the ‘sake of economic growth’. The need to attract and retain skilled, or ‘creative’ (Florida, 2005), workers meant a need for a more accessible and less regulated housing market (Bontje & Musterd, 2009), as it was argued. Moreover, the 2008 housing memorandum makes clear that this should be at the expense of ‘cheap housing’ leading to a policy aiming for an absolute decline in affordable housing and low income households (van Gent, 2013). Also other cities in The Netherlands recently adapted such housing policy, for example in Rotterdam and its recent ‘woonvisie’ (Gemeente Rotterdam, 2016). As a result of subsidy cuts for housing, higher demand for city living and increased mortgage lending leading to rising housing prices (cf. Sassen, 2014), owner occupancy increased from 8% in 1990 to 29% in 2014 (Savini et al., 2016).

This transformation of tenure structure has been a controlled effort and is been accomplished through a spatial strategy by the Amsterdam municipality. In the 1990s and 2000s, several new residential areas were developed, such as the Eastern Harbours, IJburg and several projects along the IJ-banks. Indeed, since the 1990s, the municipality in close cooperation with market actors and social housing associations, embraced a strategy of large-scale development projects to redevelop strategic parts of the city (Jolles, Klusman, & Teunissen, 2003). As in many other cities, such projects were driven by an international economic transition towards a service and leisure economy, and became key spatial and symbolic markers of a ‘rediscovery’ of cities as places in which to work, live and play (Fainstein, 1994; Moulaert, Rodriguez, & Swyngedouw, 2003). Geographically, the concentration of these projects could be found first on the banks of the IJ estuary, which are former urban port areas, and around the newly completed highway/metro ring in the west, south and southeast parts of the city (Savini et al., 2016). During the early 1990s, while redevelopment plans along the IJ banks around the Central Station were driven by a mix of public and residential functions, embodied by the Amsterdam Waterfront Public Private Partnership that collapsed in 1993 (Rooijendijk, 2005), the municipality rethought its development strategy with an increased focus on housing development. As such, the ‘Eastern Harbours’ were developed into dense and attractive residential areas, financially supported by a national ‘Key Project’ policy (sleutelproject) aimed at strengthening cities and developing them in a compact way via in-fill housing projects (Schuiling, 1996). After the turn of the millennium, the strategy of constructing dense housing developments alongside the waterfront continued to the west side of the Central Station, with the Westerdok-seiland and Houthavens developments. In the far east of the city, a completely new urban district, IJburg, was planned in the 2000s as a series of artificial islands in the Ijsselmeer (Lupi, 2008).

In contrast to the southern banks, the transformation of the northern IJ-banks shows a different organization of land development, more focused on punctual interventions in space. In contrast to the southern banks, the market demand for these obsolete port areas was minimal, suffering from a negative image. Therefore, the Masterplan for the Norther IJbanks (2003) set out the long-term strategic goals with a strategy based on punctual interventions grounded on cultural heritage, creative industries (NSDM wharf) and symbolic interventions to generate market demand. The Overhoeks location, a former Shell port area, was developed (e.g. EYE film institute) with a focus on high-end housing investment, aimed at infusing a process of social and economic change in the working class neighbourhoods around it (Savini, 2013). At the same time, the A10 ring road was completed and a polycentric development based on Transit Oriented Development was proposed, specially focusing on tailoring office development to regional railway networks such as the Bijlmer Arena and the South Axis (Majoor, 2015).

Amsterdam always had a strong relationship with its surrounding municipalities and cities. Since the 1960s, both large logistical facilities and important residential areas have been developed outside of the city, but remained strongly connected to the core, such as Almere, Schiphol or Haarlemmermeer. In the 1970s, metropolitan coordination had already gained some political urgency due to the increased socio-economic asymmetry between the declining core municipality and the growing suburban New Towns. This forced regional coordination to become politicized. During the 1980s and 1990s, important experiments of inter-municipal, metropolitan and regional cooperation were undertaken in order to achieve socio-economic growth. In this period, an assemblage of different methods of coordination between municipalities was at play. Elected officials of the G4 cities (Amsterdam, Rotterdam, The Hague and Utrecht) effectively lobbied for an increased focus on the 'Randstad', illustrated by a focus on large national programs at housing renewal and the Mainport policy, directing public investments towards the port of Rotterdam, the port of Amsterdam and Schiphol airport (Boelens, 2009a). All these efforts led to a national growth coalition and policies such as the Big City Policy (Grote steden beleid) and the National key Projects, first and second generation (Majoor & Schuiling, 2008). Ten years later, the state approved a national vision for the region of the Randstad (Randstad 2040). These regional policies were supported by a coalition formed by national and local interests around objectives of urban growth. In the mid-1990s, these coalitions set the conditions for new forms of regionalism and alternative models of soft-governance between Amsterdam and its surrounding cities. The 'Stadsregio' was formed as a regional body, with an actual budget, tasked with governing housing growth and transport within Amsterdam and its first belt of neighbouring cities. Second, the Amsterdam Metropolitan Region (Metropoolregio Amsterdam, MRA) provided a continuous (subsidized) platform under the coordination of the Amsterdam municipality, discussing regional infrastructural, environmental, and residential development issues with an impact on the region. The success of MRA came forth from the combination of urban and economic development strategies and the reduction of counterproductive competition between neighbouring municipalities. At the same time, the MRA functioned as a system of coordination for incoming funds and resources from the national government, reinforcing the widespread feeling that the MRA region was a growing economy (Salet, 2006). In other words, the MRA made sure that all public stakeholders involved could share a piece of the economic wealth (Savini et al., 2016). The recent global financial crisis in 2008 and subsequent economic crises had an important impact and changed the political, institutional and financial pillars of these regional development models and of national planning policy. Three causes altered the relationship between Amsterdam and its surrounding municipalities. First, the position of the national government was reduced following programs of decentralization that gave each (sub)level of governance more authority (cf. glocalisation). Although the Dutch national government published its Structural Vision on Infrastructure and Space with the appointment of the economic competitive (urban) regions, it was up to the provinces and cities to further develop these ideas (Savini, 2013). Further, the Randstad is no longer referred to as a spatial and political reference (Roodbol-Mekkes, van der Valk, & Altes, 2012). Secondly, Amsterdam is the only municipality since the crisis of 2008 that economically grew beyond the national average. This relates to the cognitive-cultural economies, which are blossoming in the central areas of the city (Scott, 2008). Consequently, and this in contrast to the 1960s-1990s, the economic performance of Amsterdam is overtaking that of its MRA surroundings (Gemeente Amsterdam, 2017). Thirdly, the political landscape changed. In 2014, for the first time since the Second World War, the social-democratic party was outside the city executive. As such, Amsterdam's political landscape, both in the city and its surrounding region, is much more diverse. This change confronts the traditionally consolidated labour party on key issues for the development of the region as a whole. The policy of supporting regional long-term and large projects is questioned, and more attention is given to smaller urban interventions of entrepreneurial urbanism, undermining the general consensus for regional growth among the MRA. The coordination is more about sharing costs of the crisis rather than dividing the revenues of growth, and concerned more with boosting selected competitive areas of the region (Savini et al., 2016).

This evolution created tensions between the port of Amsterdam and the municipality of Amsterdam. While the MRA has an interest in growing the port of Amsterdam, which was already planned in the mid-1990s, the current Amsterdam municipal political executive questions this and shifts to policy that favours the need of resizing the existing port area for housing production and energy transition goals (Savini et al., 2016). The most recent planning project is to start constructing the 'Haven-Stad', a project considering 40,000 to 70,000 houses on contemporary western port area within the A10 ring road, from 2029. It can be perceived as a 'new phase at the port-city interface'. As explained by Wiegmans and Louw (2011), this new phase entails that the port area, which is not yet obsolete, is being subject to urban projects, creating a land-use conflict (Figure 4.2).

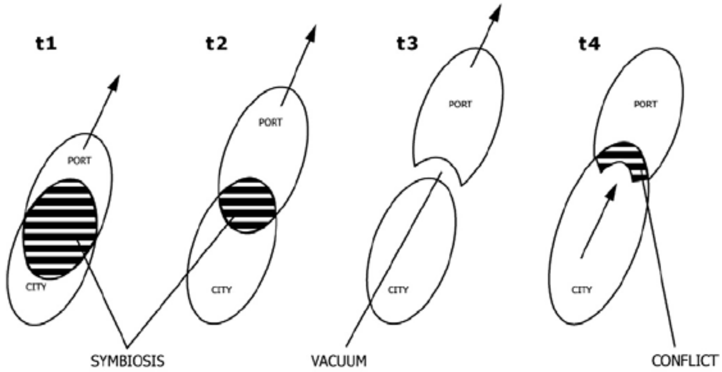


Figure 4.2 The conflict phase at the port-city interface (Wiegmans & Louw, 2011)

The future of this land-use conflict has to be understood in the changing political forces at play. As we will explain in next paragraph, the port area is governed by the Port Authority Amsterdam, hence the most important institutional defender of the existing port areas. However, the Port Authority lost an important amount of its political influence during the last decade. This is illustrated by three events. First, in 2016, CEO Dertje Meijer left, or perhaps was forced to leave, the Port Authority of Amsterdam. Since the mid-2000s, Meijer directed the port authority during the process towards corporatization, completed in 2013. At the same time, she convinced the municipality of Amsterdam and the Dutch national government to start the process of building a new larger sea-lock in Ijmuiden, on which construction eventually started in 2016 (see Pot, Dewulf, Biesbroek, Vlist, and Termeer (2018) for a detailed timeline of the new sea-lock in Ijmuiden); this in order to make it possible for larger container ships and cruise ships to enter the port of Amsterdam. The urge for this new sea-lock was backed up by the forecast that the container and cruise activities would increase significantly for Amsterdam, and these economic opportunities should be embraced[45]. Consequently, the port authority of Amsterdam and other governments also invested in the establishment of a brand new container terminal, which became operational in 2010. However, by 2012 the newly created container terminal was already bankrupt due to low market demand, creating a huge deficit. Moreover, one could ask why a cruise terminal was proposed, knowing that a consolidation was taking place within the container market, concentrating routes to fewer nodes, such as Rotterdam and Antwerp; plus, Amsterdam was located behind a sea-lock, making it a disadvantage for container ships in comparison with Rotterdam and Antwerp. Nevertheless, the container terminal was created. Although this is arguable, the decision to build a container terminal in Amsterdam cannot be understood without knowing the (historical) competition between the cities of Rotterdam and Amsterdam (Hoekstra

45 During the interview with Martijn van Vliet, director of the economic department of the city of Amsterdam, this hypothesis was confirmed. He explained that the Port Authority of Amsterdam exaggerated the foreseen throughput figures in order to have a convincing story to develop the new sea-lock in Ijmuiden. Important parts of these figures were based on the growth of coal. Although at that moment, critiques from among other the city of Amsterdam were formulated that it is ‘dangerous’ to base throughput figures on the throughput of fossil fuels, this was denied and neglected by the Port Authority at that time. Martijn van Vliet told us that the new CEO of the Port Authority, Koen Overtoom, admitted this deliberate denying of the critiques by the Port Authority. Hence, although this does not confirm our hypothesis directly, we can argue that Dertje Meijer had to leave for this reason.

& Milikowski, 2012), similar to the history of the North Sea Canal in Amsterdam in response to the Nieuwe Waterweg in Rotterdam (Koelemaij, 2013).

While the new sea-lock is constructed at the moment, critics question its contemporary and future need due to the bankruptcy of the container terminal (Vrijsen, 2015). This 'change of perception' has to be seen in light of the changing perception and implementation of the Dutch Mainport policy. Different than for example in Belgium, in 1988 The Netherlands explicitly formulated a policy to stimulate the throughput of their main ports, Rotterdam and Schiphol, and to a lesser extent, the port of Amsterdam as well (Boelens, 2009a; VROM, 1988). Public investments were aimed more strategically to a fewer topics, focussing more on the Randstad and on its mainports, which soon became a strong policy symbol (Faludi, 1996). While originally the Mainport policy clearly aimed to stimulate added-value activities related to the logistical processes, the actual added value was arguably unsuccessful (Boelens, 2009a). Increasingly, the Mainport policy, or at least its effects, came under fire, questioning its relevance for the Dutch economy (Boelens, 2009a; RLI, 2016). In this light, following the demand of the Port Authority Amsterdam to enlarge the sea-lock in reference to the construction of a container terminal, the Port Authority was seen as responsible for these two (within the perceived public and political opinion) 'misjudgements' (the lock and the terminal) and the lack of creating added-value activities for the city and region. Hence, the Port Authority lost a significant amount of political weight[46], which likely dictated departure of Meijer. Second, the diminishing influence of the port authority is illustrated by Amsterdam's municipality plan to convert existing port areas to urban residential areas within the A10 ring road, one to the west and another on the north shore of the IJ (Figure 4.3) (Hoekstra & Milikowski, 2012), this despite strong remarks from the Port Authority Amsterdam, the existing firms and the national ministry of Economic Affairs (Lalkens, 2017). This decision is in contrast to the past, when only obsolete port areas were subject to redevelopment. Hence, this created the land-use conflict between the port authority and the municipality of Amsterdam (Wiegmans & Louw, 2011) (Figure 4.2).

46 Micha Hes from the Port Authority Amsterdam confirmed this hypothesis.

Figure 4.3 Main projects of urban development in Amsterdam *(Savini et al., 2016)*

Third, and related to former, are two more recent decisions by the Amsterdam's municipality. First, in December 2016, the municipality decided to ban (partially) the transport and trade of coal and gasoline in the port. The city plans to ban coal in 2030, although a major coal energy plant is located within the port, which has also been adapted by the port authority in its planning documents (van Zoelen, 2017). The banning of diesel, in particular, follows the publication of a recent report that illustrated the large scale process of blending regular diesel within the port of Amsterdam with so-called 'dirty diesel', according to European standards, which subsequently is being shipped mostly to African countries (van Zoelen, 2016b). While this also happens in Rotterdam or Antwerp, for example, the municipality of Amsterdam reacted strongly and asked to ban these practices. However, the problem is that the majority of the profits of the port of Amsterdam are increasingly derived from coal and oil activities. The recent decisions of the municipality thus put a significant pressure on the contemporary business model of the Port Authority (Westeneng, 2017). Second, during the summer of 2017, the municipality of Amsterdam decided to build one or more bridges across the IJ to better connect the city with the northern part to foster urban development. This idea is, however, controversial for port activities, as once such a bridge is built, it will make the passage of large ships to the hinterland more difficult or even impossible (Van Weezel, 2017). At the moment, mostly large cruise ships berth to the east of the city. The cruise sector is booming, and was one of the reasons for the growth of the Ijmuiden sea-lock. However, the new bridge would make the current cruise terminal unreachable for cruise ships, making the municipality of Amsterdam decide to relocate the cruise terminal to the western port areas (Muller, 2017; van Bockxmeer, 2017).

4.1.5 The port of Amsterdam in search of its new role

What the two last paragraphs have shown is the changing political and economic setting of the port city of Amsterdam. Its origins and successes lie in the close relationship between port and city and global trade foremost during the Golden Age. This ended because of the saltation of the Southern Sea. However, by building canals towards the sea, Amsterdam could keep up and remained an important port city. During the 20th century as such, national and regional governments succeeded in developing the port city of Amsterdam and attracting different economic sectors. Even during the 'urban crises' since the 1960s, Amsterdam achieved growth by forming new regional collaborations to turn the tide. This eventually led to the above average success of the urban development of Amsterdam, even during the most recent crisis. However, the latter changed the political balance, especially after the elections of 2014, and directed the focus of the municipality more on the (short term) urban development of Amsterdam rather than a regional long-term socio-economic development (Bossuyt & Savini, 2018). During this period, the port authority of Amsterdam became independent, capable of making its own decisions, but arguably losing its presence within the 'mind' of the city and subsequently diminishing the importance of the port on the policy agenda, as illustrated by recent decisions taken by the city of Amsterdam regarding important economic sectors and the port's land use. Hence, as we will describe for the biobased sector in part 4.4 and within the discussion chapter, the port authority is trying to find its new role and its new license to operate within Amsterdam and within the MRA by focussing on its role as a circular and biobased (regional) port.

4.2

The Port-City Interface

In this paragraph, we explain the contemporary port-city interface. For this, we will focus on the variables 'institutional structure', 'governance structure', and socio-economic profile'.

4.2.1 The institutional structure

The municipality of Amsterdam has a rather unique institutional structure within The Netherlands. The institutional structure of Amsterdam namely resembles a federal state structure. While it is one municipality (Amsterdam) embodied by an executive board of aldermen and mayor, it composes seven different boroughs with their own administration having a certain degree of independence. Each part has between 80,000 and 140,000 inhabitants and is in control of different functions within their own areas. One part is, however, under direct control of the central municipality government: the port and industrial area Westpoort (Figure 4.4). In 2015, following the corporatization of the port authority, Westpoort was divided into two parts. The part west of the A10 ring road is governed by the port authority; the part east of the A10 ring road is governed by the city municipality. This port area is not obsolete, but nonetheless is planned to become urban area.

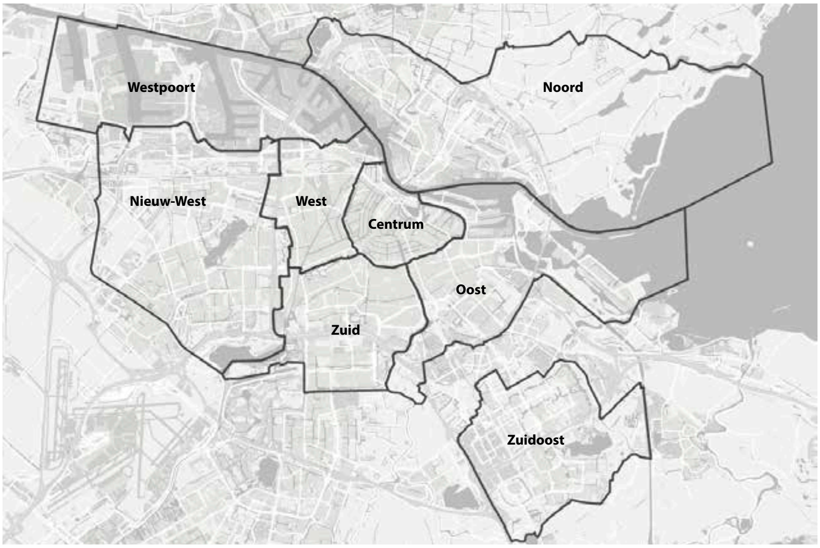


Figure 4.4 The 7 different institutional semi-independent neighbourhoods in the municipality of Amsterdam since 2010

On a regional scale, the municipality of Amsterdam is part of the Amsterdam Metropolitan Region (Figure 4.5). The MRA acts as a collaboration platform under coordination of the Amsterdam municipality, discussing regional issues with an impact on the region (Salet, 2006). Thirty-three municipalities are part of it, as well as the provinces of North-Holland and Flevoland, and the transport region Amsterdam. However, the latter is mostly a collaboration platform and depends on the willingness of the involved municipalities to tune their policy with regional goals. Hence, the MRA is subject to changing political ideas in which foremost the willingness of the municipality of Amsterdam to cooperate across borders is leading. If this changes, cross-border issues receive less attention, like the port areas along the North Sea Canal, for example.

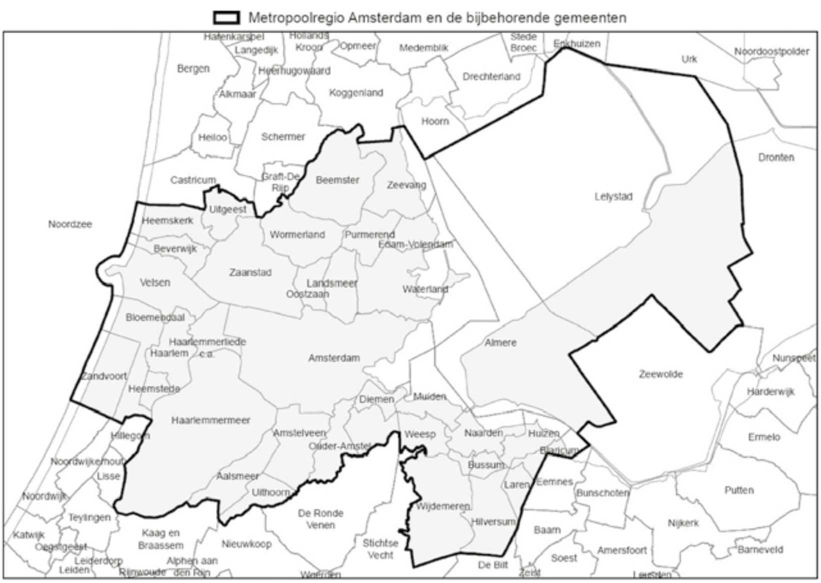


Figure 4.5 The Amsterdam Metropolitan Region (MRA) (Savini et al., 2016)

Different from Ghent-Terneuzen-Vlissingen (see next chapter), Antwerp or Rotterdam, all existing port areas along the North Sea Canal do not belong to the same port authority (Figure 4.6). While the port of Amsterdam expanded, an ‘annexation’ in terms of municipalities did not occur as it did in Antwerp and Ghent, for example. Therefore, today four municipalities have a port area along the canal: Ijmuiden-Velsen, Beverwijk, Zaandam and Amsterdam. Economically, all four port areas are closely related and are also as such being approached and analysed under the name of ‘North Sea Canal Area’ (NZKG), for example within the annual Dutch Port Monitor (Van der Lugt et al., 2016).

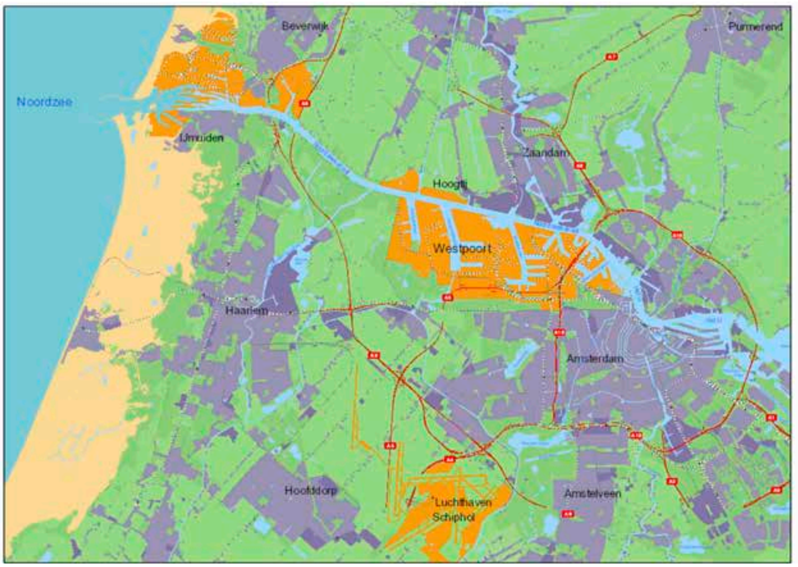


Figure 4.6 The different (air and sea) port areas[47]

Two out of four have established an independent port authority, Amsterdam and Ijmuiden-Velsen (but with different shareholder structures, see next paragraph), while the port area of Beverwijk and Zaandam are currently still under the direct maintenance of the municipality. However, Beverwijk recently launched the idea to corporatize the management of their port area (Mainport magazine, 2017). The idea to make one port authority for the four port areas is mostly pushed by the port authority of Amsterdam. Until now, this was not well received by the three others, particularly by Ijmuiden-Velsen (Weissink, 2014). Nonetheless, more recently Zaandam and the port authority of Amsterdam announced a plan to intensify collaboration. The port authority of Amsterdam will tax the incoming ships in the port area of Zaandam (Port of Amsterdam, 2017b), but one merged port authority along the North Sea Canal was, until today, not a reality. Most logical, issues regarding the NZKG port areas are on the agenda of the MRA, but are subject to changing political views. Hence, the absence of an overarching institutional structure regarding the NZKG port areas makes it difficult to coordinate regional issues. It also makes it more vulnerable to changing local political ideas within all the different municipalities, as the port areas are not represented by one main organisation that decreases their political weight.

47 Source: http://www.arcgis.com/home/item.html?id=1a1eab5885da41e8b46ce97b89696b42

Although this seems rather a miscellaneous fact, it is, however, important for our research. As we will see, in most economic studies, or even the annual reports of the port authority of Amsterdam, all four ports along the North Sea Canal are considered as one in terms of employees, added value or throughput, for example. However, this creates an ambiguous situation in which figures measured for the whole NKZG region are used by the port authority of Amsterdam, which does not have any authority on the other three ports. Rather, these figures are used to 'mask' that the port of Amsterdam, especially in terms of added value of number of employees, as a relatively small port within the Eurodelta. This will be explained in much more in detail in the socio-economic profile variable (4.2.3).

4.2.2 Governance structure

The 21km-long North Sea Canal, with a 270-meter width and 15.1-meter depth, is managed and owned by the national Rijkswaterstaat, who dredges the canal and is also responsible for the maintenance and enlargement of the sea-locks in Ijmuiden. Four municipalities along the canal have port areas: Ijmuiden-Velsen, Beverwijk, Zaandam and Amsterdam. Two of those manage their port areas themselves: Beverwijk and Zaandam. The two other have independent or semi-independent port authorities: Ijmuiden-Velsen and Amsterdam, respectively. The port authority of Ijmuiden has a rather exceptional governance structure. First, as the only one in the Hamburg-Le Havre range, it is a private firm in the sense that its shares are owned by different, mostly unknown and mostly private shareholders. This is different than all other independent port authorities, including Amsterdam, which are fully owned by public shareholders, mostly the host municipalities. The port authority Zeehaven IJmuiden NV was privatised already in 1989 (Gille, 2013). The main tasks of the port authority are the daily maintenance and expansion of the port areas in Ijmuiden. The port area of Ijmuiden has two parts (Figure 4.7). One part is situated before the sea-lock (Buitenhaven Ijmuiden), where TATA steel is located, for example. This port area is the only one along the North Sea Canal with direct deep-sea access. The other part is located behind the sea-locks along the canal. Here, the port area of Beverwijk directly borders the one of Ijmuiden (Zijkanaal A).

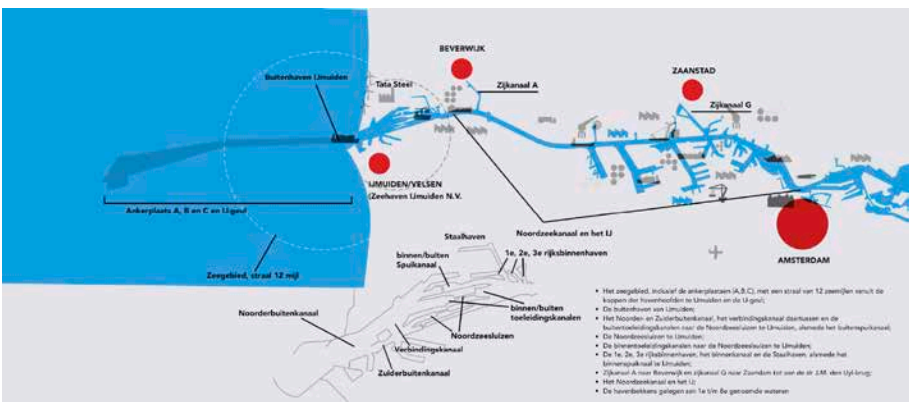


Figure 4.7 The Central Nautical Maintenance of the North Sea Canal and a zoom-in on the sea-locks of IJmuiden (Port of Amsterdam, 2017a)

The port authority of Zeehaven Ijmuiden NV is a landlord port governance model, responsible for the public port management, infrastructure, land-use planning and the promotion of the available 175 hectares of port area in Ijmuiden (ZHIJ, 2016). Zeehaven Ijmuiden NV is not responsible for the nautical management. In the 1990s, all four port areas decided to centralize and establish the Central Nautical Maintenance North Sea Canal Area (Centraal Nautisch Beheer Noordzeekanaal-gebied, CNB) in 1994 (Port of Amsterdam, 2017a). As shown on Figure 47, CNB is responsible for the management of the run-up to the canal 24 miles on sea, the port areas along the North Sea Canal and the port areas east of Amsterdam. The members of the CNB is composed of members from the four municipality councils and one representative from the private firms having a port area: Zeehaven Ijmuiden NV and TATA Steel. The chairman of CNB is the port alderman of the municipality of Amsterdam. The annual budget of the CNB is the responsibility of the province of North-Holland.

Zeehaven Ijmuiden NV is, however, more than a landlord port. While most port users are private firms, Zeehaven Ijmuiden NV is also the full owner of an important port user in Ijmuiden, namely the sea mine 'Hollandse Visveiling Ijmuiden BV'. The latter was created in 1899 because Ijmuiden became a popular landing place for fishing boats after the opening of the canal in 1876 , as it was the only port between Rotterdam and Den Helder, plus it was well connected to the hinterland along the North Sea Canal. However, soon these fishing boats blocked the sea-lock of Ijmuiden, making the city of Amsterdam decide in 1899 to build a fish port in Ijmuiden along the sea-locks, today being the outer port area of Ijmuiden (Gille, 2013; ZHIJ, 2016). As such, the Zeehaven Ijmuiden NV port authority is in fact an extended landlord model, whereby it is foremost a landlord, but also runs some important port functions itself. An exception in Ijmuiden is TATA Steel, who fully owns the port areas needed for its activities. Although it is only for 'own use', TATA Steel can be regarded a fifth port authority along the canal.

The port authority of Amsterdam was corporatized on the 1st of April, 2013, with the municipality of Amsterdam being the sole shareholder (Havenbedrijf Amsterdam NV, 2017). As such, it was the last 'big' one within the Hamburg-Le Havre region: Antwerp (1996), Ghent (2000), Bremen (2002), Rotterdam (2004) Hamburg (2005) and Wilhemshaven (2005). The port authority of Amsterdam is a landlord, responsible for public port management, infrastructure, land-use planning and the promotion of the available 1300 hectares of port area (plus 600 hectare water). As a corporate port authority, its main income is derived from land lease and taxing incoming ships. Recently, the port authority of Amsterdam also began taxing the incoming ships in the port area of Zaandam (Port of Amsterdam, 2017b).

Recently, the port authority of Amsterdam broadened its activities. In 2016, it opened a start-up area called Prodock', a renovated port warehouse in the Moezelhaven. At Prodock, the port authority of Amsterdam offers cheap (sometimes free) facilities for innovative port-related companies, with the goal that they eventually expand within the port of Amsterdam (Van Zoelen, 2016a). Hence, also the port authority of Amsterdam can in fact be regarded as an 'upgraded' landlord.

According the property rights, some differences exist along the North Sea Canal. As the port authority of Ijmuiden is fully privatized, the port authority itself is the owner of the port areas in Ijmuiden. Subsequently, it leases these grounds to other economic actors. An exception is TATA Steel, which owns and utilizes the port area and port facilities (terminal) itself. For Beverwijk and Zaandam, the municipalities own the areas and lease these. Until April 1, 2013, this was also the case in Amsterdam; however, since the corporatization, the municipality has given the Westpoort area in full lease to the Port Authority of Amsterdam NV, which has the rights to offer 'second-hand' lease of these grounds to other actors. Only a small amount of grounds are fully owned by other firms, such as the car firm Nissan and the ADM living and working community (Figure 4.8). In general, lease contracts have a minimum of three years and a maximum of 50 years (Havenbedrijf Amsterdam, 2015, 2017).

Figure 4.8 Map of different plots in the port area of Amsterdam: Red (rent), Green (long term lease), Yellow (particular property), Grey (available for rent or lease contracts) (Havenbedrijf Amsterdam, 2016)

Different than in Belgium, (cf. 'Havendecreet' (1999)) is that the jurisdictional boundaries of Dutch port areas are not defined within national laws (see next chapter). This implies that port areas are jurisdictionally no different from regular industrial areas. Hence, the responsible municipalities themselves can decide the land-use rules of port areas and what activities can happen. Also the municipality of Amsterdam has such a document. The 'land policy document for the port of Amsterdam'[48] (Havenbedrijf Amsterdam, 2017) explains that port areas can facilitate four different 'levels' of activities:

- First grade: Firms with a need of direct water access and that generate maritime throughput
- Second grade: Firms related to throughput
- Third grade: Firms that have to be located within port areas because they need water access or are in support of other port functions (warehouses, offices)
- Fourth grade: Firms that do not necessarily have to be located within port areas.

48 https://www.portofamsterdam.com/nl/business/grondbeleid-havenbedrijf-amsterdam

For the first three grades, the port authority of Amsterdam has full authority to grant rental contracts. For firms of the fourth grade, the port authority has to explicitly ask permission from the municipality of Amsterdam for rental contracts (Havenbedrijf Amsterdam, 2017).

The non-jurisdictional definition of port areas and their general land-use rules explains why the municipality of Amsterdam itself, without the interference of other government levels as the region or state, can decide whether land-use rules of port areas can change. This is illustrated by the decision to start constructing the 'Haven-Stad', a project considering 40,000 to 70,000 houses on the contemporary western port area within the A10 ring road, from 2029, although complains of the national level.

4.2.3 Socio-economic profile

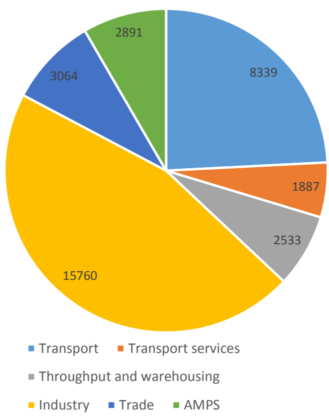
In most studies, all four port areas along the North Sea Canal are considered together under the name of 'North Sea Canal Area' (NZKG[49]) within socio-economic studies. The NZKG ports are a mix of throughput and industrial activities (CBS, 2017). In terms of throughput (measured in tonnage), the NZKG ports are fourth in Europe, behind Rotterdam, Antwerp and Hamburg. Next, also a considerable amount of people are directly employed within the port (Table 4.1) (NBB, 2017; Van der Lugt, Witte, De Jong, & Streng, 2017).

	Throughput (million tonnes)	Direct Value Added (million Euros)	Direct employment (FTE)	Port area (hectare)
Port of Zeebrugge	37.81	966.00	9,332.00	2,857.00
Port of Ghent	29.09	3,838.00	28,072.00	4,648.00
Port of Antwerp	214.17	10,785.00	60,837.00	13,057.00
Zeeland Seaports	33.00	3,477.00	15,959.00	4,400.00
Port of Rotterdam	466.00	12,566.00	92,367.00	12,603.00
NZKG ports	96.00	4,153.00	34,897.00	4,500.00

Table 4.1 Socio-Economic profiles ARA ports, figures 2016

The NZKG has 4,500 hectares in total . Compared within the Eurodelta, this is almost the same as Ghent (4,648 hectares) and Zeeland Seaports (4,400 hectares), although, since their merge, they are now twice as big as Amsterdam. Antwerp (13,057 hectares) and Rotterdam (12,603 hectares) are significantly bigger. Zeebrugge Seaports is significantly smaller with 2,857 hectares.

49 Noordzeekanaalgebied



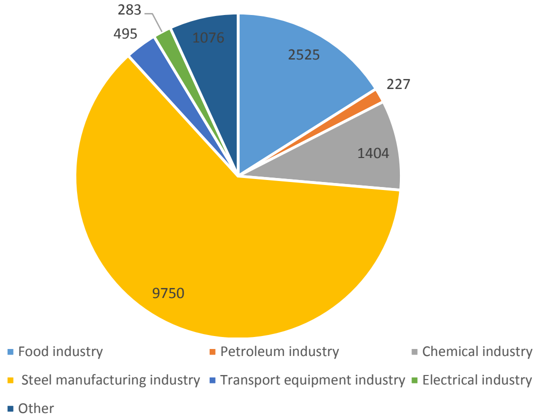
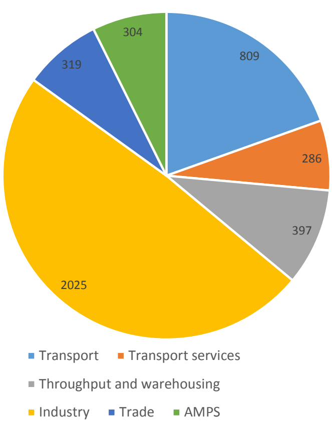


Figure 4.9
The Direct Employment (FTE) in NZKG per economic sector, 2015 (Van der Lugt et al., 2016)

Figure 4.10
The Direct Employment (FTE) in NZKG per industrial subsector, 2015 (Van der Lugt et al., 2016)

`Almost half of the direct employment of the NZKG is derived from industrial activities, significantly more than transport activities (Figure 4.9). However, latter is a derived demand and for a large part also a consequence of regional and European industrial activities and foremost from the steel manufacturing industry in Ijmuiden (Figure 4.10). Similar to the direct employment, the added value is mostly derived from industrial activities (Figure 4.11), and, in turn, from the steel manufacturing industry (Figure 4.12) (Van der Lugt et al., 2016).



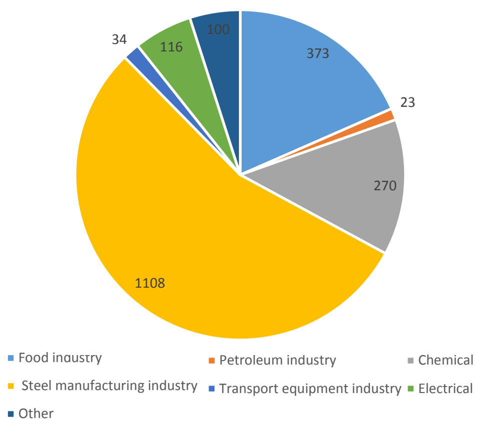


Figure 4.11
Direct Added Value (million EUROS) in NZKG per economic sector, 2015 (Van der Lugt et al., 2016)

Figure 4.12
Direct Added Value (million EUROS) per industrial subsector, 2015 (Van der Lugt et al., 2016)

However, as said before, the NZKG figures are in fact grouping four port areas and are therefore ambiguous. This is of course not wrong, but it gets confusing when figures are mixed, particularly in terms of framing. For example, the port authority of Amsterdam positions itself as the 4th port of Europe based on throughput figures (Havenbedrijf Amsterdam NV, 2017). It states that 97 million tonnes of throughput were handled in 2015. However, this is the total figure for all four NZKG ports. This doesn't seem like a big problem, but then other closely related port areas (for example Ghent-Zeeland Seaports or even Ghent-Zeebrugge), could also be considered together without being one administrative port area50. Thus, if one considers only the port of Amsterdam, the throughput figure decreases to 79.2 million tonnes in 2015, almost 20 million less. This is still the fourth most in Europe, but comes much closer to number five, Bremen, with 73 million tonnes in 2015 (Figure 4.13).

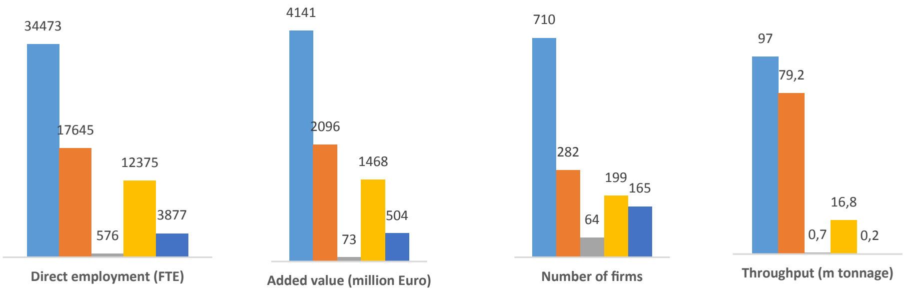


Figure 4.13 The different socio-economic variables for the NZKG ports, divided for the four ports, year 2015 (Van der Lugt et al., 2016)

A similarly ambiguous situation exists for the total amount of direct employment and added value (Havenbedrijf Amsterdam NV, 2017, p. 8). Again, the port authority of Amsterdam publishes that 34,473 FTE and a total direct added value of 4 billion euro was generated in 2015. However, again, this is for the four NZKG ports. If one considers only the port of Amsterdam, it is only half of these figures (Figure 4.13). As such, the port of Amsterdam alone could be considered as a rather small port, especially based on the number of employees and added value. Based on these ranking, Amsterdam ranks much lower than fourth place. Even within The Netherlands, Zeeland Seaports in this case ranks higher (Table 4.1).

Within the NKZG, a large concentration of jobs and added value is generated by the small port of Ijmuiden-Velsen. This concentration comes from the industrial activities within Ijmuiden, and more specifically from the steel manufacturing sector, which generates around 9,000 FTE. This number is almost completely generated by the steel mill TATA Steel Ijmuiden and its related activities, explaining the relatively high share of added value of the steel manufacturing sector for the total NZKG ports (Figure 4.10). Therefore, while the NZKG can be considered a mixed port area that combines industrial activities with throughput activities, the port of Amsterdam is foremost a throughput port as shown by the different socio-economic variables (Figure 4.13). Of this throughput, almost 79% is related to energy, such as oil, coal and more recent biofuels. Smaller shares in terms of throughput and added value are derived from the chemical and food sector (Van der Lugt et al., 2016).

50 Note that from the 1st of January 2018, the port of Ghent and Zeeland Seaports have merged into one port authority: North Sea Port

For these reasons, in the next two paragraphs, we will focus first on the steel manufacturing sector, foremost located in Ijmuiden, and second on the biobased/circular sector, foremost located in Amsterdam. While the former is a long-established and strongly embedded sector in the NZKG (thus especially in Ijmuiden), the latter is relatively new. The port authority of Amsterdam is focusing strongly on the development of the biobased/circular sector, as it is in search of a new role (Havenbedrijf Amsterdam NV, 2017), moving away from the fossil fuel and coal activities.

4.3

The Steel Manufacturing sector

4.3.1 A brief historical perspective

The coal mining and steel manufacturing industry within The Netherlands started relatively late in comparison with Germany, Luxembourg and Belgium. About hundred years later than Belgium, coal mines became economically important in Dutch Limburg following (improved) measurements by Belgian mining engineers. This discovery (or renewed attention) triggered the mining industry in The Netherlands[51]. Through its established 'Staatsmijnen', the Dutch government was one of the main miners[52].

While The Netherlands was not involved in the First World War between 1914 and 1918, the war had shown the vital role of coal and the production and importation of steel. Both in Belgium and France, the mining industry and steel manufacturing sector were hit hard; and in the years after the war, severe economic and political tensions rose in order to control coal production locations (Versteegh, 1994).

Different than Luxembourg, Germany, France and Belgium, there were no steel mills in The Netherlands, and all steel had to be imported, hence its strategic disadvantage. In order to become less dependent, the Dutch government ordered the building of a steel mill (AWN, 2006).

From a logistical and geological point, an obvious location would have been southwestern Limburg, close to the mines. However, during the war, The Netherlands decided to build the steel mill along the coast in Ijmuiden. Ijmuiden was chosen in favour of Rotterdam because the underground in Ijmuiden is sandy and more stable, plus Ijmuiden was well connected to the hinterland by the North Sea Canal (Baeten, 2007). Due to its coastal location, foreign iron ore could easily be imported from around the world. The coal would then be transported from southwestern Limburg (AWN, 2006).

51 Iron ore mines are almost not present in The Netherlands. Hence, from the beginning of the Industrial Revolution, iron ore had to be imported. The absence of abundant coal and iron ore in The Netherlands and the need to import these is one of the main reasons Hoogovens eventually was located along the coast.

52 'Staatsmijnen' transformed to DSM (Dutch State Mines), today a global chemical company.

In 1918 '*de Koninklijke Nederlandse Hoogovens en staalfabrieken NV*' (Dutch Royal blast furnaces and steel mills) was established. Hoogovens Ijmuiden is originally a national company, in close collaboration with the Amsterdam industrial and banking elite (Dankers & Verheul, 1993) and as such it became very closely linked with the Dutch government and the national economy (Dankers & Verheul, 1993; Greif, 1994) This differs to Belgium or Germany, where steel mills were established and operated by private companies such as Cockerill (1842) and Krupp (1811) respectively (see next chapter).

The relatively small Hoogovens became operational in January 1924 as a crude iron factory, but soon the factory expanded significantly in order to produce steel and as such became part of a large integrated industrial complex. For example, in 1924, a brick factory was opened to produce masonry bricks out of the blast furnace slags[53]. Next, following a collaboration between Hoogovens and the Dutch, oil company Shell factory Mekog[54] was established to process nitrogen fertilizer out of the slags. After several transformations, Mekog eventually closed in 2010. In 1930, the cement factory Cemij was built to transform the slags to cement. In 1931, a power plant was built next to Hoogovens to process the blast furnace emission gasses to electricity. In 1936, Hoogovens started to cast its crude iron into cast iron pipes. Subsequently, in 1939, Hoogovens finally managed to produce steel from its cast iron and scrap metal following the opening of its Siemens-Martin open heart furnace (Baeten, 2007). To obtain a significant amount of skilled workers, Hoogovens established its own technical school in 1939, still in existence today and known as TATA Steel Academy (ONH, 2018).

At the beginning of the Second World War, the cooling units of Hoogovens were blown up by the Dutch resistance forces. The steel manufacturing industry in Ijmuiden was of high importance for the German forces as the war industry required a large steel production. However, following the damage and the lack of resources, Hoogovens was out of production during the entire war (ONH, 2018).

After World War II, the Hoogovens became one of the main examples of the resurgence of the Dutch economy and the company could profit greatly from the support offered by the Marshall-plan (Greif, 1994). Subsequently, supported by the Marshall plan, the Dutch government established Breedband NV in 1953, a hot rolling and cold rolling plant next to Hoogovens. Now sheet steel and tinplate could be produced (Elteren, 1986). In 1965, Breedband merged with Hoogovens.

After the steel manufacturing industry in Ijmuiden experienced a strong economic revival, the Dutch government launched its 1.1 million steel plan in 1955, its 1.6 million steel plan in 1959 and its 2.45 million steel plan in 1960, all aimed at reinforcing and expanding the steel manufacturing industry in Ijmuiden by also producing non-flat steel products, such as rebar and wire rod. Following the Breedband and the 1.xx million plans, the number of blue collars increased from 6,300 to 11,200, while the number of white collars increased from 3,000 to 6,300. Next to Hoogovens, in Ijmuiden another 1,700 employees were hired (Elteren, 1986, p. 899). Following the booming steel industry, the Dutch government planned

53 Closed in 1927

54 Maatschappij tot Exploitatie van Kooksovengas

in 1968 to open a second plant at the Maasvlakte 1 that was being built at that moment. Hoogovens Ijmuiden became too small and it was foreseen that the coal and iron ore transport would increasingly use bigger and deeper ships, which could easily berth at the newly created Maasvlakte terminals, similar to the planned oil terminals. However, mostly due to protest from environmental groups, the Maasvlakte steel mill was never realized while the oil terminals were (Zweers, 1984).

The expansion and the broadening of production processes continued during the 1960s. In Europe, for almost fifteen years, the production increased 5% annually (European Commission, 2005). In this light, Hoogovens became a two-type metal factory in 1966 (Baeten, 2007). Additionally to steel, Hoogovens started to produce aluminium, too. The idea was that, as such, Hoogovens would become less vulnerable to the volatile steel market because aluminium mirrors the steel market, as was supposed. Therefore, Hoogovens established Aldel in Delfzijl in 1966. Aldel was established in coastal Delfzijl and not in Ijmuiden because of the cheap electricity following the recent discovery of the gas field of Slochteren. However, the crises in 1972 and 1979 proved that this was a miscalculation, as the aluminium market almost copied the steel market, hitting both hard (Dankers & Verheul, 1993; Greif, 1994).

Indeed, both in 1972 and 1979 the steel (and thus also aluminium) sector in Europe experienced an economic crisis. These two crises triggered a large merging wave between European steel manufacturing plants and companies during the 1970s and 1980s. However, Hoogovens was the only steel manufacturing factory within The Netherlands (different than, for example, Belgium; see next chapter), thus it was obliged to look for cooperation with foreign companies. Hence, in 1972, Hoogovens merged with the German steel company Hoesch from Dortmund and the company was named Estel. However, soon this merge came under severe stress following the outflows of the crises, and the merge eventually had to be canceled in 1982. Remarkably, during the discussions between Hoogovens and Hoesch, a major flaw was discovered within the contract signed in 1972. Following German legislation, Estel was obligated to be warrant for the financial losses of the former Hoesh, while in The Netherlands such legislation did not existed. To back up the losses, of which almost all were generated by the far less productive Hoesh, the company Estel had to loan large amounts of money. Hence, Estel generated an enormous debt, becoming one of the main reasons why Estel eventually could no longer operate and the merge had to be cancelled. The main discussion point during the separation was the separation of debt among Hoogovens and Hoesh. During this period, the support of the Dutch government was essential. The stakes in this discussion were very high and became discussed at the highest level by the national governments themselves, thus putting The Netherlands and Germany in a fierce 'martial' separation. Eventually, the agreement was that the debts were separated 30/70 Hoogovens/Hoesh, although Hoogovens was not responsible for the generated losses. Consequently, in 1982 when Hoogovens Ijmuiden became an individual company again, Hoogovens had a debt of 1.5 million euros. Therefore, to prevent the (inevitable) closure, theDutch government changed the status of Hoogovens from 'company' to 'a special company' ('onderneming apart'), making Hoogovens, in fact, a nationalised company in which the Dutch government could directly invest and interfere in order to save it (Dankers & Verheul, 1993).

Although the aluminium production did not counter the decreasing steel market, Hoogovens kept expanding its aluminium activities. It took over the American aluminium producer Kaiser in 1987 and the Canadian aluminium producer Aluminerie (Dankers & Verheul, 1993; Greif, 1994) However, during the late 1980s and early 1990s, the European steel market again experienced a crisis due to the overcapacity and subsequently decreasing steel prices, reinforced by the collapse of the Soviet Union and the increasing import of cheaper steel from East European countries. Moreover, the occurring overcapacity did not decrease because almost 60% of all steel production plants in Europe were (partly) supported by their governments, including Hoogovens, guaranteeing their existence. However, in 1993, the European Commission obliged its member states that their financial support only was allowed if it was accompanied by restructuring programs (European Commission, 2005). Due to the large reconstruction programs, Hoogovens managed to book profit in 1993, for the first time in years (Greif, 1994).

What followed was the continuing of a large consolidation within the European steel market. France's Usinor joined forces with Sacilor and, a few years later, it swallowed Cockerill Sambre from Belgium. Germany's Krupp & Thyssen merged (ThyssenKrupp) and 35% of Spanish Aceralia was bought by Luxembourg's Arbed. In Europe, the British Steel and the Dutch Hoogovens became the ones left out (Wheelan, 1999). Therefore, eventually in 1999, Hoogovens merged with British steel, a by Margaret Thatcher in 1988 liberalized steel company, into Corus company (Baeten, 2007). British steel represented 61.7% of all Corus activities with around 50,000 employees; Hoogovens with 38.3% and around 22,000 employees. Due to the merge, Corus became at that time worldwide the third-largest steel production company worldwide, and the largest in Europe. It was argued that the deal could lead to large cost savings (Wheelan, 1999).

In the years after the merge, Corus greatly reduced the number of employees and eventually became profitable, also following the favourable market conditions. Already started in 2002, Corus and the Brazilian steel company CSN[55] were exploring a merge. The advantage would be the combination of the overproduction of iron ore of CSN and the shortage of iron ore Corus was experiencing. However, in 2007, TATA Steel, a rather small steel producer worldwide but part of the international conglomerate TATA Group[56] representing 96 companies, pushed for a takeover of Corus (Garrelts, 2006). Subsequently, a takeover bid occurred between TATA and CSN, which TATA won, but forced TATA to pay significantly more than its original offer. The goal of TATA Steel was to increase its global steel production significantly. TATA Steel Europe was created as a subsidiary of TATA Steel, at its turn subsidiary of TATA Group.

However, in 2008, the 'Great Recession' started and, consequently, the demand for steel collapsed. TATA Steel Europe[57], having paid 'a lot' for Corus, announced job cuts of 1,000 FTE in The Netherlands and 2,500 FTE in the United Kingdom. In the years after, the debt of TATA Steel Europe kept growing and the company was forced to continue its reconstructions. Eventually, TATA Steel Europe even planned

55 2007: 5.6 million ton steel production, market cap 8.6 billion dollar
56 2007: 4.4 million ton steel production, market cap 50 billion dollar
57 Until 2010, TATA steel Europe was still named Corus.

to sell out the entire UK production activities (Pickard, Campbell, & Michael, 2016) because in February 2016, the UK government did not back up the EU plan to restrict the import of cheap Chinese steel in Europe following its free-trade policies and as a 'statement' for its 'global' policy in reference to the Brexit (Swinford, 2016).

Eventually, in July 2016, TATA Steel Europe stopped the sale procedure of its UK activities because a possible joint venture was being discussed with German steel manufacturing company ThyssenKrupp. ThyssenKrupp experienced the disadvantages of overcapacity and pursued strong restructuring, for which it needed TATA Steel Europe. Eventually on September 20, 2017, the merge between TATA Steel Europe and ThyssenKrupp was announced as ThyssenKrupp TATA Steel, headquartering in Amsterdam with 48,000 employees. At that moment, around 20,000 employees worked at TATA Steel Europe – 10,000 in The Netherlands, 7,000 in the UK and 3,000 elsewhere in Europe – and 28,000 employees worked at ThyssenKrupp (N.N., 2018f).

At first, the Dutch prime minister Rutte and minister of economy Kamp positively welcomed the merge, especially because the R&D facilities and headquarters would remain in The Netherlands (Leijten & Tamminga, 2018; N.N., 2017f). However, soon critiques arose on the deal. First, TATA Steel Netherlands – a subsidiary of TATA Steel Europe, which financially 'isolates' the profits and losses of TATA Ijmuiden within the group (Leijten & Tamminga, 2018), was not involved in the deal negotiations. Moreover, the deal would entail that this financial structure would cease to exist, implying that the profits that are made in Ijmuiden could be transferred more easily to the other parts within the group and, at the same time, debts could flow to Ijmuiden (Leijten & Tamminga, 2018; N.N., 2017g), hence, the Dutch government and particularly the ministry of economy was heavily involved (Leijten & Tamminga, 2018). Eventually, TATA Steel Netherlands decided to go to court in January 2018 against its own parenting company, TATA Steel Europe (N.N., 2018e). Second, TATA Steel ThyssenKrupp announced that, following the merge, around 4,000 employees would be fired equally between TATA Steel Europe and ThyssenKrupp. This would entail that proportionally more people would have to leave TATA Steel Europe, having 20,000 employees, compared to ThyssenKrupp's 28,000. Moreover, most likely most of the 2,000 within TATA Steel Europe would be in Ijmuiden. This can be predicted because, within Corus and later within TATA Steel Europe, the UK has experienced the most layoffs. Plus, similar to the merge between Hoogovens and Hoesch in the 1980s, within Germany, ThyssenKrupp (and thus, after the merge, TATA-Steel-ThyssenKrupp) had already promised that jobs were assured for the following nine years, no plants would be closed and the 2,000 layoffs that had to happen would only be by retirements (N.N., 2018f). This of course comes with a (potentially high) cost, putting (potential) stress on the other parts of the new company and thus also (potentially) on the profitable steel mill Ijmuiden as the 'golden goose' within ThyssenKrupp TATA Steel.

Therefore, one can argue that, although the news of the merger was initially welcomed by the Dutch government, the (potential) deal held (again) significant risks for the steel mill of Ijmuiden (Jessayan, 2018). Referring back to the total added value and number of employees of the NZKG ports, largely dependent on TATA Steel Ijmuiden, the problems TATA is now experiencing are not only a potential danger for the plant, but also for the overall industrial sector of the larger Amsterdam region.

4.3.2 Structural couplings

(a) Industrial regulation

The particular dynamic history of TATA Steel Ijmuiden, strongly connected with the national economic and political levels, is illustrative for the geostrategic importance of the steel sector for a country, tracing back to the First World War and Second World War, but more and more also for the European Union. Although many regulations do not exist anymore, the existence of TATA Steel Ijmuiden today cannot be explained without understanding the former geostrategic incentives and regulations.

Regulative, since the Second World War, the steel sector is perceived as being one of the main strategic sectors within Europe. Moreover, the existence of the European Union (EU) today can be traced back to the regulation of the steel sector. In 1951, under the initiative of the French minister Robert Schuman in order to prevent a new war between France and Germany, the European Coal and Steel Community (ECSC) was established following the Treaty of Paris, regulating the industrial production of steel under a centralised authority (Schuman, 1950). The Benelux, western Germany, France and Italy were part of the ECSC. The structure of the ECSC closely resembled the structure of the European Union today, with an executive committee, a parliament and a court of justice. The ECSC eventually stopped existing and became fully part of the European Community in 2002.

Still today the European Union regards the steel industrial sector as a key industrial sector within Europe. First, the European Union is the second largest producer of steel in the world, after China. Around 500 production sites, like the one in Ijmuiden, are split between 23 EU countries. Second, the steel sector is closely linked to other geostrategic sectors such as the automotive, construction, electronics, mechanical and electrical engineering sectors (European Commission, 2013). Since 2014, the European Commission even further recognized the steel sector as strategic. In 2014, the EU called for an industrial renaissance, urging its member states to recognize the central importance of industry for creating jobs and growth and to mainstream industry-related competitiveness concerns across all policy areas. The EU urged its member states to raise the industry's share in Europe's GDP from 15% to 20% in 2014 (European Commission, 2014). Following the central role of steel within the value chain of many other industrial sectors, the steel sector thus obtained an even more geostrategic position within the EU policy.

The central problem of the European steel sector is the overcapacity, on a global level around 25%. The reason for this overcapacity is, however, considered mostly to be non-European. First, following the economic boost in the 2000s by mostly Asian countries, China in particular went from a net-importer of steel to a producer of steel, producing around half of the global production. Second, following the production of shale gas in the United States of America, the energy cost of industrial firms – in particular for the energy-intensive steel plants – decreased, giving them a production advantage. Third, neighbouring EU countries such as Russia and Turkey invested significantly in their steel sectors. And lastly, countries like Brazil or India produce more steel but at the same time shut down their demand for steel from the global market by implementing import tariffs, for example, hence increasing the overcapacity on the global market (European Commission, 2013).

Taking these into account, the European Commission concluded that the production of and demand for steel are almost in balance within Europe and the deregulating factors are due to non-European regulating measures. Hence the 2030-2050 plan of the European Commission in 2013 argued for the strengthening of the European steel sector (European Commission, 2013) and boosting the industrial sector in Europe to increase the (domestic) demand for steel among others (European Commission, 2014).

Central within the 2030-2050 EU plan is the argument for regulation for the steel sector, adapted to the contemporary and future challenges. First, the EU will implement financial market instruments to assess if non-European steel producing countries use so-called 'non-tariff' measures, unequally boosting their steel sector through technical regulations, export steel subsidies or export restrictions for commodities such as iron ore or coal. Second, steel can be infinitely recycled without losing essential properties. Moreover, recycling steel requires 75% less energy and 90% less commodities. Considering the difficulties of accessing commodities (coal, iron ore, chalk) plus the relatively expensive energy prices within Europe (almost double than in the USA) recycling should be encouraged as much as possible. In this light, the European Commission also stresses that, although Europe should move to a more sustainable energy market, the influence of this on the energy prizes should be followed up closely in regard to the energy-intensive steel sector. Third, the steel sector is one of the main sources of CO2-emission gasses. For example, TATA Steel Ijmuiden represents 6.5% of the Dutch total, and ArcelorMittal Ghent is 8% of the total Belgium emission. Consequently, the steel sector receives emission rights (see next chapter for more explanation). To decrease the energy factor within the steel production process, the EU urges investing in the implementation and research of new technologies. Fourth, the European Commission highlights the social dimension of the steel sector in terms of the (long-term) number of employees. Hence, it urges training and attracting more young and scientific educated employees, while applying the available EU social funds to ease the transformations (European Commission, 2013).

(b) The industrial setting

Steelmaking is the process of producing steel from iron ore or steel scrap. Generally, first iron ore, limestone and cokes, which are gassed coals, are heated within a furnace to make pig iron. By adding oxygen to pig iron within a convertor, the liquid iron is purified to liquid steel with a carbon content of less than 2%. The removed particles are called slags. Through alloying, all kinds of liquid steel can be produced. Steelmaking has existed for millennia, but it was only able to be deployed on a massive scale following the Industrial Revolution in the 19th century (Smil, 2006). The first inexpensive industrial process for the mass production of steel was the English Bessemer process, invented in 1856. The key principle of this process is that it removes the impurities from iron by oxidation with air being blown through the molten iron. The Bessemer process has two main difficulties. First, it cannot remove phosphor. Especially in western continental Europe in Belgium, Germany, France and Luxembourg, the iron ore was/is, in contrast to the United Kingdom, of relatively low quality as it contains high levels of phosphor. Therefore, in 1879 Sidney Gilchrist Thomas improved the Bessemer process to the Gilchrist-Thomas process. In particular, it added a significant amount of limestone and the addition of oxygen. On the other hand, the Bessemer, and also the Thomas-Gilchrist process, was rather difficult to control. Therefore, during the second half of the 19th century, the German/British engineer Carl Wilhelm Siemens, brother of Ernst Werner Siemens who established the same-named company, first invented the open-heart furnace, fine-tuned by the French engineer Pierre-Emile Martin. The advantage of the Siemens-Martin process was that steel was not exposed to excessive nitrogen, easier to control and could handle large amounts of scrap iron and steel (Lagneux & Vivet, 2009; Smil, 2006).

In addition, in 1939, Hoogovens installed Siemens-Martin open-heart furnaces to produce steel. In 1972, these furnaces were closed and replaced by oxygen furnaces. Swiss engineer Robert Durrer invented the oxygen steelmaking process in 1949. In essence, it is a Bessemer blast furnace, but the air blowing is replaced by a direct oxygen input. In comparison of Siemens-Martin, the oxygen process reduced significantly the costs of plants, the conversion of ore to steel (40 minutes instead of 11-12 hours) and hence the labour requirements per ton steel. Today, around 60% of global steel output uses oxygen furnaces (Smil, 2006).

Now, the blast furnace is the only option to produce steel from iron ore. However, to produce steel from steel scrap (optionally with addition of liquid iron), an electric arc furnace can also be used. An electric arc furnace uses a so-called electric arc discharge between two or more electrodes. Such arc can be noticed between the power line and pantographs of an electric train, for example, or when someone is welding. Using these principles, scrap metal is heated within an electric arc furnace and can be reused (Lagneux & Vivet, 2009; Smil, 2006).

A third (potential) way is the HIsarna ironmaking process, developed in 1986 within Hoogovens Ijmuiden and at the moment still being tested for further industrialization within a pilot plant. HIsarna processes iron ore almost directly into hot metal by using a Cyclone Converter Furnace for ore melting and a Smelting Reduction Vessel to produce liquid iron. There is no requirement anymore of coal being transformed into cokes[58], hence it is 20% more energy efficient and has a 20% lower carbon footprint in comparison with the other blast furnace processes (TATA STEEL, 2016).

Eventually, the liquid steel is molded in long continuous strings of steel of 1- to 2-meter width. These are then divided into bars of 12-meter length. Next, these bars are heated up again, rolled into steel from 0.5 to 40mm thick and eventually winded up. Such steel is used by the car automotive sector, for example.

Steel mills are generally integrated. This implies that all production processes follow up each other in one product chain, from the iron making to the rolling of the steel into finished shapes. The first steel mills were exclusively located close to the coal and iron ore mines , for example, within the German Ruhr Area or Southern Belgium. However, due to the import of cheaper coals and iron ore from around the world, maritime locations or locations along larger rivers or canals became more productive, hence the location of ArcelorMittal in Ghent or Hoogovens in Ijmuiden. Steel mills are also integrated because of the energy intensive and labour intensive production processes, based on which several energy saving and additional production processes are attached to increase its productivity.

58 The sinter plant can be removed.

However, since the electric furnaces, iron ore and coals are no longer needed because of the use of steel scrap. This has led to so-called 'mini-mills'. Different from the traditional steel mills that demand a continuous production process, electric arc furnaces can be stopped easily and restarted when needed. Many traditional blast furnaces also have these electric arc furnaces. Due to the absence of coal and iron ore, mini-mills can also be found inland, only requiring the transport of iron scrap.

4.3.3 Strategic couplings

In this paragraph, we describe the effects of the strategic couplings. It is important to stress out that we are observing these all together. A description of the strategic coupling effects inevitably follows a historical perspective in explaining why an effect exists (for example why company A sells a product to company B); however, there is a difference with our step 2, which traces back the lines in detail for why and how the coupling effects came into existence. As we already explained, for the steel manufacturing sector we will not go to this step 2 and step 3. The main reason for this is that tracing back the lines of the steel manufacturing sector goes back too far to be fully able to find and analyse the relevant tactics and strategies employed.

The description of the strategic coupling effects is structured along the six different relations taken into consideration (Table 3.1). Each have their own extent (thematic + spatial boundary), their own structure and their own hierarchy. Taking these together, will eventually give us a detailed view of the steel manufacturing sector. The visualisation of the relational geometry is presented in paragraph 4.3.4.

(a) Input/Output

Most obviously, we start with the input/output relations going to and from the steel mill TATA Steel Ijmuiden. As already explained in the brief historical perspective, from the beginning, the Hoogovens steel mill was designed as an integrated industrial complex, using as much as possible the residual flows and products, besides their main products: iron and steel. Since the beginning of the 1930s, the residual blast furnace slag has been used to produce blast furnace cement. The blast furnace slag is one of the most important commodities to produce cement, hence the establishment of Cemij next to the new Hoogovens steel mill in 1931. Today, Cemij is called Enci[59]. Enci is fully owned by the German multinational HeidelbergCement, the third biggest cement producer worldwide[60].

Today, Enci has around 70 employees and produces 1.4 million tons of cement a year, using 800,000 tons of blast furnace slag. Also since the beginning of the 1930s, next to the blast furnace slags, the blast furnace emission gasses are used to produce electricity, which in turn is then largely used again by Hoogovens. In 1931, the P.E.N.[61] power plant was opened next to Hoogovens. Following different M&A, today the power plant in Ijmuiden is part of Nuon. In Ijmuiden, Nuon produces around 970 megawatts a year. Nuon Ijmuiden has 214 employees. Nuon has another important power plant in the NZKG, namely a coal-powered plant, located in the

59 Eerste Nederlandse Cement Industrie
60 https://www.enci.nl/nl/enci-ijmuiden
61 Provinciaal Elektriciteitsbedrijf van Noord-Holland

port of Amsterdam. The residual steel slags are transported to Harsco Metals Transport Ijmuiden. Harsco recycles around 1.5 million tons of steel slags annually. It has 128 employees. Harsco is an American multinational, specialised in recycling solutions for industrial steel producers (Jacobs & Van Dongen, 2012). Indaver is one of the most recent added production plants aimed at recycling residual products from TATA Steel Ijmuiden. Indaver recycles the residual steel sludge. Once recycled, the sludge cake can be fully reused by TATA Steel Ijmuiden[62]. A similar process exists for the hydrochloric acid used by TATA Steel to remove the rust after rolling the steel sheets. After recycling, the regenerated hydrochloric acid and iron oxide are transported back to TATA Steel Ijmuiden[63]. Indaver is a Belgian company founded in 1985 by the Flemish government to export the recycling knowledge. For the production of steel, TATA uses a significant amount of scrap metal. Three companies import scrap metal, Koster[64], located in the port of Beverwijk, HKS Scrap metals[65] and Rietlanden Terminals[66], both located in the port of Amsterdam. For the production process of steel, TATA needs oxygen and nitrogen[67]. Linde Gas Ijmuiden, part of the German multinational Linde Gas, produces both. Linde Gas Ijmuiden has 93 employees. To produce steel, coal is needed. Although a large portion of the coal and iron ore are imported by TATA Steel directly, coal is also occasionally imported from the coal terminal of Overslagbedrijf Amsterdam[68], which also exports its coal to the coal-powered plant of Nuon. Lubricants are needed for the production process, which are imported from Quaker Chemicals, an American company located in Uithoorn (Jacobs & Van Dongen, 2012). TATA Steel Ijmuiden produces around seven million tons of steel a year. Although it is not known where TATA exports all its steel, a major amount most likely goes to the British car manufacturing company Jaguar-Land Rover, as it is owned by TATA Group.

(b) Energetic

As already mentioned, TATA Steel uses the electricity produced by Nuon. Recently, TATA Steel also decided to cover its roofs with solar panels as much as possible. Pure Energie Zon, who will import the solar panels from the Indian TATA Power Solar systems, will install these solar panels[69].

(c) R&D

A large part of the R&D is internal within TATA Steel, more precisely located at TATA Steel Technology. The latter is a large R&D unit, employing around 500 employees, both researchers and supporting staff[70]. The activities of TATA Steel Technology do not only focus on steel processes, but also research focusing on car manufacturing, the packing industry and constructions. TATA Steel Technology has also close connections with the Technical University of Delft. It financially supports

62 http://www.indaver.nl/nl/installaties-en-specialismen/specialismen/slibontwatering/
63 http://www.indaver.nl/nl/installaties-en-specialismen/materiaalterugwinning/recycling-van-zoutzuur/
64 http://www.kostermetalen.nl/bedrijfsprofiel/
65 https://www.hksmetals.eu/nl/over-ons/geschiedenis
66 http://www.rietlanden.com/en/about-us/facts-and-figures/
67 https://conet.nl/portfolio-view/linde-gas-legt-onderhoud-met-gerust-hart-handen-van-conet/
68 https://issuu.com/amports/docs/zha-4_versie_4-9-2012
69 https://www.duurzaambedrijfsleven.nl/energie/10737/tata-steel-22-megawatt-van-nederlands-grootste-zonnedak
70 https://www.tatasteel.nl/nl/innovatie/Research-Development

Prof. Dr. Yongxiang Yang, the stichting Leerstoel Grondstoffen and the department of Material Science and Engineering[71]. More recently, TATA Steel opened their TATA Steel Office at the Amsterdam Science Park. This office is rather small, but is primarily established to connect with the knowledge economy and the different startups in Amsterdam. Consequently, it has connected with the startup Scyfer, which is doing research regarding steel control by Artificial Intelligence[72]. More recently, Beverwijk also created its own 'science park', called Techport. Techport aims to streamline educational programs with the labour demands of the material and steel sector in the region[73]. Techport, among others, examines the employment of robotics within production processes. For this, it also works together with paper factory Crown van Gelder, also located in Ijmuiden[74].

A major R&D process that has existed for some years is the HIsarna pilot plant in Ijmuiden[75]. Developed in 1986, HIsarna is within its last foreseen testing phase at the moment, before it can potentially be employed on a large scale (TATA STEEL, 2016). Until now, around 75 million Euros have been invested, of which 60% comes from TATA and partner companies as ArcelorMittal, Voestalpine and ThyssenKrupp, and 40% from governmental bodies, such as the Dutch Economics Ministry[76].

(d) Advanced Producer Services

Following the extensive production process and the involvement of a numerous amount of installations, it is not surprising that the largest part of the services related to TATA Steel are engineering. Intures[77], Tebodin and Engie are all companies specialised in the maintenance and deployment of machines. Willis, located in Beverwijk, organizes the insurance. TATA Consultancy Amsterdam located, at the Zuidas, maintains and installs the ICT processes within TATA Steel Ijmuiden (Jacobs & Van Dongen, 2012).

(e) Membership

No important membership relations were found relevant for the explanation of the steel manufacturing sector in Amsterdam.

(f) Shareholder

The shareholder relations reveal that the Indian TATA Group controls all important aspects of the steel manufacturing sector in Amsterdam. It not only controls the production of steel through its purchase of TATA Steel Europe, but also one of the main purchasers of the steel, as well as the important R&D and service functions. HIsarna is hereby an exception, whereby the search of a new cleaner steel production process is research wise and financially shared with some of its most important competitors.

---

71 https://www.tatasteeleurope.com/en/innovation/technology/external-collaboration

72 http://www.uva.nl/nieuws-agenda/nieuws/uva-nieuws/content/nieuwsberichten/2016/02/amsterdam-science-park-verwelkomt-tata-steel.html

73 https://www.techniekraad.nl/techport-campus/

74 http://www.techport.nl/

75 http://www.wattisduurzaam.nl/1797/energie-besparen/consumptie/hisarna-vermindert-uit-stoot-staalproductie/

76 https://www.tatasteeleurope.com/en/innovation/hisarna/about-hisarna

77 http://www.intures.nl/projecten

4.3.4 STEP 1: The relational geometry

In the last two paragraphs, we first identified the different structural couplings of the steel manufacturing sector, namely the industrial regulation and the industrial setting. These two taught us how the sector distinguishes itself from others regarding the regulation and the technology applied. Next, we focussed on the strategic couplings. We identified the relevant actors and their different relations. The data was added to a database model, which is able to combine the topographical data with the topological data. Eventually, we are able to visualize the relational geometry of the steel manufacturing sector in Amsterdam, as shown on Figure 4.14. While we did not trace back the lines looking for the causal mechanisms for the steel manufacturing sector, we nevertheless conducted a few interviews to assess if our desktop research and the obtained visualization is correct (Table 4.2).

Amsterdam - Interviews		
Name	**Main task/role**	**Date**
TATA Steel Ijmuiden (Jean-Pierre Westerveld)	Strategic Modelling engineer TATA Steel Europe	20-03-2017
TATA Steel Ijmuiden (Donald Voskuil)	Manager Regional Affairs at TATA Steel Europe	20-03-2017
City of Amsterdam (Director Martijn van Vliet)	Economy department	13-3-2017

Table 4.2: List of interviews conducted in Amsterdam concerning the steel manufacturing sector

As illustrated by the relational geometry, what is clearly noticeable is the scattered institutional structure. As already explained in the socio-economic profile of Amsterdam, almost the entire steel sector is located in Ijmuiden, which is confirmed by our relational geometry. While TATA Steel Ijmuiden obviously dominates, there is a significant number of other relevant companies with different functions active within Ijmuiden, related to the steel sector. In other words, although it is logical that most activities are related to the production of steel, also relevant R&D, energy and service relations are located within the port area of Ijmuiden. Although the focal point of the steel manufacturing sector is located in Ijmuiden, other port areas and cities are also involved within the sector. Bordering the port of Ijmuiden, Beverwijk hosts three functions, of which Techport is relatively new, created with the goal of increasing its embeddedness within the sector. Also, the city of Amsterdam is recently increasingly involved with the steel manufacturing sector with the connection between its science park and TATA Steel; this was rather limited until now. As already explained in previous paragraphs, the port of Amsterdam is a throughput port, confirmed by this relational geometry. Delft is involved following its Technical University, absent in the region of Amsterdam.

Two main conclusions can be formulated. One, the steel manufacturing sector has almost nothing to do with the (institutional) port-city of Amsterdam. Two, almost all relevant parts of the steel manufacturing sector are dominated by TATA Group. Although TATA Steel Nederland, as a subsidiary, still owns TATA Steel Ijmuiden and Technology, within the historical perspective paragraph (4.3.1), we have shown how the steel mill Ijmuiden has always been a pawn among international companies, during the 1980s and even now, following the merger between TATA Steel Europe and ThyssenKrupp. In other words, although the sector in the NZKG is a well-integrated complex, the institutional structure makes it more difficult for spatial policy to further integrate and find new connections within and between sectors. In addition, the shareholder construction illustrates how depended the sector is on the decisions taken by one foreign actor, TATA Group, without a primary involvement within Amsterdam.

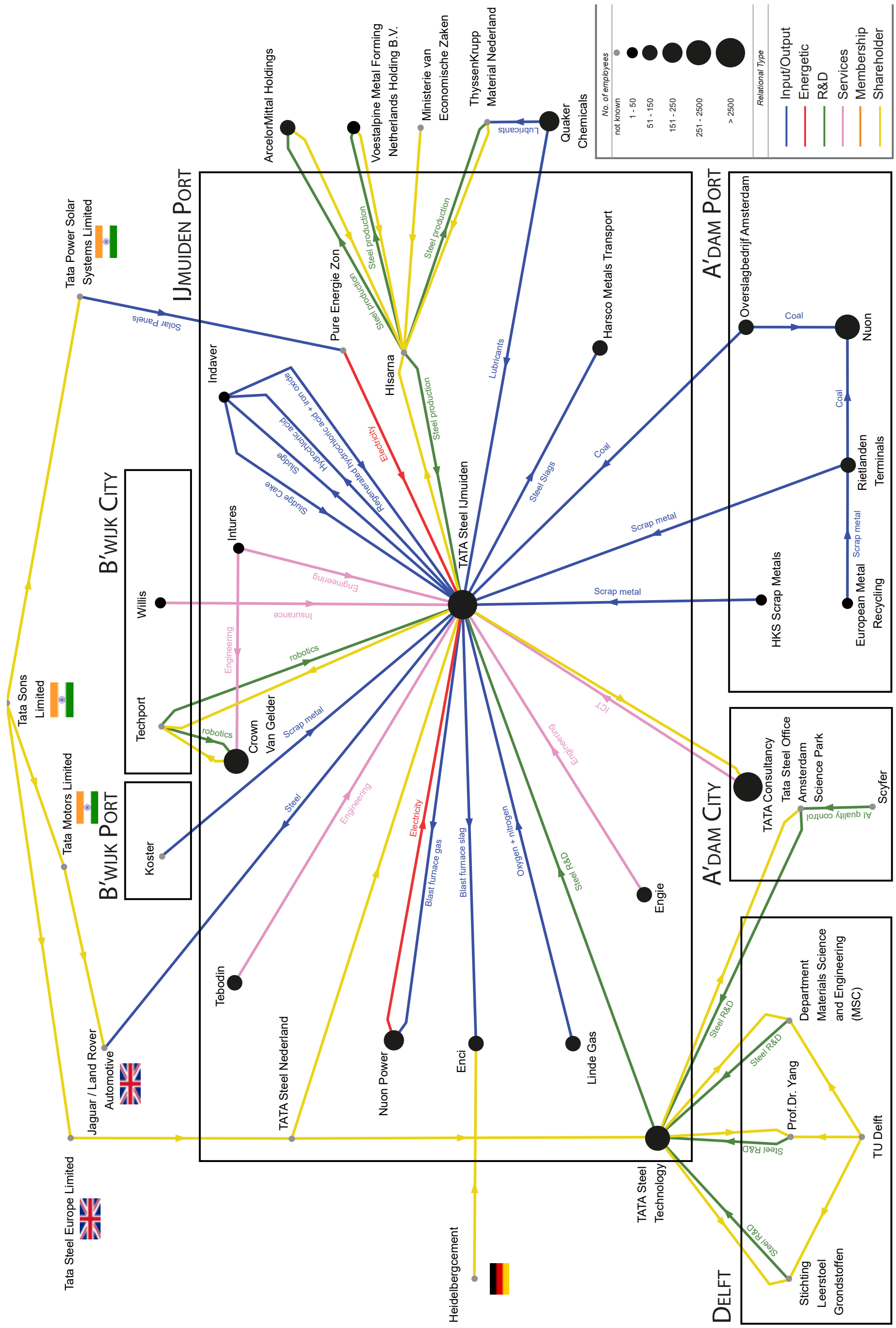


Figure 4.14 The relational geometry of the steel sector in the NZKG area (source: author)

4.4

The Biobased sector

Different from the steel manufacturing and the car manufacturing, being our other chosen economic sector, the biobased sector is more difficult to describe. Therefore, before we focus on the biobased sector in Amsterdam, we first need to define what is meant by the 'biobased sector'.

The biobased sector is best understood as the biobased economy, which produces biobased products by using biomass (Langeveld, Dixon, & Jaworski, 2010). Hence, as a sector, it is rather broad as it does not imply the production of a particular product or service, like the steel manufacturing sector or the financial sector. Rather, the common ground is the use of biomass, hereby understood as renewable or as non-fossil, in order to produce non-food products (Dale, 2007; Jenkins, 2008). Biomass can be defined as the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal products), forestry and related industries, as well as the biodegradable fraction of industrial and municipal waste (European Commission, 2001a). In other words, biomass comes from natural vegetation, agricultural products, agricultural energy crops or waste- and residual products (Vandermeulen et al., 2010).

Worldwide, only 3.5% of the available biomass is used. Of this 3.5%, around 62% is used as food, 38% is used to produce biobased products, and 33% is hereby used for energy, paper, furniture and construction. Only 5% is used for clothing or chemicals (Shen, Haufe, & Patel, 2009).

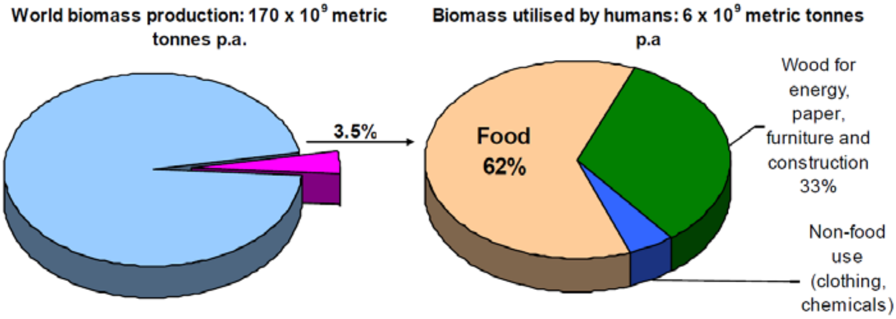


Figure 4.15 World biomass production (left) and biomass utilized by humans (right) (Shen et al., 2009)

Two main groups of bio-products can be distinguished. First, there is bio-energy. Bio-energy requires a high biomass input, but creates a rather low added value. Examples of this are bio-heat, bio-electricity or biofuels, such as biodiesel or bio-ethanol (Figure 4.16).

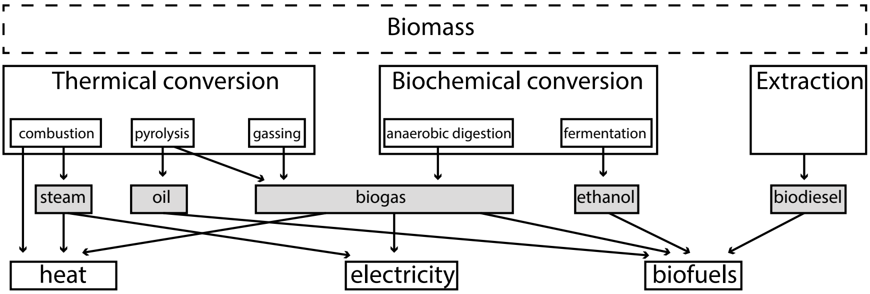


Figure 4.16 From biomass to bio-energy, adapted from Vandermeulen et al. (2010)

Second, there are bio-materials. Bio-materials include pharmaceuticals, chemicals, industrial oils, biopolymers/plastics and fibers. Of these, pharmaceuticals provide the highest added value, but still require high research and development costs. The chemical market is more common. The chemical market includes bulk chemicals with high volumes but rather low values, as well as fine chemicals with a smaller market size but higher added value. Examples are adhesives, solvents and surfactants. Although many are still mainly petroleum-driven, increasingly they are made from renewable feedstock such as vegetable oils like coconut, rapeseed, sunflower or palm oils. Solvents, used in the manufacturing of pharmaceuticals, paints and inks, can be produced from biobased products obtained via fermentation from cereals, potatoes or sugar beets. Industrial oil products include lubricants andhydraulic oils and are increasingly biobased. Biopolymers or bioplastics arguably hold the highest opportunities, given that plastics are used extensively worldwide. Mostly bioplastics are derived from maize, cane, potato or wheat. Last, fibers like polyester or nylon can be derived from wood and straw, but also hemp or jute. Bio-energy, biomaterials and biochemicals can be arranged from high market volume with a lower added value, to a low market volume with a higher added value (Langeveld et al., 2010).

Within the biobased economy, one cannot avoid the 'food versus fuel' debate (N.N., 2007b), expressed in so-called 'generations'. The 'first generation' biobased products (thus bio-energy or bio-materials) are mainly based on cereals, such as wheat, maize, soybeans or rapeseed. Worldwide, cereals represent around 70 to 90% of all crops cultivated. Cereals are used extensively as food for humans, but also for animal feed. To produce non-food productions, cereals are generally pressed to oil. Another source of the first-generation bio-products is sugar (Langeveld et al., 2010).

'First-generation' biobased products are rather easily manufactured from cereals and sugar by using conventional technologies. Hence, this is one reason the technology is widespread, following the minimum risk to deploy the technique for companies. This is different from the 'second-generation' biobased products. Hereby the products are based on woody crops, agricultural residues (stems, leaves and husks) or waste, which makes it harder to extract from. While one would argue the use of residuals is in less competition with food, still the availability is determined by the crop area, harvest index and demand for other purposes such as livestock fodder (Langeveld et al., 2010).

Therefore, the next-(third-)generation biobased products focus on photosynthesis, producing sugars by plants and bacteria using chlorophyll to harvest solar energy. However, to really avoid competition with food, one would need to be able to build biofuel systems in which plant fuel cells tap photosynthetic products directly, bypassing the development of plant structural elements (Langeveld et al., 2010).

4.4.1 A brief historical perspective

The current biobased sector in Amsterdam cannot be understood without understanding its long history with (fossil) fuels. Indeed, at the moment, the port of Amsterdam (referring to the exact port area of Amsterdam), is the biggest gasoline throughput port in the world. As explained in the socio-economic profile, this translates itself clearly in the throughput figures of Amsterdam.

The first oil drilled was in Pennsylvania in the United States of America during the summer of 1859. By 1860, the first oil barrels arrived in Rotterdam and Antwerp, the two ports that took the lead (Bakker, 2011). As a reaction, the city government of Amsterdam opened a newly created petroleum depot at the Galgenveld in 1867, at the western part of the Volewijck and the North side of the IJ. The exploitation of the depot was done by the pseudo-public company Amsterdamsche Petroleum Entrepot. However, big accidents in Antwerp showed the danger of the new kind of oil products, and Amsterdam decided to create a new port located far from the city. At that time, the new North Sea Canal was just finished in 1876, and Amsterdam had bought two newly created polders, the Noorder-IJ-Polder and the Amsterdammer-polder, expanding the city boundaries along the canal. In the meantime, the oil sector expanded rapidly. In 1877, the first dedicated oil ship was built, requiring larger steel tank-terminals for the storage of oil. Antwerp was the first port to have these tanks. To respond to the expanding oil sector and to prevent incoming ships from clashing with outgoing ships, a new kind of horseshoe port was proposed. Eventually, the petroleum-port was built in 1887 in the Amsterdammer-polder along the canal (Figure 4.17), where it is still located today. The petroleum port was 14ha big, 8.2m deep and could accommodate 19 ships at the same time. A railway bridge towards Zaandam could transport oil from the port to the hinterland. However, the port was not that successful, partly following the public structure of the Amsterdamsche Petroleum Entrepot. Therefore, in 1891 the American Standard Oil Company asked for and obtained a concession to rent 20,000 square meter in the petroleum port. Following the arrival of Standard Oil Company, the Amsterdamsche Petroleum Entrepot quickly went broke in 1895. During the first decades of the 20th century, the oil market expanded rapidly in Amsterdam, also following the arrival of Shell among others. The port was deepened to 9.5 meters and widened to 50 meters, and new terminals and dedicated infrastructure was built. In 1905, the first gasoline arrived in Amsterdam, for which the inner-island of the petroleum port was adapted in 1906 (Bakker, 2011; Gemeente Amsterdam, 2009).

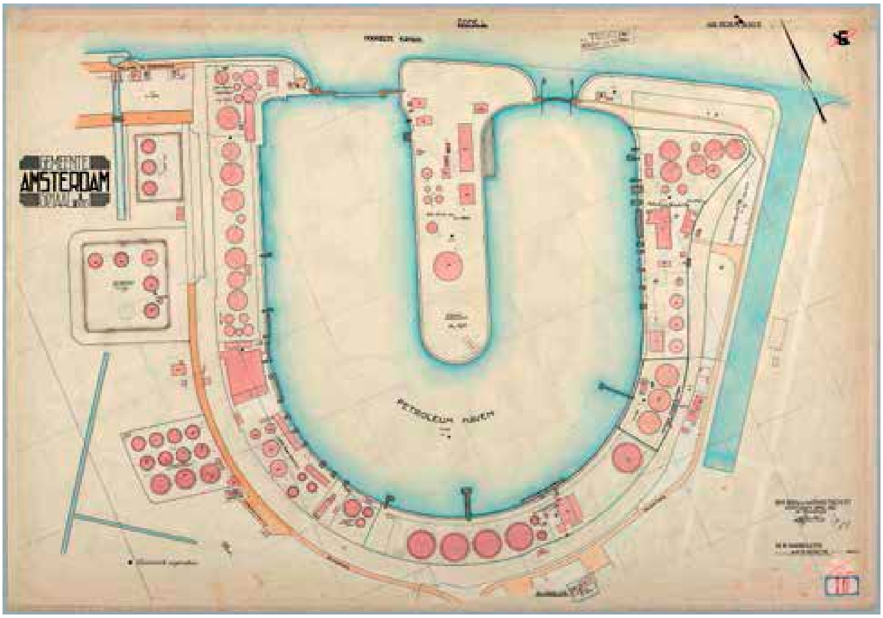


Figure 4.17 The petroleum port 1921 (Hameleers, 2015)

While during the First World War almost all oil activities in Amsterdam stopped, the oil activities soon returned afterwards. Consequently, further expansions were needed. To ease the ingoing and outgoing movements of the ships, new port areas were proposed that would be built diagonally on the canal. Hence, as proposed in the General Expansion Plan of 1934, the Westpoort was built to the west of the petroleum port in 1937. Until 1961, it was called the Ford port due to the presence of a Ford car factory. Consequently, in 1940, around 185,000 cubic meters of oil storage capacity was available in Amsterdam. However, to prevent the German Army from using these capacities, the entire oil capacity was set on fire and destroyed on the 14th of May, 1940, by British engineers. After the war, in 1950, Amsterdam managed to restore and expand the capacity to 200,000 cubic meters. To further expand, the Jan van Riebeeck port and the Usselincx port were built in between the petroleum port and the Westpoort, making the existing terminals accessible from both sides (Bakker, 2011; Gemeente Amsterdam, 2009). West of the Westpoort, the Amerika port was built and opened in 1968. Modern oil terminals were constructed in this port and the first oil refinery Mobil was established; however, Mobil closed by 1982. Also the German Oiltanking built its terminal in the Amerika port. On the one hand, the Oiltanking terminal was directly connected with the North Sea oil platforms by pipeline, and, on the other hand, the terminal was connected directly by pipeline with the airport Schiphol for the transportation of kerosene. Consequently, in 1960, the capacity was 770,000 cubic meters, making it the biggest gasoline port in the world at that time. At the end of the 20th century, the Afrika port was built in Amsterdam (Bakker, 2011). The Rotterdam-based oil company Vopak, already having a terminal in the Westpoort, decided to build a large terminal of more than 1 million cubic meters of storage capacity in 2006 . Subsequently, Amsterdam is again the biggest gasoline and petrol port in the world, and has been since 2011 (Stil, 2011).

While not having a refinery today as in Rotterdam or Antwerp, Amsterdam did find its place within the petroleum sector. The success of Amsterdam follows the role it plays in balancing the relation between the global demand of oil-derived products on the one side and the global gasoil resources on the other side (Stil, 2011). The enormous capacity, its close location to the refineries in Rotterdam and Antwerp, the facilities to blend oil products, and its good fore- and hinterland connections explain why Amsterdam is the world's largest petrol throughput port today.

However, as already explained in paragraph 4.1.5, the port of Amsterdam is in search of its new role. In the last years, the city government of Amsterdam, still being the sole shareholder of the port authority of Amsterdam, has increasingly expressed strong critiques on the presence of, on one hand, petrol activities and, on the other hand, coal throughput within its port area. First, in light of climate change and emission gases, the city of Amsterdam, as well as the port authority of Amsterdam in the meantime, aims to get rid of coal throughput activities. Both Rietlanden terminals (being part of the steel relational geometry as shown in previous paragraph) and OBA terminals were informed their lease contract would not be renewed in 2030 (van Zoelen, 2017). Also in Rotterdam there is a debate going on to end coal activities, both from the city and port authorities, however, recently, the port authority of Rotterdam decided to extend the lease contract of the EMO coal terminal till 2043 (Hotse-Smit, 2018). On the other hand, the petrol and gasoline activities in Amsterdam are questioned by the public opinion and by the city government of Amsterdam. The commotion about especially the petrol activities in Amsterdam followed the release of a research report called 'Dirty Diesel', explaining how Swiss oil traders, mostly based in Geneva, transhipped oil and its derives between several ports to blend and sell the so-called dirty diesel, which holds 150 times more sulphur than the European diesel, to African countries. Antwerp, Rotterdam, and thus Amsterdam were appointed as being the focal nodes in this trading network (Public Eye, 2016). While the dirty diesel is indeed forbidden following European environmental standards,that is not the case for most African countries. Hence the 'incentive' of companies like Vitol or Trafigura to blend dirty diesel in Amsterdam and sell it to African countries. While none of this dirty diesel is used in Amsterdam, The Netherlands or Europe, political parties in Amsterdam called to forbid these activities in Amsterdam (Hotse-Smit, 2018; van Zoelen, 2016b). In Rotterdam and especially in Antwerp, the report did not get much attention by the responsible politicians, who reacted on the report with no comment" (Geeraert, 2016).

For the port of Amsterdam, the questioning of the coal and petrol activities is troublesome. As we already explained, the port of Amsterdam, thus without Ijmuiden, is almost entirely a throughput port, for which coal and petrol are increasingly the most important cargo. Indeed, in 2017, the increasing throughput of coal and petrol pushed the port to a record financial year (Westeneng, 2017). Thus, having its two most important activities questioned, the port authority tries to defend its 'license to operate', already weakened as shown by the Haven-Stad urban transformation, and hence is in search of new activities. Therefore, to 'clean up' its image among politicians and among the public opinion, the port authority aims at expanding its biobased activities (Berger, 2016), as expressed within its 'Vision 2030', launched in 2015 (Port of Amsterdam, 2015).

Following that Amsterdam is the biggest petrol port in the world, it can easily accommodate biofuel activities, because similar to fossil fuel, biofuel has to be blended, stored and eventually transhipped (Gemeente Amsterdam, 2006)[78]. However, different from the port of Ghent, as we will explain later, no major cereal terminals are located in the port of Amsterdam or in the other NZKG ports. Hence, the production of biofuels has to be of 'second-generation', or in other words, based on organic residues. The port authority of Amsterdam welcomes this idea because, if fully deployed, it would imply significant flows and storage demands of biomass, hence creating a new source of income following the taxation of biomass transporting ships and a solution for the questioned coal terminals. Next, the biodiesel would also imply that the questioned diesel activities and infrastructure could continue to exist (Berger, 2016). The question then, logically, is where sufficient feedstock of organic residues can be found. As we will see, a major flow comes from the large distribution centre of supermarket Ahold, located in Zaandam, and from the regional collection of particular green waste and the collection of used cooking oils (Jonkers, 2012).

4.4.2 Structural couplings

(a) Industrial regulation

The biobased sector is difficult to perceive as a clear economic sector, but rather as a grouping of non-food bio-products based on biomass. Biomass can be used to produce bio-energy, bio-materials and bio-fuels. First, in 2001, the European Union published its directive 2001/77/EC promoting renewable energy use in electricity generation. It sets national indicative targets for renewable energy production for individual member states without enforcing them. The target for Belgium was set at 6% and for The Netherlands at 9% share of gross renewable domestic energy consumption by 2010 (European Commission, 2001a), without enforcing them. According bio-fuels, in May 2003 the European Union published the directive 2003/30/EC, better known as the biofuels directive, to promote the use of biofuels for EU transport. The directive implied that its member states should replace 5.75% of all transport fossil fuels (petrol and diesel) with biofuels by 2010. An intermediate target of 2% was called for by the end of 2005 (European Commission, 2003). Important to underline is that the use of biofuels is done by the blending of biodiesel with regular diesel to make sure the conventional widespread fossil-based engines would not break down. Hence, regular fuel blended with biofuel was marked as B5 for diesel blended with 5% bio-diesel, for example.

However, neither the 2001 nor the 2003 directives were enforced. Hence, in April 2009, the European Union published its Renewable Energy Directive (RED) 2009/28/EG to replace both the 2001/77/EC and the 2003/30/EC directives, forcing its member states to have 10% of their energy consumption bio-based by 2020 (European Commission, 2009b). For bio-fuels in particular, it published its Fuel Quality Directive 2009/30/EG (European Commission, 2009a). This directive focussed in particular on the production of biomass. Indeed, in the directive 2001/77/EG biomass, as it should be used to produce bio-products, was defined generally as the "the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related

78 The port authority of Amsterdam was established in 2013

industries, as well as the biodegradable fraction of industrial and municipal waste" (European Commission, 2001a; Vandermeulen et al., 2010). However, the production of biomass, especially for bio-fuels, tends to have indirect changes of land uses. Argued by the European Commission, a significant amount of the production of biomass takes place on cropland that was previously used for other agriculture, such as growing food or feed, hence the food-fuel debate. This process is termed as indirect land use change (ILUC). Such ILUC risks negating the greenhouse gas savings that result from increased biofuels because grasslands and forests typically absorb high levels of CO2. Hence, by converting these land types to cropland, atmospheric CO2 may increase, despite the use of bio-fuels. Therefore, in 2015, the European Commission 'corrected' the former 2009 directives in light of ILUC (European Commission, 2015). This directive states that, by 2020, the share of bio-fuels from crops grown on agricultural land fall within the target goal of 7 to 10%. Thus, 3% should be second- generation. Second, it recommends that the biomass feedstock should be harmonized across the EU.

The EU directives have to be translated by the member states individually. This has, however, led to an arguably fragmented European and global bio-fuel market creating strong changes in stock market prices for bio-fuels (Mijnheer, 2015). Following (bio)fuel is traded by a minimum of 1.000 tonnes, 'minimal' price changes can lead to huge differences. For example, first, most EU countries translated the EU directive of 2001 and 2009 based on fuel blending obligations. For The Netherlands, at the moment the obligation is set at 8.5%. However, because bio-fuel is (still) not competitive in comparison with fossil fuels, almost all countries subsidize the production of bio-fuels in one way or another. For example, for the production of bio-fuels, Belgium used a system of duty-free production-quota, allocated by tender. Because the allocation is arranged per region, Flemish and Walloon companies retrieved these quota (see next chapter), hence giving them a price advantage for their production of bio-fuels in comparison for non-Belgian companies (in case they are unsubsidized or less subsidised per ton of bio-fuel)[79]. In meantime, these quotas do not exist anymore. The Netherlands, however, decided to oblige the fuel transporting companies to reach the blending obligations. In other words, if a fuel trader or producer like Shell, BP, Total or Gulf ships in fuel to a Dutch port, it has to be blended with bio-fuel. However, as such, a trader can obtain multiple subsidies just by transporting diesel around the world. For example, a large part of the global bio-fuel production is located in South-America and Asia. A trader buying a ship full of pure biodiesel (B100) subsequently ships it to the United States of America and blends it with only 1% of regular diesel (B99). As such, the entire ship could receive American subsidies of blending regular diesel with biodiesel. Especially in the United States, the blending of biodiesel and regular diesel is strongly financially supported. Subsequently, having already obtained the American subsidies, the ship goes to Europe where it can be sold much cheaper, and is thus more competitive, than the European produced biodiesel blends. Therefore, in only a few years. the European market was 'flooded' by the import of cheap American biodiesel. While in 2005 the import of bio-fuel was no more than 1,000 tons, by 2007 this increased to 1 million tons. Consequently, several bio-fuel facilities in The Netherlands were (temporally) shut down or went bankrupt, such as Rosendaal Energy Sluiskil, Biovalue Eemshaven, Dutch Biodiesel Rotterdam and Ecopark

79 This example does not include the decrease of prices following scale of economies.

Harlingen Rotterdam. In general, only 20% of the produced bio-fuels was effectively used. As a reaction, in 2009, the European Union set anti-dumping measures for bio-fuel coming from countries that subsidized their bio-fuel production heavily. However, such import barriers can easily be bypassed by shipping the US biofuel first to Canada, for example, having no export restrictions. There, the fuel is blended with Canadian fuel and, as such, the whole ship receives a 'new bill of origin' before shipped to the European Union (Mijnheer, 2015).

Also within the EU, strong differences exist. For example, partly following the existence of 'second-generation' producers, The Netherlands rapidly translated the preference for second generation into its national legislation in 2008. In contrast, until cancellation in 2015 of the Constitutional Court[80], by regulation Belgium favoured the first-generation following the existence of these producers in Belgium, as we will explain in next chapter. Germany can be situated 'in between' the regulations of The Netherlands and Belgium. Recently, Germany has changed its directive and bases its goals of blending not on the volume percentages but instead on the percentage of CO2 reduction value of the bio-fuel used. On paper, this would imply that the so-called 'second-generation' fuels are favoured; however, the 'first-generation' fuels can also obtain lower CO2 reduction values by, for example, using cereals from local farmers and improving their logistics and production processes. Hence, for the same 'bio-fuel', if it is first of second generation, different prices exist within Germany (Mijnheer, 2015).

Thus, although the idea of promoting bio-products, particularly bio-fuels, based on the use of biomass seems logical at first sight, in reality, it is a very difficult economic market to comprehend, following it is regulated so strongly and differentiated. The bio-fuel market is, in fact, arguably artificial. The demand for bio-fuels is, in other words, a consequence of the regulations all over the world demanding the blending of biofuels. These regulations are in the first place linked to sustainability goals, but one may not forget it also is linked to agriculture policies, which are of a protective nature and strongly subsidized in many countries. Hence, during the last 10 years, from a market illustrated by many small national bio-fuel producers, a strong vertical integration occurred in creating an increasing oligopoly among the 'traditional' fuel producers and (food/feed) commodity traders. For example Shell, one of the worldwide biggest fuel producers, recently started to cooperate with the Brazilian sugarcane-ethanol producer Cosan, ensuring Shell is able to fulfil its 'blending obligation' internally and is no longer obliged to buy the needed bio-fuel on the volatile trading markets. Similarly, Total decided to buy refinery La Mede and transformed it to a bio-fuel facility in 2015, capable of fulfilling the total needed demand of bio-fuels. Although for Shell or Total the biobased activities are financially minimal, these oil-producers nevertheless see the opportunities to have an extra 'option' to ensure the trade of their oil-products. Moreover, the biobased facilities bare small risks. Indeed, the production within biobased facilities can easily be stopped or started according the demand. For these large companies, the temporary closure of a biobased facility is only of minimum cost. Small cooperative biobased facilities therefore can be easily outcompeted, if they are not heavily protected by subsidies for example, hence creating the oligopoly

80 https://legalworld.wolterskluwer.be/nl/nieuws/in-het-staatsblad/grondwettelijk-hof-vernietigt-beperking-biobrandstoffen-tweede-generatie-in-diesel/

within the biobased market. Other fossil-fuel companies without bio-fuel producing facilities have to buy their bio-fuels on the international markets. This market is dominated by the so-called ABCD club, the commodity trader 'giants' Archer-Daniels-Midland company, Bunge ltd, Cargill and Louis Dreyfus. Different from the regular oil market, the biobased fuel market is much more difficult to hedge because it entails two markets: the fuel market and the agricultural market. As already said, prices of the latter market are very hard to predict, as they are influenced by so many regulations, next to of course the weather. Hence, well-informed trading houses understanding how the regulations change in all the different (EU) countries, such as the ABCD club, can make significant profits on the biobased fuel markets (Jacobs & van Berghe, 2014; Mijnheer, 2015).

(b) The industrial setting

Next to the difference in bio-products and the generation of the products, a difference can also be made within the production processes. Within a so-called bio-refinery concept, one aims at an optimal use of plant components. In this concept, bio-energy production is not a primary, but only one optional application of biomass. Feedstock selection, logistics and bio-refining techniques are used to optimize the valorisation of available functionalities and biomass utilization. In other words, it implies the implementation of complex input-output chains. First, a whole crop bio-refinery (based on first-generation) processes grain into a range of products. In addition to processing oils from grains, grains are also processed into ethanol or into starch and eventually into bio-plastics. Second, an oleo-chemical refinery (also based on first generation) combines the production of biodiesel with that of high added-value vegetable-oil based products to produce chemicals, lubricants or surfactants. Moreover, on the long term, oleo-chemical bio-refining may produce feedstock for fossil-based refineries. Third, lignocellulose feedstock bio-refinery (based on second-generation) encompasses the transformation of lignocellulose biomass into intermediate outputs to be processed into a spectrum of products and bio-energy. Three processing routes exist. Bio-chemical processing treats the biomass to release cellulose. The cellulose is then used to convert into glucose. These sugars are then eventually converted into bio-fuels and/or added-value chemicals. Thermo-chemical refining consists of gasification under high-temperature of lignocellulose biomass into syngas, which after cleaning, can be used to produce biofuels and/or chemicals (Langeveld et al., 2010).

While the bio-products in Ghent are produced following the whole-crop bio-refinery and oleo-chemical refinery methods, in Amsterdam, as we will explain, bio-products are of 'second-generation', hence produced following lignocellulose feedstock bio-refinery method.

4.4.3 Strategic couplings

In this paragraph, we describe the effects of the strategic couplings. It is important to stress that we are observing these all together. While the description of the strategic coupling effects inevitably follows a historical perspective in explaining why an effect exists (for example why company A sells a product to company B), there is a difference with our step 2, which traces back the lines in detail why and how the strategic effect came into existence. Step 2 will be performed in paragraph 4.4.5.

The description of the strategic coupling effects is structured along the six different relations taken into consideration (Table 3.1). Each have their own extent (thematic + spatial boundary), their own structure and their own hierarchy. Taking these together will eventually give us a detailed view of the biobased sector in Amsterdam. The visualisation of the relational geometry is presented in paragraph 4.4.4.

(a) Input/Output

Arguably, the biobased sector in Amsterdam has already existed for a long time. Knowing that waste can be used, the biobased sector in Amsterdam started when the Afval Energie Bedrijf (AEB), burning the waste of Amsterdam and Haarlem, was established in 1919. Since 1993, AEB has produced electricity and heat from the combustion. However, obviously, AEB can hardly be perceived as 'biobased', at least not in the way it is defined by the different directives. However, AEB and the Port of Amsterdam label AEB as being a central node within the biobased sector because it recovers valuable resources from the collection of waste as much as possible. For example, within the vision 2030, the Port Authority Amsterdam argues that AEB produces 'green' electricity (Port of Amsterdam, 2015). However, arguably, following the biomass is never fully organic or renewable, this label can be questioned.

While the biobased electricity is rather questionable, AEB, however, does produce biobased gas from the sewage sludge it receives from the wastewater treatment plant of Waternet, closely located in Westpoort. The sewage sludge is combusted and gas is retrieved, which it uses to produce heat and electricity (Kuipers et al., 2015). AEB also receives the non-recyclable waste from Vosse[81], a green composting company located in the port of Amsterdam. The mineral waste, such as grind or sand, is transported to Rey Beheer[82].

However, while conducting the research of the biobased sector in Amsterdam, it was quickly clear that not AEB or Waternet but rather the cluster Greenmills Amsterdam is the contemporary focal point of the biobased sector in Amsterdam. Greenmills is a cluster of biobased companies sharing different input-output relations. Greenmills is located next to the Horndock. Within Greenmills, Orgaworld, producing bio-gas and bio-electricity, and Biodiesel Amsterdam, producing biodiesel and bio-heat, stand central. Both use processed organic waste. Rotie collects this organic waste, which is green waste as well as used cooking oils, from the main factory of Unilever in Rotterdam. It also collects from different fast-food stores of McDonalds and from individuals and municipalities[83]. First, the used cooking oils undergo a filtration and settling before being sent to Biodiesel Amsterdam.

However, one has to bear in mind that the usage of used cooking oils is questionable as sustainable biomass. Indeed, at first sight, used cooking oils are an ideal source to produce biodiesel; however, the question can be asked when frying oil can be considered as cooking oil. Indeed, logically a restaurant will only refresh its cooking oil when it is used as many times possible, according the quality standards and the type of oil. However, if the bio-fuel market based on used cooking oils is subsidised,

81 https://www.vossegroenrecycling.nl/wat-doen-wij/
82 https://www.vossegroenrecycling.nl/wat-doen-wij/
83 https://simadan.nl/blog/processen/rotie/

as within Europe, the question can be asked if the collectors are not pushing restaurants to refresh their cooking oils already after one-time usage. While no suggestions or reports were found backing this up, this is not entirely impossible. Indeed, the biggest problem for biodiesel made of used cooking oils is the lack of availability. Indeed, within especially The Netherlands, a large part of the produced biodiesel, around 55%, is based on used cooking oils. Next to Biodiesel Amsterdam, Sunoil Biodiesel Emmen and Biodiesel Kampen collect used cooking oils, creating a huge deficit of used cooking oils within The Netherlands. Consequently, there is a huge inflow of used cooking oils from China, around 100,000 tons, and from India as well as around 50 other countries around the world. Following the Dutch regulation that states that used cooking oils are counted as double for blending, one ton of biodiesel made of used cooking oils is around 150 times more valuable than regular biodiesel. Traders in used cooking oils can make $615 American per ton. Thus, while being promoted as ‘sustainable' for the production of bio-fuel, more than 80% of the Dutch biodiesel based on used cooking oils is imported from around the world (Mijnheer, 2016). This illustration already shows how difficult it is to label the different ‘generations' according their ‘sustainability'.

At Biodiesel Amsterdam, the processed oils and fats are transformed following a chemical reaction with potassium hydroxide and methanol[84]. This creates three products: biodiesel, around 125 million tons annually, glycerine and bio heating oil that is directly combusted to heat. The glycerine is transported and stored at the neighbouring Tankstorage Amsterdam[85], from where it can be transported on a ship or by truck. Biodiesel is stored there as well as at Zenith terminal[86], the former BP terminal, located further in the port of Amsterdam (Kuipers et al., 2015).

Orgaworld is the second producer of bio-products in Greenmills, next to Biodiesel Amsterdam. Similar to Biodiesel Amsterdam, Orgaworld's production is based on organic waste. This waste is imported from the organic waste of Unilever collected by Rotie[87], but also directly from American Cargill's cacao plant, supermarket company Albert Heijn's distribution centre, wastewater from Waternet[88] and wastewater from beverage production company Wild Juice (Kuipers et al., 2015). Orgaworld is a lignocellulose feedstock bio-refinery. This entails that the organic waste is fermented, creating biogas. Next to energy and biogas, Orgaworld also produces bio-agricultural fertilizers[89].

Within the biobased sector, a last group of input-output relations start from the Unilever factory in Rotterdam. While Rotie collects the organic fats, Icova Amsterdam collects the general waste. After processing this waste, it is transferred to Icopower. Icopower produces organic pellets that can be used to produce energy from[90].

84 https://simadan.nl/blog/processen/biodiesel-amsterdam/
85 https://simadan.nl/blog/processen/tankstorage-amsterdam/
86 http://simadan.nl/over-simadan/
87 http://orgaworld.nl/overtuigende-cases/cases-voor-vooruitstrevende-bedrijven/duurzame-samenwerking-unilever-en-orgaworld
88 http://orgaworld.nl/meer-over-ons-bedrijf/onze-locaties/amsterdam-greenmills
89 http://orgaworld.nl/
90 http://www.icova.nl/web/over-icova/icopower.htm

(b) Energetic

Different energetic relations exist. First Orgaworld produces biogas and subsequently uses it to produce electricity and heat. While Orgaworld itself uses the heat, the electricity is transferred to the main network, of which Albert Heijn's distribution centre is an important customer[91]. Similarly, Biodiesel Amsterdam has residual heat while producing biodiesel. This heat is used by Biodiesel itself, but also by Tankstorage Amsterdam and Rotie, two neighbouring Simadan sister companies at Greenmills[92].

Technically, bio-kerosene can easily be transferred to the national Dutch airport Schiphol. Already by 2008, the French-Dutch airline KLM started bio-kerosene company SkyEnergy to assess these possibilities. In 2009, a first one-hour KLM flight was performed by a plane on a 50/50 blend of regular kerosene and bio-kerosene. If fully deployed, the bio-kerosene, which would be blended like any fuel by using the catalysts from Albemarle[93], would flow by pipeline from the main supplier of Schiphol, Oiltanking Amsterdam or from Zenith terminal (Kuipers et al., 2015). However, until now this is rather limited or even not existing seen on the total kerosene use of Schiphol. Although the infrastructure is available in Amsterdam, the problem is the availability of bio-kerosene, which until now was only incremental[94].

(c) R&D

The fermentation Orgaworld performs within its factory involves significant R&D input. Most of this R&D is internalized; however, since 2013, Chaincraft is also located within Greenmills and uses the R&D facilities of Orgaworld[95]. Chaincraft is an independent company, originally a startup within the Wageningen University in collaboration with Orgaworld. Currently, Chaincraft is upscaling its techniques by building its MCFA[96] factory in close collaboration with Orgaworld (Kuipers et al., 2015).

Within The Netherlands, the main bioprocess pilot plant is located in Delft (N.N., 2010b). Although the plant is open for all kinds of R&D programs from anyone interested, in reality, it can arguably be seen as the R&D testing facility of DSM, a global chemical company originally established as the 'Staatsmijnen'. Moreover, the pilot plant's backbone today is the former DSM testing facility[97]. DSM is also working closely together with the Catchbio R&D consortium conducting research in the field of catalytic biomass conversion[98] (Catchbio, 2017).

Within the biobased sector in Amsterdam, Avantium stands out. Avantium is an Amsterdam-based R&D company conducting research on biological plastics, originally a startup within Shell. Being promising, Amsterdam, but also Rotterdam

91 http://orgaworld.nl/overtuigende-cases/cases-voor-vooruitstrevende-bedrijven/duurzame-samenwerking-albert-heijn-en
92 https://simadan.nl/blog/processen/biodiesel-amsterdam/
93 http://docplayer.nl/1151998-Maak-kennis-met-albemarle-catalysts-in-amsterdam-noord.html
94 https://www.rtlz.nl/beurs/bedrijven/kabinet-wil-duurzame-luchtvaart-maar-biokerosine-is-nog-schaars
95 http://www.chaincraft.nl/relocation-to-amsterdam/
96 Medium-chain fatty acid
97 https://www.biobasedpress.eu/2013/10/the-bioprocess-pilot-facility-in-delft/
98 http://www.catchbio.com/about-catchbio/challenge-and-approach/

and Western Brabant where their first small R&D facility is located at Geleen, was eager to be the host once Avantium could upscale its techniques to a – demonstrating - plant. However, in 2016, Avantium decided not to build its so-called FDCA plant in The Netherlands, but in Belgium in the port of Antwerp, close to the production site of chemical giant BASF (Verbraeken, 2016a, 2016b).

A last existing R&D relation is the one between Coppens Diervoeding and the Simadan company Noba located at Greenmills. Noba is a producer of energy-rich fat products for animal feed. To improve their products, a close R&D relation exists with Coppens Diervoeding[99].

(d) Services

The main existing service relation in Greenmills is the services provided by Simadan company Cleaning and Services. Its main task is to clean the facilities and trucks of Biodiesel Amsterdam, Rotie, Orgaworld, Tankstorage Amsterdam and Noba. Each truck trip requires cleaning as described by several safety regulations, hence the incorporation of this task within Greenmills[100] (MVO, 2014).

As already described for the steel-manufacturing sector in Amsterdam, Tebodin, an engineering company, also performs services for Cargill and Orgaworld (Jacobs & Van Dongen, 2012).

(e) Membership

Two main consortia exist for the biobased sector in Amsterdam. First, there is Be-Basic[101]. Be-Basic, originally coordinated by the Technological University Delft, is an international public-private partnership that develops industrial biobased solutions. Wageningen University, Chaincraft and DSM are partners of this consortium[102]. Second, as already mentioned, there is Catchbio. The University of Amsterdam is a partner, as well as DOW Benelux, Avantium and BASF Nederland. Hence, within this consortium, the first connections were established between BASF and Avantium resulting in the construction of FCDA plan in Antwerp[103].

(f) Shareholder

The shareholder relations reveal that the focal point of the biobased sector in Amsterdam is largely controlled by Simadan Holding, part of Kuminda holding, owning five of the seven operational companies at Greenmills. Moreover, originally, Orgaworld was part of Simadan before being sold to the British Shanks Group[104]. With the acquisition of Orgaworld, Shanks has enlarged its recycling activities within The Netherlands[105]. This implies that, at the moment, two shareholders control the biobased sector in Amsterdam. If Chaincraft eventually scales up, this will become three.

99 https://laboratorium.nl/bedrijven/noba-b-v/
100 https://simadan.nl/blog/processen/cleaning-services-amsterdam/
101 Biotechnology based Ecologically Balanced Sustainable Industrial Consortium
102 http://www.be-basic.org/about/partners.html
103 http://www.catchbio.com/partners/
104 http://orgaworld.nl/
105 In 2017, Shanks also acquired Dutch recycling company Van Gansewinkel: https://www.vangansewinkel.be/afval-bestaat-niet/afvaljournaal/shanks-group-plc-and-van-gansewinkel-complete-their-merger-and-rebrand-as-renewi-plc

Next, there are two main venture capital funds involved within the biobased sector. First, there is Shift Invest. Shift Invest is created by the Word Wide Fund (WWF) for Nature, the Dutch Rabobank, the TU Delft, Wageningen University, health insurance company Menzis and by the venture capital fund of the province of Gelderland, Topfonds Gelderland[106]. Together with private venture capital fund Horizon 3, Shift Invest was the main funder when Chaincraft bought the patent that was developed within the Wageningen University and became an independent company[107]. Second, there is Kansen voor West. Kansen voor West is a public partnership between the four Dutch provinces (North and South Holland, Utrecht and Flevoland) and four Dutch cities (Utrecht, Rotterdam, Den Haag and Amsterdam), sponsored by the European Commission. Kansen voor West' goal is to give an innovation boost to the regional economy of the Randstad by giving subsidies to promising companies. Hence, in 2017, Chaincraft obtained financial support of Kansen voor West to start the construction of its MCFA factory[108].

As mentioned before, the Bioprocess Pilot Facility in Delft is the former testing facilities of DSM Delft. While DSM is still a shareholder, the Pilot Facility is also financially supported by the TU Delft; Be-Basic; Kansen voor West; the municipality Delft; Rotterdam and Utrecht; the province of South-Holland and Flevoland; the German consortium CLIB2021; food company Corbion; and the international non-profit organization Wetlands[109] (Ministerie van Economische Zaken, 2013; N.N., 2010b). These relations thus explain why one can arguably say that the Bioprocess Pilot Facility is still – at least implicitly – foremost the testing facility of DSM.

Other financial relations reveal that other startup bio-based R&D companies exist in Amsterdam, such as Photanol, Plantics and the aforementioned Avantium. Photanol is a spin-off of the University of Amsterdam and financially supported by the Province of Flevoland located at the Science Park in Amsterdam conducting research on the sustainable production of chemicals (Ministerie van Economische Zaken, 2013). Plantics is an R&D spin-off of the University of Amsterdam and financially supported by Greenport Aalsmeer and the Port Authority of Amsterdam conducting research on bio-plastics[110] (Berger, 2016).

4.4.4 Step 1: The relational geometry

In the last two paragraphs, we first identified the different structural couplings of the steel manufacturing sector, namely the industrial regulation and the industrial setting. These two taught us how the sector distinguished itself from others regarding the regulation and the technology applied. Next, we focussed on the strategic couplings. We identified the relevant actors and their different relations. The data was added to a database model, which is able to combine the topographical data with the topological data. Eventually, we are able to visualize the relational geometry of the biobased sector in Amsterdam as shown on Figure 4.18.

106 https://shiftinvest.com/
107 https://www.wur.nl/en/newsarticle/Spin-off-From-organic-waste-to-valuable-chemical-building-blocks.htm
108 http://www.kansenvoorwest.nl/
109 https://www.bpf.eu/partners/partners-founders/
110 http://plantics.nl/

First, the relational geometry confirms that the focal point of the biobased sector in Amsterdam is Greenmills. Greenmills is a cluster of several companies working together in producing several bio-products, such as fertilizers, bio-electricity, bio-heat and bio-fuels. Besides Greenmills, several other 'nodal' bio-based productions sites exist, but these remain rather isolated (e.g. Icopower) or have the production or distribution of bio-based products only as a secondary goal (e.g. Waternet, AEB, Zenith terminal). The main input of Greenmills is organic waste, which is collected within the port or within the region. The output of this cluster is sold directly (electricity, heat, fertilizer), or stored in the available terminals (Tankstorage, Zenith terminal) in the port of Amsterdam. The import and export can be seen as the input/output 'shells' around the integrated production cluster of Greenmills.

Second, the relational geometry reveals a straightforward financial network of the biobased sector. Only two companies, Simadan / Kuminda and Shanks, control the main production nodes, the focal (production) part. They thus hold the decision power. Around this 'core', numerous financial relations can be observed, concentrating in three main centres. First, there is the Bioprocess Pilot Facility in Delft. However, we could also have left out the Bioprocess Pilot Facility as, remarkably, no direct relation was found between the Pilot Facility and the biobased sector in Amsterdam. Moreover, one could argue that, not only for Amsterdam but for the whole of The Netherlands, the Bioprocess Pilot Facility is rather isolated from other biobased sectors in Rotterdam or Terneuzen, even though many governmental institutions are partners. The relational geometry thus confirms the argument that the Biobased Process Facility can still be seen as the pilot facility of DSM.

The second and third financial 'nodes' are the two aforementioned venture capital funds, Shift Invest and Kansen voor West. The former can be seen as having a more private character, while the latter can be seen as more public. Both intend to backup promising 'biobased' or 'sustainable' ideas willing to scale up to the industrial – or, in other words, potentially profitable – phase. Although both have already existed for a significant period, they are only recently involved with the biobased sector in Amsterdam. This is most clearly illustrated by Chaincraft, which was both supported during its establishment as well as during its contemporary scaling-up process. If the MCFA is eventually finished and added to the Greenmills production cluster, this will be the first time the venture capital funds succeed in pushing promising ideas to full-grown industrial production processes in Amsterdam. Other 'ideas' which are still in their startup phase at the moment can be observed in Amsterdam (Photanol, Plantics). Avantium is hereby a 'failure' for Amsterdam and The Netherlands, as it eventually choose not to scale-up within The Netherlands, but rather in Belgium, in the port of Antwerp. In other words, the invested money and R&D efforts in Avantium by public institutions like the University of Amsterdam did not lead to the foreseen financial and economic returns (Verbraeken, 2016a). Hence, the R&D network of the biobased sector in Amsterdam is rather limited or almost non-existent, besides of course the internalized R&D processes of Orgaworld and Chaincraft.

The six different networks together create a relational geometry with a rather large extent. However, at the moment, this large extent is mostly financial or following secondary R&D and input/output relations. Although these relations have to be taken into account to understand the biobased sector in Amsterdam, the large extent somewhat blurs the rather limited extent of the ‘real’ biobased sector in Amsterdam, which for all different types of relations does not go far beyond the extent of the Greenmills cluster. In other words, no other important companies in the port of Amsterdam are directly included, no important direct relations exist with the city of Amsterdam, or no important direct relations exist with other ‘non-Amsterdam’ companies. Thus, the relational geometry of the biobased sector in Amsterdam does not reveal a biobased port-city interface, although the (financial) incentives are clearly present. Hence, arguably, one can say that the biobased sector, instead of the questioned fossil fuel and coal sector, cannot (yet) be seen as the ‘new regional and urban role’ that the port of Amsterdam wants to fulfil. Therefore, in the next paragraph, we ‘trace back the lines’ to explain why we observe such biobased relational geometry.

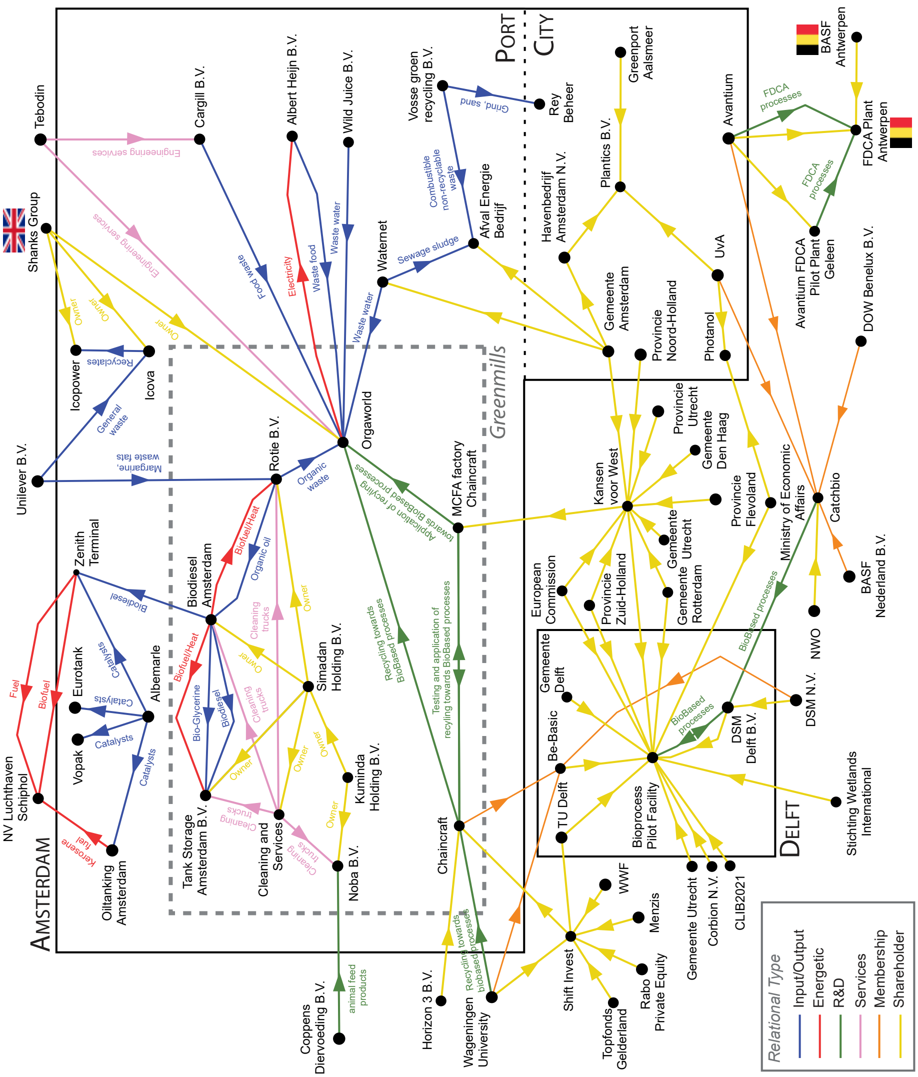


Figure 4.18 The relational geometry of the biobased sector in Amsterdam (Van den Berghe et al., 2018)

4.4.5 Step 2: The coupling mechanisms

In the previous paragraph, we presented and explained the visualization of relational geometry of the biobased sector in Amsterdam according our methodology. This relational geometry is, however, nothing more than the current crystallization at analytical time 'zero'. It thus does not explain why we see this relational geometry. It only is the first step; a first step that makes it possible to identify the 'identifying causal mechanisms' that at work (Somers, 1994; Sunley, 2008). In other words, using the visualization of the relational geometry, we can go deeper to 'trace back the lines' uncovering the causal mechanisms.

Our starting point is the institutional structural coupling of the biobased sector in Amsterdam in 2010. We label this as such, because at that time, Greenmills became operational and an effective coupling occurred between the (fossil) fuel industry, the food/feed (waste) industry, and the chemical industry (fermentation techniques). This coupling can be seen as structural because it entails a creation of a new system (the biobased sector) comprising two or more other systems while the resulting overarching biobased sector cannot simply be reduced to the properties of the constituent subsystems (Bhaskar, 2008 [1975]; de Haan, 2006). The biobased sector is, as such, (potentially) 'bigger' than the rather narrow production aspect, also involving notions like 'environmentally friendly', 'sustainability' or 'circular'. Hence, while the biobased sector is already a broad sector and in fact can better be understood as the biobased economy (Langeveld et al., 2010), it most likely will become even more overarching, defining more and more elements of the economy and everyday life. If this happens, the biobased sector will not only be an institutional structural coupling, but also a hegemonic discourse (cf. Hajer, 1995). However, arguably, this is still 'ongoing'.

If one intends to trace back the lines, one will quickly experience a background of a polyphony of voices, structure and agency, and a diverse mix of details, blurring the causal mechanisms. By explaining the different structural couplings in Amsterdam, we already 'narrowed it down'. Indeed, one would not be able to explain the biobased sector in Amsterdam without knowing the huge tensions existing between the role and income of the port of Amsterdam as the global leading gasoline port, and the more local and national call to abandon these kinds of activities in particular, thus threatening the future of the port as we know it today.

However, this tension is rather new and cannot fully explain the existence of the biobased sector in Amsterdam. Indeed, arguably the beginning of the biobased sector in Amsterdam can be traced back to 2003. In 2003, the 'Horndock' area within the port of Amsterdam became vacant. In 1965, the American chemical company Marbon, part of the Borg-Warner Corporation, opened a new ABS-plastic facility along the Cyprusweg in Westpoort (where a fire occurred[111] in 1971). In 1988, Borg-Warner sold its plastic business to General Electric Company, hence, Marbon became GE Plastics Amsterdam (Gilijamse et al., 2009). Eventually, in 2003 GE Plastics closed its plastic factory in Amsterdam, and along the Horndock, a vacant area appeared.

111 See footnote 44

From this moment, we will reconstruct how the biobased sector in Amsterdam was established and the trajectory of the causal coupling mechanisms. Hereby, we relied not only on desktop research, but also on information retrieved through interviews. This is necessary because the researcher was not directly involved. Therefore, by relying on the visualization of the relational geometry, we selected a group of interviewees to gain insights in the particular case and give us information we did not find during our first step or to confirm our resulting relational geometry. We trace back the causal coupling mechanisms for the biobased sector because the growth of the sector, in comparison with the steel manufacturing and car manufacturing sector, is relatively recent and information can still be retrieved from actors involved directly from the beginning. Hence, in Table 4.3 we present the list of interviewees and their memories.

Amsterdam – Conducted interviews		
Name	**Main task/role**	**Date**
Orgaworld (CEO Klaas van den Berg) – since 2012	Biodiesel production	12 -1-2017
Port Authority of Amsterdam (Micha Hes) – since 2009	Bio-based/circular responsible	27-1- 2017
Chaincraft (CEO Niels van Stralen) – since 2010	R&D Fermentation processes	3-2- 2017
City of Amsterdam (Eveline Jonkhoff) – since 2011	Bio-based/circular department	6-2- 2017
City of Amsterdam (Director Martijn van Vliet) – since 2000	Economy department	13-3- 2017
Amsterdam Economic Board (Marjolein Brasz) – since 2016	Bio-based Economy Association	27-3- 2017

Table 4.3 List of interviews conducted in Amsterdam concerning the bio-based sector

As already explained, and as showed by the visualisation of the biobased sector of Amsterdam, we first needed to interview Orgaworld and Simadan, being the focal actors in production terms, but also following the financial and R&D networks. This illustrates how the first step of our methodology is crucial to let us 'win time' and be much more precise in finding and obtaining information for step two of our methodology. We were able to interview the CEO of Orgaworld Klaas van den Berg, but did not succeed in interviewing Simadan, as they refused[112]. This, however, did not create a major information shortage because Orgaworld is a former company owned by Simadan. Klaas van den Berg therefore could provide us with all necessary information concerning the causal mechanisms of the biobased sector in Amsterdam.

The information retrieved from the interview with Klaas van den Berg, in combination with the documents found, was surprisingly (although, of course, predicted thanks to our first step) satisfying. However, to be sure we understood the case as well as possible, we also conducted interviews with Chaincraft (CEO Niels van Stralen) to understand how the company as a university spin-off found its way to Greenmills. Second, we interviewed the Port Authority Amsterdam (Micha Hes) to understand its biobased ambitions and the underlying reasons. Third, two interviews were conducted with the City of Amsterdam, particularly with the economic department (director

112 Chris Linderman, CCO of Simadan Amsterdam

Martijn van Vliet) and the biobased department (Eveline Jonkhoff), to understand the broader setting and perspective of the city towards the biobased activities within the port. And fourth, we conducted an interview with the Amsterdam Economic Board, biobased division (Marjolein Brasz), which concerns the economic private and public biobased activities in Amsterdam (Table 4.3).

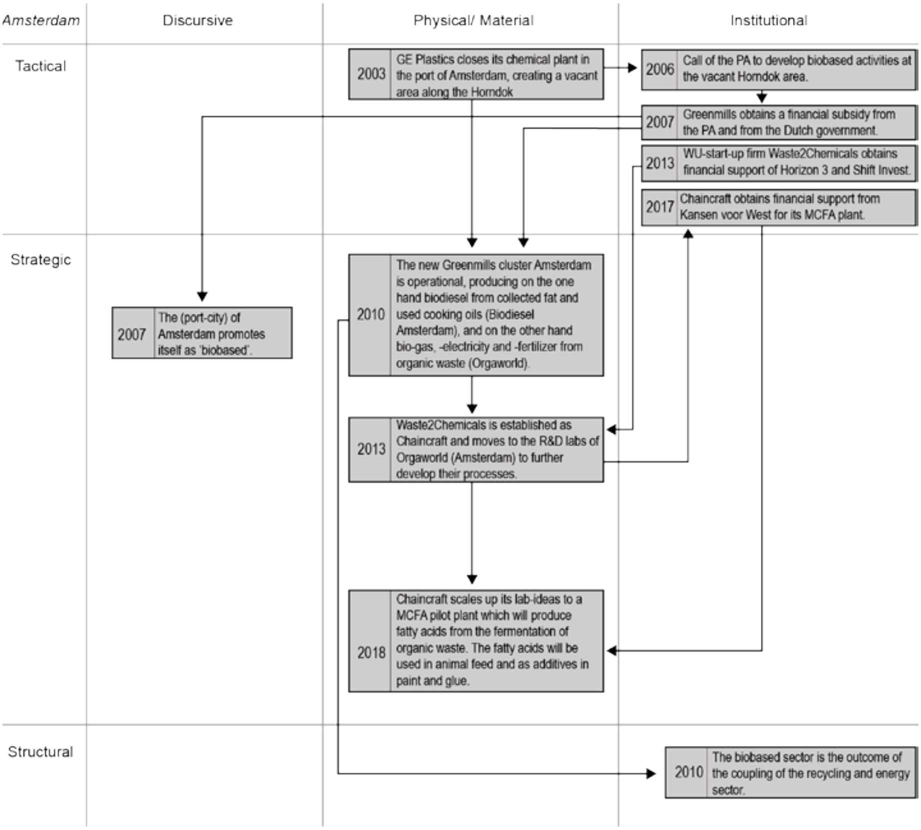


Figure 4.19 The coupling mechanism trajectory explaining the current relational geometries of the bio-based sector in Amsterdam (adapted from Van den Berghe et al. (2018))

As shown by Figure 4.19, our starting point is 2003, the moment a vacant tactical physical/material area along the Horndock appears following the closure of the GE Plastics plant. Subsequently, the municipality of Amsterdam, still the operator of the port at that time, conducts economic studies to assess the possibilities of the vacant area at Horndock. In 2006, it concludes that the area suits itself well for bio-based activities (Gemeente Amsterdam, 2006). The Dutch national government, creating a subsidy to support the call for bio-based activities, confirmed this. Eventually, in 2007, companies Simadan and Orgaworld, still mother and daughter companies at that time, obtained the subsidy and were offered the chance to build their biobased activities at the vacant Horndock area (RVO, 2007).

Although mother and daughter at that time, originally Simadan and Orgaworld were separate companies. Peter Bakker established Simadan as a fat-processing company in Lijnden in 1985. Simadan further built on company Noba, established in 1950 by the father of Peter Bakker. Noba, to this day, is an animal fat-processing company producing oils, fats and fatty acids for animal feed. As regulations became stricter and waste had to be collected separately, Peter Bakker founded Rotie in 2000. Rotie collects and separates different kinds of waste (N.N., 2007c). In 2001, Peter Bakker established Orgaworld. Orgaworld is specialized in the processing of organic waste and the production of fertilizer and compost. During the 2000s, Orgaworld established facilities in Canada, for which it worked together with the British Shanks Group. Eventually, in 2007, Orgaworld was completely acquired by Shanks.

At that time, Simadan was increasingly moving towards the energy production based on fats. Therefore, together with Orgaworld, it needed to centralize the different operational needed steps to create biofuel, -electricity, -fertilizer and -heat into one cluster. Thus at that moment, the *institutional discursive* call and eventually subsidy of the PA Amsterdam and the Dutch government came at the right moment for Simadan / Orgaworld in search of a new location (RVO, 2007).

Once the deal was made, the new development at the vacant Horndock became *strategically discursive* promoted as “biobased Amsterdam” in which the concept of the Greenmills cluster received significantly attention and was put to the front (Gemeente Amsterdam, 2008), ever since (Amports, 2016).

Works started and eventually the cluster was operational, and the first biodiesel, -gas and -fertilizer was produced in 2010. In other words, once the cluster was operational, a *strategic physical / material* coupling effect was accomplished. The vacant area no longer existed. This coupling also led to the *structural institutional coupling* of the biobased sector as the outcome of coupling between the recycling and the energy sector, the two main subsystems of the new biobased system.

Following Dutch regulations stating that the oil trading companies had to fulfil the blending requirements, Simadan, thus the biodiesel ‘section’ of Greenmills, soon thrived. Among its customers, BP (today Zenith Terminals) is one of the biggest. As regulations – the European, but more so the Dutch, ones – started to push for the ‘second generation’ fuels, Simadan thrived even more as they made biofuel out of used cooking oils (Munsterman, 2012).

Within Greenmills, the other part, Orgaworld, is concerned with the processing of organic biomass. The separation and fermentation of this is relatively difficult, as it has to be as ‘clean’ as possible. This way, the production is at a maximum level. Within the Wageningen University, a new fermentation process was developed. In 2013, Waste2Chemicals/Chaincraft bought the patent and a *tactical institutional coupling occurred*, with venture capital funds Horizon 3 and Shift Invest making it eventually possible for a strategic *physical/material coupling* to occur and Chaincraft to move as an independent firm to the building and R&D facilities of Orgaworld in Amsterdam (Chaincraft, 2013). Until now, Chaincraft has not produced anything, and is mostly making financial losses, as it is still in the development phase (Verbraeken, 2017). In the meantime, Chaincraft has tactical institutional coupled with Kansen voor West in an agreement for financial support for their MCFA plant. Once this plant is operational, predicted to happen at the end of 2018, this coupling will transform to a *strategic physical/material coupling*. If completed thus, the organic biomass section of Greenmills will thus be added by a production unit making acids from the imported biomass.

Tracing back the lines and the causal coupling mechanisms as represented by Figure 419 shows the coincidence of the establishment of the biobased sector in Amsterdam. Of course, the right infrastructure was present and there was a demand for biodiesel in The Netherlands following the Dutch regulation. Moreover, the gasoline and diesel industry is mostly located in Amsterdam due to the presence of the enormous oil terminals. However, the biobased sector still only came up following the goals of the non-Amsterdam company Simadan. In other words, not Vopak, BP or other Amsterdam-based oil trading companies established a biodiesel facility to fulfil their obliged blending norms. Klaas Van den Berg confirmed this:

> *Our location in Amsterdam is up to a certain level a coincidence, it also could have been Rotterdam for example. The advantage of Amsterdam is that we were offered a vacant area were we could integrate all components. Moreover, Amsterdam is a central location within the Randstad for waste collection. And of course, within the port, we can connect to the oil terminals for biodiesel and attract other companies within the food or feed sector to collect their biomass and to sell our bio-heat and –electricity to. (interview: Orgaworld)*

As a general rule for companies, Simadan and Orgaworld of course used a technology that had already proven its efficiency. In other words, the main obvious goal of Simadan and Orgaworld is, in the first place, making profits. This implies that a company minimizes the risks. On the total balance of needed investment, being offered a vacant area is hereby an important reason to move to Amsterdam. This also implies Greenmills' goal to innovate is arguably always secondary, and first profits have to be made. This is especially true for Simadan, which already succeeded in optimizing its production of biodiesel from fats during the last decades (Munsterman, 2012), but, to a lesser extent, for Orgaworld as well, which does invest quite a lot of effort into R&D in order to improve its fermentation processes. However, Orgaworld remains a rather small company, especially in comparison with the nearby Shell Technology Centre in Amsterdam, for example, and therefore can only invest limited efforts and budget into R&D. This is of course not a 'rule' only within the biobased sector, but is especially relevant for this sector since the 'bio-economy' and all its possibilities are still in development. Therefore, what is noticeable is that, in many cases, and also for Ghent, this R&D risk is covered by public institutions and especially by pilot plants in which companies can conduct their R&D. However, as explained in the relational geometry, the biobased pilot plant in The Netherlands is located in Delft and arguably can still be seen as the DSM pilot plant, since it still is one of the main shareholders. Although this hypothesis was not confirmed during the interviews in Amsterdam, Professor Wim Soetaert of the Ghent University and the founder of the biobased pilot plant in Ghent confirmed it:

> *The main difference between the pilot plant in Ghent and Delft is that we in Ghent succeeded to 'stick' to our independent character. You have to know this is enormously important within the biobased sector, which is in full R&D development. A company takes huge risks to invest in R&D and finding a new or improved technology is like looking for a needle in a haystack. You do not want that another one eventually finds it first, although you did all the efforts. However, still R&D has to be done and many companies cannot do*

this on their own and need collaborations[113], for example within a pilot plant offering the needed infrastructure to third parties. Such collaborations can only be successful if they happen within a 'trust' environment. Therefore, I always underlined that the biobased plant has to be as independent as possible. Even the influence of the university or port authority has to be limited to some level. At any moment, a pilot plant has to act as a 'heaven' of '(biobased-)trust'. The slightest indication a company, being public or private, has something to say or has more influence than other companies within a pilot plant, for example through the shareholder relations such as DSM Delft, can discourage companies to do their R&D within a pilot plant. In this case, three options exist, or they go to another pilot plant – we do receive a significant amount of Dutch companies doing their R&D research in Ghent instead of Delft - , or they invest and do their R&D research themselves – but this hold enormous financial risks -, or they do not conduct the R&D after all and 'buy in' or deploy proven (foreign) technology. Latter option is in this case the most plausible. (interview: Professor Wim Soetaert)

Thus, although distances always can be covered to Delft or Ghent, still, one could arguably say that Amsterdam misses such a public R&D institution or facility to become less dependent on the investment and R&D incentives and possibilities of the companies in Amsterdam. Klaas Van den Berg confirmed this:

I would not say that Orgaworld for its daily operations really misses a closely located university, but it is nevertheless a disadvantage for the sector in Amsterdam. We work together with the universities of Delft or Wageningen. Hence, meetings have to be scheduled and distances have to be covered. Also students have to move for internships. It is not that we can bump up a professor in the local supermarket (interview: Orgaworld)

Indeed, within Amsterdam, or the region of Amsterdam, no public technical (cf. technical steel manufacturing school is owned by TATA Steel Academy) or biobased university or college is located. During our interview with Martijn van Vliet, director of the economic department of the city of Amsterdam, this was confirmed.

It is true that Amsterdam lacks a true technical beta-institution. We have two universities, the 'Free University of Amsterdam' and the 'University of Amsterdam'. In broad terms, you could say that on the one hand these train 'social scientist' and on the other hand 'theoretical physics and chemists'. Both lack the incentive to translate innovative ideas to business cases. In other words, we lack a technical university who trains people 'in the middle' capable of doing innovative research and being able to eventually make a business out of it. For a long time, in Amsterdam we thought we did not need this. If you look at our economy, especially in the last decades, Amsterdam, even more than other 'big cities' evolved to a tertiary sector. No more than 3% is active in the industrial sector today, while during the

113 Illustrative for this is the HIsarna technology developed in Ijmuiden by TATA Steel, but in collaboration with its main competitors such as ThyssenKrupp and ArcelorMittal. This illustrates that even large TNCs need R&D collaborations.

1970s this was 20%. We therefore need people trained to work in these (social) sectors. However, the recent financial and economic crises opened our eyes. Especially in the tertiary sector in Amsterdam was hit hard, in particular the banking sector, a large amount of people were fired in light of the automation. In other words, while the industrial sector already for a long time has experienced automation and standardisation, we now see that this also affects the tertiary sector in Amsterdam. Hence, as a city, we are now aware how 'vulnerable' we are regarding this, and how volatile the tertiary sector is. (interview: Economy department Amsterdam)

In this light, in 2015, the city of Amsterdam first launched a tender to create a new academic institution / university aimed at transferring ideas to the economic realm. Surprisingly, the Amsterdam' universities did not win this tender, but a consortium of the Dutch TU Delft and Wageningen University and the American MIT. In 2016, the Amsterdam Metropolitan Solutions (AMS) was established, aimed at creating several academic master educational programs[114]. The city of Amsterdam is the main financier of AMS with around 50 million euros of subsidies for the next ten years. Second, the city of Amsterdam (re)launched its Amsterdam Science Park, located in the east of the city. Similar to its 'type' of university, the Science Park mostly hosts companies developing rather theoretical fundamental research or products related to ICT (AIX), biology (Plantics, 2017), mathematics or medicines. To improve the diversity, in 2016 Amsterdam announced that TATA Steel would open an office at the Science Park, trying to connect the theoretical knowledge dealing with automation and robotics with its existing industrial network (an example of this is Scyfer as shown on Figure 4.14). However, as confirmed by Martijn van Vliet, the goal to bridge the theoretical and industrial economy is until now rather unrealized.

From a spatial point of view, the creation of a new technical institution in Amsterdam seems rather strange, as the TU Delft and its biobased pilot plant are only 60km south and easily reached by high speed train or by car[115]. However, according to Martijn van Vliet, in reality he doesn't see this interaction happening

In reality, Amsterdam is 'isolated' from Rotterdam and Delft. Although we do speak of the 'Randstad', in particular for the bridging of knowledge and the industrial production, it does not happen for Amsterdam. That is why we as a city promote increasingly our science park and take quite a huge financial risk to invest in the development of our 'own' technical institution. (interview: Economy Department Amsterdam)

Klaas van den Berg confirmed that the public government and institutions play a crucial role that is hard to fill by corporate companies.

As Orgaworld, we do invest a significant amount of effort in R&D. However, this is mostly linked to the improvement of our existing processes. We cannot invest a lot of effort in fundamental research. This has to be done

114 https://www.tudelft.nl/bk/samenwerken/amsterdam-institute-for-advanced-metropolitan-solutions/

115 Belgium and The Netherlands are characterized by many nearby located small to medium city centres well connected by different transport infrastructure. See for more information van Meeteren, Boussauw, et al. (2016) or Van Oort, Van Aalst, Lambregts, and Meijers (2010)

by public universities, who can take these risks. Foremost they should fulfil the development of the idea and the start-up phase. Chaincraft is a good example of this. They developed their fundamental idea within the Wageningen University, became a start-up at the Wageningen University and eventually moved to our facilities in Amsterdam as an independent company to develop further their ideas with us. (interview: Orgaworld)

This shows thus how (industrial) companies in Amsterdam are forced to cooperate with non- Amsterdam public research institutions to rely on incremental R&D. Martijn van Vliet also confirmed the public character of such an institution, similar to the problem of the biobased pilot plant in Delft.

Interesting is that in Amsterdam we have two important research institutions: the TATA Steel Academy and foremost the Shell Technological Centre. They are part of global powerful firms and can invest significant amounts of money into R&D. However, the problem with these institutions is that we as city or region do not know what they research. Especially Shell is closed and does not communicate on what they do. This creates a problem for our policies. We as a city want to evolve towards a more biobased port-city. We were informed that Shell also was performing biobased research but without clear reasons recently stopped this. We thus cannot rely on them, hence another reason to have a public R&D institution. (interview: Economy department Amsterdam)

However, what cannot be forgotten is that the R&D only plays a 'minor' role within the biobased sector in Amsterdam. As already explained, the biobased sector in Amsterdam is of 'second-generation' and uses organic waste. As waste cannot be 'harvested' with relative regularity like grain, for example, the feedstock of organic waste is highly important for the sector, as confirmed by Klaas van Berg:

You know, we talk a lot about R&D and the importance of it for the development of the biobased sector. Although this is of course true as we discussed before, however in my opinion, we may not forget the importance of the feedstock. Especially for the 'second generation' fuel, a rather strange feedstock exists. On the one hand, we do want to create bio-products from waste, but also on the other hand we want to avoid waste. You see, this creates an intensive competition for an increasingly smaller feedstock. We all compete for the same waste. Also within Greenmills, Orgaworld competes with Chaincraft to import waste. And in its turn, Greenmills competes with the biobased activities in the North Sea Port and so on. Thus, waste prevention will eventually become, as it is already in fact, a huge problem for our activities. (interview: Orgaworld)

This illustration confirms why used cooking oils became increasingly valuable during the last decade and that The Netherlands are now importing fats from all over the world to maintain the 'waste-feedstock' for the biofuel-production (Mijnheer, 2016).

In chapter 6 we will further discuss the coupling mechanisms in comparison with the biobased sector in Ghent and move gradually to step 3 of our methodology.

CHAPTER 5

Ghent

5.1

A brief historical perspective

During its history, Ghent arguably surpassed the entire range of stereotypes from the urban geography. However, in fact, the relation is reversed (Boussauw, 2014) because the Belgian history professor Henri Pirenne at the Ghent University, highly influential for the Belgian and European historical academic field during the end of the 19th and the beginning of the 20th century (Van Werveke & Verhulst, 1960), based his medieval socio-economic 'city models' partially on the city of Ghent and Bruges in his international well known book 'Les villes du Moyen-Age' (Pirenne, 1927), based on a series of lectures Pirenne delivered in the United States of America in 1922. In what follows, we will briefly give an overview of the (spatial) history of Ghent.

Geomorphological, Ghent lies in an extensive march area created by the confluence of the rivers Lys and Scheldt. Upstream of the Scheldt to the east and the Lys to the west, these two rivers split up along the now called Blandijn-hill, a hard rock sand Pliocene hill of 29 meters. Although inhabitation dates back to the Roman period, it is common to set the 'start' date of present Ghent along the establishment of two historical influential abbeys during the 7th century. At the confluence of the two rivers within marchland, the bishop of Tongeren-Maastricht, in light of the Christianization that enrolled itself over the Low Countries, established first the Saint-Bavo's Abbey. He or one of his followers established a second abbey shortly after, the Saint-Peter's Abbey on the Blandijn hill along the Scheldt river. Because Ghent and its wider coastal region were primarily marsh land, instead of agriculture, extensive sheep farming activities soon began, and the import and export of (Flemish) cloth brought economic prosperity (Van Werveke & Verhulst, 1960; Verhulst, 1964, 1977).

The Saint-Peter and Saint-Bavo abbeys are located about 1.3km from each other. Towards the end of the 9th century, two other 'cores' were established in between and around these abbeys. First, a trade post was created at the foot of the Blandijn hill along the Scheldt river, at the place where the Saint-Bavo cathedral is located today. Second, some 500 meters to the east, Baldwin II, a great-grandson of Charlemagne and count of Flanders from 879-918, established a fortified military camp, today known as the Gravensteen, along the Lys river, to protect Ghent from the raids of the Vikings. During the 10th century, these four cores together became connected and created the medieval city of Ghent (Van Werveke & Verhulst, 1960).

5.1.1 The ever-changing maritime access

From the beginning of the 11th century until mid-16th century, Ghent was the third-largest city in Western Europe, after Paris and London. During the 13th century, 50 to 60,000 people lived in Ghent. Ghent thrived from the trade of cloth and became a rich city. Consequently, during the Hundred Years' War, Ghent, although being occupied by France, choose the side of England instead of France, as England was an important supplier of wool. The wealth of the city of Ghent during these years is illustrated by the continuing discussions and (sometimes) fights between the ‘sovereign’ counts of Flanders and the different guilds trying to decide who can rule and govern the city, and thus where the money flows. Symbols of the wealth of the city are, among others, the ‘three towers of Ghent’ (the Saint Bavo’s Cathedral, the Belfry of Ghent and the Saint-Nicholas’ church), still existing today (Van Werveke & Verhulst, 1960).

While during the first centuries, trade activities concentrated themselves around the river Scheldt, during the next few centuries trade activities increasingly moved to the area around the Lys river (Graslei, Korenlei), closer to the Gravensteen, creating a busy medieval commercial maritime area characterized by large warehouses, markets and wealthy houses. From the 10th until the 12th century, Ghent, in a similar way as Bruges, was still reachable by numerous estuaries. However, similar to the Zwin estuary later on, these estuaries to the north of Ghent silted. Hence, Ghent started to build the Lieve canal towards the port of Damme and the Zwin estuary. As the silting of the Zwin increasingly made the maritime trade activities of Bruges impossible, the Lieve also lost its relevance. Therefore, under the reign of Charles V during the beginning of the 16th century, Ghent was given permission to establish the Sassevaart to the North, connecting Ghent to the Wester Scheldt (Soens, 2009).

Arguably, and although it was part of count of Flanders, Ghent until the 16th century could be labelled as a ‘city state’, even deciding what religion it followed. As such, during the beginning of the 16th century, Ghent played a prominent role in the upcoming of the Calvinism in Western Europe. However, Emperor Charles V, being a devoted Catholic and born in Ghent in 1500, repelled the revolt of Ghent and as a punishment demolished the Saint-Bavo’s Abbey and replaced it in 1545 with a stronghold called the ‘Spaniards’ Castle’ in order to control the city of Ghent, for a large part ending its (semi-)independence.

The son of Charles V, Fillips II, tried to suppress the increasing popularity of the Protestant ideas within the Low Lands. These religious ideas became even more popular after the Spanish Army plundered the city of Antwerp in 1576, inciting a strong anti-Spanish, and thus Catholic, feeling within the Low Lands. William I, a wealthy nobleman who until then represented the Spanish rule within the present Netherlands, started a revolt against the Spanish Habsburgs and signed the Pacification of Ghent, uniting the States of Brabant, Flanders, Artois, Hainaut, Holland and Zeeland. To decrease the power obtained by Willem I, Protestants in Ghent established the Ghent Republic in 1577, controlling large parts of Flanders. Following Ghent, Antwerp also established a Protestant Antwerp Republic. In the next few years, Ghent built a new city wall and the (theological) Ghent University was founded. However, the Spanish Army took over Ghent in 1584 and Antwerp in 1586, forcing thousands of Protestant wealthy (commercial) people to flee to the northern Protestant Dutch Republic. This was one of the reasons the Dutch Golden Age started. Crucial hereby is that, from this moment, the control of the Wester Scheldt was no longer in control of the powerful medieval Flemish cities of Bruges, Ghent and Antwerp.

Indeed, while in the meantime the maritime access to Bruges was already decreased due to the silting of the Zwin, from 1586 maritime trade activities for both Ghent and Antwerp were also almost impossible, as the Wester Scheldt was first controlled by the Sea Beggars (Geuzen) and then became part of the Dutch Republic following the Peace of Munster in 1648 (Gelderblom, 2000; Israel, 1989). The Dutch Republic controlled, and mostly hindered, the maritime access to the two Flemish port cities of Ghent and Antwerp, favouring their own port cities like Amsterdam and Rotterdam. To literally bypass the Wester Scheldt obstruction, Ghent, Bruges and Antwerp managed to find a new way to the sea. The port of Ostend[116], located along the North Sea, and thus not along the Wester Scheldt, was chosen as the new main seaport of Flanders., Canals were constructed first from Ostend to Bruges, and then to Ghent, and following the Scheldt from there to Antwerp, to connect them, rather limited, again to maritime trade (Boelens & Taverne, 2012). The canals were completed in 1623 (Rozek, 2007).

5.1.2 Ghent, 'the Manchester of the mainland'

During the 17th until the mid-18th century, economic activity in Ghent remained rather limited. Around 1750, economic activity increased following the enlargement of the canal Ostend-Bruges-Ghent and the construction of a new and larger canal, the Coupure, improving the connection of Ghent with the canal and thus to the sea. While the Industrial Revolution had been happening in England for some decades, Ghent became the first city outside England to industrialize. In 1798, during 32 trips, entrepreneur Lieven Bauwens managed to smuggle all parts of one of the first key industrial machines of the early Industrial Revolution, a Mule Jenny, to Ghent (Mokyr, 1974). Subsequently, by 1801, the first industrial cotton mill was already operational in Ghent and soon Ghent became 'the Manchester of continental Europe'. Compared to the industrial complex in Wallonia, Ghent differs as the industrial revolution was not built on the mining of coal or the production of steel, but on its centuries-old clothing tradition. The number of factories in which the linen and cotton industry was based on labour intensive machineries increased quickly and, in a few decades, Ghent became the largest city in Belgium once more (De Visser, 1877; Van Werveke & Verhulst, 1960)[117].

The industrialization of Ghent occurred when the French Army defeated the Austrians in Belgium in 1794, and invaded The Netherlands in 1795, forcing Stadtholder Willem V to flee to England, hence ending the era of the Dutch Republic and the relinquishing of almost all its colonial territories to England (except – parts of today known - Curacao, Indonesia, Suriname and Ghana). Following the introduction of a constitution, a civil code, conscription, the cadastre or the usage of standardized measurement, this ended the so-called Ancien Regime in continental Europe. Both present-day Belgium and The Netherlands became part of the French empire. Although the French closed and ravaged Catholic institutions like Saint-Peter's abbey, for example, turning it into a military barracks, Ghent nevertheless thrived following the industrial revolution. After Napoleon was defeated in 1814

116 Note that first Ostend was not chosen as the main seaport of Flanders as Ostend was surrounded by a swamp and difficult to reach. Therefore, the canal Ghent-Bruges was expanded from Bruges to Dunkirk, at that time the best equipped Flemish port along the North Sea. However, in 1658 Dunkirk became part of France and Ostend was definitively chosen as the main seaport of Flanders,

117 The canal Ghent-Terneuzen had to be expanded several times following the increasing size of ships. In 1874-1855, the canal was expanded a first time, a second time in 1902-1910. At that time, the canal was reachable for ships with 10.000 ton cargo.

in Belgian Waterloo, the allies (the UK, the Kingdom of The Netherlands, Austria and Prussia) decided in 1815 Belgium should be united with the Kingdom of The Netherlands. The United Kingdom of the Netherlands existed from 1815-1830 (STAM, 2016).

Partly following the financial deficits due to the continuing war with the French, The Netherlands, in contrast to Belgium, did not industrialize during the 18th and the beginning of the 19th century. In 1815, Willem I, being appointed by the allies to rule The United Kingdom of the Netherlands, decided to upgrade foremost the infrastructure within his kingdom. One of these decisions was the construction of the North Holland Canal (Kahn & van der Plas, 1999). However, in fact, most of Willem I's attention went to the industrialized and economically thriving Southern Netherlands in order to further stimulate the industrial revolution of Belgium, particularly the activities in Ghent and Liege. The industry in Belgium experienced difficulties due to the disappearance of the French market and due to the competition with the more efficient British industry. Therefore, Willem I established an industrial investment bank and launched export subsidies in 1822 to stimulate the industrial activities in Belgium, among others. The Belgian industry could also thrive following the export to Dutch India. Willem I also established or 'relaunched' the University of Leiden, the University of Utrecht, the University of Groningen, the Ghent University, the University of Liege and the (in 1835 changed to Catholic) University of Leuven in 1817. For the industrial city of Ghent, Willem I ordered the construction of the canal Ghent-Terneuzen. On the one hand, in Terneuzen, along the Wester Scheldt, two new sea-locks were built; and on the other hand, the canal from Terneuzen to Ghent, partly due to the older Sassevaart of Empire Charles V from Ghent to Sas Van Ghent, was enlarged and improved. This was finished in 1827. To protect the United Kingdom of the Netherlands against France, the British in Belgium constructed the so-called 'Wellington barrier'. For Ghent in particular, this was a citadel stronghold on the south slope of the Blandijn hill (STAM, 2016).

Following the different interventions of Willem I for Ghent, Ghent became one of the few places in Belgium with a strong preference for the United Kingdom of the Netherlands, arguably even today. During the Belgian Revolution in 1830, and although the industrial and trading elite of Ghent was French-speaking[118], Ghent favoured Willem I and can, in retrospect, be labelled as an 'oranginistic' city within Belgium (STAM, 2016).

5.1.3 The progressive role of Ghent within the new created country Belgium

The Belgian Revolution had strong economic consequences for Ghent. The Wester Scheldt and the sea-locks in Terneuzen were closed once again. In addition, the important export market of Dutch India disappeared. In a short time, the clothing industry of Ghent lost half of its export market. While in 1829 the cotton production of Ghent was 7.5 million kilogram, by 1832 this had decreased to 2 million. For Antwerp, as the main port of the United Kingdom of the Netherlands, the consequences were similarly harsh. In 1829 in Antwerp, 1,028 ships called the

118 Following the mandatory introduction of Dutch within Belgium among others, the revolution started.

port and 129,000 tons were transhipped, which was the double that of the ports of Amsterdam and Rotterdam combined by 1831, the number of ships decreased to 398 (STAM, 2016).

In 1838, and despite the fact that Willem I refused to sign initially, Belgium was recognized as a new neutral independent country within the Treaty of London. Its neutrality would be guaranteed by the major European powers. This 'guarantee' became one of the catalysts of the First World War when Germany invaded Belgium in 1914, forcing the UK and France to fight Germany. Within the Treaty of London, Belgium was allowed to construct the so-called Iron Rhine, a railway connecting Antwerp to the German Ruhr area[119]. The Treaty also decided that The Netherlands should keep the Wester Scheldt open and maintain it for the ports of Antwerp and Ghent[120]. Hence, by 1839 both Antwerp and Ghent were opened again (Van den Berghe, 2016).

While initially it was mostly Belgium that experienced negative consequences of its revolution, on the long term The Netherlands began to experience more negative economic consequences following the Belgian Revolution. Between 1815 and 1830, Willem I conducted relatively large infrastructure works in Belgium. Following the Treaty of London, which allowed Belgium to have maritime access, these investments now resulted in a strong economic resurgence in Belgium, of which the financial benefits were no longer distributed among The Netherlands, but remained in Belgium. Following these investments without return, the lack of domestic industrial production centres 'feeding' their trade economy, and the financial effects of the successive wars, the Dutch finances were in a precarious situation.

Arguably, the rather late arrival of the Industrial Revolution in The Netherlands is a consequence of its traditional focus on trade and a minor focus on technological innovation, going back to the Golden Age. Also, The Netherlands lacked commodities like coal until the beginning of the 20th century (see paragraph 4.3.1), being abundant in Belgium. Hence, the focus on trade and the absence of commodities resulted in The Netherlands not experiencing a thorough Industrial Revolution until the end of the 19th century, 100 years after Belgium. However, arguably this difference between trade and production in The Netherlands and Belgium still exists today.

In new born Belgium, the industrialization continued in the 19th century. In 1860, the Belgian 'octroi'-taxes, a tax collected on various articles that were produced outside city centres, expired. Hence, for the first time, the city of Ghent expanded beyond its large extended medieval walls, and factories were built along canals,

119 The Iron Rhine is still a point of discussion between Belgium and The Netherlands. Although the Iron Rhine railway exist, it is hardly used and needs to be upgraded. However, The Netherlands block this arguing it would threaten the natural park De Meinweg. However, most likely, The Netherlands obstruct the upgrade of the Iron Rhine to prevent increasing competition of the Port of Antwerp for the ports of Rotterdam and Amsterdam: http://www.standaard.be/cnt/dmf20180116_03302100

120 Based on this Treaty, in 2005 The Netherlands were obliged to allow the Wester Scheldt to be deepened further. To compensate the loss of nature, the Dutch Hedwig polder was assigned to be flooded. Following the dissatisfaction of the Dutch public opinion, until today, the polder exists and is subject of many court debates.

waterways and railways (De Visser, 1877). Also, increasingly, factories arose in other nearby places along the canal and along the railway network, for example in Aalst and Ronse, as it expanded (Debo, 2014). Until now, all industrial activities, relying almost exclusively on maritime transport, were scattered in the city centre along the numerous small waterways. However, starting now and as shown on Figure 5.1 (A1), industrial complexes were built at the city edge along the Ghent-Terneuzen Canal (Boussauw, 2014). From the medieval gate Dampoort along the canal, all kinds of industrial activities came up and the first dock, the Houtdok (Wood dock), was constructed in 1890 (Figure 5.1 -B2) (Van den Berghe, 2016).

Ghent was the first industrial city on the European mainland. Due to the extensive uncontrolled growth of the city and the bad conditions the workers and families were living and working in, Ghent was the birthplace of the socialist movement and trade unions in Belgium. The latter implies that, rather than the government, trade or labour unions are responsible for welfare payments. Denmark, Finland, Iceland and Sweden also implemented this so-called ‘Ghent system’ (Böckerman & Uusitalo, 2006). The growth of the social labour unions was one of the other reasons, next to the development of the railways and waterway networks, that factories were increasingly built outside Ghent. This increased competition for the Ghent factories, forcing them in turn to push for further mechanization. One of the improvements was the electrification of entire industrial factories, making it possible to work around the clock. While at first the electricity production was decentralized, soon large electricity plants were built in Ghent to centralize the production (Debo, 2014).

During the first decades following the Industrial Revolution, most factories were family-owned companies. However, for example following the electrification, the needed investments became too big and the first joint-stock companies came up around 1870, making it possible to significantly increase the capital investments. In 1881, the canal Ghent-Terneuzen was deepened and widened. Obstructing corners in Langerbrugge, Rieme, Rodenhuize and Zelzate were removed and the canal was straightened as much as possible. Until then, the canal was 6.5m deep and 68m wide. Ghent thrived and, in 1913, the Belgian textile production counted for 17% of the global textile production. Large 19th century neighbourhoods started to surround the medieval centre of Ghent. To demonstrate its industrial power and wealth, Ghent organized the world expo in 1913. Two of the most prominent exhibitions during the expo were the ‘Palace of Electricity’ and the ‘Palace of Fashion and Industrial Textiles’ (Debo, 2014).

During the First World War, from 1914-1918, the port of Ghent was damaged extensively and, due to the neutrality of The Netherlands, trade and the economic activity in Ghent vanished. Also many electro-machines were confiscated by the German Army (Debo, 2014). However, the ‘advantage’ was that both the port of Ghent and all the factories had to be upgraded after the war. Under the guidance of Emile Braun, the *Société Générale de Belgique*[121] among others, several bankrupt companies[122] were united and the textile industry in Ghent was relaunched; the port infrastructure was upgraded as well, making Ghent one of the most modern ports in

121 Originally the industrial investment bank established by Willem I

122 In 1940, the Société Générale de Belgique owned 40% of all industrial companies in Belgium and Congo.

Western Europe. A new and modern port area with three new large docks, terminals and railway connections was built to the north of the city along the canal (Figure 51 -C3). Consequently, in the 1930s, Ghent became the fourth-biggest port in Europe (De Herdt & De Smet, 1995; Van den Berghe, 2016).

Following the rapid liberation of Belgium in 1944 during the Second World War, neither the port nor the industrial factories experienced major damages, this in contrast to the textile industry in France and Germany. Although the port of Antwerp is known today as the most important port of the allies during the liberation of Europe, the port of Ghent also played an important role, foremost for the import and production of textiles. Hence, by 1946, the textile production equalled the pre-war production and the Belgian textile industry became tenth in the world. Thus, following the competitive advantage of the infrastructure in Ghent, the textile industry flourished. The Korean war in 1950 even extended this economic upturn (Debo, 2014).

However, foreign textile production centres quickly modernized, while investments in Ghent decreased. For example, Turkey, being a major cotton-production country, quickly industrialized following the Marshall plan and became, instead of an important cotton import partner of the Ghent textile industry, an important production competitor. Hence, during the 1950s and even more in the 1960s, the textile industry in Ghent (and Belgium) quickly lost its importance. The textile industry quickly transformed from a labour intensive industry to a capital-intensive industry, focusing on automation and economies of scale. The textile industry in Ghent did not manage to fully make this transformation and largely disappeared. Consequently, the Belgian government decided to launch its ‘textile plan’ to modernize and promote the Belgian textile industry. Therefore, it is important to stress that the Belgian textile industry and fashion did manage to transform, and important global textile machinery producers such as Picanol still exist today (Boelens & Taverne, 2012; Debo, 2014).

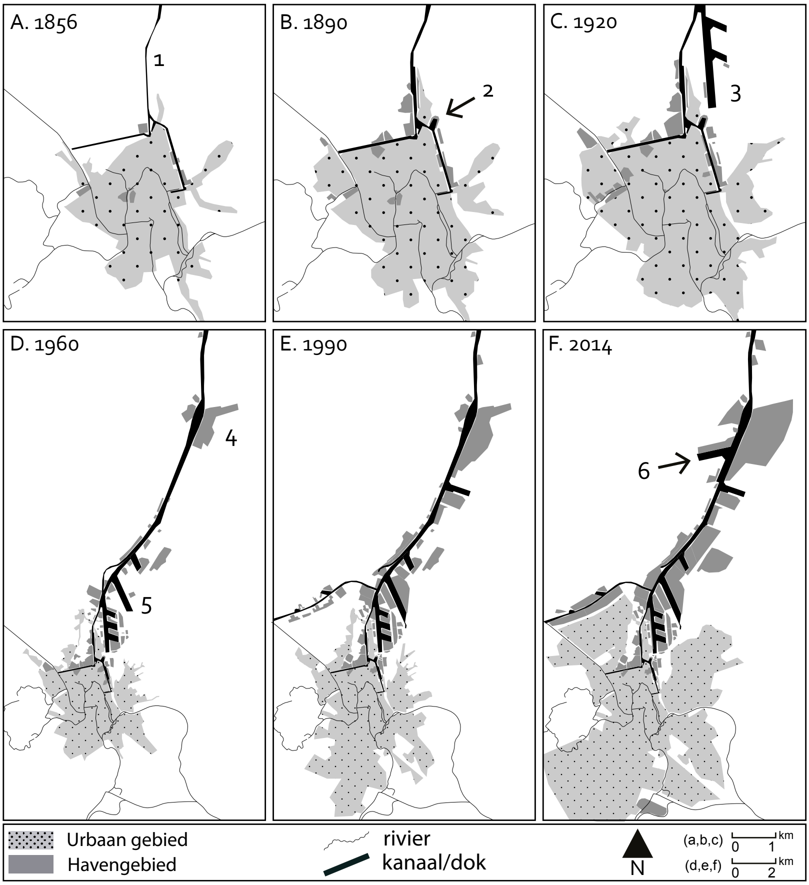


Figure 5.1
The evolution of the port city Ghent during the last 200 years (Van den Berghe, 2016)

5.1.4 The 'new start' of the port of Ghent

Being one of the main industries in Ghent, the decreasing importance of the textile industry pushed Ghent into a relative economic downturn. Different than in large parts of Europe, the 1950s and partly the 1960s did not bring an impressive economic upturn in Belgium (Van Baelen, 2012). Foremost between 1964 and 1967 an economic downturn occurred. The Belgian industry and infrastructure in general were outdated and outcompeted by the increasingly global production markets and the lack of investments during the 1950s. Also, industrial export was increasingly regulated by international trade agreements, for example within the in 1957 established European Economic Community, increasing the competition within Europe (Debo, 2014).

Towards the end of the 1960s and the beginning of the 1970s, the Belgian industry started to come up again. Following new regulations, firms were encouraged to merge and all remaining textile factories in Ghent merged into NV Union Cotonnière (UCO)[123] to improve modernization (Debo, 2014). Following a 'Keynesian' policy, the

123 UCO Ghent closed eventually in 2008

Belgian government increasingly invested in infrastructure. Highways were built, but particularly in Ghent, large infrastructure programs were conducted. First, in 1969, the 'Ringvaart' (a large waterway ring waterway of 21.6 km) around Ghent was completed, connecting all important waterways with each other (Scheldt, Lys, Ghent-Bruges-Ostend, Ghent-Terneuzen). Second, along this Ringvaart, the new ring highway road R4 was built, connecting, among others, the industrial port areas with the major European highways E40, E17 and E19. The Ringvaart and the R4 thus significantly improved the hinterland connection of Ghent. Third, the canal Ghent-Terneuzen and the sea-locks in Terneuzen were expanded, also improving the foreland connections of Ghent. These major infrastructure measurements thus (theoretically) significantly improved the conditions for industrial investments. However, arguably, these infrastructure improvements were successfully attracting investments due to the implementations of the so-called 'expansion laws' (expansiewetten), launched in 1959 by the Belgian Eyskens-administration. These laws aimed at attracting investment of large industrial companies with the potential to create significant employment. If companies were interested, the Belgian government offered a fiscally enticing deal; but mostly, it offered to sell the grounds to the interested companies. The latter is particularly relevant to understanding the current port areas in Belgium, as for new developments in port areas today, leasing is mandatory. The results were arguably very effective. In addition, because large refineries were already present in the port of Antwerp, in 1967 the German chemical giant BASF opened one of its few major production centres in the port of Antwerp[124]. Also, the other German chemical giant, Bayer, opened a plant in Antwerp. In Genk, the American automotive company Ford opened a plant. Major investments occurred in Ghent, as well. First, Sidmar decided to build a new steel mill to the north along the canal (Figure 51 -D4) and Swedish automotive company Volvo decided to build its second major assembling plant in Ghent (Figure 5.1 -D5) (Van Baelen, 2012). Both will be explained in detail in paragraphs 5.4 and 5.3 respectively.

Different from Amsterdam, the numerous municipalities along the canal did not establish their own port authorities, as the municipality boundaries of Ghent were expanded along the canal in 1965 and 1977 (Boussauw, 2014).

5.1.5 Developing the 'left bank'

In comparison with the period prior to the enlargement of the sea-lock in Terneuzen in 1968, in 1985 the throughput of the port of Ghent was eight times bigger, around 27 million tons. The port grew continuously (Figure 5.1 -E). However, from 1986, the port of Ghent experienced a major slowdown. It was clear that Ghent was increasingly lacking water-bound port areas, and that new or existing companies were eager to invest and expand their operations. Indeed, different from Amsterdam, Antwerp or Rotterdam etc., no major new docks or terminals were constructed or expansions conducted since the end of the 1970s (the Rodenhuizedok was the last

124 Arguably, herein lies the origin of the important contemporary difference between the port of Rotterdam and the port of Antwerp. Both host important and large refineries, however, Antwerp host more large chemical plants. As explained in the economic figures of the ARA ports, this explains why Antwerp today has a relatively higher throughput/added value balance then Rotterdam.

one in 1978)[125]. Therefore, in 1989, it was decided to transform the Petroleum-dock to a 'regular' dock. The petroleum dock was constructed in 1968 to host the new oil refinery of Texaco[126]; hence, the quays were constructed with 'telescopic' constructions 'off-quay' to embark oil tankers. The presence of an oil refinery is rather strange as similar to Amsterdam, because large and deep oil tankers cannot not enter the port. Crude oil was therefore imported along the NATO pipelines (known as the Central Europe Pipeline System – CEPS[127]) from the port of Zeebrugge to Ghent and subsequently the refined oil was exported by ship from the Petroleum dock[128]. However, the Texaco refinery Ghent closed in 1982 and in 1989 the Petroleum dock was transformed to the Mercator dock with regular quays (Vandeweghe, 1994) to make it ready for 'regular' use. Today, mostly Volvo and Honda use the Mercator dock to load and unload their cars on and off RoRo-ships.

However, soon the 'right-bank' along the canal was fully developed and new water-bound port areas were needed. Especially Volvo and Honda were asking for extra water-bound areas to expand their activities (N.N., 1988). Hence, the city of Ghent argued for the creation of two brand new docks of 2.5 km on the 'left-bank' of the canal. The decision eventually was to build one, named the 'Kluizendok' (Vandeweghe, 1994) (Figure 5.1 -F6). While planning the dock, two phases were proposed. The first phase would start immediately, and the second phase, to enlarge it further, would be possible in the future. Preparations on the Kluizendok started in 1996, construction in 2001, and the Kluizendok, partly situated on the grounds of the municipality of Evergem[129], was opened in 2004, creating 175.5 ha of extra port area.

5.1.6 Goodbye Port of Ghent, hello North Sea Port

The current mayor of Ghent, Daniel Termont, was just newly appointed as port alderman during the announcement of the construction of the Kluizendok in 1994. In the interview, while announcing the construction of the Kluizendok, Termont explicitly complained of the favoured attention from the Flemish government for the ports of Antwerp and Zeebrugge, stating that 'his port' should receive more attention as it creates the highest relative added value of all ports. Hence, he welcomes the investment of the Kluizendok, but also maintains the idea to further enlarge the port through an increasing collaboration with the bordering Dutch ports of Terneuzen and Vlissingen (Vandeweghe, 1994), both at that moment just recently merged themselves as Zeeland Seaports (Van den Berghe & Willems, 2017). During this time, the idea to collaborate with Zeeland Seaports was labelled as 'Het portaal Vlaanderen' (Flanders portal) (Vandeweghe, 1993).

125 http://www.vlaamsezeehavens.be/4_w2.html
126 http://www.vlaamsezeehavens.be/4_w2.html
127 CEPS exist since 1960. Today CEPS has a total length of 5.300 km and transports 13 million cubic of fuel annually, mostly kerosene, but also diesel, gasoline and naphtha, in The Netherlands, Belgium, Germany, Luxemburg and France. Along the network, 29 military NATO and 6 non-military depots are located. Ghent is one of these nodes. For more info: https://www.nato.int/cps/en/natolive/topics_49151.htm?selectedLocale=en
128 Koen Van Kerckhove, CEO of Oiltanking Ghent explained to us during an interview that the connection of Ghent to this European pipeline network today is one of the main reasons Oiltanking still has a relatively large oil terminal in Ghent.
129 Therefore, Evergem became a shareholder of the Port Authority Ghent

The idea to merge with Zeeland Seaports follows a long line of discussion, strongly interwoven with the (historical) geo-strategic tensions along the Wester Scheldt since the independence of Belgium in 1839. First, the establishment of the port of Bruges (Zeebrugge) is directly linked to the Wester Scheldt. Although the idea originally was mostly welcomed in Bruges in order to be a catalyst for a new economic upturn for the city, King Leopold II, King of Belgium from 1865 till 1909, favoured the idea of a new modern seaport on the Belgian coastline to create easy and quick access for the upcoming new and bigger steam ships to Belgium. Also, as such, Belgium could locate its marine force directly in connection with the North Sea, without having to transfer Dutch territory. The port of Zeebrugge was eventually completed in 1907 and has three parts: an off-shore port area, an on-shore port area behind sea-locks, and a port area closer to the city of Bruges through a canal from Zeebrugge (Marechal & Denduyver, 1964; N.N., 2012; Van Houtte, Devliegher, Vanedewalle, & Van Acker, 1982).

Although the Treaty of London prohibited The Netherlands from blocking the Flemish ports, the fear of closure still existed among (spatial) economics and spatial planners, (especially before the strong interrelatedness within Europe). Hence, in 1970 at the Europe College in Bruges, the director of the planning department of the Ghent University, Professor Anselin, hosted an international conference on ports, inviting, among others, human geographer Brian Hoyle to exchange ideas on port planning in general. One of the chapters within the conference proceedings dealt with the so-called 'Problem of the Belgian Seaports', referring thus (implicitly) to the potential obstruction of the Wester Scheldt by The Netherlands. Hence, in 1970, one of the ideas discussed was creating a new 'super canal' along the border between Belgium and The Netherlands[130], starting from the seaport of Bruges, towards the port of Ghent and eventually to the port of Antwerp, making thus the passage of ships along the Dutch Wester Scheldt no longer necessary. Moreover, along the canal the three port areas (and also the Dutch port of Terneuzen) would eventually merge into each other, enlarging the available port area by 26,600 hectares (Anselin, 1970) (Figure 5.2).

130 At the same time, this canal would also create a 'natural' barrier between Belgium and The Netherlands, an idea going back to the first Belgian King Leopold I, who started the creation of a canal along the Zeeuws-Vlaamse border. However, in 1839 the construction stopped following the Treaty of London. Hence, nowadays the 46km long Leopold-canal starts in Zeebrugge and ends abruptly as a small stream to the northwest of Ghent in Boekhoute.

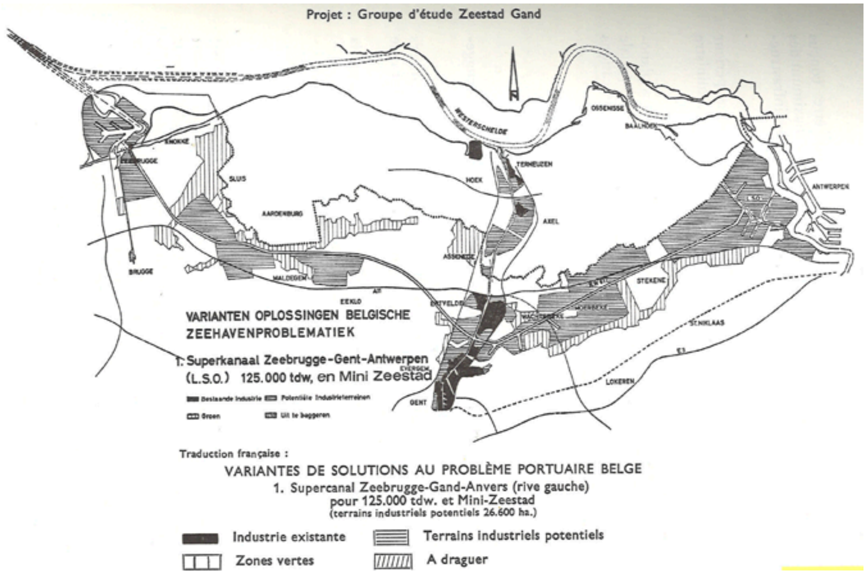


Figure 5.2 The proposal of a 'super canal' along the Dutch border connecting and merging the three Flemish seaports (Anselin, 1970)

However, the idea of the super canal, as such, was never developed; although, in hindsight, several major port-related planning ideas from this plan were developed. First, the seawards extension of the port of Zeebrugge can be noticed. In comparison with today, this proposed extension is around double as large as today. The reason only half of the extension of the port of Zeebrugge was eventually realized follows the Belgian policy of the so-called 'waffle iron policy' for large infrastructure programs. This policy was in force until 1988 and stated that the budget for large infrastructure programs should be divided equally between Flanders and Wallonia. Hence, the port of Zeebrugge could only be extended by half according to the plan, and the other half was spent to expand the 102 m high large boatlift of Strépy-Thieu in the province of Hainaut along the Central Canal[131]. Hence, in 1970, the Belgian government decided to expand the port of Zeebrugge offshore, although work was only finalized in 1985[132]. Second, two 'left-banks' can be seen. The one in Ghent with an early 'version' of the Kluizendok; and, of course, the one in Antwerp, known as the Waasland port today, on which construction started in 1980. Third, although Figure 5.2 calls for an infrastructural connection between the Flemish ports, the plan also incorporates the Dutch port of Terneuzen, and its possible extensions, along the canal Ghent-Terneuzen.

Arguably, one could say that, at least visually, the idea of a continuous port area along the Ghent-Terneuzen canal already exists in this plan (Van den Berghe & Willems, 2017). However, only when European borders began to fade out following the increasing integration and the customs union of first within the Benelux and increasingly directed within the EU, the idea gained popularity. Hence, in the 1990s the Chambers of Commerce of Ghent and Zeeuws-Vlaanderen started to develop the ideas of an increasing collaboration between the port of Ghent and the port of

131 The construction started in 1982 and was only completed in 2002: http://voiesdeau.hainaut.be/Education/Ast/Fr/ascenseurstthieu.html

132 https://inventaris.onroerenderfgoed.be/erfgoedobjecten/122052

Terneuzen. They started to work together, under the guidance of the planning department of the Ghent University of Professor Georges Allaert, and published a shared development vision plan (Figure 5.3).

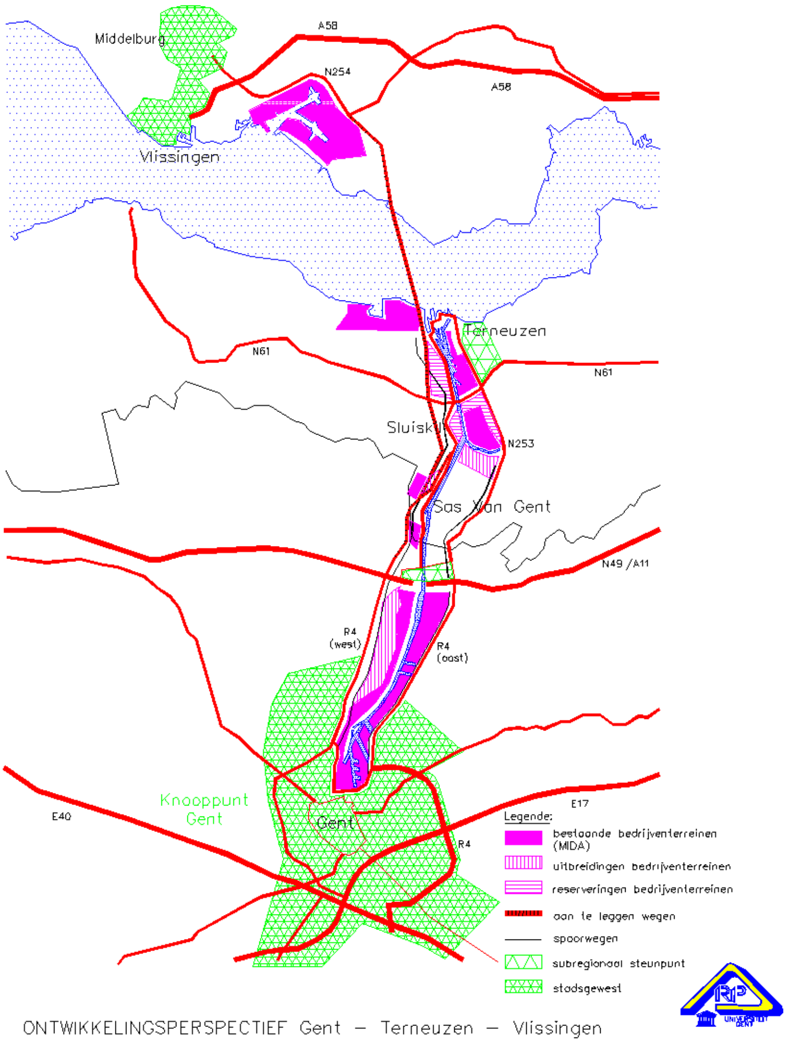


Figure 5.3 Development plan 'VlisTerGent' for the port areas of Ghent – Terneuzen – Vlissingen (Flushing) (Allaert, van den Abbeele, van Lambalgen, de Potter, & Vermeulen, 1991)

Arguably, the 'VlisTerGent'-plan (accompanied with other studies, such as Allaert (1992)) is foremost a plan towards further infrastructural integration within the extended port area. First, one can notice a tunnel road between Terneuzen and Vlissingen, which eventually became the 6.6 km long Wester Scheldt tunnel in 2003 (Meijers, van der Wouw, Louw, & Spaans, 2018). Second, the N61 is proposed to connect the port of Terneuzen to the east with the left bank of the port of Antwerp. Today, however, the N61 only exists between Breskens, to the west of Terneuzen, and Terneuzen. Third, the ring road of Ghent, the R4, is proposed to be extended along the port areas of Ghent and Terneuzen to eventually connect to the proposed tunnel and thus eventually create a continuous road between the ports of Ghent, Terneuzen and Flushing (Vlissingen). Only today, the connection between the R4 and the tunnel, better known as the Tractaat-road, is being upgraded. This will eventually connect the tunnel with the R4, however, from the east side (R4-Oost), crossing to the west and to the tunnel just south of Terneuzen.

The collaboration between the Chambers of Commerce of Zeeuws-Vlaanderen and Ghent should be seen in light of the decision of the Dutch government to phase out its interests in the port area of Vlissingen and of Terneuzen. The public port authorities of Flushing and Terneuzen have existed since 1971. Shareholders were the host municipalities, the province of Zeeland and the Dutch government. Both ports performed well economically. In thirty years, the throughput Terneuzen grew from 3 to 11.5 million tons annually, and Flushing grew from 1 to 13 million tons. However, in 1994, the Dutch government, following a decentralizing policy (cf. saving program), decided that the province of Zeeland should be the 'main commander' of their port areas[133]. Obviously, this comes with a relatively high cost, as seen from the perspective of the province. Therefore, to ease the transition and to lower costs, the Dutch government insisted that the ports of Vlissingen and Terneuzen should merge, forming the port of Zeeland. Eventually, in 1998, the ports of Terneuzen and Vlissingen merged into Zeeland Seaports (Van den Berghe & Willems, 2017).

However, instead of what the plan of 1991 suggested, Zeeland Seaports did not increase its (infrastructural) cooperation with the port of Ghent; quite the contrary (e.g. no improved connection with the R4/Wester Scheldt tunnel, and no connection towards Antwerp). Indeed, next to an increased collaboration within Zeeland Seaports (e.g. the Wester Scheldt tunnel), Zeeland Seaports eventually chose to increase its cooperation with the port of Rotterdam. Arguably, this 'twist' can be seen as a (in)direct consequence of the implementation of the Dutch Mainport-policy. Started in 1988, the Mainport policy favoured public investments for the port of Rotterdam and Schiphol Airport, hence decreasing public investment towards Amsterdam and towards Zeeland Seaports, not being the principle mainports. Therefore, during the 1990s, Rotterdam, increasingly expanding its activities, started to see the port of Flushing as a potential 'satellite port', capable of absorbing maritime activities if congestion in Rotterdam should occur. Indeed, during the beginning of the 1990s, Rotterdam was losing breakbulk throughput to the port of Antwerp; and Flushing, being a deep-sea port and able to easily receive large and deep ships, could help Rotterdam to "take back this throughput from the Belgians" (Horsten, 1995). At the same time, Zeeland Seaports was enthusiastic of a further collaboration with the port of Rotterdam because as such, public investments to Rotterdam could eventually be invested again in Zeeland Seaports. Hence, in 1996, the ports of Rotterdam and Zeeland Seaports, of which Terneuzen and Flushing were not yet officially merged but were already working towards it, established a joint-venture (50/50): the 'Exploitatiemaatschappij Schelde Maas' (ESM). ESM announced it would quickly establish a new container terminal in Flushing. However, significant investments never occurred. Foremost, this was caused by the announcement of the construction of the large port expansion Maasvlakte II in Rotterdam in 1998 (Dutch Government, 1998), reserving the majority of Dutch public port investments towards Rotterdam for several years (Van den Berghe & Willems, 2017).

133 https://www.zeelandseaports.nl/nl/het-havenbedrijf/historie-zeeland-seaports.htm

Increasingly, Zeeland Seaports saw the ESM joint venture as a huge failure. The perception was created that, instead of stimulating cooperation between Rotterdam and Zeeland Seaports, Rotterdam was actively blocking further developments in Flushing mainly to prevent Flushing from increasing its market share[134]. Indeed, within an official letter on the 21st of July, 2009, from the Execution Board of Zeeland Seaports addressed to its main stakeholder, the province of Zeeland, it is stated that ESM is a 'suboptimal' deal with no clear results for Zeeland Seaports within the last 13 years (since 1996). As mentioned in the letter, reasons for the lack of results are the difference in size between the two parties, the difference of strategic focus (economic versus social) and a (alleged) conflict of interest between the two (Zeeland Seaports, 2009).

The year after the ending of the ESM joint venture, on the 2nd of September, 2010, Zeeland Seaports officially became an independent port authority. Within the announcement, the port authority states that, although it will continue to work together with Rotterdam, it changes its (geographical) direction of focus and will increase its collaboration with its neighbouring Flemish ports, Antwerp and mainly Ghent. The announcement to increase its collaboration of Ghent, they argue, follows the infrastructural (historical) dependence between the port of Terneuzen (and to a minor extent Vlissingen following the realisation of the tunnel) and Ghent, but also follows the increasing cooperation within the 'Biobased Valley' Ghent-Terneuzen (Zeeland Seaports, 2010).

Indeed, as we will explain in much more detail in paragraph 5.5, the cross-border success of the biobased valley Ghent-Terneuzen became a catalyst for further collaboration between the port authorities of Ghent and Zeeland Seaports.

In the last 8 years, the port areas of Ghent and Zeeland increasingly worked together. Next to the biobased valley, in 2011 a principal agreement was signed between the Flemish minister-president Kris Peeters and Dutch prime minister Mark Rutte to enlarge the sea-locks in Terneuzen, worked out in detail by the ministers of mobility and infrastructure Hilde Crevits and Melanie Schultz van Haegen in January 2012 (NieuweSluisTerneuzen, 2012). Eventually, the decision was formalized by the Dutch government in 2016 (I&M, 2016) and subsequently, in 2017, the contract was signed by the consortium 'Sassevaart'[135] of Belgian and Dutch construction companies and work started. It is predicted that the new sea-lock will be operational in 2022 (Koenen, 2017).

The Flemish Government paid 80% of the total cost of the new sea-lock in Terneuzen (around 1 billion Euros), while 188 million Euros is paid by the Dutch government. This financial construction illustrates the difference in priority of the sea-lock of Terneuzen between the Dutch government. The Netherlands stated that the lock is only a minor priority for the Dutch economy and should only be enlarged on a long-term base (I&M, 2012). In contrast, the port and city of Ghent and the

134 In this light, in 2004, the mayor of Ghent Daniel Termont announced explicitly in an interview that he wanted the ports of Ghent and Zeeland to work increasingly together: "the future of Ghent lies in Terneuzen" (De Roo, 2004).

135 Note the reference to the historical Sassevaart canal between Ghent and Sas van Gent constructed by Emperor Charles V.

Flemish government stated in 1994 that the enlargement of the sea-lock is of vital importance of the economy of Ghent (Vandeweghe, 1994).

Zeeland Seaports and the port of Ghent officially merged on the 1st of January, 2018, as the European North Sea Port. Officially, North Sea Ports is a 50/50 merge of ‘equals’ with two directors, Daan Schalck, the former director of the port of Ghent until 2008, and the Belgian Jan Lagasse, the former director of Zeeland Seaports until 2014 (Balkenende, 2017; FD hoofdredactie, 2017; Havenbedrijf Gent NV, 2017b). The official headquarters will be located along the border in the Dutch Sas van Gent, while the main international meeting centre will be located in the centre of Ghent within a renovated medieval port warehouse (Havenbedrijf Gent NV, 2017b). Since the sea-lock project started and the merge was announced, another important infrastructure project was announced: the railway Ghent-Terneuzen. This railway would be a ‘restart’ of the railway ‘55’ that was already crossing the border since 1922. Railway 55 was a mixed railway, transporting cargo and passengers. Since 1961, only cargo has been transported. In 2017, in light of the North Sea Port merger and in light of the increasingly saturated R4 ring road, it was announced that studies would be conducted and budget would be reserved to upgrade railway 55 to passenger transport once again (Weedy, 2017).

During the writing of this dissertation several politicians in Antwerp, Bruges and the Flemish Government, on a short notice, launched the idea to merge the ports of Zeebrugge and Antwerp (Sertyn, 2018). The mayor of Bruges even argued that Antwerp and Bruges were ‘inspired’ to work together following the merge of the North Sea Port (N.N., 2018c). Although the idea to merge Bruges and Antwerp, similar to the North Sea Port idea, is a long-term idea, collaboration between Zeebrugge and Antwerp had been rather difficult until now. Indeed, as already explained before, Zeebrugge is a throughput port, specialized in handling large ships and cargo. Next to being an important liquid gas port, both military and civil (Fluxys Belgium, 2016), it is the main European port handling RoRo cargo and as such the most important import and export port in Europe for cars[136], for example. The latter activities are located behind the sea-lock. As Zeebrugge has a seaport off shore, it is well-suited for large container ships. In 2016, the port of Zeebrugge’s entrance was deepened to 17m, enough for the latest generation of container ships of 20,000 TEU[137] and more (at the moment, the Madrid Maersk is one of the biggest and has a maximum operating depth of 16.02 meters). This is almost exactly the operational depth of the port of Antwerp. With a maximum depth of 16.0 meters during high tide (Port of Antwerp, 2018), just enough to welcome the Madrid Maersk, which happened on the 9th of June, 2017 (Port of Antwerp, 2017). Hence, if container ships keep growing on the short term, which is likely, the port of Antwerp needs to expand its container terminals – for which, according to the PA Antwerp, the Saeftinghe dock on the left bank would be ideal (N.N., 2018a),– as well, as deepen the Wester Scheldt. While the latter can only happen if the Dutch allow it, most likely, it will not happen in the short term in order to favour the port of Rotterdam. Hence, a possible scenario is the port of Antwerp working together with the port of Zeebrugge to use the port of Zeebrugge as an Antwerp satellite port, together capable of welcoming all kinds of ships and operators. The big problem of the port of

136 https://www.portofzeebrugge.be/nl/de-haven/cijfers

137 Twenty Foot Equivalent Unit (6.10 meter long, 2.44 meter wide and 2.59m high)

Zeebrugge is, however, its hinterland connections. The existing canal between the port towards Bruges and Ghent is too small and has many bottlenecks; especially the ring waterway of Bruges is too small. On the short term, this bottleneck will also become a problem in connecting the port of Zeebrugge to the new corridor Paris-Rotterdam following the Seine-Scheldt connection (see next paragraph). Hence, the idea to expand the Schipdonk canal.

The Schipdonk canal was constructed in 1860 with two goals. First, it would help prevent Ghent from flooding as the Lys river's outflow can increase significantly during showers (Van den Berghe & De Sutter, 2014a). Second, it would divert the polluted water of the Lys away from Ghent. The Lys was strongly polluted during the 19th century following the flax industry in Kortrijk, where the flax was prepared by rotting the plant in water. Therefore, the Schipdonk canal runs south of Ghent from the Lys towards the northwest. It crosses the older canal of Bruges-Ghent and then heads up north towards the border with The Netherlands, then parallel to this border to the Leopold canal, discharging eventually at the port of Bruges in the North Sea. The parallel canals along the border are better known as the 'Stinker' (smelly) and 'Blinker' (shiny) canals, referring back to their historical water quality. The Schipdonk canal, bypassing Bruges, connects the port of Zeebrugge to the Bruges-Ghent canal, the water ring road of Ghent and connects to the upcoming Seine-Scheldt corridor. However, the expansion of the Schipdonk canal is met by fierce protest from nature groups, but also from a technical aspect, as there is a chance there is not enough fresh water to maintain a sufficient level at all times (Van den Berghe & De Sutter, 2014b). Moreover, such expansion would be expensive and take a long time to finish. Hence, on the short term, the Flemish Government decided to expand the railroads between Bruges and Ghent from two to four tracks (km, 2017)[138]. Note that this expansion of the rail network between the Flemish ports along the Dutch boarder is in fact a 'newer' version of the 'super canal' to bypass the 'Wester Scheldt problem' proposed half a century ago by Anselin (1970).

Hence, if the collaboration or even merge between Zeebrugge and Antwerp is signed, in 20 years, the five long-existing ports around the Wester Scheldt (Bruges, Ghent, Antwerp, Terneuzen, Flushing), would have evolved to only two ports: the new North Sea Port and the Ant-Bruges Port (Table 5.1). In this case, and based on the figures of 2015, the Ant-Bruges Port would still not be as big as the port of Rotterdam, although it would come close. Thinking this through, if all these ports along the Wester Scheldt eventually worked together (let say we term this the World Port), this port area would become the largest port in Europe (Table 5.1). Although such collaboration along the Wester Scheldt seems odd at first, it would, however, be similar to the port area of Rotterdam, which is also a merge of several different port areas along the New Meuse. If the World Port would be founded, Rotterdam would remain bigger in terms of throughput; however, if we experience an increasing concentration of throughput within a few nodes, termed recently as the 'Rotterdam-ization' of ports (Notteboom, 2018), arguably, the World Port would quickly increase its throughput figures, a 'Wester Scheldt-ization' thus. Such scenario thinking

138 This is rather exceptional as the train and rail network is a federal authority. However, at the moment, the political party N-VA is part of both the federal and Flemish governments. Hence, it was possible to create a 'Flemish priority list', bypassing investment in the rail network of Wallonia, as the rule is a 60/40 investment rate between the two regions.

based on rankings illustrates how important rankings are in terms of promotion and marketing these days.

	Throughput (million tonnes)	Direct Value Added (million Euros)	Direct employment (FTE)	Port area (hectare)
Port of Zeebrugge	37,81	966,00	9 332,00	2 857,00
Port of Ghent	29,09	3 838,00	28 072,00	4 648,00
Port of Antwerp	214,17	10 785,00	60 837,00	13 057,00
Zeeland Seaports	33,00	3 477,00	15 959,00	4 400,00
Port of Rotterdam	466,00	12 566,00	92 367,00	12 603,00
Port of Amsterdam	79,20	2 125,00	17 596,00	1 900,00
North Sea Port	62,09	7 315,00	44 031,00	9 048,00
The Ant-Bruges Port (non-existing)	*251,98*	*11 751,00*	*70 169,00*	*15 914,00*
World Port (non-existing)	*314,07*	*19 066,00*	*114 200,00*	*24 962,00*

Table 5.1 Redefining rankings in light of potential further port merges along the Wester Scheldt port, based on figures 2015

5.1.7 Towards a corridor Rotterdam-North Sea Port-Paris

Although traces of the new sea-lock and the improvement of the road infrastructure between Ghent and Flushing (R4, Tractaatweg, Wester Scheldt tunnel) go back to the beginning of the 1990s they arguably would not be possible without the European Union and its Trans-European Transport Networks (TEN-T) program to stimulate cross-border infrastructure. The first action plans promoting trans-European road, rail, air and water transport networks date back to 1990 and were adopted by the European Parliament and Council in July 1996 (European Commission, 1996). In 2001, the European Parliament and Council worked out a more detailed infrastructure program for seaports, inland ports and intermodal terminals (European Commission, 2001b). The program aims at financially stimulating large transport networks across borders, through subsidies as well as guidelines and coordination. TEN-T foresees up to 50% co-financing for studies and up to 20% for work. The TEN-T program has nine projects. The North-Sea-Mediterranean Corridor is one of these, stretching from Ireland and the north of the UK through The Netherlands, Belgium and Luxembourg to the Mediterranean Sea in the South of France. Within this corridor, the connection between the Seine river basin (cf. the economic area of Paris – Le Havre) and the Scheldt river basin (cf. Lille-Flanders) is one of the most important projects (Figure 5.4).

Figure 5.4 Seine-Scheldt canal

The Seine-Scheldt route connects, on one hand, two of the most important economic and industrialized regions in Europe – Belgium-Germany and Le Havre-Paris-northern France; and, on the other hand, the North French agricultural regions with the agricultural industrial sectors of Flanders. The Seine-Scheldt project consists of several different parts. First, it will expand the existing historical canals. Indeed, during the Industrial Revolution, numerous canals, locks and lifts were constructed between Cambrai-Dunkirk (cf. the existing canal Dunkirk-Scheldt) and Flanders, all relying on and densifying waterways along the rivers Lys (Ghent-Lille) and Scheldt (Ghent-Wallonia). Similar, Paris is connected with Compiegne. The main bottleneck is the Canal du Midi, a small canal between Compiegne and Cambrai[139]. Now, between Ghent and Cambrai, ships up to 1,000 to 1,300 tons can navigate. Beyond Cambrai on the Canal du Midi, only ships of 500-700 tons can pass. If the axe Ghent-Paris is expanded, ships up to 3,000 tons will be able to pass, enabling a large expansion as one ship can go all the way with more cargo and improved efficiency, as ships would no longer have to be loaded and unloaded, nor cleaned after cargo is shipped[140].

139 Until now, inland waterway transport was possible, however only for a maximum of 600 tons. The new canal aims at 4,000 tons.

140 Explained by Luc Malysse (Cargill). Especially for Cargill Sas van Gent the Seine-Scheldt canal will be important as Cargill Sas van Gent today mostly processes grains from northern France.

Other bottlenecks are the sea-lock in Terneuzen. All together, the inland waterway axis Paris-Rotterdam (from Terneuzen inland ships go along the Wester Scheldt to the east and subsequently to Rotterdam along the Rhine-Scheldt canal[141]) was assigned as a strategic TEN-T project and eventually, in 2009, an agreement was signed between France, Belgium and The Netherlands, under guidance of the EU, to improve this axe. Each country was appointed to improve the needed infrastructure. For France, this implied it has to construct a new canal Compiegne-Cambrai, or Oise to Canal Dunkirk-Scheldt. The project is aimed at 4.7 billion Euros. France signed the deal under the governance of President Sarkozy. For the construction of the canal, a public-private partnership contract was developed. However, following the crisis in 2012, during the governance of the socialist President Hollande, the contract was questioned and halted, as it was argued that the deal was too expensive for the French state. Hence, Hollande ordered the project reconsidered and eventually, in 2016, his administration relaunched the project with significant budget cuts. In May 2017, the Macron government replaced the Hollande government. President Macron appointed Édouard Philippe as his prime minister. Being the former mayor of Le Havre, he convinced the new French government to cancel the Seine-Scheldt canal (Schils, 2017) as once completed, the ports of Ghent, Antwerp and Rotterdam would become major competitors for 'his' port, Le Havre. Indeed, cargo flows to and from Europe are increasingly concentrated within the port regions of Rotterdam/Antwerp (and thus also North Sea Port). Hence, while the Le-Havre-Hamburg ports used to welcome the majority of European maritime flows, increasingly the flows are herein concentrated within Rotterdam/Antwerp. (cf. 'Rotterdamization' (Notteboom, 2018)). In this light, once the canal is completed, significant cargo flows will no longer have to be called upon by sea ships in the port of Le Havre after calling the ports of Rotterdam or Antwerp. Instead, they could be directly unloaded onto inland ships and transhipped to Paris, or be brought from Paris or Northern France to the North Sea Port-Antwerp-Rotterdam.

Hence, on the 5th of September, 2017, the Seine-Scheldt project (cf. the canal Seine-Nord in France) was cancelled once more; however, this time it was received 'furiously' by the French Region Hauts-de-France. Within France, the latter region has one of the highest unemployment figures following major industrial closures during last century (cf. Dunkirk). Hence, the canal is perceived within the region as an essential tool to stimulate its economy. Therefore, the cancellation of the program by the Macron administration was perceived as another 'favouritism' from the French national government for its most wealthy part, the region of Paris, leaving other regions behind (Schils, 2017). Therefore, the region Hauts-de-France proposed that in order to prevent any further delay (the project is now almost 10 years in delay), the region financially guarantees the project instead of the state of France. This obviously implies a financial risk for the region as such. This solution was accepted, hence since September 2017, the canal is no longer managed by the state of France, but by the region Hauts- de-France (N.N., 2017e).

141 Remarkably, The Netherlands forbid inland ships from using the Wester Scheldt. The Netherlands argue that The Wester Scheldt is similar to a sea, and thus ships have to be sea ships. The Flemish government, aiming to stimulate inland waterway transport between its ports Zeebrugge, Ghent and Antwerp – there is no 'super canal' between the three as explained before – actively tries to convince The Netherlands to change their restrictive policy, however, so far without success. Information retrieved from a parliamentary question to the Flemish minister Ben Weyts (03/03/2018): https://www.kustnieuws.com/wonen-en-welzijn/vlaanderen-blijft-inspanningen-leveren-estuaire-vaart/

While the Seine-Scheldt will most likely eventually be a reality, at this moment, the North Sea Port and the port of Rotterdam are already preparing themselves. A likely scenario is the increasing throughput to and from Paris and Northern France will eventually be centralized in the port of Rotterdam, hence the corridor Rotterdam-North Sea Port-Paris. To prove to commercial companies that the connection Rotterdam-Ghent is viable and possible, the port authorities of Ghent and Rotterdam launched in 2016 a subsidy to stimulate container barge inland ships between the two ports and several private companies have at the moment daily container routes between the two[142].

5.1.8 'County of Flanders'?

The former paragraphs briefly explained the history of the port city of Ghent. During the last millennium, Ghent almost never 'diminished' for a long time compared to its 'rivals' Bruges, Antwerp, Amsterdam or Rotterdam within the different subsequent time periods. Ghent was always there, despite its geomorphological problems connecting to the sea. It overcame these problems by finding its political, economic and social niche within the busy and ever-changing setting of the low lands. Being a small port, at least in terms of the overrated port rankings, it always had to find coalition or be creative. During its long history, it was always able to be both a production and trading city, and to make this possible, it had to reinvent itself economically (from artisanal clothing to grain trade to industrial clothing to cars, steel and biobased among others), plus it had to find new ways to the North Sea (Scheldt, Lieve, Sassevaart, canal Ostend-Bruges-Ghent, Coupure, canal Ghent-Terneuzen). The latter changes followed the continuously changing borders around Ghent, which, like Belgium, were at the mercy of the 'great superpowers' during last centuries. For Ghent, this decided thus if trade should go to the west towards the North Sea or to the north to the Wester Scheldt.

However, the seemingly negative consequences of the borders increasingly bring new opportunities for Ghent. Arguably, during the last decade(s), both in The Netherlands and in France, an increasingly centralizing policy is in force, favouring mostly the Randstad and the region of Paris, respectively (van Meeteren, 2011). Indeed, the ESM failure between Rotterdam and Zeeland Seaports, as well as the increasing frustration over the toll on the Wester Scheldt tunnel (Meijers, 2018; Meijers et al., 2018), plus the frustration of Hauts-de-France, means that these 'peripheral' regions are now increasingly looking across the border to Flanders. Within the context of an integrating Europe Union (but arguably, at the same time, navel-gazing member states), an interesting playing field formed in which three bordering international regions (Zeeland, Flanders, Hauts-de-France) are increasingly working together. Some daydreaming historians could argue that this is no more than logical, as it resembles the 14th century historical 'County of Flanders'[143] and only wars since then have prevented this historical socio-

142 https://www.rijnmond.nl/nieuws/149235/Nieuwe-binnenvaartdienst-containers-Rotterdam-Gent

143 The County of Flanders was a historic territory governed by the Counts of Flanders. Its main cities were Ypres, Bruges and Ghent. For centuries, the region was one of the most affluent regions in Europe. The area consisted of present northern France (Dunkirk/Duinkerke, Bergues/Sint-Winoksbergen, and Lille/Rijsel), West- and East-Flanders, and Dutch Zeeuws-Vlaanderen (Sluis).

economic region to be institutionally symbolised into one region. Regardless, during its history, Ghent, and Antwerp of course, has shown that it is able to react quickly if borders are non-existant or open; and at the same time, it is able to change its role if circumstances change. What arguably stands central within its history is that Ghent was always, to some level, able to maintain a balance between trade and production, making its economy less vulnerable to the ever-changing political setting. Today, within an increasing open-border context, Ghent once more lies central on several (European) lines, from an infrastructural point of view to an economic and social point of view. Considering all this, Ghent, as the recent turn of events (cf. North Sea Port, Seine-Scheldt) illustrate, is increasingly playing a (potentially) vital role.

5.2

The Port-City Interface

5.2.1 The institutional structure

Between the 16th and the 19th centuries, the municipality boarders of Ghent remained unchanged. Even the first Handelsdok could be built within the boundaries of the 'medieval city walls'. However, following the first decades of industrialization, eventually the municipality of Ghent expanded along the canal Ghent-Terneuzen. In 1900, Ghent bought an extensive area along the canal to construct the Groot Dok (Figure 5.1 -3). Soon, along the canal and further away from the city centre, several factories were constructed; and it was decided in 1927 that Ghent would become the owner of the canal and the bordering grounds up to the municipality of Zelzate along the border with The Netherlands (Agentschap Onroerend Erfgoed, 2017).

Two important municipality merger programs were introduced by the Belgian government. During the first one in 1965, Ghent merged with (parts of) municipalities along the canal. During the second one in 1977[144], Ghent merged with municipalities around its city centre to the east, south and west, becoming a long, stretched municipality towards the north (Figure 55).

For the port in particular, one could say that the municipality border of Ghent expanded following the industrialization of the port of Ghent. For the Belgium 'part' of the canal Ghent-Terneuzen, this differs from Amsterdam, having four different municipalities and port authorities along the canal. Indeed, today almost the entire port area of Ghent is located within the municipality of Ghent, except for small parts located in Evergem (Rieme-Noord and parts of the Kluizendok) and Zelzate (parts of ArcelorMittal and the canal). This explains why the municipalities of Evergem and Zelzate are (small) shareholders of the North Sea Port today (see next paragraph).

144 On January 1, 1977, 2,359 municipalities were merged to 596 municipalities. Only Antwerp and Brussels are exceptions. For example, the current municipality of Antwerp has only existed since 1983 and the former independent municipalities are still represented by semi-independent districts, similar to the institutional structure of Amsterdam, as explained before.

Figure 5.5 The municipality of Ghent within the province of East-Flanders (Provincie Oost-Vlaanderen, 2010)

Also different from the Netherlands, the port areas in Belgium are officially defined within national laws according to land-use terms. In this sense, a port area is not the same as a regular industrial area. The reason port areas in Belgium are defined in this particular way goes back a relatively long time. Its origins trace back to the 12th of January, 1973. On that day, the Royal Order[145] KB12/01/1973 was published, defining, on one hand, the port areas in Belgium and, on the other hand, the labour specifications for these areas (Federale Overheid België, 1973). Latter is better known as the Law Major, named after minster Louis Major during the Gaston Eyskens-Andre Cools government. The Law Major ensures that all ships in Belgian ports be unloaded and loaded by authorised dockworkers. Hence,

145 In Belgium, different institutional levels can publish decree and laws. To differentiate these, the laws from the Belgian Federal Government, applying to the whole of Belgium, called Royal Order, are signed by the King of Belgium (Koninklijk Besluit: KB) and are published within the Belgian Official Journal. Laws from the Flemish Government, applying to Flanders, are called Flemish decree instead of Flemish law, although they do the same thing.

the legal definition of port areas in Belgium is of ‘social’ origin. The work of the port workers is regulated by a labour union per port area, called ‘Paritair Comite’, which dictates who does what type of work and where. Companies working in ports indicate how many workers they need for certain tasks and then the labour unions assign workers to these tasks. This implies that a port worker can be assigned every day to a different company, as long as the task is the same. The Law defines six types of workers: (i) port worker for ‘general tasks’, (ii) crane operator, (iii) cooper[146], (iv) ‘coverman’, (v) marker, and (vi) container operator (Van Hooydonk, de Wit, Maritime, & Law, 2003, p. 25). According to the Law Major, port workers have to have a certificate of good conduct, be medically checked by a doctor, pass psychological tests and be aware of the dangerous working conditions within port areas[147]. Following these definitions, port labour forces in Belgium are rather expensive and the law has led to difficult discussions between companies, labour unions, the Flemish government and the European Union (Michielsen, 2015). Hence, since 1973, the Law Mayor has been modified several times. Mostly for logistical activities, companies complained that hiring port labour forces was too expensive. Therefore, in 2000, port work was split into a ‘general’ and ‘logistical’ contingent (Van Hooydonk et al., 2003).

If port labour work is defined, then obviously the law must also define the port areas. Indeed, within the KB12/01/1973, for the port areas of Antwerp, Ghent, Brussels/Vilvoorde, Bruges, Ostend and Nieuwpoort, these areas are geographically

146 Someone making barrels

147 http://www.aclvb.be/nl/pc-301-loon-en-arbeidsvoorwaarden

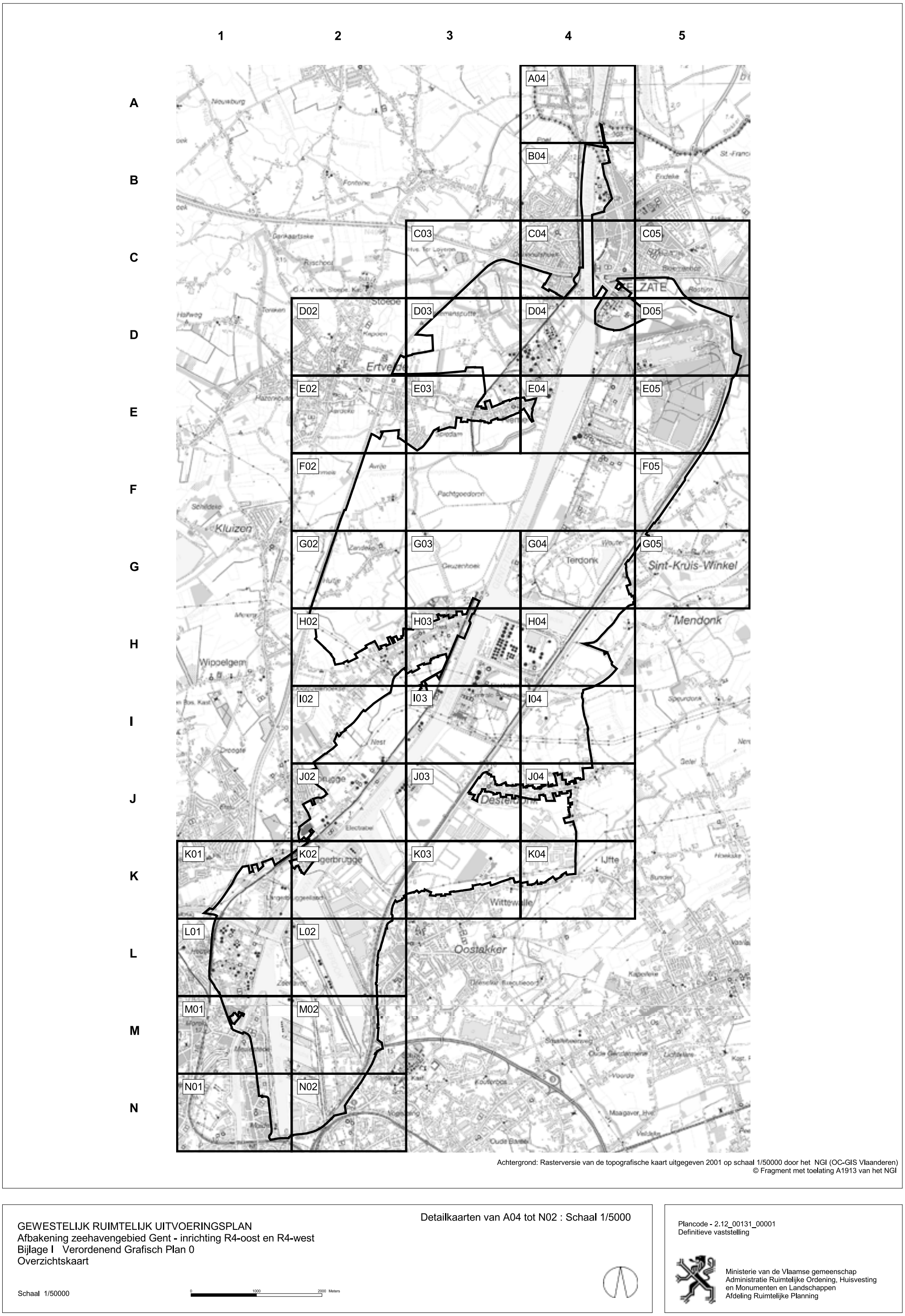


Figure 5.6 Official boundary of the port area of Ghent (Vlaamse Overheid, 2005)

defined in detail[148] and changed several times by Royal Order since then. The port areas are defined within jurisdictional Flemish spatial plans like, for example, the port of Ghent (Figure 5.6).

Following the regionalisation within Belgium distributing increasingly federal tasks to the Belgian regions, on the 1st of January, 1989, the port policy came under Flemish authority. This means that Flanders had the right to change the different Federal Royal Orders regarding port-related issues. One of the first decrees the Flemish Government, launched in 1989, was the establishment of the Flemish Port Commission (Vlaamse Havencommissie – VHC). The VHC was established to create an overarching organization that could help prepare and set out the strategic goals for the policy of the Flemish ports. Its goals are to be a meeting platform between the different ports and meant to streamline the public investments needed between the different ports. It also aims to ensure the Flemish port remain internationally competitive and act as an advising commission towards the Flemish Government. In 1989, the Flemish Government also wanted to renew the KB regarding the port areas and how they should be governed; however, it took 10 years to eventually publish this decree[149]. On March 2, 1999, the Flemish Port Decree (Havendecreet) was published (Vlaamse Overheid, 1999). In this Port Decree, the governance of

148 For example for the port of Ghent: *"Voor Gent. Het gebied begrensd door twee rode lijnen op een plan gevoegd bij het besluit genomen op 19 december 1966 door de gemeenteraad van de stad Gent. De eerste dezer grenslijnen begint aan het linkerhoekhuis van de Dampoortstraat en het Dok, doorsnijdt het Handelsdok langs een lijn lopende over de Dampoortbrug naar het rechterhoekhuis van het Octrooiplein en de Koopvaardijlaan, de oostelijke aflijning van de Koopvaardijlaan tot aan de Afrikalaan; de oostelijke aflijning van de Afrikalaan, doorkruist de ringspoorweg tot aan het kruispunt van de Vliegtuiglaan en de Hoge Weg, de oostelijke aflijning van de President J.F. Kennedylaan tot aan de noordelijke stadsgrens, de grens van het grondgebied tot aan de westelijke trekweg van het Zeekanaal naar Gent, de westelijke trekweg in zuidelijke richting tot juist voor de Ringvaart waar de westelijke aflijning wordt gevolgd van de Rijksweg tot over de wegbrug (W 18), gaat langs de Pantserschipstraat, de Zeestraat, de Wondelgem- en Wiedauwkaai, waarvan zij de aflijning volgt tot aan de stuw van het Tolhuis, doorsnijdt het eilandje van de Tolhuissluis en de stroomopwaartse sluisdeur van het Tolhuissas, loopt langs de huizen der Sassekaai, tot aan de Muidebrug, doorkruist de Voormuide; bezoomt de huizen van het Dok (pare huisnummers), van het Stapelplein en het Dok (onpare huisnummers) tot aan de hoek van de Dampoortstraat, waar zij haar uitgangspunt weer bereikt. De tweede grenslijn bepaalt de binnenomtrek der haven af volgens een kringloop, die begint aan het gebouw gelegen hoek Muidepoort en Houtdoklaan, doorsnijdt de Muidepoort en bezoomt de huizen van de Terneuzenlaan. Zij doorsnijdt verder de ringspoorweg, loopt langs de afsluiting van die spoorweg tot aan de Meulestedesteenweg, doorsnijdt de Voorhavenlaan, loopt langs de oostelijke aflijning van de Londenstraat, doorsnijdt het Voorhavenplein, loopt langs de oostelijke aflijning van de Voorhavenlaan, volgt de oostelijke aflijning van de Meulestedekaai tot aan de noordzijde van het Redersplein, de noorderaflijning van de Meeuwstraat om zo de Port Arthurlaan te bereiken, waarvan zij de westeraflijning volgt tot aan de Pauwstraat, die zij doorsnijdt, evenals de ringspoorweg om de gronden te bezomen ten westen van het Houtdok tot aan de Muidepoort, volgt dan de westelijke aflijning van de Houtdoklaan, waar zij haar uitgangspunt vervoegt. Ten slotte een strook van 50 meter breed langs beide oevers van het gedeelte van de Ringvaart gelegen tussen het Kanaal van Terneuzen en de sluis te Evergem (en tevens een strook van 50 meter breed langs beide oevers van het gedeelte v.an de Moervaart gelegen tussen het Kanaal van Terneuzen en de Baileybrug te Mendonk welke de verbinding maakt over de Moervaart tussen de Spanjeveerstraat en de Mendonckstraat. Aan het Kluizendok behoort tot het havengebied de zone begrensd door enerzijds het kanaal Gent-Terneuzen, en anderzijds een lijn die vertrekt aan het kanaal ter hoogte van de Averijevaart, de stadsgrens volgt tot aan de kruising ervan met Doornzele Dries en vervolgens deze weg volgt tot aan het kanaal.) <KB 2006-09-24/44, art. 1, 011; Inwerkingtreding: 20-10-2006>"*

149 http://www.vlaamsehavencommissie.be/vhc/thema/vlaanderen/vlaams-havenbeleid

port areas was jurisdictionally defined, with the aim to overcome the historical discussions and blockings between the several port areas and their (urban) administrations. Indeed, the Port Decree defined that, for the four Flemish seaports (Antwerp, Ghent, Zeebrugge, Ostend), the governance should be partly independent of its local (urban) government, although the Decree explicitly avoids cutting the ties between the port and its host city (Van Hooydonk et al., 2003, p. 14). According to the governance of ports, the Port Decree regulates (Van Hooydonk et al., 2003, p. 15; Vlaamse Overheid, 1999):

1. The management and operation of the public and private port areas
2. The setting and collection of port fees
3. The provision of port-related services to port users as well as the conditions of their use
4. The establishment and tasks for the port policy forces

Consequently, from March 2, 1999, four port authorities were established with an independent board of members150 and a director and administration:

1. Het Gemeentelijk Havenbedrijf Antwerpen (GHA)151
2. Het AG Haven Oostende
3. Het Havenbedrijf Gent GAB152
4. De NV Maatschappij van de Brugse Zeevaartinrichtingen (MBZ)

In 1999, the first three port authorities became independent municipal companies with legal responsibility, while the MBZ was and independent company from the beginning. On February 1, 2008, all port authorities could become independent companies by decree, following an update of the Flemish Port Decree (Vlaamse Overheid, 2008). From this moment, institutions other than their host city could become shareholders[153]; however, the Port Decree states that only public entities ('publiekrechtelijke rechtspersonen') may participate in port authorities. Only Flanders is forbidden to participate directly within the Flemish port authorities because Flanders is appointed by the Port Decree to be the main supervisor of the port authorities (this differs from the port of Rotterdam, of which the Dutch national government is a direct shareholder[154]). The reason all port authorities eventually chose to become public limited companies (with the restriction that only public and no private entities could participate) is that it is the only way for port authorities to work together with public entities besides their host entity (the cities of Antwerp, Ghent, Bruges, Ostend) (Van Hooydonk et al., 2003, p. 14). The Port Decree of 1999 has been modified several times[155].

Hence, the institutional structure of the port-city interface differs relatively strongly from the institutional structure in The Netherlands. Following first the Royal Orders and now the Flemish Decrees, port areas are defined by law geographically, but also according to labour activities, labour settings and the institutional governance models of these port areas. In this sense, port areas cannot be seen as 'industrial

150 The board of members is chaired by the Flemish Port Commission chair and consist of the director of the port authority, the city alderman of the port, several municipal councillors and several independent experts.

151 The GHA was established prior to the Port Decree in 1997.

152 From 2000

153 In 2013, GAB transformed into an NV and next to the city of Ghent, the municipalities of Zelzate, Evergem and the province of East-Flanders became shareholders.

154 https://www.portofrotterdam.com/nl/havenbedrijf/over-het-havenbedrijf

155 For a timeline: http://www.vlaamsehavencommissie.be/vhc/thema/vlaanderen/havendecreet

areas along water', as one could argue in The Netherlands. Although host cities like Antwerp, Ghent, Bruges and Ostend are the main shareholders and thus can define the financial and economic goals, the geographical port area and institutional structure are controlled by the Flemish government and cannot be changed easily. Hence, land-use conflicts between urban and port use are not likely to happen. As described in a previous chapter, in Amsterdam there is a strong debate between the port and the city over transferring port area into residential area (Haven-Stad) leading to a spatial conflict (Wiegmans & Louw, 2011) (Figure 4.2). Similarly, within Rotterdam, geographic tensions exist between urban and port land use. The M4H port area is being increasingly transformed into urban area, leading to conflicts with the port authority of Rotterdam. As such, one can understand better why the Port Authority of Rotterdam puts a lot of (marketing) effort toward 'praising' the RDM campus, a former shipping construction area that is leased for free to start-up companies and technical colleges, because as long as there is economic activity at the RDM campus, there is a slight chance the city of Rotterdam could decide to transform it into residential area.

Of course, in Flanders as well, former port areas have been changed into residential land-use areas; however, such changes can only occur if all the involved institutions agree and if Flemish decrees change, which takes a lot of effort on a long-term basis. In this sense, one can argue that, within Flanders, port areas are institutionally part of 'everyone'[156]. They are still the port of their host city, following the shareholder structure and the financial structure; but they are also part of Flanders, due to their supervising role, and are as such important assets for both city and region. Also historically, the institutional boundaries were adapted to the expanding industrial port areas, meaning that there is almost an exact match between the port areas and their port authorities, in contrast to Amsterdam, for example. This implies that the Flemish government, the host city and the port authority are much more in harmony, as they all have authority. Moreover, it also implies that the different port authorities have two roles to fulfil. On one hand, they have to prove they are still an asset for the city; but on the other hand, they also have to make sure they are an important asset for Flanders. In this sense, in comparison with The Netherlands, the Flemish Port Decree of 1999, with the central goal to avoid obstruction between the different institutional levels, implies that in Flanders the rather intense land use discussion following the Amsterdam Haven-Stad project between on the one side the port authority, the private companies and the national government and on the other side the city administration, most likely will not occur in Flanders, at least until the opposite occurs.

5.2.2 The governance structure

As defined within the Port Decree, the port authorities in Flanders are landlords, implying they are the owner of their respective port areas and are responsible for the construction and maintenance of port infrastructure as well as for the collecting of port fees. Since 2013, the Port Authority of Ghent became a limited company

156 Note that within The Netherlands, the port authorities of Rotterdam and Zeeland Seaports have a different institutional structure. Following the construction of the Maasvlakte II, the Dutch national government became a shareholder of the Port Authority of Rotterdam (see for more information Jacobs (2007)). As explained, the province of Zeeland is one of the stakeholders of Zeeland Seaports.

and, as well as the city of Ghent, the municipalities of Zelzate and Evergem – where small port areas are located – and the province of East-Flanders, became shareholders[157].

The port authorities are obliged to publish a policy report and a financial report annually. Every five years, port authorities have to present a long-term strategic financial and economic plan (Vlaamse Overheid, 2008).

Although strictly speaking, port authorities are landlords, the Port Decree does allow port authorities to participate in public or private companies or establish companies, on a very limited basis. The limitation is that, at any moment, these companies can not disturb the existing economic balance between port companies nor disturb the private market. For example, the port authority may not participate in or financially help a private container terminal, like what happened in Rotterdam between the Port Authority Rotterdam and Europe Container Terminal (Jacobs & Lagendijk, 2014).

According to the Port Decree of 1999 – article 9, only port authorities may manage both the public as well as private port areas. This has two implications. First, areas owned and managed by the port authority outside port areas can be handed to other institutions. This happened for the port area Oude Dokken in Ghent in 2003, during which the ownership was handed from the port authority to the city administration. Second, within port areas, private ownership – understood as being owned by private actors – is something of the past. Indeed, during the 1960s in reference to the 'expansiewetten', it was allowed that private companies bought port areas (Van Baelen, 2012). For example, BASF in Antwerp or steel mill ArcelorMittal (then called SIDMAR) and Volvo Car Ghent were able to buy the areas where they are now still located. Since the Port Decree of 1999 – article 13, port areas can only be leased for a maximum of 99 years (Vlaamse Overheid, 1999), although, for example, the Port Authority of Antwerp has a maximum of 40 years for maritime activities and 30 years for supporting activities[158]. The port authority itself decides the concession tariffs.

According to the activities that may be deployed within port areas, the regulations prescribe that these have to be 'port related', both directly and indirectly. The different port authorities are responsible for distributing concessions contracts (Havenbedrijf Antwerpen, 2018).

The Port of Ghent merged with the Dutch Zeeland Seaports on the 1st of January, 2018, into the North Sea Port. Logically, the stakeholder structure changed. All former stakeholders of both the Port of Ghent and Zeeland Seaports became the stakeholders of the new Port Authority, as well. Two stakeholders have a veto-right: the former most important stakeholder of Zeeland Seaports, the Province of Zeeland, and the former most important stakeholder of the Port of Ghent, the City of Ghent. This leads to the following distribution of shares: Province of Zeeland 25%, Borsele 8.33%, Terneuzen 8.33%, Flushing 8.33%, Ghent 48.52%, Evergem 0.03%, Zelzate 0.005%, and the Province of East-Flanders 1.444% (Havenbedrijf Gent NV, 2017b)[159].

157 http://www.logistiek.be/uncategorized/havenbedrijf-gent-wordt-nv
158 http://www.portofantwerp.com/nl/concessietermijn
159 https://www.northseaport.com/thema/3785/havenbedrijf

5.2.3 Socio-economic profile

As illustrated by the 'standard' variables (Table 5.2), the port of Ghent can be characterized as an industrial port generating a relatively high amount of added value and employment, with a rather limited throughput. This is similar to Zeeland Seaports, although they have a slightly higher throughput. Following the merge, the North Sea Port climbed up several places within the rankings (NBB, 2017; Van der Lugt et al., 2017). Note that, until now, no annual report has been published and hence no official figures are published for the North Sea Port. Therefore, the figures in the following table are the sum of the figures of Zeeland Seaports and the Port of Ghent.

	Throughput (million tonnes)	Direct Value Added (million Euros)	Direct employment (FTE)	Port area (hectare)
Port of Zeebrugge	37,81	966,00	9 332,00	2 857,00
Port of Ghent	29,09	3 838,00	28 072,00	4 648,00
Port of Antwerp	214,17	10 785,00	60 837,00	13 057,00
Zeeland Seaports	33,00	3 477,00	15 959,00	4 400,00
Port of Rotterdam	466,00	12 566,00	92 367,00	12 603,00
Port of Amsterdam	79,20	2 125,00	17 596,00	1 900,00
North Sea Port	62,09	7 315,00	44 031,00	9 048,00

Table 5.2 Socio-Economic profiles ARA ports, year 2016

The North Sea Port has a throughput of 62 million tonnes, a direct added value of 7.315 million euros and a direct employment of 44.031 FTE. Around 1.000 hectares are still open for development[160].

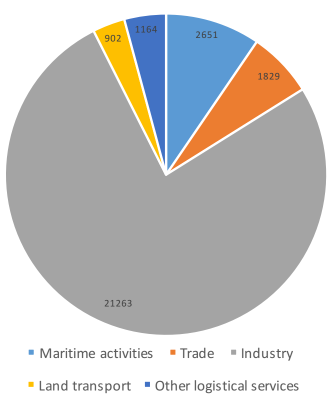


Figure 5.7
The Direct Employment (FTE) in the port of Ghent per economic sector, 2015 (Mathys, 2017)

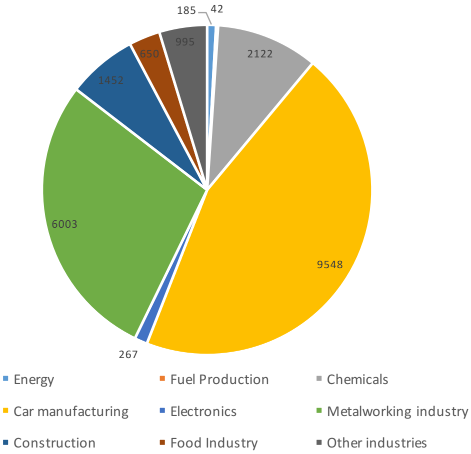


Figure 5.8
The Direct Employment (FTE) in the port of Ghent per industrial subsector, 2015 (Mathys, 2017)

160 https://www.northseaport.com/thema/3785/havenbedrijf

More than three-quarters of the direct employment of the port of Ghent is derived from industrial activities (Figure 5.7). The other quarter is divided between trade activities, maritime activities, land transport activities and other logistical services. Taking a closer look at the different industrial subsectors, clearly two sectors stand out: the car manufacturing sector (9.548 FTE) and the steel manufacturing sector (6.003 FTE). The chemical sector is third and the construction sector is fourth. These figures are also articulated within the top-10 largest companies within the port of Ghent (Table 5.3). The car manufacturing sector in Ghent consists of two factories: a car manufacturing plant, Volvo Car Belgium, and a truck manufacturing plant, Volvo Group Belgium. Originally, these two companies were part of one and the same company, Volvo, but were split into two separate companies. However, recently the Chinese owner of Volvo Car, Geely, also bought 8.2% of the shares of Volvo Trucks (N.N., 2017b). The second largest company by employment is the steel mill Arcelor-Mittal.

EMPLOYMENT TOP 10 AT THE PORT OF GHENT IN 2015		
Ranking	Company name	Sector
1	VOLVO CAR BELGIUM	Car manufacturing
2	ARCELORMITTAL BELGIUM	Metalworking industry
3	VOLVO GROUP BELGIUM	Car manufacturing
4	DENYS	Construction
5	HONDA MOTOR EUROPE LOGISTICS	Trade
6	TAMINCO	Chemicals
7	STORA ENSO LANGERBRUGGE	Other industries
8	PLASTAL	Car manufacturing
9	KRONOS EUROPE	Chemicals
10	OLEON	Chemicals

Table 5.3 Top ten companies according their employment port of Ghent in 2015 (Mathys, 2017)

A similar profile of the port of Ghent can be seen based on the added value. Again, the industrial sector generates the largest added value, followed by trade activities (Figure 5.9). Percentage wise, trade activities thus do generate more added value than employment, following that a significant amount of oil products is traded within the port of Ghent. However, this trading activity is largely automated and directed through pipelines, thus generating quite large amounts of money but not a lot of work, similar to the port of Amsterdam. A closer look at the industrial subsectors shows again the importance of the steel and car manufacturing sector, although now the steel manufacturing is first, and the chemical sector – producing high-value products – generates relatively more added value (Figure 5.10).

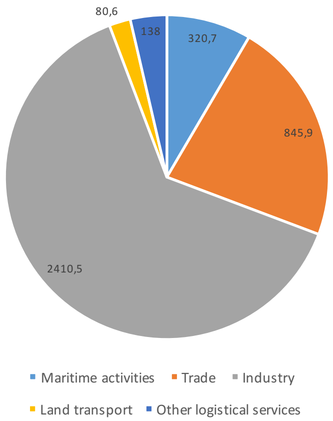


Figure 5.9
Direct Added Value (million euros) in the port of Ghent per economic sector, 2015 (Mathys, 2017)

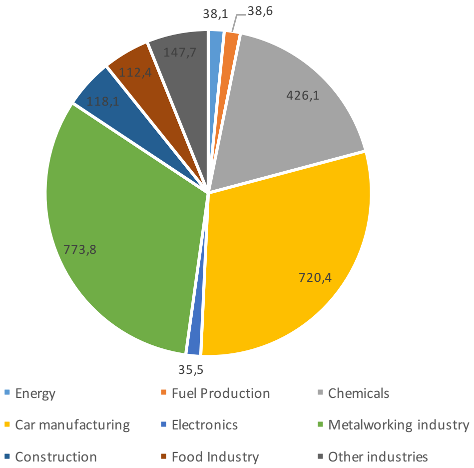


Figure 5.10
Direct Added Value (million euros) in the port of Ghent per industrial subsector, 2015 (Mathys, 2017)

The top 10 list of companies according their added value shows that steel mill ArcelorMittal now ranks first. The two car manufacturing companies of Volvo are now ranked third and fourth, and Total Belgium indeed ranks higher, as argued before. The trading of oil is profit making, without need for high amounts of workers (Table 5.4).

VALUE ADDED TOP 10 AT THE PORT OF GHENT IN 2015		
Ranking	Company name	Sector
1	ARCELORMITTAL BELGIUM	Metalworking industry
2	TOTAL BELGIUM	Trade
3	VOLVO CAR BELGIUM	Car manufacturing
4	VOLVO GROUP BELGIUM	Car manufacturing
5	BELGIAN SHELL	Trade
6	TAMINCO	Chemicals
7	STORA ENSO LANGERBRUGGE	Other industries
8	CRI CATALYST COMPANY BELGIUM	Chemicals
9	HONDA MOTOR EUROPE LOGISTICS	Trade
10	OLEON	Chemicals

Table 5.4 Top ten companies according their employment port of Ghent in 2015 (Mathys, 2017)

Therefore, in what follows, we will focus on three sectors. First, we will examine the car manufacturing sector with a focus on Volvo Car Belgium (paragraph 5.3). We did not chose to take into account Volvo Group Belgium (cf. Volvo Trucks) as they are a separate company. Second, we will examine the steel manufacturing sector (paragraph 5.4). Hereby ArcelorMittal stands central. Third, we will examine the biobased sector in Ghent (paragraph 5.5). Although the biobased sector is not yet defined and thus 'detectable' within official economic reports, the biobased sector in Ghent during the last 10 years has proven to be of high importance for the port of Ghent, as we will explain. Similar to Amsterdam, we will perform step 1 for all sectors, but will focus on the biobased sector to perform steps 2 and step 3.

5.3

The Car Manufacturing sector

5.3.1 A brief historical perspective

Belgium, without having an international car brand, has always been an important car manufacturing place. In the last century, seven car manufacturing plants were located in Belgium:

- Renault in Vilvoorde – from 1922 till 1997 - ,
- Citroen in Brussels – from 1924 till 1980 - ,
- Leyland (Mini and Austin Allegro) in Seneffe – from 1965 till 1982 -,
- General Motors/Opel in Antwerp – from 1925 till 2010 -,
- Ford Antwerp/Genk – from 1930 till 1968 / from 1968 till 2012 -,
- Volkswagen in Vorst – since 1949 and since 2007 transformed to Audi Vorst, and
- Volvo in Ghent – since 1965.
- Thus, today only two plants (Audi and Volvo) remain operational.

Arguably, Volvo Ghent and Leyland Seneffe are exceptions within this list. Both are relatively new and were not located within the region of Antwerp (GM/Opel and Ford) or Brussels (Renault, Citroen and Volkswagen/Audi), the two main focal points of the car manufacturing industry for decades. Leyland Seneffe can arguably be seen as a rather small plant of a British conglomerate with a troubled financial history[161]. Volvo Ghent, in contrast, succeeded in surviving until today and became the largest car manufacturing plant of Belgium, producing around 260,000 cars annually (Volvo Car Gent, 2017b), more than double the production of Audi Brussels with around 120,000 cars annually[162]. While Citroen Brussels and Leyland Seneffe can be considered part of the smaller plants, Volvo Car Ghent is the last remaining big one with a production around 200,000 cars. Renault Vilvoorde produced 183,359 cars in 1989, Opel Antwerp produced 250,000 and Ford Genk topped the ranking with 478,053 cars in 1997 (Van Lierop, 2017)

161 Leyland Motors was a British vehicle manufacturer of lorries, buses and trolleybuses. It acquired Triumph and Rover in 1960 and 1967. In 1968, it merged with British Motor Holdings and became the nationalized British Leyland. This conglomerate housed brands like Jaguar, Rover, Land Rover and Mini and in 1978 it owned 40% of the UK car market. However, following financial problems, it closed in 1986 and sold several of its brands. For example, Jaguar Land Rover is now owned by TATA, as explained in a previous chapter.

162 http://www.audibrussels.com/audi_brussels/brand/nl/onderneming/audi-brussels-in-een-oogopslag.html

Volvo Car[163] stands out from the list because, in 1965, the Swedish Volvo company was the first brand that wasn't part of an American company (GM/Opel or Ford) or not from neighbouring countries (Renault, Citroen, Leyland, Volkswagen/Audi). In fact, this is the main reason Volvo Car eventually opened its second European factory in Ghent. During the 1960s, Volvo Car wanted to enlarge its market share. Until then, Volvo was a rather small regional car company. However, at that time, its most important export market – the European one – was undergoing some important institutional changes. Indeed, in 1951 following the Treaty of Paris, the European Coal and Steel Community (ECSC) was established (paragraph 4.3.2). As we know today, this was the beginning of an ever-increasing European integration and eventually the European Economic Community (ECC), the direct ancestor of the modern European Community. The ECSC was established on March 25, 1957, when the Treaty of Rome, prepared by Belgian Prime Minister Paul Henri Spaak, was signed. The Benelux, France, West Germany and Italy signed the ECC. On one hand, it created common policies for agriculture, transport, trade and standardization; and on the other hand, it created a custom union with a common external tariff. Hence, product made in non-EEC countries, such as Sweden, became relatively more expensive for European customers. Volvo Car therefore was in search of a place to establish an assembling plant for its cars within the EEC.

For its European location, there were two requirements. First, it had to be a location central within the EEC or, more specifically, in northwestern Europe. Second, it had to be a port area with good fore- and hinterland connections. The latter was required because the newly established plant would be designed to assemble the Volvo car by using the different parts imported by ship from the main factory in Gothenburg, Sweden. As such, the import tariffs could be avoided. Well-documented within the recently published book by Volvo Car Ghent for its 50th anniversary, the former port alderman (1959-1970) and later mayor of Ghent (1971-1976), Geraard Van den Daele, as well as the Swedish Volvo engineer, Ghent Lars Malmros, were the two key players (Volvo Car Gent, 2017a). In search of a location, Volvo Sweden sent out representatives to the different possible locations in the EEC to explore the possibilities. Their search area was specified from Dunkirk, Northern France, over Belgium, The Netherlands, to Kiel in Northern Germany (Volvo Car Gent, 2017a, p. 8). Lars Malmros was assigned to the quest. Lars Malmros was able to speak six languages fluently, Dutch among them, as he grew up in Dutch Indonesia (Volvo Car Gent, 2017a, p. 13).

Belgium was not an unfamiliar place for Volvo. The Société Belge de Matériel Automobile (SBMA) had imported Volvo cars since the 1930s and even assembled Volvo vehicles. For this, SBMA established a factory in the Flemish village of Alsemberg, south of Brussels, where it could assemble both Volvo cars and trucks. The different parts were shipped in with huge crates from Sweden to the port of Antwerp. SBMA also opened a distribution centre and garage in Ghent[164], which is nowadays Automobiel Centre Gent (ACG), one of the main selling partners of

163 Volvo Car Corporation was established in 1926. From the beginning, Volvo produced both cars and trucks. In the 1950s, Volvo started to export its cars to the American market, first California, then Texas and eventually the whole of the United States and Canada. During the beginning of the 1960s, Volvo produced around 150 different products, from cars and trucks to cranes, agricultural machines and even jet fighter engines (Volvo Car Gent, 2017a, p. 19).

164 First in the Bagatten Street, in front of the Vooruit. Today, ACG is located at the Ijzerweglaan and it has the concession to sell Volvo, Maserati and Effeffe in Ghent.

the Volvo factory in Ghent (Volvo Car Gent, 2017a, p. 10). However, due to the establishment of the EEC and the small scale of Alsemberg, Volvo Sweden needed a new and bigger plant within the EEC. Belgium was in this case a favorite from the beginning, due to the presence of several large car manufacturing plants in Belgium (Van den Berghe, 2017b).

Initially, the Province of East-Flanders was assigned to welcome the Swedish delegation[165]. As explained by Marc Ulens, who was present during the first meeting, Lars Malmros initially did not know Ghent was a port city (Volvo Car Gent, 2017a, p. 16). The Province presented Ghent as a university city with, most importantly, an engineering faculty, but also as a cultural, historical and entrepreneurial medium-sized city with good living conditions and the availability of large villas in its outskirts. The latter is rather important as, especially during the first years, high-earning Swedish engineers would have to move to Ghent. This is illustrated by Lars Malmros himself, who bought a (large) villa in Sint-Martens-Latem, still today one of the richest suburban areas of Ghent and Belgium, and remained there even after retiring until his death (Volvo Car Gent, 2017a, p. 13). Next to this, Ghent could offer the outlook of the expansion of the sea-lock in Terneuzen and a sufficient amount of technical labour forces. Arguably, the latter was of high importance to understand the arrival of Volvo in Ghent. Ghent was a strong industrial city for more than a century, but during the beginning of the 1960s, Ghent was experiencing a strong economic downturn following the closing of several important clothing industry plants. As such, significant amounts of technically trained labour forces were unemployed, exactly the type of employees Volvo would need if the plant became operational (N.N., 1994). Moreover, the historical industrial tradition in Ghent, creating the ability to operate and maintain large machines, was also one of the main reasons Sidmar, today ArcelorMittal, chose Ghent to establish its steel mill as we will explain later in detail (N.N., 1994).

Soon after this first meeting in 1963, the port alderman of the city of Ghent, Geraard Van den Daele, invited Lars Malmros for dinner and asked him exactly what Volvo needed. Apparently, Lars Malmros drew on the back of the restaurant menu an idea of what was needed to build a car manufacturing plant, and Geraard Van den Daele answered that “it would be taken care of” (Volvo Car Gent, 2017a, p. 16). The likelihood of this turn of events is credible, as Lars Malmros himself took an option on an area along the Siffer dock within the port of Ghent, even before Volvo Sweden was aware of this (N.N., 1994). The reason Volvo could buy a large area followed the Expansion Laws of the Eyskens government (Van Baelen, 2012).

The deal was eventually confirmed by Sweden. Its daughter company, Volvo Europe, was established and started to build its plant in Ghent. The production of cars started on the 28th of June, 1965. At that moment, the factory in Alsemberg stopped producing Volvo cars but kept producing Volvo trucks until 1990. In 1965, Volvo Europe had 251 employees and produced 1,200 cars (Volvo Car Gent, 2017a, p. 10). Volvo was also not the only car company that arrived in Ghent along the Siffer dock. Japanese Honda came as well, and is still present today, but Honda never upgraded its main European distribution centre into a production centre.

165 I did not find any sources on whether Lars Malmros also visited Antwerp or Brussels where, at that moment, the other large car manufacturing plants were located.

Initially, Volvo Europe was a small industrial plant of 10,000 square meters, finalizing almost-finished cars imported from Sweden by roll-on-roll-off ships docked at the Siffer dock. In 1970, Volvo decided to expand and, in 1972, it opened a large welding and spraying unit. From the 5th of September, 1972, Volvo Europe became an operational assembling plant. Hence, production grew to 50,000 cars in 1973 and, in addition to the EEC market, cars were also produced for export to the American market (Volvo Car Gent, 2017a, p. 24). However, the oil crises in the 1970s sharply decreased the demand for cars [166] and the production in Ghent decreased to 29,380 cars. A significant amount of workers were fired in 1978, resulting in a three-week strike (Volvo Car Gent, 2017a, p. 25).

In the beginning of the 1980s, Volvo Europe entered an upturn as the demand for cars increased strongly within Europe, but foremost in the United States. Also, increasingly the production model of Japanese Toyota[167] was copied with a focus on standardization, automation and quality (Jacobs, 2007). To achieve the same, Volvo installed their first fully operational robots in 1984 (Volvo Car Gent, 2017a, p. 34). Increasingly, Volvo became known as a design and safe car branch (Volvo Car Gent, 2017a, p. 30). While the demand quickly increased, the plant in Ghent could not expand enough and Volvo decided to outsource the production of several of the car parts. Prior to 1984, Etablissmenent Christianes Assenede (ECA) – just to the northeast of Ghent and called Johnson Controls today – produced the leather and fabric of car seats, and the seats were assembled within the plant of Ghent subsequently. The latter took up a significant amount of space and Volvo asked ECA to fully take over the production of car seats. Once completed, Volvo could expand its assembling hall. Increasingly, Volvo outsourced the production of the different car parts and an extensive Just-In-Time production and logistical network was established in the region of Ghent. For example, car bumpers were produced by Raufoss[168] (since 1989), the roof coating by Collins and Aikman[169] (since 1990), fuel tanks by TI Group (since 1995), floor carpets by Rieter (since 1996), wheel rims by MCSyncro (since 1996), dashboards and doors by Sommer Allibert (since 1999), drive shafts by Benteler (since 2000), electric cables by Delphi (since 2000), mufflers by Tenneco (since 2000), doors by Brose (since 2002), the body works by Tower Automotive (since 2002), and the logistics by DFDS (maritime, since 2001) and DSV (road) (Volvo Car Gent, 2017a, pp. 26-27).

In 1975, Volvo Europe[170] decided to build a second plant in Ghent for the production of trucks and subsequently the production of trucks in Alsemberg was faded out. Although the plant is located in Oostakker, just to the east of Ghent and thus not in the port area, a similar production and logistical network was established in close collaboration with the car manufacturing within the region and towards Sweden by RoRo ships. During the 1980s, the production of cars increased from 72,000 in 1982 to 90,000 in 1986. In 1988, the millionth car in Ghent was produced (Volvo Car Gent, 2017a, p. 31).

166 Gasoline prices increased by 300%

167 Toyota introduced the so-called 'lean manufacturing', which is a management philosophy focused on quality, waste minimization and maximum customer value.

168 Today Plastal

169 Later on, this company became Johnsons Controls, but since 2013, Volvo Car Ghent has insourced the supply of roof coating.

170 In 1979 Volvo Europe was split into two companies: Volvo Car and Volvo Truck (Volvo Car Gent, 2017a, p. 21)

However, Volvo recorded an operating loss of 250 million euros in 1992. This was a consequence of the changing international car market, with stabilizing demands and changing production networks due to the opening of the Asian, but foremost the East-European markets. Renault Vilvoorde eventually had to close its plant in Vilvoorde in 1997. Increasingly, Volvo Car was not capable of securing its demand. Therefore, Volvo tried to merge with the French Renault, but this deal was cancelled (Volvo Car Gent, 2017a, p. 47). While losses remained, Volvo increasingly wanted to get rid of its car manufacturing division. Indeed, Volvo was still a rather small car manufacturing company; it was mainly a truck (and bus) manufacturing company, one of the biggest worldwide even today. Eventually, Volvo Group (AB Volvo) sold Volvo Car Corporation to the American Ford company in 1999. As part of the deal,Mitsubishi Motors became the owner of the former joint-venture production plant of Volvo and Mitsubishi in Dutch Born[171]. This implied that Ghent's production had to be increased to 200,000 cars a year. However, outsourcing was no longer possible and Volvo Car Ghent experienced a lack of space. Following the help of the port alderman, Daniel Termont, a large land exchange was performed whereby wood trade company Van Hoorebeke[172] moved to the areas along the developing Kluizendok (Volvo Car Gent, 2017a, p. 16). This allowed both the distribution plant of Honda as well as the main distribution areas of Volvo, performed by DSV, to move from the Siffer dock to the Mercator dock. Volvo Car could now expand its plant by investing 400 million euros. Volvo built a new engine centre and Tower Automotive opened a new factory next to Volvo. Most of the other suppliers were moved to a new neighbouring industrial area called Skaldenpark. Hence, by 2005 Volvo Ghent was able to produce around 250,000 cars (Volvo Car Gent, 2017a, pp. 56-57).

In 2008, after years of growth, demand decreased significantly. Ford wanted to sell Volvo, as Ford did not succeed in turning Volvo, which remained a rather small division within the Ford Group, into a profit-making company. Rather unexpectedly, it was announced in 2010 that the in Hangzhou[173] based Chinese holding company, Zhejiang Geely Holding, had bought Volvo Car Corporation. During the announcement, this takeover was received with concerns by experts (Bradsher, 2010; Burns, 2010).

The main concern was a geostrategic one, as one of the historically European engineering and R&D companies was taken over by China, hence making it possible for Volvo technology to be copied and deployed for Chinese car brands. "Geely's purchase of Volvo does have much to commend it. Volvo's technology is world class... Geely is looking to build substantial manufacturing facilities and a supply chain in China to make the Volvo line up for the local market. Quite how Geely is going to improve Volvo's European operations economic to get them making money though remains uncertain. Expect to see component manufacture move to Geely's China supply over the coming years..." (Burns, 2010).

171 Originally, the car manufacturing plant in Born was established by DAF and by the Dutch government in order to ease the high unemployment rates following the closing of the mines in the province of Limburg as explained in a previous chapter. Today the car plant in Born is called VDL Nedcar. This is the only car manufacturing plant in The Netherlands. In 2012, Mitsubishi Motors stopped the production in Born and since then BMW Minis and X1s are assembled in Born.

172 Today Sidoco

173 20 km south of Shanghai

This geostrategic concern was also one of the main concerns of the Swedish government and labour unions, which had to agree with the deal in the end. However, at the same time, the Swedish government was worried that Volvo Car Corporation – after it lost its other car brand, Saab, during that time – would be bankrupted if Volvo was not taken over quickly (Milne & Shepherd, 2016). Geely eventually convinced the Swedish to agree with the deal, as it proposed that not Geely Car Manufacturing, but the Geely Holding company – the personal company of Geely's founder, Li Shufu – would buy Volvo Car Corporation. As such, Volvo would remain an independent company within the holding and, foremost, this deal ensured that the Volvo technology was jurisdictionally protected and could not be used or copied by Geely Car Manufacturing. The deal was agreed upon and Li Shufu once more stated, "Volvo is Volvo and Geely is Geely. Volvo will be run by the Swedish Volvo management" (Bradsher, 2010). Hence, the Swedish saw the deal as ideal. A financially strong company bought it, and the Asian market, with its strongly increasing demand for cars, became accessible to Volvo. As such, Volvo was convinced it could become a profit-making company again, after more than two decades (Van den Berghe, 2017b).

However, the experts' geostrategic concerns that the Chinese would eventually be able to access key European technology soon became true. Indeed, Chinese legislation determines that non-Chinese companies cannot build a factory on Chinese land without a partnership or joint venture with a Chinese car company (Shirouzu, 2011). Soon after the deal was signed, this of course created a hard choice for Volvo. It could leave the deal and protect its technology, but risk bankruptcy; or it could allow a joint venture and consequently have access to the important Asian market to heighten the chances of becoming profitable again. Eventually, together with Geely, Volvo established the joint-venture China Euro Vehicle Technologies. From this moment, Geely, and other brands within the Geely Holding, were able to legally use the Volvo technology. In other words, since then "Volvo is Geely and Geely is Volvo" (Anderson, 2012).

However, Volvo's technology was not directly useable for Geely. Volvo produced mostly large cars and SUVs, while Geely focussed on small and medium cars. Thus, in order to raise its sales in Asia, Volvo had to add small cars to its portfolio. Hence, both Geely and Volvo had to adapt their modular car architecture. As such, in the past years, together with Geely, it developed in Sweden the Compact Modular Architecture (CMA) platform, which would be used by both Volvo and Geely (Shirouzu, 2016). Next to the CMA for smaller cars, Volvo also updated its existing platform for medium and large cars to the Scalable Platform Architecture (SPA) platform for medium and large cars. These two new platforms are currently installed in all Volvo factories. Torslanda is already using SPA as well as the two first Chinese Volvo factories[174]. Ghent currently uses a pre-SPA platform, but is being modified to use both SPA and CMA. In theory, this means that Ghent, next to a at the moment first Chinese Volvo/Geely plant (Henry, 2016), in the future will be able to produce both Volvo cars as well as Chinese cars. And indeed, in 2017, Geely announced that there is a good chance Ghent will produce Lynk&Co cars in the near future, one of the brands owned by Geely (Shirouzu, 2017). Its' 01 model will be made by the same assembly line as Volvo Car's XC40 and will be a rather luxury car. While only 15 years

174 In these two Chinese plants, only Volvo cars will be produced.

ago, the first Chinese car sold in Europe, the Landwind, was not even able to pass minimal crash tests, the announcement of Geely to produce and sell luxury cars in Europe illustrates how quickly China was able to upgrade its domestic car brands. And indeed, the prediction that Geely's takeover of Volvo would be the main catalyst by which Chinese cars would eventually match up to their western competitors came arguably even quicker than foreseen. While writing the dissertation, on March 26, 2018, Geely announced that Lynk&Co would start assembling its Model 1 in Ghent starting as soon as the end of 2019, using the same CMA car architecture as the XC40 model (De Cort & Lemmens, 2018). Ghent will be the first European location where Chinese cars are produced.

The Volvo takeover by the Chinese is part of the larger Chinese mergers and acquisitions (M&A) of European companies, which is increasingly raising concerns within western economic regulating governmental bodies, as they are strongly state driven (Beunderman & Kooiman, 2017; Mack, 2009; U.S.-China Economic and Security Review Commission, 2008). Since 2016, China unseated the USA for the first time as the top acquirer of foreign companies. For China, Europe has been the prime focus (Beunderman & Kooiman, 2017). It performs M&A of different types of companies, from the chemical sector to mobile developers, aluminium producers or even stock exchange companies (Enders, 2009; Mack, 2009). To illustrate this, in the first six months of 2016, on average a German company was bought by Chinese M&A investments every week, a huge increase compared with only 25 in 2015 (Shepard, 2016). This increasing amount of Chinese M&A goes back to 2010, when the Chinese government launched its Industrial Upgrading and Restructuring Plan for 2011-2015 and the Plan for Strategic Emerging Industries. Hereby, China would shift from backward industries to competitive industries. To accomplish this, the focus was on accelerating the development of key export sectors like agricultural products, textile, pharmaceutical, steel building materials, chemicals, ICT, telecommunication, and car manufacturing (Holslag, 2016). The Chinese government actively supported Chinese companies in venturing into foreign terrain (Shepherd, 2016), supported by new infrastructure rapidly spreading across Eurasia called the one-belt-one-road initiative (Notteboom & Yang, 2017). Interestingly, the car manufacturing sector was one of the key focus sectors of the Chinese government, arguing that by improving Chinese car brands to western standards, the export of Chinese cars would increase and eventually could be a solution to that other strategic economic problem of China, namely its overproduction of steel (Yuan, 2010).

The acquisition of Volvo by Geely should thus be seen in this geostrategic playing field (Van den Berghe, 2017a). If the takeover is 'good' or 'bad' depends on the point of view. It is clear that Geely bought Volvo in the first place to copy key western technology in order to improve its car manufacturing economy and move the Chinese from a backward economy with small profits to a competitive leading economy with large exporting profits (Holslag, 2016). Second, today Volvo Car Corporation makes profits again and demand has increased in Asia and within Europe. In the last few years, it succeeded in positioning itself once again as an innovative car brand. For example, as the first 'traditional' car manufacturing brand, in 2017 following 'dieselgate', Volvo announced that starting in 2019 it will only produce electrical or hybrid driven cars and thus will stop producing cars with combustion engines (Vaughan, 2017). More recently, during the annual Geneva car show, for the first time ever, Volvo was awarded the European car of the Year 2018 for its model XC40, which is being assembled in Ghent only (Winton, 2018). Moreover, there is even a chance Volvo Car Corporation can be united again with truck manufacturing company Volvo Group, from which it separated in 1999, as Geely bought 8.2% of the shares for 3.2 billion euros, making it the biggest shareholder (Beunderman & Kooiman, 2017; N.N., 2017b)[175].

Hence, in only eight years, Volvo Car Corporation succeeded in avoiding bankruptcy. As confirmed during our interview with Marc De Mey, head of marketing at Volvo Car Ghent, one of the reasons is that Geely, in contrast to Ford, allowed Volvo more control, both in design and in production networks. However, it is still unclear what the effect of the takeover will be on long term. Considering the comments of Burns (2010) foreseeing that the supply chain will increasingly be fed by Chinese firms, indeed during the last eight years the production network of Volvo has changed, and this will most likely have consequences for Ghent. First, in 2014 18% of the production in Ghent was exported to the Chinese market (Heylen, 2014). This share is already replaced by production at Chinese Volvo/Geely factories in China and until now Ghent has been able to obtain its production levels by an increasing demand for Volvo cars within Europe. Plus, instead of Gothenburg, Ghent has changed to the CMA platform. Hence, it is predicted that Volvo/Geely will increasingly launch small to medium cars, such as the XC40. Therefore, chances are high that Ghent will be chosen to assemble these types in the near future. Also, similar to the establishment of Volvo Ghent in 1965 following the establishment of the EEC, Volvo/ Geely will always need a production plant within Europe to avoid the import tariffs making Chinese cars too expensive for the European market (Deloitte University Press, 2013; European Commission, 2017b). However, again similar to the 1960s, a large amount of car parts will probably be produced in China and imported to Europe for assembly. As such, on the long term, the supply chain of Volvo will indeed evolve to a situation as predicted by Burns (2010) by which different car parts, such as electric engines, will be transported along the One Belt One Road.

For Ghent, the story is thus twofold. On one hand, at least the production for the European market is ensured. Demands rise and the recent election of the XC40 model, exclusively produced on the CMA platform in Ghent, as the European Car of the Year will definitely help (Winton, 2018). However, the question is whether the European demand for Volvo cars will be enough to support the production in Ghent and Gothenburg. Hence, most likely – and this in contrast to the statements made by Li Shufu in 2010 ensuring the production levels of Ghent and Gothenburg (Kurstjens, 2010), one of these will have to be downgraded or even have to close[176]. Some 10 years ago, without a doubt, Gothenburg would be the one to remain open. Gothenburg is the 'origin' of Volvo, the management of Volvo Car Corporation is still located in Gothenburg, and the R&D facilities, too. However, increasingly, these functions are being shared with the Chinese or even relocated to China. Thus Volvo i

175 Next to the British Lotus Geely acquired in 2017, maybe even more remarkable is that in 2018, Geely also acquired around 10% of the shares of the German Daimler, the owner of Mercedes-Benz (N.N., 2018d).

176 However, Gothenburg and Ghent became two different factories. The former produces large cars based on the PSA platform, while the latter produces small to medium cars based on the CMA platform. Thus closing one of these would imply a choice for small or large cars, or imply the transformation of one of these to a dual platform.

s becoming increasingly Chinese instead of Swedish (Van Biesbroeck, 2015). Taking into account that the production level of Ghent is higher than that of Gothenburg (Volvo Car Gent, 2017a, 2017b) and that Ghent is located more centrally within the European market, increasingly Ghent and Gothenburg are ‘in balance’, at least from a Chinese point of view (Van Biesbroeck, 2015; Van den Berghe, 2017a, 2017b).

Nonetheless, even if Ghent would be favoured for the production for the European market, the consequences of the Chinese acquisition of Volvo would most likely have some negative consequences for the manufacturing sector in Ghent. Indeed, the acquisition of Volvo is foremost driven by a geostrategic political and economic policy. China wants to upgrade its economy, and foremost its military, by copying key western technology on one hand; but on the other hand, it also wants to ensure that its products are easily exported to Europe. For the latter, it invests huge amounts of money in the One Belt One Road. The Volvo car will continue being assembled in Ghent to avoid import tariffs, but the different parts will increasingly be produced in China and exported to Ghent. In 2017, the first train with Volvo cars, the S90 models – which are produced in China – arrived in the port of Zeebrugge, the most important port for vehicles in Europe (Vanacker, 2017). Many of these Volvo are subsequently put on a truck to Volvo Ghent to be finished there. Hence, although the trip of 10,000 kilometres is rather small, there is a logistical disadvantage. Therefore, it was recently announced that there is a possibility that the port of Ghent, instead of the port of Zeebrugge, will become the end station of the ‘Volvo-train’ in the near future (Luyten & Theuns, 2018), bringing cars and primarily car parts to Ghent.

If car parts are increasingly imported from China, these parts will not or at least in smaller amounts be produced by the different suppliers in Ghent and the surrounding region. During the 1980s, Volvo copied the so-called ‘lean manufacturing’ philosophy of Toyota and started to outsource its production. However, in 2014, the year the Chinese president Xi Jiping and the Belgian King Filip visited the factory in Ghent (Volvo Car Gent, 2017a, p. 67), Volvo Ghent started to insource again and acquired Johnson Controls and DSV in 2015, increasing the employees of Volvo Ghent by 800. For the car manufacturing sector in Ghent, this is a positive evolution. However, in 2016, Volvo announced it would not renew a number of its most important supplier contracts, for example Tower Automotive, Tenneco and Faurecia; and, starting in 2019, they will no longer deliver parts to Volvo, threatening 870 jobs, a significant amount of the car manufacturing sector in Ghent (Rasking, 2016). The different parts will be imported by ship from Sweden.

This is rather strange from a logistical point of view, as transport from Gothenburg takes two days and a storm or a problem at the sea-lock can significantly slow down or even stop the just-in-time logistics of the Ghent plant. Most likely, the decision to move the production of several car parts to Sweden has to again be understood in the changing production network of Volvo following the takeover by the Chinese. Increasingly, Ghent and Gothenburg will be played against each other. Hence, if the decision has to be made to downgrade or even close one of these two, more ‘economic’ aspects instead of ‘heritage’ will be taken into account (Van Biesbroeck, 2015). The decision will be based on the production level and factory performance. If production is slowed down in Ghent following the delay of import from Sweden several times a year, this would tip the balance in favour of Sweden (Van den

Berghe, 2017b). However, Geely recently acquired an important amount of shares of Volvo Trucks. If these two become one company again, Ghent would be favoured again, at least from a logistical and economic point of view.
Recently, Volvo Car Ghent celebrated its 50th anniversary. Its long history should best be understood in light of the ever changing national and international geostrategic and political goals. Subsequently, these goals are then translated to and mixed with economic, financial, logistical and production goals. This combination explains the reason for the establishment of the Volvo factory in Ghent, the strong expansion in the decades afterwards, as well as the contemporary discussion about its future. To better understand this, in the following two paragraphs, we present the structural and strategic couplings of the car manufacturing sector in Ghent.

5.3.2 Structural couplings

(a) Industrial regulation

The car manufacturing sector is regulated by numerous regulations. These regulations affect the way cars look, how their components are designed, the safety features that are included and the overall performance of any given vehicle. The first governmental regulating body involved with vehicle regulations was established in Europe in 1958 as the World Forum for Harmonization of Vehicle Regulations. Although it was established within the United Nations, at first only countries part of the United Nations Economic Commission for Europe (ECE)[177] were allowed to join. The participating countries during the first years were Germany, France, Italy, The Netherlands, Belgium and Sweden. Later on, also non-ECE countries joined, such as Russia, Turkey, Australia, Thailand and South Africa. The World Forum harmonizes regulations from different countries and international unions. For example, the European Union has a list of directives and regulations[178], the National Highway Traffic Safety Administration (NHTSA), has been the regulation commission of the United States since 1967, and China has its Guobiao standards for vehicles.

Prior to the governmental regulating bodies, only car manufacturers were responsible for their safety and performance. For example, Ford was first to invent and apply safety glass within its cars in 1930. Next, General Motors introduced the beginning of car safety tests in 1934. Chrysler introduced standard disc brakes and SAAB introduced the safety cage both in 1949. In 1958, Volvo introduced the three-point lap and shoulder seat belt. Governmental bodies made many of these inventions obligatory, although, for example in the state of New York, seat belts have only been obligatory since 1984. Europe introduced the NCAP[179] crash tests in 1997, however they are still only voluntary and new vehicles are tested for the European market according to the framework of the European directive (European Commission, 2007).

Regulations can be divided into three main groups. First, there are safety regulations. These are active, referring to technology that assists in the prevention of a crash; or passive, referring to components of the vehicle such as airbags,

177 UN-ECE is one of the five regional commission within the UN. It thus differs from the EEC, explaining why Sweden is part of the ECE in the 1960s.
178 https://ec.europa.eu/growth/sectors/automotive/legislation/motor-vehicles-trailers_en
179 New Car Assessment Programme

seatbelts and the structure, that help during a crash. Next to these, regulations also exist to reduce the impact on bikes or pedestrians. For example, since 2006, so-called bull-bars are forbidden within the European Union. During the last 50 years, other regulations include the standardization of the gear sequence, head restraints to prevent whiplashes, automotive lighting, airbags and, more recently, electronic stability control and anti-lock braking system (ABS). A second group of regulations deals with environmental standards. These are more recent and deal with the fuel efficiency (N.N., 2018b), emission gases – especially within urban areas – and noise pollution. On a global level, the European Union is hereby the strictest, although dieselgate has shown that it is possible for car manufacturers to avoiding these regulations (Vaughan, 2017). Recently, following these strict EU environmental regulations, the Trump administration threatened to put a 'correcting' import tariff on European cars, as not all American cars exported to Europe were allowed to be sold due to their environmental impact (Smith, 2018). A third group deals with the origin of the different car parts. These regulations oblige that every used part is accompanied by a letter of origin. Arguably, these regulations can be seen as instruments to compensate the consequences of 'free trade' and the consequences of moving supply chains to lower wage areas for the domestic economy. For example, since the establishment of the NAFTA Free Trade Agreement (FTA) in 1994 between Canada, the United States of America and Mexico, the automotive trade export from Mexico to the USA grew from $11 billion annually to $76 billion in 2015, as many car manufacturing companies, including American ones, moved their production facilities to Mexico. Hence, in absolute terms, Mexico became a bigger car manufacturing country then the United States. As a consequence, once again, the Trump administration wants to end or at least renegotiate the NAFTA FTA (Flannery, 2018), in order to force companies to move their production sites back to the United States[180], in particular those of the car manufacturing industry.

(b) Industrial setting

In general, 1886 can be regarded as the birth year of the modern automobile following the Benz patent-Motorwagen, a three-wheeler car driven by a gasoline engine, by the German inventor Carl Benz. Through the end of the 19th century, following improvements by Nikolaus Otto, Gottlieb Daimler and Rudolf Diesel, the combustion engine replaced the steam engine as the primary type of engine within the industry and for transport. During the first decades, each car was unique and handmade in small-scale production; although by 1903 60,000 cars had already been produced worldwide, half of which in France.

The production of cars changed dramatically in 1913, when the American Henry Ford implemented the assembly-line style of mass production. Ford succeeded in producing a car every fifteen minutes and could decrease the needed manpower by

180 This idea has to be seen in combination with the Trump administration's idea to put a 25% and 10% import tariff on European steel and aluminium. Following primarily EU safety regulations, at the moment only steel and aluminium produced within Europe has a minimum satisfying quality. Hence, because cars are produced for the global market, cars produced within the US are forced to use European steel and aluminium for their cars. In other words, due to the import tariffs on steel and the threat of taxing European cars, Trump wants to force American car manufacturers to only fulfil the less-strict American car safety and environmental standards for which the quality of American steel and aluminium would be 'good enough'.

more than 10 times[181]. The consequences were that the Ford car became much less expensive. Ford's employees could buy a car with four month's pay. Hence, Ford was able to balance his mass production with market demand (Jessop, 2005 [1992], p. 64). The invention of the assembly line was such a game changer, it affected not only other industries, but eventually the whole society, better known as Fordism. In the latter, one strives for the standardization of products, mass production, mass consumption and labour specialized on just one specific task. This system is then macro regulated in the form of a Keynesian welfare state. The combination of Fordism and Keynesianism was responsible for the great post-war boom from 1945 to the first oil price crisis in 1973 (Jessop, 2005 [1992])[182].

The oil crisis decreased demands and forced the economy, which was built on mass production with a focus on lowering the cost per item via economies of scale, to change. Hence, overproduction, not mass production per se, had to be avoided. The car manufacturing sector, as one of the most important and illustrative sectors during the last century, is a good example of the consequences of these changes. While overproduction only became a problem in the United States and Europe during the 1970s, overproduction was already a problem in the Japanese Post-War economy, during which the levels of demands were low and hence a mass production based on an economies of scale had little application. Hence, while the US and European economies increasingly reflected that of the Japanese Post-War economy, during the 1970s the Japanese Toyota Production System (TPS) soon became duplicated in the rest of the western capitalist world and became the start of the so-called 'post-Fordism' era (Jessop, 2005 [1992]).

Central within TPS stands the principle of 'Kaizen' or, generally translated, a focus on a continuous improvement of the different production processes, logistics and, primarily, the products made. Central hereby is that the production follows demand (pull), instead of demand following production (push). Overproduction, in all production steps, has to be avoided. Therefore, TPS, or lean manufacturing, tries to improve the machines and persons involved, on one hand. Hereby tasks have to be harmonized with the capacities. On the other hand, it tries to avoid waste, not only in overproduction, but also within the entire production chain. Most known hereby is the application of the 'just-in-time' (JIT) logistical production process (Hindle, 2009). JIT eliminates the need for each stage in the production process to hold buffer stocks because every part arrives 'just-in-sequence' at the assembly line, which results in huge financial savings. JIT also allows a variety of models to be produced on the same assembly line simultaneously, making it able to change according to demands. Assembly lines are thus no longer designed for the production of just one product anymore and do not need expensive retooling anymore.

Following the implementation of TPS and JIT within the car manufacturing industry worldwide, the car manufacturing industry's industrial setting is characterized by an assembly line able to perform mass production, on one hand; but at the same time, this mass production is combined with the ability to differentiate many different types of cars, and even the ability to have different 'optional settings' per

181 Because the time interval was so low, paint became the bottleneck for production. Only the Japanese black paint could dry fast enough, explaining why only black cars were produced.

182 Post-Fordism, since the 1970s-1980s is characterized by a craft production or flexible specialization paradigm in contrast to mass production during Fordism.

individual car model (cf. Customer Ordered Production). For example, at the moment Volkswagen has 24 different passenger vehicles, and one of those, the UP model , has four different versions.

In many cases, the implementation of JIT within the car manufacturing industry, but also within other industries, led to a continuously increasing number of companies involved within the production process. Indeed, the avoidance of waste also implied that 'non-essential' tasks should be avoided and outsourced to a company that is much better placed to optimize this specific task. Outsourcing was understood as increasing the profitability (Görg & Hanley, 2004). In addition, Volvo Ghent increasingly combined a JIT regional network with outsourcing in the region of Ghent since the 1980s. However, one should not assume that the implementation of JIT automatically means an increase in the number of companies involved. Indeed, as explained by Jessop (2005 [1992], p. 65), within one company, the different units can act as relatively autonomous production units can act as relatively autonomous productive units, resembling a network of different small, specialized firms. The advantage hereby is that flexibility within one company is combined with the overarching services such as research, marketing, and finance. Arguably, the latter explains why since a few years Volvo Car Corporation, thus Volvo Sweden/Geely, started to insource many of the outsourced tasks again, within Ghent or within the Volvo group. For car manufacturing in particular, a JIT with different companies turned out to be a disadvantage during the transition from one model to a new one. Indeed, such a transition, such as the implementation of the CMA platform in Ghent, for example, can be accompanied by a smaller production. The demand of some suppliers during this time, mostly with only one task for one plant, sharply decreases or even stops. Also, as illustrated by Volvo Ghent, every few years, these suppliers are in the dark about whether they will be granted a new contract. Hence, suppliers are more sensitive to bankruptcy and have to rely more on temporary contracts. This also holds risks for the main car assembling plant, if eventually the new model is introduced or a new unforeseen part is needed. Hence, if these suppliers are part of the group itself, employees can be transferred temporarily to other units. Also, as such, the engineers can work closer with the supplying car part manufacturers following their overarching R&D structure. Therefore, after a period of outsourcing, which was thought necessary to grow (Eusk, 2017), the car manufacturing sector is now experiencing a period of insourcing once again.

Arguably, the American car manufacturer Tesla first induced this move towards insourcing that is increasingly characterizing the industrial setting of the car manufacturing sector. Tesla Motors was established in 2003 and launched its Model S, a fully electric car, in 2012. Instead of a regional or global network of independent suppliers, Tesla choose to produce cars completely in-house and choose thus a vertical integration not seen in the auto industry for decades (Sage, 2017). One of the reasons for this is that, within the current car and certainly within future cars, each different car part is integral to the overall technological design, which has to be right from the start of the design. However, as argued by experts, it is this choice for a very expensive in-house production process that made Tesla, or tech companies Apple and Google (N.N., 2015), is until now incapable of producing the promised and needed volumes to become a true global automotive brand (Eusk, 2017; Waters & Platt, 2017). Nonetheless, many other car companies are watching Tesla and are inspired, at least partly, by its product manufacturing. Also, this has to be seen in light of the increasing protectionist policy ideas demanding producers to produce ‘local’ (N.N., 2018b; Ruda, 2017).

At least one aspect of Tesla is increasingly being copied, namely its selling strategy, which is similar to the business model of Apple. Instead of relying on dealer companies like, for example, Volvo Ghent and ACG Ghent, Tesla sells its cars directly to customers online and through its own global selling network (Eusk, 2017). Also Volvo Car is increasingly implementing this selling model, as confirmed during the interview with the Volvo Car Ghent spokesperson, Mark De Mey. Within the Geely group, the brand Lynk&Co, which will be assembled in Ghent (Cardinaels & Vanacker, 2017; Shirouzu, 2017), no longer sells cars to its customers, but leases them. Customers will be able to choose the car they want and the car will then be home-delivered. This business model will be run in cooperation with the Chinese e-commerce giant Alibaba. Every time the car needs service or has a problem, Lynk&Co will collect and return the car itself. The owner thus never needs to see a garage. The collect-and-return service also means that the customer may not necessarily get the same car, or even the same model, in return. Indeed, this business model makes sure that Lynk&Co is able to upgrade the brand’s car, for example its emission system, in a very short period. This is in contrast to the traditional car-selling model, in which customers buy a car for a period of five to 10 years before buying a new one. Moreover, Lynk&Co will make it possible for a car to be shared and leased to known persons, but also to strangers. To make this possible, the car will have no keys but will be activated by a mobile app and data will be stored in the cloud. Although many such services already exist around the world, for example Cambio in Belgium or Car2Go in The Netherlands, the main difference here is that the car company itself will be in charge. Hence, while Apple’s most innovative idea was simply to combine existing ideas and to vertically integrate, Lynk&Co is trying to do the same thing within the car industry (De Feijter, 2016)[183]. Mark De Mey confirmed that, if the results of Lynk&Co are satisfying, other car brands within the Geely group, thus including Volvo, will implement this model.

Hence, today the industrial setting of the car manufacturing is arguably experiencing its ‘third’ big change. A hundred years ago, it was based on the ‘Ford’-model, which introduced the assembly line and introduced mass production of one model; it then transformed to Toyota’s lean manufacturing model, in which mass production was combined with specialism, introducing numerous types of car models and optional design possibilities (cf. Customer Ordered Production). Within the latter, the economies of scale were combined with an avoidance of ‘waste’ and accompanied by an outsourcing movement and JIT logistical networks. Third, and most recently, car manufacturers are moving again towards insourcing. While insourcing first influenced the production process, increasingly other parts of the ‘car ecosystem’ are also insourced. Most likely, car manufacturing companies will become producer, seller and service provider in the future (Hawkins, 2017). Therefore, the relational geometry as explained in following paragraphs will most likely change in the near future.

183 Also other car manufacturing companies recently launched the same selling and sharing business model: Volkswagen with Moia, Ford with Chariot and GM with Cruise Automation, for example (Hawkins, 2017)

5.3.3 Strategic couplings

In this paragraph, we describe the effects of the strategic couplings. It is important to stress out that we are observing these all together. While the description of the strategic coupling effects inevitable follows a historical perspective to explain why an effect exists (for example why company A sells a product to company B), there is a difference with our step 2, which traces back the lines in detail to discover why and how the strategic effect came into existence. As we already explained, we will not go to this step 2 for the car manufacturing sector. The main reason for this is that tracing back the lines of the car manufacturing sector goes back too far, to the 1960s (at least) and many of the key actors are not around anymore[184], to fully be able to find and analyse the relevant tactics and strategies employed.

The description of the strategic coupling effects is structured along the six different relations taken into consideration (Table 3.1). Each have their own extent (thematic + spatial boundary), their own structure and their own hierarchy. Taking these together will eventually give us a detailed view of the car manufacturing sector. The visualization of the relational geometry is presented in paragraph 5.3.4.

(a) Input/Output

The input/output relations are the most important ones within the car manufacturing industrial sector in Ghent. It centres on the large assembling plant of Volvo Car Ghent. As already mentioned, since the 1980s, an increasingly extensive regional Just-In-Time logistical network exists in which several independent suppliers deliver their product just-in-sequence to the assembling line of Volvo Car. Every day, around 4 million car parts are delivered from different suppliers to Volvo Car Ghent[185]. Although a significant amount of the parts are delivered by maritime ships from Gothenburg, for example, we primarily focus on the regional suppliers in and around Ghent. The main reason for this is that the maritime supply primarily originates from Volvo Sweden and hence is not published online or in reports.

Within Skaldenpark in Ghent, Faurecia produces car doors and tunnel consoles, Tenneco produces exhausts, Benteler produces driving shafts, MCSyncro produces car rims, Brose produces car doors and windows, and Plastal produces car bumpers. Tower Automotive is located just to the north of the Mercatordok and produces car bodyworks. Johnson Controls located in Assenede, just to the northwest, produces the car seats. In the past, Johnson Controls Assenede also supplied the roof coating, but in 2013 Volvo insourced this supply[186]. TI Automotive Systems, located in Lokeren to the northeast, produces fuel tanks. These are also supplied by Kautex Textron Benelux, which is located the furthest away in Tessenderlo, as it was until the closure an important supplier of Ford Genk.

In 2016, Faurecia, Tower Automotive, Benteler, SAS Automotive and Tenneco were informed by Volvo Sweden[187] that their supplier contracts would not be renewed in

184 Geeraard Van den Daele died the 1st of October, 1984, and Lars Malmros died on the 25th of October, 2008.

185 http://www.volvocargent.be/nl/nieuws/995-is–tamelijk-perfect

186 https://www.gva.be/cnt/eid197338/extern-volvo-car-neemt-activiteiten-over-van-toeleveranciers-johnson-controls-en-dsv

187 Volvo Car Ghent is not able to negotiate contracts.

light of the production of the new Volvo XC40 model and will only be able to supply for the production of ending models. Most of these contracts will end in 2019. Only SAS Automotive located in the port of Ghent, producing dashboards, has stopped in the meantime and Volvo Car Ghent has insourced their activities in light of the ongoing restructuring of the supply chain. Tower Automotive succeeded in obtaining a new supply contract with Audi Vorst to supply bodyworks for the new Audi E-Tron model[188]. Benteler will close its factory, similar to Faurecia and Tenneco. In total, around 900 jobs will disappear or are already gone.

Within a JIT network, logistics play a crucial role. Volvo Car Ghent is the main organizer of this logistical network and has installed different so-called Logistical Centres (LC). At the moment, five LCs exist. LC1 collects all parts needed for the assembly and is located right next to the main plant. In the past, LC1 was operated by logistical company DSV butVolvo Car Ghent insourced these activities in 2013 (Volvo Car Gent, 2017a). LC2 is located at the Skaldenpark and collects all parts that are needed for assembly in Sweden or in China. This entails that these parts eventually are shipped from the Mercatordok. LC3 is a general logistical centre located at the Skaldenpark. LC4 is also located at Skaldenpark, but uses the warehouses of Belgian logistical company Katoennatie. LC5 is located next to the main plant and is called Esdic. Esdic performs the last customer-specific tasks, such as the addition of spoilers. In the past, road transport was primarily performed by DSV, but since the insourcing, Volvo Car Ghent has been centralizing many of these buildings. The most important road transport exists between the assembling plant towards the Danish based DFDS[189] terminal along the Mercatordok, from which cars are transported to and from Gothenburg. Every day, a ship from DFDS Seaways[190] arrives and leaves to Gothenburg. The daily line Ghent-Gothenburg is better known as ‘Euro Bridge’. DFDS Seaways also performs the maritime transport between Volvo Trucks Ghent and Volvo Group Sweden[191].

(b) Energetic

While construction began in 2015, since 2016, a 4 kilometer-long water exchange pipeline is operational, connecting paper factory Stora Enso, located in the port of Ghent to the west of the canal, with Volvo Car Ghent at the other side. Within its production process, Stora Enso has residual energy. This energy is now used to heat water to 125 degrees Celsius and subsequently transported to Volvo Car Ghent. There, the water is converted again to heat and used to heat the buildings and the large paint booth. Water is chosen as the transfer unit as, in this case, it is easier to maintain exactly the right temperature and humidity levels needed in the paints booths to ensure a high quality paint process. The pipeline carries 25MW of heat and 150 litres is transferred every second (Port of Ghent, 2014; Stora Enso, 2016).

Since 2010, together with energy company Electrabel, Volvo Car Ghent has built three wind turbines on the grounds of Volvo. Electrabel owns the wind turbines and the electricity is sold to Volvo, providing around 15% of its needed electricity annually.

188 https://www.nieuwsblad.be/cnt/dmf20170307_02767029

189 Det Forenede Dampskibs-Selskab

190 DFDS Logistics and DFDS Seaways are both part of DFDS. The former is responsible for road transport, the latter for maritime transport.

191 https://www.tijd.be/content/tijd/nl/mme-articles/99/84/96/9984960

(c) R&D

Because the main R&D centre of Volvo is located in Sweden, no important R&D relations exist. One exception exists following the rather weak relation between Volvo Car Ghent and the R&D centre Flanders Drive. The Ghent University and the Flemish Government, among others, established the latter in order to boost the car manufacturing R&D in Flanders. While this information was only gathered during informal conversations, the aim of Flanders Drive, particularly for Ghent, was to eventually establish a similar R&D cluster as what happened within the steel manufacturing sector and OCAS, as will be explained later within this chapter. Since its establishment, and still today, Volvo Car Ghent only produces and assembles cars. All the design and research is conducted in Sweden. Hence, in 1996, supported by public money and by the Ghent University, there was an attempt to convince Volvo to at least partly move R&D functions to Ghent. However, Volvo Sweden never supported this move and Volvo's R&D centre is still located in Gothenburg[192] today and no important car R&D cluster exists in Ghent in collaboration with Volvo Car Ghent.

(d) Services

No relevant service relations were found. Volvo Car Ghent employs engineers and engineers travel frequently between Ghent and Gothenburg, as informed during the interview.

(e) Membership

No relevant membership relations were found within the region of Ghent.

(f) Shareholders

In past years, Volvo Car Ghent has acquired several independent suppliers, such as (partly) Johnson Controls, SAS Automotive and DSV, and integrated their activities within the main plant in Ghent. Volvo does not own the other suppliers; hence, the input/output relations only relate them to Volvo Car Ghent. The only financial relation from out of Volvo Car Ghent is the one towards their commercial business sales unit located in Brussels. Volvo is originally a Swedish car manufacturing company and still today the main headquarters of the Volvo Car Corporation is located in Gothenburg. Since 2010, Volvo Car Corporation has been fully owned by the Zhejiang Geely Holding Group located in Chinese Hangzhou. Zhejiang Geely Holding Group is the main shareholder with 51% of shares and thus the owner of Geely Auto. In this financial structure, Geely Auto and Volvo Car Corporation are two independent firms, but both are shareholders of the Gothenburg-based Joint-Venture China Euro Vehicle Technology, which is the owner and developer of the Volvo/Geely factories in China. Hence, within this firm, the technology transfer between Volvo and Geely can officially occur. Next, Zhejiang Geely Holding Group is the owner of Lynk&Co, but more recently it also became an important shareholder of AB Volvo (8.2%) (N.N., 2017b), the Volvo truck manufacturer, and of the German Daimler (9.69%), owner of Mercedes-Benz and Smart, among others (N.N., 2018d).

192 https://www.media.volvocars.com/global/en-gb/media/pressreleases/48079/volvo-cars-and-geely-cooperate-in-new-randd-centre-in-gothenburg-sweden

5.3.4 Step 1: The relational geometry

In the last two paragraphs, we identified the different structural and strategic couplings of the car manufacturing sector. First, the industrial regulation and the industrial setting taught us how the sector evolved during the last century. While it became a global market, it also became increasingly internationally regulated. Today, arguably, cars look quite similar, as they have to conform to safety regulations. Also increasingly, environmental regulations have led to cars that are increasingly more fuel efficient and are developing, especially in the last few years, from fossil-fuel driven to electric engines. Also, regulations are increasingly regulating the origin of cars or the different car parts, becoming an important instrument within the global trade wars.

Second, the strategic couplings taught us with whom Volvo Car Ghent has relations and what type of relations exist. Eventually, we are able to visualize the relational geometry of the car manufacturing sector in Ghent, as shown on Figure 5.11. While we did not trace back the lines looking for the causal mechanisms for the steel manufacturing sector, we nevertheless conducted a number of interviews to assess if our desktop research and the obtained visualization is correct (Table 5.5).

Name	Main task/role	Date
Mark De Mey – since 1982	Manager PR and communication Volvo Car Ghent.	04-09-2017
Daan Schalck – since 2009	CEO North Sea Port	01-09-2017
City of Ghent (roundtable)	Economy department	14-3-2017
Prof. Em. Dr. Georges Allaert – since 1990	Professor Spatial Planning Ghent University	15-08-2016
Stefan Derluyn – since 2007	Regional director Chamber of Commerce East-Flanders	07-03-2017

Table 5.5 List of interviews conducted in Ghent concerning the car manufacturing sector

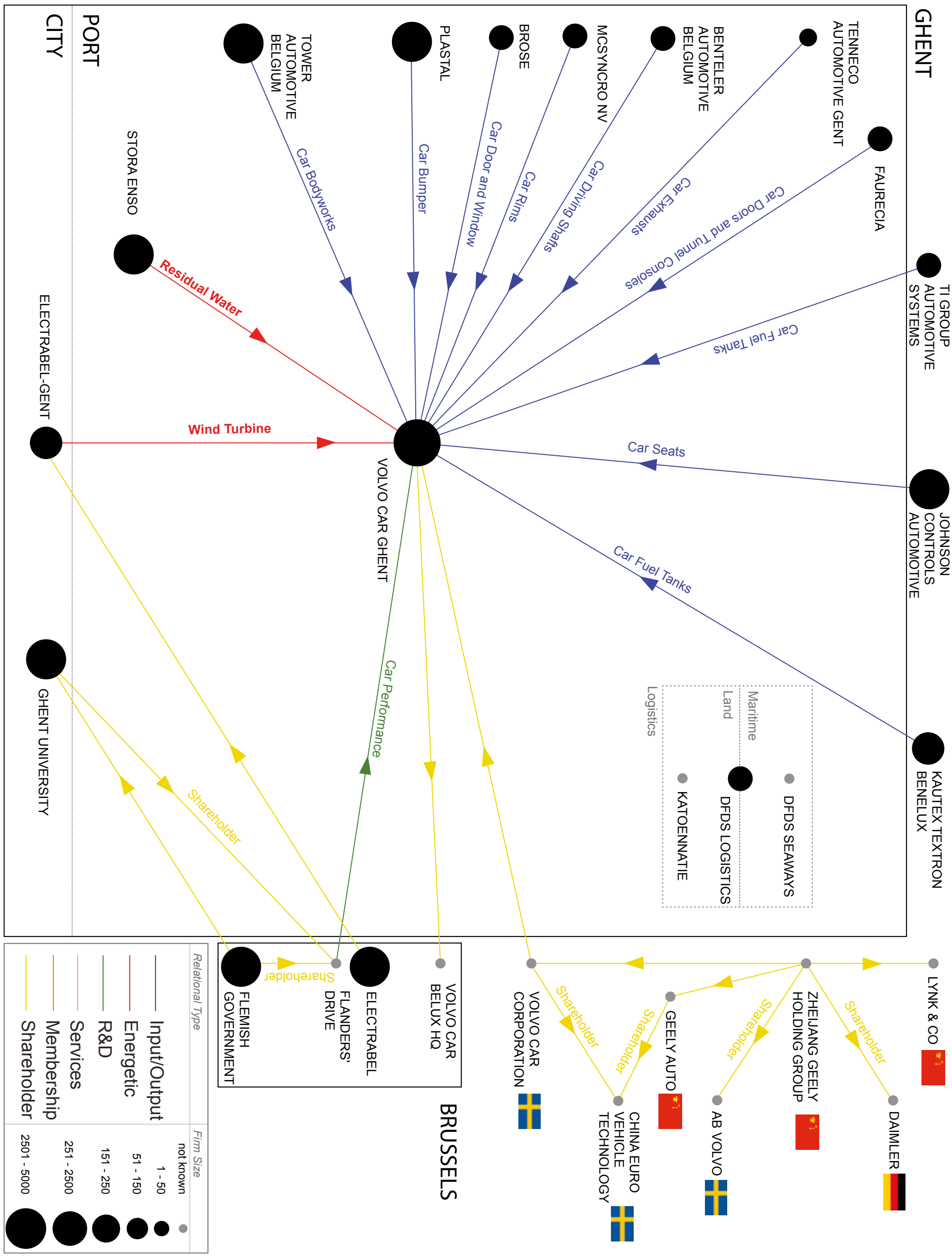


Figure 5.11 The relational geometry of the car manufacturing sector in Ghent. Source: Author, adapted from an earlier version in Van den Berghe (2017b)

The relational geometry clearly shows a hub-and-spoke network centred around Volvo Car Ghent. Several nearby independent suppliers deliver their main product just-in-sequence to the plant. However, this hub-and-spoke, or lean manufacturing network, is changing. Car manufacturers are increasingly insourcing activities again. For Volvo Car Ghent, this implies activities are insourced in Ghent, or car parts are produced within the Volvo/Geely group. Although this is not published publicly, increasingly an insourcing is happening within Volvo and within Geely. The former is an effort to tip the balance favouring Gothenburg; the latter follows the increasing implementation of the One Belt One Road initiative. Most likely, in the future we will see a further consolidation and a change of the hub-and-spoke network. Also the increasing acquisition of the Geely Holding by key European companies will further be a game changer. Only the future will tell what consequences this geostrategic play will have and how Europe will react on this. A trade war is already going on and within this war, the car manufacturing sector, as well as the steel sector, will definitely play a key role, foremost between Germany, the United States and China (Münchau, 2018).

As shown by the relational geometry, the main weakness of the car manufacturing sector in Ghent is, on one hand, the absence of any relevant relation with the urban economy, for example following R&D relations. We already explained before that Flanders Drive was established for this reason, but did not succeed in triggering the creation of a car R&D cluster in Ghent. On the other hand, there is the absence of a regional input relation of car steel. Indeed, as we will explain further in this chapter, less than 10km to the north the ArcelorMittal steel mill is located. One of the main products of this steel mill is steel for the car manufacturing industry. Volvo is hereby an important buyer. For example, ArcelorMittal recently congratulated Volvo Car Corporation with the European Car of the Year 2018 for its XC40 model, produced in Ghent. Among others, their Usibor and Ductibor steel types are used for the XC40 car body work (ArcelorMittal, 2018). However, before this steel – which is delivered as thin sheets on rolls – can be used, first it has to be pressed within a car part metal shaping hydraulic or mechanical press. These presses are relatively large and require large financial investments. At the moment, most car body components are stamped at the Volvo Car Body Components in Olofstrom and Gothenburg in Sweden (ISMR, 2006). As confirmed during the interviews, in the past several times, the management board in collaboration with the city and port of Ghent and the Flemish Government, have tried to convince Volvo Car Corporation to establish such steel metal press in Ghent. As such, the investment would be a large one, and the Volvo Car Corporation only makes such decisions every five years. Ghent hereby has to present the idea and has to convince the management board in Sweden. The main argument is the relatively large financial savings that would occur if steel could be transferred directly between the nearby steel mill and the Volvo assembling plant. Following political reasons, as we will explain later, this investment has not been approved. However, during the interview with Mark De Mey, it was confirmed that, because the ‘playing field’ has changed in light of the acquisition of Geely, Volvo Car Ghent is once again trying to convince its superiors of this strategic investment.

5.4

The Steel Manufacturing sector

5.4.1 A brief historical perspective

The steel manufacturing sector in Ghent cannot be understood without understanding the establishment and evolution of the steel manufacturing sector in southern Belgium during the 19th and 20th century. Numerous (strategic) mergers and acquisitions, crossing regional, national and international borders, characterize this history. While we do not attempt to fully explain this history, the following provides a brief historical explanation in order to understand the contemporary importance of the steel manufacturing sector in Ghent.

Belgium has always been an important iron and steelmaking region. While today only the steelmaking industry is present, in the past, Belgium was also an important and diverse ore mining area. To understand this, a short introduction to the geological situation is welcome. Today, southern Belgium is characterized by a very complex geology and geomorphology with a dense sequence of numerous uncovered geological earth strata from the Palaeozoic (Primary), Mesozoic (Secondary), Cenozoic (Tertiary) and, most recently, Quaternary eras. The basement rock comprising the strata from the Palaeozoic era[193] is situated between the contemporary rivers of Sambre and Meuse, and is severely deformed and broken due to the mountain formation during the Caledonian and Hercynian[194] orogenic[195] processes. The latter explains the complex geology of Southern Belgium. Southern Belgium was, at that time, partly a (huge) mountain range, but it increasingly eroded. Hence, during the Mesozoic and Cenozoic, (Southern) Belgium was emerged by the sea and, among others, chalk was deposed. During the Tertiary, the Alpine orogeny[196] lifted the region out of the sea and subsequently flattened by erosion and incised by rivers during the Pleistocene, uncovering old strata[197]. This explains why, for example along the river Lesse, one can find limestone caves[198] and why along the rivers Sambre and Meuse, one could easily find and mine coal. The latter is the reason the unfolding of the industrial revolution was located in Southern Belgium during the 19th century[199] (Broothaers, 1995).

Prior to the industrial revolution, iron ore was heated using coal or wood to produce iron. As described by Julius Caesar, during the Roman Empire, Southern Belgium was already an important iron producing centre. Also during the medieval times, the Sambre-Meuse region was one of the most important iron producing centres in

193 542 till 251 Ma
194 Latter created the supercontinent of Pangaea
195 390 till 300 Ma
196 (still) Forming among others the mountain ranges of the Alps and Himalaya.
197 For more information: http://cartogis.ugent.be/geologis/geologis/de_geologie_van_belgi.html
198 For example Han-sur-Lesse, one of the largest caves in Europe.
199 At the same time, the industrial revolution started and mines were opened, also the scientific field of modern geology was established in Southern Belgium. This explains why many international geological strata, many of which can be found in Southern Belgium, are named after Belgian villages.

Europe. This was because, especially around the villages of Chimay and Verviers, one could find iron ore on the surface in so-called ‘gossans’, which are the oxidized or weathered upper parts of iron ore holding rocks. The abundance of these gossans, the availability of wood and the availability of streaming water in and around Chimay and Verviers explains why, during the last two millennia especially, this part of Southern Belgium was an important iron producing area (Burke, 1990).

Similar to the role of Lieven Bauwens in understanding the industrial evolution of Ghent for Northern Belgium, William Cockerill is one of the main reasons why Southern Belgium industrialized during the 19th century. Born in Lancashire in 1759, Cockerill produced mechanic Spinning Jenny frames. Although it was forbidden, Cockerill left England in 1797, fled to Russia and subsequently arrived in Verviers, Belgium. In Verviers, Cockerill started working at a local textile company and, in 1799, he mechanized the power looms. In 1807, during the Napoleon-issued Continental Blockade against British trade, Cockerill established a textile factory in Liege. However, Cockerill soon started to produce steel and, in 1821, under the reign and with support of William I, his son John Cockerill established the first industrial blast furnace in Seraing, close to Liege. These first blast furnaces were capable of reaching a much higher temperature, as they used coal as fuel. Coal became the main commodity, replacing wood and charcoal, and increasingly the iron industry moved from Chimay to Liege along the river Meuse where coal could easily be mined. Next to the Société John Cockerill, the Belgian iron and steel producing company Société d’Ougrée was also established in Seraing in 1835. The concentration of the steel and iron industry along the river Meuse accelerated around 1860 when the Société d’Ougrée succeeded in processing iron ore with lower amounts of phosphor. This type of iron ore can be found along the Meuse between Namur and Huy. Hence, during the 1860s and 1870s, both coal and the type of iron ore that was preferred at that time could be mined easily along the Meuse (Burke, 1990). Soon, large mines and large steel manufacturing industrial complexes were established and the region became urbanized quickly. During the 19th century, this small continuous stretch of valleys along the rivers Haine, Sambre, Meuse and Vesdre, also known as the ‘Sillon industriel’, became the industrial backbone of Belgium, an area of roughly 1,000 square km where today around two-thirds – over 2 million people – of the population of Wallonia lives. The Sillon Industriel to the west is called the Borinage and was primarily a coal mining area[200], to the east, the activity is concentrated around Liege and was a combination of coal mining and iron and steel production.

During the 1850s, in the south of the Belgian province Luxembourg, but primarily in the south of the Grand Duchy of Luxembourg[201], iron ore was discovered. These iron ore mines were much larger than the mines of the Sillon Industriel. However, the iron ore in Luxembourg was rich in phosphor and thus not ideal for producing iron and steel. This changed with the invention of the Thomas-Gilchrist process. This process added limestone to the production of iron, capable of removing the phosphor from the iron ore. The iron mines quickly became important firms. In

200 During 1878-1880 Dutch painter Vincent van Gogh spent several years living in the Borinage. He initially preached to and lived among the coal miners, later suffering a breakdown and deciding to become an artist. His first masterpiece, The Potato Eaters, was indirectly inspired by the bad conditions of the miners and their families in the Borinage.

201 Independent from the French Empire and elevated to Grand Duchy in 1815

Belgium, these mines were located in the Gaume region in Halanzy and Musson and were exploited from 1880 until 1978 by S.A. Minière Métallurgique Halanzy-Musson. The problem with iron ore was its fragility. Hence, the iron ore could not be transported over long distances and had to be melted first. This explains why the S.A. Minière Métallurgique Halanzy-Musson was not only a mining company, but also operated blast furnaces[202] (Burke, 1990).

A similar situation existed within the Grand Duchy of Luxembourg. The iron production was located near the iron ore mines. In 1838, entrepreneur Norbert Metz, with the help of Belgian investments holding group '*Société d'industrie Luxembourgeoise*', established the first Luxembourgian blast furnaces in Esch with his company '*Société en commandite Auguste Metz & Cie'*. During its modern history, the Duchy of Luxembourg always had a close and open economic relationship with its neighbouring countries, primarily Belgium and Germany. For example, in 1842, Luxembourg joined the *Zollverein*, the German custom union, which gave the country access to the large and booming German (Ruhr) market to the East. Hence, Luxembourg could easily profit from the German financial power. This explains why, in 1856, the shareholding company 'Saarbrücker Eisenhüttengesellschaft - Société en participation des Forges de Sarrebruck' was founded by German and Luxembourg industrials and investors. This holding company invested in several iron and steel producing companies. While at first Luxembourg focused on producing iron, the invention of the Thomas-Gilchrist process made it possible to make steel, as well. In this period, several large companies were founded. For example, the company of the Metz family, which merged in the 1880s with the Luxembourg-German company '*Société anonyme des Hauts-fourneaux et Forges de Dudelange'*.

In a short time, Luxembourg developed an extensive mining and iron and steel manufacturing industry. For example, from 1854 to 1869, there were 64 requests for a concession to mine iron ore in Luxembourg, mostly from Belgian and Prussian companies[203]. Due the fragility of the iron ore, it had to be melted in Luxembourg before it could be transported. Therefore, from 1855 to 1875, an extensive railway network was built between the German Ruhr area, Luxembourg and Southern Belgium. Hence, mostly cokes from the Ruhr area were transported to Luxembourg, where the iron ore could be melted and finally the iron and steel could be transported back to Belgium and Germany, where it could be processed further.

On one hand, the rapid growth of the Luxembourg mining and steel industry in the 1870s meant that the iron ore mining industry, thus not coal, almost entirely disappeared in Belgium. On the other hand, following the financial relations and migration flows, the industrial regions of Germany, Luxembourg and Belgium became strongly interwoven. However, since the beginning of the 19th century, Luxembourg became increasingly dependent on Germany, and soon almost 90% of the used cokes in Luxembourg were imported from the Ruhr, and up to 70% of the produced steel and iron were exported to the Ruhr. Also, most machines and engineers came from Germany. Therefore, Luxembourg increasingly became a periphery of the Ruhr area.

202 Usines de Halanzy and Musson

203 In the Ruhr area, iron and steel manufacturing company Thyssen was founded in 1891. Krupp was founded in 1811. In 1999, Thyssen and Krupp merged into ThyssenKrupp. As explained in a previous chapter, in 2017, ThyssenKrupp decided to merge with TATA Steel.

At that time, steel became a very important strategic good. In almost all aspects of economic life at that time, and arguably still today, steel was important for building machines and vehicles, and, of course, the army vehicles and weaponry. Germany, having been left out by the powerful in the 19th century during the 'scramble of Africa', was keen to claim its position within the world top and modernized increasingly its economy, hence, the importance of steel and other minerals[204]. However, except for the Ruhr area, Germany, especially in contrast to the United Kingdom, had a lack of coal and iron ore to support its intensifying war industry. Hence, after the Franco-German War of 1870-1871, Germany – in search of the pan-German ironmaster's dream of an industrial hegemony based upon national self sufficiency with regard to the control of the sources of raw materials – annexed the French-bordering region of Alsace-Lorraine. The latter is, similar to Luxembourg, one of the finest iron ore basins of Europe (Berglund, 1919). Hence, similar to the UK, Russia and Belgium – but in larger quantities and of better quality[205], Germany was now also a country with the presence of both iron ore and coal. Moreover, the immense iron ore basin of Alsace-Lorraine is one of few in the world that is located close to large coal basins; in this respect, to the ones of Belgium and Germany. Indeed, although for examples the iron basins of the USA (Lake Superior), Sweden, Cuba and Brazil, already one century ago being important iron ore miners, are larger, the iron ore mines were located far from the coal mines and had a strategic logistical disadvantage in comparison with Germany (Berglund, 1919, p. 535).

The annexation of Alsace-Lorraine implemented an increasing competition for the steel manufacturing industry of Luxembourg. Hence, several companies had to merge and different cartels were formed in order to control the market prices better and to combine production factors. Therefore, a strong vertical integration took place, combining the mining, melting and steel production steps, forming bigger and bigger steel conglomerates. For example, in 1911, the Metz family and Tesch family, already working together, combined all their companies and formed ARBED[206]. Hence, just before World War I and in only 50 years, Luxembourg became the sixth-largest cast iron producer and the eighth-largest steel producer worldwide.

The paradox is thus that the boundaries – as defined in the Treaty of London in 1838, trying to make sure that, on one hand, peace would be ensured on the European mainland by founding several independent 'buffer' countries like Belgium and Luxembourg and, on the other hand, to ensure the dominance of the UK would be long-lasting – was in fact the seed of World War I. Indeed, in 1838, the importance of the raw materials coal and iron ore were rather minimal; but, in only a few decades, it became extremely strategically important. Hence, by 1871 Germany had already annexed Alsace-Lorraine and changed the European boundaries. However, even the addition of the iron ore basins of Alsace-Lorraine was not enough to fulfil German demand and Germany had to increasingly import iron ore from Sweden, France and Spain. Therefore, in hindsight, it is not surprising that the next war would deal with the access to the areas abundant with iron ore, coal and limestone. In geological terms, such an area combining all these raw materials exists in Europe and is called

204 Copper became another important mineral for the war industry. Primarily Belgian Congo is rich in copper and, prior to the war, Belgium exported the copper to Germany. During the war, the UK purchased all of Congo's wartime output to prevent it from being delivered to Germany.

205 The coal and iron in the UK was more scattered; the iron in Belgium was of lesser quality; and in Russia the raw materials were distributed over large distances (Berglund, 1919).

206 SA des Aciéries Réunies de Burbach-Eich-Dudelange

the Rhenish Massif (Ruhr, Wallonia, Luxembourg, and Alsace-Lorraine). The paradox is thus that, due to the Treaty of London, exactly this geologically important region was split among five countries. Hence, one could have predicted that the next war would be fought in Belgium, Luxembourg, Germany and France.

Indeed, in 1914 at the beginning of the World War I, Germany succeeded in quickly annexing first Luxembourg, than Belgium and northwestern France. During almost the entire war, Germany thus controlled the whole Rhenish massif and had all essential raw materials at its disposal. However, no one foresaw that the war would last so long; and the longer the war lasted, even with the control of the Rhenish massif, the more the Allied forces were in favour, in terms of manpower and in terms of raw materials and supplies. Both Germany and the UK, being the most important opponents, ran out of men, raw materials and finances; but in 1917, the United States of America took over the Allied supplies, hence becoming the tipping point for the First World War as it 'refreshed' France, Belgium and the UK of supplies. Of course, the US did not offer these for free and put a price on it, and fast. Therefore, because the US asked for quick payments, the Allies, and especially the UK, demanded huge pay reparations from Germany, being, in turn, one of the seeds of the Second World War.

The end of the First World War in 1918 changed the steel and mining industry extensively (Berglund, 1919). Because of the German defeat, Luxembourg had to withdraw from the 'Zollverein' custom union in 1919. At first, the Luxembourg steel industry sought collaboration with the French, but failed (Kreins, 1996). Consequently, Luxembourg found a new economic and trade partner in Belgium, and together they formed the Belgium-Luxembourg Economic Union (BLEU) in 1921. This union lifted the economic frontier, and the Belgian franc and Luxembourg franc were set at a fixed parity, thus also establishing a monetary union that existed until the introduction of the Euro[207]. For Luxembourg, the BLEU, compared to the Zollverein, had several advantages. The most important one was that Luxembourg and Belgium decided together if rules had to change, this in contrast to the Zollverein, where Luxembourg had to go along with German decisions.

All Luxembourg-German steel companies had to be dissolved and sold, and several mergers and acquisitions took place. For example, in 1919, ARBED, together with the Banque de Bruxelles, bought the sites of the *Gelsenkirchener Bergwerks-AG* in Esch. Next, in 1920, ARBED together with the Luxembourg-Belgian Terres Rouges, bought the coal mines around the German city of Cologne[208], Belgium and in The Netherlands. However, France, now owning the iron ore mines, and Germany, owning the coal mines, refused to work together after the First World War, and an economic steel war started between France and Germany during the 1920s. The management of ARBED, which was able to speak both languages, succeeded in ending the steel war and, in 1926, the International Steel Pact was accepted, regulating the production levels of Germany, France, Belgium and Luxembourg. Hence, ARBED could grow further and became an international steel company with sites in Belgium, Luxembourg, Germany and France, as well as Brazil.

207 Also, the BLEU was the forerunner of the Benelux union in 1946
208 Germany had to sell these as described within the Treaty of Versailles of 1918.

Also important is that the Belgian capital state of Brussels increasingly raised its stakes within the steel industry, first in Southern Belgium and later in Luxembourg, and internationally through ARBED. Indeed, while the industry was dominated by families in the first decades of the Industrial Revolution at the beginning of the 19th century, , increasingly these 'captains of industry' had to take financial risks to expand further (Quevit, 1978). The result was that the Banque de Bruxelles acquired important financial participation from the Walloon companies and Brussels increasingly became the dominant financial and economic centre of the Belgian territory. As such, under guidance of Brussels, the steel industry transformed from a Walloon regional industry to a Belgian industry. For example, the Cockerill steel company, region of Liege, had already come under state control by 1865.

The national Belgian participation in ARBED enabled ARBED to buy land next to the Ghent-Terneuzen canal by the 1920s. By 1932, the company had acquired 211 ha in Ghent. The idea to move the steel mill to a port area in the 1920s is illustrative of the changing steel industry at that time. Indeed, as already explained in a previous chapter and illustrated by the foundation of Hoogovens in Ijmuiden, coal and iron ore became cheaper following the import from non-European mainland countries, such as Sweden and Brazil. However, the global economic crisis of the 1930s halted ARBED's plan to open a steel mill in Ghent. Indeed, during the 1930s ARBED's production decreased to only 20% of its former production.

During the 1930s, and in violence with the Treaty of Versailles, Germany quickly upgraded its army forces and machinery, and hence was in need of large amounts of steel. Therefore, after the invasion and annexation of Luxembourg on the 10th of May, 1940[209], Germany once again turned the steel industry of Luxembourg towards Germany. Although several German steel companies were eager to take over ARBED, Luxembourg-Belgium never lost control of the management of ARBED and, although put under control by the Germans, the director remained the same. Although the production levels during the war were never as high due to the lack of (qualified) employees, the steel production in Belgium and Luxembourg was rather high. The total production was almost entirely transported to Germany, and only a minor percentage could be used domestically. Hence, the economies of both Belgium and Luxembourg were exhausted at the end of the Second World War (Mommen, 2002).

As already explained in a previous chapter, steel production rose sharply in the aftermath of the Second World War, fueled by the growing economies of Europe, the US and Japan (Lagneaux, 2004). Because coal, iron ore and steel were largely the reasons why Europe and the world experienced several fierce wars in the last 80 years, after the Second World War, the European Coal and Steel Community was founded in 1950, under the direction of the French foreign minister, Robert Schuman. Germany, Belgium, Italy, The Netherlands and Luxembourg agreed to free access to raw material and the free trade of steel. Hence, and also following the Marshall Plan, the economies of Western Europe grew rapidly. In the following three decades, the steel industry in Belgium and Luxembourg expanded. To support and

209 Also Belgium and The Netherlands were invaded on the 10th of May 1940, (which is my birthday -1989 ; and which my grandfather –who was 14 years old at the time – reminds me of every year). The Netherlands were occupied after 14 days of fighting, while Belgium resisted for 18 days.

consolidate this growth, several mergers took place. In Belgium in 1955, SA Cockerill merged in Seraing with neighbouring Ougrée-Marihaye to form Cockerill-Ougrée. This company produced over 2 million tons of steel and employed 45,000 people in 1957. In 1966, it merged with the Belgian Les Forges de la Providence with plants in northern France, forming Cockerill-Ougrée-Providence, with a production of 5 million tons of steel. In 1970, it merged with the Société Métallurgique d'Espérance Longdoz, forming Cockerill-Ougrée-Providence et Espérance Longdoz. Cockerill even further increased its economic strength with the purchase of Phenix Works, specializing in galvanised sheet steel, following the failure of negotiations between Phenix Works and the Dutch Hoogovens. The name was shortly after shortened to Cockerill and, from this moment, there was only one steel company in the Liege basin (Mény, Wright, & Rhodes, 1987). Cockerill operated 27 blast furnaces in total and employed 40,000 employees.

During the 1960s, three centres of steel production in Belgium emerged: Cockerill in Liege, Sidmar in Ghent and Thy-Marcinelle-Monceau (TMM) in Charleroi. TMM was created in 1966 after a merge between the two important firms in the Borinage, the Forges the Thy-Marcinelle and the Aciereies et Minieres de la Sambre. During the 1960s, TMM was commercialized and sold by Albert (Mény et al., 1987) who became the richest person in Belgium, and still is today (Barrez, 2011).

The establishment of the company Sidmar is rather complex. It was founded in 1962 with a capital of 4.5 billion Belgian franc. Of this sum, 2 billion came from ARBED and 1 billion from Cockerill. The other investors were the Franco-Belgian industrial holding Schneider-Empain, the Belgian bank Société Générale de Belgique[210] and the Belgian industrial private equity investments holdings Compagnie Belge de Participations (COBEPA)[211] and Compagnie Financière et Industrielle (COFININDUS)[212]. Construction began in 1964, with a cold rolling mill completed in March, 1966, and a hot rolling operational by the end of that year. The first blast furnace was completed in 1967 and a second one in 1968. Expansion continued with a coking factory and a second rolling mill in 1972. There are several reasons Sidmar choose Ghent. First of all, ARBED had already acquired grounds along the canal in the 1930s. However, the reason Ghent got the first and only maritime steel mill of Belgium was also due to the availability of technical employees, who were largely unemployed following the textile industrial crisis (N.N., 1994), as well as, the financial support from the Belgian Expansion Laws favouring the arrival of large multinational complexes (Van Baelen, 2012)[213], and the enlargement of the sea-lock in Terneuzen to the Panamax-level (Allaert, 1992; N.N., 1993a; Vandeweghe, 1993).

However, in 1974, the world steel market collapsed (Mény et al., 1987). The reasons for this were the oil crisis of 1973 – which increased energy prices and caused demand to decrease – competition from Asia, and the financial protection of the European companies by their host countries. Although Sidmar experienced big

210 This latter became Fortis and was sold to the French bank BNP Paribas following the financial crisis in 2008, resulting in BNP Paribas Fortis.

211 Today a 2 billion Euros investment company based in Brussels and New York: http://www.cobepa.com/

212 Today this is venture capital firm Finindus, owned by ArcelorMittal and the Flemish Government: http://www.finindus.be/about-us

213 The Netherlands were, at that time, less interested in attracting foreign investors (N.N., 1994).

problems, the steel industry in Southern Belgium was hit especially hard. Cockerill sold its shares of Sidmar to ARBED and, in 1981, it eventually merged with Hainaut-Sambre, forming Cockerill-Sambre. The Belgian State owned 81.44% of its shares in order to save it from bankruptcy (Capron, 2003). In the meantime, being almost fully owned by the Walloon Government (98.18%), Cockerill-Sambre sought collaboration with foreign steel companies during the 1990s. Hence, in 1998, Cockerill-Sambre merged with the French steel group Usinor (Usines du Nord), created in the aftermath of the Second World War following Alsace-Lorraine becoming French again.

During the 1980s, the Belgian bank Société Générale de Belgique sold its shares to ARBED and, following the Belgian regionalization, the Belgian COFININDUS evolved to the Flemish public holding Gimvindus, which later split into Finindus, among others. Since then, ARBED became the majority owner of Sidmar (Mény et al., 1987). In Southern Belgium, this evolution was poorly received because, from then on, neither the Belgian state nor the Walloon Government had any major influence in ARBED. While Sidmar was an integrated maritime steel industrial complex, it had an important competitive advantage in comparison with the older Walloon steel industry. Hence, due to the enormous importance of the steel industry for the Walloon economy, the shareholder evolution of Sidmar was labelled as '*la guillotine de la Wallonie'* by labour unions (Leboutte, 2008).

After the crisis of the 1970s, Sidmar expanded during the 1980s with the installation of new rolling mills and galvanizing units, among others. The production increased to 5 million tons of steel annually, primarily for the car manufacturing sector. Interestingly, the galvanising facilities of Sidmar during the 1990s were built by a joint venture between Sidmar and the Dutch Hoogovens. This 50-50 joint venture, named Galtec, aimed at sharing knowledge during the construction of the galvanizing units in Ijmuiden and Ghent. After completion, the joint venture was dismissed and Sidmar and Hoogovens became the owners of the galvanizing units (Newman, 2003).

On August 1, 1997, ARBED formed a strategic alliance with the publicly owned Spanish steel group, Aceralia. At the same time, ARBED closed its Luxembourg blast furnaces, marking the end of the steel industry in Luxembourg. ARBED remained a global company and, through its diversification and international M&As and expansions, it remained competitive. In this light, in 2002 it merged, on one hand, with the Spanish Aceralia, and on the other hand, with the French steel group Usinor. From this moment, the Luxembourg-based company was renamed Arcelor and became the second-largest steel producer worldwide, after the Indian Mittal steel group. This implied that, from 2002, Arcelor owned the entire steel industry of Belgium, in Liege, Hainaut and Ghent.

In 2006, after an intense bidding war against the German ThyssenKrupp, Arcelor took over Canada's largest steel producer, Dofasco. At the same time, a bidding offer of 33.1 billion euros, twice the stock market value of Arcelor, was announced by the world's largest steel producer, the Indian Mittal Steel, to take over Arcelor. Mittal Steel was only founded in 1989 by Indian Lakshmi Mittal and very quickly became an enormous conglomerate by turning around a sick steel plant in rapidly expanding markets, from Trinidad to Kazakhstan (Kanter, Timmons, & Giridharadas, 2006). ArcelorMittal became the largest steel producer worldwide by far, with a production of 100 million tons of steel every year. ArcelorMittal, similar to TATA Steel, has its own mines for iron ore and coal, among others, and its own shipping agency.

In 2009, the financial and economic crises hit ArcelorMittal hard. Already within Arcelor, the idea existed to close the blast furnaces of Liege; however, Mittal explicitly promised to keep the facilities in Liege open in order to get Arcelor to accept their bid. Hence, after the takeover, the facilities were expanded in Liege; but soon the steel sector experienced overcapacity following the crises, and ArcelorMittal decided to close all (blast furnaces and hot rolling mill) but the cold rolling mill in Liege in 2011. These closures happened all over Europe, such as in Britain at Port Talbot within TATA Steel and in Bilbao in Spain (Tovey, 2016). Consequently, almost the entire steel industry of Southern Belgium has now disappeared. Following the crises, ArcelorMittal had a net loss of $7.9 billion in 2015, and share value dropped by 60%. In February 2017, ArcelorMittal announced its first annual profits in five years.

Now, arguably, ArcelorMittal Ghent is doing well within the international ArcelorMittal group. From a production and logistical point of view, the advantage of Ghent is that it is a maritime integrated steel mill. This means that, as opposed to the steel industry in Liege, all production steps are next to each other and no additional transport is needed, and maritime ships can directly load and unload next to the plant. However, the disadvantage of Ghent is that it is located behind the sea-lock of Terneuzen, this in contrast to TATA Steel Ijmuiden, for example. As informed during the interview with David De Rocker (Table 5.6), manager of external transport at ArcelorMittal Ghent, ships carrying coals or minerals have to be lightened in order to reduce its draught before they can pass Terneuzen and go to Ghent. Hence, in most cases, the ship – mostly owned by ArcelorMittal – first goes to the steel mill in the French port of Dunkirk, where it unloads its coals before it continues to the plant in Ghent. Hence, ArcelorMittal Ghent was one of the main economic actors demanding the enlargement of the sea-lock in Terneuzen, as coals are increasingly shipped globally by so-called Capesize ships[214]. In light of the enlargement of the sea-lock Terneuzen, ArcelorMittal has already installed two new unloading cranes along its coal terminal (ArcelorMittal Ghent, 2017).

Similar to TATA Steel Ijmuiden, ArcelorMittal Ghent also has its own R&D unit, called OCAS. However, the regional effect of this R&D unit is different. Indeed, since the establishment of Sidmar, an extensive steel and metal R&D cluster has emerged around the steel mill, in close collaboration with the Ghent University. However, in fact, one should look at it another way. Indeed, arguably, the steel and metal R&D network already existed in Ghent, and Sidmar/ArcelorMittal became part of it in 1968. Technical research and education in Ghent is indeed much older than Sidmar, and arguably goes back as far as the beginning of the 19th century with the establishment of the Ghent University and the unravelling of the industrial revolution in Ghent. Hence, the presence of this regional technical knowledge

214 These ships are too big to fit into the (old) Suez Canal or Panama Canal and have to pass Cape Horn to travel between oceans.

concerning machinery was exactly one of the reasons Sidmar chose to establish its steel mill in Ghent, similar to the establishment of Volvo Car.

The 'modern' phase of the Ghent metal and steel R&D goes back to at least the end of the Second World War. One of the main academic laboratories in Ghent, the 'Soete Laboratory' was established in 1946. In general, one could argue that there are two types of R&D facilities in Ghent. Alternatively, the unit is fully owned by the university and deals foremost with fundamental academics research and education, or it is a spin-off company and deals foremost with applied research in collaboration with private partners. The Soete laboratory is somewhere in between, as it covers the education of numerous mechanical engineering courses within the Faculty of Engineering and Architecture, but also deals with academic research and applied research as a service to the industry. Hence, at the moment, several different metallurgy research centres exist in Ghent, which we will explain in paragraph 5.4.3 when explaining the strategic R&D couplings.

This probably explains why Sidmar founded its own R&D centre in 1991, called OCAS[215]. This is much later than, for example, Hoogovens Ijmuiden, with an R&D centre that goes back to 1931 and later became first in 1999 Corus Research Development & Technology and today TATA Steel Research Development & Technology. Sidmar founded this R&D unit as steel companies increasingly began to compete not only on the cheapest price per unit of steel, but also on the quality of steel in regard to its strength and lightness, primarily within the car industry[216]. For example, in May 2017, ArcelorMittal produced around 200 unique steel grades for automotive purposes, half of which were only introduced in 2007. The difference between OCAS and TATA Steel Research Development & Technology today, however, is that OCAS is no longer fully owned by ArcelorMittal. Indeed, in 2004, the Flemish Government approved the 'Steel-friendly Flanders'[217] project. Hereby, the Flemish Government decided to invest 30 million euro into steel and metal R&D activities. To accomplish this, the publicly owned Gimvindus was dismantled. The R&D joint venture between the Flemish Government and ArcelorMittal became the former fully by ArcelorMittal owned OCAS. The financial holding above these became Finindus funded by both ArcelorMittal and the Flemish Region in order to increase the capital of the semi-independent R&D company OCAS (Vlaamse Overheid, 2004)[218].

The new structure of OCAS – based on the 1984 business model of the research centre IMEC[219] at the Catholic University of Leuven, which today is the biggest European independent research centre dealing with nano- and micro-electronica – meant that OCAS could broaden its research activities from now on, both in subject and in terms of partnerships (Mooijman, 2006). While the R&D unit of TATA, or Shell Amsterdam, exclusively conducts research for its mother company, OCAS can do both. Indeed, while OCAS was originally founded within Arcelor to conduct automotive R&D,it was expanded to include multiple sectors dealing with

215 Onderzoekscentrum voor de Aanwending van Staal

216 As explained before, the 2018 European car of the year the Volvo XC40 assembled in Ghent uses car steel produced by ArcelorMittal Ghent: http://automotive.arcelormittal.com/News/3319/Volvo-XC40-COTY-2018

217 Staalvriendelijk Vlaanderen

218 http://www.finindus.be/about-us

219 Interuniversitair Micro-Elektronica Centrum

a wider product mix in 2004 (OCAS, 2016). The move towards an open joint venture soon proved to be successful. In only a few years, the research centre doubled in employees and the budget increased to 100 million euros (Mooijman, 2006; OCAS, 2016).

Similar to TATA Steel, the main structural disadvantage production factor of ArcelorMittal today is the emission of greenhouse gases, toxic heavy metals and atmospheric particulates. Indeed, ArcelorMittal Ghent alone accounts for 5.8% of the total emission of heavy metals in Europe, and ranks ninth in Europe for particulates emission (Mooijman, 2017). Increasingly, these emissions are being regulated. In paragraph 5.4.2 we will explain these emission regulations in more detail. Therefore, ArcelorMittal Ghent launched several projects in recent years, in addition to improving its own production process (De Roo, 2016), to reduce its environmental impact. First, in collaboration with energy company Electrabel in 2015, it opened a new electrical plant converting emission gases to electricity, decreasing its emission of CO2 by 70,000 tons (Electrabel, 2015). Next, since a couple of years, ArcelorMittal Ghent, in collaboration with LanzaTech, is testing a gas fermentation unit that can convert the CO waste gas into ethanol[220]. This project is called Steelanol[221] (De Roo, 2017a, 2017b). And most recently, ArcelorMittal launched the Steel2Chemical project with plastic chemical plant DOW chemical Terneuzen. This project aims at converting CO and H2 into syngas. Subsequently, this syngas can be converted into synthetic naphtha, which is the main input source of the DOW Chemical plant in Terneuzen (N.N., 2017a). As we will describe further, one of the reasons this project could be established follows the success of the biobased sector in Ghent and the merge between the port of Ghent and Zeeland Seaports into North Sea Port.

5.4.2 Structural couplings

(a) Industrial regulation

In paragraph 4.3.2 we described the most important structural couplings of the steel manufacturing sector. Historically, the steel sector has been strongly interwoven with its host countries as steel became a key technology and material, as described before, as well as an important socio- economic sector, providing numerous well-paying long-term jobs. When such a company goes broke, the consequences are mostly harsh, as illustrated by Port Talbot in the UK and in Southern Belgium after the closure of ArcelorMittal Liege. Since the founding of the ECSC in 1951, the regulation of the steel sector is increasingly arranged on the European level. In reference to ArcelorMittal Ghent, we will give a more detailed description of the emission regulations for the steel industry. Even more than for TATA Steel Ijmuiden, the increasing regulations for emission gases is an important evolution in reference to the steel mill of Ghent.

The Kyoto Protocol in 1997 – to which the European Union, among others, agreed in 2002 – was established to regulate the global emission of greenhouse gases.

220 https://ec.europa.eu/inea/en/horizon-2020/projects/h2020-energy/biofuels/steelanol
221 http://www.steelanol.eu/en/news/ethanol-production-in-gent-successfully-tested-on-real-steel-waste-gas-stream

Hereby, a market mechanism was approved to regulate emission gases[222]. Central in the mechanism stands so-called caps or quotas for greenhouse gases. The quantity of these are denominated in units, which represent an allowance for emitting one metric ton of carbon dioxide equivalent. These units are then assigned to all participating countries, which then have to arrange the systems internally. The European Union is seen as 'a country' and thus regulated for all EU countries, plus Iceland, Norway and Liechtenstein. Therefore, in 2005, the EU launched the European Union Emissions Trading System (EU ETS), which remains the biggest greenhouse gas emissions trading scheme in the world. The EU ETS covers more than 11,000 factories, power stations and other installations with a net heat in excess of 20 MW. The scheme uses a 'cap and trade' principle, in which a maximum cap is set on the total amount of greenhouse gases that can be emitted by all participating installations. This cap will be gradually lowered. For example, the initial goal of the EU was a decrease of 20% in 2020 and 43% in 2030. The allowances under this cap are then auctioned off or allocated for free and can be subsequently traded. Every installation has to monitor its emission and make sure it does not exceed its permitted allowance. If this happens, that particular installation has to buy extra allowances from installations that have surpluses. In 2012, the EU ETS was also extended to the airline industry, though this only applies for airlines within the European Economic Area.

There are two methods of distributing the allowances. First, there is an auction. This system is arguably 'fair' as it lets companies bet against each other to obtain the rights, hence a financial incentive exists to lower their emission as, in theory, the allowance rights should be more expensive than emission reduction measures. Second, there is an allocation system. This allocation system exists to prevent so- called carbon leakage. Carbon leakage occurs when companies do not have the financial power to pay for the allowances or the needed reduction measures. Hence, these companies could decide to relocate to countries (non EU ETC countries) with higher caps and lower allowance prices than the EU. Thus, in other words, if the EU strives for lower emission levels, companies could decide to move to China, which has less-strict emission rules (Soetaert, 2018). Therefore, half of the allowances in the EU, based on a calculation taking historical figures as benchmark figures (Rijksoverheid, 2015), are 'free emission rights' and are given to installations that otherwise would experience a competitive disadvantage with firms outside the EU. Both TATA Steel Ijmuiden and ArcelorMittal are two such installations sensitive to carbon leakage. The EU itself decides what installations are critical for carbon leakage every five years. Initially, this allocation system was meant to end by 2020, but, following an intense lobbying effort, the EU recently let go of this goal (Soetaert, 2018).

The allocation system became especially questionable following the economic crises from 2008 until 2015. Economic activity decreased, and the cap was too high and prices too low, primarily due to the free allocated emission rights. Today, the price per ton of CO2 is only 4 euros. Normally, the price would lie around 25 to 30 euros. The European Commission had to decide this year whether to lower or even stop the free allocation; but still, during the next phase of allocations, 43% of the total cap will again be allocated for free. However, most striking is that European

222 The mechanism is based on the US Acid Rain Program to reduce industrial pollutants.

installations started to make serious profits during the crisis with the trade of their surplus of emission rights, which were mostly allocated to them for free. For example, between 2008 and 2012, ArcelorMittal had a surplus of 100 million tons of emissions rights and traded them for 1.4 billion euros (N.N., 2010a). For Ghent in particular, ArcelorMittal Ghent, considered a 'critical installation', has not pay any of its emission rights since 2005, but could still trade its free allocated surplus emission rights for 50 million euros (GMF, 2016). Emission rights do not have an expiration date, thus many installations have enough emission rights to cover their future emissions, implying thus a postponement of their reduction measurement, or even an assurance for their trade of emission rights (N.N., 2010a).

The EU ETC regulation system is increasingly being questioned and experts such as biotechnology Professor Wim Soetaert suggest that, instead of free emission rights, import tariffs would be better suited to prevent carbon leakage. In this case, on one hand, the EU ETS system would stay in power and emission rights would be auctioned; and on the other hand, products imported from outside the EU would be taxed if their CO2 impact is higher and the product is thus cheaper to produce (Soetaert, 2018).

However, in light of the recent increasing trade tensions between the US under the Trump administration and the dumping of Chinese steel on the global steel market, most likely even more free emission rights will be allocated or prices will kept low within the EU into the future. Until today, the steel industry is in many countries and also in the EU still socio-economic very important. Moreover, in light of the recently reformed EUR Industrial Policy Strategy, stating that its member states should increase or maintain at least 20% of its GDP from industrial activities, the steel manufacturing sector will most likely become even more important (European Commission, 2017a). This rather strong change of policy has to be understood in light of the geostrategic value of the European industry.

Indeed, in the past, and most likely in the future, every time there is a chance a plant could be closed, the responsible government prevents it by any means necessary. This can be done by the allocation of free emission rights, but in fact with import tariffs on CO2 per product, as well. Indeed, such an import tariff favours steel mills that are the most modern, for example the TATA Steel mill in Ijmuiden and increasingly ArcelorMittal Ghent. This is similar to the safety and emission regulations for cars, which are the strictest in the EU and prevent Chinese car manufacturers from exporting to the EU. In the US and especially in China, the installations are older and the CO2 emission levels are high in comparison with the European ones. In the past, the main competition within the global steel industry was fought based on the price per ton of steel. Hence, labour costs or energy prices stood central in the global competition game (N.N., 2013)[223]. However, increasingly - and not least of all for the steel industry - competition is transforming to, on one hand, innovation in search of lighter and stronger types of steel, and, on the other hand, (environmental) efficiency. While the European Union has an advantage on both of these levels, the implication of a CO2 import tariff is just another instrument in the never-ending global trade competition; and, as such, one should see the increasing tensions

223 Especially since the 'discovery' of shale gas in the USA, energy prices have dropped becoming an important competitive advantage for American companies.

with the Trump administration and China, amongst others, in this light. The steel industry is one of the clearest examples of this. In fact, similar to the financial banks during the crisis, one can argue that several conglomerates within the steel sector, especially ArcelorMittal as the biggest one, are too big to fail, as they can put several countries against each other. This is an advantage for multinational companies, but a disadvantage for the individual steel mills, as illustrated by the uncertain future of TATA Steel Ijmuiden in light of the merge with ThyssenKrupp, in which Germany and The Netherlands are played out against each other. Next to performance, technology or environmental impact, this is thus another factor that influences regulations (Tovey, 2016). For Ghent in particular, the merge of Mittal Steel with Arcelor has been a positive story. Within Arcelor, the influence of the involved EU countries was stronger. Hence, in the past, Ghent was refused investments to prevent its performance from increasing beyond that of the steel mill of Dunkirk, located in northern France (De Roo, 2008).

(b) Industrial setting

Similar to TATA Steel Ijmuiden, and in contrast to the closed steel mill in Liege, ArcelorMittal is a maritime integrated steel mill. This implies that all production processes follow each other in one product chain, from the unloading of coals and iron ore to iron making to the rolling of the steel into finished shapes. ArcelorMittal Ghent is a relatively modern industrial complex. As such, of the 11 European installations of ArcelorMittal, Ghent is the most productive plant in all production steps and as such is the cheapest one[224] per unit of steel (ArcelorMittal Ghent, 2015; Lemmens, 2017). ArcelorMittal has two blast furnaces and produces around 9 million tons of steel annually; that's 2 million tons more than TATA Steel Ijmuiden. The two blast furnaces operate at their maximum and the idea to build a third one has been considered (De Roo, 2008). However, doing so would require extra emission rights, and the expansion still has not occurred.

ArcelorMittal Ghent uses so-called conventional blast furnaces (Lagneux & Vivet, 2009). These are oxygen furnaces (Smil, 2006) making iron and steel from iron ore and cokes, mixed with steel scrap. ArcelorMittal Ghent has a cold and hot rolling unit. About one third is hot rolled, while two third is cold rolled. ArcelorMittal Ghent is specialized in the production of car steel. Therefore, since 2014, Ghent has applied the Jet Vapor Deposition technology - developed by ArcelorMittal, OCAS and the CRM R&D group in Ghent -which adds zinc to the steel. Also, particularly for the car manufacturing industry, the steel is subsequently galvanized and painted. Before leaving the plant, Ghent has the ability to cut and laser the steel into tailor-welded blanks. Within Europe, only TATA Steel has a similar installation in the Wednesfield (UK), but this unit is not integrated within a steel mill[225].

Increasingly, ArcelorMittal Ghent has developed new steel types for the car manufacturing industry. These types are so-called Ultra High Strength Steel. Both TATA Steel and ArcelorMittal compete with each other in this category[226]. At the moment, the third generation is being developed. In Ghent, for example, the newest

224 http://pvda.be/sites/default/files/documents/2014/03/24/140324_studie_arcelor_mittal_def.pdf

225 https://www.tatasteeleurope.com/en/products/automotive/tailor-welded-blanks

226 http://www.madeinoostvlaanderen.be/nieuws/gentse-vestiging-arcelor-mittal-produceert-hogesterktestaal/

type is called Fortiform (Lemmens, 2017), while TATA has developed Hyperform. Because car body frames need several types of steel, both TATA and Arcelor steel can be found within the same car[227], within a Volvo car[228], as for example (Arcelor-Mittal, 2018).

5.4.3 Strategic couplings

In this paragraph, we describe the effects of the strategic couplings. It is important to stress that we are observing these all together. While the description of the strategic coupling effects inevitably follows a historical perspective in explaining why an effect exists (for example, why company A sells a product to company B), there is a difference with our step 2, which traces back the lines in detail to discover why and how the strategic effect came into existence. As we already explained, we will not go to this step 2 for the steel manufacturing sector. The main reason for this is that tracing back the lines of the steel manufacturing sector goes back too far, to the 1960s at least. Even more than Volvo Car Ghent, ArcelorMittal Ghent's history is even more complex and international. Hence, it is almost impossible to fully find and analyse the relevant tactics and strategies employed in reference to the establishment of Sidmar Ghent.

The description of the strategic coupling effects is structured along the six different relations taken into consideration (Table 3.1). Each have their own extent (thematic + spatial boundary), their own structure and their own hierarchy. Taking these together will eventually give us a detailed view of the steel manufacturing sector. This is presented in the paragraph 5.4.4.

(a) Input/Output

In strong contrast to Volvo Car Ghent, although this is changing, the production at ArcelorMittal Ghent is almost entirely integrated. Indeed, besides the intake of the raw materials and the export of the steel products to and from its own 1km-long terminal along the canal Ghent-Terneuzen, most other production and logistical steps remain within ArcelorMittal Ghent. This differs from TATA Steel Ijmuiden or ArcelorMittal Liege[229], which have externalized several processes, especially the recycling steps. For example, ArcelorMittal runs its own residual water cleaning and recycling unit and its own steel scrap terminal where it recycles and reuses steel from refrigerators to cars (Cleeren, 2011). Also, the residual sludge is recycled within ArcelorMittal. The required supply of oxygen and argon gases for the steel production comes from the neighbouring Air Products company[230]. Located next to Air Products, and thus also next to ArcelorMittal Ghent, is a cement factory of the former Belgian company Cimenteries et Briqueteries Réunies La Bonne Espérance (CBR). Since the establishment of Sidmar, CBR uses residual blast furnace slags to produce cement (ArcelorMittal Ghent, 2015).

227 https://www.media.volvocars.com/global/en-gb/media/videos/154738/volvo-cars-steel-story

228 https://www.tatasteeleurope.com/en/news/news/2017/volvo%E2%80 93cars%E2%80%93quality%E2%80%93excellence

229 https://belgium.arcelormittal.com/wp-content/uploads/2017/10/AM%E2%80%A2-BRCH-Decl.-Env.-2017-v.07.pdf

230 http://www.airproducts.be/company/news-center/2014/04/0425-inhuldiging-nieuwe-asu-gent-van-air-products.aspx

(b) Energetic

Since 2009, Electrabel has run an electrical power plant called Knippegroen, located in the ArcelorMittal Ghent area. This unit uses residual gases to produce electricity, which is then returned to the steel plant (Electrabel, 2015; Van Dyck, 2009). Around 40% of the emission gases is reused within ArcelorMittal, while 60% goes to Knippegroen. The production of electricity from emission gases has a rate of return of 10% in comparison with natural gas (Van Dyck, 2009).

(c) R&D

As already mentioned, ArcelorMittal transferred its R&D unit OCAS into a joint venture (JV) with the Flemish Government. Since then, an extensive and rather difficult to oversee R&D network has been established in Ghent between the production of steel (Sidmar-Arcelor-ArcelorMittal) and the long tradition of technical academic research and education centred on the Ghent University. Since 1982, most of the R&D centres and spin-offs of the Ghent University have been located at the Technological Science Park Zwijnaarde, just to the south of the city centre. Although initially only planned for the engineering and architecture faculty, today the science park hosts several R&D centres and spin-offs in a broad range of industries. Among these are the biobased sector, which will be explained further in this chapter, and the steel manufacturing sector. The latter thus became officially connected with ArcelorMittal Ghent in 2004 when OCAS opened its 'satellite-office' in Zwijnaarde, easing the relationship with the existing R&D network. In addition to OCAS, ArcelorMittal has run another R&D centre in Zwijnaarde, namely the Centre for Research in Metallurgy (CRM), since 1995. However, arguably, CRM Ghent was of rather minor importance. CRM was originally founded by Cockerill-Sambre and the University of Liege, and it goes back to 1948. CRM is one of the reasons for the existence today of an important R&D steel network in the region of Liege, similar to the one of Ghent. When the steel mills of Ghent and Liege became part of the same company, CRM opened a satellite office in Ghent. Following the broadening of its focus and the increasing activity of OCAS, CRM also broadened its focus and today, next to ArcelorMittal, TATA Steel is also one of its core members[231].

Being one of the main goals when OCAS became a JV in 2004, a first spin-off Xcelcoat was established out of the R&D activities of ArcelorMittal and OCAS in 2006. Xcelcoat, located next to OCAS HQ, develops aesthetic and functional surface properties for indoor applications (OCAS, 2016). Next, in 2007, OCAS together with CRM founded Metals Processing Centre (MPC), an R&D centre in Zwijnaarde. In 2008, OCAS, the Belgian Welding Institute (BIL[232]) and Soete Laboratory founded the Metal Structures Centre (MSC). In 2010, a second spin-off was established out of OCAS, namely Borit, which was located in Geel and produced components for fuel cells and heat exchangers, among others.

Next to the OCAS, Agoria also has a satellite office at the Zwijnaarde Science Park, representing the provinces of East- and West-Flanders. Agoria is the main representative of the Belgian technological industry, representing around 1750 companies and 300.000 employees. Originally, Agoria represented the metal processing, electrical and synthetic industries, in particular. Its origin goes back to 1948, when

231 http://www.crmgroup.be/about-us/missions
232 Belgisch Instituut voor Lastechniek

it was founded as Fabrimetal. In Ghent, Agoria founded Sirris, a publicly owned research lab offering laboratory and machinery to small companies and spin-offs. Next, Sirris and Agoria together founded Strategic Initiative Materials (SIM), a non-profit organisation offering a research centre to industry and academia, among others, to OCAS. In 2009, SIM founded Flamac, a research centre in high-throughput methodologies with the goal to develop top competencies in this sector, give technological advice and perform collective as well as contract research for the materials and chemical industry[233]. The last important R&D centre in Zwijnaarde is Clusta[234].

(d) Services

No relevant service relations were found. ArcelorMittal owns most of its own maintenance and supportive services.

(e) Membership

Arguably, the landscape of R&D institutes, spin-offs and other companies in Ghent is rather difficult to oversee and especially confusing if one wants to find the right person for the right challenge. Hence, in 2010, under the driving force of OCAS, all relevant actors within the metallurgy R&D sector in Ghent (OCAS, CRM, BIL, Sirris, Ghent University, Clusta, SIM and Flamac) founded the consortium Materials Research Cluster (MRC) to join forces and share laboratory space and equipment (OCAS, 2016).

(f) Shareholder

The shareholder relations within the Belgian, European and global steel industry were changing constantly and this trajectory is arguably difficult to reconstruct. Nonetheless, the different shareholder relations largely explain why today we see a rather complex shareholders network in Ghent. First, ArcelorMittal Ghent is owned by ArcelorMittal, which has its HQ in Luxembourg. Today, ArcelorMittal Ghent and the Flemish Government are both shareholders of OCAS, through Finindus. Because of this, an extensive R&D network has developed and the shareholder network became increasingly complex. While in the beginning most shareholder relations were directly linked to ArcelorMittal, the Ghent University or the Flemish Government, in the last 15 years, several of these newly founded centres founded their own new divisions and companies. Also, other financially powerful companies became involved, such as TATA Steel through its subsidiary packing unit Duffalco in the Belgian Duffel. During the last 10 years, two spin-offs have been developed with direct links to OCAS, namely Xcelcoat and Borit.

5.4.4 Step 1: The relational geometry

In the last two paragraphs, we identified the different structural and strategic couplings of the steel manufacturing sector. Hence, we are able to visualize the relational geometry as shown on Figure 5.12. First, as also explained in the brief historical perspective, the industrial regulation has taught us that the competitive factors within the steel manufacturing industry have changed several times and, as such, are increasingly changing the industrial setting. While in the past the location

233 http://www.flamac.be/about/history/
234 http://www.clusta.be/over-clusta

of raw materials determined the location of the steel industry, being southern Belgium, the Ruhr area, Luxembourg and Alsace, today the preferred location of a steel mill is a maritime location and the preferred setting is an integrated one. Hence, the competition moved towards productivity. However, due to, among others factors, the changing industrial regulations of the car manufacturing sector, there is increased competition on the type and quality of steel. This explains why the presence of R&D is increasingly becoming a key input factor. In the meantime, the environmental aspect also became important. While at the moment these regulations are still being developed and subject to global trade wars, this explains why ArcelorMittal Ghent, but also TATA Steel Ijmuiden, is now increasingly in search of cleaner and better environmental production processes. Hence, as we will explain for the biobased sector in Ghent, the steel industry is increasingly moving and connecting with the biobased sector, crossing borders with other sectors in search of a decrease in its environmental impact.

In order to back up our desktop research, we conducted several interviews to check if our visualisation of the relational geometry is correct and well-understood (Table 5.6). We did not move towards step 2 and step 3 for the steel manufacturing sector, as it is almost impossible to trace back all the different tactical and strategic couplings that occurred in the past. As illustrated by the brief historical perspective, it is even difficult to reconstruct and understand all relevant structural couplings of the steel manufacturing sector.

Name	**Main task/role**	**Date**
David De Rocker – since 2002	Manager external transport at ArcelorMittal Ghent	06-04-2017
Daan Schalck – since 2009	CEO North Sea Port	01-09-2017
City of Ghent (roundtable)	Economy department	14-3-2017
Prof. Em. Dr. Georges Allaert – since 1990	Professor Spatial Planning Ghent University	15-08-2016
Stefan Derluyn – since 2007	Regional director Chamber of Commerce East-Flanders	07-03-2017

Table 5.6
List of interviews conducted in Ghent concerning the steel manufacturing sector

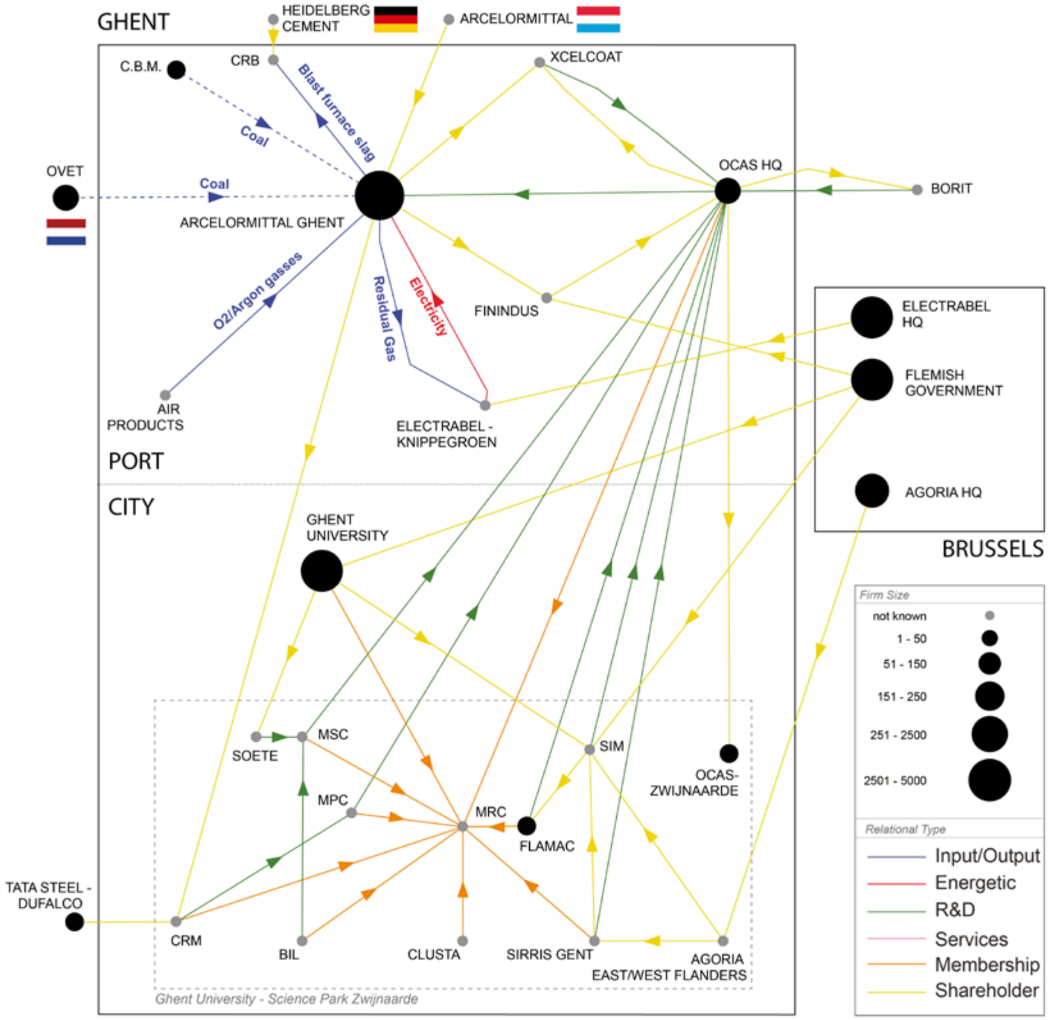


Figure 5.12 The relational geometry of the steel manufacturing sector in Ghent. (Source: author)

In production terms, the relational geometry of the steel manufacturing sector clearly shows that ArcelorMittal Ghent can be regarded as a stand-alone firm. At first sight, this is rather different from TATA Steel Ijmuiden; however, ArcelorMittal operates an important amount of functions that TATA Steel Ijmuiden has externalized. Hence, although not being visible within the relational geometry, the industrial processes of Ghent and Ijmuiden are relatively similar.

Missing is the direct input/output connection between ArcelorMittal and one of its customers, Volvo Car Ghent, less than 10km away. The board of Volvo Car Ghent, backed up by the board of ArcelorMittal Ghent, have already tried for decades to convince the mother company, Volvo Car Corporation, to invest in a metal car-part shaping hydraulic or mechanical press. If this unit was installed, steel could be directly transported between the steel mill and the car manufacturing plant. However, that decision has still not been made. Although we did not find sources on this, and the idea was only confirmed during the interviews with Mark De Mey and Professor Georges Allaert – whose institutional memories go back far enough – one of the main reasons the deal continues to fall through within the headquarters of Volvo Car Corporation and Sidmar/Arcelor/ArcelorMittal is a political one. The deal is never signed because the 'liberal' Swedish board of Volvo Car Corporation does not trust the 'socialist' Belgian/Luxembourg board of Sidmar/Arcelor/ArcelorMittal. This thus has, in essence, nothing to do with the economy and could not be understood at first sight; but considering the two historical perspectives of the car manufacturing and steel manufacturing sectors in Ghent, this is indeed plausible and goes back to the end of the First World War. Following the defeat of the Germans, the 'DNA' of ARBED at that time changed from an arguably 'entrepreneurial or liberal' German-Luxembourg one, to a 'socialist' Franco-Belgian-Luxembourg one. Moreover, in light of the disappearance of the steel sector in Wallonia and the struggles and influence of the labour unions, ARBED became increasingly socialist. Of course, such a political label is always incomplete; however, one can agree that the entrepreneurial historical DNA of Volvo and ArcelorMittal differs indeed. Today, their DNA has changed completely in light of the merges with Indian and Chinese companies, which perhaps creates a new chance for ArcelorMittal Ghent to be directly connected with Volvo Car Ghent. As confirmed by Mark De Mey, this idea at least exists within the board in Ghent, and new efforts are underway at the moment. Moreover, in light of the call of the EU to reappraise the industrial sector, and in light of the changing global industrial settings and tensions (Münchau, 2018), chances are arguably becoming even better that such a coupling will occur.

For now, the main advantage of the steel manufacturing sector is that it is a good example of the connection between the large-scale maritime industry and the urban knowledge economy, hence the existence of a port-city interface. It is rather impressive to observe the extensive R&D network of the steel manufacturing sector. In hindsight, the decision of the Flemish Government in 2004 to become a shareholder of OCAS is a milestone. This decision not only meant that OCAS could broaden its activities and connections, but also ensured that the R&D network, an integral part of Ghent since the Industrial Revolution, became strongly embedded within Ghent and Flanders. Indeed, arguably it is important for a region that the R&D is not entirely dependent on decisions made, in this case, in Luxembourg/India. If so, the embeddedness of the R&D is vulnerable, as shown by the discussion regarding TATA Steel Technology in light of the merge between TATA Steel and

ThyssenKrupp. In only 15 years, the R&D network of the steel manufacturing sector in Ghent was able to connect academic research with corporate research, and the network is arguably almost too complex to oversee. In any case, if ArcelorMittal Ghent disappeared, at least the R&D network would be 'saved', being exactly one of the main goals of the Flemish Government in 2004 (Vlaamse Overheid, 2004, p. 80).

5.5
The Biobased sector

The biobased sector differs from the car manufacturing and steel manufacturing sectors that are taken into consideration in this dissertation. It differs as the sector is more difficult, or even impossible to define. The biobased sector should be understood as the biobased economy, which produces biobased products by using biomass (Langeveld et al., 2010). There are two main groups of bio-products, namely, on one hand, bio-energy, which considers bio-heat, bio-electricity or biofuels as biodiesel or bio-ethanol (see Figure 4.16); and, on the other hand, bio-materials, which is broad and includes pharmaceuticals, chemicals, plastics and fibres (Langeveld et al., 2010). There is the 'food versus fuel' debate (N.N., 2007b), which is expressed in 'generations'. The first generation uses cereals, the second generation uses bio-waste, and the third generation is based on photosynthesis (Langeveld et al., 2010).

While the biobased sector in Amsterdam is second generation, the biobased sector in Ghent produces biofuels and –products of the 'first generation'. As we will see, its historical evolution differs rather significantly from the one in Amsterdam, explaining the difference between the first-generation character of the biobased sector in Ghent and the second-generation character of the biobased sector in Amsterdam.

5.5.1 A brief historical perspective

While the port of Amsterdam is the biggest petroleum port in the world, today the port of Ghent is the biggest grain and cereals port in Europe. To understand why Ghent is the biggest European grain port today, one has to take into account the historical importance of Antwerp as a grain port. Its importance has two historical periods. The first goes back to the United Netherlands during the 16th century. Prior to the Golden Age, the Dutch port cities began to extend their maritime trade primarily towards the Baltic Sea region, particularly in grain trade. Many of these Dutch ships sailed to Antwerp, being the biggest and most important port city in the Low Lands at that time. As such, Antwerp, served by these large merchant ships, became the most important grain port at that time (Stad Antwerpen, 2010). The year 1585 marked the end of this trade with Antwerp. During the second half of the 19th century, the port of Antwerp once again became an important grain port. The Wester Scheldt was open again for international trade and Belgium was the first continental nation that industrialized, pushing Antwerp and Ghent quickly to two important industrial port cities. Trade overseas with America and Canada, but also with Russia and Ukraine, increased rapidly at that time, for grain in particular. Indeed, the agricultural market became increasingly global and industrialized, favouring the large-scale farms in Northern America, Eastern Europe and Russia. The so-called Agricultural Invasion of large volumes of grain – as well as meat, rice, corn, tobacco, coffee, tea, oil and wine – into Europe through the port of Antwerp is one reason the agricultural sector in Belgium was forced to modernize and move towards higher added-value production systems and products with a strong push towards stockbreeding and horticulture, especially in the provinces of West- and East-Flanders. This also explains why, even today within Flanders, the grain-farming sector almost exclusively grows grains for animal application instead of bread grains (Segers, 2003).

Hence, towards the end of the 19th century, large grain warehouses were being constructed in the port of Antwerp, such as the ones of S.A.M.G.A[235] in 1892, a consortium of grain traders with a capacity of 25,000 tons. Increasingly, additional capacity was built in 1939 and in the 1970s (Kennes, Plomteux, & Steyaert, 1992).

Following the modernization of the agricultural sector and the need for specific grains to produce the correct nutrition for animal feed, or fodder, companies were founded specializing in this fodder. One of these is Vanden Avenne, a grain trader and animal feed producer active in West-Flanders since 1883. These two activities were split in 1962. This split of activities was needed because the grain-trading division of Vanden Avenne wanted to expand internationally in light of the increasing industrialization and globalization of the agricultural sector. Hence, new grain terminals were needed to scale up its activities. Most logically, the new grain terminals would have been built in the port of Antwerp, from where all grain volumes had been distributed until then. However, during the 1960s, the port of Antwerp, while expanding primarily its petrochemical activities, had less attention on its long-present grain-trading companies. This, combined with the rather long distance from Antwerp to its main market – located in the south of the province of West-Flanders in the region of Roeselare-Kortrijk, where important grain trading and processing companies had been located until now – resulted in the new grain terminals being built in the port of Ghent (N.N., 2007b).

In 1969, the newly founded company Euro-Silo built the new grain terminal in Ghent. Vanden Avenne, today known as Vanden Avenne Commodities, founded Euro-Silo together with two other companies, namely the American company Cargill and the Antwerp-based International Corn Company (ICCO) (N.N., 2007b). Similar to Vanden Avenne, Cargill was founded in the 1880s as a grain storage company following the increasing grain trade with Europe. Gradually it extended its activities to the production of fodder, seeds, vegetable oils and derives. Today, Cargill is the largest privately owned company in the world. ICCO was owned by two historical grain trading families, Delvaux and Marchant, and was an international company owning shares and daughter trading companies all over Europe (Whiteside, 1993). During the 1960s, the fodder industry in south West-Flanders was expanding quickly (cf. Vandemoortele). Hence, Vanden Avenne, Cargill and ICCO combined their efforts and built a grain terminal with an initial capacity of 18,000 tons in the port of Ghent, at the end of the Siffer dock along the R4 ring road; the terminal is still located there today, but now with a capacity of 240,000 tons. The port of Ghent was in an ideal location, as the sea-lock in Terneuzen was enlarged and the industrial fodder

235 Société Anonyme des Magasins à grains d'Anvers

factories in Roeselare and Kortrijk could easily be reached by inland water transport from the port of Ghent along the river Lys (N.N., 2007b).

Eventually, because Jean Delvaux had no successor, ICCO stopped being a grain terminal company and moved its trading division into Vandema together with Vanden Avenne, referring to Vanden Avenne, Delvaux and Marchant. Now, Vandema owns 80% and Cargill owns 20% of the shares of Euro-Silo. Both Vandema and Cargill are thus responsible for the grain trade, while the company Euro-silo is the warehouse division and does not deal with trade as such. Cargill is thus both a shareholder and competitor of Euro-silo[236]. In 1978, another grain warehouse company was founded in Ghent by the Rotterdam companies of Hes Beheer, Furnes and Continental, called Ghent Grain Terminal (GGT), which built a 360,000-ton grain terminal at Rodenhuize along the canal Ghent-Terneuzen. After a first attempt in 1989 (N.N., 1989), Euro-Silo acquired GGT in 1992 and renamed it Euro-Silo Rodenhuizedok (PDD, 1992). With around 600,000 tons of capacity since then, the Belgian grain sector's focal point clearly moved from Antwerp to Ghent, with a market share of more than 60% of grain trade at that moment (N.N., 1992) and about 80% more recently (N.N., 2007b).

In 1920, after the First World War, Belgium became owner of the former German oil sources in Romania. To manage them, a group of Antwerp investors founded the oil company Compagnie Financière Belge des Pétroles, and later changed its name to PetroFina. Increasingly, Petrofina, in addition to petrochemistry, branched out to oleochemistry. Hence, in 1957, PetroFina founded Oleochim NV in Ertvelde on the left bank of the canal Ghent-Terneuzen, producing fatty acids. In 1956, Oleochim acquired Bougies de la Cour NV Oelegem and, in 1972, it merged with PalmaFina Ertvelde – a deep fat fryer oil, butter, chocolate spread and soap producer – becoming as such OleoFina. However, following the economic crises during the 1970s, OleoFina's unprofitable departments were sold off: the candle division to Vermorgen, the soap to Christeyns and the food section to Safinco, which was a shareholder of Vandemoortele Izegem. During the 1980s, OleoFina could invest again, expand its Ertvelde plant and begin producing fatty alcohols. In 1999, the Belgian Petrofina joined the French Total and became TotalFina. TotalFina decided to sell OleoFina as part of their plan to concentrate on their core competencies in 2000. OleoFina was taken over by a large group of Belgian investment groups and banks, such as KBC, Fortis and Ackermans & van Haaren, and was renamed Oleon, which it still is today[237]. Eventually, in 2007, Oleon built the first biodiesel plant in Belgium, as we will explain more in detail later.

First, we go back to the evolution that began with the takeover by Safinco/ Vandemoortele of the food section of OleoFina in 1979-1980. Following the takeover, Vandemoortele expanded OleoFina's activities and founded the company Vamo Mills, a brand new oilseed crusher in Ghent. The Vamo Mills crusher was built next to the newly established grain terminal of GGT on the Rodenhuizedok. Hereby, Vandemoortele almost exactly copied the building plan of its competitor, Unilever in Rotterdam, which had built its crusher two years earlier. Similar to Unilever,

236 As explained during the interview with Daniel Matthys, CEO of Euro-Silo (17/08/2017)
237 http://www.oleon.com/our-company/milestones

Vandemoortele chose to build its crusher next to an independent grain terminal, and chose to produce oil from soybeans.

In addition to being located close to Euro-Silo, Vamo Mills at Rodenhuizedok could also easily connect to the oil terminals of Oiltanking Ghent to store its vegetable oils. For this, in 1983, Oiltanking and Vandemoortele founded a joint venture that built a 20,000 cubic-metre terminal on Oiltanking's grounds, which could use the loading and unloading facilities from which the vegetable oil could be transported by fuel ships[238].

At first sight, it is rather illogical that a large oil terminal be located in the port of Ghent, since the focal point of the petrochemical industry in Belgium was, and still is, Antwerp. However, similar to Amsterdam, Ghent stores refined oil and is primarily a distributor of gasoline and petroleum. Oiltanking is a German company that originates in Hamburg as Mabanaft. Mabanaft was a distributor of petroleum in Germany and wanted to duplicate these activities in Belgium in 1970. Ghent was hereby an ideal location, as it is located centrally within north Western Europe and has maritime access. The refined oil came in by ship and the petroleum was distributed from the terminal of Ghent by truck, such as fuel oil to households[239] and diesel to gasoline stations. In 1972, Mabanaft split the trading and storage activities and became Marquard & Bahls, a holding of Mabanaft and Oiltanking[240].

As such, during the 1980s and 1990s, within the company Vandemoortele, several divisions existed, including the division of vegetable soy-based dairy alternatives (Alpro[241]), mayonnaise, frozen dough, and the crushing and production of vegetable oils. Vamo Mills expanded its activities and built six crushers in France and two in Germany. However, the soil crushing division within Vandemoortele was volatile, especially in comparison with its successful Alpro division, and Vandemoortele decided to sell Vamo Mills to Cargill in 1997.

During the early 2000s, the first ideas came up to produce biofuels in Belgium, both bio-diesel and bio-ethanol. The technology to produce biofuels was proven profitable in France. Indeed, during the 1990s, France became the most important biofuel producing country in Europe. One of the reasons France was one of the first European countries developing a biofuel industry was geostrategic. During the 1980s and 1990s, within Europe, the fodder industry and vegetable oil seed crushing industry was increasingly using soybeans. Also, Vamo Mills Ghent, for example, used only soybeans until 1997. However, soybeans were increasingly being imported from the United Stated of America as much as 90% for Vamo Mills. For decades, the US has been the biggest producer of soybeans worldwide. Moreover, during the 1960s, 90% of the worldwide soybean export came from the US; and today soy is America's largest cash crop. During the second part of the 20th century, the soybean export increasingly went to the European market, where the demand for soybeans increased in light of the increasing and expanding fodder industry and seed oil industry. Moreover, since the 1960s, US soybeans can be imported to the

238 Interview Daniel Matthys

239 Within Belgium, 43% of the households use fuel oil ('mazout'), this in contrast to The Netherlands with a higher share of natural gas.

240 Interview with Koen Van Kerchove, CEO Oiltanking Ghent (21/08/2017)

241 Sold in 2009 to WhiteWave Foods and in 2016 as part of Danone

EU tariff free. In the last decades, the global soybean market has changed. Although the US is still the largest producer, Brazil and, to a less extent, Argentina, are also large soybean producing countries today, while China now imports twice as many soybeans as the EU.
However, during the 1990s, France wanted to decrease its dependence on US soybean imports. The enormous and increasing importance of soybeans was becoming a geostrategic disadvantage, as it was estimated that, if the US stopped its export of soybeans to the EU, the EU fodder industry would run out of business in less than a week, forcing the entire meat production sector in the EU to to a hault in three weeks, hence the risk of a major feed/food shortage in the EU. French President Mitterrand therefore decided to stimulate European rapeseed production as the main input resource for the oilseed industry (Shurtleff & Aoyagi, 2015).

The choice of rapeseed for the biofuels industry is a consequence of the so-called Blair-House Agreement that was signed in 1992. The Blair-House Agreement was an agreement between the United States and the European Union on export subsidy and domestic subsidy reduction commitments. The agreement implied that European agricultural production should decrease by 10%. This, of course, led to enormous protests by farmers and the agricultural sector, mostly in France (Shurtleff & Aoyagi, 2015, p. 978). The Blair-House agreement was applicable to agricultural production that was eventually used to produce food, such as the fodder industry. However, there was no restriction on agricultural production used to produce biofuels. Hence, the Mitterrand government decided to replace the ‘lost’ 10% of agriculture feed/food production by rapeseed production and created a biofuels sector, based on the seed oil industry, for which the rapeseed production could eventually be used.

The technology to produce biofuels on a large scale was thus implemented and proven valuable by France during the 1990s. Increasingly, also within the European Union, there was a call to increase the share of biofuels within the total fuel usage amount. As explained in paragraph 4.4.2, in 2001 the European Union published its directive, 2001/77/EC, promoting renewable energy use in electricity generation (European Commission, 2001a). Subsequently, in 2003, directive 2003/30/EC was published – better known as the biofuels directive – to promote the use of biofuels for EU transport. The directive required that its member states replace 5.75% of all transport fossil fuels (petrol and diesel) with biofuels by 2010. An intermediate target of 2% was called for by the end of 2005 (European Commission, 2003). Even though neither the 2001 nor 2003 directives were enforced (they eventually were enforced following the Renewable Energy Directive (RED) 2009/28/EG) countries and companies were already brainstorming on the potentials of the biobased sector, hence also in Ghent.

The biobased industry in Ghent, as it is known today, originates from three different initial ideas developed within Eurosilo and Cargill. First, Eurosilo developed the idea to produce bio-ethanol. The original idea to produce bio-ethanol in the port of Ghent lies with Charles Albert-Peers, who was and is still today the CEO of Brussel-based Alcogroup, one of the world’s leading producers of ethanol with applications in the food, cosmetic and fuel industries. However, his decision to pick the port of Ghent as the location for his new bio-ethanol factory was rather a coincidence. Charles Albert-Peers is a close friend of the Lippens family, the founders and owners of the sugar refinery Suikergroep NV in Moerbeke[242], northeast of Ghent near the Dutch border[243]. Charles Albert-Peers' initial idea was to produce bio-ethanol from sugar. Hence, while driving from Brussels to Moerbeke, he took the R4 ring road and passed by the large grain terminals of Eurosilo in Ghent. As grain is also a possible resource for the production of bio-ethanol, Charles Albert-Peers called and arranged a meeting with the CEO of Eurosilo, Daniel Matthys. Daniel Matthys was educated as a civil engineer and started his career at PetroFina. He was involved with OleoFina and, after its sale, became responsible for the Vamo Mills factories within Vandemoortele, first in Ghent and later in France, getting to know the French biofuel industry. Eventually, he returned to Ghent and became CEO of Eurosilo in 2002. Hence, as Daniel Matthys has the experience to develop biofuels on an industrial scale, Alcogroup was convinced to register the idea and bio-ethanol concept, called Alco Bio Fuel, in 2004. Eurosilo never became a shareholder of Alco Bio Fuel, as Cargill, a 20% shareholder of Eurosilo, produces bio-ethanol primarily in the United States. Therefore, Daniel Matthys himself, rather than Eurosilo, became a member of the board of Alco Bio Fuel, while remaining CEO of Eurosilo. In this role, Daniel Matthys was responsible for the construction of the plant in 2007. In addition to Alcogroup, Vanden Avenne (14.5%), Vandema (14.5%), Aveve (10%) and Walagri (10%) became shareholders of Alco Bio Fuel. The latter two are the regional representatives of the agricultural sectors in Flanders and Wallonia, respectively. Considering that grain would be used to produce bio-ethanol, Aveve and Walagri became shareholders to ensure 'Flemish' and 'Walloon' grain would also be used at Alco Bio Fuel (AVEVE, 2006).

Second, in 2005, the Cargill seed oil plant was close to bankruptcy. As said before, Brazil and Argentina were increasingly becoming major soy producing countries; the soybeans were exported to Europe where, in Ghent for example, it was pressed to oil. However, at that time, Argentina introduced taxes on the export of soybeans, but not on oils or flour. Hence, increasingly, the soybeans were first pressed or processed in South America before being exported to the EU. Cargill Ghent, like other European soybean pressing facilities, soon started to see financial losses, as it could not compete with this import. The sudden change in the soy market was another example of the strong dependence of Europe on the import of soy and its derives. Hence, also considering the outlook of the biofuel market, Cargill Ghent decided to replace soybeans with European rapeseed and then construct a biodiesel refinery for which the rapeseed oil could be used. This eventually became a significant change in production for Cargill. While in 2005 the entire oil production went to the production of margarines and the fodder industry, today the entire oil production of Cargill Ghent goes to the production of biodiesel. In 2005, Cargill registered the idea for its biodiesel refinery as Bioro. The concept of Bioro, however, originated prior to 2005, as it is an idea of Lode Speleers, a bio-engineer educated at the Ghent University. Prior to 2005, Cargill was not interested in his idea; but due to the changing markets, Cargill thus eventually decided to register the Bioro concept. Bioro is founded as a joint venture between Cargill, Vanden Avenne and private equity and venture capital Biodiesel Holding[244].

242 The sugar refinery closed in 2007.

243 https://inventaris.onroerenderfgoed.be/erfgoedobjecten/34318

244 https://www.nieuwsblad.be/cnt/be398f0ee9c37a

During the interviews with Fons Maes[245] and Luc Malysse[246], we were informed that Cargill Ghent's initial idea to produce biodiesel based on the crushing of rapeseed was almost not realised, as it was being blocked within Cargill itself, particularly by the management in Amsterdam. Cargill is the largest privately owned company in the world; it has a hierarchical management structure based on 'regions'. Ghent; Antwerp and Amsterdam; some of the locations of Cargill in Belgium; and The Netherlands report to Cargill Schiphol, which is responsible for northwestern Europe. Subsequently, Cargill Schiphol reports to the headquarters of Cargill in Minneapolis in the United States. In 2005, Cargill Ghent, being on the brink of closure, presented its biodiesel project Bioro to the board in Amsterdam. However, Amsterdam did not approve the idea presented by the management board of Ghent, and eventually Amsterdam informed Minneapolis that Ghent should be closed. However, at that time, the Belgian Guillaume Bastiaens, originally from Westerlo, was vice president of Cargill[247]. Bastiaens started his career within Cargill in Ghent, and when the message arrived in Minneapolis that Ghent would be closed, he personally asked Amsterdam for more information. Doing so is not normal within Cargill because it has so many locations all around the world. Amsterdam replied that, in all possible scenarios, Ghent could not be saved; but according to Fons Maes, when Bastiaens asked if biodiesel production could be a possible future for the Ghent plant, Amsterdam was not able to convince the opposite. Subsequently, Bastiaens looked up who was responsible for the scenarios in Ghent and discovered that only Dutch people, and no Belgian or people from Ghent, were involved. Hence, he appointed Fons Maes from the plant in Ghent as responsible for the biodiesel scenario, and eventually Fons Maes convinced the leadership that Ghent should start crushing rapeseed and producing biodiesel according to the Bioro concept.

Because both Eurosilo (Alco Bio Fuel) and Cargill (Bioro) were relatively far along in developing their biofuel production ideas, in May 2005 the port authority of Ghent organized a local conference around biobased ideas. During the conference, Cargill and Eurosilo presented their biobased ideas to inform each other. In hindsight, this conference was an essential moment in the establishment of the biobased sector in Ghent as it is known today. Indeed, although not scheduled as a speaker, Professor Wim Soetaert, professor in biotechnology at the Ghent University[248], was present at the confernece, as well as Lode Speleers of Bioro. Wim Soetaert and Lode Speleers are friends because they were close classmates and assigned next to each other in alphabetical order during their bio-engineering (lab)studies. During the conference, Wim Soetaert, having an industrial corporate background before becoming professor (De Smet, 2017), asked the different companies and authorities (mayor Daniel Termont) if he could pitch the idea of forming and establishing a biobased lobby in Ghent, which was allowed. After pitching the idea, all relevant companies and the port and city authorities agreed to join this lobby group, led by Wim Soetaert.

Wim Soetaert wanted to establish a lobby group, as he knew that Belgium would eventually be obligated to translate the European directives into its policy. He

245 During the 2000s, Fons Maes was one of the leaders within Cargill Ghent in exploring the biodiesel possibilities, and today is the chairman of the Belgian Biodiesel Board.

246 Luc Malysse is director of Cargill Transport & Logistics.

247 http://www.vilt.be/Als_het_goed_gaat_met_de_boeren_draait_ook_Cargill

248 https://biblio.ugent.be/person/800000027562

knew that Belgium was working on a so-called 'quota' system for the production of biofuels. The Netherlands chose a system that obliged oil trading companies such as BP or Shell to blend their fuels with biofuel. The quota would be distributed by tender, hence interested companies had to convince the governments of their business case, therefore the importance to deliver a clear long term message, which eventually became formulated within the lobby as 'biobased valley Ghent'. To formalize this lobby group, the Ghent Biobased Economy Valley (GBEV) consortium was established. The consortium became based in the Ghent University within the faculty of bio-engineering.

Initially the quota was to be distributed in 2005, however, this was delayed, which was almost fatal for Cargill Ghent, as explained by professor Wim Soetaert during our interview. The quotas were delayed because of the rather specific institutional structure in Belgium (N.N., 2007a). In Belgium, finances are a responsibility of the federal government – at that time, the ministry of Didier Reynders, a liberal politician part of the Walloon MR[249] party. While the financial agreement of the quota was the responsibility of the federal government, the allocation of the quota, was the responsibility of the Flemish government and the Walloon government. While Flanders, primarily Ghent, was ready to hand in their tender to obtain the quota, Wallonia was not. Hence, as Didier Reynders could only get votes from Wallonia, he slowed down the quota process until Wallonia was ready, frustrating the project in Ghent (VILT, 2007). Eventually, in 2007, two years in delay, Wallonia was also ready with their plan, called 'Biowanze'. Biowanze intended to produce bio-ethanol based on grains and sugar beets. Biowanze is located at the sugar refinery in Wanze. Next to Tienen, in Flanders, Wanze, along the river Meuse, hosts one of the two largest sugar refineries in Belgium, known as 'Tiense Suikerraffinaderij' and 'Sucre Tirlemont' in Flanders and Wallonia respectively. Today the company is part of the German multinational Südzucker, the largest sugar producers in Europe. At the moment, Biowanze produces around 300,000 cubic metres bio-ethanol per year, based on grains and sugar beets (VILT, 2017).

Thus, in 2007, the quota was distributed with a validation until 2013 (Vandermeulen et al., 2010, p. 45). Of the 10 candidates to produce bio-ethanol, three were selected: Biowanze (Wanze), Alco Bio Fuel (Ghent) and Tate&Lyle (Aalst). Four companies were selected to produce biodiesel: Proviron (Ostend), Bioro (Ghent), Neochim (Feluy) and Oleon (Ghent)[250]. The lobby goal of GBEV thus was successful, especially if the quota is expressed in volumes. In this case, 90% in Flanders was assigned to GBEV (De Bousies, 2008).

Oleon, which originated from OleoFina like Cargill Ghent, is part of this list. In 2005, Oleon had no plans to produce biofuels and hence was not present at the conference in Ghent and did not became a member of GBEV. However, as Oleon is located just on the other side of the canal from Cargill and Eurosilo, its leaders closely followed the debate; in 2007, once it was clear the quota would be distributed, they became part of GBEV and were successful in their attempt. Oleon, producing vegetable fat oils, could relatively easily add biodiesel production. In 2008 and 2009, Oleon, Bioro and Alco Bio Fuel became operational (De Bousies, 2008). Today, the quota no longer

249 Mouvement Réformateur

250 Neochim, Proviron and Tate & Lyle do not exist anymore.

exists and has been replaced by the obligation to blend fossil fuels with biofuels (Federale Overheid België, 2013)[251].

As we will explain in the following paragraphs, the allocation of the biofuel quota to GBEV was the start of the upcoming of the biobased sector in Ghent. However, what this brief historical overview shows is that not only the upcoming of the GBEV explains why today we see a rather successful biobased sector in Ghent and for example not in Antwerp as Antwerp is the main petrochemical cluster in Belgium. In hindsight, the 'real' reason, or at least one of the most important ones, that the biobased sector is located in Ghent today and not in Antwerp, for example, goes much further back in history, to when the grain-trading families were 'not well-treated' in Antwerp and wanted to be closer to their customers in West-Flanders, so they moved to Ghent. Building further on the industrialization and globalization of the fodder and food industry around Roeselare-Kortrijk, in the port of Ghent, the closest maritime port, new production processes were increasingly introduced, from the import of soy, the crushing of oil seed and producing fatty oils to biofuels today. Hence, the biobased sector in Ghent is relatively diverse, as it produces not only biofuels but also biochemicals and biomaterials, and is an important international biobased R&D region. All of this will be explained in the next paragraphs.

5.5.2 Structural couplings

(a) Industrial regulation

In the previous chapter, in paragraph 4.4.2, we explained that the biobased sector is rather difficult to perceive as a regular sector, and could be better understood as a biobased economy that produces bio-energy, and –materials. Second, we explained that there are three generations of biofuels, depending on the type of biomass used. While Amsterdam is second-generation, Ghent remains first-generation today. Next, we explained that there is a misalignment within Europe between the international market of the product and the local or national rules, creating a grey zone of prices that the large multinationals primarily use to increase their trading profits (Mijnheer, 2015).

At the moment, Europe favours the second-generation above the first-generation, changing the obliged blending quota. However, we also explained that, although the idea of waste as fuel is essentially legitimate, the definition of used cooking oils, for example, could be stretched so far that it almost comes to mean just cooking oils. Moreover, the local/regional feedstock, for example in The Netherlands, is by far not enough to supply the industry, forcing used cooking oils to be shipped all over the world, and questioning once more the 'environmental advantage' (Mijnheer, 2015).

Important to note is that today the biobased sector in Ghent does not receive any financial subsidies anymore, and thus has to compete on production prices with other biofuel producing companies. This change from national support to a competing market happened all over Europe around 2010 to 2015. This is the reason many biofuel companies stopped producing during this time, as they could not

251 https://www.milieurapport.be/sectoren/energieproductie/sectorkenmerken/productie-biobrandstoffen-voor-eindgebruikers

offer a price low enough without support. In Belgium, this is Proviron, Neochim and Tate&Lyle. The exception is Ghent, which can compete still today, as it is able to offer lower prices thanks to its integrated production process. This also explains why Ghent remains the most important biodiesel producing unit within the group of Cargill. Prior to 2008, Cargill did not produce biodiesel anywhere, hence Ghent was the first one. In the following years, Cargill opened several other biodiesel units in Europe, such as Germany and France, following the national financial support programs there; but in the meantime, when the support stopped, almost all these units were closed again. Today, Cargill produces only biodiesel in Ghent and Frankfurt. This also explains why the biodiesel trading unit of Cargill, even though its main trading locations are Genève and Amsterdam, is located in Ghent, as Ghent has the most experience in the biodiesel market. Until today, the biodiesel that is produced in Ghent is traded and transported primarily to Western Europe.

(b) The industrial setting

The biobased sector in Ghent is of first-generation. Two types of bio-refineries belong to this generation. First, there is the whole crop bio-refinery that processes grain into a range of products. On one hand, the oils (Cargill) are used to produce biodiesel (Bioro). On the other hand, grains can be used to produce bioethanol (Alco Bio Fuel). While producing ethanol (and also bio-gas, as we will see further,) these refineries can also produce starch from grain, which can eventually be used to produce bio-plastic. Today, the production of bio-plastic is not yet present in Ghent. Second, an oleo-chemical refinery combines the production of vegetable and animal oils and fats with the production of biodiesel (Oleon).

While today there is no production of bio-products based on the second- or third generation in Ghent, Ghent is developing the production of biofuels and biomaterials based on residual CO2. Let us call this a ‘special’ version of the second-generation, as the CO2 can be seen in this case as a waste product similar to used cooking oils. Still today, the residual CO2 – in this case coming from steel mill ArcelorMittal – is released into the air or burned and converted within Electrabel Knippegroen into electricity. However, the CO2 can also be fermented into ethanol or naphtha by using micro-organisms, which in turn becomes a possible input resource for the transport and chemical industry. This process is better known as ‘carbon capture and utilisation’. In February 2018, the Biobased Pilot Plant Ghent announced an investment of 9 million euros to build an R&D demonstration plant for gas fermentation (De Mare, 2018).

5.5.3 Strategic couplings

In this paragraph, we describe the effects of the strategic couplings. It is important to stress that we are observing these all together. While the description of the strategic coupling effects inevitably follows a historical perspective in explaining why an effect exists (for example, why company A sells a product to company B), there is a difference with our step 2, which traces back the lines in detail to discover why and how the strategic effect came into existence. This will be done in paragraph 5.5.5.

The description of the strategic coupling effects is structured along the six different relations taken into consideration (Table 3.1). Each have their own extent (thematic + spatial boundary), their own structure and their own hierarchy. Taking these together will eventually give us a detailed view of the biobased sector in Ghent. The visualization of the relational geometry of the biobased port city interface is presented in the next paragraph 5.5.4.

(a) Input/Output

The origin of the 'first-generation' biobased sector in Ghent, as it is known today, goes back to the arrival of the grain terminals and then the oil seed crushing sector of Vamo Mills when Vandemoortele took over the food section of OleoFina and constructed a crushing plant in 1979 to 1980. This crushing unit was built next to the grain terminal of Eurosilo, from where the soybeans were coming, and next to the terminals of Oiltanking, where tanks were built in a joint venture to store the vegetable oil. Today, this is still the basis of the biobased sector in Ghent, however it has changed and expanded significantly. First, from Eurosilo to Cargill, rapeseeds rather than soybeans are transferred. After being crushed, this oil is no longer stored at Oiltanking, but delivered to Bioro, where it is processed into biodiesel. This biodiesel is then stored at Oiltanking. Second, wheat is transferred from Eurosilo to Alco Bio Fuel, where it is processed to bio-ethanol, protein-rich feed DDGS (which is stored at Eurosilo) and liquid CO2. The latter was added to Alco Bio Fuel in 2015. As informed by Daniel Matthys (Eurosilo), from the beginning in 2008, the residual CO2 was already being seen as a potential product. Hence, eventually in 2013, together with Vanden Avenne, a joint venture called Green-CO2 was established with the industrial ice factory Strombeek (Meise) and gas factory Messer (Zwijndrecht) to produce liquid CO2.

In addition to the cluster at Rodenhuize, Oleon also started to produce bio-products in 2008. For this, it constructed its biodiesel plant next to its factory in Ghent, to where it transports its crude rapeseed oil, and from which the glycerine and biodiesel is transported back (Oleon, 2017).

Next to Rodenhuize and Oleon, arguably a third biobased production exists in Ghent, namely the production of bio-electricity at the Electrabel electricity plant Max Green. Located just south of Rodenhuize and next to the Bio Base Europe Pilot Plant, Max Green was originally a joint-venture in 2009 between Electrabel and investment holding group Ackermans & van Haaren, but fully owned by Electrabel. Max Green was converted from the former thermal electricity plant Rodenhuize, built during the 1960s in support of the expanding industry along the canal Ghent-Terneuzen. This former plant Rodenhuize produced electricity in four different units, from which it could produce electricity using coal, petroleum (later natural gas) and the residual emission gases from Sidmar. A significant amount of the produced electricity then went back to Sidmar. During the beginning of the 2000s, Electrabel started testing whether Rodenhuize could be transferred to a biomass electricity plant; eventually in 2009, the Max Green construction started, and by 2011 the entirety of its electricity production was based on the usage of wood pellets. Knippegroen replaced the conversion of emission gases of Arcelor-Mittal to electricity. However, if problems occur with Knippegroen, it is still possible for the residual gases to be transported to Max Green and converted to electricity.

The wood pellets are imported from Canada and the United States of America and stored at the Ghent Coal Terminal, just south of Max Green, from where it is transported by a conveyor belt (Electrabel, 2009).

(b) Energetic

No relevant energetic relations were found. The energy from Max Green is put on the electricity grid and not sold to particular companies directly (Electrabel, 2009). Next, there are existing internal energetic relations. For example, Alco Bio Fuel has a heat-recovery steam generator, by which it converts the residual heat to electricity that it can use for its own plant again[252]. Oleon has a similar unit (Van Dyck, 2009).

(c) R&D

An extensive R&D network exists within the biobased sector in Ghent. The historical and defining coupling mechanisms explaining this network today will be explained in paragraph 5.5.5. The R&D network today is centred on Flanders Biobased Valley (FBBV), the successor of GBEV. While in the beginning GBEV was solely a lobbying consortium, today it is also an R&D centre[253]. In this R&D network, its Bio Base Europe Pilot Plant is especially essential. The Biobased Pilot Plant is located next to Rodenhuize and Max Green, in a former fire department building. Within this pilot plant, companies and other research centres can use the installation and laboratories to conduct fundamental research or to test experimental technologies. As such, the pilot plant covers a large part of the financial risk a company would otherwise have to take, or ultimately would not take, to conduct research. Second, the FBBV also has a biobased training centre located in Terneuzen, in The Netherlands.

Since its establishment in 2012, the Bio Base Europe Pilot Plant has received companies from all over the world, but also still works together, on continuing or occasional basis, with the biobased companies in Ghent. Hence, the FBBV today is, in addtion to a lobbying and meeting group, also a centre through which companies (can) work together on research and development. However, from the beginning, the R&D network, and thus the consortium, also connects companies that do not produce biobased products as such. For example, Stora Enso, the large paper factory in Ghent, is part of the network; as well as Constructiewerkhuizen Van Wingen, a company producing large heat exchange installations; and Grontmij (cf. Sweco), a large international engineering company. On the other hand, research centres with less focus on biobased products as such are also part of FBBV. For example, since 1995 the internationally known public Flemish Institute of Biotechnology (VIB) has been located at the Zwijnaarde Science Park in Ghent, among other locations near other Belgian universities. The VIB conducts research primarily on molecular processes (e.g. genetics) and not directly on the production of biobased products. However, the VIB has a division in Ghent called Institute of Plant Biotechnology Outreach, which conducts research with a potential application for the so-called ‘third-generation’ bio-economy. This division is therefore closely linked to FBBV.

252 https://www.waterleau.com/en/references/combined-heat-and-power-plant-alco-bio-fuel-1
253 If an update of the FBBV network is needed, see http://www.fbbv.be/en

(d) Services

During our research we did not find any relevant ‘first grade’ service relations within the biobased sector.

(e) Membership

The biobased sector, as it is known today, would not have been possible without the establishment of the first GBEV, now FBBV consortium, uniting all interested biobased companies and authorities in Ghent[254]. Except for Oleon, it is not the ‘main’ companies that are part of FBBV (e.g. Cargill, Eurosilo, Vanden Avenne), but rather their newly created entities, such as Bioro or Alco Bio Fuel. Other members are Oiltanking Ghent, the energy company Electrabel, the Ghent-based logistical multinational Sea-Invest, the paper factory Stora Enso, the yeast plant Genencor in Bruges, the venture capital and equity fund Capricorn, the engineering company Grontmij and the Ghent-based Organic Waste Systems, an engineering company specialized in fermentation processes.

(f) Shareholder

The shareholder relations of the biobased sector show that not just one or a few companies own the entire biobased sector, as in Amsterdam, for example. In contrast, arguably no one company is so important that its decisions are crucial for the biobased sector in comparison with Simadan Amsterdam. Arguably, Cargill is the most powerful company, according to its resources; but Cargill does not control Rodenhuize on its own as it for all its nodes has a collaboration with other local partners, in the first place with Vanden Avenne. Other ‘locals’, understood as having its decision centre, or at least its regional decision centre if part of a multinational, in Flanders or Belgium in contrast to Cargill, are Vandema, Eurosilo, Biodiesel holding, Aveve, Walagri, Oleon and Electrabel and Alcogroup. There is, however, a difference between the Rodenhuize cluster and the biobased production of Oleon and Max Green, the latter two being owned and controlled by only one company, Oleon and Electrabel, respectively.

Financially, FBBV’s partners are the PA Ghent, the city of Ghent, the Development Agency of the province of East-Flanders (POM[255]), and the Ghent University, since FBBV is located within the Faculty of Bioengineering.

The FBBV, in turn, owns the Bio Base Europe Pilot Plant and BioPark Terneuzen; however, the latter two largely operate and are perceived as independent institutions. As informed by Professor Wim Soetaert during the interview, this independent character is, according to him, the sole reason for the success of the pilot plant in Ghent. As he informed us, and as shown by our relational geometries of the biobased sectors in Amsterdam and Ghent, this independence is the main difference between the pilot plants in Ghent and Delft, and hence the main reason for its success. Moreover, he informed us that even Dutch- and Delft-based companies come to Ghent to perform their research, as the pilot plant in Delft is at least perceived as being owned by DSM, a competitor for many.

254 If an update of the FBBV network is needed, see http://www.fbbv.be/en

255 Provinciale Ontwikkelingsmaatschappij

5.5.4 Step 1: The relational geometry

In the last two paragraphs, we first identified the different structural couplings of the steel manufacturing sector, namely the industrial regulation and the industrial setting. These two taught us how the sector distinguished itself from others regarding the regulation and the technology applied. Next, we focussed on the strategic couplings. We identified the relevant actors and their different relations. The data was added to a database model, which is able to combine the topographical data with the topological data. Eventually, we were able to visualize the relational geometry of the biobased sector in Ghent as shown Figure 5.13.

First, the relational geometry shows that, in production terms, three main production processes exist in Ghent: Rodenhuize, Max Green and Oleon. Of these three, Rodenhuize is clearly an integrated cluster, in which several companies work together, sharing their input and output products. Taking one step back again, the relational geometry shows that the biobased sector in Ghent is the result of a combination of several types of relations. In other words, it not only consists of input/output relations, but also of R&D, membership and shareholder relations. Altogether, an as shown by the relational geometry, these different networks together result in a strong embeddedness of the biobased sector in the region of Ghent, primarily in the port of Ghent and the city of Ghent.

Despite the input/output and shareholder relations, the R&D and membership network shows that the focal point of the biobased sector in Ghent is FBBV, led by Professor Wim Soetaert. While the FBBV as such is more focussed on the lobbying and consortium network relations, through its pilot plant and training centre, it also directs the R&D relations within the biobased sector of Ghent and Terneuzen.

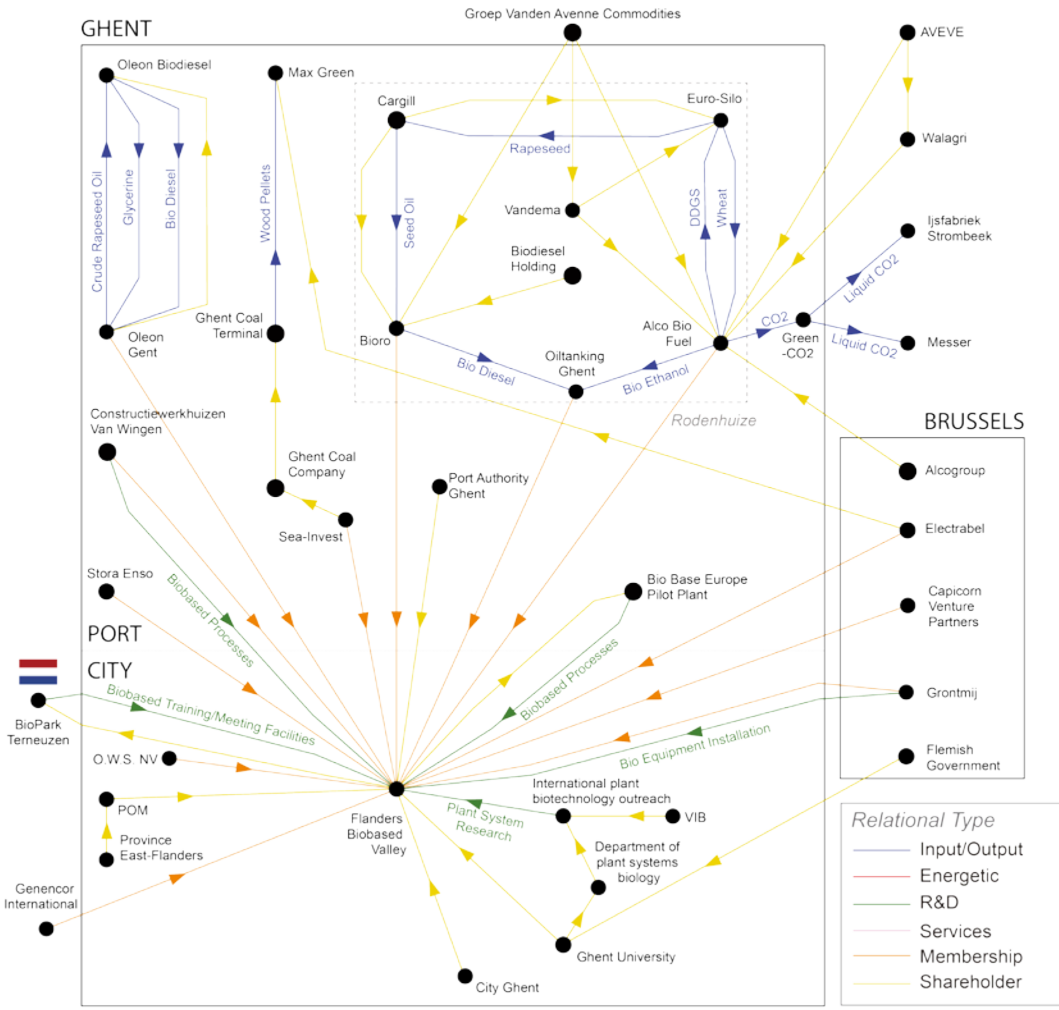


Figure 5.13 The relational geometry of the biobased sector in Ghent (Van den Berghe et al., 2018)

5.5.5 STEP 2: The coupling mechanisms

In the previous paragraph, we presented and explained the visualization of relational geometry of the biobased sector in Ghent according our methodology. This relational geometry is, however, no more than the current crystallization at analytical time ‘zero’. It thus does not explain why we see this relational geometry. It is only the first step, making it possible to identify the ‘identifying causal mechanisms’ that are at work (Somers, 1994; Sunley, 2008). In other words, using the visualization of the relational geometry, we can go deeper to trace back the lines uncovering the causal mechanisms.

Our starting point is the conference in Ghent in May 2005, during which there was an agreement to jointly create the lobbying group Ghent Biobased Economy Valley (GBEV). We take this moment as the starting point because, prior to this moment, no more than scattered biobased ideas existed. Eventually, the GBEV obtained the biobased quota, hence from 2009/2010, the production of biobased products started. The GBEV thus made possible that the structural coupling between the grain sector, the oil crushing sector and the (fossil) fuel sector occurred. This coupling can be seen as structural because it entails the creation of a new system (the biobased sector) comprising two or more other systems, while the resulting overarching biobased sector cannot simply be reduced to the properties of the constituent subsystems (Bhaskar, 2008 [1975]; de Haan, 2006). Indeed, as already explained a few times, the biobased sector is relatively hard to define as a sec sector, as it comprises many products and production processes. Hence, the structural coupling of the biobased sector between, for example, the grain sector and the (fossil) fuel sector does not imply that these two stop existing, but implies that they have become part of what we today label as the biobased sector. Hence, the overarching biobased effect cannot simply be reduced to the properties of the constituent subsystems.

If one implies to trace back the lines, one will quickly experience a background of a polyphony of voices, structure and agency and a diverse mix of details, blurring the causal mechanisms. By explaining the different explained structural couplings in Ghent, we already narrowed it down. Indeed, it would not be possible to explain the biobased sector in Ghent today without understanding the reasons Ghent is Europe’s largest grain port, a consequence of the expansion of the sea-lock in Terneuzen in the 1960s. Building further on this, the oil seed industry came up as the main reason the GBEV had any chance to form a biobased lobby group, eventually obtaining 90% of the Flemish quota.

From 2005, we will reconstruct how the biobased sector in Ghent was established and the trajectory of the causal coupling mechanisms. Hereby, we relied not only on desktop research, but also on information retrieved through interviews. This is necessary because the researcher was not directly involved. Therefore, by relying on the visualization of the relational geometry, we selected a group of interviewees used to gain insights in the particular case and give us information we did not find during our first step or to confirm our resulting relational geometry. We trace back the causal coupling mechanisms for the biobased sector because the growth of the sector, in comparison with the steel manufacturing and car manufacturing sectors, is relatively recent and information can still be retrieved from actors directly involved from the beginning. Hence, in Table 5.7 we present the list of interviewees and their 'memory'.

Ghent		
Name	**Main task/role**	**Date**
City of Ghent (Lieven Tusschans) – since 1990	Economy department	19/01/2017
Cargill Ghent / Bioro Ghent (Luc Malysse) – since 1989	Biodiesel production	02/08/2017
Eurosilo Ghent / Alco Bio Fuel (Daniel Matthys) – since 1976	Bio-ethanol production / Grain storage	17/08/2017
Oiltanking Ghent (Director Koen Van Kerkhove) – since 1986	(bio)fuels storage	21/08/2017
Professor Wim Soetaert – since 2004	Ghent University, FBBV	07/09/2017
Port Authority of Ghent (Director Daan Schalck) – since 2009	Landlord	01/09/2017
Cargill - since 1967 / Belgian Biodiesel Board – since 2007 (Fons Maes)	Engineer-Manager / Chairman	05/09/2017

Table 5.7 List of interviews conducted in Ghent concerning the bio-based sector

As shown by the relational geometry, we needed to first interview FBBV, particuar-lyProfessor Wim Soetaert, as well as the two main industrial actors within the Rodenhuize cluster, Cargill and Eurosilo, due to their involvement with Bioro and Alco Bio Fuel. For Cargill, we interviewed Luc Malysse, who is director of Cargill Transport & Logistics and has been present in Cargill since 1989, and Fons Maes. Fons Maes started working at Cargill in 1967 and was the main person responsible for assessing the biodiesel scenario to save the Ghent plant from bankruptcy during the beginning of the 2000s. Fons Maes is currently the chairman of the Belgian Biodiesel Board. Next, we conducted interviews to check if our understanding was correct. To check our understanding of the industrial and logistical processes of the Rodenhuize cluster, we interviewed Koen Van Kerkhove, director of Oiltanking Ghent. To understand the policy of the port and city of Ghent according the biobased cluster, we interviewed Lieven Tusschans during a roundtable workshop with the department of economy, and we interviewed Daan Schalck, CEO of the former port of Ghent and today of the North Sea Port authority.

Based on the information retrieved through these interviews in our step 2, together with our desktop research and visualization of step 1, we were able to reconstruct the trajectory of relevant coupling mechanisms as presented in Figure 5.14 according our analytical framework (see Figure 2.2).

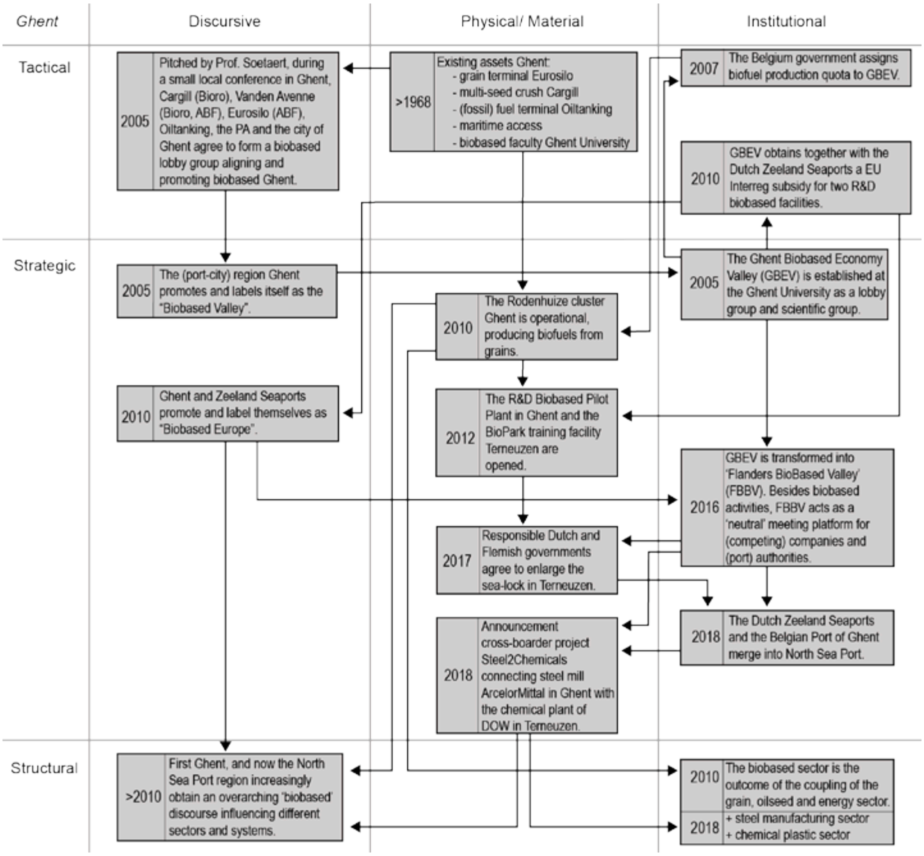


Figure 5.14 The coupling mechanism trajectory explaining the current relational geometries of the bio-based sector in Ghent (adapted from Van den Berghe et al. (2018))

Although we set the starting point of the biobased sector in Ghent in 2005, we added, similar to Amsterdam, the main prior step of 2005, namely 1968 in this case, the year since when the grain sector and oil sector came important in Ghent. In this sense, the growth of the biobased sector in Ghent is, on some level, not surprising, as it was the case in Amsterdam. Much earlier than 2005, important personal and industrial relations were formed between companies, university professors and authorities. In our brief historical perspective, we tried to give an idea of the situation that existed prior to 2005, from OleoFina to Vandemoortele.

While we already briefly explained that two initially separated ideas existed to develop biofuels in Ghent – on one hand, the bio-ethanol at Eurosilo and, on the other hand, bio-diesel at Cargill – during the interview with Fons Maes, we were informed in much more detail why Cargill Ghent eventually established the JV Bioro to produce biodiesel and why it, through Bioro, became part of the GBEV group of Wim Soetaert. The interview taught us is that there is a fundamental difference between Eurosilo and Cargill. While for Eurosilo the production of bio-ethanol, and in the meantime bio-gas, could be seen as an economic opportunity to expand its existing operations, for Cargill Ghent the production of biodiesel was the only option to save the plant from closure. However, while the idea to produce biodiesel at the plant of Cargill made good economic sense, it almost did not happen:

What I have learned during my long career at Cargill [cf. 40 years] is that if you want to understand how the economy or economic networks evolve, you have to not only take into account the economic parameters, but also, and maybe even more so, the personal parameters. As you know, Amsterdam is the headquarters for Ghent. Most directors are Dutch. But also within Cargill worldwide, The Netherlands positioned many Dutch managers. This is the main reason Cargill Ghent could not build out its biodiesel activities, and thus was almost closed. I followed the biodiesel market in Belgium for a long time. Thus I knew that in the near future Belgium and Flanders would put a tender out for the production of biofuels. At that moment, our crush unit working on soybeans was making huge losses and, around 2004/2005, the letter was typed that would eventually be handed over to the labour unions declaring the plant would be closed. However, you have to know that I had already suggested to my boss in Amsterdam three times that the Cargill crusher could be saved and made profitable again if Cargill would focus on biodiesel. However, my ideas were ignored every time, and I was even told to 'shut up'. After a while, I understood why the biodiesel idea Ghent was countered so strongly by Amsterdam. The board in Amsterdam, with only Dutch people, preferred that, if Cargill were to create a biodiesel unit, it should happen in Rotterdam rather than in Ghent. Thus, although I could very clearly show that Cargill Ghent could easily be saved in economic terms, the board in Amsterdam did not want to hear it because of the personal/national backgrounds. (interview Fons Maes)

Eventually, the letter declaring that the Ghent plant would be closed was sent to the Cargill HQ in Minneapolis. There, Bastiaens – the vice president at the time, and a Belgian – saw it in passing. After he asked if all possible scenarios for Ghent were assessed and was not convinced, he obliged Amsterdam to re-assess the biodiesel scenario for Ghent and required that a Belgian be put in charge, which became Fons Maes. Eventually, Fons Maes was indeed given the permission to work out the biodiesel project in Ghent by the Amsterdam board. However, soon the next problem appeared.

First, I went to the minister of finances, Bruno Tobback, who was responsible for working out the quota system. However, when I informed him that Cargill was planning to build a biodiesel unit in Ghent using these quotas, he was not enthusiastic. The idea that 'Belgian money' would flow to America was a no-go. Therefore, I informed my boss that Cargill would not be able to build out the biodiesel alone, which at first was received by laughter, as the idea was that 'we are Cargill, we can do anything alone!'. Eventually I convinced them, and I proposed working together with Lode Speleers. I knew Lode Speleers had worked out the idea for a biodiesel plant on his own, and that he was involved with the development of the quota system. I met him and I have to say that it was a match made in heaven. On the one side, his economic idea was not good. We knew that 'his plant' would never be profitable. On the other hand, his knowledge of the legal and political system was incredible, just the information we needed so much. We also invited Xavier Vanden Avenne, with whom we had already worked in Eurosilo for a long time. Eventually, we decided that we three would establish the biodiesel idea as the joint-venture Bioro. I have to say that this was a 'bullseye'.

> *Everybody was enthusiastic: on the one side, all economic partners, because the possible profits were proven; and on the other side, all political levels (city, port, Flanders, Belgium) because it was a Flemish-based company that would produce biodiesel, and to which the quota would flow. However, although Ghent was the most enthusiastic, note also that we checked whether Antwerp was an option. I had a meeting with the CEO of the port authority of Antwerp, Eddy Bruyninckx, but he laughed the idea away[256]. Ghent was much more willing to support the idea. Hence, all partners in Ghent were lined up. Subsequently, as everything must within Cargill, the project moved 'up' to Minneapolis for final authorization. As Bastiaens was still involved personally, I booked a meeting in Chicago between Bastiaens and the Belgian prime minister and Ghentian, Guy Verhofstadt. Bastiaens informed Verhofstadt that Cargill was willing to invest in Belgium if Belgium would soon work out the quota system. (interview Fons Maes)*

Eurosilo at the same, as well as Oleon, developed a project to move towards the production of biofuels in light of the quota, just like Cargill.

> *Everyone who had something to do with grains or oils at that time (2003/2004) developed an idea for the production of biofuels, including us (Eurosilo), Cargill and Oleon. (interview Daniel Matthys)*

However, it was exactly the quota system in Belgium that created another problematic procedure. During all the interviews, it was clear that Professor Wim Soetaert played a key role. Indeed, Professor Wim Soetaert managed to *tactical discursively* couple the relevant partners and governments in light of the biobased sector in Ghent during the conference in the city centre of Ghent in May 2005. In other words, they approved the idea that Ghent would collectively come out as biobased.

This idea became a *strategic discursive* coupling, and in 2005 the city of Ghent, the port of Ghent and the different companies started to label themselves as a 'biobased valley'. The difference with Amsterdam is that this strategic idea also became *strategic institutionally* coupled as the Ghent Biobased Economy Valley (GBEV), causing the 'biobased idea', and thus GBEV, to became an actor on itself.

Initially, the GBEV had one main task, i.e. lobbying for the quota. GBEV eventually succeeded in doing so when a *tactical institutional coupling* occurred, in which 90% of the Flemish quota was assigned to Ghent in 2007. Construction could start and in 2010 the biofuel production at the Rodenhuize dock, as well as at Oleon, could start. Hence, once the production started, two new couplings occurred. On one hand, a *strategic physical/material coupling* occurred between several companies, making it possible to produce new bio-products next to the existing production. On the other hand, from this moment one can state that the biobased sector effectively was established as a *structural institutional coupling* between the grain and oil seed crushing sector and the fossil fuel sector. In other words, in 2010 the biobased sector became an overarching system of several subsystems, initially the grain and fossil fuel sectors.

256 See also interview of Wim Soetaert in Engineernet.be&nl (De Smet, 2017)

At the same time, around 2010, another important coupling line developed itself out of GBEV. Indeed, GBEV was founded by Professor Wim Soetaert to not only negotiate the quota or to make sure that the 'biobased image' of Ghent would succeed, but also to make sure that a biobased R&D network would come up simultaneously. From the beginning, the GBEV had three main goals: (i) cluster formation by building synergies between industrial partners, (ii) sensitize the public, for which GBEV opened an information kiosk during the 10-day summer city festival 'Gentse Feesten' and during the annual Belgian Motor Show in 2007, for example (De Troch, 2008), and (iii) foster technological innovation by building R&D expertise in the field of bio-energy and the biobased economy (Anthonis, 2012). In an interview with Engineeringnet.be&nl, professor Wim Soetaert explained how important the establishment of the R&D expertise is (De Smet, 2017):

> *Because I have more than 10 years' experience within the industry, I know how important it is to test the economic viability of new ideas and technologies before they can be scaled up. However, many companies cannot or will not put a lot of effort and money in these test phases and will primarily focus on economy-proven technologies. Therefore, this risk part has to be covered by the public government. Hence, in 2009, I was frustrated that such a pilot plant did not exist in Ghent. (interview with Wim Soetaert and De Smet (2017))*

A decade earlier, Wim Soetaert explained why research is so important for the biobased sector (Buys, 2007).

> *You know, in my opinion the second-generation is, of course, better than the first-generation; but believe me, the technologies, and certainly the market to facilitate the second-generation on an industrial scale, do not exist yet. Moreover, much of the R&D we conducted and are still conducting for the first-generation is necessary to eventually find technologies for the second-generation. You first need to walk before you can run. (Interview with Wim Soetaert and Buys (2007))*

Eventually, the GBEV succeeded in creating a *tactical institutional couple* in 2009/2010 with Europe to obtain a European Interreg project of 21 million euros to establish a biobased pilot plant. As a requirement, Interreg can only be acquired if the project is presented in collaboration with another European region. GBEV chose to work with the Dutch province of Zeeland, in particular with Terneuzen, which is the neighbouring region and port of the port-city region of Ghent. Hence, next to the pilot plant, called Bio Base Europe Pilot Plant, a training and meeting facility was also established in Terneuzen, called BioPark Terneuzen. Eventually, in 2012, the pilot plant and the training centre were opened and became a *strategic physical/material coupling*.

Before we continue our line of coupling mechanisms, first we want to explain the role of the pilot plant a bit more. From the start, the pilot plant was very successful. In only five years, about 200 projects were conducted by firms from all around the world at the pilot plant, enabling it to scale up by 30% every year (De Smet, 2017). Moreover, in February 2018 it was announced that the pilot plant received a subsidy of 9 million euros to build out its gas fermentation units (De Mare, 2018). This technology could arguably be labelled as part of the second-generation biofuel.

Professor Wim Soetaert explained the reason the pilot plant was so successful, especially in comparison with its Delft competitor, during the interview[257]:

> *The main difference between the pilot plant in Ghent and Delft is that we in Ghent succeeded in sticking to our independent character. You have to know this is enormously important within the biobased sector that is in full R&D development. A company takes huge risks to invest in R&D, and finding a new or improved technology is like looking for a needle in a haystack. You do not want another one to find it first, even though you did all the work. However, R&D still has to be done, and many companies cannot do it on their own; they need collaborations[258], for example within a pilot plant offering the needed infrastructure to third parties. Such collaborations can only be successful if they happen within a 'trusted' environment. Therefore, I always underlined that the biobased plant has to be as independent as possible. Even the influence of the university or port authority has to be limited to some level. At any moment, a pilot plant has to act as a 'haven' of '(biobased-)trust'. The slightest indication that a company, being public or private, has something to say or has more influence than other companies within a pilot plant – for example, through the shareholder relations at DSM Delft – can discourage companies from doing their R&D within a pilot plant. In this case, three options exist, or they go to another pilot plant: we do receive a significant amount of Dutch companies doing their R&D research in Ghent instead of Delft, or they invest and do their R&D research themselves – but this hold enormous financial risks, or they do not conduct the R&D after all and only 'buy in' or deploy proven technology. The latter option is, in this case, the most plausible. (interview: Professor Wim Soetaert)*

Indeed, during the interview with Fons Maes, it was confirmed that the pilot plant was not only essential during the first years of the biobased cluster in Ghent, but also for its future.

> *Today the biobased sector is changing fast. The quota system ended and the sector stabilized. Of the initial four producers, only two are still operative, both in Ghent. This thus proves that we are economically profitable. However, the political landscape is also changing. I always say that 10 years ago, our biggest supporters were the green political parties. However, today they are our main 'enemies'. Let me be clear, I am not against the second-generation biofuels, but neither the technology nor the feedstock are ready to scale up and replace the first-generation biofuels market and industry. However, politicians are increasingly pushing towards more second-generation blending regulations. Do you know who is in fact behind this lobby? Kraft and Unilever. There is no 'food-versus-fuel' debate, as*

257 Note: this quote was also used in paragraph 4.4.5

258 Illustrative for this is the HIsarna technology developed in Ijmuiden by TATA Steel, but in collaboration with its main competitors such as ThyssenKrupp and ArcelorMittal. This illustrates that even large TNCs need collaborations.

presented in the public opinion. Instead, there is a battle going on for the feedstock. Unilever and Kraft's main feedstock is grain. Hence, if grains are used for the production of first-generation fuels, even if it is only for a small part, prices go up, hence Kraft and Unilever's profits are smaller, and hence their lobby to push for more second-generation fuels. Moreover, in this case, their food waste becomes a resource[259]; hence you see the reason for their strong lobby for second-generation biofuels. (interview Fons Maes)

And indeed, as we explained, the industrial regulation of the biobased sector in Europe is increasingly favouring second-generation fuels, also eventually changing the situation for Ghent.

Therefore, again, this shows how important the presence of the pilot plant is in Ghent. We as Cargill Ghent hope that the pilot plant will come up with new technologies to improve the production of second-generation fuels. Until now, we only can rely on market-proven technologies like, for example, the conversion of used cooking oils. For your information, at the moment, we have started the procedure to also develop such a unit in Ghent. However, on the long term, this is not ideal, as the feedstock is a difficult aspect. Therefore, Cargill Ghent has already secured its feedstock sources of waste and used cooking oils (interview Fons Maes)

Indeed, as explained to us by Daniel Matthys, although second-generation biofuel seems logical 'on paper', it is rather questionable if it is really as 'environmental' as it is labelled:

Using used cooking oils? I have strong remarks. Of course, the idea is good, but what will happen? First, used cooking oils will be collected after using them, let's say, six times. However, prices will rise and soon there will be not enough used cooking oils. Hence, two options exist: alternatively, they start to import used cooking oils from all over the world, or the definition of 'used cooking oils' will change. Deals will be made with McDonalds, for example, to refresh their oils after three uses, and eventually even after just one use. The cooking oils will still be 'used', you see, but this of course does not rhymes with the 'environmental idea' of the second-generation that is now increasingly being favoured above the 'less environmental' first generation. (interview: Daniel Matthys)[260]

Thus, since 2012, the biobased cluster in Ghent is not only a strategic physical/material industrial cluster, but it is also a strategic physical/material R&D network. Although the production of biofuels of the second-generation has not yet started in Ghent like it has in Amsterdam, most likely this production will start in the near future. The question is what 'profile' this second-generation will get. Indeed, although regulations are increasingly making the second-generation more economically profitable, our research shows that questions can indeed be raised on whether the second-generation will ever be profitable without governmental financial

259 As shown by the relational geometry of the biobased sector in Amsterdam
260 As explained in previous chapter, this remark about used cooking oils is indeed applicable for the second-generation cluster of biofuels in Amsterdam (Mijnheer, 2016).

support systems, as the first-generation has become. This does not imply that the second-generation should be ignored and, as informed by Fons Maes, Cargill/Bioro will construct a new unit to process used cooking oils to biofuels. However, as informed by Professor Wim Soetaert and Koen Van Kerkhove of Oiltanking Ghent, one of the most promising ideas for the next generation of biofuels is gas fermentation.

> *What is the biggest problem of ArcelorMittal Ghent? Indeed, it's emission gases. Gas fermentation is done by using sugars as input source to let micro-organisms, bacteria or fungi to grow upon[261]. However, emission gases can also be used as an input source instead of sugars to grow certain types of bacteria and to produce bio-ethanol. Today, emission gases are transported to Knippegroen to be converted to electricity. However, this is becoming less and less profitable, hence, together with ArcelorMittal, we are looking for ways to reduce its environmental impact and at the same time make a win-win out of it. (interview Wim Soetaert and interview with Wim Soetaert and De Smet (2017))*

Next to the option to convert emission gases to ethanol, FBBV is also researching if and how emission gases can be converted to an input resource for the chemical industry. Indeed, if the CO2 can be isolated, subsequently CO together with H2 can be converted into so-called syngas, which then can be converted into synthetic naphtha[262], which can be used as an input source for the chemical industry. At this moment, DOW Chemicals Terneuzen is conducting the research with Arcelor-Mittal Ghent in the project called Steel2Chemicals (N.N., 2017a). If this technology proves to be economically viable, it can have important consequences for the petrochemical industry in Antwerp too.

> *Antwerp is one of the most important chemical clusters in the world. Today, this cluster's main input source is crude oil that is transported along the pipeline from Rotterdam[263]. However, imagine if, in the future, emission gases can become an input material for the chemical sector! Then Ghent, instead of Rotterdam, can become the main 'input source' for Antwerp. (interview Wim Soetaert)*

Wim Soetaert already explained this long-term vision during the start of the biobased sector in Ghent in 2007 (Buys, 2007).

> *A large part of the petrochemical industry that we know today is not sustainable. This is unfair for many reasons. Hence, we need biotechnology to give us a solution. I am convinced the petrochemical industry is perfectly combinable with biotechnology. First, it can give us bioplastics that are degradable. Second, we can produce bioethanol from emission gases, which*

261 cf. the techniques used by Orgaworld and Chaincraft
262 Naphtha is a flammable liquid hydrocarbon mixture
263 The Rotterdam-Antwerp Pipeline (RAPL) has existed since the 1960s, as the port of Rotterdam is deeper than the port of Antwerp and thus can receive the largest oil tankers in the world. To eventually transport the crude oil to Antwerp, a 102km long pipeline was operational in 1971. Today, around 30 million tons of crude oil are transported from Rotterdam to Antwerp every year.

then can be converted into ethylene and eventually into polyethylene, which is the main input source for the petrochemical industry today. (Interview with Wim Soetaert and Buys (2007)

In a more recent interview, he came back to this long-term vision (De Smet, 2017):

In 2050, half of the chemical sector will be biobased. The other half will still be fossil-fuel driven, but increasingly we will move to a biobased chemical industry. (interview with Wim Soetaert and De Smet (2017))

Going back to our coupling mechanisms, the strategic coupling physical/material coupling of the pilot plant in 2012 will soon induce thus a new *strategic physical/ coupling* between ArcelorMittal and DOW Chemicals Terneuzen. If this happens effectively, it will mean that the steel manufacturing sector in Ghent and the chemical sector in Terneuzen will be 'added' as subsystems to the overarching biobased system, hence becoming a new *structural institutional coupling*.

Moreover, most likely in the near future, the need to constantly renew the biobased sector in Ghent will be essential for its long-term survival, as explained to us by Koen Van Kerkhove:

At the moment, the Rodenhuize biobased cluster is at its maximum. Even more, it now produces at 120% of its initial design in 2010[264]. Without large investments, production will not increase; and I guess this will not happen in the near future, because Alco Bio Fuel has just acquired the bio-ethanol plant in Rotterdam, which is much bigger than their first one in Ghent. At least their 'attention' will now be shared between Rotterdam and Ghent. (Interview Koen Van Kerkhove)

And indeed, in 2016, it was announced that the shareholders of Alco Bio Fuel Ghent, thus Alcogroup, Vanden Avenne and Vandema, acquired the bankrupted ethanol plant Abengoa in Rotterdam, which was constructed only five years earlier in 2011. With this takeover, Alco Bio Fuel was able to more than double its production, from 250,000 to 700,000 cubic metres The argument that it is cheaper to take over an existing plant than to expand existing plants was given as the main reason by the new Belgian shareholders (VILT, 2016). The paradox is, while the port of Rotterdam saw this takeover as essential for it sustainability (N.N., 2017c), the takeover implies, at least in the short term, that Alco Bio Fuel Ghent will not expand significantly.

However, during the last 10 years, closely linked and interwoven to the growth of the biobased sector in Ghent and Terneuzen, another 'line of coupling mechanisms' developed itself that has changed the institutional and economic landscape in Ghent significantly. The start of this 'line' goes back to 2009, when GBEV obtained the Interreg project. The GBEV was required to work together with another European region, and it chose to do so with the Dutch Terneuzen, part of Zeeland Seaports at that moment. In hindsight, the collaboration between GBEV, of which the port of Ghent is part, and Terneuzen was a major game changer. Indeed, as explained to us

264 This was confirmed during the interviews with Fons Maes, Luc Malysse and Daniel Matthys.

by Lieven Tusschans, prior to 2009, the port of Ghent and Zeeland Seaports were arguably not on 'speaking terms'.

> *It was always a long-term dream of Daniel Termont that the port of Ghent would work together with Terneuzen, since he was alderman of the port and mayor of Ghent. However, somewhere during the beginning of the 2000s, I do not recall when exactly, Daniel Termont made the mistake of acting 'like a Hollander[265]' with the goal of working closer together with Terneuzen. Namely, he clearly and strongly announced that he wanted Ghent to merge with Zeeland. However, this was badly received, especially by the governor of the province of Zeeland at that time, who felt 'attacked'. You know, Zeeland is not Holland and their 'culture' is not as direct as Daniel Termont thought it would be. Hence, in contrast to his goal of improving the dialogue, the effect was exactly the opposite, until the biobased sector came up (interview: Lieven Tusschans)*

Indeed as informed by Wim Soetaert, the GBEV soon became much more than only a consortium of biobased activities:

> *Maybe the most important aspect of GBEV is that it became a neutral discussion platform for companies and public authorities to discuss much more than only bio-based ideas. For example, for many years during the GBEV meetings, the new sea lock in Terneuzen or the merge between the port of Ghent and Zeeland Seaports were discussed. (Interview Professor Wim Soetaert)*

The assignment of the Interreg project to Terneuzen was very welcome in 2009 and perceived as a strong positive signal for the port economy in Zeeland. Hence, Terneuzen and Ghent together began to increasingly label themselves as a large integrated and international biobased valley. Eventually, a *strategic discursive coupling* occurred in which the Terneuzen-Ghent region labelled itself as 'Biobased Europe'. Similar to 2005, this coupling eventually led to a *strategic institutional coupling* in 2016 when the GBEV changed its name to Flanders Biobased Valley (FBBV), enlarging its focus and ambition to the rest of ('Zeeuws[266]-')Flanders.

The success of GBEV for the biobased sector and for the relationship between Ghent and Terneuzen also influenced the policy of the port authority of Ghent.

---

265 Without ignoring the difficulty in explaining why and whether this is appropriate, within Flanders it is common to appoint a Dutch person as 'Hollander'. Arguably, this goes back to the Golden Age when primarily the Dutch province of Holland was an economically powerful unit. Today, 'Hollander', used by a Flemish person, refers to the difference between Flanders and The Netherlands in terms of attitude, behaviour or communication, which is, arguably, more 'direct' in The Netherlands than in Flanders. For more information about these differences, see for example Terhorst and van de Ven (1997), Hofstede (2001, p. 63), Gerritsen (2014) or Gerritsen and Claes (2017) explaining the difference in norms and values between Flanders and The Netherlands.

266 Zeeuws-Vlaanderen is the southern part of the Dutch province of Zeeland directly neighbouring to the north the Belgian provinces West- and East-Flanders, or the regions of Bruges and Ghent, respectively.

Prior to 2010, we focused primarily on throughput. This is still important, but the bio-based success has convinced us of the importance of having a well-connected economy, not only between companies or economic sectors, but also with Zeeland Seaports. (Interview Daan Schalck)

The renewed dialogue became a solution for Ghent's long-lasting wish to enlarge the sea-lock of Terneuzen, going back to at least the beginning of the 1990s (Allaert, 1992; Allaert et al., 1991; N.N., 1993b, 1994). However, for a long time, this wish to enlarge the sea-lock was not acknowledged by the Dutch government, responsible for the sea-lock, which stated that the sea-lock would only be enlarged in the far future (Van den Berghe & Willems, 2017). However, in 2012, the Dutch government appointed the port of Terneuzen as a port of 'national concern' (I&M, 2012). This 'change of vision' has to be understood in light of the TEN-T project of the Seine-Scheldt axe, which eventually will also be important for the port of Rotterdam. In 2012, it was decided that the sea-lock of Terneuzen should be enlarged (VNSC, 2012) and, in 2016, the project and the financial agreement between Flanders and The Netherlands was signed (I&M, 2016). The total project is estimated at 999 million euros, the majority of which will be paid by Flanders. Hence, the start of the expansion of the sea-lock in Terneuzen in 2017, with completion foreseen in 2022, can be labelled as a new *strategic physical/material coupling*.

In the meantime, the Belgian and Ghent University alumnus Jan Lagasse became CEO of Zeeland Seaports in 2014. Hence, the collaboration between the port authority of Ghent and Zeeland Seaports improved further and merger talks eventually started. On January 1, 2018, the port of Ghent and Zeeland Seaports merged into the North Sea Port. Hence, this can be labelled as a *strategic institutional coupling*. As informed by Daan Schalck, the merge was a huge opportunity for many reasons, but primarily it meant that both their political weight increased significantly as, according to several rankings, they entered the top 10.

Hence, in Ghent-Zeeland in only 13, years the biobased sector has effectively become much bigger than its initial goals. In other words, different than Amsterdam today, the biobased sector increasingly coupled several different systems. At first, these were different economic sectors, but today the political and institutional system is also influenced by the overarching biobased system. Hence, although this is always difficult to state, one can argue that today the biobased sector in Ghent-Terneuzen is indeed a *structural discursive coupling*, or in other words, a hegemonic discourse (cf. Hajer, 1995).

CHAPTER 6

Discussion

6.1

Introduction

We have arrived at the discussion chapter. In this chapter, we return to our proposition as formulated in our introduction chapter. Our proposition is that one should perceive the port-city interface as an interactive (economic) system. If the port-city interface is a system, according to Luhmann (2004), the port-city interface system should presuppose certain features of its environment on an on-going structural basis on its subsystems. This thus goes beyond only the economic subsystem, but also entails an overarching effect on other subsystems, such as the political and law systems (Martin & Sunley, 2015).

We argued therefore that if we use this proposition, we are required to take into account the various coupling mechanisms creating different (inter-)relationships within, without and towards the port-city interface system (if existing as an overarching system). This means that particular forms of coordination and relational ties with a stake in the port-city interface operate and are articulated at various spatial levels of aggregation, from the local to the global. Consequently, every port-city interface is unique, as juxtaposed with the Anyport (-city interface) Model (Van den Berghe et al., 2018).

In chapters 2 and 3, we explained how we would use and operationalize the relational approach in reference to our proposition. In chapters 4 and 5, these were applied to Amsterdam and Ghent. This discussion chapter gives us the ability to look over these four chapters together and discuss them. This enables us to see if our proposition is true and, if so, what this means for the understanding and study of the port-city interface. Eventually, we will thus answer our research question: *How to understand the port-city interface?*. Hereby, our findings and statements will be based on all five case studies.

However, before we can answer this question, we have to understand how the development agenda of the port-city interface is formed. Therefore, first we will perform our step 3 of our conceptual framework. Step 1 reconstructed the relational geometry of a particular economic sector of the port-city interface of Amsterdam or Ghent at analytical time zero. Step 2 reconstructed the relevant coupling mechanism trajectories. Hereby, we looked for the relevant tactical and strategic coupling mechanisms and their forms in reference to our analytical framework. The challenge of the second step is that it is highly dependent on the time frame in which the case study is situated. The longer ago it happened, the harder it becomes to ‘trace back the lines’.

Indeed, the further back in time we go, the less likely it is that relevant actors, especially those directly involved, can be found or are willing or able to collaborate. People can make career changes, become more selective in their memories or even have passed away. Next, the further back into time we go, the more complex a case study becomes. Especially couplings that did not succeed will fade over time, as they are most likely not recorded in some way (e.g. newspaper article) or the people involved do not want to talk about their failures. In this light, all tactical couplings become blurred over time – the successful ones, and especially the unsuccessful ones. Several kinds of tactics are deployed constantly, and only a few lead to a more durable emergent strategic coupling. Hence, if even strategic couplings are hard to detect after a while, tactical (de)couplings, even the successful ones, will disappear and become the subject of a never-ending discussion among historians. In other words, it is no longer possible to obtain a polyphony of voices and perspectives, which would eventually enable the researcher to crosscheck information and hence obtain a better and more relevant narrative (Huijs, 2011; Van den Berghe et al., 2018).

This is why we only performed our step 2 and 3, for the biobased sectors of Amsterdam and Ghent. For the car manufacturing sector in Ghent and the steel manufacturing sectors in Amsterdam and Ghent, we also explained their presence with a brief historical perspective, trying to provide as much detail as possible. Arguably, within these historical perspectives, one could also appoint and label different kinds of coupling mechanisms. However, this exercise would always be incomplete and always be based on indirect sources. Especially the tactical couplings cannot be found anymore.

Our step 1 and step 2 for the biobased sector offered us a 'flat and deep' iterative and a reflexive detailed analysis of our different case studies. These first two steps followed an intrinsic case study whereby the case is of primary interest. The case is not used because it represents other cases (no 'any port'!) nor because it illustrates a particular problem. In other words, although there are similar aspects, of course, the car manufacturing sector in Ghent cannot be used to understand the car manufacturing sector in Detroit, for example.

However, the intrinsic case studies can be taken together if one wants to explain and investigate a specific phenomenon or the influence of a rather general cause. In our case, we attempt to investigate the concept of agency. Hereby we will assess the two biobased intrinsic case studies of Amsterdam and Ghent together. Hence, step 3 will follow a collective case study. Hereby we will not attempt to generalize the concept of agency. Our purpose is thus not theory building. We are able to perform a collective case study, as the biobased sectors in Amsterdam and Ghent are admittedly quite harmonious. Both started around the same time and are part of similar markets, both in product as well as geographical aspects. The central research question in our step 3 is therefore: *'How do actors possess agency to influence and construct the development agenda of the port-city interface?'*.

After this step 3, we are able to move back to our proposition. Our first step is the description of the port-city interface (relational geometry), step 2 informs us how this happened (emerging coupling mechanisms) and step 3 explains the conditions under which these coupling mechanisms occurred (agency). Although we did not perform these 3 steps for all case studies, at this point we are still able to critically reflect on all five, in light of the understanding of the port-city interface. Again, we will not formulate a general definition of the port-city interface, but we will discuss all five port-city interfaces in light of our proposition, being an interactive economic system. Eventually, based on these critical analyses, in chapter 7 we will formulate policy recommendations and answer our main research question: *How to plan the port city?*.

6.2

Step 3: Uncovering agency

Step 2 of our conceptual framework applied to the biobased sectors of Amsterdam and Ghent already indicated that there are important differences in reference to agency. For Amsterdam, we can already state that during the establishment today, primarily Simadan and its CEO, Peter Bakker, possess(ed) agency. Of course, the decisions and influence of Klaas van den Berg (Orgaworld), Niels van der Straelen (Chaincraft) and people from the port authority of Amsterdam should not be forgotten. However, arguably, it was Peter Bakker who first decided to relocate his group of companies to Amsterdam in 2007, hence starting the biobased sector in Amsterdam. Since 2007, not much has changed. As shown by our relational geometry, Simadan, and hence Peter Bakker, is still the focal point today.

This differs rather strongly from Ghent. The list of persons who possessed agency to influence the development agenda around 2005 is a bit longer. There is, of course, Professor Wim Soetaert of the Ghent University and founder of GBEV and the pilot plant. Next, there is Daniel Matthys, CEO of Eurosilo, who together with (Xavier) Vanden Avenne, Alcogroup, Vandema, Walagri and Aveve established Alco Bio Fuel. There is Fons Maes of Cargill Ghent who, based on Lode Speleers' idea, established Bioro together with Vanden Avenne and Biodiesel Holding. However, Fons Maes could only establish Bioro Ghent after intervention by Guillaume Bastiaens, a Belgian who worked himself up to vice-president of Cargill. Next to the longer 2005 list, another difference with Amsterdam is that, since then, the list of persons possessing agency to influence the development agenda of the biobased port-city interface had changed. Today within Cargill, Luc Malysse, for example, has become more important, while Fons Maes has moved to become chairman of the Belgian Biodiesel Board. While the biobased sector grew, several persons who were not involved in 2005 within ArcelorMittal, DOW Chemicals, the biobased pilot plant or the port authority, for example, have gained agency to influence the biobased development agenda.

We thus already have some indications that, in reference to agency, there are differences between Amsterdam and Ghent, hence the relevance of performing a collective case study in this chapter. The goal is understanding agency better. To structure our step 3, Figure 6.1 presents the trajectories of the coupling mechanism for the biobased sectors in Amsterdam and Ghent together.

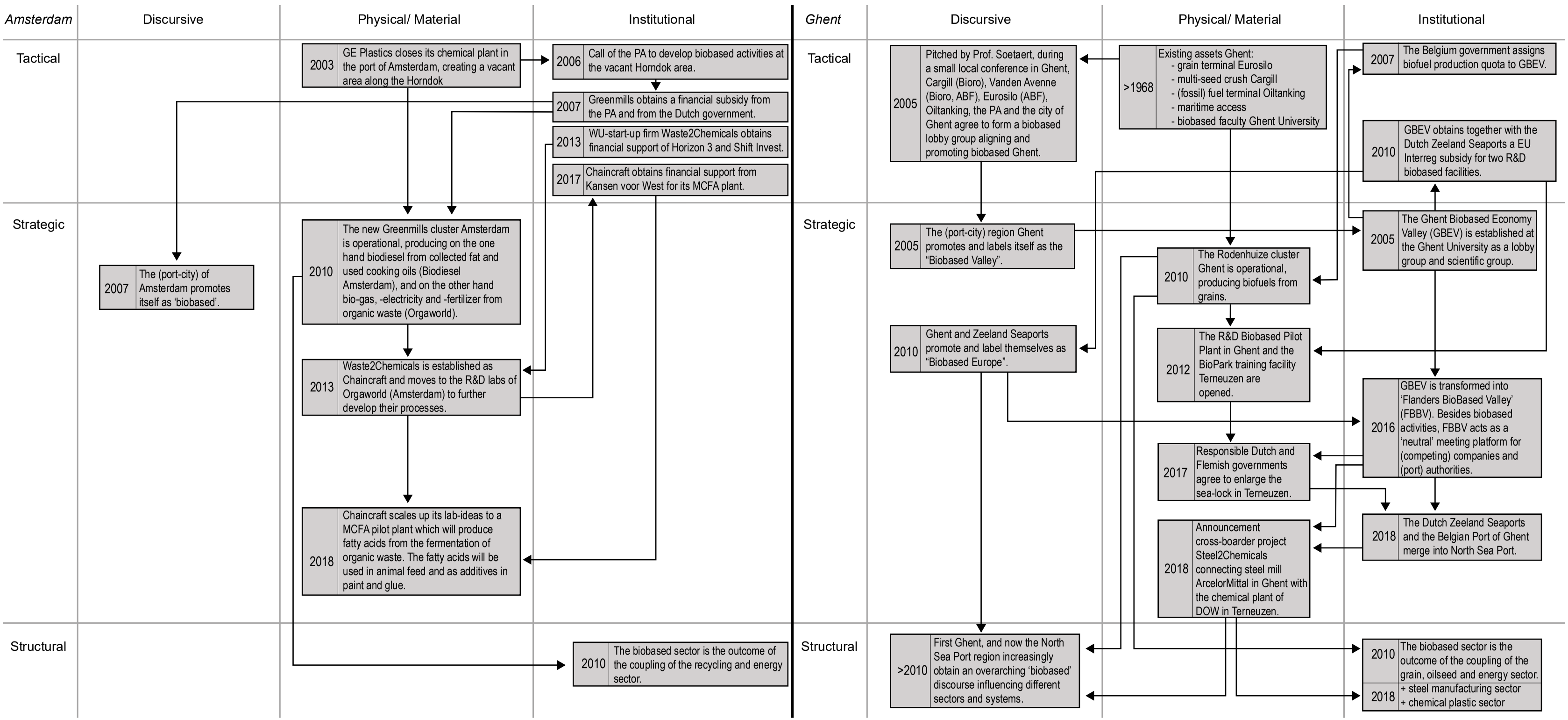


Figure 6.1 The coupling mechanism trajectories explaining the current relational geometries of the bio-based sector in Amsterdam (left) and Ghent (right) (Van den Berghe et al., 2018)

6.2.1 Amsterdam

Agency is an emergent relational effect that has to be understood in relation to its constituent elements. This explains why Peter Bakker was able to establish the biobased sector in Amsterdam on his own. The starting conditions in 2006 were different between Amsterdam and Ghent. In hindsight, for Ghent during the early 2000s, one could have quite easily predicted that, if a biobased sector would be established, in one way or another it would be established on the existing grain and oil seed industry and the present (latent) value and production chain knowledge. This is especially true if one knew how the French biobased industry was constructed (cf. based on rapeseed), which was already full grown by then. at that time already full-grown

For Amsterdam, the answer to this question during the beginning of the 2000s would be more difficult to answer. Of course, Amsterdam was at that time already the main European petroleum throughput port, and it was not unthinkable that biofuel would also be traded and shipped in Amsterdam at some point. However, in hindsight, the establishment of the production of biofuels in Amsterdam is arguably rather a coincidence. For that matter, the establishment of the biobased sector in Amsterdam could have never happened, and we would not be able to examine the biobased sector in Amsterdam within this dissertation. Indeed, if never established, the biobased sector of Amsterdam would still today be no more than a tactical coupling without further effects, and would probably have already disappeared as fast as it came up. Indeed, a call for a certain type of economic activity is, so to speak, launched every day by a responsible economic authority, in this case the 2006 call of the port authority of Amsterdam to attract biobased economic activities (Figure 6.1). Hence, this shows how difficult it is to find and then understand the trajectories of coupling mechanisms that explain a situation that today rather seems obvious.

While one could argue that the growth of the biobased sector in Ghent was rather obvious, this was not at all the case in Amsterdam around 2006. Following the 'Mainport' policy, which was launched in 1988 and still dominant at the time, (sea)port authorities in The Netherlands were mostly focused on attracting large throughput flows. To understand this dominant policy paradigm, we need to briefly explain its origins.

The origins of the Dutch Mainport policy go back the first integral spatial intervention plans of the national Dutch government. During the early 1960s, the population increase was high. It was predicted that by the 2000s the Netherlands would have 20 million inhabitants. This created an important challenge for the main cities as well as the rural areas surrounding them (Bontje, 2002). The rising middle class preferred a suburban owner-occupied house with a garden, creating concerns within national planning institutions due to the increasing pressure on the rural areas. To steer this suburbanization, the 'Tweede Nota over de Ruimtelijke Ordening', and other plans such as the 'Nota Volkshuisvesting' (Volkshuisvesting en Ruimtelijke Ordening, 1972), launched the 'bundled de-concentration'-policy (RPD, 1966). Sixteen cores were assigned to house the population growth. Most of these were existing urban cores situated in the outskirts of the Randstad, although some were planned from scratch, such as Almere (van der Wouden, 2016).

The 2000+ plan is illustrative in this respect, especially the combination of the predicted expansion of port and city in and around Rotterdam. The 2000+ plan foresaw that the port of Rotterdam would need to expand significantly, in combination with the urban areas. Therefore, it planned a new city to accompany a half-million inhabitants: Grevelingenstad. Hereby, the plan ensured that the port would be able to expand without conflicting with existing urban areas and their expansions. It was foreseen that the port expansions that were planned at that time, such as Maasvlakte 1 (realised in 1973), would not be enough by 2000. Hence, the 2000+ plan foresaw, on one hand, that the entire south side of the port of Rotterdam (cf. Voorne-Putten) would eventually become a port area, and that the island Goeree-Overflakkee would host the city of Grevelingenstad. The creation of Grevelingenstad would, at the same time, mean the end of the ongoing expansion of the existing villages/cities of Spijkenisse and Hellevoetsluis on the south bank of the port of Rotterdam, this to make sure the port would be able to expand southwards, if necessary (Gemeente Rotterdam, 1969).

The 2000+ plan met fierce protest. Grevelingestad was not realised, Voorne-Putten did not become a port area and Spijkenisse and Hellevoetsluis expanded significantly, hypothecating a possible southern port expansion. However, arguably this plan can be seen as the first idea of the Maasvlakte II and the expansion of the Moerdijk port, realised in 2013. Besides these, the plan is illustrative for the state-regulated Keynesian way of thinking during the 1960s. Hereby one boost its economy by large infrastructure programs supporting mass production and eventually mass consumption and full employment (Jessop, 2002).

While the housing program was strongly financed by public money, the raising of employment levels was not. To achieve more economic activity, one was rather convinced that this would come without much effort, and that by stimulating the existing cities, new ‘growth poles’ and hence the increasing consumption desire, eventually economic activity would follow if one at least foresaw adequate areas and infrastructure (Bontje, 2002). This is illustrated by the large areas assigned for port/industrial expansion in the ‘super canal’ plan (Anselin, 1970) (see paragraph 5.1.6), as well as in the 2000+ plan (Gemeente Rotterdam, 1969) and other similar plans for other port areas, such as Amsterdam. These expansion areas were planned to host primarily industrial manufacturing activities, which were quickly expanding at the time, (see paragraph 5.1 for example) and petro-chemical activities (Bontje, 2002).

However, soon after the plan 2000+, the super canal plan and the Nota Volkshuisvesting during the 1970s the oil crises came (van der Wouden, 2015). The industrial manufacturing activities (e.g. ship construction) were hit especially hard, and blue-collar unemployment figures rose. More fundamental was that the crises showed the economic and social vulnerability of the main cities following the Tweede Nota over Ruimtelijke Ordening and the Nota Volkshuisvesting. Foremost middle class financially more powerful households moved out during the 1960s and weakened the cities. Hence, first the ‘Structuurschets stedelijke gebieden’ in 1983, but especially the ‘Vierde Nota over de ruimtelijke ordening’ (VINO) (VROM, 1988) reoriented the policy from a bundled de-concentration policy, which could be seen as a spatial-economic correcting spatial policy, to the ‘compact city’ policy, which aimed at strengthening the already strong aspects (RLI, 2016). Both for housing – in particular worked out in the Vierde Nota Extra (VINEX) (VROM, 1990) – and economic activities, the policy now focused primarily on the existing main cities. In these policy documents, it was argued that the Randstad should expand in order to be able to compete internationally (Bontje, 2002; van der Wouden, 2016).

Prepared by several other studies (see for an overview RLI, 2016, pp. 37-38), the Mainport concept increasingly received a positive connotation. Eventually, the concept was also put forward by the Dutch planning department. Hereby the airport Schiphol (first appointed as gateway) and the port of Rotterdam were assigned as being of structural importance for The Netherlands and for the attraction of international competing businesses (Boelens, 2009b). The Mainport concept was adapted within VINO (VROM, 1988) and was further worked out in the Vierde Nota Extra (VINEX) (VROM, 1990). The Maasvlakte II and the fifth runway are examples of eventual realisations (Boelens, 2009a; van der Wouden, 2015).

The main idea of the Mainport policy was not only to attract transport and logistical activities in order to create 'The Netherlands Distribution land' (van der Wouden, 2015), but also to attract internationally competing related-service and added-value activities (RLI, 2016). However, in the following decade(s), it became clear that the added-value and economic spin-off activities of the transport and logistical sectors were smaller than expected (Boelens, 2009a; RLI, 2016). This meant that several assigned related-service areas, such as the Kop van Zuid, only developed thanks to public investments or because of the move of already existing (public) economic activities, rather than by new private activities (Boelens, 2009a; van der Wouden, 2016).

It thus became clear that the relationship between the attraction and facilitation of transport and logistical activities and the (presumably automatically following) related added-value and service activities is more subtle. Hence, in hindsight, the (implicit) focus on attracting and facilitating logistical activities created port areas that were less economically diverse. Taking this into account, the Mainport policy received criticism during the last two decades from, among others (Boelens, 2009a; RLI, 2016), Professor of port economy Harry Welters, of the Erasmus University Rotterdam, in 1995 (N.N., 1995):

> *I say it bluntly: we wasted the 1980s! We let the variety of our ports go because we thought that we could solve everything by mechanization. However, we forgot that you also have to win on the level of productivity. (Professor Welters during the annual Dutch port discussion days in 1995, reported within the newspaper Nieuwsblad Transport (N.N., 1995))*

While the Mainport policy primarily focused on the port of Rotterdam and the Schiphol airport, arguably the economic profile of the port of Amsterdam was also affected by the Mainport policy, as confirmed by Micha Hes from the PA Amsterdam during our interview:

> *It is true that, in the past, the port of Amsterdam had a similar profile as, for example, Ghent. Especially during the interbellum, our activities were much more diversified and we were especially well positioned within manufacturing industries. However, somewhere during the 1970s and 1980s, we*

and other policy makers started to neglect these manufacturing industries and started to focus on throughput activities and mechanization. For Amsterdam, the turning point was foremost the large fire of the chemical plant Marbon in 1971[267]. After this, we no longer handed out building permits to petro-chemical activities. Hence, today Amsterdam has only the logistical part of the petro-chemical sector, and not the manufacturing sector. This combined with the closure of the Ford plant during the 1980s meant that the port of Amsterdam, as well as the city of Amsterdam, changed radically from primarily a manufacturing port-city to a logistical port, on one hand, and a service urban economy, on the other hand, as we know it today. (interview: Micha Hes)

In other words, although the port of Amsterdam was not assigned as a Mainport, its policy was rather like one. During the last decades, arguably, this at least helped to make the port of Amsterdam become an important petroleum port today (see paragraph 4.1.3). However, during the 2000s, (container)ships were rapidly getting bigger[268] and cargo flows were being concentrated within a decreasing number of 'nodes' (Notteboom, 2018). Due to the disadvantage of the sea-lock of Ijmuiden and the more developed hinterland connections from Rotterdam, the port of Amsterdam was increasingly losing market share to Rotterdam, but also Antwerp and Hamburg, for example.

Thus, during the 2000s when Amsterdam was losing (throughput) market share to Rotterdam, arguably it had two options in regard to policy. First, it could decide to diversify its economy. However, the chance of success is very low in this case, as it is very difficult to attract economic activities 'out of the blue'; it is much easier to attract so-called related (within sectors) and unrelated (between sectors) activities (cf. Frenken et al., 2007). In this respect, the call to attract the biobased sector in 2006 is not all that surprising, as it is (un)related to the existing activities in the port of Amsterdam, at least in reference to its final product (biofuels). The second option is to stimulate throughput activities to regain its market share. Within this market, the competition is primarily conducted in terms of infrastructure and fore- and hinterland connections. Hence, not surprisingly considering the dominant Mainport policy in The Netherlands, the port of Amsterdam chose the second option. Two 'tactics' were started. First, it asked for and got a strategic physical enlargement of the sea-lock in Ijmuiden, allowing bigger ships to enter the port of Ijmuiden and Amsterdam. Second, closely linked to the enlarged sea-lock Ijmuiden, it also wanted to actively attract more cargo flows. On one hand, Amsterdam wanted to attract

267 See section 4.1.3

268 Since its enlargement in 1985, the Panama Canal defined that container ships for more than a decade could transport around 4,000 TEUs. As volumes of global trade increased towards the end of the 1990s, the Post Panamax ships were introduced, carrying up to 8,000 TEUs. Especially since the beginning of the 2000s, the growth of ships is impressive. By 2006, Maersk introduced 14,500 TEUs ships. This increased to 18,000 TEUs in 2013. At the moment, the OOCL Hong Kong is the biggest container ship with a capacity of 21,413 TEUs, with a length of 399.87 meters breadth of 58.8 meters and a maximum draft of 16.0 meters Obviously, this has important implications for ports. They were forced to adapt their infrastructure and hinterland connections simultaneously. For port areas behind sea-locks, such as Amsterdam or Ghent, 2006, when the first Ultra Large Container Vessels were introduced, can be seen as an important turning point, hence explaining the absolute and relative rapid increase in container volumes in Rotterdam or Zeebrugge during these years.

more of the maritime container sector, which was rapidly increasing at the time and on which Rotterdam, Zeebrugge and Antwerp were thriving. At that moment, container carriers no longer called the port of Amsterdam[269]. Hence, to stimulate the market and to attract inform carriers to the port of Amsterdam, Amsterdam invested hundreds of millions of euros[270] into the 'Amsterdam Container Terminal'. The idea to establish a dedicated terminal in Amsterdam goes back at least to 1999, just a few years after the last private container terminal closed. In 1999, Professor Harry Welters had strong remarks on Amsterdam's idea to go completely against the foreseen market conditions. However, considering the (historical) rivalry between Amsterdam and Rotterdam (Koelemaij, 2013) and the fact that the professorship of Welters was paid by the port of Rotterdam, among others, his opinion was ignored in Amsterdam (Persson & Heijne, 2012). Also during the beginning of the 2000s, in addition to container throughput, Amsterdam started to focus on the cruise sector, but this idea also received opposition from the city government of Amsterdam (Muller, 2017).

Thus, in 2006, prior to the financial and economic crisis and prior to the collapse of the container sector in Amsterdam, the call to attract biobased activities can be seen as no more than a small project to revive the brownfield of GE Plastics along the Horndok. Hence, this explains why a rather small entrepreneur like Peter Dekker from Simadan possessed the agency to establish the biobased sector in the given environment of Amsterdam in 2007. His agency was created because, on one hand, he had the company and activities for which Amsterdam was calling upon, namely the production of biofuels based on organic waste and fat processing; and, on the other hand, Amsterdam offered him the availability of the Horndock area, which was no more than a brownfield area 'in the back area of the port'. Thus, while Klaas van den Berg informed us that Simadan also could have chosen to position itself in Rotterdam, arguably, in hindsight, it was a good choice by Simadan to locate in Amsterdam. Indeed, following the collapse of the (agency of) throughput volumes, other economic sectors gained in prestige, and thus in agency. Hence, a rather small regional economic actor like Simadan was able to become one of the key economic focal points for the port authority of Amsterdam, as we will explain a bit further.

Indeed, most likely, such a significant rise in importance would have never happened for Simadan if it had located itself in Rotterdam. As a small regional company, it would have been very difficult to become 'equal' with petrochemical giants such as Shell or ExxonMobil, at least in terms of attention from the port authority.

The way by which Simadan was able to possess and expand its agency also happened in other moments throughout our research. Indeed, the fact that Simadan possesses agency in Amsterdam today is similar, on some level, to the reason the grain trading families Delvaux and Marchant decided to move from Antwerp to Ghent during the 1960s, and also why Cargill decided to construct its biodiesel refinery 'Bioro' in Ghent instead of Antwerp. As informed during our interviews, in both cases, the lack of support from the port authority of Antwerp for the development of the grain logistical and biofuel sectors respectively in their port area, as well as t

269 The most important container terminal CTA Amsterdam was bankrupt in 1995.
270 Around 400 million (Persson & Heijne, 2012)

he hearty welcome in Ghent, forced them to avoid Antwerp and to develop in Ghent. This on its own is already an important insight for the policy of port (city) authorities.

In other words, following agglomeration effects, the chance that new or newly arrived innovative economic actors possess agency is arguably greater in small and diverse ports than in large ports dominated by a group of multinationals. However, this is not always true, as shown by Amsterdam in 2006. Indeed, in the beginning, arguably the agency that Simadan possessed came about because a biobased or circular activity was ‘a nice thing to have’ within the portfolio of a port authority’s economy, due to the sustainability agenda gaining importance and offering a new possibility for directing public investments towards a port area (Gemeente Amsterdam, 2006). However, arguably it was primarily the crisis and the more recent political loss of relevance of the port authority seen from the city government of Amsterdam, that has allowed Simadan’s agency, but also the agency of the entire biobased and circular sector in Amsterdam, to remain significant, especially in reference to the rather small and regional size of the involved companies and economic sector.

Indeed, today, in an attempt to regain its license to operate, the port of Amsterdam presents itself as awell-integrated urban port, focussed on integrating several functions with a focus foremost on sustainability. The port authority supports this vision with scientific studies (e.g. Kuipers et al., 2015), and especially with its Vision 2030 (Port of Amsterdam, 2015) (Figure 6.2) setting the agenda of the port for the years to come.

Figure 6.2 Vision 2030 illustrating Amsterdam Metropolitan Port of the Port Authority Amsterdam (Port of Amsterdam, 2015).

Thus, if one wants to understand how the actors of the biobased sector in Amsterdam possess agency to influence the development agenda of the port city today, this has to be seen in light of the loss of political weight of the port authority of Amsterdam following the crisis. Although still today almost all of the profits of the port authority of Amsterdam, and hence the annual financial dividend for the city, are derived from large-scale global petroleum flows[271] (but which apparently no longer lead to agency) the port of Amsterdam is increasingly framing itself as a regional port that is ready to pick up its responsibility to help Amsterdam and the MRA region become sustainable and circular (Port of Amsterdam, 2015). In other words, it tries to play this card in order to possess agency and to secure its 'license to operate'.

Unfortunately, but only the future can answer this, from the viewpoint of the port at least, at the same time the city of Amsterdam is increasingly isolating itself from the MRA, the port area of Amsterdam and the NZKG port areas, changing thus the structural coupling of the institutional structure (paragraph 4.2.1). Since the port of Amsterdam has lost a significant part of its license to operate and tries to regain its influence (cf. agency) by, on one hand focussing on sustainability and circularity in reference to the city of Amsterdam, and on the other hand, on a regional 'metropolitan' embeddedness, it is highly questionable if this tactic (cf. tactical coupling) will become a strategic one on a larger scale for the port of Amsterdam.

6.2.2 Ghent

Within the biobased sector in Ghent, it is not possible to assign one single actor who possessed the sole agency or capacity to establish the biobased sector during the 2000s, as we did for Amsterdam. We explained that one of the reasons Peter Dekker solely possessed the agency to establish the biobased sector (but not the port-city interface) and thus to influence the development of the port since then was due to the port authority's minor focus on biobased activities, and instead its major focus on logistical processes during the first half of the 2000s. In other words, the lack of attention by the port authority on the biobased sector, at least as guiding activities for the future of its port areas, paradoxically made it possible that Peter Dekker alone was able to possess the agency to establish the biobased sector in Amsterdam.

This differs from Ghent. In 2005, the port authority detected, through its close contacts with its port companies, that a group of companies was separately working on biobased processes. In other words, the port authority itself did not 'top down' ask for a biobased development, but it detected that a window of opportunity was presenting itself. Indeed, due to the knowledge of the biobased sector and the continuous changing global production chains and value chains, particularly the grain-trading and seed-processing companies understood the possible opportunities within the biobased sector for their businesses. The port authority detected this and organised the conference. The relevance of these 'windows of opportunities' in explaining the development of port areas has been described for other ports as well in recent research articles (Jacobs & Notteboom, 2009; Raimbault et al., 2014).

271 As informed by Micha Hes during our interview

During the conference in May 2005, the port authority not only brought together the relevant companies, but also the relevant institutions, port and city. However, it was crucial that the Ghent University (Professor Wim Soetaert) also showed up, and especially that he proposed 'grasping' the tactical window of opportunity to strategic-institutionally form the GBEV, in which almost all present actors and institutions from that conference participated.

The biobased development gained further importance following the crises of 2008. Similar to the port of Amsterdam, Ghent also aimed at attracting the maritime container sector prior to the crisis, and framed this sector as a strategic goal. Indeed, in 2008, port alderman Sas van Rouveroij announced that the port of Ghent would focus on attracting container activities, in particular along the newly created Kluizendok on the left bank. As described in a newspaper article in De Standaard on October 1, 2008, the reason Ghent wanted to attract container activities was that the market at that time grew exponentially, and that Ghent should also thrive on these activities (Herregodts, 2008). This was also confirmed by Daan Schalck during our interview:

> *Prior to 2010, we focussed foremost on throughput. This is still important, but the bio-based success has convinced us of the importance of having a well-connected economy; not only between companies or economic sectors, but also with Zeeland Seaports. (Interview Daan Schalck)*

The goal in 2008 was for Ghent to load and unload 300,000 TEU annually by 2018, five times as much as the 60,000 it loaded and unloaded in 2008. To make this possible, a joint venture was established by the companies Manuport and Multi-Link, with the goal of opening a container terminal in Ghent (Herregodts, 2008). However, soon after this announcement, the crisis started and the container sector was hit especially hard (Drewry, 2015; Express, 2015; N.N., 2017d; Paris, 2014; Sertyn, 2015; SSE, 2015). For Ghent, the crisis thus arrived before it or any other authority had invested significant amounts of public money into container activities, as the port authority of Amsterdam had.

However, in comparison with Amsterdam, it is strange at first glance that a company like Cargill could not be 'the Simadan of Ghent' in 2005 and develop the industrial biobased sector itself. Indeed, if one compares the assets of Cargill and Simadan, Simadan is almost non-existent. Hence, if one defined agency in terms of 'power in things', 'power as a process' or 'power as immanent force', one would not be able to explain Cargill's 'incapacity to act' to influence the development of the port-city interface. As argued by Sayer (2004), our empirical results indeed confirm that it is impossible in this case to label the power of Cargill according the types of power as defined by Allen (2003). The (lack of) agency of Cargill is a combination of all types of power. This is not surprising, as we already argued that agency is an emergent effect and cannot be seen as only a relational effect. Indeed, agency is the capacity to act in reference to its constituent elements, and not only immanent (Sayer, 2004).

Why thus was Cargill, as the biggest company within the maritime biobased sector in Ghent, not able to act on its own? Even once the internal discussion within Cargill was resolved (the one about Bastiaens intervening in Amsterdam versus Ghent) and there was a go to develop the biobased sector, Cargill Ghent employees informed their managers that Cargill would not succeed on its own. It lacked a connection with the Belgian political world, and therefore would not be given the needed quota to start producing biofuels, as confirmed during in our interview with Fons Maes.

Hence, as opposed to Amsterdam, not only the technical industrial side of the biobased sector had to be developed, but also the institutional (Belgian/Flemish) one. It was thus not enough to couple with the institutions of the port, but it was also necessary to couple with the city and the 'higher' Flemish and Belgian institutional levels. One needed thus an actor or actant who could couple these. This explains why Lode Speleers and Professor Wim Soetaert possessed agency in 2005, and why the port-city interface eventually came into existence. Indeed, without having any financial or industrial assets on their own, it was exactly their 'broker' capacity to connect the (port/city/region/national) political and industrial worlds of the biobased sector that created their agency. However, by 2005 one could already predict that the agency coming from this 'broker' role would only be short term. Indeed, once the quota was assigned to the relevant companies, the tuning between the legislation and industry happened, and subsequently the biobased sector started (Bioro, Alco Bio Fuel), the indirect relationship between government and the corporate world would be replaced by a direct link, bypassing the people in between. And indeed, the role of Lode Speleers today is less relevant within the biobased sector in Ghent, while the one of Professor Wim Soetaert arguably became even greater compared to 2005.

The question is thus why Professor Wim Soetaert was able to obtain and even increase his possessed agency. The reason is because Professor Wim Soetaert was able to redefine his role. In this aspect, and as also argued by Sayer (2004), Allen (2003) is right that power is not uniform or continuous, and that power is always constituted in space and time. Indeed, arguably in the momentum of 2005, one could argue that Professor Wim Soetaert's agency was derived from his authority as a biotechnological professor and his experience within the biotechnical industry. As a professor of biotechnology, similar to biotechnological engineer and consultant Lode Speleers, he was thus able to know both worlds. Especially for Wim Soetaert, in 2005 one could have argued that the agency he possessed came with the job of being a professor. However, as clearly argued by Allen (2003, p. 6), authority, which he argues is the best label to explain this kind of power, has to be constantly justified in the eyes of those around. In other words, it is conceded, not imposed. Authority is thus 'lent', and only for so long as its recognition lasts. It is thus always situational. Thus Wim Soetaert could retain his agency until now exactly because he was able to justify it constantly. This was possible because the GBEV, which was initially a lobby group with the goal of meeting the quota, transformed itself twice since 2005; once intentionally and once 'accidentally'.

First, from the beginning the GBEV was (intentionally) institutionalized, which on its own is already an important event. It had two main goals. Next to cluster formation and sensitisation, its other goal was to create biobased technological innovation by building R&D expertise (Anthonis, 2012; De Smet, 2017; De Troch, 2008). However, arguably, this (tactical) goal would never have existed if GBEV would not have eventually received the Interreg grant enabling it to construct a biobased pilot in Ghent. From this moment, Professor Wim Soetaert – or, in fact, GBEV/FBBV – became not only of political importance, but increasingly of marketing and scientific importance as well, hence explaining the redefinition of its agency due to this diversification. Indeed, for Cargill for example, the fact that Ghent-Terneuzen became increasingly known as a biobased valley resulted in public investments that were increasingly directed to Ghent (cf. expansion sea-lock of Terneuzen); hence, in the end, also becoming important for companies such as Cargill. During the interviews, we found out that this agency still exists as, for example, Fons Maes explained that the industry has not yet found the perfect technology to become a fully grown 'second/third-generation' biobased sector. Even today, no one company, not even Cargill, can achieve this on its own, hence, one of the reasons for contemporary agency of FBBV.

Second, following the Interreg grant in 2010, the FBBV became (accidentally) a 'broker' once more. But instead of the connection between the political, industrial and scientific worlds, this time the FBBV was the broker between the port of Ghent and Zeeland Seaports. The FBBV became a neutral discussion platform that eventually led to the North Sea Port merge in 2018. Arguably, therefore, this 'agency' of the FBBV no longer exists, as there is no longer an 'in between' position between Ghent and Zeeland.

However, arguably, the FBBV is still of high importance, or at least it should be, to the North Sea Port. As we have explained, structural couplings are beyond the power of all those involved. Indeed, nobody on his or her own created capitalism or, in our case, made it so that the biobased idea became increasingly structurally hegemonic for Ghent. A structural coupling is an emergent effect. In a similar way, the North Sea Port is not yet a structural coupling, but still only a strategic (institutional) one. In other words, today this strategic institutional coupling of the North Sea Port can be rather easily decoupled once again.

Indeed, despite its 'history', its 'geography' or its 'economic complementarity' (Allaert et al., 1991), there are still many differences between Ghent and Zeeland even today, at least culturally(Lalkens & Gersdorf, 2017). Referring back to our analytical framework, if the North Sea Port wants to become more enduring for overarching structural couplings, it has to find more strategic couplings. If this happens, chances are higher that the North Sea Port will eventually become a structural coupling of different (in speed) systems, making it less likely to be decoupled in the future. To imagine this, the port of Rotterdam is a good example, as almost nobody any more thinks that the port of Rotterdam in the first place is a coupling between the ports of Schiedam and Rotterdam among others.

As illustrated by our analytical framework, several possibilities exist. The enlargement of the sea-lock in Terneuzen is one example that is ongoing now. Another (strategic physical coupling) possibility is making the Wester Scheldt tunnel, being the only road connection between Flushing and Ghent/Terneuzen, toll free[272]. As studies show, this would significantly stimulate the economic relationship (Meijers, 2018; Meijers et al., 2018), hence the coupling between the different port areas.

272 At the moment, a truck has to pay 25 euros to pass the tunnel.

However, in reference to the ideas of related and unrelated variety, it is easier for policymakers to work further on already existing relations. An existing economic/scientific/marketing relationship between Zeeland and Ghent is the biobased one. However, as also confirmed during our interview with Professor Wim Soetaert, the clearest biobased link today between Ghent and Zeeland – the relationship following the existence of BioPark Terneuzen and the pilot plant through FBBV – is rather weak. Indeed, also within our relational geometry, besides BioPark Terneuzen, we did not find any other relevant biobased relations. This could change if ArcelorMittal Ghent and DOW Chemicals Terneuzen engage within the project Steel2Chemicals. If this project is eventually realized, it would not only confirm that Ghent/Zeeland is a biobased region but, following the constructed pipeline between ArcelorMittal and DOW, it would also be another strategic physical coupling across borders, in turn helping to confirm the structural idea of the North Sea Port (see Figure 6.1).

To return to the agency of Professor Wim Soetaert, we may, however, also not overestimate his agency. We must foremost value the combination of local and non-local actors, tangible and intangible assets, and formal and informal institutions. The rather positive view we have assigned to the role of Wim Soetaert in this research is exactly a consequence of the confluence of several 'momentums', created in turn by different persons possessing agency – an actor-network thus (Boelens, 2011). Indeed, if Belgian Guillaume Bastiaens, for example, had not climbed up to vice-president of Cargill, Amsterdam Cargill would probably not have been overruled and Cargill would have most likely constructed a biofuel refinery in Rotterdam instead of Ghent. Next, if Charles Albert-Peers, CEO of Alcogroup, had not driven by the grain terminals of Eurosilo Ghent, he would not have called Daniel Matthys and, most likely, Alcogroup would have established its bio-ethanol factory in Maldegem instead of Ghent. Next, if Xavier Vanden Avenne had not had a good relationship following their long-lasting shareholder relations with Cargill and Eurosilo, Cargill would probably not have been able to create the 'Belgian' biodiesel refinery Bioro, hence not being able to meet the quota. The list could go on and on. However, all these other 'undefined becomings' (Boelens & de Roo, 2014) did not happen and, in the end, turned out otherwise.

6.3

Understanding the port-city interface

We performed all three steps of our conceptual framework. We know how we can examine and visualize the port-city interface (step 1), we know why we observe this (step 2), and we know how the development agenda was formed (step 3). To guide this, we applied the relational approach of Yeung (2005, p. 48): "A relational approach to regional development seeks to identify the complex relational geometry comprising local and non-local actors, tangible and intangible assets, formal and informal institutional structures, and their interactive power relations."

Taking this into account, our proposition is that one should perceive the port-city interface as an interactive (economic) system (Van den Berghe et al., 2018). At this point of the dissertation, we can answer our two remaining research questions.

The first one (“How can we understand the port-city interface?”) is of a describing nature. To answer this question, we will, on one hand, reflect on all five case studies in order to improve our understanding of the port-city interface; on the other hand, we will describe all five individually. The second question (“How to plan the port city?”) deals with the (future) planning of the port-city interface. While answering this question, we will reflect on our results, on our analytical framework and, in particular, on the ‘arrows’ of our analytical framework. This will be answered in chapter 7.

First, we have to clarify our understanding of the port-city interface. A port-city interface exists if at least the two urban and maritime economies are involved and coupled. This seems rather obvious, but because we applied a relational approach, this goes beyond the geographical and land-use definition of a port city, implying an interface exists if port and city are located next to each other (Hoyle, 1989). In relational terms, a port-city interface does not necessarily imply that port and city should be located next to each other. In other words, it is possible for there to be a significant topographic distance between port and city. Following day-to-day meetings and especially in light of tacit knowledge, chances are higher, of course, that relations exist between closely located urban and maritime economies, especially if they are historically related.

Following this, we can, at this moment, conclude that all our five case studies are examples of a port-city interface, as they all reveal existing relations between (local and non-local) urban and maritime actors (but see further). All five economic sectors reveal that these actors couple the institutional port and city being considered (Amsterdam or Ghent) and their (local) bordering institutional city and port, respectively.

For Ghent in particular, all three case studies show existing, primarily shareholder, relations between the port, city or port-city of Ghent with the city of Brussels. The port(city) of Ghent is thus – in relational terms, to a certain extent – the port of Brussels. This confirms the findings of Hanssens et al. (2014) that central Belgium is a good example of a functionally polycentric mega-city region, with Brussels as the dominant financial city.

However, different than Hanssens et al. (2014) or other similar world-city network studies, besides the financial (shareholder) relations, we have taken five other, six in total, relations into account (Table 3.1). Each have their own extent (thematic + spatial boundary), their own structure and their own hierarchy. These two are correlated and give an indication of the relational differences existing between the individual economic agents contributing to the economic network. Hence, over time, hierarchy, in terms of control or importance, gets crystalized within the structure (Denicolai et al., 2010). Although we did not perform any network calculations, such as centrality or connectivity (Amin & Thrift, 1992; Yeung, 2000), by eventually taking these together, we get a more nuanced and detailed visualization of the port-city interface.

There is limited analysis on how different types of networks together affect the emergence of successful and vibrant (port-city) clusters; to our knowledge, this is also true for the port-city interface. A possible reason for this is that disentangling different networks' effect on performance is a difficult exercise (Boggs & Rantisi, 2003).

This has implications for our interpretation of the port-city interface, because it implies that not all existing relations are equally important to creating an interactive economic port-city interface. Therefore, as argued by Giuliani (2010, p. 264), if one wants to compare the effects of the positions of firms within different networks, the central issue is not essentially a quantitative one, understood as identifying the different factors and variables, but a more relational-qualitative one, in which one assesses the different types of networks that exist.

The research results of Giuliani (2007) revealed that there is an important difference between the business networks (understood as shareholder or consortium, in our case) and the knowledge networks (R&D in our typology). Our results (visualization and cross checked in interviews) confirm that there is an important difference between the knowledge and business network. Indeed, all relational geometries show that the shareholder (and, to a lesser extent, the consortium) network is relatively inclusive and has the largest geographical outreach. On the other hand, the knowledge networks (if they exist) are relatively exclusive and rather limited, both in the amount of involved actors as well as in geographical outreach. In other words, business networks are pervasive, connecting almost the entire population of actors within the particular economic sector being considered in a fairly homogeneous way; at the same time, knowledge networks are very selective, less dense and unevenly distributed.

The difference between the knowledge and business networks confirms, to a certain extent, the second twin process of glocalisation. One one hand, this process explains how economic activities simultaneously became more localised/ regionalized following the increasing importance of knowledge production and innovation, cf. regional world (Storper, 1997). All our case studies show that, if knowledge (R&D) relations are involved, they only directly connect a limited amount of actors and they are local or maximum regional (e.g. the biobased sector and steel sector Amsterdam towards TU Delft). On the other hand, economic activities became transnational (Brenner, 2004; Swyngedouw, 2004), creating thus the global corporate world (Taylor, 2016). All our case studies show (in)directly that, through their shareholder relations, they are part of globalized networks and that financially powerful multinationals are involved.

Our results also confirmed the first process of glocalisation. Although this is not visualised, before we discussed the relevant strategic couplings and presented the visualization, each case study described the structural couplings of the economic sector being considered, namely the industrial regulation and industrial setting. All case studies, especially the oldest ones (the steel and car manufacturing sectors), show that regulation is increasingly defined on the international level or the highest possible institutional level involved (EU, USA), or this is increasingly being taken over by these international levels (the biobased sector).

Although we did not quantify the six different network structures and hierarchies individually or in reference to each other, based on our empirical results we are able to indicate the importance of each type of network and its structure and hierarchy in reference to the economic port-city interface and the (possible) agency present within these networks in order to influence and set the development agenda.

In order to better grasp this, we can examine the different networks by looking at the type of actors and assets involved (Yeung, 2005). In addition to looking at the involved formal institutional structures based on the geographical location of the actors involved (cf. local and non-local), we can also distinguish local and non-local by looking at their stakeholder relations in order to find out who is in control. This can be done by looking at the location of the headquarters and/or the nationality of the actor. Our results show that, in most cases, the leading actors, as taken by the structure and hierarchy of all six networks together, are non-Belgian or non-Dutch multinationals (e.g. ArcelorMittal, TATA Steel, Volvo Car, Cargill). These are thus, in other words, not creating local, regional or even national control; decisions are taken elsewhere. In some cases, this can lead to an uncertain future for that particular firm, and, if it is a leading actor within the regional economy, even for the entire regional economic sector.

Some of our case studies confirmed this. The (partly) uncertain future of the steel manufacturing sector in Amsterdam following the possible merge between TATA Steel and ThyssenKrupp as well as the takeover of Volvo Car by Geely are examples of how decisions made in other parts of the world can have an important direct effect on other regional economies.

However, on some level, we have found how this uncertain future can be reduced. Closing or moving an economic activity comes with a cost, because one loses the built-up embeddedness (Jones, 2008). Embeddedness, in this case, is understood as an emerging relational effect. To understand this, one should look at the tangible and intangible assets (Yeung, 2005). Tangible assets are assets that have a physical form. These include the involved assets such as machinery, buildings, land and inventories. In other words, in most cases, the larger the firm, the more tangible assets it has. In our case studies, these large firms were mostly multinationals (e.g. TATA Steel, ArcelorMittal, Volvo Car, Cargill). Due to their large investments, as confirmed during our interviews, these firms tend to focus primarily on maintaining their profit and productivity levels. Or, in other words, they tend to minimize risks because their (tangible) stakes/investments are high. This is illustrated by the steel manufacturing sector in Ghent (ArcelorMittal partly outsourcing its R&D to OCAS), but especially by our biobased case studies. Until now, only the first-generation has proven that it can be (internationally) competitive without public support. This is the reason the search for more economic techniques for second or third generation or other biobased processes is done by adventurous entrepreneurs (e.g. Lode Speleers, Avantium, Chaincraft) or by public research institutions (e.g. Bio Base Europe Pilot Plant). It also explains why the biobased sector in Amsterdam can still today only survive with the financial support systems at work.

Intangible assets are nonphysical assets such as patents, trademarks, copyrights or brand/image recognition. In other words, intangible assets are more related to the development of knowledge. Following knowledge networks are achieved on long-term, are relatively exclusive, and limited in involved actors, these indicate if the network is local embedded. Moreover, taking into account that urban innovations increasingly redefine the way logistics and production networks are organised and how they impact globalized metropolitan regions, the economic competitive strength is increasingly determined by the present R&D relations and actors involved (Van den Berghe et al., 2018).

Thus by looking at the local and non-local actors (understood in geographical terms and by their stakeholder relations); the tangible and intangible assets; the formal (international regulations, the involvement of local and non-local institutional governments) and informal institutions; and the six different networks with their structures and hierarchies, we can evaluate our five different port-city interfaces and better understand the economic port-city interface.

Of course, before we can evaluate our port-city interfaces, we have to decide what is 'good' or what is 'bad'. For this we rely on our proposition that the port-city interface is an interactive economic system[273]. Interactive is debatable, but should be understood as a port-city network contributing significantly to the economic development of the particular economic sector that is taken into account. Hence, following this, and although we first said that all five are examples of port-city interfaces, only two can arguably be seen as good examples of a port-city interface. These two are the steel manufacturing and biobased sector in Ghent. This implies thus that the steel manufacturing sector and biobased sector in Amsterdam and the car manufacturing sector in Ghent are not examples of an interactive economic port-city interface. These three are examples of well-functioning economic maritime clusters, but lack a significant connection to a regional urban economy. We will now briefly look at our five case studies.

(a) Steel manufacturing sector Amsterdam

First, the steel manufacturing sector in Amsterdam, but in fact in Ijmuiden, is an extensive production network of different input and output commodities and energetic relations connecting a large amount of actors. Its leading actor is a powerful international company (TATA Steel, TATA Motors). The dominance of TATA Steel in the network is high because of its integrated character and also due to the structure and hierarchy of the networks (cf. hub and spoke network). The latter implies that these connected actors are directly dependent on TATA Steel (e.g. scrap metal delivery). However, different than for the car manufacturing sector in Ghent, many of these functions are difficult to replace or to skip. Indeed, many of the existing input and output relations are integral to the design of the steel manufacturing sector in Ijmuiden, and have been since the beginning. In other words, different than in the production and delivery of car doors for example, the waste products of TATA Steel can only be processed in the direct vicinity of TATA Steel. Hence, although a waste product, the outgoing waste commodity relations from TATA are also valuable for TATA itself. Of course, these functions could be internalized in TATA Steel, which would alter the network, but in terms of productivity or in terms of employees, this would not much change the network dramatically.

273 Although confusing, note that we developed the meaning of a system during this dissertation. Our proposition sees a system as an economic system, whereby the economic maritime and urban networks are (strategically) coupled. However, according to Luhmann (2004), a system is much more and entails the (emergent) structural coupling of additional (sub)systems, while at the same time composing structural components on these.

In terms of the different types of networks, the steel manufacturing sector performs well. TATA Steel Ijmuiden is innovative on a global level in terms of the development and production of steel products. However, and this is in contrast to the steel manufacturing sector in Ghent, the shareholder relations reveal the weaknesses of the R&D network, and thus also increasingly of the steel manufacturing sector in Amsterdam/Ijmuiden. Similar to Shell[274], the R&D is internal within TATA Steel. At first, one would not argue that this is a disadvantage for the economic (long-term) development of the regional economy. Indeed, different than the car manufacturing sector in Ghent, its presence is already valuable, especially with its gaining importance. Such a knowledge network is difficult to establish and is of long-term significance. Hence, the presence of an R&D network contributes to the embeddedness of the economic sector on the long term. However, the saga since the merge between TATA Steel and ThyssenKrupp was announced has shown that the R&D functions in Ijmuiden are subject to possible closure, or at least substantial change, because if the merge succeeds the company will have two R&D centres. Because these will be fully owned by the newly created company, there is a chance that the R&D in Amsterdam/Ijmuiden will be closed in favour of the German one. This (risk) differs from the steel manufacturing sector in Ghent. Indeed, it was exactly the goal to prevent OCAS, being the central key actor in the steel R&D sector in Ghent, from closing that the Flemish Government in 2004 decided to invest 30 million euro in light of its ‘Steel-friendly Flanders’ plan (Vlaamse Overheid, 2004). Since then, the Flemish Government possess agency, as it can decide together with ArcelorMittal about OCAS, and hence the long-term development of the steel R&D network in Ghent in close relation with the university.

The closure of the R&D functions and disappearance of the knowledge network in Ijmuiden/Amsterdam remains hypothetical. Nevertheless, our relational geometry reveals another weakness of the steel manufacturing sector. There is no important interactivity with an urban economy, in the first place with Amsterdam. Of course, there are commodity relations with the port of Amsterdam, but these are arguably not significantly contributing to the steel sector. In comparison to the steel manufacturing of Ghent, an important knowledge network of public research institutions or spin-offs is absent. This is similar to the biobased sector in Amsterdam. This absence is a consequence of the lack of an applied science institution in Amsterdam. Indeed, the existing R&D relations link Ijmuiden to Delft, and in particular to the TU Delft. In the cases of both the steel manufacturing and biobased sectors, one could thus say that the port-city interface exists between the port of Ijmuiden and the port of Amsterdam, respectively, with the city of Delft. However, in comparison with Ghent, the R&D steel manufacturing network is rather limited.

The absence of an applied research institution is acknowledged by the city of Amsterdam (economic department). However, there is a fundamental (institutional) problem. Although otherwise communicated by the port authority of Amsterdam, almost the entire steel sector does not belong to nor is a responsibility of the city or port authority of Amsterdam. Hence, if one would like to create a port-city interface system (first understood in economic relational terms, and not – yet – as according to Luhmann (2004)) in order to maintain or improve the existing embeddedness of

274 https://www.shell.nl/over-ons/amsterdam.html

the steel manufacturing industry on the long term for reasons already explained above, two options exist. First, one could change the institutional setting by merging the port authorities (or even the entire municipalities) of Ijmuiden and Amsterdam for example, making at least the authority responsible for the different port areas and the connection with the urban region (compare in this case the North Sea Port or the Port Authorities of Antwerp or Rotterdam); or one could improve the existing knowledge network with Delft by creating a primarily public-owned R&D network, for example.

(b) Biobased sector Amsterdam

The biobased sector in Amsterdam did not reveal an important port-city interface. Although there are existing (shareholder) relations to the city, these are of minor importance to economic development. The relational geometry reveals that the input/output, energetic and services networks are present, and that their hierarchy and structure are distributed fairly. In other words, there is a biobased cluster. However, they are controlled by only two companies, Simadan and Orgaworld. In terms of assets and actors, the biobased sector in Amsterdam remains local and small. Although Orgaworld is part of the multinational Shanks, there is no direct involvement by an important multinational, such as Cargill in Ghent. This holds the risk that it could be outcompeted more easily if the biobased (fuel) sector becomes global, for example in terms of feedstock. Indeed, although the biobased sector in Ghent is still first-generation, during our interviews we were informed that Cargill has already secured its second-generation feedstock. The price of, for example, used cooking oils increases quickly and will determine the near future of many second-generation biobased clusters.

However, not only the feedstock but also the techniques will decide if the second-generation cluster in Amsterdam will be able to survive. As informed during our interviews, even Cargill is not able to develop these techniques and is dependent on (mostly) public-owned fundamental research. Chaincraft, however, shows that the biobased sector in Amsterdam is also able to rely on and use knowledge development within universities, in this case the Wageningen University. The relational geometry also revealed existing indirect relations with the biobased pilot facility in Delft. However, in comparison with Ghent and in reference to the importance of knowledge development, the needed financial efforts and its tacit and local character, one can wonder if the existing biobased knowledge network of Amsterdam will be able to perform in the same way.

Two options exist. First, the biobased pilot facility in Delft could become fully independent. Of course, OCAS illustrates that a semi-independence also works, but arguably OCAS functions more as a transmission hub between the existing R&D steel cluster in Zwijnaarde and ArcelorMittal, rather than as the main R&D actor. Second, the biobased sector in Amsterdam will probably need to raise its investments in infrastructure, employees and feedstock, once the second-generation sector becomes fully grown. In this case, the situation of the second-generation biobased sector in Amsterdam resembles the situation of the first-generation biobased sector in Ghent a few years ago. After Belgium and many other countries in Europe stopped their financial support mechanisms, many production centres in Belgium and in Europe closed. Ghent is able to survive because its production process is well-designed, its production costs are low and it continues to innovate.

It is able to do this because it is financially backed by powerful local actors (especially Vanden Avenne commodities) working closely together with powerful multinationals (Cargill). Hence, there is a good chance that the biobased sector in Amsterdam will experience a similar evolution. Only the near future will tell us if Amsterdam is able to make this change, but their contemporary knowledge and shareholder networks can be seen as a weakness. In this respect, the network would benefit from at least financial corporation by a preferably locally or regionally based multinational.

(c) Car manufacturing sector Ghent

The car manufacturing sector in Ghent is the clearest example of a rather mono-functional regional economic network, in this case assembling cars. In other words, besides the extensive Just-In-Time input/output network, almost no other important relations or networks were found. Also in network structure, the car manufacturing sector is a good example of the dominance of one actor, in this case Volvo Car. TATA Steel and ArcelorMittal resemble a similar dominance, but are at least partly counterweighted by reciprocal and/or diffusing relations. In other words, the regional network of the car manufacturing sector is Volvo Car. This is even more so because the existing input/output relations are rather easily replaceable, or internal – which, from a regional point of view, is not a bad thing – or from outside the region. The latter is arguably the ‘worst case scenario’ and is effectively happening in Ghent at the moment. Indeed, the latest developments of the car manufacturing sector in Ghent are two-fold. On the hand, the only actor that really matters as shown by our relational geometry, Volvo Car, is sure of production, at least for the near future. However, on the other hand, the takeover by Geely increasingly means that different car parts will be produced in Sweden, but most likely increasingly in China as well, and subsequently transported to Ghent through its one belt one road. The future will tell if the car manufacturing sector in Ghent will be able to attract the (additional) production of car parts in the region, either from within Volvo or by new or adapted economic actors.

Regional or even national policy cannot do much to influence this evolution. The reason is shown by our relational geometry and shows that the decision power lies in Sweden, but in fact in China. We already explained that the R&D of Volvo Car is located in Sweden today, and that the Flemish government has tried in the past to convince Volvo to establish such an R&D centre in Ghent; but this never happened due to being blocked by the Swedes. Of course, Flanders’ drive was established and still exists; but in reference to the car manufacturing sector in Ghent, this has not (yet) translated into new R&D relations between the maritime and (urban) knowledge economy.

This illustrates the difficulty for regional or national governments in creating an R&D centre that is able to innovate existing economic networks. In turn, this also illustrates that the success of the Bio Base Europe Pilot Plant Ghent is a difficult goal to achieve, and that it is easier to create an R&D centre together with existing private partners (OCAS, Pilot Plant DSM). For policy within R&D networks, the car manufacturing sector in Ghent is therefore also a refutation of our findings following the comparison of the biobased sectors in Ghent and Amsterdam, stating that it is a good idea to establish the main R&D centre publicly. If the main private partners are not directly involved (cf. Volvo Car), then the question remains whether significant relations will appear. The chance that such relations appear depends on the pull and push character of the R&D developed in the public-owned research centre. For the steel manufacturing and biobased sectors in Ghent, apparently the involved private actors need to be involved within the R&D networks to be able to further innovate. Apparently, for the involved corporate actors within steel manufacturing sector in Amsterdam, the biobased sector in Amsterdam or the car manufacturing sector in Ghent, the locally or regionally developed R&D is not important enough to actively connect to. In these cases, the needed R&D is being primarily developed within the company itself (TATA Steel, Orgaworld, Volvo Car) or within other regional economies (Volvo – Gothenburg and, possibly, TATA Steel / Thyssen Krupp - Germany).

For regional policy, it is thus difficult to improve the embeddedness of a particular economic sector by improving or even creating the R&D network from scratch. Although this is not visualized in our relational geometries, one may not forget that both the car manufacturing and the steel manufacturing sectors in Ghent do contain important knowledge; not in reference to the innovation of its products, but in reference to its production processes. Indeed, during our interviews, it was confirmed that probably the most important reason both Volvo Car and ArcelorMittal Ghent are still open is because of their high productivity.

Taking this into consideration, for the car manufacturing sector, policy could aim at further improving this aspect, as it builds further on what is already present. Of course, only Volvo Car itself will have to further invest and improve its production processes, but policy can at least help to facilitate this. This is already the case. Recently the port authority Ghent helped to improve the connection from the R4 ring road to Volvo Car, and it is currently helping to transform the terminal functions towards DFDS by creating an internal road, making it unnecessary to use epublic roads for the transport from the factory to the terminal.

However, probably the most important weakness of the car manufacturing sector and the steel manufacturing sector in Ghent is that there is not a direct relation between the two. As already explained, the necessary steel metal press is still not present in Ghent. If it was created, this would alter the relational geometries, and hence also its embeddedness (especially in terms of tangible assets), of the car manufacturing and steel manufacturing sectors.

(c) Steel manufacturing sector Ghent

Together with the biobased sector Ghent, the steel manufacturing sector is a good example of a port-city interface, understood as a coupling between the urban and maritime economy. Both the maritime and urban economy and its relevant actors contribute significantly to the regional economic development. For the steel manufacturing sector, in terms of involved actors, one could argue this is less the case for the maritime economy because only ArcelorMittal matters. However, due to its tangible and intangible assets and its integrated production process, which is more integrated than that of TATA Steel Ijmuiden, ArcelorMittal could be perceived as a cluster on its own.

The weakness of the steel manufacturing sector in Ghent is, similar to TATA Steel Ijmuiden, related to the absence of any important local, regional or national buyer of its products. As explained just above, this weakness could be reduced if the output commodity relation could be realised with one of its current customers, Volvo Car. The steel manufacturing sector in Ghent has, of course, other weaknesses besides this. In addition to the absence of an important buyer of steel, its environmental impact is large. This is similar to the steel manufacturing sector in Ijmuiden.

However, on the aspect of a lack of local customers as well as the aspect of its environmental impact, improvements will most likely be made in the near future if the Steel2Chemicals project is realized. Indeed, if Steel2Chemicals becomes reality, not only will ArcelorMittal be able to significantly lower its environmental impact, it will establish a new output relation with DOW Chemicals Terneuzen at the same time. Although DOW Chemicals will not buy steel but CO2, this would nevertheless imply an important investment and further embeddedness of the (maritime) production side of the steel manufacturing sector.

The policy recommendation for the steel manufacturing sector in Ghent would be to improve the relation between the port of Terneuzen (DOW) and the port of Ghent (ArcelorMittal). During the research of this dissertation, since January 1, 2018, the North Sea Port exist, thus in fact this policy recommendation has been fulfilled. This combined with the FBBV being R&D involved in the city of Ghent, the city of Terneuzen, the port of Ghent and port of Terneuzen, the opportunities now exist to further improve the economic port-city interface and extend it beyond Ghent towards Terneuzen. Because the integration of DOW and ArcelorMittal involves R&D processes and procedures, the FBBV should take the lead while the North Sea Port, being of course closely involved, can assure primarily that the institutional and land-use arrangements are fulfilled.

(d) Biobased sector Ghent

The biobased sector Ghent is probably the best example of a well-developed port-city interface. Both the urban knowledge part and the maritime production part reveal two well-connected economic clusters. Although Cargill, being much bigger in terms of assets, is part of the network, our relational geometry does not reveal that this is also the case hierarchically. In other words, and different from all four other case studies (TATA Steel, Simadan, Volvo Car, ArcelorMittal), if Cargill decided to leave the biobased sector in Ghent, it would of course be a negative development, but most likely not a fatal one. Alco Bio Fuel, for example, operates individually from the node of Cargill. Plus Cargill could be replaced by another grain-pressing company, in the same way that Cargill overtook the activities of Vamomills (Vandemoortele) in the past.

The biobased sector in Ghent has two important challenges up ahead. First, there is the impossibility that the Rodenhuize cluster will expand in its current configuration. As informed during our interviews, because of some operational improvements, the production processes already currently surpass the maximum possible production levels that were set out in the original design of the cluster. In other words, if the biofuel cluster of Rodenhuize wants to expand, it will need significant investments. Because Alco Bio Fuel has now expanded its activities in Rotterdam, one can wonder if this will happen in the near future. The second challenge is the implementation of the second- or even third-generation of biofuels and products.

However, as informed during our interview, the foreseen transformation of the entire cluster and its production processes will be rather easy. This is illustrated by the fact that Cargill is already securing the needed feedstock.

However, the real strength of the biobased cluster in Ghent is its ability to transform other existing economic sectors and to connect with those. Although the (near) future will tell us if it goes beyond outlooks, the fact that the chemical (plastic) sector as well as the steel manufacturing sector are looking to transfer their processes to more biobased ones is largely the consequence of the presence of GBEV/FBBV and its Pilot Plant. Hence, if (economic) planners would like to know how regional economic networks can achieve a higher level of embeddedness, be innovative and even connect to each other if possible, the developments of the biobased sector in Ghent can arguably be seen as a good example. Although it remains important, these processes go (far) beyond merely the improvement of infrastructure or of (national) financial regulation programs.

In light of our understanding of the port-city interface, the biobased sector in Ghent combines both local (Bioro, pilot plant) and non-local actors (Cargill); tangible (Oleon, Cargill, Electrabel) and intangible assets (R&D processes); and informal (biobased Europe) and formal institutions (North Sea Port Authority and the cities of Ghent and Terneuzen), creating an interactive economic system[275].

275 However, see footnote 273.

CHAPTER 7

Conclusions

7.1

Introduction

The port-city interface is much more than only the geographical area between port land use and urban land use. Being better known as the waterfront, this area has been the subject of real estate developers all around the world since the 1980s. The urban redevelopment of many waterfronts is a consequence of the (voluntary or obligated) movement of many traditional port industrial and logistical functions downstream or to the hinterland, creating obsolete port areas. However, this is largely based on a rather biased and old view of the 'dirty' industrial and logistical port. Such view ignores the fact that many port industries increasingly rely on innovations that redefine the way logistics and productions are organized and how these impact globalized regions. Regarding the port-city interface only in terms of (in-)compatible land use holds the risk that one does not recognize how, on one hand, specialized business services in the city connect with port and shipping operations and, on the other hand, how (maritime) entrepreneurship and innovation is related to urbanization externalities. In other words, the port-city interface is much more than only the waterfront and, if only regarded in land use terms, there is a risk that policy measures and plans can alter existing economic networks, something Hayuth (1982) already warned us about four decades ago.

Therefore, we started our research with the proposition that the port-city interface is an interactive economic system. This requires that we take into account the various coupling mechanisms creating different (inter-)relationships within the port city, but also outwards and towards this system. The port-city interface thus not only represents existing relations between port and city, but also between the local and global (cf. regional worlds), creating thus multiple challenges for the (spatial) policy of port cities. This is the reason for asking our research question: '*How to plan the port city?*'.

Before we give our answer to this research question in section 7.4, first we reflect on our theoretical and methodological approach, and on our case studies.

7.2

Reflections on the theoretical and methodological approach

The theoretical chapter started by explaining the origin of the relational approach. We explained that the relational approach is ideally placed to combine topological and topographical information. We argued, however, that the network relational approach tends to focus on the microscale and networked phenomena, neglecting insights from 'older' relational institutional approaches. Consequently, we combined the network relational approach with the concept of emergence and emergent systems. This helped us to construct a flat but dynamic (emergent) multilevel ontology. Based on this ontology, we introduced the concept of the relational geometry. A relational geometry identifies and allows us to understand the relation between local and non-local actors; tangible and intangible assets; and formal and informal institutional structures and their interactive power relations. Such relational geometry expresses the crystallization of power and structural capacities, particularly institutions and actors. This is our first step of our conceptual framework.

In our methodological chapter, we identified the different variables that need to be examined to identify the relational geometry. First, we argued that one needs to combine the thematic and spatial boundaries to allow the research to focus and to (arbitrarily) find the research 'horizons'. Second, we argued that each network has a structure, but also a hierarchy. Third, and most importantly, we argued that different types of relational networks are at work at every moment and every place. We heuristically identified six types of networks, which have been taken together.

To make this possible, we proposed a database model based on two interrelated main tables. The first table contains the nodal quantitative data, such as employee figures, net incomes or geographical coordinates. The second table contains the relational quantitative data. Subsequently, we proposed a visualization methodology capable of combining the geographical (institutional) data with the topological actor-relational data. Eventually, the relational geometry could be visualized.

Subsequently we argued that the analysis of the relational geometry should be integrated with causal theory, making it possible to distinguish the conditions and causal mechanisms that have significant effects from those that do not. In other words, one needs to be able to identify causal mechanisms that are operative in particular places. Ontologically, this creates a problem, as such analysis requires analytical stability as a starting place for understanding the causes of particularity. Therefore, we argued that, in addition to a flat ontology, and despite its genealogy arguably contains references to a similar focus on causal processes, one also needs a deep ontology in order to stop time and to go back and forth into time. Leaded by the principle of contingency, causality should be understood in reference to its contingent conditions that explain why other mechanisms can trigger, block or modify the mechanisms observed.

By focussing on causal coupling mechanisms we could formulate our analytical framework. Based on system theory and emergent coupling mechanisms, we introduced tactical, strategic and structural coupling mechanisms, each with three different forms: discursive, physical/material and institutional. This is the second step of our conceptual framework.

Our analytical framework is, in fact, in essence a refinement of the concept of strategic coupling of places and networks as studied widely within Global Production Network (GPN)-studies (Yeung & Coe, 2015). Indeed, we argued that strategic coupling can have particular forms, but it is also emergent from tactical coupling and, in turn, emergent towards overarching structural couplings. We identified structural coupling as a higher level emerging outcome, beyond the control of those involved. In this respect, an economic sector (car manufacturing, steel manufacturing, biobased sectors) or the port city can be regarded as (potential) structural couplings.

Hence, the identification of the emergent relation between strategic and structural leads arguably to a call for a research agenda, namely to combine the macro level with the strategy policy agenda on the meso level. The meso strategy and policy agendas, and its role as mechanisms leading to effects, is rather unexplored in this dissertation. Exactly focussing on the meso level, could lead to new insights, enriching the literature of World City Networks (WCN) and GPN studies. It could lead to a connection between the vast (describing) literature on global network phenomena and more regional and local research examining policy processes. For example, it could lead to the combination of more quantitative data such as trade data, studied on global levels, with its effects on the regional level, surpassing the often implicit bias of 'it's the economy stupid'. Indeed, although aimed for to some level in this research, it is critical to understand how particular development agendas and discourses are formed, modified or blocked, but also how they in a reciprocal way form, modify or block reality. This dissertation foremost focussed on the effects on the micro level, in reference to the meso and macro levels.

Indeed, our central concept we used was the relational geometry. Important to stress out is that, although we appointed a set of variables to examine and understand the relational geometry, in essence it is a more fluid concept; it could even be regarded as a result of or even a language itself in constant development; hence, our proposition of the economic port-city interface as an interactive economic system, including much more than only economic aspects. The economy is a relational social construct. We used the concept of the relational geometry in our step 1. Subsequently, we focussed on the causal coupling mechanisms in step 3. However, we also argued that we need a step 3 in our conceptual framework. Indeed, while we obtained a detailed view on causal mechanisms, there is still a closer empirical look needed to understand how actors possess agency in order to perform causal coupling mechanisms and, in the end, to influence and set the developmental agenda of a particular (regional) economy. To be able to do so, we defined agency as the capacity to act. In this respect, agency, as any other relational phenomenon, cannot be understood without taking into reference its constituent elements, which is, to a certain extent, inexcludably subjective. Power is always ambiguous. While step 1 and step 2 followed an intrinsic case study whereby the case speaks for itself, step 3 followed a collective case study. Hereby, we did not generalize the concept of agency or generalize the port-city interface in this respect, but aimed to understand the concept of agency and its causal mechanisms in reference to the economic development of the port-city interface.

The research method that was applied was, on one hand, desktop research. This was followed by our theoretical research and, for our step 1, the visualization of the relational geometry. While desktop research was still needed to crosscheck the obtained data, for step 2 and step 3, we relied on different semi-structured interviews with all the relevant public and private actors involved. At first glance, more interviews could have been conducted; however, this is exactly one of the advantages of our three-step conceptual framework. The visualized relational geometry is namely ideal for the identification of (potential) coupling mechanisms and the selection of relevant actors (Van den Berghe et al., 2018). Hence, once selected, we moved to a more qualitative fashion through interviews. A critical point here is the background of the people interviewed, since they can have different temporal 'institutional memories' on their roles and those of others in what is essentially a reconstruction. The further back in time we look, the less likely it is that this can be achieved (since people make career changes, become more selective in their memories, or simply pass away). Hence, this meant we could only perform step 2 and step 3 for the biobased sectors in Amsterdam and Ghent. While on one hand, these cases or not (yet, but soon) too long ago, it also helped to analyse these sectors, as they are admittedly quite harmonious. In more conflicting situations, and in cases where couplings fail to materialize or when there is a de-coupling (cf. MacKinnon, 2012), key people are less willing to discuss past failures or are simply frustrated.

7.3

Reflections on the case studies

We performed five case studies in two port cities. Each case study stands on its own; nevertheless, they were selected to at least be able to be compared with each other, without attempting to generalize. First, Amsterdam and Ghent were chosen, as they are comparable in several aspects. Both are situated in the Hamburg-Le Havre range and in particular to the Rhine-Scheldt Delta, which is the main logistical throughput region for the European economy. In addition, both port authorities are landlords with public shareholders.

Although at first glance, both the port city and the economic sectors taken into consideration are rather similar, important differences exist. In reference to the port city, a first important aspect is that in Belgium port areas are jurisdictionally defined in federal and now regional (Flemish) decrees. On its own, this already creates a different institutional setting. Although port authorities' shareholders in Belgium are mostly its host municipality or municipalities, the definition of the area itself is the responsibility of the nation state (if one regards Flanders as a state, in this respect). In other words, although of course Belgian port cities have also experienced the evolutionary phases as described by Bird (1963) or Hoyle (1989) – by which vacant port brownfields are reconverted to urban functions – jurisdictionally this cannot continue, since the 1990s. Hence, the contemporary land-use conflict between port and city in Amsterdam in The Netherlands, and presented as 'universal' (Wiegmans & Louw, 2011), is in fact not applicable for Belgian port cities, at first glance; at least not until the definition of the port area within the Flemish law is changed.

Second, although the jurisdictional definition of Belgian port areas is rather fixed, they nevertheless adapted to the changing (geographical) economy during the last one-hundred years. Indeed, the ports of Bruges, Ghent and Antwerp expanded their institutional borders gradually (even internationally, cf. North Sea Port). While the port of Rotterdam has also done this in a similar way, the port of Amsterdam did (partly) not. Hence, although the Port Authority of Amsterdam includes the NZKG ports of Ijmuiden, Beverwijk and Zaandam in marketing terms, they are, if one splits the figures, a rather 'small' port, also explaining their diminishing agency and their search for a 'new sustainable role' in times that go 'beyond the Mainport' (RLI, 2016).

In these (structural) contexts, we examined the steel manufacturing, the car manufacturing (only Ghent) and the biobased sectors. Another possible research agenda would be to see if our research results could also be found in more throughput ports. Indeed, both Amsterdam and Ghent are chosen for their rather industrial character. First, their separate relational geometries showed that, although similar sectors tend to follow 'general' rules (e.g. lean-and-mean or integral steel production), their local and regional embeddedness is different each time. Like all economic sectors, these three sectors also are regulated in several ways. These regulations are the result of the interweaving of different related institutional levels, from the global to the local.

Our case studies helped us to understand the port-city interface in reference to our proposition. We argued that two of our case studies represent an economic port-city interface. These are the steel manufacturing and biobased sectors in Ghent. Although all three other case studies also have relations between maritime and urban economies, they are not significantly contributing to the economic development; hence the absence of the coupling of the urban and the maritime economy, or the economic port-city interface. For each case study, we briefly reflected on possible policy recommendations in order to improve or create a port-city interface. However, these policy recommendations will only be effective if they are effectively realized. Hence, what remains is to answer the more general question: '*How to plan the port city?*'.

7.4

Take-home message

The challenge for the (spatial) policy planning of port cities is not to manage the conflict between port and city (cf. Wiegmans & Louw, 2011), but to manage the (if existing) relations between port and city, to fine tune the opportunities (Hall, 2016) and the related place-based strategies, articulated within evolving structures of provision (Jacobs & Lagendijk, 2014; Van den Berghe et al., 2018). Improvements will come if one understands hereby the glocal processes at work (Gilliard, Wenner, Lamker, Van den Berghe, & Willems, 2017). The lion's share of this dissertation has tried to achieve this. We found that the existence of the economic port-city interface is not straightforward. This is illustrated by our five case studies of three economic sectors within the port cities of Amsterdam and Ghent. At first glance, one would expect similar results. Indeed, we conducted our research within port cities that are relatively alike, in terms of the institutional setting as well as the (economic) culture. Moreover, we looked at two economic sectors that are present in both port cities. However, our results show that the existence of a port-city interface differs not only between port cities, but also within port cities. In other words, knowing if one or more port-city interfaces exist within a certain port city requires detailed quantitative and qualitative research capable of understanding and analysing the structural and strategic conditions per port city, per economic sector and even per economic actor taken into consideration.

Our results show that, in the first place, one has to be able to understand the 'macro' market forces at work (Lagendijk, 2006) and let them 'do their thing' (Davy, 2017); but at the same time, intervene or regulate if necessary in reference to the development of the port-city interface (from the viewpoint of regional economic development). Our results show that maritime and urban economies are or should be (increasingly) intertwined, which would create the economic port-city interface (Van den Berghe et al., 2018). In particular, our results show that it is especially important that the R&D functions should be (financially) neutral, or at least neutral in perception (cf. Bio Base Pilot Plant, OCAS), and not the responsibility of the private market. As such, the R&D functions are not subject to the centralized power and decision-making of (hierarchically structured) multinational leading firms; the financial performance and shareholder value subordinating employment to profit; nor the increasing dominance of equity capital in most industrial economies.

Especially R&D relations between corporate firms and local or regional research centres, and (in)direct shareholder relations between multinationals and local financially powerful actors help to, on one hand, create the port-city interface and, on the other hand, create a connection between the local economy and global markets. In other words, a port-city interface should be able to connect to global markets; connect the maritime and urban economies; and create and facilitate knowledge development.

This creates a paradox. On one hand, this implies that the 'dual' institutional structure of a port city (like Ghent or Amsterdam) formed by a (semi-)dependent port authority and an urban government should continue to exist. Indeed, port authorities should remain focussed on attracting global production networks by improving their infrastructure and areas. Cities should remain focussed on facilitating the knowledge economy and living conditions, among others.

On the other hand, however, this creates exactly the problem of facilitating the existence of the port-city interface. There is namely no institutional 'level' or actor responsible for the port-city interface. Of course, in practice, port and city meet each other constantly; but as we have described, for the long-term policy of the MRA region, for example, such collaborations are not self-evident and subject to the willingness and openness of the involved institutions to work together. One needs both to achieve results.

In this respect, for all our case studies, the port-city interface – understood as an overarching system – does not (entirely) exist. The 'best' economic port-city interface, the biobased port-city interface, couples not only the economic systems, but also the research systems and financial systems. However, it has not (yet) led to an institutional coupling. Although the GBEV/FBBV was institutionalized, it did not become an overarching institution, understood as a regulating entity. Maybe in the near future, the biobased sector will evolve to an overarching system defining several aspects of the port and city, such as land use, regulation or production processes. Until then, we can conclude that there is an economic port-city interface (or an interactive economic system, according to Hoyle (1989, p. 429)), but not an overarching system presupposing features of its environment on an on-going basis and on which they (port and city) rely structurally (cf. Luhmann, 2004).

During our interview with Professor Wim Soetaert, it is exactly this missing institutional aspect that is perceived as an important constraint for the further development of the biobased sector (or in this case, towards a biobased system). Indeed, our results show that the success of the economic port-city interface of the biobased and the steel manufacturing sectors in Ghent were primarily formed by overlapping port-city actors, GBEV/FBBV and OCAS, respectively. However, in land-use terms, neither belong to the port or the city. Simplified, GBEV/FBBV or OCAS are functions with an 'industrial' character that does not belong in urban regions (cf. environmental regulations); and yet, they are not industrial enough, in throughput or direct added value for example, to be ideally (according to the land lord business model of ports) located in port areas.

This forms a problem because our results show that exactly these 'illicit' hubs are (increasingly) important and are the main reason that, on one hand, the economic port-city interface exists and, on the other hand, local and non-local actors connect; tangible and intangible assets are deployed; and the necessary institutions are involved (ports and cities).

Solving this paradox is, however, not straightforward. Our research shows that the 'right' or adequate solution is dependent on context and time, but also on the specific economic sector and market (regulation). Nevertheless, a strategic coupling has to be achieved in the end.

In this respect, we can formulate some clear policy recommendations in reference to our main research question '*How to plan the port city?*'. First, the most important task is that one understands the port-city interface. Understanding the port-city interface requires one to go beyond the merely abundant abstract economic lists (e.g. throughput, number of employees) biasing his or her view; instead, one should combine quantitative and qualitative tools. This is our step 1. Next to this snapshot, one also has to monitor the port-city interface. In this dissertation, we looked back to understand how (step 2) and why (step 3) the situations within the port-city interface exist, but the true value lies in continuing this observation in the (near) future. At the moment you are reading the presented relational geometries in this dissertation, they are already outdated and should be updated.

Having such a detailed monitoring tool, will, secondly, help to detect the windows of opportunity that present themselves constantly (Boschma & Frenken, 2009; Buitelaar, Lagendijk, & Jacobs, 2007; Storper & Walker, 1989). However, we need to make an important remark here: The most important windows of opportunity (e.g. biofuel quota) that present themselves will and must be detected by the economic actors themselves, and not by the policy makers. Indeed, the task for policy makers is not to detect opportunities for economic actors as such, but rather to detect and facilitate the latent (tactical) acquaintance that economic actors possess to deliver the (strategic and structural) potential of windows of opportunity, if the chance presents itself. In other words, the policy makers of the port-city interface should know what the weaknesses and strengths of the port-city interface are and how to use windows of opportunity to guide the economic development of the port-city interface towards new strategic couplings.

However, if there is not an actor responsible for (at least) overseeing the (evolution of the) port-city interface, how can the related windows of opportunity, related thus to its maritime as well as its urban character, be evaluated comprehensively? Even if port and city meet each other regularly, the development of the port-city interface is only possible if the two are willing to do so. In other words, if port or urban interests are opposed, soon the port-city interface will develop into an avoidance or even (spatial) conflict (Hall, 2016; Wiegmans & Louw, 2011).

To avoid this and to be able to improve or even create the port-city interface(s), port and city (cf. region) have to acknowledge the added value of the other to their own economic development. To better grasp this, on one hand, (unbiased) urban authorities should include the maritime economy when performing urban (economic) development. Once a quay is transformed from economic activities to urban residential areas, it (most likely) will never return, mortgaging future relations between port and city (e.g. circular economy). On the other hand, although port authorities and advising research entities are increasingly acknowledging this (OECD, 2013), port authorities should underline the importance of added value and the number of jobs for regional development, especially in reference to their license to operate. The diminishing license to operate in the port of Amsterdam is illustrative in this respect. Port authorities should be encouraged to do this, and even should be able to alter their (landlord) business models, even if it has financial implications both for the port authority and dividend-receiving shareholders on the short term. In other words, both port and city should not choose for the ‘parochial’ urban or maritime growth machine (Logan & Molotch, 1987), but should facilitate economic activities that can improve the long-term competitiveness of existing economic networks. Thus, besides the fact that port and urban authorities should be able to detect the windows of opportunity that ‘their’ economic actors present to them, both should also be able to detect the windows of opportunity that port and city present to each other. Planning the port-city interface entails thus a co-evolutionary planning (de Roo & Boelens, 2016) with and between the maritime and urban economy that is able to move from a tactical to an emergent strategic coupling of actors, assets and institutions; this eventually towards an emergent structural undefined becoming of the port city.

For the waterfront, as one of the main and clearest challenges and threats to the planning of the port city, one should see this particular area as flexible and incomplete. Instead of seeing the waterfront as a ‘buffer’ to split port and urban functions in order to mitigate conflict, rather these areas should be of high importance to the port city, all in reference to the ever-changing situation and tactical opportunities. Hence, the waterfront could/should never be complete because the future is undefined. Moreover, it should be avoided that the waterfront is part of an ‘end state’ architectural or urbanist masterplan. It should be a place where port and city meet and learn about each other, and where the different relations, networks and potential hub actors (e.g. GBEV/FBBV) can find a (land-use) location to develop, if necessary.

APPENDIX A

Appendix A Amsterdam Interviews

Name	Main task/role	Date
Orgaworld (CEO Klaas van den Berg) - since 2012	Biodiesel production	12/01/2017
City of Amsterdam (Director Martijn van Vliet)	Economy department	13/03/2017
TATA Steel Ijmuiden (Jean-Pierre Westerveld)	Strategic Modelling engineer TATA Steel Europe	20/03/2017
TATA Steel Ijmuiden (Donald Voskuil)	Manager Regional Affairs at TATA Steel Europe	20/03/2017
Port Authority of Amsterdam (Micha Hes) - since 2009	Bio-based/circular responsible	27/01/2017
Chaincraft (CEO Niels van Stralen) - since 2010	R&D Fermentation processes	3/02/2017
City of Amsterdam (Eveline Jonkhoff) - since 2011	Bio-based/circular department	6/02/2017
Amsterdam Economic Board (Marjolein Brasz) - since 2016	Bio-based Economy Association	27/03/2017

APPENDIX B

Appendix B Ghent

Name	Main task/role	Date
City of Ghent (Lieven Tusschans) - since 1990	Economy department	06/08/2015 & 19/01/2017
Prof. Em. Dr. Georges Allaert - since 1990	Professor Spatial Planning Ghent University	15/08/2016
Stefan Derluyn - since 2007	Regional director Chamber of Commerce (Voka) East-Flanders	7/03/2017
City of Ghent (roundtable)	Economy department	14/03/2017
ArcelorMittal Ghent (David De Rocker) - since 2002	Manager external transport	6/04/2017
Cargill Ghent / Bioro Ghent (Luc Malysse) - since 1989	Biodiesel production	2/08/2017
Eurosilo Ghent / Alco Bio Fuel (Daniel Matthys) - since 1976	Bio-ethanol production/ Grain storage	17/08/2017
Oiltanking Ghent (Director Koen Van Kerkhove) - since 1986	(bio)fuels storage	21/08/2017
Port Authority of Ghent (Director Daan Schalk) - since 2009	Landlord	1/09/2017
Volvo Car Ghent (Mark De Mey) - since 1982	Manager PR and communication	4/09/2017
Cargill - since 1967 / Belgian Biodiesel Board since 2007 (Fons Maes)	Engineer-Manager / Chairman	5/09/2017
Professor Wim Soetaert - since 2004	Ghent University, FBBV	7/09/2017

APPENDIX C

Appendix C Paper presentations at (inter)national conferences

Conference	Paper	Date
AESOP Young Academics Conference 2015 – Palermo	Beyond geographic path dependencies: Towards a Post-Structuralist Approach the Port-City Interface	24/03/2015
Plandag Leuven 2015	Waarom blijven we stadhavens geografisch anayseren? De huidige lock-in van het conceptueel denken zet innovatie onder druk (awarded with Best Dutch/Flemish Young Planner prize 2015)	21/05/2015
AESOP Prague 2015	Understanding the fuzzy port city complex: an	14/07/2015
Isocarp Rotterdam 2015	The Economic Port-City Interface	20/10/2015
AAG San Francisco 2016	Tinder for Port Cities: Who's connecting the dots?	01/04/2016
WPSC – AESOP Rio de Janeiro 2016	Port Cities: An actor relational approach	07/07/2016
AIVP Rotterdam 2016	Using the Diversity of Port City Relations as Tool for Spatial policy.	05/10/2016
Plandag Gent 2017	Gamechanger China verhoogt regionale economische competitie tussen Gent en Gotenburg. De voortdurende veranderingen sinds de overname van Volvo Cars bewijst hoe belangrijk de gedeelde ruimte tussen haven en stad is	18/05/2017
RSA Dublin 2017	The Relational Power Geometry of the Port-City Interface. Case studies Ghent & Amsterdam	05/06/2017
CVS Gent 2017	De zeesluis van Terneuzen als 'pasmunt'? Besluitvorming ontleed rondom havenontwikkling in het Schelde-estuarium	23/11/2017

Bibliography

Aalbers, M. B. (2011). Place, Exclusion and Mortgage Markets: Wiley.

Agentschap Onroerend Erfgoed. (2017). Gent - 19de- en 20ste-eeuwse stadsuitbreiding (online). Retrieved 05/03/2018 https://id.erfgoed.net/erfgoedobjecten/122211

Agnew, J. (1994). The territorial trap: the geographical assumptions of international relations theory. Review of International Political Economy, 1(1), 53-80.

Albrechts, L., Healey, P., & Kunzmann, K. R. (2003). Strategic Spatial Planning and Regional Governance in Europe. Journal of the American Planning Association, 69(2), 113. doi:10.1080/01944360308976301

Allaert, G. (1992). Zeekanaal en Ruimtelijke Ordening: Probleemstelling en toepassing in de kanaalzone Gent-Terneuzen. Water, 6(67), 4.

Allaert, G., van den Abbeele, F., van Lambalgen, H., de Potter, W., & Vermeulen, M. (1991). Een ekonomische inventarisatie van de Kanaalzone Gent-Terneuzen. Een aanzet tot grensoverschrijdende samenwerking op ekonomisch gebied. Gent/Terneuzen: Seminarie voor Survey en Ruimtelijke Planning RU Gent, Kamer van Koophandel en Nijverheid van het Gewest Gent, Kamer van Koophandel en Fabrieken voor Zeeuwsch-Vlaanderen.

Allen, J. (2003). Lost geographies of power (Vol. 79): John Wiley & Sons.

Allen, J. (2011). Powerful assemblages? Area, 43(2), 154-157. doi:10.1111/j.1475-4762.2011.01005.x

Allen, J., & Cochrane, A. (2010). Assemblages of State Power: Topological Shifts in the Organization of Government and Politics. Antipode, 42(5), 1071-1089. doi:10.1111/j.1467-8330.2010.00794.x

Allen, J., Massey, D., & Cochrane, A. (1998). Rethinking the region: New York (N.Y.) : Routledge.

Amin, A. (1994). Post-Fordism : a reader: Oxford : Blackwell.

Amin, A. (1999). An Institutionalist Perspective on Regional Economic Development. International Journal of Urban and Regional Research, 23(2), 365-378. doi:10.1111/1468-2427.00201

Amin, A. (2002). Spatialities of globalisation. Environment and Planning A, 34(3), 15.

Amin, A., & Thrift, N. (1992). Neo-Marshallian Nodes in Global Networks*. International Journal of Urban and Regional Research, 16(4), 571-587. doi:10.1111/j.1468-2427.1992.tb00197.x

Amin, A., & Thrift, N. (1995a). Globalisation, institutional 'thickness' and the local economy. In P. Healey, S. Cameron, S. Davoudi, S. Graham, & A. Madani-Pour (Eds.), Managing cities. Chichester: Wiley.

Amin, A., & Thrift, N. (1995b). Institutional issues for the European regions: from markets and plans to socioeconomics and powers of association. Economy and Society, 24(1), 41-66. doi:10.1080/03085149500000002

Amin, A., & Thrift, N. (2000). What kind of economic theory for what kind of economic geography? Antipode, 32(1), 4-9.

Amin, A., & Thrift, N. (2002). Cities: reimagining the urban: Polity Press.

Amports. (2016). Innovatie en Duurzaamheid. Pijlers van de moderne haven. Zeehavens Amsterdam.

Anderson, G. E. (2012, 21/02/2012). Volvo is Geely, and Geely is Volvo.

Anselin, M. (1970). La Fonction des Ports de Belgique. In R. Regul (Ed.), College d'Europe (Semaine de Bruges): L'Avenir des Ports Europeens || College of Europe (Bruges Week): The Future of the European Ports (Vol. 1, pp. 283 - 312). Bruges: De Tempel, Tempelhof.

Anthonis, T. (2012). Open innovation for the biobased economy. In GBEV (Ed.).

ArcelorMittal. (2018). ArcelorMittal congratulates Volvo on XC40 winning Car of 2018 with AHSS [Press release]. Retrieved from http://automotive.arcelormittal.com/News/3319/Volvo-XC40-COTY-2018

ArcelorMittal Ghent. (2015). Project MER - hervergunning site ArcelorMittal Gent. Retrieved from

ArcelorMittal Ghent. (2017). Investering: nieuwe havenkranen [Press release]

Archer, M. S. (1982). Morphogenesis versus Structuration: On Combining Structure and Action. The British Journal of Sociology, 33(4), 455-483. doi:10.2307/589357

Armstrong, D. (1997). Foucault and the sociology of health and illness: a prismatic reading. In A. Petersen & R. Bunton (Eds.), Foucault, Health and Medicine. London: Routledge.

Arthur, W. B., Durlauf, S. N., & Lane, D. A. (1997). The economy as an evolving complex system II (Vol. 27): Addison-Wesley Reading, MA.

AVEVE. (2006). Oprichting eerste Belgische productie-eenheid van bioethanol [Press release]. Retrieved from http://www.aveve.be/Nederlands/Nieuws/Aveve-Actueel/articleType/ArticleView/articleId/183/Oprichting-eerste-Belgische-productieeenheid-van-bioethanol/dnnprintmode/true?SkinSrc=%5BL%5DSkins%2Faveve%2Fprint&ContainerSrc=%5BL%5DContainers%2Faveve%2Fprint

AWN. (2006). Van Hoogovens tot Tata. Archeologische Werkgroep Beverwijk-Heemskerk.

Baeten, P. (2007, 19/01/2007). Korte historie van Hoogovens in IJmuiden: de ideale lokatie voor een staalbedrijf. Kennislink.

Bakker, T. (2011). Van Petroleumhaven tot grootste benzinehaven ter wereld: de geschiedenis van de olieopslag in Amsterdam. Retrieved from http://www.theobakker.net/pdf/petroleumhaven.pdf

Balkenende, F. (2017, 31/08/2017). Fusie Zeeland Seaports en Havenbedrijf Gent al op 1 januari. PZC.

Barnes, T. J. (1996). Logics of dislocation: Models, metaphors, and meanings of economic space: Guilford Press.

Barnes, T. J. (2001). Retheorizing Economic Geography: From the Quantitative Revolution to the "Cultural Turn". Annals of the Association of American Geographers, 91(3), 546-565. doi:10.1111/0004-5608.00258

Barnes, T. J., Peck, J., Sheppard, E., & Tickell, A. (2007). Politics and practice in economic geography: Sage.

Barrez, D. (2011, 13/10/2011). Sluiting ArcelorMittal Luik, een heel curieuze mondialisering. De Wereld Morgen.

Bathelt, H., & Glückler, J. (2003). Toward a relational economic geography. Journal of economic geography, 3(2), 117-144. doi:10.1093/jeg/3.2.117

Bathelt, H., & Glückler, J. (2005). Resources in Economic Geography: From Substantive Concepts towards a Relational Perspective. Environment and Planning A, 37(9), 1545-1563. doi:10.1068/a37109

Bathelt, H., Malmberg, A., & Maskell, P. (2004). Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. Progress in Human Geography, 28(1), 31-56. doi:10.1191/0309132504ph469oa

Beauregard, R. A. (2012). What Theorists Do. Urban Geography, 33(4), 474-487. doi:10.2747/0272-3638.33.4.474

Bennet, D. (2009). Positivism/Positivist Geography. In R. Kitchin & N. Thrift (Eds.), International Encyclopedia of Human Geography (pp. 4126-4133): Elsevier Science.

Berger, J. (2016). The Port of Amsterdam Pursues a Bio-Based, Circular Economy. Retrieved from http://www.renewableenergyworld.com/articles/2016/12/the-port-of-amsterdam-pursues-a-bio-based-circular-economy.html

Berglund, A. (1919). The Iron-Ore Problem of Lorraine. The Quarterly Journal of Economics, 33(3), 531-554. doi:10.2307/1885949

Berry, B. J. L. (1964a). Approaches to Regional Analysis: A Synthesis. Annals of the Association of American Geographers, 54(1), 2-11.

Berry, B. J. L. (1964b). Cities as Systems within Systems of Cities. Papers in Regional Science, 13(1), 147-163. doi:10.1111/j.1435-5597.1964.tb01283.x

Berry, B. J. L. (1974). Daivd Harvey: Social Justica and the City. Antipode, 6(2), 142-149. doi:10.1111/j.1467-8330.1974.tb00606.x

Beunderman, M., & Kooiman, J. (2017, 28/12/2017). De Chinese investeringsgolf is niet voorbij. Het belang dat het Chinese Geely neemt in Volvo laat zien dat de strategische expansie van China doorgaat. NRC.

Beyers, W. B., & Fowler, C. S. (2012). Economic structure, technological change and location theory. The evolution of models explaining the link between cities and flows. In P. Hall & M. Hesse (Eds.), Cities, Regions and Flows (pp. 23-41). London: Routledge.

Bhaskar, R. (2008 [1975]). A realist theory of science: Routledge.

Bird, J. (1963). The major seaports of the United Kingdom. London: Hutchinson.

Bird, J. (1989). The Changing World of Geography. Oxford: Clarendon Press.

Böckerman, P., & Uusitalo, R. (2006). Erosion of the Ghent System and Union Membership Decline: Lessons from Finland. British Journal of Industrial Relations, 44(2), 283-303. doi:10.1111/j.1467-8543.2006.00498.x

Boelens, L. (2009a). Associatieve Mainports. Een alternatief voor locatie gebaseerde benaderingen. In M. van Gils, M. Huijs, & B. de Jong (Eds.), De Nederlandse Mainport onder druk: speuren naar ontwikkelkracht (pp. 185-194). Houten: Spectrum.

Boelens, L. (2009b). The Urban Connection: An actor-relational approach to urban planning. Rotterdam: 010 Publishers.

Boelens, L. (2010). Theorizing practice and practising theory: outlines for an actor-relational approach in planning. Planning Theory.

Boelens, L. (2011). Going beyond planners' dependencies: an actor-relational approach to Mainport Rotterdam. Town Planning Review, 82(5).

Boelens, L. (2014). Delta Governance: The DNA of a Specific Kind of Urbanization. Built Environment, 40(2), 169-183.

Boelens, L., & de Roo, G. (2014). Planning of undefined becoming: First encounters of planners beyond the plan. Planning Theory, 15(1), 31. doi:10.1177/1473095214542631

Boelens, L., & Taverne, E. (2012). Why cities prosper as Deltas: the urbanisation of the Eurodelta. In L. Lucassen & W. Willems (Eds.), Living in the city: urban instituttions in the low countries, 1200-2010 (pp. 192-215). New York, NY, USA: Routledge.

Boggs, J. S., & Rantisi, N. M. (2003). The 'relational turn' in economic geography. Journal of economic geography, 3(2), 109-116.

Bontje, M. (2002). Van groeikern tot Deltametropool. Bevolkingsdynamiek, dagelijkse mobiliteit en het Nederlandse verstedelijkingsbeleid. Mens & Maatschappij, 77(3).

Bontje, M., & Musterd, S. (2009). Creative industries, creative class and competitiveness: Expert opinions critically appraised. Geoforum, 40(5), 843-852. doi:https://doi.org/10.1016/j.geoforum.2009.07.001

Boschma, R. (2005). Proximity and innovation: A critical assessment. Regional Studies, 39(1), 61-74. doi:10.1080/0034340052000320887

Boschma, R., & Frenken, K. (2006). Why is economic geography not an evolutionary science? Towards an evolutionary economic geography. Journal of economic geography, 6(3), 273-302.

Boschma, R., & Frenken, K. (2009). Some Notes on Institutions in Evolutionary Economic Geography. Economic Geography, 85(2), 151-158. doi:10.1111/j.1944-8287.2009.01018.x

Boschma, R., & Martin, R. (2010). The Handbook of Evolutionary Economic Geography. Cheltenham: Edward Elgar Publishing Limited.

Bossuyt, D. M., & Savini, F. (2018). Urban sustainability and political parties: Eco-development in Stockholm and Amsterdam. Environment and Planning C: Politics and Space, 0(0), 2399654417746172. doi:10.1177/2399654417746172

Boussauw, K. (2014). City profile: Ghent, Belgium. Cities, 40, Part A(0), 32-43. doi:http://dx.doi.org/10.1016/j.cities.2014.04.004

Bradsher, K. (2010, 29/03/2010). Ford agrees to sell Volvo to a Fast-Rising Chinese Company. New York Times.

Brakman, S., Garretsen, H., & Van Marrewijk, C. (2001). An introduction to geographical economics: Trade, location and growth: Cambridge university press.

Brenner, N. (1998). Between Fixity and Motion: Accumulation, Territorial Organization and the Historical Geography of Spatial Scales. Environment and Planning D: Society and Space, 16(4), 459-481. doi:doi:10.1068/d160459

Brenner, N. (2004). Urban governance and the production of new state spaces in western Europe, 1960–2000. Review of International Political Economy, 11(3), 447-488. doi:10.1080/0969229042000282864

Broothaers, L. (1995). Geologie van Vlaanderen: een schets. Retrieved from Brussel:

Bruttomesso, R. (1993). Waterfronts : a new frontier for cities on water. Venice: International Centre Cities on Water.

Bryant, L. R., Srnicek, N., & Harman, G. (2011). The speculative turn : continental materialism and realism: Melbourne re.press.

Bryman, A. (2015). Social Research Methods: Oxford University Press.

Buitelaar, E., Lagendijk, A., & Jacobs, W. (2007). A theory of institutional change: illustrated by Dutch city-provinces and Dutch land policy. Environment and Planning A, 39(4), 891-908. doi:10.1068/a38191

Buncombe, A., Wilts, A., & Stone, J. (2018, 22/03/2017). US steel tariffs: Trump exempts allies including UK and EU from China-targeted trade barriers. Independent.

Bunge, W. (1966). Theoretical geography (Vol. 1): Royal University of Lund, Dept. of Geography; Gleerup.

Burghardt, A. F. (1971). A Hypothesis about Gateway Cities. Annals of the Association of American Geographers, 61(2), 269-285.

Burke, E. (1990). Ertswinning in Belgie: een rijk verleden. Natuurtijdschrift.

Burns, S. (2010, 31/03/2010). Geely Buys Volvo as Tata's Nano Goes up in Smoke. Metal Miner.

Burton, I. A. N. (1963). The Quantitative Revolution and Theoretical Geography. Canadian Geographer / Le Géographe canadien, 7(4), 151-162. doi:10.1111/j.1541-0064.1963.tb00796.x

Buys, A. (2007, 01/06/2007). Eerst Lopen, dan Fietsen. Reflex.

Capron, M. (2003). La sidérurgie en Wallonie entre Usinor, Duferco et Arcelor. CRISP.

Carasso-Kok, M., Frijhoff, W., Huizinga, N., Wouthuysen, E., Krook, W., & de Rooy, P. (2004). Geschiedenis van Amsterdam: SUN.

Cardinaels, J., & Vanacker, L. (2017). Volvo Gent stevige kandidaat voor productie Chinese Lynk. De Tijd.

Castells, M. (1996). The rise of the network society, the information age: economy, society and culture, Vol. I. Malden, MA: Blackwell Publishers.

Castree, N. (2003). Environmental issues: relational ontologies and hybrid politics. Progress in Human Geography, 27(2), 203-211. doi:10.1191/0309132503ph422pr

Catchbio. (2017). Catchbio: Ten years biomass catalysis. Retrieved from

CBS. (2017, 09/12/2017). Een derde van de aangevoerde goederen wordt doorgevoerd.

Chaincraft. (2013). Relocation to Amsterdam [Press release]

Cleeren, E. (2011, 27/09/2011). Een tweede leven voor afval. De Tijd.

Coe, N. M., Hess, M., Yeung, H. W.-c., Dicken, P., & Henderson, J. (2004). 'Globalizing'regional development: a global production networks perspective. Transactions of the Institute of British Geographers, 29(4), 468-484. doi:10.1111/j.0020-2754.2004.00142.x

Collier, A. (1994). Critical Realism. London: Verso.

Collier, A. (2003). In Defence of Objectivity: Routledge.

Cox, K. R. (1997). Spaces of globalization: reasserting the power of the local: Guilford Press.

Cox, K. R. (1998). Spaces of dependence, spaces of engagement and the politics of scale, or: looking for local politics. Political Geography, 17(1), 1-23. doi:10.1016/S0962-6298(97)00048-6

Cox, K. R. (2014). Making Human Geography: Guilford Press.

Cumbers, A., MacKinnon, D., & McMaster, R. (2003). Institutions, Power and Space:Assessing the Limits to Institutionalism in Economic Geography. European Urban and Regional Studies, 10(4), 325-342. doi:10.1177/09697764030104003

Dale, B. (2007). Why this new journal? Biofuels, Bioproducts and Biorefining, 1(1), 1-2. doi:10.1002/bbb.1

Dankers, J. J., & Verheul, J. (1993). Hoogovens 1945-1993. Van staalbedrijf tot tweemetalen-concern. Een studie in industriële strategie. Den Haag: SDU.

Davy, B. (2017). Benjamin Davy — Contemplating Kunzmann's Five Issues. disP - The Planning Review, 53(2), 52-53. doi:10.1080/02513625.2017.1340664

De Bousies, F. (2008). Productie- en marktstructuren van biobrandstoffen in Belgie. (Master),

De Cort, G., & Lemmens, K. (2018, 26/03/2018). Volvo Gent bouwt eerste 'Chinese' auto in Europa. De Standaard.

De Feijter, T. (2016, 23/10/2016). Everything You Need To Know About Lynk & Co's New Business Model To Sell And Share Cars. Forbes.

de Haan, J. (2006). How emergence arises. Ecological Complexity, 3(4), 293-301. doi:https://doi.org/10.1016/j.ecocom.2007.02.003

De Herdt, R., & De Smet, G. (1995). Gent havenstad: een vriendelijke en dynamische haven: Gent : Snoeck-Ducaju.

de Langen, P. (2002). Clustering and performance: the case of maritime clustering in The Netherlands. Maritime Policy & Management, 29(3), 209-221. doi:10.1080/03088830210132605

de Langen, P. (2004). Governance in Seaport Clusters. Maritime Econ Logistics, 6(2), 141-156.

De Mare, T. (2018, 19/02/2018). Miljoeneninvestering in Gentse testfabriek voor biotechnologie. VRT NWS.

de Roo, G., & Boelens, L. (2016). Spatial Planning in a Complex Unpredictable World of Change: Towards a proactive co-evolutionary type of planning within the Eurodelta: In Planning.

De Roo, M. (2004, 27/09/2004). Toekomst van Gent ligt in Terneuzen. De Tijd.

De Roo, M. (2008, 08/02/2008). ArcelorMittal Gent bouwt derde hoogoven. De Tijd.

De Roo, M. (2016, 22/04/2016). Gent maakt staal van de toekomst. De Tijd.

De Roo, M. (2017a, 29/11/2017). ArcelorMittal Gent investeert fors in biobrandstof. De Tijd.

De Roo, M. (2017b, 29/11/2017). ArcelorMittal investeert 150 miljoen in Gent. De Tijd.

De Smet, L. (2017, 06/2017). Biogebaseerde economie is géén luchtkasteel. Engineernet.

De Troch, R. (2008). Ruimtelijk-Economische vraagstukken omtrent de uitbouw van een bio-energy valley in Vlaanderen. (Master in de bedrijfseconomie), Universiteit Gent, gent.

De Visser, J. (1877). Industrialisatie. (Master), Ghent University, Ghent.

De Waard, P. (2018, 02/01/2018). Directeur Tata Steel ongerust over Trumps importheffing: 'Amerikanen kunnen ons staal niet eens maken'. De Volkskrant.

Debo, R. (2014). Spinnen en weven in de Stad. Een chronologische en geografische reconstructie van de Gentse textielindustrie 1900-2000. (Master), Ghent University, Ghent.

DeLanda, M. (2002). Intensive science and virtual philosophy: London : Continuum.

DeLanda, M. (2011). Emergence, Causality and Realism. In L. R. Bryant, N. Srnicek, & G. Harman (Eds.), The speculative turn : continental materialism and realism: Melbourne re.press.

Deleuze, G. (1995). Negotiations (trans. M Joughin). New York: Columbia University Press.

Deloitte University Press. (2013). Business Trends 2013. Adapt, Evolve, Transform. Retrieved from

Denicolai, S., Zuchella, A., & Cioccarelli, G. (2010). Reputation, trust and relational centrality in local networks: an evolutionary geography perspective. In R. Boschma & R. Martin (Eds.), The handbook of evolutionary economic geography (pp. 559). Cheltenham: Edward Elgar Publishing Limited.

Dicken, P., Kelly, P. F., Olds, K., & Yeung, H. W.-c. (2001). Chains and networks, territories and scales: towards a relational framework for analysing the global economy. Global Networks, 1(2), 89-112.

Dicken, P., & Malmberg, A. (2001). Firms in Territories: A Relational Perspective*. Economic Geography, 77(4), 345-363. doi:10.1111/j.1944-8287.2001.tb00169.x

Drewry. (2015). Container Shipping Will be Lucky to break Even in 2015. Retrieved from

du Tertre, C. (2005 [1995]). Sector-based dimensions of regulation and the wage-labour nexus [Théorie de la régulation: l'état des savoirs. (trans. Carolyn Shread)]. In R. Boyer & Y. Saillard (Eds.), Regulation Theory: The State of the Art (Vol. 2, pp. 204-213). Paris: Routledge.

Ducruet, C. (2011). The port city in multidisciplinary analysis. In A. Joan & B. Rinio (Eds.), The port city in the XXIst century: New challenges in the relationship between port and city (pp. 32-48): RETE.

Ducruet, C., Cuyala, S., & El Hosni, A. (2018). Maritime networks as systems of cities: The long-term interdependencies between global shipping flows and urban development (1890–2010). Journal of Transport Geography, 66, 340-355. doi:https://doi.org/10.1016/j.jtrangeo.2017.10.019

Ducruet, C., & Lee, S.-W. (2006). Frontline soldiers of globalisation: Port–city evolution and regional competition. GeoJournal, 67(2), 107-122. doi:10.1007/s10708-006-9037-9

Dutch Government. (1998). Startnotitie PKB + / M.E.R Mainportontwikkeling Rotterdam. Retrieved from

Eddy, M., & Bray, C. (2018, 02/03/2018). E.U. Leader Threatens to Retaliate With Tariffs on Bourbon and Bluejeans. The New York Times. Retrieved from https://www.nytimes.com/2018/03/02/business/europe-steel-tariffs-trump.html

Einstein, A., & Infeld, L. (1966). Evolution of Physics: Touchstone.

Electrabel. (2009). Centrale Rodenhuize. 100% op biomassa. Max Green. In G. Suez (Ed.).

Electrabel. (2015). Elektriciteitscentrale Knippegroen opent haar deuren [Press release]. Retrieved from http://corporate.engie-electrabel.be/nl/nieuws/elektriciteitscentrale-knippegroen-opent-haar-deuren/

Elteren, M. C. M. (1986). Staal en arbeid: Brill.

Emirbayer, M. (1997). Manifesto for a Relational Sociology. American Journal of Sociology, 103(2), 281-317. doi:10.1086/231209

Enders, T. (2009, 29/05/2009). Airbus is once again in need of political courage. Financial Times.

Escobar, A. (2007). The 'Ontological Turn' in Social Theory. A Commentary on 'Human Geography without Scale', by Sallie Marston, John Paul Jones II and Keith Woodward. Transactions of the Institute of British Geographers, 32(1), 106-111.

Decision No 1692/96/EC of the European Parliament and of the Council of 23 July 1996 on Community guidelines for the development of the trans-European transport network, 1692/96/EC C.F.R. (1996).

Betreffende de bevordering van elektriciteitsopwekking uit hernieuwbare energiebronnen op de interne elektriciteitsmarkt, (2001a).

Decision No 1346/2001/EC of the European Parliament and of the Council of 22 May 2001 amending Decision No 1692/96/EC as regards seaports, inland ports and intermodal terminals as well as project No 8 in Annex III, 1346/2001/EC C.F.R. (2001b).

Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport, 2003/30/EG C.F.R. (2003).

Advies van het Economisch en Sociaal Comité over het thema Industriële reconversie en overheidssteun in de staalindustrie, (2005).

DIRECTIVE 2007/46/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, 2007/46/EC C.F.R. (2007).

Fuel Quality Directive, 2009/30/EG C.F.R. (2009a).

Renewable Energy Directive, 2009/28/EG C.F.R. (2009b).

European Commission. (2013). Actieplan voor een concurrerende en duurzame staalindustrie in Europa. Retrieved from Straatsburg:

European Commission. (2014). Member States need to act to boost European industry. Retrieved from Brussels:

Directive (EU) 2015/1513 of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources (Text with EEA relevance), 2015/1513 C.F.R. (2015).

Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank: Investing in a smart, innovative and sustainable Industry A renewed EU Industrial Policy Strategy, COM/2017/0479 final C.F.R. (2017a).

European Commission. (2017b, 04/04/2017). European Commission Trade Policy China. Countries and Regions.

European Commission. (2018). EU, Japan and US met in Brussels to discuss overcapacity, steel [Press release]

Eusk, M. (2017, 13/11/2017). Tesla Versus the World: Can Insourcing Beat Outsourcing? Harvard Business School, Technology and Operations Management.

Express. (2015). Containeroverslag Zeebrugge krijgt zware klappen. Retrieved from http://www.express.be/sectors/nl/logistics/containeroverslag-zeebrugge-krijgt-zware-klappen/211544.htm

Fainstein, S. (1994). The city builders : property politics and planning in London and New York: Oxford : Blackwell.

Fairclough, N., Jessop, B., & Sayer, A. (2003). Critical realism and semiosis. In J. Joseph & J. M. Roberts (Eds.), Realism, discourse and deconstruction. London: Routledge.

Faludi, A. (1996). Framing with Images. Environment and Planning B: Planning and design, 23(1), 93-108. doi:10.1068/b230093

FD hoofdredactie. (2017, 04/09/2017). Havenfusie verdient brede steun. Financieel Dagblad.

Koninklijk besluit tot vaststelling van het aantal leden van het Paritair Comité van het havenbedrijf., KB12/01/1973 C.F.R. (1973).

Koninklijk besluit tot vaststelling van de minimale nominale volumes duurzame biobrandstoffen die de volumes benzine, die jaarlijks tot verbruik worden uitgeslagen, moeten bevatten, (2013).

Flannery, N. (2018, 12/03/2018). Is Trump Really Going To End NAFTA? Forbes.

Florida, R. (2003). Cities and the Creative Class. City & Community, 2(1), 3-19. doi:10.1111/1540-6040.00034

Florida, R. (2005). Cities and the creative class: Routledge.

Florida, R. (2017). The New Urban Crisis: How Our Cities Are Increasing Inequality, Deepening Segregation, and Failing the Middle Class and What We Can Do About It: Basic Books.

Fluxys Belgium. (2016). Zeebrugge: Kloppend hart van de Europese gasstromen. In.

Flyvbjerg, B. (1998). Rationality and power: Democracy in practice: University of Chicago press.

Flyvbjerg, B. (2001). Making social science matter: Why social inquiry fails and how it can succeed again. Cambridge: Cambridge university press.

Foucault, M. (1972 [1969]). L'archéologie du savoir [The Arechology of Knowledge] (trans. Tavistock Publications). Paris: Editions Gallimard.

Foucault, M. (1975). Surveiller et punir: Naissance de la prison. Paris: Gallimard.

Frenken, K. (2006). Innovation, Evolution and Complexity Theory: Edward Elgar Publishing Limited.

Frenken, K., van Oort, F., & Verburg, T. (2007). Relate variety, unrelated variety and regional economic growth. Regional Studies, 41(5), 685-697. doi:10.1080/00343400601120296

Friedmann, J., & Wolff, G. (1982). World city formation: an agenda for research and action. International Journal of Urban and Regional Research, 6(3), 309-344. doi:10.1111/j.1468-2427.1982.tb00384.x

Fujita, M., Krugman, P. R., Venables, A. J., & Fujita, M. (1999). The spatial economy: cities, regions and international trade (Vol. 213): Wiley Online Library.

Garrelts, M. (2006, 05/12/2006). Lichte voorkeur CSN bij overname van Corus. IEX.

Geeraert, G. (2016, 07/12/2016). Wanneer pakt Antwerpen zijn "vuile" olie-export aan? MO.

Geertz, C. (1973). The interpretation of cultures (Vol. 5019): Basic books.

Gelderblom, O. (2000). Zuid-Nederlandse kooplieden en de opkomst van de Amsterdamse stapelmarkt (1578-1630): uitgever niet vastgesteld.

Gemeente Amsterdam. (2006). Jaarverslag Gemeente Amsterdam. Retrieved from

Gemeente Amsterdam. (2008). Havenvisie gemeente Amsterdam 2008-2020. Retrieved from

Gemeente Amsterdam. (2009). Cultuurhistorische verkenning Haven Stad. Retrieved from Amsterdam:

Gemeente Amsterdam. (2017). Economische Verkenningen Metropool Regio Amsterdam. Retrieved from Amsterdam:

Gemeente Rotterdam. (1969). Plan 2000+. In.

Gemeente Rotterdam. (2016). Woonvisie Rotterdam: Koers naar 2030, agenda tot 2020. Retrieved from Rotterdam:

Gerritsen, M. (2014). Vlaanderen en Nederland: 1 taal, 2 culturen? Neerlandia/Nederlands, 118(2).

Gerritsen, M., & Claes, M.-T. (2017). Culturele waarden en communicatie in internationaal perspectief: Coutinho.

Giddens, A. (1979). Central problems in social theory: Action, structure, and contradiction in social analysis (Vol. 241): Univ of California Press.

Giddens, A. (1984). The Constitution of Society: Outline of the Theory of Structuration. Cambridge: Polity Press.

Gilbert, T., Cochrane, A., & Greenwell, S. (2003). Professional discourse and service cultures: an organisational typology developed from health and welfare services for people with learning disabilities. International Journal of Nursing Studies, 40(7), 781-793. doi:https://doi.org/10.1016/S0020-7489(03)00115-9

Gilijamse, R., Bonke, H., Moes, J., Kurpershoek, E., Misset, C., & Bakker, B. (2009). De haven van Amsterdam: zeven eeuwen ontwikkeling: Thoth.

Gille, L. (2013). Zeehaven Ijmuiden NV 25 jaar zelfstandig. Seaport Magazine.

Gilliard, L., Wenner, F., Lamker, C. W., Van den Berghe, K., & Willems, J. J. (2017). Potentials of Entrepreneurial Thinking for Planning. disP - The Planning Review, 53(3), 94-100. doi:10.1080/02513625.2017.1380439

Giuliani, E. (2007). The selective nature of knowledge networks in clusters: evidence from the wine industry. Journal of economic geography, 7(2), 139-168. doi:10.1093/jeg/lbl014

Giuliani, E. (2010). Clusters, networks and economic development: an evolutionary economics perspective. In R. Boschma & R. Martin (Eds.), The handbook of evolutionary economic geography (pp. 559). Cheltenham: Edward Elgar Publishing Limited.

Glaeser, E. L. (2011). Triumph of the city : how our greatest invention makes us richer, smarter, greener, healthier, and happier. New York :: Penguin Press.

Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992). Growth in Cities. Journal of Political Economy, 100(6), 1126-1152. doi:10.1086/261856

GMF. (2016). GMF vraagt concrete doelstellingen CO2 reductie voor ArcelorMittal. Retrieved from Ghent:

Görg, H., & Hanley, A. (2004). Does Outsourcing Increase Profitability? IZA Discussion Paper No. 1372. doi:https://ssrn.com/abstract=612228

Gosman, J. G. (2015). Politiek Compendium. Retrieved 13/12/2017, from Leiden University

Gould, P. (1979). Geography 1957-1977: The Augean Period. Annals of the Association of American Geographers, 69(1), 139-151. doi:10.1111/j.1467-8306.1979.tb01243.x

Grabher, G. (2006). Trading routes, bypasses, and risky intersections: mapping the travels of `networks' between economic sociology and economic geography. Progress in Human Geography, 30(2), 163-189. doi:10.1191/0309132506ph600oa

Granovetter, M. (1985). Economic Action and Social Structure: The Problem of Embeddedness. American Journal of Sociology, 91(3), 481-510.

Greif, B. (1994, 20/01/1994). Hoogovens was altijd een 'apart' bedrijf. Nrc Handelsblad, p. 1.

Gruis, V. (2005). Financial and Social Returns in Housing Asset Management: Theory and Dutch Housing Associations' Practice. Urban Studies, 42(10), 1771-1794. doi:10.1080/00420980500231696

Haggett, P., Cliff, A. D., & Frey, A. E. (1965). Locational analysis in human geography: Wiley.

Hajer, M. A. (1995). The Politics of Environmental Discourse: Ecological Modernization and the Policy Process: Clarendon Press.

Hall, P. (2009). Container ports, local benefits and transportation worker earnings. GeoJournal, 74(1), 67-83. doi:10.1007/s10708-008-9215-z

Hall, P. (2016). How can joint Urban and Port Planning facilitate the Next Economy - Flexible Frameworks of Port and City? Paper presented at the AIVP World Conference 2016, Rotterdam.

Hall, P., & Hesse, M. (2012). Cities, regions and flows. London :: Routledge.

Hall, P., & Jacobs, W. (2012). Why are maritime ports (still) urban, and why should policy-makers care? Maritime Policy & Management, 39(2), 189-206. doi:10.1080/03088839.2011.650721

Hall, P., & Soskice, D. (2001). Varieties of Capitalism. The Institutional Foundations of Comparative Advantage. New York: Oxford University Press.

Hameleers, M. (2015). Gedetailleerde kaarten van Amsterdam. Productie en gebruik van grootschalige, topografische kaarten. (PhD), University of Utrecht, Utrecht.

Hanssens, H., Derudder, B., Van Aelst, S., & Witlox, F. (2014). Assessing the Functional Polycentricity of the Mega-City-Region of Central Belgium Based on Advanced Producer Service Transaction Links. Regional Studies, 48(12), 1939-1953. doi:10.1080/00343404.2012.759650

Hartshorne, R. (1939). The Nature of Geography. Lancaster: Association of American Geographers.

Harvey, D. (1969). Explanation in Geography (Vol. 21): Edward Arnold.

Harvey, D. (1975). Review of Berry, The Human Consequences of Urbanisation. Annals of the Association of American Geographers, 65(1), 99-103.

Harvey, D. (1989a). The Condition of Postmodernity: An Enquiry Into the Origins of Cultural Change: Wiley.

Harvey, D. (1989b). From Managerialism to Entrepreneurialism: The Transformation in Urban Governance in Late Capitalism. Geografiska Annaler. Series B, Human Geography, 71(1), 3-17. doi:10.2307/490503

Harvey, D. (1996). Justice, nature, and the geography of difference.

Harvey, D. (2001). Globalization and the spatial fix. Geographische revue, 2(3), 23-31.

Harvey, D., & Reed, M. (1997). Social Science as the Study of Complex Systems: University of Michigan Press.

Hassink, R., Klaerding, C., & Marques, P. (2014). Advancing Evolutionary Economic Geography by Engaged Pluralism. Regional Studies, 48(7), 1295-1307. doi:10.1080/00343404.2014.889815

Havenbedrijf Amsterdam. (2015). Algemene voorwaarden voor tijdelijke ondererfpacht in het havengebied 2015. Retrieved from

Havenbedrijf Amsterdam. (2016). Kaart uitgiftes haven Amsterdam. Retrieved from

Havenbedrijf Amsterdam. (2017). Grondbeleid Havenbedrijf Amsterdam. Retrieved from

Havenbedrijf Amsterdam NV. (2017). Annual Report 2016. Retrieved from

Havenbedrijf Antwerpen. (2018). Algemene voorwaarden voor concessie in het havengebied Antwerpen. Retrieved from http://www.portofantwerp.com/nl/het-concessiebeleid#voorwaarden

Havenbedrijf Gent NV. (2017a). Annual Report 2016. Retrieved from

Havenbedrijf Gent NV. (2017b). Havenbedrijf Gent en Zeeland Seaports leggen fusieovereenkomst voor aan hun aandeelhouders [Press release]

Hawkins, A. (2017, 06/12/2017). The car of the future isn't a car at all. The Verge.

Hayuth, Y. (1982). The Port-Urban Interface - an Area in Transition. Area, 14(3), 219-224. doi:http://www.jstor.org/stable/20001825

Healey, P. (1992). An institutional model of the development process. Journal of Property Research, 9(1), 33-44. doi:10.1080/09599919208724049

Hein, C. (2013). Port Cities. In P. Clark (Ed.), The Oxford handbook of cities in world history (1st ed. ed.). Oxford: Oxford University Press.

Henderson, J., Dicken, P., Hess, M., Coe, N., & Yeung, H. W.-c. (2002). Global production networks and the analysis of economic development. Review of International Political Economy, 9(3), 436-464.

Henry, I. (2016, 30/09/2016). Volvo: new platforms for a new company. Automotive manufacturing solutions.

Herregodts, D. (2008, 01/02/2008). Haven zet in op containers. De Standaard.

Hesse, M. (2017). Approaching the Relational Nature of the Port-City Interface in Europe: Ties and Tensions Between Seaports and the Urban. Tijdschrift voor economische en sociale geografie. doi:10.1111/tesg.12282

Hewson, M. (2010). Agency. In A. Mills, G. Durepos, & E. Wiebe (Eds.), Encyclopedia of case study research. Thousand Oaks: SAGE.

Heylen, V. (2014, 29/08/2014). Quo vadis Volvo Gent? De Tijd.

Hindle, T. (2009, 06/07/2009). Just-in-Time. The Economist.

Hodgson, G. M. (2003). The hidden persuaders: institutions and individuals in economic theory. Cambridge Journal of Economics, 27(2), 159-175. doi:10.1093/cje/27.2.159

Hoekstra, E., & Milikowski, F. (2012, 22/08/2012). De onzichtbare haven van Amsteradm: Straks alleen nog maar cruiseschepen. De Groene Amsterdammer.

Hofstede, G. (2001). Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations: SAGE Publications.

Holland, J. (1998). Emergence: From chaos to order. Oxford: Oxford University Press.

Hollingsworth, J. R. (1997). Continuities and changes in social systems of production: the cases of Japan, Germany, and the United States. Contemporary capitalism: The embeddedness of institutions, 260282.

Hollingsworth, J. R., Schmitter, P. C., & Streeck, W. (1994). Governing capitalist economies : performance and control of economic sectors. New York :: Oxford University Press.

Holslag, J. (2016). Geoeconomics in a globalized world: the case of China's export policy. Asia Europe Journal, 14(2), 173-184. doi:10.1007/s10308-015-0441-y

Horsten, H. (1995, 18/02/1995). Rotterdam maakt van Zeeland zijn tweede haven. Volkskrant.

Hotse-Smit, P. (2018, 21/02/2018). Ondanks protesten blijft Rotterdam nog 25 jaar doorvoerhaven steenkool. De Volkskrant.

Hout, W. (1996). Globalization, Regionalization and Regionalism: A Survey of Contemporary Literature. Acta Politica, 31(2), 161-181.

Howarth, D. (2010). Power, discourse, and policy: articulating a hegemony approach to critical policy studies. Critical Policy Studies, 3(3-4), 309-335. doi:10.1080/19460171003619725

Hoyle, B. S. (1989). The Port City Interface - Trends, Problems and Examples. Geoforum, 20(4), 429-435. doi:Doi 10.1016/0016-7185(89)90026-2

Hubbard, P., & Kitchin, R. (2010). Key thinkers on space and place: Sage.

Hughes, A., & Reimer, S. (2004). Geographies of Commodity Chains. London: Routledge.

Huijs, M. (2011). Building Castles in the (Dutch) Air: Understanding the Policy Deadlock of Amsterdam Airport Schiphol 1989 - 2009. (doctoral thesis), Technological University Delft, Delft.

Huygens. (2009). Biografisch Woordenboek van Nederland. Den Haag: Huygens.

I&M. (2012). Structuurvisie Infrastructuur en Ruimte (SVIR). Retrieved from Den Haag:

I&M. (2016). Tracésluit Nieuwe Sluis Terneuzen. Retrieved from Den Haag:

Isaac, J. C. (1987). Power and Marxist theory: A realist view: Cornell University Press Ithaca, NY.

Isaacson, W. (2007). Einstein: His Life And Universe: Simon & Schuster.

Isard, W. (1956). Location and space-economy: a general theory relating to industrial location, market areas, land use, trade and urban structure. New York; London: Wiley.

ISMR. (2006, June 2006). Form and Function. Into Volvo Cars Body Components' plant in Olofstrom, Sweden. International Sheet Metal Review.

Israel, J. I. (1989). Dutch Primacy in World Trade, 1585-1740: Clarendon Press.

Jacobs, J. (1969). The economy of cities: New York (N.Y.) : Vintage books.

Jacobs, W. (2007). Political economy of port competition: institutional analyses of Rotterdam, Southern California and Dubai: Nijmegen: Academic Press Europe.

Jacobs, W., Ducruet, C., & De Langen, P. (2010). Integrating world cities into production networks: the case of port cities. Global Networks, 10(1), 92-113.

Jacobs, W., Koster, H., & Hall, P. (2011). The Location and Global Network Structure of Maritime Advanced Producer Services. Urban Studies, 48(13), 2749-2769. doi:10.1177/0042098010391294

Jacobs, W., & Lagendijk, A. (2014). Strategic coupling as capacity: how seaports connect to global flows of containerized transport. Global Networks, 14(1), 44-62. doi:10.1111/glob.12035

Jacobs, W., & Notteboom, T. (2009). A theory on the co-evolution of seaports with application to container terminal development in the Rhine-Scheldt Delta. Retrieved from

Jacobs, W., & Notteboom, T. (2011). An Evolutionary Perspective on Regional Port Systems: The Role of Windows of Opportunity in Shaping Seaport Competition. Environment and Planning A, 43(7), 1674-1692. doi:10.1068/a43417

Jacobs, W., & van Berghe, T. (2014). Understanding the economic geography of commodity trade. Port planning, design and construction, 3.

Jacobs, W., & Van Dongen, F. (2012). Amsterdam, Smartport in Global Trade. Retrieved from Utrecht:

Jenkins, T. (2008). Toward a biobased economy: examples from the UK. Biofuels, Bioproducts and Biorefining, 2(2), 133-143. doi:10.1002/bbb.62

Jessayan, H. (2018, 22/02/2018). Vlag in IJmuiden kan nog niet uit. Financieel Dagblad.

Jessop, B. (2001a). Institutional re (turns) and the strategic–relational approach. Environment and Planning A, 33(7), 1213-1235.

Jessop, B. (2001b). Regulationist and Autopoieticist Reflections on Polanyi's Account of Market Economies and the Market Society. New Political Economy, 6(2), 213-232. doi:10.1080/13563460120060616

Jessop, B. (2002). The future of the capitalist state: Polity.

Jessop, B. (2005 [1992]). Fordism and Post-Fordism. A critical reformulation. In M. Storper & A. J. Scott (Eds.), Pathways to Industrialization and Regional Development (pp. 43-62). New York: Routledge.

Jessop, B. (2008). Spatial Fixes, Temporal Fixes and Spatio- Temporal Fixes. In David Harvey: A critical reader (pp. 142-166): Blackwell Publishing Ltd.

Jolles, A., Klusman, E., & Teunissen, B. (2003). Planning Amsterdam: Scenarios for urban development, 1928-2003: NAi publishers.

Jones, A. (2008). Beyond embeddedness: economic practices and the invisible dimensions of transnational business activity. Progress in Human Geography, 32(1), 71-88. doi:10.1177/0309132507084817

Jones, J. P., Woodward, K., & Marston, S. A. (2007). Situating Flatness. Transactions of the Institute of British Geographers, 32(2), 264-276.

Jones, M. (2009). Phase space: geography, relational thinking, and beyond. Progress in Human Geography, 33(4), 487-506. doi:doi:10.1177/0309132508101599

Jonkers, G. (2012, 28/09/2012). Van frituurvet naar biodiesel. Want to Know.

Kahn, D., & van der Plas, G. (1999). Amsterdam. Cities, 16(5), 371-381. doi:https://doi.org/10.1016/S0264-2751(99)00019-0

Kanter, J., Timmons, H., & Giridharadas, A. (2006, 25/06/2006). Arcelor agrees to Mittal takeover. The New York Times.

Kennes, H., Plomteux, G., & Steyaert, R. (1992). Inventaris van het cultuurbezit in België, Architectuur, Stad Antwerpen, Fusiegemeenten. Bouwen door de eeuwen heen in in Vlaanderen. Retrieved from

Kesteloot, C., & Saey, P. (2003). The nature of changes in human geography since the 1980s: variation or progress? Belgeo, 2, 14. doi:10.4000/belgeo.16227

km. (2017, 12/12/2017). Vlaanderen investeert voor eerste keer in geschiedenis in spoor: ‘Nood breekt wet’. De Standaard.

Knack. (2018, 02/03/2018). Bourgeois niet te spreken over Amerikaanse invoerheffingen op staal. Knack Trends.

Koelemaij, J. (2013, 29/06/2016). Second City Syndromes: Everlasting Rivalries? The Protocity.com.

Koenen, I. (2017, 30/06/217). BAM en Deme bouwen nieuwe sluis Terneuzen voor 753 mln. CoBouw.

Koot, J. (2018, 16/03/2018). Kan Amerika wel zelf al het staal maken? Financieel Dagblad.

Kreins, J. M. (1996). Histoire du Luxembourg: des origines à nos jours: Presses Universitaires de France.

Krugman, P. (1991). Increasing Returns and Economic Geography. Journal of Political Economy, 99(3), 483-499.

Kuipers, B., De Jong, O., van Raak, R., Samders, F., Meesters, K., & van Dam, J. (2015). De Amsterdamse haven draait (groen) door: Op weg naar duurzaam concurrentievoordeel door inzet op de biobased en circulaire economie. Retrieved from Rotterdam:

Kurstjens, B. (2010, 28/03/2010). Een Volvo uit Gent of Hangzhou. De Tijd.

Lagendijk, A. (2006). Learning from conceptual flow in regional studies: Framing present debates, unbracketing past debates. Regional Studies, 40(4), 385-399. doi:10.1080/00343400600725202

Lagendijk, A., & Boekema, F. (2008). Global Circulation and Territorial Development: South-east Brabant from a Relational Perspective. European Planning Studies, 16(7), 925-939. doi:10.1080/09654310802163710

Lagendijk, A., & Pijpers, R. (2013). Beyond the Regional Cradle and Policy Trap: Proximity and Embedding as Development Potentialities. European Planning Studies, 21(5), 631-636. doi:10.1080/09654313.2013.734457

Lagneaux, F. (2004). Economisch belang van de Vlaamse zeehavens: verslag 2002. Retrieved from

Lagneux, F., & Vivet, D. (2009). The Belgian Iron and Steel Industry in the International Context. Working Paper. Retrieved from

Lalkens, P. (2017, 02/11/2017). Scherpe kritiek havenbedrijven op stad Amsterdam. Financieel Dagblad.

Lalkens, P., & Gersdorf, F. (2017, 01/09/2017). Zeeland en Gent knokken tegen cultuurverschillen. Financieel Dagblad.

Langeveld, J. W. A., Dixon, J., & Jaworski, J. F. (2010). Development Perspectives Of The Biobased Economy: A Review. Crop Science, 50(Supplement_1), S-142-S-151. doi:10.2135/cropsci2009.09.0529

Latham, A. (2002). Retheorizing the scale of globalization: Topologies, actor-networks, and cosmopolitanism. In A. Herod & M. Wright (Eds.), Geographies of power: Placing scale. Oxford, U.K.: Blackwell.

Latour, B. (1986). The powers of association. In J. Law (Ed.), Power, action, and belief: A new sociology of knowledge? (pp. 264-280).

Latour, B. (1987). Science in action: How to follow scientists and engineers through society: Harvard university press.

Latour, B. (1991). We have never been modern: Harvard University Press.

Latour, B. (1996). On actor-network theory: A few clarifications. Soziale Welt, 47(4), 369-381.

Latour, B. (2005). Reassembling the Social: An Introduction to Actor-Network-Theory. Oxford: University Press.

Lauria, M. (1997). Reconstructing Urban Regime Theory: SAGE Publications.

Leboutte, R. (2008). Histoire économique et sociale de la construction européenne: P.I.E. Lang.

Lee, R. (2002). 'Nice maps, shame about the theory'? Thinking geographically about the economic. Progress in Human Geography, 26(3), 333-355. doi:10.1191/0309132502ph373ra

Lefebvre, H. (1974 [1991]). The production of space (Vol. 142): Oxford Blackwell.

Leijten, J., & Tamminga, M. (2018, 14/02/2018). Hoe Nederland lobbyde voor het hoofdkantoor van TATA/ThyssenKrupp. NRC.

Lemmens, K. (2017, 24/03/2017). Gentse voorbeeldfabriek ArcelorMittal werft 100 arbeiders aan. De Standaard.

Logan, J. M., & Molotch, H. L. (1987). The Urban Growth Machine. The Political Economy of Place. Berkeley: University of California Press.

Lovering, J. (2001 [1989]). The restructuring debate. In R. Peet & N. Thrift (Eds.), New models in geography (pp. 1).

Luhmann, N. (1986). The autopoiesis of social systems. Sociocybernetic paradoxes, 6(2), 172-192.

Luhmann, N. (2004). Law as a social system (trans. Klaus A. Ziegert): Oxford University Press.

Lupi, T. (2008). Buiten Wonen in de Stad: De 'Maakbaarheid' Van Ijburg: Uitgeverij Aksant.

Luyten, S., & Theuns, K. (2018, 11/01/2018). Snoept Gent trein naar China af van Zeebrugge? Het Nieuwsblad.

Mack, B. (2009, 26/06/2009). Airbus Planes Built In China May Mean Trouble For Europe. Wired.

MacKinnon, D. (2012). Beyond strategic coupling: reassessing the firm-region nexus in global production networks. Journal of economic geography, 12(1), 227-245. doi:10.1093/jeg/lbr009

MacKinnon, D., Cumbers, A., Pike, A., Birch, K., & McMaster, R. (2009). Evolution in Economic Geography: Institutions, Political Economy, and Adaptation. Economic Geography, 85(2), 129-150. doi:10.1111/j.1944-8287.2009.01017.x

MacLeod, G. (2001). Beyond Soft Institutionalism: Accumulation, Regulation, and Their Geographical Fixes. Environment and Planning A, 33(7), 1145-1167. doi:10.1068/a32194

MacLeod, G., & Goodwin, M. (1999). Space, scale and state strategy: rethinking urban and regional governance. Progress in Human Geography, 23(4), 503-527. doi:10.1191/030913299669861026

Mainport magazine. (2017, 02/03/2017). Beverwijk zet dit jaar in op verzelfstandiging haven. Mainport Magazine.

Majoor, S. (2015). Resilient practices: a paradox-oriented approach for large-scale development projects. Town Planning Review, 86(3), 257-277. doi:10.3828/tpr.2015.17

Majoor, S., & Schuiling, D. (2008). New Key Projects for station redevelopment in the Netherlands. In F. Bruinsma, E. Pels, P. Rietveld, H. Priemus, & B. van Wee (Eds.), Railway Development: Impacts on Urban Dynamics (pp. 101-123). Heidelberg: Physica-Verlag HD.

Malmberg, A. (2003). Beyond the cluster - local milieus and global economic connections. In J. Peck & H. W.-C. Yeung (Eds.), Remaking the Global Economy: Economic-Geographical Perspectives: SAGE Publications.

Malmberg, A., & Maskell, P. (2002). The Elusive Concept of Localization Economies: Towards a Knowledge-Based Theory of Spatial Clustering. Environment and Planning A, 34(3), 429-449. doi:10.1068/a3457

Mansfield, B. (2005). Beyond rescaling: reintegrating the `national' as a dimension of scalar relations. Progress in Human Geography, 29(4), 458-473. doi:10.1191/0309132505ph560oa

Marechal, J., & Denduyver, J. (1964). Havencomplex Brugge-Zeebrugge : geschiedenis, economische betekenis en toekomstmogelijkheden.

Marshall, A. (1892). Economics of industry. London: Macmillan.

Marston, S. A., Jones, J. P., & Woodward, K. (2005). Human Geography without Scale. Transactions of the Institute of British Geographers, 30(4), 416-432.

Martin, R. (1999). The New 'Geographical Turn' in Economics: Some Critical Reflections. Cambridge Journal of Economics, 23(1), 65-91.

Martin, R. (2003). Putting the economy in its place: one economics and geography. Paper presented at the Cambridge Journal of Economics, Cambridge, UK.

Martin, R. (2005 [2000]). Institutional approaches in economic geography. In E. Sheppard & T. J. Barnes (Eds.), A companion to economic geography (Repr. ed., pp. 77-94): Malden (Mass.) : Blackwell.

Martin, R. (2008). National growth versus spatial equality? A cautionary note on the new 'trade-off' thinking in regional policy discourse*. Regional Science Policy & Practice, 1(1), 3-13. doi:10.1111/j.1757-7802.2008.00003.x

Martin, R., & Sunley, P. (2006). Path dependence and regional economic evolution. Journal of economic geography, 6(4), 395-437. doi:10.1093/jeg/lbl012

Martin, R., & Sunley, P. (2007). Complexity thinking and evolutionary economic geography. Journal of economic geography, 7(5), 573-601. doi:10.1093/jeg/lbm019

Martin, R., & Sunley, P. (2015). Towards a Developmental Turn in Evolutionary Economic Geography? Regional Studies, 49(5), 712-732. doi:10.1080/00343404.2014.899431

Maskell, P. (2001). Towards a Knowledge based Theory of the Geographical Cluster. Industrial and Corporate Change, 10(4), 921-943. doi:10.1093/icc/10.4.921

Massey, D. (1978). Regionalism: some current issues. Capital & Class, 2(3), 106-125.

Massey, D. (1979). In what sense a regional problem? Regional Studies, 13(2), 233-243. doi:10.1080/09595237900185191

Massey, D. (1984). Spatial Divisions of Labour.

Massey, D., Allen, J., & Sarre, P. (1999). Human geography today. Cambridge, U.K.: Polity Press.

Massey, D., Minns, R., Morrison, W. I., & Whitbread, M. (1976). A strategy for urban and regional research. Regional Studies, 10(4), 381-387. doi:10.1080/09595237600185411

Mathys, C. (2017). Economic Importance of the Belgian Ports: Flemish maritime ports, Liege port complex and the port of Brussels - Report 2015. Retrieved from Brussel:

Maturana, H. R., & Varela, F. J. (1980 [1972]). Autopoiesis and Cognition: The Realization of the Living [De Maquinas y Seres Vivos]. Dordrecht: Reidel Publishing Company.

McCann, P., & Sheppard, S. (2003). The Rise, Fall and Rise Again of Industrial Location Theory. Regional Studies, 37(6-7), 649-663. doi:10.1080/0034340032000108741

Meegan, R. (2017). Doreen Massey (1944–2016): a geographer who really mattered. Regional Studies, 1-12. doi:10.1080/00343404.2017.1329434

Meijers, E. (2018, 21/02/2018). Schande, die tol voor de Westerscheldetunnel. NRC.

Meijers, E., van der Wouw, D., Louw, E., & Spaans, M. (2018). Tolweg of Tol Weg? Continueren of afschaffen van de tolheffing voor de Westerscheldetunnel - een scenariostudie. Retrieved from Delft:

Mény, Y., Wright, V., & Rhodes, M. (1987). The Politics of Steel: Western Europe and the Steel Industry in the Crisis Years (1974-1984): Walter de Gruyter.

Menzel, M.-P., & Fornahl, D. (2009). Cluster life cycles—dimensions and rationales of cluster evolution. Industrial and Corporate Change. doi:10.1093/icc/dtp036

Merckx, J.-P., & Neyts, D. (2015). De Vlaamse Havens. Feiten, statistieken en indicatoren voor 2014. Retrieved from

Michielsen, T. (2015, 16/09/2015). Europa houdt been stijf over aanpassing wet-Major. De Tijd.

Mijnheer, D. (2015). De handel in duurzame biobrandstoffen begint te stinken [Press release]

Mijnheer, D. (2016, 18/02/2016). Nederland, de vetput van de wereld. Follow The Money.

Milne, R., & Shepherd, C. (2016, 19/06/2016). Volvo: Remaking the marque. Financial Times.

Ministerie van Economische Zaken. (2013). Bioraffinage en SBIR: kansen verzilveren in de praktijk. Retrieved from Utrecht:

Mokyr, J. (1974). The Industrial Revolution in the Low Countries in the First Half of the Nineteenth Century: A Comparative Case Study. The Journal of Economic History, 34(2), 365-391.

Mommen, A. (2002). The Belgian Economy in the Twentieth Century: Taylor & Francis.

Mooijman, R. (2006, 06/04/2006). Het Imec van het staal. Onderzoekscentrum Arcelor Vlaams verankerd. De Standaard.

Mooijman, R. (2017, 10/07/2017). ArcelorMittal Gent bij grootste vervuilers in Europa. De Standaard.

Moulaert, F., Rodriguez, A., & Swyngedouw, E. (2003). The Globalized City: Economic Restructuring and Social Polarization in European Cities: OUP Oxford.

Moulaert, F., & Sekia, F. (2003). Territorial innovation models: a critical survey. Regional Studies, 37(3), 289-302.

Muller, M. (2017, 14/12/2017). Verplaatsing aanlegplaats cruiseschepen kost 150 miljoen. De Telegraaf.

Münchau, W. (2018, 18/03/2018). In a trade war Germany is the weakest link. Financial Times.

Munsterman, R. (2012, 27/09/2012). Afgedankt frituurvet is goud voor Simadan. Financieel Dagblad.

Murdoch, J. (1998). The spaces of actor-network theory. Geoforum, 29(4), 357-374. doi:http://dx.doi.org/10.1016/S0016-7185(98)00011-6

Murdoch, J. (2006). Post-structuralist Geography: A Guide to Relational Space: SAGE Publications.

Musterd, S. (2006). Segregation, Urban Space and the Resurgent City. Urban Studies, 43(8), 1325-1340. doi:10.1080/00420980600776418

Musterd, S., Bontje, M., & Ostendorf, W. (2006). The Changing Role of Old and New Urban Centers: the Case of the Amsterdam Region. Urban Geography, 27(4), 360-387. doi:10.2747/0272-3638.27.4.360

MVO. (2014). De natuur als oorsprong. MVO, 8.

N.N. (1988, 02/07/1988). Herschikking gronden. De Tijd.

N.N. (1989, 20/05/1989). Ghent Grain Terminal bijna zeker in Belgische handen. De Tijd.

N.N. (1992, 23/01/1992). GGT overgenomen door Euro-Silo. Nieuwsblad Transport.

N.N. (1993a, 25/11/1993). Gent is een grootstad, geen middelgrote stad. De Tijd.

N.N. (1993b, 11/12/1993). Lars Malmros pleit voor voortzetting onderlinge samenwerking. De Tijd.

N.N. (1994, 24/11/1994). Metaalstad met troeven maar beperkte groeimogelijkheden. De Tijd.

N.N. (1995, 23/11/1995). Welters tijdens discussiedag over zeehavenbeleid: 'We hebben de jaren '80 verprutst'. Nieuwsblad Transport.

N.N. (2007a, 25/08/2007). Falend beleid biobrandstoffen leidt tot uitstel. De Tijd.

N.N. (2007b, 05/10/2007). Hoge tarweprijs heeft niks met biobrandstof te maken. Vilt.

N.N. (2007c). NOBA/Rotie zet kaarten steeds meer op energie (nieuwsbrief juni 2007). Dierlijk Vet.

N.N. (2010a, 09/03/2010). Emissiehandel levert monsterwinsten op in plaats van CO2-vermindering. Mondiaal Nieuws.

N.N. (2010b). Survey of the Biorefinery programmes in The Netherlands. Retrieved from

N.N. (2012). De historiek van de haven van Zeebrugge, 1895-1907. Retrieved from http://www.zeebruggeport.be/nl/node/101

N.N. (2013, 15/04/2013). Vakbonden ArcelorMittal Gent trekken aan Europese alarmbel rond energiekosten. Het Nieuwsblad.

N.N. (2015). Upsetting the apple car; cars and technology. The Economist, 414, 61-62.

N.N. (2017a, 08/02/2017). Arcelor en Dow lossen elkaars probleem op. Financieel Dagblad. Retrieved from https://fd.nl/ondernemen/1186712/arcelor-en-dow-lossen-elkaars-probleem-op

N.N. (2017b, 27/12/2017). Chinese eigenaar Volvo Cars koopt nu ook aandeel in Volvo Trucks. De Morgen.

N.N. (2017c, 11/09/2017). Ethanol kan goed de hoofdrol spelen in Rotterdamse vergroening. Financieel Dagblad.

N.N. (2017d, 09/02/2017). Jaar van de waarheid voor Rotterdamse containeroverslag. Financieel Dagblad.

N.N. (2017e, 14/09/2017). Regionalisering moet kanaal Seine-Nord van uitstel redden. Flows.

N.N. (2017f, 20/09/2017). Rutte blij met fusie Tata en ThyssenKrupp. De Telegraaf.

N.N. (2017g, 20/10/2017). Tata Steel Nederland bang voor toekomst van het bedrijf. NOS.

N.N. (2018a, 17/01/2018). Havenbedrijf Antwerpen blijft voorstander van Saeftinghedok. Gazet van Antwerpen.

N.N. (2018b, 18/01/2018). How much impact does government regulation have on the automotive sector? Investopedia.

N.N. (2018c, 12/01/2018). Landuyt: "Havenfusie Gent drijft Antwerpen/Zeebrugge in elkaars armen". Flows.

N.N. (2018d, 24/02/2018). Mercedes is deels Chinees. Telegraaf.

N.N. (2018e, 10/01/2018). Ondernemingsraad Tata Steel Nederland sleept directie voor de rechter. Nu.nl.

N.N. (2018f, 05/02/2018). Waarom is er zoveel verzet tegen fusie ThyssenKrupp en Tata? Nu.nl.

NBB. (2017). Press Release: The economic importance of the Belgian ports - Flash estimate 2016 [Press release]

Newman, H. (2003). The mineral industry of The Netherlands. Retrieved from

Ng, A. K. Y. (2013). The Evolution and Research Trends of Port Geography. The Professional Geographer, 65(1), 65-86. doi:10.1080/00330124.2012.679441

Ng, A. K. Y., Ducruet, C., Jacobs, W., Monios, J., Notteboom, T., Rodrigue, J.-P., . . . Wilmsmeier, G. (2014). Port geography at the crossroads with human geography: between flows and spaces. Journal of Transport Geography, 41(0), 84-96. doi:10.1016/j.jtrangeo.2014.08.012

Nicolis, G., & Prigogine, I. (1977). Self-organization in nonequilibrium systems (Vol. 191977): Wiley, New York.

Nicolis, G., & Prigogine, I. (1989). Exploring complexity.

NieuweSluisTerneuzen. (2012). Akkoord over Nieuwe Sluis Terneuzen [Press release]

Norcliffe, G. (1981). Industrial change in old port areas. Cahiers de géographie du Québec, 25, 237-254.

Notteboom, T. (2018, 18/02/2018). Towards a "Rotterdamisation" of the european container port system? PortEconomics.

Notteboom, T., de Langen, P., & Jacobs, W. (2013). Institutional plasticity and path dependence in seaports: interactions between institutions, port governance reforms and port authority routines. Journal of Transport Geography, 27(0), 26-35. doi:http://dx.doi.org/10.1016/j.jtrangeo.2012.05.002

Notteboom, T., & Rodrigue, J.-P. (2005). Port regionalization: towards a new phase in port development. Maritime Policy & Management, 32(3), 297-313. doi:10.1080/03088830500139885

Notteboom, T., Verhoeven, P., & Fontanet, M. (2012). Current practices in European ports on the awarding of seaport terminals to private operators: towards an industry good practice guide. Maritime Policy & Management, 39(1), 107-123. doi:10.1080/03088839.2011.642315

Notteboom, T., & Winkelmans, W. (2001). Structural changes in logistics: how will port authorities face the challenge? Maritime Policy & Management, 28(1), 71-89. doi:10.1080/03088830119197

Notteboom, T., & Yang, Z. (2017). Port governance in China since 2004: Institutional layering and the growing impact of broader policies. Research in Transportation Business & Management, 22, 184-200. doi:http://dx.doi.org/10.1016/j.rtbm.2016.09.002

O'Connor, K., Derudder, B., & Witlox, F. (2016). Logistics Services: Global Functions and Global Cities. Growth & Change, 47(4), 481-496. doi:10.1111/grow.12136

OCAS. (2016, 02/2015). OCAS: Company History.

OECD. (2013). The Competitiveness of Global Port-Cities: Synthesis Report. Retrieved from Rotterdam:

OECD. (2014). The Competitiveness of Global Port-Cities. Retrieved from Paris:

Oleon. (2017). Oleon Corporate: working process. Retrieved from http://www.oleon.com/our-company/corporate

Oliver, C., Hanke, J., & Von der Burchard, H. (2018, 01/03/2018). Europe digs in to fight global trade war against Trump. Politico.

ONH. (2018). 5 dingen die je moet weten over de Hoogovens.

Orwell, G. (1949). 1984: Harvill Secker.

Overman, H. G. (2004). Can we learn anything from economic geography proper? Journal of economic geography, 4(5), 501-516. doi:10.1093/jnlecg/lbh028

Oyama, S. (2000). Causal Democracy and Causal Contributions in Developmental Systems Theory. Philosophy of Science, 67, S332-S347. doi:10.1086/392830

Paasi, A. (2010). Commentary. Environment and Planning A, 42(10), 2296-2301. doi:10.1068/a42232

Papa, E., & Lauwers, D. (2015). Smart mobility: Opportunity or threat to innovate places and cities. Paper presented at the International Conference on Urban Planning and regional Development in the Information Society, Ghent.

Paris, C. (2014, 26/03/2014). Shipping Alliance Set to Make Waves: Maersk and Two Other Container Shippers Aim to Cuts Costs Amid Overcapacity. The Wall Street Journal.

Parr, J. B. (2002). Missing Elements in the Analysis of Agglomeration Economies. International Regional Science Review, 25(2), 151-168. doi:10.1177/016001702762481221

PDD. (1992, 23/01/1992). Euro-Silo via overname GGT grootste Gentse graanopslaggroep. De Tijd.

Peck, J. (2005). Economic Sociologies in Space. Economic Geography, 81(2), 129-175. doi:10.1111/j.1944-8287.2005.tb00263.x

Peet, R., & Thrift, N. (2001 [1989]). New models in geography.

Persson, M., & Heijne, S. (2012, 08/09/2012). Er is geen zeeschip meer te zien in de Amerikahaven. Volkskrant.

Phelps, N. A., & Waley, P. (2004). Capital Versus the Districts: A Tale of One Multinational Company's Attempt to Disembed Itself. Economic Geography, 80(2), 191-215. doi:10.1111/j.1944-8287.2004.tb00307.x

Pickard, J., Campbell, P., & Michael, P. (2016, 12/04/2016). Tata Steel sets deadline of May 28 for sale of British arm. Financial Times.

Pike, A., Birch, K., Cumbers, A., MacKinnon, D., & McMaster, R. (2009). A Geographical Political Economy of Evolution in Economic Geography. Economic Geography, 85(2), 175-182. doi:10.1111/j.1944-8287.2009.01021.x

Pirenne, H. (1927). Les Villes du Moyen Age. Essai d'Histoire Economique et Sociale. Brussels.

Plantics. (2017, 01/06/2017). Plantics: Our Story. Retrieved from http://plantics.nl/

Polanyi, K. (1963). Ports of Trade in Early Societies. The Journal of Economic History, 23(1), 30-45. doi:10.2307/2116276

Port of Amsterdam. (2015). Visie 2030. Retrieved from

Port of Amsterdam. (2017a). Centraal nautisch beheer Noordzeekanaalgebied. In.

Port of Amsterdam. (2017b). Samenwerking Havenbedrijf Amsterdam en gemeente Zaanstad breidt verder uit [Press release]

Port of Antwerp. (2017). Antwerpen breekt met aanloop Madrid Maersk nieuw record [Press release]

Port of Antwerp. (2018). 2017: Feiten en cijfers. Retrieved from

Port of Ghent. (2014). Stora Enso gaat via pijpleiding Volvo Car Gent verwarmen [Press release]

Porter, M. E. (1990; 1998). The competitive advantage of nations. Harvard business review, 68(2), 73.

Porter, M. E. (1998). Clusters and the new economics of competition (Vol. 76): Harvard Business Review Boston.

Pot, W. D., Dewulf, A., Biesbroek, G. R., Vlist, M. J. v. d., & Termeer, C. J. A. M. (2018). What makes long-term investment decisions forward looking: A framework applied to the case of Amsterdam's new sea lock. Technological Forecasting and Social Change. doi:https://doi.org/10.1016/j.techfore.2018.01.031

Powell, W., & Smith-Doerr, L. (2005). Networks and economic life. In N. Smelser & R. Swedberg (Eds.), The handbook of economic sociology (Vol. 2). Princeton: Princeton Univeristy Press.

Pratt, A. (1995). Putting critical realism to work: the practical implications for geographical research. Progress in Human Geography, 19(1), 61-74. doi:10.1177/030913259501900104

Pratt, A. (2009). Critical Realism/Critical Realist Geographies. In R. Kitchin & N. Thrift (Eds.), International Encyclopedia of Human Geography (pp. 922-927): Elsevier Science.

Pred, A. (1986). Place, Practice, and Structure. Cambridge: Polity Press.

Provincie Oost-Vlaanderen (Cartographer). (2010). Fusiegemeente Oost-Vlaanderen

Public Eye. (2016). Dirty Diesel. How Swiss Traders Flood Africa with Toxic Fuels. Retrieved from

Quevit, M. (1978). Les Causes du Declin Wallon. Bruxelles.

Raimbault, N., Jacobs, W., & van Dongen, F. (2014). Port Regionalisation from a Relational Perspective: The Rise of Venlo as Dutch International Logistics Hub. Tijdschrift voor economische en sociale geografie.

Rasking, J. (2016, 22/03/2016). Volvo doet het voortaan zonder toeleveranciers. De Standaard.

Restuccia, A., & Behsudi, A. (2018, 01/03/2018). Trump decides on steep tariffs on steel and aluminum imports. Politico.

RHV. (2015). Havenmonitor 2014. Retrieved from

Rifkin, J. (2011). The third industrial revolution: how lateral power is transforming energy, the economy, and the world: Macmillan.

Rigby, D. L., & Essletzbichler, J. (2006). Technological variety, technological change and a geography of production techniques. Journal of economic geography, 6(1), 45-70. doi:10.1093/jeg/lbi015

Rijksoverheid. (2015). Emissiehandel in Europa. Retrieved from

RLI. (2016). Mainports voorbij. Retrieved from

Ronse, S., & Van de Cloot, I. (2017). De maakindustrie van de toekomst in Belgie. Retrieved from

Roodbol-Mekkes, P. H., van der Valk, A. J., & Altes, W. K. K. (2012). The Netherlands Spatial Planning Doctrine in Disarray in the 21st Century. Environment and Planning A, 44(2), 377-395. doi:10.1068/a44162

Rooijendijk, C. (2005). That City is Mine!: Urban Ideal Images in Public Debates and City Plans, Amsterdam & Rotterdam 1945-1995. (PhD), Amsterdam University Press, Amsterdam. Retrieved from https://books.google.be/books?id=pW9ZAQAAQBAJ

Rozek, J. (2007). De barges tussen Brugge, Nieuwpoort en Duinkerke (17e-18e eeuw).

RPD. (1966). Tweede Nota over de Ruimtelijke Ordening. Retrieved from Den Haag:

Ruda, T. (2017, 18/07/2017). How regulatory changes may impact the auto industry. Reuters.

RVO. (2007). Tweede Generatie biodieselfabriek Greenmills Projectgoedkeuring. Retrieved from

Rydin, Y. (2010). Actor-network theory and planning theory: A response to Boelens. Planning Theory, 9(3), 265-268. doi:doi:10.1177/1473095210368772

Ryle, G. (2009 [1971]). Collected Essays 1929 - 1968: Collected Papers: Taylor & Francis.

Saey, P. (1971). De nieuwe orientatie van de aardrijkskunde : oorsprong, ontwikkeling en beoordeling: Gent : RUG.

Sage, A. (2017, 26/10/2017). Tesla's seat strategy goes against the grain...for now. Reuters.

Salet, W. (2006). Rescaling territorial governance in the Randstad Holland: The responsiveness of spatial and institutional strategies to changing socio-economic interactions. European Planning Studies, 14(7), 959-978. doi:10.1080/09654310500496396

Sassen, S. (2000). Cities in a world economy /Saskia Sassen: Pine Forge press.

Sassen, S. (2014). Expulsions: Brutality and complexity in the global economy: Harvard University Press.

Savini, F. (2013). The Governability of National Spatial Planning: Light Instruments and Logics of Governmental Action in Strategic Urban Development. Urban Studies, 50(8), 1592-1607. doi:10.1177/0042098012465131

Savini, F., Boterman, W. R., van Gent, W. P. C., & Majoor, S. (2016). Amsterdam in the 21st century: Geography, housing, spatial development and politics. Cities, 52, 103-113. doi:http://dx.doi.org/10.1016/j.cities.2015.11.017

Sawyer, K. (2001). Emergence in Sociology: Contemporary Philosophy of Mind and Some Implications for Sociological Theory. American Journal of Sociology, 107(3), 551-585. doi:10.1086/338780

Sayer, A. (1989). The 'New' Regional Geography and Problems of Narrative. Environment and Planning D: Society and Space, 7(3), 253-276. doi:10.1068/d070253

Sayer, A. (1997). Critical Realism and the Limits to Critical Social Science. Journal for the Theory of Social Behaviour, 27(4), 473-488. doi:10.1111/1468-5914.00052

Sayer, A. (2000). Realism and social science: Sage.

Sayer, A. (2001). For a Critical Cultural Political Economy. Antipode, 33(4), 687-708. doi:10.1111/1467-8330.00206

Sayer, A. (2004). Seeking the geographies of power. Economy and Society, 33(2), 255-270. doi:10.1080/03085140410001677157

Sayer, A. (2010 [1984]). Method in Social Science: A realist approach: Taylor & Francis.

Schils, J. (2017, 05/09/2017). President Macron schrapt Seine-Nord kanaal als prioritair infrastructuurwerk. Scheepvaartkrant.

Schuiling, D. (1996). Key Projects for Urban Regeneration: The Dutch experience. Planning Practice & Research, 11(3), 279-290. doi:10.1080/02697459616852

Schuman, R. (1950). The Schuman Declaration. Retrieved from

Schumpeter, J. A. (2003 [1943]). Capitalism, socialism and democracy: Routledge.

Scott, A. J. (1998). Regions and the world economy. In: Oxford University Press.

Scott, A. J. (2000). Economic geography: the great half-century. Cambridge Journal of Economics, 24(4), 483-504. doi:10.1093/cje/24.4.483

Scott, A. J. (2004). A Perspective of Economic Geography. Journal of economic geography, 4(5), 479-499. doi:10.1093/jnlecg/lbh038

Scott, A. J. (2008). Social Economy of the Metropolis: Cognitive-Cultural Capitalism and the Global Resurgence of Cities: OUP Oxford.

Segers, Y. (2003). Economische groei en levensstandaard: de ontwikkeling van de particuliere consumptie en het veodselverbruik in België, 1800-1913: Universitaire Pers.

Sertyn, P. (2015, 29/06/2015). Havens zijn niet gebaat met containerwedloop. De Standaard.

Sertyn, P. (2018, 07/03/2018). Vlaamse havenfusie dichterbij dan ooit. De Standaard.

Shen, L., Haufe, J., & Patel, M. K. (2009). Product overview and market projection of emerging bio-based plastics PRO-BIP 2009. Report for European polysaccharide network of excellence (EPNOE) and European bioplastics, 243.

Shepard, W. (2016, 10/11/2016). China Hits Record High M&A Investments In Western Firms. Forbes.

Shepherd, C. (2016, 02/11/2016). Volvo and Geely to share China car factory. Financial Times.

Sheppard, E. (2002). The Spaces and Times of Globalization: Place, Scale, Networks, and Positionality. Economic Geography, 78(3), 307-330. doi:10.2307/4140812

Shirouzu, N. (2011, 12/07/2011). Is Volvo Swedish or Chinese? The Wall Street Journal.

Shirouzu, N. (2016, 02/11/2016). Volvo, Geely to deepen ties, share small car plant. Reuters.

Shirouzu, N. (2017, 29/11/2017). Geely-Volvo considering making Lynk & Co cars in Belgium, South Carolina: executive. Reuters.

Shurtleff, W., & Aoyagi, A. (2015). History of Soybeans and Soyfoods in France (1665-2015): Soyinfo Center.

Silva, P. (2016). Tactical urbanism: Towards an evolutionary cities' approach? Environment and Planning B: Planning and design, 43(6), 1040-1051. doi:10.1177/0265813516657340

Slack, B. (1989). The port service industry in an environment of change. Geoforum, 20(4), 447-457. doi:10.1016/0016-7185(89)90028-6

Smil, V. (2006). Transforming the Twentieth Century: Technical Innovations and Their Consequences: Oxford University Press, USA.

Smith, D. (2018, 03/03/2018). Trump escalates trade war rhetoric with threat to tax Europe-made cars. The Guardian.

Smith, N. (1987). "Academic War over the Field of Geography": The Elimination of Geography at Harvard, 1947-1951. Annals of the Association of American Geographers, 77(2), 155-172.

Soens, T. (2009). De spade in de dijk? Waterbeheer en rurale samenleving in de Vlaamse kustvlakte (1280-1580). Gent: Academia Press.

Soetaert, W. (2018, 08/02/2018). Column: Carbon Leakage. Petrochem.

Soja, E. W. (1989). Postmodern geographies: The reassertion of space in critical social theory: Verso.

Somers, M. R. (1994). The Narrative Constitution of Identity: A Relational and Network Approach. Theory and Society, 23(5), 605-649.

SSE. (2015). Shanghai Shipping Exchange: Shanghai Containerized Freight Index. Retrieved 25/08/2015, from Chinese Ministry of Transport http://en.sse.net.cn/indices/scfinew.jsp

Stad Antwerpen. (2010). Open monumentendag. De vier elementen: aarde, lucht, vuur en water. Retrieved from

Stake, R. E. (1995). The Art of Case Study Research: SAGE Publications.

STAM. (2016). Het verloren koninkrijk. Willem I en België. In. Ghent: STAM museum Ghent.

Stil, H. (2011, 26/10/2011). Amsterdam grootste benzineopslag van de wereld. Parool.

Stinchcombe, A. (1990). Information and organizations. Berkeley: University of California Press.

Stora Enso. (2016). Stora Enso and Volvo Cars: Renewable energy pipeline in Ghent, Belgium [Press release]

Storper, M. (1997). The regional world: territorial development in a global economy. New York :: Guilford Press.

Storper, M., & Walker, R. (1989). The capitalist imperative: Territory, technology, and industrial growth: Blackwell.

Strambach, S. (2010). The German business software industry. In R. Boschma & R. Martin (Eds.), The handbook of evolutionary economic geography (pp. 406-431). Cheltenham: Edward Elgar Publishing Limited.

Sunley, P. (2008). Relational Economic Geography: A Partial Understanding or a New Paradigm? Economic Geography, 84(1), 1-26. doi:10.1111/j.1944-8287.2008.tb00389.x

Swinford, S. (2016, 30/03/2016). EU row over deal to save steel. The Telegraph.

Swyngedouw, E. (2000). Authoritarian Governance, Power, and the Politics of Rescaling. Environment and Planning D: Society and Space, 18(1), 63-76. doi:10.1068/d9s

Swyngedouw, E. (2004). Globalisation or 'glocalisation'? Networks, territories and rescaling. Cambridge Review of International Affairs, 17(1), 25-48. doi:10.1080/0955757042000203632

TATA STEEL. (2016). Regionale Staalagenda 2016. Retrieved from

Taylor, P. J. (2016). Corporate Social Science and the Loss of Curiosity. Retrieved from Items - Insight from the Social Sciences website: http://items.ssrc.org/corporate-social-science-and-the-loss-of-curiosity/

Terhorst, P. J. F., & van de Ven, J. C. L. (1997). Fragmented Brussels and Consolidated Amsterdam: a comparative study of the spatial organization of property rights: Netherlands Geographical Society Amsterdam.

Teubner, G. (1987). Autopoietic Law - A New Approach to Law and Society: De Gruyter.

Thompson, G. (2003). Between Hierarchies and Markets: The Logic and Limits of Network Forms of Organization: Oxford University Press.

Thrift, N. (1983). On the Determination of Social Action in Space and Time. Environment and Planning D: Society and Space, 1(1), 23-57. doi:10.1068/d010023

Thrift, N. (1990). For a new regional geography 1. Progress in Human Geography, 14(2), 272-279. doi:doi:10.1177/030913259001400205

Thrift, N. (1991). For a new regional geography 2. Progress in Human Geography, 15(4), 456-466. doi:doi:10.1177/030913259101500407

Thrift, N. (1993). For a new regional geography 3. Progress in Human Geography, 17(1), 92-100. doi:10.1177/030913259301700107

Thrift, N. (1998). The rise of soft capitalism. In A. Herod, G. Ó. Tuathail, & S. M. Roberts (Eds.), An Unruly World?: Globalization, Governance, and Geography. London: Routledge.

Thrift, N. (2000). Pandora's box? Cultural geographies of economies. In G. L. Clark, M. S. Gertler, M. P. Feldman, & K. Williams (Eds.), The Oxford handbook of economic geography: Oxford University Press.

Thrift, N. (2014 [1986]). Little games and big stories. In K. Hoggart & E. Kofman (Eds.), Politics, Geography and Social Stratification. London: Routledge.

Thrift, N., & Pred, A. (1981). Time-geography : a new beginning. [Berkeley, Calif.]: Institute of Urban & Regional Development, University of California, Berkeley.

Tilly, C. (1984). Big structures, large processes, huge comparisons: Russell Sage Foundation.

Tilly, C. (1998). Durable inequality. Berkeley: University of California Press.

Tilly, C. (2001). Mechanisms in political processes. Annual Review of Political Science, 4(1), 21.

Tovey, A. (2016, 25/01/2016). Steel crisis spreads to Europe as Arcelor Mittal shuts Spanish plant. The Telegraph.

U.S.-China Economic and Security Review Commission. (2008). Report to Congress. Retrieved from Washington:

Uzzi, B. (1999). Embeddedness in the Making of Financial Capital: How Social Relations and Networks Benefit Firms Seeking Financing. American Sociological Review, 64(4), 481-505. doi:10.2307/2657252

Van Assche, K., Beunen, R., & Duineveld, M. (2014). Evolutionary Governance Theory: An Introduction: Springer Heidelberg.

Van Baelen, J. (2012, 30/05/2012). De Economische Opmars van Vlaanderen: 'Uplace zou in de Sixties op Applaus onthaald zijn'. Knack Extra, 6.

Van Biesbroeck, J. (2015, 31/03/2015). Volvo Gent is niet helemaal kansloos. De Tijd.

van Bockxmeer, J. (2017, 14/06/2017). Passenger Terminal Amsterdam moet verplaatsen. Financieel Dagblad.

van Bueren, E., & ten Heuvelhof, E. (2005). Improving Governance Arrangements in Support of Sustainable Cities. Environment and Planning B: Planning and design, 32(1), 47-66. doi:10.1068/b31103

Van den Berghe, K. (2016). Waarom blijven we havensteden geografisch analyseren? De ideaaltypische concepten zorgen voor een institutionele lock-in. Ruimte & Maatschappij, 7(4), 25.

Van den Berghe, K. (2017a). China neemt (Volvo) over. Agora, 33(3), 3.

Van den Berghe, K. (2017b). Gamechanger China verhoogt regionale economische competitie tussen Gent en Gotenburg : de voortdurende veranderingen sinds de overname van Volvo Cars bewijst hoe belangrijk de gedeelde ruimte tussen haven en stad is. Paper presented at the Plandag, Ghent.

Van den Berghe, K., & De Sutter, R. (2014a). De hydrologische cyclus in de Belgische kustzone en-polders. Ruimte & Maatschappij, 5(4), 32-64.

Van den Berghe, K., & De Sutter, R. (2014b). The governance dilemma in the Flanders coastal region between integrated water managers and spatial planners. Water International, 39(6), 858-871. doi:10.1080/02508060.2014.954663

Van den Berghe, K., Jacobs, W., & Boelens, L. (2018). The relational geometry of the port-city interface: Case studies of Amsterdam, the Netherlands, and Ghent, Belgium. Journal of Transport Geography, 70(C).

Van den Berghe, K., & Willems, J. J. (2017). Leren de waarheid te definiëren : besluitvorming ontleed rondom havenontwikkeling in het Schelde - estuarium.

Van Der Haegen, H., & van Weesep, J. (1974). Urban Geography in the Low Countries. Tijdschrift voor economische en sociale geografie, 65(2), 79-89. doi:10.1111/j.1467-9663.1974.tb01217.x

Van der Lugt, L., Witte, J.-J., De Jong, O., & Streng, M. (2016). Havenmonitor 2015. Retrieved from

Van der Lugt, L., Witte, J.-J., De Jong, O., & Streng, M. (2017). Havenmonitor 2016. Retrieved from

van der Wouden, R. (2015). De ruimtelijke metamorfose van Nederland 1988-2015: Nai010.

van der Wouden, R. (2016). Succes of falen? Een halve eeuw verstedelijkingsbeleid in Nederland. Ruimte & Maatschappij, 8(1), 6-26.

Van Dyck, B. (2009). Reststromen in de Gentse Kanaalzone: Onderzoek naar mogelijkheden voor uitwisseling en valorisatie. Retrieved from gent:

Van Gastel, G. (2016). Economic Importance of the Belgian Ports: Flemish maritime ports, Liege port complex and the port of Brussels - Report 2014. Retrieved from Brussel:

van Gent, W. P. C. (2013). Neoliberalization, Housing Institutions and Variegated Gentrification: How the 'Third Wave' Broke in Amsterdam. International Journal of Urban and Regional Research, 37(2), 503-522. doi:10.1111/j.1468-2427.2012.01155.x

van Gils, M., Huijs, M., & de Jong, B. (2009). De Nederlandse Mainport onder druk: speuren naar ontwikkelkracht. Houten: Spectrum.

Van Hooydonk, E., de Wit, R., Maritime, E. I. o., & Law, T. (2003). Stouwers, naties en terminal operators: het gewijzigde juridische landschap : Antwerpse Zeerechtdagen: Maklu.

Van Houtte, J. A., Devliegher, L., Vanedewalle, A., & Van Acker, F. (1982). De geschiedenis van Brugge.

van Kempen, R., & Priemus, H. (2002). Revolution in Social Housing in the Netherlands: Possible Effects of New Housing Policies. Urban Studies, 39(2), 237-253. doi:10.1080/00420980120102948

Van Lierop, T. (2017, 24/02/2017). Sluiting Renault was eerste mokerslag voor Belgische auto-industrie. De Redactie (VRT).

van Meeteren, M. (2011). De stand van Neêrlands platteland. Agora(4), 4.

van Meeteren, M. (2016). From Polycentricity to a Renovated Urban Systems Theory. Explaining Belgian Settlement Geographies. (PhD), University of Ghent, Ghent.

van Meeteren, M., Boussauw, K., Derudder, B., & Witlox, F. (2016). Flemish Diamond or ABC-Axis? The spatial structure of the Belgian metropolitan area. European Planning Studies, 24(5), 974-995. doi:10.1080/09654313.2016.1139058

van Meeteren, M., Poorthuis, A., Derudder, B., & Witlox, F. (2016). Pacifying Babel's Tower: A scientometric analysis of polycentricity in urban research. Urban Studies, 53(6), 1278-1298. doi:10.1177/0042098015573455

van Oort, F. (2004). Urban Growth and Innovation: Spatially Bounded Externalities in the Netherlands: Ashgate.

Van Oort, F., Van Aalst, I., Lambregts, B., & Meijers, E. (2010). The Spatial Economy and Networks of the Northwing of the Randstad. Utrecht: Utrecht University.

Van Weezel, T. (2017, 21/07/2017). Hij gaat er ondanks bezwaren van de minister komen: een fietsbrug over het IJ. De Volkskrant.

Van Werveke, H., & Verhulst, A. (1960). Castrum en Oudburg te Gent: Bijdrage tot de oudste geschiedenis van de Vlaamse steden. Handelingen der Maatschappij voor Geschiedenis en Oudheidkunde, 14, 3-62.

Van Zoelen, B. (2016a, 08/06/2016). In havenloods Prodock mogen start-ups herrie maken. Het Parool.

van Zoelen, B. (2016b, 26/10/2016). Meer doen tegen export vervuilende brandstoffen naar Afrika. Het Parool.

van Zoelen, B. (2017, 15/03/2017). Steenkool verbannen uit de Amsterdamse haven. Het Parool.

Vanacker, L. (2017). Eerste Chinese Volvo naar Europa. De Tijd.

Vance, J. E. (1970). The Merchant's World: The Geography of Wholesaling: Englewoord Cliffs (N.J.): Prentice-Hall.

Vandermeulen, V., Nolte, S., & Van Huylenbroeck, G. (2010). Hoe biobased is de Vlaamse economie? Retrieved from Brussel:

Vandeweghe, H. (1993, 25/11/1993). Ghent Seaport: achterhaven, binnenhaven of gewoon zeehaven. De Tijd.

Vandeweghe, H. (1994, 24/11/1994). Gentse haven krijgt Linkeroever, maar wil meer. De Tijd.

Varró, K., & Lagendijk, A. (2013). Conceptualizing the Region – In What Sense Relational? Regional Studies, 47(1), 18-28. doi:10.1080/00343404.2011.602334

Vaughan, A. (2017, 05/07/2017). All Volvo cars to be electric or hybrid from 2019. The Guardian.

Verbraeken, H. (2016a, 15/03/2016). Avantium wijkt met fabriek uit naar Basf in Antwerpen. Financieel Dagblad.

Verbraeken, H. (2016b, 07/10/2016). Bouw Antwerpse bioplasticfabriek van Basf en Avantium vergt €250 à 300 mln. Financieel Dagblad.

Verbraeken, H. (2017, 01/05/2017). Chaincraft schaalt op bij productie biologische vetzuren. Financieel Dagblad. Retrieved from https://fd.nl/ondernemen/1196713/chaincraft-gaat-op-grotere-schaal-biologische-vetzuren-maken

Verhoeven, P. (2010). A review of port authority functions: towards a renaissance? Maritime Policy & Management, 37(3), 247-270. doi:10.1080/03088831003700645

Verhulst, A. (1964). Het landschap in Vlaanderen in historisch perspectief: De nederlandsche Boekhandel.

Verhulst, A. (1977). An aspect of the question of continuity between antiquity and middle ages: the origin of the Flemish cities between the North Sea and the Scheldt. Journal of Medieval History, 3(3), 175-205. doi:10.1016/0304-4181(77)90019-7

Versteegh, A. P. (1994). De onvermijdelijke afkomst?: de opname van Polen in het Duits, Belgisch en Nederlands mijnbedrijf in de periode 1920-1930: Verloren.

VILT. (2007). Productie biobrandstof loopt vertraging op in Belgie [Press release]

VILT. (2016). Belgisch Alco Bio Fuel koopt Rotterdamse ethanolfabriek [Press release]

VILT. (2017). BioWanze heeft meer in zijn mars dan enkel biobrandstof [Press release]

Decreet houdende het beleid en het beheer van de zeehavens, (1999).

Vlaamse Overheid. (2004). Beleidsnota Financien en begroting 2004-2009. Retrieved from

Vlaamse Overheid. (2005). Afbakening Zeehaven Gent Inrichting R4-oost en R4-west. Retrieved from

Decreet tot wijziging van het havendecreet van 2 maart 1999 in relatie met het gemeentedecreet, (2008).

VNSC. (2012). Besluit van het politiek college van de Vlaams-Nederlandse Schelde commissie inzake planuitwerkingsfase grote zeesluis kanaal Gent-Terneuzen. Retrieved from Bergen op Zoom:

Volkshuisvesting en Ruimtelijke Ordening. (1972). Nota volkshuisvesting. Retrieved from

Volvo Car Gent. (2017a). 50 verhalen. Mensen maken geschiedenis. Gent: Graphius.

Volvo Car Gent. (2017b). Volvo Car Gent in 2016: alweer een sterk jaar [Press release]

Vrijsen, E. (2015, 03/08/2015). Hoe nuttig is de peperdure nieuwe zeesluis bij IJmuiden? Elsevier weekblad.

Vierde Nota Ruimtelijke Ordening (VINO), (1988).

Vierde Nota Extra (VINEX), (1990).

Wachsmuth, D. (2017). Competitive multi-city regionalism: growth politics beyond the growth machine. Regional Studies, 51(4), 643-653. doi:10.1080/00343404.2016.1223840

Wallerstein, I. (1974). The Rise and Future Demise of the World Capitalist System: Concepts for Comparative Analysis. Comparative Studies in Society and History, 16(4), 387-415. doi:10.2307/178015

Waters, R., & Platt, E. (2017, 01/11/2017). Tesla model 3 production target falls further behind schedule. Financial Times.

Weber, M. (1978). Economy and Society: An Outline of Interpretive Sociology. New York: Beminster Press.

Weedy, S. (2017, 12/06/2017). Zeeland & Ghent ports plan rail link as merger comes a step closer. RailFreight.

WEF. (2016). The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution. Retrieved from

Weissink, A. (2014, 10/11/2014). Ambitie Havenbedrijf Amsterdam stuit andere havens tegen de borst. Financieel Dagblad.

Westeneng, A. (2017, 28/07/2017). =Havenbedrijf Amsterdam groeit flink door steenkool en olie. Financieel Dagblad.

Wheelan, S. (1999, 23/06/1999). British Steel and Hoogovens merge. World Socialist Web Site.

Whiteside, R. (1993). Medium Companies of Europe 1993/94: Volume 1: Medium Companies of the Continental European Community: Graham & Trotman Limited.

Wiegmans, B. W., & Louw, E. (2011). Changing port–city relations at Amsterdam: A new phase at the interface? Journal of Transport Geography, 19(4), 575-583. doi:http://dx.doi.org/10.1016/j.jtrangeo.2010.06.007

Willink, B. (1998). De tweede Gouden Eeuw. Nederland en de Nobelprijzen voor natuurwetenschappen 1870-1940. Amsterdam: dbnl.

Winton, N. (2018, 06/03/2018). Volvo XC40 SUV Wins Car Of The Year Award At Geneva Show. Forbes.

Witte, P., Slack, B., Keesman, M., Jugie, J.-H., & Wiegmans, B. (2017). Facilitating start-ups in port-city innovation ecosystems: A case study of Montreal and Rotterdam. Journal of Transport Geography. doi:10.1016/j.jtrangeo.2017.03.006

Woermann, M. (2016). Bridging Complexity and Post-Structuralism: Insights and Implications: Springer International Publishing.

Wohl, S. (2017). Tactical urbanism as a means of testing relational processes in space: A complex systems perspective. Planning Theory, 1473095217722809. doi:10.1177/1473095217722809

WTO. (2018). Trends in world trade: Looking back over the past ten years. Retrieved from

Yeung, H. W.-c. (1997). Critical realism and realist research in human geography: a method or a philosophy in search of a method? Progress in Human Geography, 21(1), 51-74. doi:10.1191/030913297668207944

Yeung, H. W.-c. (2000). Organizing 'the firm' in industrial geography I: networks, institutions and regional development. Progress in Human Geography, 24(2), 301-315. doi:10.1191/030913200671984115

Yeung, H. W.-c. (2003). Practicing New Economic Geographies: A Methodological Examination. Annals of the Association of American Geographers, 93(2), 442-462. doi:10.1111/1467-8306.9302011

Yeung, H. W.-c. (2005). Rethinking relational economic geography. Transactions of the Institute of British Geographers, 30(1), 37-51. doi:10.1111/j.1475-5661.2005.00150.x

Yeung, H. W.-c. (2009). Regional Development and the Competitive Dynamics of Global Production Networks: An East Asian Perspective. Regional Studies, 43(3), 325-351. doi:10.1080/00343400902777059

Yeung, H. W.-c., & Coe, N. M. (2015). Toward a Dynamic Theory of Global Production Networks. Economic Geography, 91(1), 29-58. doi:10.1111/ecge.12063

Yin, R. K. (1981). The Case Study Crisis: Some Answers. Administrative Science Quarterly, 26(1), 58-65. doi:10.2307/2392599

Yuan, H. (2010, 17/09/2010). Baoshan Steel, Geely seek to cut Chinese auto weight. The Jakarta Post.

Zeeland Seaports. (2009). Brief aan het college van van de provincie Zeeland: Beëindiging samenwerking in ESM verband (29 juli 2009). Middelburg.

Zeeland Seaports. (2010). Verzelfstandiging Zeeland Seaports. Retrieved from Terneuzen:

Zhao, Q., Xu, H., Wall, R. S., & Stavropoulos, S. (2017). Building a bridge between port and city: Improving the urban competitiveness of port cities. Journal of Transport Geography, 59, 120-133. doi:10.1016/j.jtrangeo.2017.01.014

ZHIJ. (2016). Annual Report Zeehavens IJmuiden NV. Retrieved from

Zweers, L. (1984). Dolf Kruger. Fotolexicon, 1.

Planning the Port City

Ports have historically played a key role in the economic development of their host cities and regions. However, since the second half of the 20th century, their historical connection came under pressure. Ports and cities grew apart, not only physically, but also socially, culturally and institutionally. Within the literature, foremost the physical separation between port and city is being studied. In this case, the concept of the port-city interface becomes a synonym of the waterfront, a developer's window of opportunity for urban renewal in port cities around the world.

However, perceiving the port-city interface only in terms of land use neglects that the port-city interface is also an interactive economic system composed of different relationships within, without and towards this system, hence our proposition.

This dissertation proposes a relational approach to the port-city interface. A relational approach allows us to focus on how development is constituted through dynamic coupling mechanisms across territorial scales and along different institutionalised structures. Within a flat and deep ontology, we combine the relational approach with causal theory and system theory. This results in our analytical framework capable to analyse different emergent coupling mechanisms and their effects.

Subsequently, we operationalize this in our three-step conceptual framework. In step 1, we analytically stop the time to identify and visualize the relational geometry. Step 2 distinguishes the causal processes from the less-relevant background conditions. Step 3 analyses the emergent powers that are enabling the coupling mechanisms and, in the end, explain how actors possess agency.

The empirical work, the lion's share of this dissertation, focusses on five port-city interfaces in the port-cities of Amsterdam (The Netherlands) and Ghent (Belgium). In both Amsterdam and Ghent we focus on the steel manufacturing sector and the biobased sector, while in Ghent we also focus on the car manufacturing sector.

Based on our results, we answer the main research question 'How to plan the port city?'. We will argue that the port-city interface should not be governed to maintain and prevent the conflict between port and urban land use, but should, in contrast, be of high added value for both the urban and maritime economy.

Karel Van den Berghe was born at 10 May 1989 in Torhout, Belgium. He grew up in Diksmuide and moved to Ghent for his academic studies. Karel holds a Bachelor of Geography (2010), Master of Geography (2012) and a Master of Urbanism and Spatial Planning (2013). From 2014 to 2018, Karel was a PhD researcher at the Ghent University, supported by a BOF grant. During his PhD, Karel was elected first board member and second president of the Young Academics of the Association of European Schools of Planning (YA-AESOP). Karel is also member of the editorial board of the AESOP journal plaNext. From September, 2016, until February, 2017, Karel was a visiting researcher at the Erasmus University Rotterdam, supported by a FWO grant. Next to his PhD, Karel is chair of the spatial planning advisory board of the city of Diksmuide (Gecoro) since 2014. From June, 2018, Karel holds a post-doc research position at the Delft University of Technology.

//IN/
PLAN/
/NING