

MSc Thesis

Ecological Modernisation Theory and the Shipping Sector

Applying the triad-network model to a carrier whom is obliged to implement the sulphur requirements

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ABSTRACT

This study applied the triad-network model to explore the roles of organizations surrounding Dutch carriers whom are obliged to implement the sulphur requirements as set forth in Marpol Annex VI. Herewith the fundament was provided to explore the applicability of the Ecological Modernisation Theory (EMT) and its ecological rationale to the shipping sector. Carriers and related key players were mapped and described based on document analysis and semi-structured interviews. It was found that the majority of organizations in the economic network have a reactive attitude and follow carrier-led market developments. As a result, there was no superior compliant technology readily available once the limits entered into force and carriers implemented ad hoc, temporary solutions. The diversity of compliance methods further complicated achieving solid enforcement for organizations in the policy network. And without much public awareness on (sulphur) pollution generated by the shipping sector, organizations from the societal network are few in number and cannot use the public as a stick towards carriers which limits their tools to business-business contact. Combining the findings from all networks, it was shown that an ecological rationale is largely absent. Accordingly, the core concepts of EMT are coming up short as well. Overcoming this impasse of ineffective regulation and detained technological development could be achieved by consolidating global regulation in the shipping sector with a global implementation plan.

Key words:

Shipping sector, sulphur emissions, ecological modernisation theory, triad-network model, policy network, economic network, societal network, carriers.

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ABBREVIATIONS

| | |
|------|---|
| AV | Anthony Veder |
| CESA | Community of European Shipyards Association |
| CSC | Clean Shipping Coalition |
| DGB | Directoraat Generaal Bereikbaarheid |
| EC | European Commission |
| ECA | Emissions Control Area |
| ECSA | European Community of Shipowners' Association |
| EMSA | European Maritime Safety Agency |
| EMT | Ecological Modernisation Theory |
| IACS | International Association of Classification Societies |
| IAPH | International Association of Ports and Harbours |
| IB | Intercontinental Bunkering |
| ICS | International Chamber of Shipping |
| IGO | Inter-governmental Organization |
| ILT | Inspectie Leefomgeving en Transport |
| IMO | International Maritime Organization |
| KVNR | Koninklijke Vereniging voor Nederlandse Reders |
| LNG | Liquified Natural Gas |
| LSFO | Low Sulphur Fuel Oil |
| MDO | Marine Diesel Oil |
| MEPC | Marine Environmental Protection Committee |
| MGO | Marine Gas Oil |
| NGO | Non-governmental Organization |

| | |
|-----------|--------------------------------------|
| NI | Nautilus International |
| NSF | North Sea Foundation |
| OOOR | Operationeel Overleg Overheid Reders |
| Paris MoU | Paris Memorandum of Understanding |
| QHS | Quality, Health, Safety |
| SECA | Sulphur Emissions Control Area |
| TNWM | Triad-network Model |
| UN | United Nations |

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1. Introduction

The effects caused by the latest increase in sulphur emissions in the atmosphere are trilateral. Abundant evidence shows the contribution of sulphur emissions to acid downfall (Notteboom & Vernimmen, 2009). There is also ample evidence that sulphur emissions are a major contributor to anthropogenic climate changes (Chapin III, Matson, & Mooney, 2011; Ward, 2009). And it is shown that the air quality in coastal areas is affected by sulphur emissions. Sulphur particles in coastal areas are linked with adverse effects on the respiratory system (US EPA, OAR, 2015). Besides impacting the levels of sulphur, these particulate and gaseous components can enhance new particulate formation in urban areas (Viana et al., 2014).

The European Union (EU) can be considered a frontrunner in dealing with sulphur emissions. In the EU, sulphur emissions substantially decreased since a combination of measures was adopted from 1990 onwards. Several EU directives on sulphur were adopted, starting already in 1993, prescribing a maximum sulphur content to transport fuels (European Parliament, 1998). Sulphur emissions in non-shipping sectors were addressed dating back in 1990, resulting into decreases of up to 65 percent in the energy production and distribution sector (European Environment Agency, 2015). By contrast, the shipping sector which is one of the top emitters of sulphur emissions was only regulated on sulphur emissions as from 2005 onwards when Marpol Annex VI entered into force.

Marpol Annex VI was introduced by the International Maritime Organization (IMO) and was first in establishing actual global limits on sulphur content in marine fuel as shown in table 1. The IMO is the international rule-maker in charge of the sole worldwide mandate to develop legislation for the shipping sector. However the first 'limits' on sulphur emissions in most of the sea areas still allowed the use of HFO. Heavy Fuel Oil (HFO) is the residue product of the petroleum distillation process and the most commonly used fuel in the shipping sector (Helfre et al., 2013). Since HFO has a normal sulphur content of 4.5%, these first set of limits cannot be considered limits at all.

Table 1. Sulphur limits for fuel in all sea areas. Source: International Maritime Organization, 2015d

| Date | Limit |
|---|------------|
| Before 1 January 2012 | 4.50 % m/m |
| Between 1 January 2012 and 1 January 2020 | 1.00 % m/m |
| After 1 January 2020 | 0.50 % m/m |

Table 2. Sulphur limits for fuel in SECAs. Source: International Maritime Organization, 2015d

| Date | Limit |
|--|------------|
| Before 1 July 2010 | 1.50 % m/m |
| Between 1 July 2010 and 1 January 2015 | 1.00 % m/m |
| After 1 January 2015 | 0.10 % m/m |

Actual attention was set on dealing with sulphur emissions in the EU when it planned to install the first (Sulphur) Emissions Control Areas ((S)ECAs) in EU ports. Once the need for global action was recognised, the IMO was eventually pushed by the EU to implement more stringent global sulphur limits (EU, 2005; van Leeuwen, 2010). From then on SECAs extended beyond ports when from 2010 onwards a 1% limit applied for designated coastal areas in the European Union (EU), North America and the Caribbean Sea as shown in table 2. Although the limits are finally in place, their ambition level is questioned.

The limits on sulphur emissions in the shipping sector are still substantially higher than the ones used for road transport and whether the set that is scheduled for 2020, will actually be implemented is still uncertain. The most stringent limit for the shipping sector, which is only valid in SECAs and scheduled for 2020, is still 10 times lower than the one that was already in place for road transport from 2009 onwards (Chevron Global Marine Products, 2008). Once it became clear that limits for the shipping sector would enter into force, many maritime actors waved a red flag and the IMO scheduled a fuel availability study to accommodate them (International Chamber of Shipping, 2013). This fuel availability study is set up for 2018 and will be decisive in whether the plans will go through as intended (International Maritime Organization, 2015e). As for the limits that are already in place, enforcement remains a tough nut to crack.

The nature of the shipping sector makes effectively implementing environmental governance a continuous challenge. Ships are highly mobile and cross state boundaries on a daily basis. Moreover, they are often in remote areas making their polluting effects not directly seen or felt to the public. Vessels are registered in varying countries and berth in a variety of ports. Since their polluting effects are scattered around the globe, a global legislative and enforcing scheme would be suitable. But authority is disseminated to a wide variety of actors with conflicting interests. It is clear that the global character and invisibility of the shipping sector in combination with its large degree of administrative fragmentation complicates effective enforcement.

Effective policy elaboration and -enforcement in the shipping sector seems to be a complicated challenge. To understand the processes hampering effective environmental policy development (van Koppen, 2014), this study systematically reveals the influence of organizations surrounding Dutch carriers whom are obliged to implement the sulphur requirements. By doing so it can reveal the reasons behind the inert pace and low ambition levels of the limits on sulphur emissions and show how future environmental policy for the shipping sector should be improved to make it work in practice. The data for revealing the organizations in

these networks is gathered by conducting a case study that combines information from (scientific) document analysis and semi-structured interviews.

A suitable conceptual framework for exploring the dynamics in the shipping sector is found in Ecological Modernisation Theory (EMT). EMT assumes that industrial transformations will occur in a modernising society. Science and technology are considered the central institutions for environmental reform, market dynamics and economic agents are essential in accelerating change and the role of the state shifts from a command-and-control, to a more participatory one. The position of social movements evolves from critical outsiders into critical, independent participators whose contribution is valued by industrial partners. Moreover, intergenerational solidarity is the dominant ideology and the fundamental counter-positioning of economy and ecology is rejected. At the heart of this theory is the notion that an ecological rationality penetrates society. The ecological rationality rises up to a similar level as the traditional rationales in society namely the economic, social and political rationale and integrates into the corresponding networks. Analysing the different interplays of networks in society within EMT, is done by applying the triad-network model. The triad-network model foresees three networks linked to the traditional rationales, the economic, policy, and societal network which are all represented within a certain sector (Mol, 1995; van Koppen & Mol, 2009; van Koppen, 2014). By uncovering the networks in which a carrier operates, it becomes visible how the actors within the networks are represented. In this way the factors contributing to inert environmental reform in the shipping sector can be revealed. These theories are extensively described in chapter 3 devoted to the conceptual framework. EMT is a widely used concept, but it is also widely criticised. Starting from criticism in the literature, some challenges while applying these models for this study are set forth.

The processes of ecological modernisation and the emergence and embedding of the ecological rationale, as explained in EMT literature are rather abstract. Moreover, the case of the shipping sector seems to be an anomaly to the assumptions made in EMT. EMT assumes that in every capitalist liberal democracy (in this case, the IMO) an ecological rationale rises up to equal importance as the other rationales stimulating ecological modernisation processes. But since the ecological rationale and ecological modernisation are both solely fragmentally present in the shipping sector, this universal assumption is challenged. Also, the steering processes initiating the emergence of the ecological rationale are ill-defined. These steering processes are essentially socio-politically oriented. Hence Buttel (2000) argued that the absence of elaboration on the steering processes is due the lack of insights from socio-theoretical sciences in EMT. In addition to vagueness about the steering processes, the literature on EMT also remains inconclusive on essential questions such as how, where and by whom the emergence is initiated. In the shipping sector, the presence of an ecological rationale on both the producer and the consumer sight can be contested. The role of carriers in the rather slow implementation and inert targets for sulphur emissions indicate the lack of an ecological rationale on the producer sight. As shown by Spaargaren (2011) embedding an ecological rationale in consumption patterns is contested. There is few public awareness on pollution from the shipping sector

and consumers are several steps away from the actual act of shipping, especially in the case of by or partial products (Chul-hwan, 2010). This further complicates embedding the ecological rationale in consumer's choices. All in all, EMT seems too bluntly about the assumption of and processes steering and embedding the ecological rationale.

For appropriately applying the above described conceptual framework to the case, the following main research question has been developed.

Is the shipping sector ecologically modernising ?

To structure the research the following sub-questions have been formulated:

- How are the policy, economic and societal network surrounding Dutch carriers represented?
- How is the ecological rationale represented in the shipping sector?
- How do the core elements of ecological modernisation theory relate to the shipping sector?
- How should future environmental policy be improved in the shipping sector?

This report is structured as follows. To start with, the methodology is explained. Consequently, the background chapters start by providing a problem description highlighting the developments around sulphur emissions and an in-depth actor description. The analytical section first discusses each network separately, where after it combines the networks by exploring overarching issues and key activities. Conclusions are drawn on the presence of an ecological rational and the core elements of ecological modernisation theory. To conclude, a discussion and conclusion is presented which goes in-depth on the theoretical problem statement and makes recommendations for future environmental policy.

2. Methodology

This study entailed a case study conducted on the basis of document analysis and semi-structured interviews. A wide variety of documents was consulted, ranging from grey to scientific literature. The interviewees were key players in the shipping sector and have been selected on their role and relevance with regards to carriers. The interviews are transcribed and analysed by using Atlas.ti. By cross-checking documents with interview data, validity was ensured.

2.1 Case Study

Case studies can take a vast array of forms. They can have various aims, can entail single or multiple cases, have varying scopes, encompass several levels of analysis (Eisenhardt, 1989). In general, a case study aims to explore and illustrate a specific setting, applying a certain view to advance the understanding of it (Cousin, 2003). The case study in this research explored the networks evolving around (Dutch) carriers obliged to comply with the sulphur requirements in the shipping sector. Two carriers were willing to participate in an interview. This contributed to the instrumental value of the case studies since additional generalizations could be drawn about the case.

Case studies are used to accomplish specific aims ranging from providing a description, testing a theory or generating a theory (Eisenhardt, 1989). The main objective of this case study was to provide a description of the dynamics of the organizations around a carrier obliged to implement the sulphur requirements in the shipping sector. In addition to that, the theoretical problem statement provided some insights in focus points for refining EMT.

The scope of this case study was primarily ‘intrinsic’ (Cousin, 2003). The aim was to reveal the dynamics and characteristics of organizations in the networks around a specific carrier. This was done by analysing all relevant organizations through applying the framework provided by the triad-network model. In this way, conclusions could be drawn about the relevant dynamics, actors and networks. In addition to that, in some cases generalizations about the case were established. This added to the ‘instrumental’ element of the case study, since it was attempted to generalize from the case study for other cases, in the same sector (Cousin, 2003). However, it is important to note that characteristics, such as cargo or the flag state, of actors in the shipping sector are still highly variable.

The amount of units of analysis for case studies varies from one to multiple units, depending on the study’s aims. This study conducts one network analysis of Dutch carriers that can be considered relatively similar in the context of this study. Hence the case study entailed one unit of analysis (Cousin, 2003).

In sum, this case study entailed one case, one unit of analysis, was descriptive, added to refining a theory and had an intrinsic scope. Combining multiple methods for data collection is a typical way to enrich case studies (Eisenhardt, 1989). For this study two data collection methods were incorporated namely document analysis and semi-structured interviews.

2.2 Document Analysis

This study used document analysis, covering primary, secondary, tertiary and grey literature, to gather information. With regards to the used scientific literature, it covered all found relevant literature from primary, secondary & tertiary sources and grey literature. Primary literature is defined as published work from (a group of) scientists whom personally conducted research or studies. Secondary literature covers publications that rely on primary information sources. Authors are not required to do the research themselves but can e.g. summarize or synthesize findings in relation to other findings. Tertiary literature is published work based on primary or secondary sources, especially developed for scientists working in other fields than the subject of the publication. It enables them to understand the topic (Schembri, 2007). Lastly, grey literature for which the most up to date definition is: “..manifold document types produced on all levels of government, academics, business and industry in print and electronic formats that are protected by intellectual property rights, of sufficient quality to be collected and preserved by library holdings or institutional repositories, but not controlled by commercial publishers i.e., where publishing is not the primary activity of the producing body.” (Schopf, 2010). Grey literature thus encompasses (scientific) sources which are not published nor distributed via the usual channels. These include e.g. dissertations, technical reports and abstracts of conference papers (Schembri, 2007). This study entailed all these literature types. In addition to this, the research encompassed relevant information that is found on websites and reports from (commercial) organisations. All documents were analysed and results were combined and for supporting the texts in this research. Document analysis for this study thus entailed a broad scope of documents, ranging from scientific papers to governmental documents, to gather both background- and in-depth information on the topic.

2.3 Semi-Structured Interviews

Besides a literature research, the study was also supported by interviews. The interviews were semi-structured, qualitative, oral or written and were conducted with key actors from the shipping sector. Simply stated, semi-structured interviews are conversations in which it is on forehand clear what the researcher wants to find out (Miles & Gilbert, 2005). This section explains why semi-structured interviews are chosen and which steps, prior, during and after the interviews were taken.

Semi-structured interviews are most suitable for research questions exploring the ‘why’ of a certain topic. The interviewer can change the questions and focus in accordance with the expertise of a certain participant. By doing so, better understanding in the research questions is achieved. Generally speaking, complex questions require less structured formats than simple questions. This also makes the interview style relatively flexible. Semi-structured interviews are also especially appropriate for exploring contradicting perspectives of participants in a certain study (Miles & Gilbert, 2005). Since the core of this study was to reveal (contradicting) interests, dynamics and networks, this way of interviewing was found to be principally suitable for this research.

Although semi-structured interviews do not require an extensive questionnaire like a survey, preparation was of valid importance and gained specific attention during this study. Prior to selecting key players for an interview, a thorough literature review on the topic was conducted. Hereby, it was identified whom would be targeted for possible interviews. Since the research question for this study is aimed at exploring the ‘why’, it is required to involve multiple participants’ characteristics and strive for maximum variation. Selecting actors in this way, is called taking a ‘purposive sample’ (Miles & Gilbert, 2005). In selecting actors for this study, it was aimed to include all types of actors that are in contact with a carrier whom is obliged to implement the sulphur requirements. Interviewees were contacted via their company’s websites and e-mail. The majority of them replied but in case a reply remained absent, telephonic contact was sought.

During the preparatory, executive and finalizing phase of the interviews several steps were taken as depicted in table 1. To start with, the set of questions as defined for this study, varied per interviewee. A generic questionnaire based on the research questions formed the basis. This initial overarching set of questions, covered all relevant elements of all the networks in the triad-network model, the general questions for all networks and questions which would aid in answering the research questions. These questions have been developed in accordance with the guidelines as set forth by Miles & Gilbert, 2005. It was ensured that the questions were brief and flowed naturally along the interview progressed. After planning the interview, a tailor-made questionnaire was established per interviewee. Based on this gross list of questions, a tailor made list of questions was established covering step one, two and three in table 3. The list was made suitable by conducting a (scientific) literature research and adjusting the questions accordingly.

Table 3. Overview of steps taken during the interview phase

| Step | Reasons |
|---|---|
| 1. (Scientific) literature research | To ensure no questions that can be found in this way are asked during the interview To select interviewee-specific questions from the gross-list |
| 2. Determining which network the organization belongs to | To ensure the right questions are asked |
| 3. Adapt list of questions | Establish a tailor-made list of questions in accordance with the interviewees network and found information |
| 4. Interview conducted and recorded | In accordance with the guidelines mentioned in this section |
| 5. Interview transcribed and sent to interviewee | To ensure their confirmation |
| 6. Interview analysis using Atlas.ti | To structurally analyse the interviews |

Once the tailor-made set of questions was developed and participants were selected, the interview was conducted. In total, this study entailed 18 interviews. Practicalities such as location and equipment were addressed first. Interviews always started, because of ethical reasons, with a briefing, which introduced the topic and reasons for the interview. This also enabled the participant to understand why certain questions are asked during the interview. Hereafter it was indicated that the interview would be recorded by using a laptop. The interview itself drifted naturally through the schedule. Helping participants was possible with certain encouraging phrases, asking for clarification or non-verbal actions. The interviewee was also sometimes steered into certain topics or steered back to the initial topic but this had to be done subtle. Introducing examples or experiences that were related to the initial topics or relate back to something relevant the participant stated earlier on in the interview. At the end of the interview, a de-briefing took place to explore whether topics were left uncovered (Miles & Gilbert, 2005).

After the interview, the participants were asked for feedback on the questions asked. Reflexivity on the effects that the interviewer had on the interview is of valid importance for improving the techniques for the next interview and for evaluating possible effects on the participant during the interview. It was explored whether the questions were easy to understand, whether they made sense and whether they enabled the participants to cover the areas that they thought were important. If the participants found anything too difficult about the questions, the questions should be evaluated in any case. This is never attributable to the participants (Miles & Gilbert, 2005). Hence, the set of questions was adapted in accordance with the abovementioned guidelines, along the study progressed.

All recordings were transcribed and sent to the interviewees for approval. Hereafter, the interviews were analysed using Atlas.ti. Atlas.ti enabled the researcher to structurally analyse the statements made during the interviews. The transcripts were loaded in Atlas.ti and statements were labelled. First they were labelled quite roughly, after which they were labelled more conceptually. Based on both the interviews and document analysis, the empirical chapters were written. Herewith sources were cross-checked and validity was ensured.

All in all, this research encompassed a case study in which the literature research covers both published and unpublished literature from scientific and commercial sources. Semi-structured interviews were used to reveal additional, in-depth information about relevant organizations in the shipping sector. Analysing the found information was done by applying the triad-network model and the ecological modernisation theory to the data that was gathered via document analysis and the interviews.

3. Conceptual Framework – Ecological Modernisation Theory

The conceptual framework for this study is founded on the Ecological Modernisation Theory (EMT). EMT analyses how in a modern society, institutions and social practices are transformed in accordance with ecologically sound goals and criteria (Mol & Spaargaren, 1993).

This section starts by providing insight in the emergence of the theory to contextualise it. Hereafter the core elements of EMT are set forth. It is assumed that these elements are present in an ecologically modernised society. Prior to the presence of these core elements, the ecological sphere initiates processes of ecological reform. Funded on the ecological sphere, the ecological rationale strives for the integration of ecological goals and criteria in decision-making procedures. Therefore, both concepts are extensively described. It can be explored to what degree these ecologically sound goals and criteria are integrated in society by applying the triad-network model. The triad-network model is of specific relevance for this study since it is used to map the dynamics and roles of the actors surrounding a carrier in the shipping sector. By uncovering these interplays, it can be indicated what actors contribute to the lack of ambition and slow implementation of environmental policy in the shipping sector. This model is highlighted in the last section. In short, these tools are operated for this study as follows. The triad-network model is applied to explore which actors hamper or contribute to ecological modernisation processes in the shipping sector. In addition to this, it is assessed whether an ecological rationale is emerging in the shipping industry and what core elements of EMT can be found in the sector. And lastly, it is explored how and if these theories relate to a case such as the shipping sector which does not yet seem to be ecologically modernising.

3.1 The Emergence of Ecological Modernisation Theory

Matching the broader scientific trend of focussing on environmental reform, Ecological Modernisation Theory gained popularity quickly. It evolved into a first and second generation of 'EMT thinking' of which the latter generation is most relevant for this study.

In the 1960s and 1970s, the first social scientists focussing on environmental concern emerged. Environmentalists urged for a fundamental reorganisation, for establishing an ecologically sound society. Therefore, most emphasis was on explaining how the composition of society induced environmental devastation. The focus was on explaining the ongoing, expanding and deepening environmental crises, in other words, explaining the 'why' of environmental destruction. (Mol, Spaargaren, & Sonnenfeld, 2009b).

In the 1980s and 1990s, the government, public and scientific community realised that the environmental crisis resulted out of the formerly made choices in politics and economics. Public awareness about the consequences of the environmental crisis rose and the need for a response to deal with it became more broadly based. The environment was no longer seen as an external factor with regard to the institutional organization of production and consumption. Environmental interests were broadly institutionalized in society which tempered down the need for a fundamental reorganisation of society. Thus, public perspectives on institutions shifted from phasing out and replacing them, towards fine-tuning and reforming

(Mol, 2000). This shift in perceptions on institutions, flourished in a period known as the 'Reflexive Modernity' (Dryzek, Downes, Hunold, Schlosberg, & Hernes, 2009). During the reflexive modernity, the prior made choices resulted in developments that induced society to question society itself. In this period, public awareness acted as a steering factor for increasingly exploring political and social transformation possibilities to deal with the environmental crisis. As a 'reflex' i.e. response, institutions were not replaced but restructured to establish a more solid political and economic management system. Modern technologies and economic development were deemed essential elements in establishing ecological reform (Mol & Spaargaren, 1993). Such an improved management system was needed to deal with the risks that followed out of the techno-economic and social developments resulting out of previous decisions (Beck, Giddens, & Lash, 1994; Dryzek et al., 2009). By accelerating institutional reform and expanding the need for innovative technologies, the scientific focus shifted likewise.

Scientists increasingly explored the process of 'how to deal with..' such environmental destruction. In other words, how processes of environmental reform are initiated. By the turn of the millennium, scientists performed many complementary studies, revealing both the causes of environmental destruction and the processes inducing environmental reform (Mol et al., 2009b). A school of thought in accordance with this focus was found in the Ecological Modernisation Theory. In accordance with this period, the theory focusses on environmental reform and environment-induced restructuring of production and consumption processes (Mol, 1997).

Besides the reflexive modernity, the emergence of EMT was also strengthened by the broader trend that the social sciences of environmental reform took stand. According to Buttel (2000), the rapid adoption of EMT was attributable to its overlap with some intellectual and broader political-economic factors going beyond environmental sociology. One of those factors, is state failure in industrial societies, as introduced by Jänicke, (1990). His work emphasized the impotence of politics to regulate industries which matched the core elements of EMT. Amongst other things these core elements prescribe a less regulatory but more cooperative role of the state and they emphasize the value of industrial initiative. Especially during the reflexive modernity, this inability of politics was recognised. Elaborating on state failure in the scientific area of environmental reform was innovative and contributed to EMT's fast ability to stand ground. Due to the increasing (social) scientific focus on environmental reform and the broader societal developments of institutional restructuring, EMT developed as one of the strongest, most well-known, used, debated and a widely cited concept (Mol et al., 2009b).

Being well-known, much used and debated, EMT evolved into a diversity of meanings and usages. A distinction can be made between two generations of EMT 'thinking'. The first-generation appeared in the 1980s and early 1990s. It indicated that a capitalist liberal democracy is able, due to modernisation, to induce environmental reform. "...capitalist liberal democracy has the institutional capacity to reform its impact on the natural environment, and that one can predict that the further development ("modernisation") of capitalist liberal democracy would tend to result in improvement in ecological outcomes." (Buttel, 2000, p.

3). Thus, the prime focus was on the ability to induce environmental reform. The second-generation of EMT thinking emerged in the late 1990s and focusses on identifying the socio-political processes, which lead the capitalist liberal democracies, into environmental reform (Buttel, 2000). Herewith the focus shifted from the *ability* to induce environmental reform to revealing the *processes* inducing environmental reform. Since this study aims to explore the networks to reveal the processes stimulating or hampering ecological modernisation processes in the shipping sector, the latter generation focussing on the actual processes behind environmental reform is most interesting.

3.2 Core Elements of Ecological Modernisation Theory

Ecological modernisation theory assumes that the environmental crisis can be managed by expanding the modernisation of the existing institutions in a capitalist liberal democracy (Spaargaren, 1997). As the shipping sector operates globally it entails multiple societies. However, legislation for the entire sector is developed by the IMO. The operations and conditions provided by the IMO can be considered occurring in the context of a capitalist liberal democracy. Thus in this sense, the entire sector is considered ‘a society’ as defined by EMT. Five core characteristics of an ‘ecologically modernised society’ have been defined and will be discussed in subsequent order:

1. Science and technology are key institutions
2. The importance of economic agents and market dynamics is acknowledged
3. The state evolves into a supportive and cooperative institution
4. Social movements are valued as critical insiders
5. Intergenerational solidarity is a dominant ideology

3.2.1 Science and Technology

EMT has a renewed perspective on the institutional position of science and technology. According to Huber (1985) in Spaargaren & Mol (1992), modern technologies enable an ecological switchover resulting in an ecological restructuring of society. Science and technology were considered culprits of ecological and social disruption in the 1970s. But triggered by the reflexive modernity, these institutions are considered by EMT of key importance for pursuing ecological reform (Mol, 1997). The renewed perspective on science and technology induces two major shifts. The first shift entails a change from add-on, simple and end-of-pipe technological regimes towards a more preventive, advanced and process-integrated perspective. For example, choosing for a different type of oil instead of installing a scrubber. The second shift entails moving away from these ‘hardware’ technologies, towards transformations in development and implementation of more socio-technological systems. An example is the increasing focus on transition management in which the attention for process-integrated technologies is replaced by introducing entirely new transport systems. Herewith, insights from new technologies are combined with new management concepts in which new roles

of the state are essential. EMT thus assumes that society needs scientific development and modern technologies to deal with environmental problems (Mol, 1997). The trajectories provided by science and technology open gateways towards the harmonization of ecology and economy (Mol & Spaargaren, 1992).

3.2.2 Economic Agents and Market Dynamics

The second core concept of EMT overcomes the fundamental counter-positioning of economy and ecology. For structurally anchoring environmental interests on the market, EMT breached through the strong preference in environmentalism to combat capitalism and break with modernity (Mol, Spaargaren, & Sonnenfeld, 2009a). Contrastingly, within EMT, the power of economic and market dynamics is deemed essential in striving for ecological reform. It is recognised that economic and ecologic development are interdependent for achieving either environmental improvement or economic development. In order to achieve this, inputs like natural resources and outputs like emissions and waste need to be delinked from economic growth. It is evident that the nature, pace and geographical allocation of economic growth needs restructuring according to ecological criteria and goals. This is done via two main processes, *economizing ecology* and *ecologizing economy* (Mol & Jänicke, 2009; Mol, 1997). Economizing ecology entails using economic mechanisms to achieve a more ecologically sound society. Examples are internalizing the external effects of economic growth or eco-taxes (Spaargaren, 1997). This naturally leads to ecologizing economy in which environmental issues and interests are given a permanent and key position in decision-making processes of firms, industries and consumers (Mol et al., 2009a). Examples are environmental management systems or eco-labelling. Both concepts show how the power of economic and market dynamics works in favour of the environment. Besides recognizing the overall strength of economic and market dynamics, there is an important role for economic agents in EMT. These agents can be innovators, entrepreneurs and industries and are considered social carriers of ecological restructuring. These actors are driving forces of environmental improvement by inducing the development of scientific and technological gateways to overstep the fundamental opposition of economy and ecology. The state is essential in establishing supportive policies and creating room for manoeuvre for these actors.

3.2.3. The Role of the State

A political reorientation process transforms the role of the state in EMT from hierarchical to cooperative (Jänicke, 2009). In his early work, Jänicke plead for an enlargement of the steering capacities of the state to support and ensure the implementation of an ecological rationale (Spaargaren, 1997). However, later on Jänicke (1990) introduced the notion of state failure and paved the way for a less regulatory and steering role of the state. In accordance with this, Huber in Spaargaren (1997) emphasized that state-intervention is only one element of environmental reform and too much state intervention can even be an obstacle to environmental reform. In more recent work on the role of the state in EMT, a middle course is found by setting forth that 'modernised' politics enables to translate experiences from the environmental field in other political arenas, making state intervention less essential. Herewith, it is assumed that environmental politics

stimulates the development of new forms, instruments and principles which eventually reshape the relation between the state and civil society (actors) (Spaargaren, 1997).

Two major paradigm shifts emerged, transforming the role of the state by a 'political modernisation' process. The first paradigm shift induced a resource preserving mode of production and the second paradigm shift recognised the diminishing steering potential of politics. A lack of effective (environmental) policy can be caused by several reasons of which the notion of 'state failure' simultaneously emerged with EMT and is most relevant for this study. State failure refers to a situation in which ineffectiveness, inefficiency and structural weaknesses in decision-making are abundant (Jänicke, 2009). As assumed in ecological modernisation theory, political modernisation induces a political reorientation process restructuring the role of the state in the context of state failure. This results in a far-reaching consensus that the authority of the bureaucratic constitutional state cannot be considered the sole legitimate steering body anymore. Thereupon a renewed perspective on the role of the state is established in society. In terms of ecological modernisation theory, Jänicke (2009, p. 35) defined the following elements:

- “From bureaucratic, detailed rulemaking to an emphasis on steering the framework conditions and action contexts;
- From the state mode of dealing with problems to the societal mode of handling them, with inclusion of the state;
- From centralist to rather decentralized problem solving;
- From exclusive to ever more inclusive and participatory decision-making structures;
- From imperative policy style to negotiated solutions;
- From reactive to a more strongly anticipative policy pattern; and;
- From steering based on public expenses to strengthened steering based on public revenues (taxes, levies, tariffs, fees).”

In short, the role of the state transforms from hierarchical, bureaucratic, top-down-, centralized-, command and control policy making into flexible, preventive, de-centralized and participatory policy making. In achieving these goals, the state applies various approaches and instruments for guiding society into sustainability (Mol & Jänicke, 2009). Although the role of the state is less prominent and controlling, the state remains an important actor for several reasons. The state is still responsible for providing a long-term and transparent regulatory framework, establishing an operational organization for advice and control, ensure the implementation of externalities, provide environmentally sound market conditions and it should take responsibility to plan and supervise technological innovations. The role of the government towards the industry focusses on elaborating effective environmental policy within an appropriate organizational framework and leaves room for the industry to decide on the means for achieving long term goals, themselves (van Koppen, 2014). Thus, the state is solely responsible for strategic tasks, safeguarding ecological minima and to define long-term environmental problems. An important change is that the state

is not the sole responsible actor anymore for environmental care. It should rather be analysed as one element among a variety of initiatives and strategies of modern society, bringing about environmental reform. Because in addition to the state, it is assumed and required that local actors go beyond these basic requirements (Jänicke, 2009). This also touches upon the second element, emphasizing the role of economic agents. Such private economic actors become entangled in environmental reform through e.g. environmental management systems or certification schemes (Mol, 1997). The transformed role of the state and initiatives from local actors, hence form the fundament for ecological modernisation.

3.2.4 Social Movements

Repositioning both roles of the state and the market as described in the first three core characteristics of EMT induces a change in the position and role of social movements in environmental care. In the 1970s, their primary role was to create public and political attention for the environment and to question techno-economic developments. This was mainly done by confrontation between them and industries. These confrontations had much influence on public opinion and forced governments to take action which mainly focussed on forcing regulation upon these industries (Huber, 2009). Over time and accelerated by the reflexive modernity, environmental awareness spread throughout society resulting in the emergence of environmental care as an integrated concept in all layers of society. The broad societal integration and recognition for their cause, transformed these actors from 'critical outsiders' into 'critical, independent participators' (Mol, 1997).

Their "...ability and power to generate ideas, mobilize consumers and organize public support or disapproval is used to support and cooperate.." (Mol, 1997, p. 142). Cooperation is key for the renewed position of social movements. It is enabled since the majority of societal forces aim at an ecologically centred reconstruction of modern society. Environmental action became more professionalized and institutionalised by integration in non-governmental civil-society organisations, research institutions, mass media and education & training. Integration in the industries is shown by concepts such as environmental management systems (Huber, 2009). In practice, such integration is enacted via two types of pressure. Pressure from groups, individuals or environmental organizations or pressure can be internally driven, from employees towards and within industries (van Koppen, 2014). Confrontation might still be necessary from time to time which makes it of valid importance that social movements and non-governmental organisations remain independent from industries and governmental bureaucracies according to Huber (2009). The transformed role of social movements shows that putting the 'ecological question' on the agenda is reached. But the task remains to ensure that such forms of social modernisation keep on pursuing a sustainable path (Huber, 2009).

3.2.5 Intergenerational Solidarity

Intergenerational solidarity is a dominant ideology within EMT (Mol & Sonnenfeld, 2000). Intergenerational solidarity as introduced by the Brundtland Commission aims to avoid destroying or exhausting resources that might be needed by future generations to sustain similar lifestyles as the previous generation has

benefited from. The term resources covers both essential resources such as fossil fuels, and resources for leisure activities (Johnston, 2001). Intergenerational solidarity might seem like a huge task but by combining all elements from the core characteristics of EMT, it is assumed that the environmental crisis can and should be overcome by ecological modernisation (Spaargaren, 1997).

Combining the elements as depicted in figure 1, from the four core characteristics of ecological modernisation theory aids in achieving ecological modernisation.

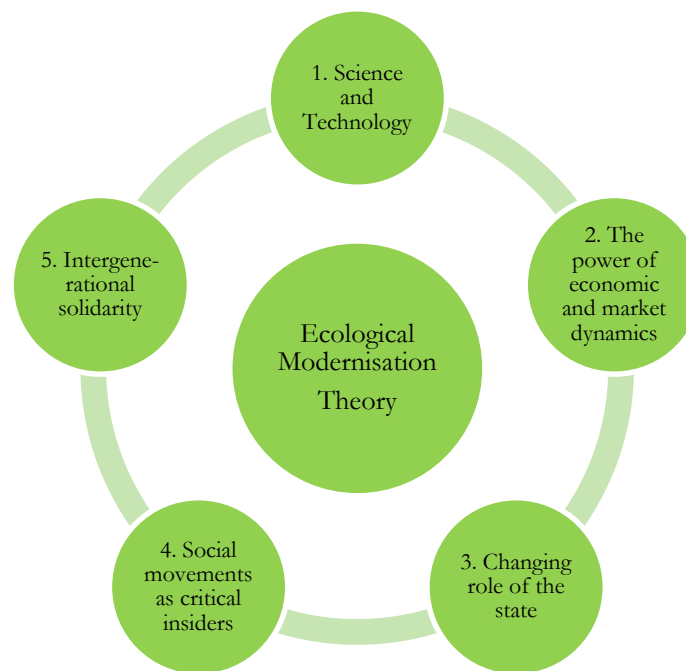


Figure 1. The five core elements of Ecological Modernisation Theory.

To summarize, ecological modernisation starts by recognizing science and technology as key institutions in society. Innovative technologies are developed aided by science. The combination of both factors provides gateways for establishing an ecological switchover by delinking economic growth and ecological devastation. Ecology and economy are not merely harmonized but in addition to this, recognized as interdependent factors in establishing ongoing modernisation of society. Besides the importance of market dynamics, economic actors are essential. Such innovators are able to exploit the gateways provided by science and technology. For enabling this process, it is essential that the state takes a less hierarchical and regulatory but an increasingly pro-active, supportive and cooperative role. Simultaneously, social movements are employed by using their knowledge and mobilizing capacity. Intergenerational solidarity is the prevailing ideology in society functioning as an umbrella concept under which the elements out of the four previously mentioned core characteristics live up to. These five core characteristics elaborate on the societal factors surrounding the ecological modernisation process. How and to what extent ecological modernisation and thus environmentally sound policies are developed and implemented is dependent on the integration of an ecological rationale.

3.3 Ecological Rationality

The five core characteristics of ecological modernisation are supported and steered by an ecological rationale. The ecological rationale is the key driver in the core patterns of ecological modernisation processes (Mol & Jänicke, 2009). By focussing mainly on the processes inducing ecological reform, the concept was established in the heart of EMT during the second-generation of EMT 'thinking'.

According to Mol (1996) there are four rationales that are embedded in four spheres in society. The ecological rationale is embedded in the ecological sphere. Next to the ecological rationale, there are three traditional rationales in society which are the societal, economic and political rationale. These are all embedded in their corresponding spheres. The spheres thus form the fundament in which the rationales exhibit. To illustrate, in the economic sphere the rationale to ensure profit is dominant. In the socio-ideological sphere, the rationale to strive for societal interests and ideologies via e.g. public pressure prevails. And in the political sphere, political interests such as implementing efficient and targeted policies are omnipresent. Since the ecological rationale is the key driver of ecological modernisation, it is important to explain this concept more in detail.

The ecological sphere initiates processes of ecological reform and the ecological rationale is the mechanism that ensures the environmental goals and criteria are integrated in the other rationales. The interaction between all four spheres and rationales is of valid importance in ecological modernisation theory. The ecological rationale is funded on the ecological sphere. Together they stimulate ecology-inspired and environment induced transformation- and reform processes in the core institutions of modern society. The above described process is known as ecological restructuring and results in ecological modernisation (van Koppen & Mol, 2009).

It is important to note that both the rationales and spheres are not specific distinct areas in society which can be identified. These rationales and spheres are analytical distinctions, enabling analysis of institutions and social practices from an ecological perspective (Mol, 1996). Herewith, conceptual space in sociological theory is given to the (relatively) autonomous ecological sphere. Considering this study, the analytical distinction between the various spheres and rationales is especially useful for analysing how the ecological rationale emerges and to what degree it is integrated in the other rationales. Therefore the emergence and of the ecological sphere and how it works in practice is discussed in detail. Hereafter, the emergence of the ecological rationale and how it works in practice is set forth.

3.3.1 The Emergence of the Ecological Sphere

To start with, the process towards an independent ecological sphere is explained. In figure 2, the 'emancipation' of the ecological sphere, from the other spheres is shown.

GROWING 'INDEPENDENCE' OF THE ECOLOGICAL SPHERE

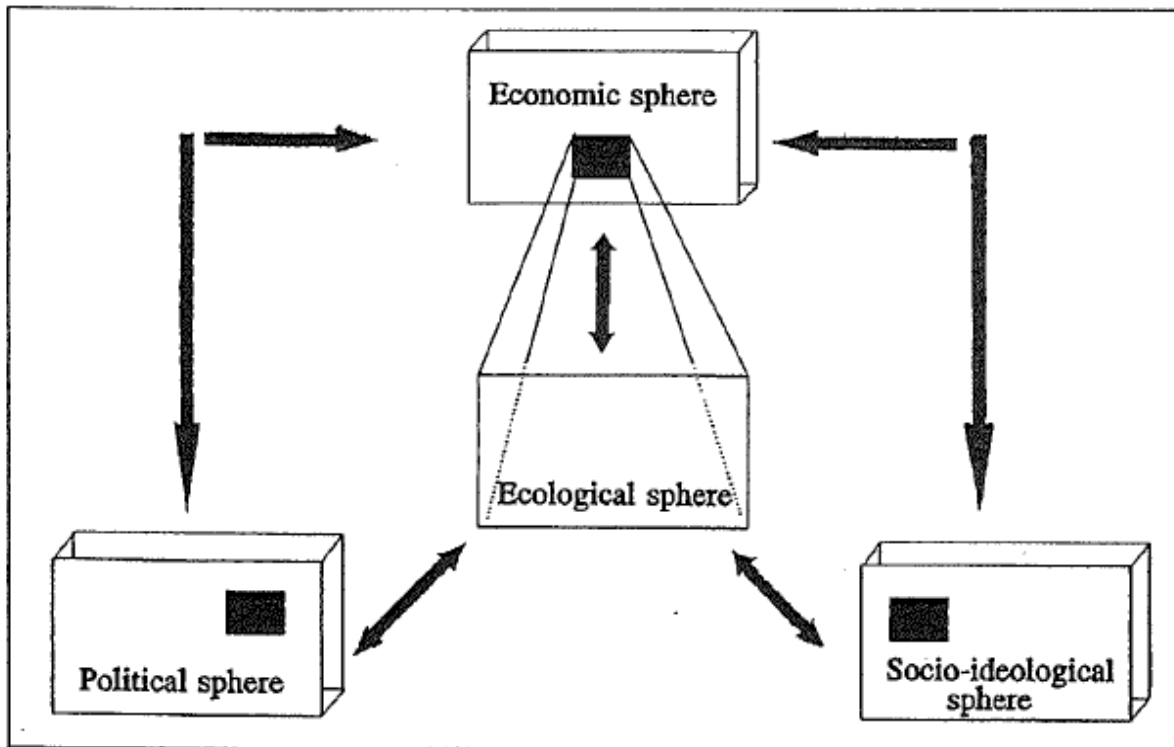


Figure 2. Growing 'independence' of the ecological sphere. Source: Mol (1996)

An emancipation process detaches the ecological sphere from solely economic interests. This emancipation process is called the 'emancipation of ecology' (Spaargaren, 1997). It entails that the environmental sphere shifts away from its economic counterparts and "...is no longer 'contained' or enclosed by the economic sphere.." (Mol, 1995, p. 30). Both spheres develop simultaneously and the environmental sphere remains closely connected to the economic sphere. In practice this means that institutions and industries are analysed and judged with independent ecological criteria that are not entirely reduced to or deduced from economic criteria (Spaargaren, 1997). In other words, first industry's decisions were steered by solely economic goals producing ecologically friendly side effects. And after the emancipation of the ecological sphere, an increasing amount of decisions in industrial systems are predominantly steered by ecological goals and criteria. However, the socio-ideological sphere and political sphere stay also connected to the environmental sphere. This transition process towards an independent ecological sphere is identified as the turning of the tide by many authors. It opens the gate towards a phase of ecological modernisation (Spaargaren, 1997). This results in a situation in which all four spheres are represented (Mol, 1996). The representation and interaction of all four spheres in practice is essential in explaining the processes behind ecological modernisation.

3.3.2 The Ecological Sphere in Practice

Highlighting the (conceptual) position of the ecological sphere once it has gained independence is important for understanding its fundamental position in EMT. After its emancipation, the position of the ecological sphere is 'on a par' with the economic, political and socio-ideological sphere. The ecological sphere does not dominate the other spheres but enables equal interaction between itself and the other spheres (Spaargaren, 1997).

Once emancipated, the ecological sphere processes its own specific domain and rationality in cooperation with the political, socio-ideological and economic spheres. The renewed position of the ecological sphere induces an ecological switch-over in society fuelled by the changed relationship between economy and ecology. In practice, the close connection between economy and ecology, means that an increasing amount of economic, processes of production and consumption are being analysed, judged and designed from both an economic- and an environmental perspective (Spaargaren, 1997). Changes induced by the ecological 'sphere' should be analysed as semi-permanent institutional changes that are largely irreversible (van Koppen & Mol, 2009). The spheres should be perceived as initiating processes of environmental reform and put slight emphasis on the relation between the economic and ecological sphere. The mechanism steering the integration of ecological goals and criteria in social practices and institutions, is the ecological rationale in which all four spheres are equally represented.

3.3.3 Rationality

For explaining the emergence of an ecological rationale, it is important to start by highlighting the meaning of 'rationalization'. Rationalization from an ecological perspective means that new sub-systems arise to deal with (ecological) issues. The existing institutions are perceived to be insufficiently equipped to deal with ecological issues.

The notion of an 'ecological rationality' was first introduced by Dryzek, 1987 in his book 'Rational Ecology'. In this early work on the ecological rationality, the emergence or 'emancipation' of the concept was explored. Although, Dryzek, 1987 perceived the ecological rationale as a dominant concept, the concept in EMT thinking, is now regarded as equally interacting. The emergence of a rationale in EMT can occur in a variety of forms. It is highly place- and time bound which rationale 'pathway' is chosen by an actor. One person may rationalise from a fundamentally different perspective, in very different directions than another person (Mol, 1996). Herewith, it is indicated there is no predetermined template in which an ecological rationale develops. It rather is sector, country and time dependent. Although the exact context of its emergence varies, authors did provide insight in the process of the emergence of the ecological rationale.

3.3.4 The Emergence of the Ecological Rationality

The emergence of the ecological rationale is enabled by the fundament established through the emancipation of the ecological sphere. The ecological sphere has gained its own prominence and is on a par with the other spheres. Herewith room for manoeuvre for the ecological rationale is created to induce processes of

ecological modernisation. Such processes of ecological restructuring are stimulated by the increasing prominence for environmental interests, considerations, representations and ideas in social practices and institutions in a modern society (Mol et al., 2009b). Thus, institutions are analysed and judged by criteria that are disconnected from and not solely based on economic criteria. Relevant social practices and institutions for EMT, are reflected in a variety of elements such as: “..production, consumption, dominant discourses, technological trajectories, market institutions, or civil society, environmental ideas, and interest.” (Mol et al., 2009, p. 23). Accelerated by the prevailing institutional restructuring in the reflexive modernity, these social practices and institutions are restructured by taking into account ecological goals and criteria (van Koppen & Mol, 2009).

The ideal picture of the emergence of the ecological rationale is quite similar to the emergence of the ecological sphere. First, the ecological rationale starts growing in autonomy and independence in society. Consequently, the ecological rationale is not integrated in one of the other rationales anymore, nor does it substitute one of them (Buttel, 2000). It is also decoupled from and exists next to the other, equally important, rationales. The ecological rationale interacts with other rationales according to ecological criteria and to achieve its goals (Mol, 1996). In contrast to Dryzek's, view from 1987, requiring the necessity for a dominant position of the ecological sphere and rationale, the rationales equally interact. As is the case with the spheres, the ecological rationale is not supposed to dominate the other rationales. Thus, all rationales equally strive for specific goals, according to specific criteria via their own realm and legitimacy (Mol, 1996).

The focus in the emergence of the ecological sphere was still slightly on its connection to the economic sphere. However, depending on the topic at stake, in the emergence of the ecological rationale a balanced and integrated interaction of all four spheres is sought. By conceptualizing the development of ecological modernisation supported by all four rationales, it is shown that sustainability is not solely a political choice. A close interaction between all four spheres results in an ecologically rational organization in the context of ecologically sound policies, supported by corresponding ecological-ideological perspectives (Spaargaren, 1997). Herewith ecological modernisation theory emphasizes that interaction with other mechanisms like administrative systems, laws, public pressure and markets is essential in realising an ecologically modernised society (Mol, 1995).

3.3.5 The Ecological Rationale in Practice

The anchoring of the ecological rationale in the remaining rationales becomes visible in several concrete examples and concepts. Overall, after anchoring the ecological rationale, the environment is no longer perceived as partially interesting or as an external precondition but is fully integrated in the remaining three rationales. This process is steered and enabled by modern societal politics. The interaction among these rationales transforms social practices and institutions in balanced versions of all four rationales (Mol, 1996; Spaargaren, 1997).

After the late 1980s, several concrete examples of the ecological rationale in society can be indicated according to van Koppen & Mol (2009). From that time on, the ecological perspective, logic and rationality gained autonomy in society. An example of this transition is shown by the transformation of environmental indicators. First these environmental indicators were indicated in other indicators but the increasing independence of the ecological rationale ensures the development of separate environmental performance indicators (Spaargaren, Mol, & Sonnenfeld, 2000). Economic valuations of environmental goods emerged, environmental management systems arose and cleaner production was addressed. Both public and private utility enterprises recognised the importance of a sustainable use of natural resources and recycling. Integrating economic valuations for environmental goods is a clear example of economizing the ecology. And ecologizing economy is achieved by enabling a permanent position for the environment in decision-making procedures through e.g. environmental management systems. Both concepts are important elements of the core characteristics of EMT. Besides more concrete practices, also (policy) concepts showed a full integration of the ecological rationale.

Several (policy) concepts show the embodiment of the interacting four rationales. The connection of the ecological and economic rationale is shown by concepts like 'environmental productivity'. In this concept the most efficient mode of production is sought, without neglecting environmental or societal effects, addressing both the economic and ecological rationale. 'The polluter pays principle' show the interrelation between the economic, political, socio-ideological and ecological rationale. This concept shows the political and socio-ideological choice to let the one causing pollution bear the costs for cleaning afterwards (Spaargaren, 1997). The abovementioned examples show the full and equal integration of the ecological rationale in society. But the process between the emergence and full anchoring of the ecological rationale, the embedding, is contested.

3.3.6 Embedding the Ecological Rationale

EMT thus assumes that in a modernising society, a rationality stressing the need for environmental reform rises up to equal importance as the economic, political and social rationale that has been inherent to our society for decades (van Koppen & Mol, 2009). Integration of the ecological rationale is only possible once the ecological rationality, logic and perspective are distinguished and emphasized in and by society. However, the theoretical and practical embedding of ecological rationalities in the socio-cultural sphere of civil society is contested. Securing ecological rationalities in everyday life, is shown to be a huge task. The cultural dimensions of EMT should be developed in much more detail, to elaborate on how to embed an ecological rationality in society (Spaargaren, 2011).

Besides additional scientific insights in this embedding process, guidance is needed in anchoring the ecological rationale in society after its conceptual emancipation. The embedding must ensure a reconnection of the ecological spheres, to the other spheres of the market, the state and society (van Koppen & Mol, 2009). One could consider to governmentally steer the embedding of the ecological rationale. However whether this fits EMT perspectives is contested since the role of the state should be less steering and more

supportive. Therefore, it is concluded that politics should mainly be employed to translate experience from the environmental field into the other fields. The role of the government in embedding the ecological rationale should rather be perceived as supportive and enabling, instead of steering (Spaargaren, 1997).

3.3.7 Challenging the Emergence and Embedding the Ecological Rationale

EMT assumes the emergence of an ecological rationale in every capitalist liberal democracy. The ecological rationale rises out of the economic sphere and integrates in other rationales and 'ecologically modernises' a society. The above described processes of the emergence and embedding of the ecological rationale are rather abstract and too short sided. EMT is criticized for insufficiently exploring the processes initiating the emergence of the ecological rationale and for being too optimistic about the ability of market dynamics to embed the ecological rationale (Buttel, 2000; Spaargaren, 2011). In short, the universal applicability of the overarching assumption that in every society an ecological rationale emerges, is questioned based on the case provided by the implementation of limits on sulphur emissions in the shipping sector.

To start with, the lack of insights from socio-political sciences in ecological modernisation theory hampers the light it sheds on the processes steering the ecological rationale. Ecological modernisation theory is founded on environmental- and policy science and did not develop out of a pre-existing body of social-theoretical thought (Buttel, 2000). It is merely supported with some citations out of these schools of thought. Still, the core of EMT is about restructuring political processes and practices. Buttel (2000) argued that EMT literature should increasingly focus on socio-political literature. Literature on e.g. embedded autonomy could serve to describe the interactions between industries, civil society (groups) and the state more precisely (Buttel, 2000). Related to this, Spaargaren, (2011) emphasized that the cultural dimensions of EMT should be explored in more detail to reveal the processes enabling the embedding of an ecological rationale. The core of ecological modernisation is essentially socio-politically oriented. Therefore enriching EMT with socio-political insights as suggested by Buttel, 2000, could serve as a starting point for more precisely revealing the processes inducing ecological modernisation. This also opens up possibilities to address more prescriptive approaches in EMT. Because once such processes are revealed, it could be extrapolated how and where, what kind of actions are necessary for a sector to incorporate an ecological rationale and eventually 'ecologically modernise'.

To continue with, criticism on EMT's over-optimism about the dynamics of the market is notorious (Sonnenfeld & Spaargaren, 2009). This is relevant both for the consumer and producer side in the shipping sector. EMT assumes that in every modernising, capitalist liberal democracy, an ecological rationale will penetrate society in equivalent form to the other rationales, economic, social and political. However the results p in this case study, by the shipping sector deviate from this assumption. The sector has a track record of implementing environmental policy at a rather slow pace and the set targets can hardly be considered ambitious. This makes one doubt whether an ecological rationality is present at the producer side at all, let alone, in an equal form. Also from the consumer side, the emergence of such a rationale is uncertain. Spaargaren (2011) conducted research on how to embed the ecological rationale into the other

rationales in consumption patterns. It was concluded that this would be a huge challenge. Within the shipping sector, consumers that buy products are several steps away from the actual act of shipping. Moreover, shipping happens on sea and pollution is not directly seen or felt. Thus, there is a rather indirect connection between carriers and consumers in the shipping sector. Applying Spaargaren's (2011) findings about the challenges concerned with embedding an ecological rationale in consumption patterns and to the shipping sector, a sector lacking direct consumers, the challenge to embed an ecological rationale is expected to be even bigger. Thus especially when considering the shipping sector, one could argue that EMT is too bluntly about the ability of market dynamics to embed an ecological rationale. Besides the embedding processes, it is also argued that more research is needed on the steering processes.

The embedding and steering of an ecological rationale in ecological modernisation theory is deemed a complicated and too little researched challenge. Considering the abovementioned hurdles in steering and embedding, it is expected that the embedding and steering of the ecological rationale is even more challenging in the shipping sector. By exploring the factors hampering or stimulating environmental reform, the operational and theoretical implications of EMT can potentially be fine-tuned.

All in all, processes inducing environmental reform are initiated by the emancipation of the ecological sphere. Funded on the ecological sphere, the ecological rationale impels the integration of actual ecological goals and criteria in the other four rationales in society. Still, the steering and embedding processes of the ecological rationale in the literature are equivocal. The interaction between all four rationales can hamper or stimulate ecological modernisation. These processes can be explored by revealing the different networks in society. Herewith, it is analysed to what degree ecologically sound sets of rules and resources are articulated in organizations and production processes (Spaargaren, 1997). It is assumed that the ecological rationale is integrated in an economic, policy and societal network. A tool that is part of EMT and that aims to reveal these networks is the triad-network model.

3.4 Triad-network Model

This section introduces the triad-network model by explaining its characteristics. Starting with its aim, relevance for the case and added value as compared to other network models. Consequently a general section on all network types highlights the network properties, how the networks are employed in scientific research, the overlap areas, globalisation and the network's boundaries.

Industrial companies are surrounded by many actors with particular interests in their way of doing business. Stakeholders might stimulate and impose environmental improvements but can also do the opposite by impeding or blocking policy development (van Koppen, 2014). Moreover environmental considerations are often not taken on board automatically by industries. Disclosing the interplay of stakeholders within these settings in the environmental policy arena of an industry, requires a thorough stakeholder analysis and can eventually reveal the dynamics blocking or impeding environmental policy development.

In the shipping sector there is a lack of ambition and inert pace of environmental policy implementation. This can be attributable to not automatically considering the environment in policy decisions as a result of the characteristics and composition of the networks in the sector. Or there could be actors in the surrounding networks that are able to influence environmental policy development. Via a network analysis, the 'embeddedness' of the carrier and its surrounding stakeholders is explored. The term embeddedness refers to all actions and their outcomes together with the structure of the overall network of relations in the sector. This network is continuously restructured during interaction (Frijns, Kirai, Malombe, & Van Vliet, 1997). Exploring the embeddedness of a certain carrier entails investigating the interplay, relations and role division among the stakeholders that are surrounding him. Eventually this exposes the dynamics behind the way (environmental) policy is dealt with within the sector.

Network models that have the ability to broaden their scope beyond merely focussing on the economic perspective have several advantages. To start with, they fulfil the need for a more sociological perspective by including the policy and societal network, on top of the traditionally solely used economic network (van Koppen & Mol, 2009). To continue with, they function in linking the "rather abstract theoretical notions of ecological modernisation with empirical developments in social systems of production and consumption." (van Koppen & Mol, 2009, p. 302). In addition to this, such network models provide an intermediary between the system perspective of system models and the agency perspective of action or agency theory. Through analysing business' settings via network models action and structural elements of businesses are brought together. And lastly, network models have the ability to include an institutional analysis together with an analysis of the contribution of capable agents. This helps to identify the necessary institutional changes for environmental improvements. Such extended network models thus combine theoretical notions of network models, structural properties of institutions and the interactions of agents constructing the network (van Koppen & Mol, 2009). Herewith they extend their scope beyond solely focussing on the structural properties. A method that combines these elements by analysing the societal context of industrial sectors is found in the triad-network model.

The triad-network model is a conceptual model which enables analysing to what extent ecological perspectives have penetrated and transformed the three other rationales in society (the economic, political and societal) (van Koppen & Mol, 2009). In other words, it analyses to what extent processes of ecological reform are initiated by employing the ecological rationale based on the fundament provided by the ecological sphere. Simultaneously, it explores to what extent the ecological rationale strived for ecological goals and criteria to be fully and equally integrated in the other rationales (the economic, political and societal rationale). The three networks in the triad-network model resemble with the rationales in society, they contain the policy, economic and societal network. And thus, the fourth, ecological sphere or rationale is assumed to be embedded in the networks that are analysed by the triad-network model. The difference between the spheres and rationales is found in their application. Whereas the spheres and rationales are analytical distinctions to explore the emergence of the ecological rationale, the networks are meant for

analysing the dynamics, roles and power of the actors who have (or have not) integrated an ecological rationale in their 'way of doing' business.

The triad-network model thus consists of three network types: the policy, economic and societal network. Together these networks make up the social-economic structure in which an industry is embedded. Each network type encompasses a specific analytical perspective, a particular set of actors, distinctive institutional arrangements and a restricted number of interacting (collective) actors (van Koppen & Mol, 2009). Actors can be part of multiple, different types of networks. The definition of actors within the triad-network model is very broadly tough, it can encompass multiple sorts of actors and relations among them are also highly variable (van Koppen, 2014). All network types relate back to the industrial companies that are analysed. The networks in the triad-network model are only analytical distinct networks and have unclear theoretical boundaries. Although the network types are presented as three different types, it is important to note that this is merely for conceptual purposes. It enables analysing the different mechanisms of and perspectives on, how the social environment interacts in the analysed sectors. The network types aid in identifying the reasons behind a company's proactive or reactive environmental care strategy. They also assist in analysing whether and how such environmental reforms are successfully institutionalised. And lastly how environmental reform transforms existing structures and arrangements (Mol et al., 2009b). Taking these theoretical notions into account, it is important to shed some light on the networks in practice.

In reality, all network types overlap, closely interact, work with unequal forces and incomparable outcomes. The individual company's strategy on environmental care is influenced by the 'social environment' and in the end this is decisive in the individual companies intentions and strategies (van Koppen & Mol, 2009). There are cases in which it is unclear to what network certain actors belong to. This is attributable to their varying roles in multiple networks which puts them in the 'overlap area'. The overlap can be seen in figure 3. Branch organisations connect the economic to the policy network by lobbying for policies at the address of policy-making organisation for their own industry. Thus branch associations operate primarily in the economic but certainly also in the policy network. For this study, the operations of business representatives occur not so much in the overlap area between the economic and societal network. They rather operate in the economic network and are closely connected with the societal network, to keep an (open) dialogue and negotiation possibilities (Frijns et al., 1997; Mol, 1995). Another practical element of the networks is the influence of globalisation.

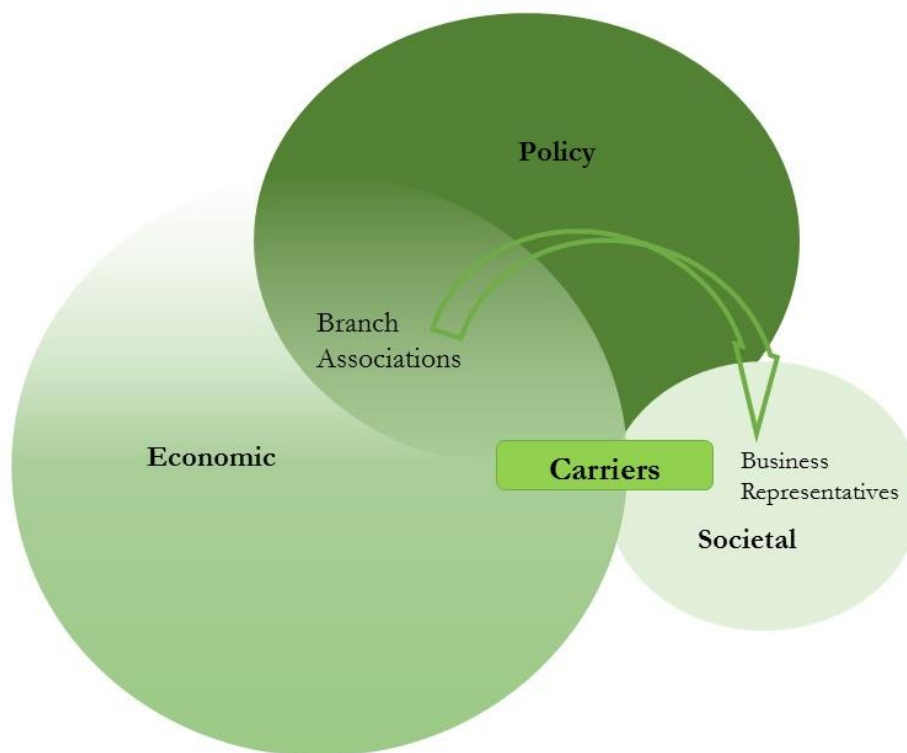


Figure 3. The three network types with overlap areas. Adapted from Mol (1995)

Globalisation is of specific relevance for all networks. EMT prescribes increasing interdependencies between “..(national) processes of ecological restructuring and the process of globalisation.” (Mol, 1995, p. 85). Since all three network types are influenced by global conditions, ecological reform in industrial societies is subjected to globalisation. But globalisation also applies the other way around. This means that the processes inducing the ecological restructuring of production and consumption, influence the direction and pace of globalisation (Mol, 1995).

To conclude, it is important to note that the network’s boundaries are ill-defined in the theory. Therefore it is chosen to determine the boundaries of all three networks as the study progresses. In this case, the boundaries of the networks are defined by the empirical scope of this study. This means that the boundaries are established by aiming for inclusion of all, to the analysed industry, relevant actors.

3.4.1 The Policy Network

In policy networks, political-administrative rules and resources dominate both interactions and institutional arrangements between state organisations and industries. In this network type, the main actors are governmental authorities and organizations representing industries in negotiations with the government. These organizations could be employee- or sector associations like labour unions (van Koppen, 2014). The network is thus centred around the political-administrative rules, resources and system and encompasses all actors (in)directly influencing these rules and resources. Besides a thorough analysis of the actors in the

policy network, legislation influencing company's strategies or the industrial ecosystem can also be studied as part of this network (Anh, My Dieu, Mol, Kroeze, & Bush, 2011). It is important to note that policy networks entail a specific international character. National policy networks can induce supranational environmental reform by implementing changes that go beyond borders. This also applies the other way around, additional constraints in policy-making can be imposed via supra-national reform (Mol, 1995).

Within policy networks, several aspects can be studied. One can analyse the interdependencies between authorities and industrial actors in terms of money, power, knowledge or information. Also the 'rules of the game' which determine the mechanisms at work and the resource dependencies between the actors can be studied. Or one can analyse the common or diverging world views providing the fundament for developing joint strategies and communication (van Koppen & Mol, 2009). This study aims to highlight both the interdependencies, rules of the game and the world views of the actors surrounding a carrier in the shipping sector.

Policy networks can occur in many different forms. Mol, 1995 mentions two opposing forms of policy networks, namely closed policy communities on the one side and more open issue networks on the other side. Whether a closed policy communities or open issue network develops depending on "the intentions of the government (which often favours closed policy communities), the (dominant) groups involved, the (sometimes conflicting) interests of actors within the government, the nature of the policy area and the availability of institutional arrangements." (Mol, 1995, p. 70). In addition to this, it is dependent on "...the economic and political importance of a certain industrial sector, the industry policy of a country and the existence of informal or patronage relationships.." (Frijns et al., 1997, p. 11). Thus, there are multiple characteristics defining whether a certain connection in the policy network is an open-issue or closed policy community. The operations of the IMO, the decision-making entity in the shipping sector are chosen to define the type of policy network. These two network variations, occur in an interactive continuum. The characteristics of both policy communities and networks are listed in table 4.

Table 4. Characteristics of closed policy communities and open issue networks. Adapted from: Mol (1995)

| Characteristics | Closed policy community | Open issue network |
|--|--|---|
| Members | Limited number | Large on both the governmental and interest group site |
| Access | Highly restricted, stringent entry criteria like expert knowledge or occupation of a certain position | Low entry, exit barriers, few commitments |
| Long term | Quite stable, express continuity | Membership can change rapidly |
| Interactions | Frequent, between governmental agencies and interest groups | Flexible degree and importance of interactions |
| Consensus | High, on rules of the game and policy aims | High number of groups prevents easy consensus |
| Ideology | Common worldview, ideology privileging certain ideas, problems and solutions | No common worldview or ideology |
| Policy issues | De-politicized towards technical issues | Political and discordant |
| Relationships | Exchange of resources like information, authority and economic values | Lobbying relationships due to limited availability resources |
| Relation to the government | The government is in need of the resources from pressure and interest groups | Consultation only |
| Interaction with the government | Ability to enter negotiation and bargaining with the government over policy direction, kind of measures and the time schedules | No necessity for the government to negotiate with these networks so no specific abilities |
| Power | Balanced, a positive sum game | Unbalanced, zero sum games |

In general, open issue networks focus on new policy areas which still lack existing institutions and established hierarchies. Once formal and informal institutions (like committees and policy communities) develop 'rules of the game', issue networks may evolve into policy networks (Mol, 1995). During this transformation process a core and a periphery where policy elaboration takes place, develops.

3.4.1.1. Core and Periphery

Policy networks consist out of a core concerned with the day-to-day policy making and a periphery who is solely able to watch policy developments. The core and periphery can also be indicated as the primary and secondary community or inner and outer circle. The core and its members are concerned with day-to-day policy making, decisions on the membership and to a certain degree, the outcome of the policy-making

process. The peripheral community merely has the ability to watch the negotiated policies, they are sometimes consulted or engage themselves in lobbying activities. All in all, they lack the resources to enter the core of the policy community (Mol, 1995). Whilst policy networks have a large core, open issue networks are more irregular and more frequently found in the periphery. And since they mostly happen in the periphery, issue networks often focus on policy issues that do not obstruct interests of major economic groups. In analysing the core and periphery for this study, elements of both the closed and open policy community are applicable to the case. Besides the policy network with its divers groups establishing environmental policy, the economic network has an even more broad range of actors included.

3.4.2 The Economic Network

In the economic network, all actors that are related to the industry's financial system are included. The type of actors that are included is hence very broad. Therefore the boundaries cannot be indicated very clearly and depend on the perspectives and interpretations of the researcher. The main actors in economic networks are all actors that have an economic relation and are centred around the companies, including the companies themselves. For instance, such actors could be the suppliers, customers, financiers and service providers. Also sector associations could be part of the economic network, in case they have influence on the economic structure (van Koppen, 2014). Network studies put emphasis on the non-material dimensions of e.g. a specific sector. This is done by unravelling economic relations, power, information monopoly and exchange, knowledge, control and ownership (van Koppen & Mol, 2009)

Economic networks go beyond regional and national borders. For example, in the ownership of large firms in the chemical sector, a trend is observed towards 'stateless companies' which lack a certain 'home country'. This trend is also applicable to the shipping sector. Since it transports beyond borders and is allowed to use flag states independent of the home country of for instance the financiers of the vessel. Moreover a ship is frequently owned and operated by multiple companies from several countries. Such an multinational character has consequences for the operational area of a certain sector. This cannot be regarded as independently influencing national or regional economic networks anymore. A full integration, going beyond the borders of nation-states or regions is essential in analysing developments of economic networks (Mol, 1995).

The network is structured in terms of power and resource dependencies. As is the case in the policy network, power and resource dependencies relate to the influence of knowledge, money, power or information in the contact between economic actors and a particular industry. Continuity and transformation are essential for the viability of economic networks (Anh et al., 2011). The continuity and transformative capacity of these actors is dependent on both the industry and the actor itself. To reveal these elements a thorough analysis of the relations can be conducted by e.g. revealing whom primarily initiates contact and how the dependencies on each other are balanced. Economic network studies analyse the economic processes behind continuity and transformation, the (economic) relationships among firms and the network structure in terms of power and resource dependencies (van Koppen & Mol, 2009).

The core of economic networks is comprised out of economic interactions. These are executed with economic rules and resources, between economic agents in and around the sector (van Koppen & Mol, 2009). The periphery is composed out of the ‘surrounding’ agents. The surrounding agents indirectly influence transactions and interactions within the economic network.

3.4.2.1 Vertical, Horizontal and Regional Interactions

Besides distinguishing between the core and periphery, economic networks also focus on vertical, horizontal and regional interactions within a sector and apply the concept of ‘integration’. The difference between interactions and integration is found in the degree of cooperation between the actors. Thus in interaction one can distinguish a basic level of cooperation. In more integrative relations, the cooperation is much closer and on additional aspects.

To start with vertical interactions are concerned with product chain interactions ranging from raw materials to consumers. The steps in vertical interactions link different firms or different divisions within a company. For studying environment-induced transformations in vertical relations, the concept of integration is applied. In EMT, the concept of vertical integration is broadened by going beyond concentrating on what happens in the vertical line of a manufacturing process. In addition to this, it encompasses concepts like: closer vertical collaboration through alliances along the product line resulting in influencing decisions of vertically related organizations. Also co-maker ship, which involves long term contracts between users and suppliers is part of vertical integration. Naturally, this results in an increase in information flows. By applying a broader definition, the ability to identify e.g. the growing influence of particular industries on each other, customers or raw material suppliers is enabled (Mol, 1995). Whereas vertical collaboration is along the product line, horizontal collaboration happens within a particular industry or among similar industries.

To continue with, a broad approach to horizontal relations is chosen including competitors, alliances and industrial branch organizations. Horizontal relations with competitors focus on two aspects. They include strategic alliances for e.g. research and development, joint product marketing, licensing agreements or investments. A more integrative approach to the horizontal relations with competitors, means it includes another aspect. Horizontal ‘integration’ relations among competitors includes actions of mergers, take-overs or joint ventures. But in addition to this, horizontally integrated relations include the branch organizations which involve actors from both the economic and policy network.

Horizontal integration of industrial branch associations involves actors from both the economic and the policy network. These associations are supposed to be analysed as relatively autonomous coordinating institutions. Branch associations have their own rules and resources, operate next to (international) markets, regulatory agencies and multinational companies. In table 5 the five fields of horizontal cooperation in which branch associations can play a significant role are distinguished. Branch organizations can have multiple, simultaneously employing roles.

Table 5. The five roles of branch associations. Adapted from: Mol (1995)

| The five roles of branch associations | Examples of focusses |
|--|---|
| 1. Shaping the industrial structures | Investments, industrial restructuring, competition, research and development, prices and profits |
| 2. Perform policies that regulate the labour market | Negotiating labour agreements, coordinating practices for hiring and firing workers, social insurance programs. |
| 3. Coordinating the production chain | Upstream or downstream by information collection for state agencies, commercial arbitration |
| 4. Develop regulations on quality, health and environmental issues standards | Clean production, safe handling of chemicals, standardization of products, certification, publication of industry's standards |
| 5. Involvement in general domestic or international economic policies | Key state organizations, favourable economic policies |

All roles of branch associations relate back to environmental issues or ecological restructuring but the third, fourth and fifth are most environmentally focussed (Mol, 1995).

And lastly, regional relations. These have a place-based focus by considering interactions in a restricted geographical area. This can encompass for example a specific eco-industrial park.

It is important to note that although actions of financiers, creditors, assurance companies and research institutions cannot be categorized vertical or horizontal, they are still valid elements of the economic network.

Mol, 1995, p. 77 mentions that it is essential for studying the economic network, to “question in what way, to what extent and how do interactions between the –horizontal, vertical and other- constituents of economic networks remain the same or transform in confrontation with the emergence of the environment in industrial societies.”. In other words, how are the separate elements of the economic network related to the embeddedness of the ecological rationale. The policy network focusses on political-administrative relations and the economic network on financial actions. The last network is the societal network, which aims to influence industries via public pressure.

3.4.3 The Societal Network

The societal network is the third element of the triad-network model. The societal network consists of non-governmental organisations and the ‘public’. Hence it entails all civil society based actors trying to influence an industry’s strategy. The network unravels relations and arrangements between the industry and civil

society (organisations). The main actors in this network type are the civil society organisations. These are environmental organizations, local community groups and consumer organisations.

Mol, 1995 observed that societal networks go beyond borders to a fewer extent than the aforementioned networks. The author indicated that NGOs and environmental organizations have only just started to become more internationally oriented. One can extrapolate from this statement, made in 1995 by Mol, that the internationalisation of NGOs and environmental organizations continued, resulting in an increasing amount of international actors in the societal network currently. Although globalisation is clearly indicated in the literature, in the policy and economic network and to a lesser extent in the societal network. It is expected that this will be made visible along the study continues.

Relations in the societal network are called the connection of the sector with the 'life world', meaning civil society (Mol et al., 2009b). The relation explores how the civil society organisations are connected to each other and the industry. Moreover, it aims to identify what kind of arrangements govern these interactions. For instance, what are the unwritten rules and how is public pressure exploited as a tool.

Interactions in the societal network happen between the industry and civil society (van Koppen, 2014). More specifically, these interaction patterns occur between environmental- and consumer organisations and industrial firms. Special emphasis is put on their continuity and transformation (van Koppen & Mol, 2009). Such interactions can be direct, indirect or by constructing public opinion.

3.4.3.1 Interactions

Interactions in the societal network can be direct, indirect (via state agencies) or by constructing general public awareness and public opinion. Direct interactions encompass direct contact between civil society (organizations) and industry. These include negotiations, product campaigns and 'responsible' care programs. In indirect interaction, the state functions as an intermediary. It enforces specific legislation focussing on changes in the production processes and products on industries. Although such legislation is enforced by states, it often follows the requirements and pressure from environmental organizations. Another form of interaction is focussed on constructing general public awareness and exercising public pressure. Public awareness is created by norm and value formation among the public. Since for industries, legitimation and significance is of valid importance, they are sensitive to public awareness. Public awareness is exercised through public pressure. This is used to influence and possibly restructure the industries in this network towards a more ecologically sound strategy (Mol, 1995). Altogether, the direct, indirect and public awareness interaction patterns compose the societal network. These interaction patterns are governed by specific rules and resources.

Rules and resources are used in societal networks to influence the interaction patterns. Herewith relations are structured and it is attempted to transform industries towards ecological reform. They mainly centre around legitimation and signification of production and products. A change in the rules is often induced by:

- Way of interaction: (un)frequent, (in)direct, constructive/hostile
- Changing ideological frameworks
- Modifications in the social environment

Examples of resources that are used in the societal network are:

- (Scientific) information on ecological consequences of production and products
- Dissemination of ideas via media to generate public support
- Mobilization of state intervention

3.4.3.2 Overlap Area

Societal networks overlap with economic networks since the environmental pressure groups force industries to professionally address the environment. Industries are obliged (via interaction patterns) to go beyond 'simple slogans'. Herewith economic action is needed and new economic relations are established in the overlap area with the societal network. In the end, such pressure might result in action inducing a common reference frame on the general goals established by a cooperation between environmental coordinators and managers from industries (Mol, 1995).

This trend touches upon the overarching hypothesis in EMT, that strategies and ideologies of environmental organizations will increasingly encompass more direct interactions with industries. Environmental organizations will eventually support progressive environmental entrepreneurs and challenge the laggards (Mol, 1995).

4. Background Chapters

This chapter serves to provide background information on the sulphur limits and the organizations that are part of this study. It starts with a description of the policy developments and practical implications of the limits on sulphur emissions in the shipping sector. Hereafter an in-depth actor description is provided by highlighting some of the key features of the organization and their biggest stumble block with regards to the limits on sulphur emissions. This functions as a fundament for analysing organizations from the networks separately and interactively.

4.1 Legislation for Sulphur Emissions

Sulphur emissions are harmful to the environment and have been addressed in other sectors already for a longer time period than in the shipping sector. The need to deal with emissions from the shipping sector was recognised when in 1973 the International Convention for the Prevention of Pollution from ships (MARPOL) was adopted. In 1997, Annex VI was added to MARPOL 73/78 specifically addressing the “Regulations for the Prevention of Air Pollution from Ships”. Annex VI prescribed limits to sulphur content in marine fuels. The EU had a distinctive role in the debate on implementing limits on sulphur emissions.

First of all, the EU implemented their own legislation before the IMO did. In 2005, it already established a 0.1% limit for EU ports as from 2010 onwards. Since many vessels spent very little amount in EU ports, this limit did not demand a technological change or substantial investment and caused fewer concern than the eventual global limits (EU, 2005; van Leeuwen, 2010). In the same year, Marpol Annex VI was amended, when the first future global limits to sulphur content in marine fuels were adopted which is shown in figure 4. Simultaneously with implementing global limits, differing limits for (Sulphur) Emissions Control Areas ((S)ECAs) were established. SECA's are mainly located in populated, coastal areas for which special attention is set on restricting sulphur emissions. A graphical representation of all limits on sulphur emissions from shipping in both SECAs and other sea areas is depicted in figure 4. The first SECAs were EU-based. They were established in 2006, in the Baltic sea, the North Sea and the English Channel (European Commission, 2015).

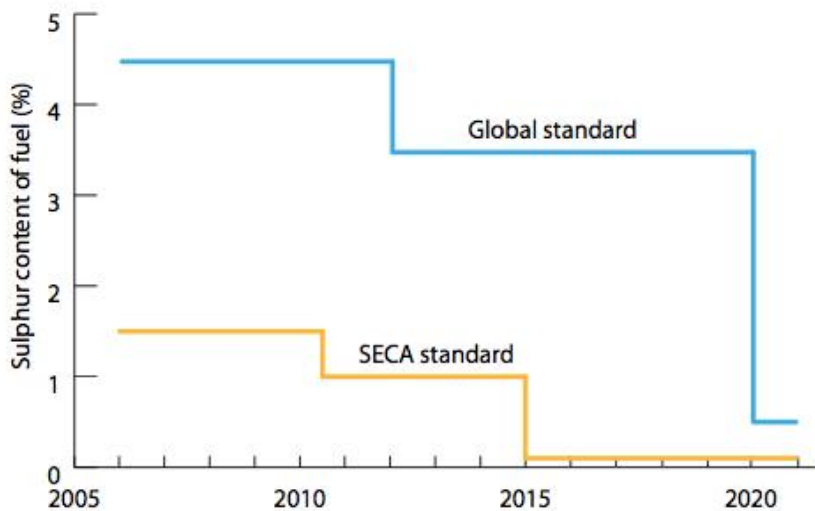


Figure 4. Limits on sulphur emissions in a graphical representation. Source: (Air Pollution and Climate Secretariate, 2016)

And second of all, the EU has been deliberately steering the debate at IMO level into more strict limits. Awaiting for decisions to be made on global sulphur limits, the EU used the threat of local (EU) strict limits if the proposed global ones were not deemed satisfactory (van Leeuwen, 2010). The fear for establishing an unequal level playing field between EU and global seafarers, brought the IMO into a compromise on the current limits. In 2008, The IMO introduced more stringent sulphur concentrations limits for all sea areas as from 2012 and for SECAs as from 2015. In addition to that it introduced new SECAs in North America (2012) and the Caribbean Sea (2014). The final due date, for stricter sulphur limits for all sea areas is scheduled for 2020 (International Maritime Organization, 2015e). A global overview of SECAs by 2015 is shown in figure 5. In the beginning of February 2016, it was announced that a new ECA is planned in the Yangtze as from April 2016 onwards (The Maritime Executive, 2016).



Figure 5. Global overview of Sulphur Emission Control Areas by 2015. Source: Hall (2016)

4.1.1 Ambition and Pace of Legislation

The ambition level of the sulphur limits is relatively low and implementation slowly came on stream (Interview NSF, 2016). The first 'limit' for all sea areas of 4.5 % which was applicable until 2012, is the standard sulphur amount in Heavy Fuel Oil (HFO) (Helfre et al., 2013). And for comparison, the average sulphur content of fuels in 2010, was 2700 times higher than the requirements set for road transport (Great-Britain Parliament, 2012). And the most strict sulphur limit for the shipping sector in SECAs, scheduled for 2020, is still 10 times lower than the one already used for automotive diesel since 2009 (Chevron Global Marine Products, 2008). Besides low ambition levels, policies for dealing with sulphur emissions from the shipping sector are implemented at a rather slow pace. The first global regulations on sulphur emissions for the shipping sector were adopted twelve years after the limits for road transport were established (European Environment Agency, 2015). Furthermore, the IMO is still not conclusive about the eventual implementation of the most strict limits. Before and after the limits entered into force, numerous actors in the shipping sector waved a red flag that costs for shipping were expected to increase once the IMO announced the set of regulations (International Chamber of Shipping, 2013). Carriers expressed great concern about the availability and associated cost rise of low sulphur fuel (Gcaptain, 2012). Several studies in 2005 predicted a shortage in low sulphur fuel (Starcrest Consulting Group, 2005). However, since the first, strict, requirements entered into force in January, very little of this has happened (ECSA, 2015a). Critics on their turn argue that this is mainly due to the global decrease in oil prices (Drewry Maritime Research, 2015). The fuel availability study will be decisive in whether the implementation date for sulphur requirements will be postponed for another 5 years, to 2025 (International Maritime Organization, 2015e). Three more issues appear out of this study. The International Chamber of Shipping (ICS) indicates 2018 will be too late for refiners to adequately invest and react (Gcaptain, 2012). The feasibility of such a study is doubted since future plans of petroleum refiners are confidential (Ship and Bunker, 2015). Moreover, carriers indicated they just seek clarity from now on to make strategic investments (Interview KVN, 2016). All in all, smoothly developing (environmental) policy for the shipping sector appears to be a challenge. The consequent, implementation, also withholds hurdles to overcome.

4.1.2 Regulating the Shipping Sector

Governance in the shipping sector is a complicated task. Ships can be considered a highly mobile version of industrial plants but are causing equally adverse effects on the earth's ecosystem (Bloor et al., 2013). Pollution in the shipping sector is non-point source and transboundary (Carter, 2007). Ships navigate across the globe resulting in pollution coming from many different sources and crossing state boundaries. Moreover, it is often generated in remote areas which causes that it is not directly seen or felt. And due to ships navigating in varying territorial waters under different flags, administrative fragmentation is omnipresent.

The shipping sector is known for its polycentric governance structure, meaning that the state is not the sole locus of authority. State actors are both regulators and regulated by overarching international treaties (Black,

2008). There are two major ways for enforcing IMO legislation in the shipping sector. Vessels are obliged to select a country in which their ship is registered. This country is the vessels' 'flag state'. Legislation from that specific country is only applicable to vessels sailing under that flag. The second way of enforcing legislation is via the 'port state'. If carriers enter territorial waters of a specific country, they must comply with the regulations set for that area (Mansell, 2009). However, since port state control is not a profitable activity, both the focus and accuracy varies highly between port states (Bloor et al., 2013). The flag state is mainly enacted but there are large gaps in to what degree it is properly enforced (Helfre et al., 2013). Consequently some carriers tend to search for countries with beneficial taxes and little enforcement measures. Thus, enforcement of the limits on sulphur emissions is in theory done in two ways. First, port state inspects vessels once these berth in their port. Second, flag state is responsible for ensuring compliance of the vessels that are registered under their flag. But enforcement remains highly dependent on the largely differing ability and willingness of the flag and port state to monitor. Large gaps in enforcement evidently result in even larger gaps in the attitude of the regulated.

4.1.3 Carriers

Carriers vary highly in their attitude towards legislation. The below described distinction is made based on literature research and data gathered during the interviews (Interview Paris MoU, 2016; Interview KVN, 2016; Interview ILT, 2016; Bloor et al., 2013; Helfre et al., 2013). It is important to illustrate the gap in attitude between compliant, 'more progressive'- and non-compliant, 'more conservative' carriers since the gap can be considered one of the major contributors to ineffective governance in the shipping sector. The characteristics of both groups are set forth in table 6.

Table 6. Overview of characteristics of carriers

| Characteristics | More progressive carrier | More conservative carrier |
|-------------------------------------|---|--|
| Trade | N-W Europe, Canada, US | Non-SECAs |
| Flag state | Strict, solid and frequent inspections | Less strict, less solid and less frequent inspections |
| Port state | Often berth in Paris MoU aligned ports | Often berth in non-Paris MoU ports |
| Reputation | Publicly 'visible' carrier | Not so much publicly 'visible' |
| Branch association | Overarching active branch association | Less active or non-existing branch association |
| Attitude towards legislation | Progressive, own government takes the lead anyway | Conservative, since currently subjected to minimum legislation |
| Compliance | Non-compliance is no option | Non-compliance can be worth the 'risk' |

Regulations that are currently in place are most fitting for ‘more progressive’ carriers. More progressive carriers are registered and often berth in Paris Memorandum of Understanding (Paris MoU) aligned ports. These carriers have a higher chance of inspection from solid port- and flag state inspectors. And if it comes to a detention or a fine, there are large reputational consequences. The branch association for Dutch carriers, the KVNR contacts them to redress and their charterers might decide to switch carriers. Such carriers are benefited with additional global legislation because their own governments, such as the EU, implement it anyhow. All in all, non-compliance is too risky for these carriers.

On the other side are carriers that already selected a lax flag state on forehand. The flag state will not conduct regular inspections, this is up to port state. If these carriers board in Dutch ports as well, the risk profile system of Paris MoU raises detection chances. Still, the chances of actual detection are relatively small and the costs of fines by far outweigh the benefits. Relying on damaging these carriers’ reputation is inappropriate since this poses no threat to them. Moreover there is no overarching branch association that serves as a ‘backup-check’ and their charterers solely aim for cheap transport. Needless to say, this carrier’s strategy makes that they are not benefited with additional legislation at all. The benefits of non-compliance weigh up against the costs and (reputational) risks for these carriers. If non-compliance is no option, costs are substantial and none of the options is superior over the others.

4.1.3.1 Three Strategies

Carriers for whom non-compliance is no option have three investment pathways to consider. They can either use Low Sulphur Fuel Oil (LSFO) such as Marine Gas Oil or Marine Diesel Oil (MDO), use liquefied natural gas (LNG) or install “scrubbers” (International Maritime Organization, 2014, 2015d).

To start with, it is possible to switch to low sulphur fuel distillates. Carriers are often forced to use this option since retrofitting their vessels, which is necessary for the other two options, is expensive. The investment costs are negligible since many vessels can run on both HFO and LSFO and solely some adjustments to the pipelines are needed. But fuel is by far the largest operational costs of carriers and the fuel prices are expected to rise because demand increases and supply remains constant (Gcaptain, 2012). In addition to this, the pool of available and suitable crudes decreases which makes refining LSFO of 1.5 % a costly process. Even residual oil, from low sulphur crudes needs to be reduced in sulphur content. For doing so, additional desulphurisation equipment is required. And once the sulphur targets are below 0.5 %, the refineries need to invest in entirely different technologies for refining. One can imagine this brings along additional costs and that these are certainly passed on to the consumers, the carriers (Helfre et al., 2013). Besides increasing fuel costs due to increased demand and challenges to fulfil the supply requirements, there is another down side. The SECAs put an additional place-based element in the requirements since requirements differ per area. Ships entering and leaving SECAs operate on different fuels. Prior to entering a SECA, the vessel must have fully changed over to fuel that follows the requirements for that area. All these switch-over activities need to be logged which requires additional administration effort (International

Maritime Organization, 2015e; Interview NI, 2016). To summarize, switching to LSFO increases overall operational costs and requires additional administration but the initial investments are low.

To continue with, it is also possible to switch to LNG. This is regarded by some as the most preferred options since there are only additional investment costs of 10-50 %, after which LNG can be used without limitations (DNV, 2010; The Moller Group, 2012). The installation for using LNG is a change in the technical composition of a ship and thus needs approval from a classification society. Classification societies are regulatory bodies ensuring maritime safety by checking the (technical) specifications of ships (International Association of Classification Societies, 2011). Still, LNG is highly flammable and toxic which makes it a dangerous form of fuel. Also, there is an inadequate supply chain for LNG in some countries making it a less solid business case. And although the combustion of LNG does not emit sulphur, it emits significant amounts of Methane which is a Green House Gas with a very high global warming potential. Especially older vessels are too poorly equipped to use LNG and cope with its potential risks, therefore this option is most suitable for newer vessels (DNV, 2010; Helfre et al., 2013).

Lastly, vessel owners can consider using scrubbers. Scrubbers use sea or fresh water and chemicals to remove sulphur particles from engine exhaust gas (PWC, 2012). Herewith, carriers can use oil with higher sulphur content because this end of pipe solution, filters the sulphur particles prior to releasing them to the atmosphere. After filtering, residue sulphate particles are discharged into the sea. One can imagine that disposing sulphur into the sea can change the acidity of water which could impact its biodiversity. Scrubbers are both suitable for retrofitted old vessels and can be built in new vessels from the start. There are various types of scrubbers suitable for varying ship types, for example vessel owners can choose to use open- or closed loop scrubbers which make use of fresh- or sea water. The price spread between LSFO and HFO will determine the amount of scrubbers installed. If LSFO becomes expensive, it is more beneficial to install a scrubber. But governments have varying perspectives towards the usage of scrubbers (Interview KVN, 2016). As is the case with LNG engines, a scrubber is an additional constructional part of a vessel, it is required to let a classification society approve it. Some classification societies already approved scrubbers which can be installed (European Maritime Safety Agency, 2015). Although scrubbers in operation might seem suitable, producing them is a very energy intensive process (Helfre et al., 2013).

Implementing either of the three options, evidently brings additional costs and none of the three options is deemed superior (Helfre et al., 2013). Retrofitting is difficult for several somewhat old vessels. Since no clear-cut solution was available, ad-hoc solutions have been fragmentally implemented and it is still insecure whom will eventually burden the additional costs once oil prices start increasing. Carriers are unable to directly, fully pass costs on to their customers since contracts with customers often contain no surcharge clauses. Moreover, the surcharges vary greatly between regions depending on the time spent in a SECA (Notteboom & Vernimmen, 2009). The large gap between compliant and non-compliant carriers diminishes the competitive position of compliant carriers overall. Therefore the contractual terms together with the ability of carriers to provide clear and transparent cost calculations for the surpluses and

thereby convincing their customers to pay a low-sulphur surcharge will be decisive in whom will eventually pay these additional costs (The Maritime Executive, 2014).

Global legislation to deal with sulphur emissions in the shipping sector slowly came on stream. Ambition levels are still relatively low and implementing effective policy in the shipping sector comes with many pitfalls. The system allows for large gaps in compliance resulting in an ‘unequal level playing field’. On top of that, options for compliant carriers are limited and none is considered superior. Seemingly, the interplay of organizations in the shipping sector make it a seedbed for ineffective policy implementation. For systematically revealing the roles of these organizations, the next chapter reveals relevant background information on all organizations.

4.2 Actor Description

4.2.1 Spliethoff and Anthony Veder

Two Dutch carriers have been selected as the core carriers around which the triad-network model builds. Both carriers are Dutch flagged carriers and can be considered ‘more progressive’ towards legislation. Both carriers maintain and operate their own vessels. Their load is provided by charterers that ‘rent’ their vessels for transport. Thus for this study a carrier is defined as a company that owns and operates its own vessels.

Although AV and Spliethoff are carriers with different cargo, overall their attitude towards legislation is similar. Spliethoff is a dry cargo specialist in worldwide ocean transport. It ships a vast array of cargo ranging from forest products to bulk cargo (Spliethoff, 2015). The interviewee was a conversions program manager in charge of the scrubber retrofit program for a selection of Spliethoff’s vessels. This was executed in cooperation with Alfa Laval, a scrubber producer. Anthony Veder (AV) is a mid-size carrier that ships Liquefied Natural Gas (LNG) globally and the interviewees were two of its operators (Anthony Veder, 2015). Both carriers acknowledge the polluting effects of sulphur and understand the reasons behind the introduced limits. Also the two carriers did not have any direct role in the establishment or introduction of the limits.

4.2.1.1 Strategies for Compliance

For AV and Spliethoff, non-compliance was no option but achieving overall change is difficult in the shipping sector. AV specifically recognized the conservative nature of the shipping sector.

“That is typical for the shipping sector, it always is a bit behind. The shipping sector is very conservative so it will actually only change if it is really necessary.”

Interview Anthony Veder, 2016

In line with this, Spliethoff emphasized that no carrier would have made this change without legislation forcing them to do so. The first step a carrier takes after legislation is introduced is illustrated by the following quote.

“The carrier starts calculating, how should I comply with these demand and what are the financial consequences?”

(Interview Spliethoff, 2016).

After calculating, both carriers selected different compliant strategies.

AV decided to retrofit several vessels in two ways. First, vessels were retrofitted to run the majority of time on MGO instead of the majority of time on HFO. Second, vessels were equipped with dual fuel engines so they can switch between MGO and LNG. Both options allow a ship to switch between compliant (MGO or LNG) and non-compliant (HFO) fuel respectively in- and outside a SECA. There are two reasons why AV chose to use oil-based fuels instead of switching to LNG, which they transport themselves. First the current low oil price which is expected to remain at low levels for, at least, the coming two years (Long Forecast, 2015). Besides the low oil price, entirely switching to LNG was also not possible because the supplier infrastructure is still lacking. For AV, a Dutch known carrier, non-compliance is no option. Regulations are introduced by the IMO and AV tries to meet them at lowest costs.

Spliethoff decided to equip a selection of vessels with scrubbers. Spliethoff's main drivers for installing scrubbers on these vessels were two-folded. First of all, for a mid-size, well-known, Dutch carrier it is important to comply with government regulation which is in line with the perspective of the KVNR on ensuring that all Dutch carriers are high-performing (Interview Spliethoff, 2016; Interview KVNR, 2016). Second, scrubbers were solely installed on the vessels that were in SECA-areas for the majority of time at sea, making the investment cost-efficient according to Spliethoff.

4.2.1.2 Solid Enforcement

The need for ‘a level playing field’ was referred to multiple times by both carriers. A substantial investment was needed from AV and Spliethoff to comply with the limits on sulphur emissions. Naturally, this increases operational costs and decreases their competitive position with respect to other non-compliant carriers whom do not make this investment. Therefore it is deemed of valid importance that the enforcement is on a substantial level, ensuring that all carriers comply with regulations.

“..what we do not want to see is that we invest, thoroughly invest, and that others unseen or without punishment or at least without significant punishment, without investing themselves and without the right fuel operate. “

(Interview Spliethoff, 2016)

Prohibiting non-compliance is considered of valid importance by AV and Spliethoff and would restore an equal level playing field. Spliethoff's membership of the Trident Alliance, a group of like-minded carriers demanding robust sulphur enforcement, endorses this (The Trident Alliance, 2015). As soon as the limits entered into force, solid enforcement methods were desired by both carriers. In line with this, the problems with current penalties and measuring methods were highlighted. Retrofitting vessels costs several millions of euros while the current fee for non-compliance is e.g. solely 1000 euro in Finland. Thus several carriers

rather risk the fine than retrofitting their vessel (Interview Anthony Veder, 2016). In addition to that, both carriers emphasized that methods for measuring during inspections are not accepted by all carriers, nor is it standardized yet. Measuring methods should be universally accepted by policy makers and carriers. In sum, AV and Spliethoff desire trustworthy, universally accepted ways of inspections with, in the case of non-compliance, substantial consequences (Interview Anthony Veder, 2016; Interview Spliethoff, 2016).

4.2.2 The Policy Network

The policy network is characterised by organizations involved in political-administrative rules and resources. It encompasses nine organizations that range from governmental authorities to organizations (indirectly) representing the industry's interests in government negotiations.

4.2.2.1 International Maritime Organization

The International Maritime Organization is a "...global standard-setting authority for the safety, security and environmental performance of international shipping." (International Maritime Organization, 2015a). The main goal of this specialized United Nations office, is to create a fair, effective, universally adopted and implemented regulatory framework for the shipping sector. The headquarters are based in the UK and it has 5 regional offices. The IMO is often criticized for its consensus seeking decision procedures. Results out of these lengthy and exhausting procedures are often aimed at the lowest common denominator (Mitroussi, 2004). Since the IMO has the tendency to search for widely accepted solutions only. The IMO is often accused of being pressured by its members. IMO members protect the interests of carriers since carriers indirectly finance the organisation (Mitroussi, 2004).

The IMO's Members

Its members are the 171 Member States and 71 Observer Organizations which encompass International Governmental Organizations (IGOs) and Non-Governmental Organizations (NGOs). All states that are member to the United Nations (UN), can become member state to the IMO and are allowed to vote. If states are not a member of the UN, a certain procedure must be followed under the IMO convention to become a member. Also for obtaining an NGO with consultative status or IGO observer role within the IMO, several criteria and specific procedures applies (International Maritime Organization, 2015b). Nor NGOs, nor IGOs are allowed to vote but can provide technical advice and assist in the development of a regulatory framework to the organization. Moreover, these NGOs and IGOs arrange side-meetings and conferences during the regular IMO meetings. Examples of NGOs are the Clean Shipping Coalition (CSC) and the International Association of Classification Societies (IACS). Examples of IGOs are the European Commission and via them, the European Maritime Safety Agency (EMSA).

Organizational Structure

The IMO's assembly is the highest governing body of the organization and is composed out of all member states. This body has a final say in adopting resolutions and elects the council. The council is the executive

body of the IMO, it is responsible for supervising the work of the organization and its committees. As shown in figure 6, there are five committees to the IMO in charge of specific topics.

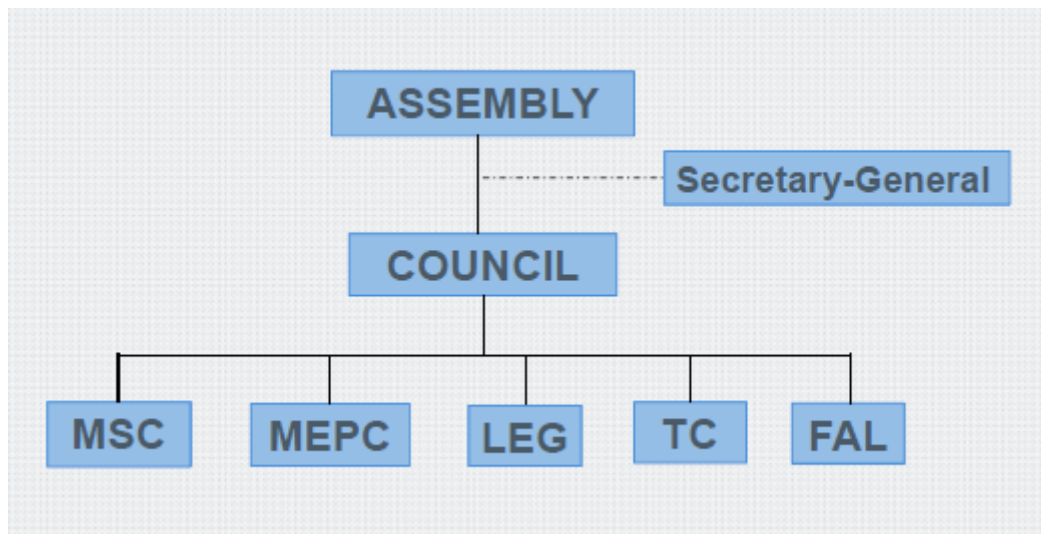


Figure 6. Organizational structure of the IMO. Source: International Maritime Organization, (2015a)

Before 1993, the IMO only fragmentally dealt with environmental safety issues but from 1993 it started to use a more holistic approach. The Marine Environment Protection Committee (MEPC) was installed, this committee was also concerned with the limits on sulphur emissions (Mitroussi, 2004).

Limits on Sulphur Emissions and the IMO

The main task for the IMO was to find consensus among its members for adopting global sulphur limits. The first limits on sulphur emissions entered into force in 2005 and in 2008, Marpol Annex VI was amended with a plan for stricter limits. The fear for increased costs due to non-availability of LSFO caused great concern amongst both the fuel suppliers and carriers (ECSA, 2015; Interview Sander den Heijer, 2016). Therefore the IMO pledged to a fuel availability study for 2018 to thoroughly investigate whether fuel deficiencies would indeed be the case (International Maritime Organization, 2015e). Issuing this study is one of the results of the IMO's consensus-based characteristics. As the IMO is a UN-body, member states are obliged to implement its policies. However responsibilities for developing solid enforcement and compliance methods are designated to its member states and remain a tough nut to crack (Bloor et al., 2013; van Leeuwen, 2010). To tackle this, the IMO developed a mandatory audit scheme for member states which will come into effect starting in 2016 (International Maritime Organization, 2013).

The IMO's Position

The IMO's 'opinion' is composed out of its member states whom have the right to vote, influenced by the IGOs and NGOs. Statements about opinion of 'the IMO' versus carriers can thus not be described as such. It has a worldwide palette of member states with varying perspectives on regulations in the shipping sector. Therefore, there is no 'one IMO ideology'. North-Western Europe, US and Canadian member states are in favour of solid enforcement and more stringent regulations as can be seen by the establishment of individual

ECAs in these areas. These member states are pushers for more stringent environmental legislation at the IMO (Interview Sander den Heijer, 2016). Whereas other member states have a more wait-and-see, conservative attitude with regards to environmental legislation (Interview Sander den Heijer, 2016). Besides these differing perspective of the IMOs member states, there are also such differences in the other IMO-attached bodies.

Besides the member states, the IMO withholds IGOs and NGOs with an observer role. In total there are 140 observer organizations to the IMO. All overarching international associations of the network of carriers as defined for this study, have such a role at the IMO (International Maritime Organization, 2015c). Although these members cannot vote, they can ask for action through action papers, are consulted for their expertise and can submit documents to inform the IMO members (International Maritime Organization, 2015a). The perspectives of the IGOs vary in accordance with their respective member states. And the perspectives of the NGOs in line with the organization's mission. These organizations range from the Clean Shipping Coalition which is a coalition of environmental NGOs to the ICS which is the international association for carriers. Hence the perspectives on matters such as the sulphur requirements vary greatly.

4.2.2.2 Paris Memorandum of Understanding

Paris Memorandum of Understanding (Paris MoU) is an international organization consisting of 27 participating maritime administrations covering the waters of the European coastal States and the North Atlantic basin from North America to Europe. Paris MoU was initiated to compensate for the overall variability and inconsistency in port state inspections (Sampson & Bloor, 2007; van Leeuwen, 2015). The organization and its member states aim to eliminate operating sub-standard ships by ensuring harmonized port state control and specifically checking safety, labour, environment and security conditions (Interview Paris MoU, 2016; Paris MoU, 2015b). Avoiding ports is too costly for carriers which makes harmonized and solid port state control a key factor in solid enforcement (van Leeuwen, 2010). The interviewee was the organization's Deputy Secretary General.

After the sulphur limits entered into force, Paris MoU translated the requirements into ways of information provision and harmonized inspection methods for the port state inspectors. The differentiated sulphur limits around the world were one of the biggest stumble blocks for Paris MoU. Besides the distinction between SECA and non-SECA areas, the issue is further complicated by the simultaneously existing EU and Marpol regulations. Although this is covered in the inspection guidelines, the bureaucratic burden for port state inspectors is enhanced. Overall Paris MoU sees, together with more stringent environmental regulation in the shipping sector, a shift from solely focusing on quality, health and safety (QHS) requirements towards the incorporation of environmental requirements in these (Interview Paris MoU, 2016).

4.2.2.3 Ministry of Infrastructure and the Environment – Directoraat Generaal Bereikbaarheid

The Directoraat Generaal Bereikbaarheid (DGB) is part of the Ministry of Infrastructure and the Environment. It is in charge of the maritime affairs and its task is to translate international law from the EU or IMO into Dutch policies. For the sulphur limits, implementation was discussed during the Operationeel

Overleg Overheid Reders (OOOR) which is led by DGB and held together with the KVNRR, classification societies and *Inspectie Leefomgeving en Transport* (ILT). The main mission for DGB is to ensure safety and the integration of environmental values, as fundament for economic development of the shipping sector (Interview DGB, 2016).

4.2.2.4 Ministry of Infrastructure and the Environment – *Inspectie Leefomgeving en Transport*

The *Inspectie Leefomgeving en Transport* is a Dutch governmental authority part of the ministry of Infrastructure and the Environment. This department is in charge of the port and flag state inspection of its registered and berthing vessels. The interviewee was the Port and Flag state coordinator from the department *handhaving zeevaart*. ILT aims to enhance compliance and enforcement of laws and regulations for the built, living, public space and the environment through companies, institutions, citizens and other governmental authorities (Ministerie van Infrastructuur en Milieu, 2015). Considering the shipping sector, ILT strives for increasing compliance and simultaneously increasing the safety of a vessels' crew. After the sulphur limits entered into force, ILT started executing inspections focused on the sulphur requirements and developing command-and-control mechanisms to increasingly ensure compliance (Interview ILT, 2016).

4.2.2.5 European Maritime Safety Agency

The European Maritime Safety Agency (EMSA) is an agency of the European Union. It strives for 'Quality shipping, safer seas, cleaner oceans'. The EMSA hence works to improve and enhance "...the quality of shipping and to ensure a high, uniform and effective level of maritime safety, maritime security, prevention of, and response to, pollution caused by ships as well as response to marine pollution caused by oil and gas installations." (Interview EMSA, 2016). The role of EMSA with regards to the sulphur requirements, should be understood as a policy preparatory entity that has no enforcement powers. It assisted the Commission in stabling the scientific and technical fundament for the establishment of the EU SECAs.

4.2.2.6 European Union

The EU and its member states are frontrunners with regards to environmental legislation at local and IMO level. The EU-based SECAs show the urge of the EU to limit sulphur emissions locally. And as described above, it also stimulated more strict environmental legislation at the IMO. Moreover the EU issued an alternative fuels directive which makes it obligatory for its member states to have a functioning LNG network before 2020 (European Commission, 2014). In this sense, the EU is a pusher for more stringent environmental legislation internationally and locally. Moreover, it proactively stimulates the sector and its member states in achieving this.

4.2.2.7 Nautilus International- FNV Waterbouw

Since 2006, FNV Waterbouw is part of the larger overarching association Nautilus International (NI) and together they compromise the labour union representing the employees from the shipping sector working from sea and ashore (Nautilus International, 2015). The interviewee was a senior industrial assistant at NI. As a labour union, their main mission is to represent the employees in the shipping sector on topics like wages and working-conditions, and health and safety requirements.

The introduction of the sulphur limits posed a challenge to NI. As a labour union, the health aspects of employees in the shipping sector are of valid importance by focusing on QHS requirements. Working on a vessel that is burning HFO means direct inhalation of the emitted smoke. Strict sulphur limits apply in SECAs due to the combination of ship density and HFO's adverse health effects in these densely populated areas (US EPA, OAR, 2015). This does not match the fact that employees in the shipping sector permanently work, closely to the emissions. In this sense, the sulphur limits are an extension of quality, health and safety regulations (van Koppen, 2014). On the other side, the introduction of the sulphur limits imposes additional work on board. Switching oil in the engine room sometimes gives errors. Besides this, the administrative burden increases since employees should maintain records as proof of the vessel's compliance (Interview NI, 2016; Dryad Maritime, 2015). Besides balancing between health benefits and increased work load, NI is also weighing the additional costs of implementing the sulphur requirements which should not go at costs of the employees' salaries. Most important is an equal level playing field which can be achieved by strict, equal enforcement. Thus on the one hand, the sulphur limits provide health benefits but on the other hand it poses challenges in the daily work and financial situation of employees in the shipping sector. In this sense, NI needs to constantly balance between employee's desires and the conditions provided by the employers.

4.2.2.8 Lloyd's Register – Classification Society

Lloyd's Register is a, globally leading, classification society for the shipping sector and belongs to one of the Dutch recognized classification societies (ILT, 2015). Dutch recognized classification societies are approved classification societies with which carriers with the Dutch flag state can certify their vessels. Their overarching, international association is the International Association of Classification Societies (IACS) and its twelve member associations classify over 90% of the cargo tonnage (IACS, 2015). The interviewees were a Marine Operations Manager and Senior Marine Representative and a Marine Training Services- and Communication Manager.

Classification societies provide standards by which commercial ships are built, after which the vessel can be classified. Such a certification, is a prerequisite for operating the ship. The Dutch government decides which classification societies are recognized as organizations. Carriers can choose between these classification societies. Classification societies advise and are paid by carriers but work independently. Classification societies operate on an extended maritime technology and knowledge base (Interview Paris MoU, 2016; International Association of Classification Societies, 2011). Their purpose is three folded, to provide classification certificates, statutory services and assistance to carriers. First, classification Societies set classification rules based on International and own rules and regulations as a fundament for providing classification certificates, prior a vessel becomes operational. Statutory services are provided to regulatory bodies for effectively regulating maritime safety and pollution prevention (International Association of Classification Societies, 2011). Classification Societies also play an important role in the implementation and enforcement of IMO conventions. Their activities have been extended because a vessel's registration might be in a country that not belongs to its frequent trades. In that case, flag states lack direct access and a

worldwide network of inspectors which complicates inspections of their registered ships on a regular basis (van Leeuwen, 2015). And lastly, carriers that desire their vessels to be classified are assisted in the designing or retrofitting process by advising them on which strategic choices to make. For example, installing a scrubber or a dual fuel engine (Interview Lloyd's Register, 2016).

By the introduction of limits on sulphur emissions, Lloyd's register increased its research on related topics. Engines were tested for their capabilities to limits emissions and the potency of scrubbers is explored. All serves to appropriately classify vessels that are supposed to comply with the limits on sulphur emissions. According to Lloyd's register, solid enforcement of the limits on sulphur emissions is of valid importance. Lloyd's register is challenged by the limits on sulphur emissions, as their rules and regulations are sometimes not entirely up to date with newly developed technologies to comply. In that case, close cooperation with carriers and manufacturers helps to overcome this (Interview Lloyd's Register, 2016).

4.2.2.9 Port of Rotterdam

The Port of Rotterdam is the second most in-demand logistics place in the world (Port of Rotterdam, 2016). The Port of Rotterdam itself is by annual throughput the largest port in Europe (Port of Rotterdam, 2015a). The international, overarching organization of the Port of Rotterdam is the International Association of Ports and Harbours (IAPH). Ports form an important business partner and controlling authority for carriers. A potential modal shift was a major concern for the Port of Rotterdam when the limits were introduced. Since the ECA does not include the Mediterranean Sea, a shift of vessels unloading their cargo over there was predicted. However, this turned out not to be the case. Thus overall, the port is in favour of an equal level playing field for ports meaning all should enforce legislation in an equally strict manner (Interview, Port of Rotterdam 2016).

Port adaptation strategies as a result of the sulphur requirements is a balance of two sides. They persistently try to prevent loss of traffic through facilitating access to alternative compliance technologies. On the other hand, they aim to raise the 'image' of shipping in general (Gritsenko & Yliskylä-Peuralahti, 2013). This was also found with the Port of Rotterdam. The mission of the Port of Rotterdam is to facilitate vessels entering the port to the port's best capacities. In other words, they aim to continuously extend the range of carriers that can and desire to enter their port through providing outstanding facilities out of commercial interests. In this sense, the Port of Rotterdam is a commercial organization. However it is also partially publicly owned. Because of its partly public nature, it is obliged to pro-actively engage in sustainability initiatives that aim for a cleaner port (Interview Port of Rotterdam, 2016). In the sulphur debate, ports can thus be seen as balancing between being environmental leaders promoting green norms without loosing traffic and income (Gritsenko & Yliskylä-Peuralahti, 2013).

The daily operation of the Port of Rotterdam made some strategic changes as a result of the limits on sulphur emissions towards more controlling and pro-active. The Port of Rotterdam has an extraordinary inspection status. They have a supervisory role and in case of infringement, contact is sought with Port State

Control to actually take action. Besides inspections, the Port of Rotterdam also perceived the tightened limits on sulphur emissions as an opportunity for strengthening its role as a frontrunner (Interview Port of Rotterdam, 2016). In this case, being a frontrunner in facilitating vessels operating on new technologies was part of the strategy. The development of an LNG terminal is a clear example (Port of Rotterdam, 2015b).

4.2.3 The Economic Network

The economic network consists out of nine organizations that are all involved in (financial) transactions with carriers. These organizations (in)directly govern a carrier's decision over economic rules and resources.

4.2.3.1 KVNR

The Koninklijke Vereniging voor Nederlandse Reders (KVNR) is the Dutch branch association representing almost 95% off all Dutch carriers. The interviewee was in charge of the environmental affairs at KVNR. KVNR collectively represents the interests of these carriers, provides them with individual advice if desired and tries to open up network possibilities for carriers (KVNR, 2015). The carrier's interests are represented with regards to labour related matters and CAOs. And the KVNR informs them about future laws and regulations. The other way around, carriers inform the KVNR if they come across certain problems. The KVNR is also in contact with the IMO, this is done via their European and international overarching organizations, the ECSA and the ICS (Interview KVNR, 2016).

The sulphur limits required the KVNR to actively engage via the ECSA and ICS on international level in the debate. After the limits were introduced, the practical implications on national, Dutch, level were discussed in the OOOR meetings. Several issues appeared. Carriers as united in the KVNR feared a lack and consequently rise in prices of LSFO. In hindsight, the rise in costs remained absent but this is mainly due to the current, low price on oil (ECSA, 2015a). But the benefits still highly depend on the contractual terms between carriers and charters (Notteboom & Vernimmen, 2009). In addition to that, the enforcement methods remained unclear. Since the KVNR's main goal is to ensure an equal level playing field between Dutch and International carriers, it repeatedly stressed this topic. It may be clear that the KVNR does not desire all vessels to be tested but risk based testing is appropriate in which badly performing carriers or vessels may be additionally tested. This is in line with the ship risk profile as constituted by Paris MoU (Paris MoU, 2012). The KVNR and ECSA also desire that inspectors should be more flexible than the current band width allows them since overall limits also have decreased (ECSA, 2015; Interview KVNR, 2016).

4.2.3.2 Damen Shipyards

Damen Shipyards is an international shipyard with Dutch roots. It both design, build, repair and converse innovative ships (Damen Shipyards, 2015). The Community of European Shipyards Association (CESA) is the European overarching association of shipyards. The introduction of the limits on sulphur emissions did not have that much effect on Damen shipyards since the ships they design are vessels that already operated on MDF or MGO, both compliant fuels (Damen Shipyards, 2016). Overall, Damen shipyards perceives

carriers as their customers, it thus supplies in accordance with carriers' desires (Interview Damen Shipyards, 2016).

4.2.3.3 Bunker Suppliers

Bunker suppliers in the shipping sector have a particular role in the sulphur debate since these are the ones that should sufficiently supply compliant fuels. During the sulphur debate, instead of responding to the market opportunity of supplying compliant fuels, bunker supplier persistently claimed that compliant fuel would not be sufficiently available (Interview Sander den Heijer, 2016). Even today, with regards to the global 0.5% cap on sulphur content in fuel, the International Bunker Association, the overarching association for bunker suppliers, claims supply will not be able to meet demand. It will even lead to a 25% cost disadvantage between compliant and non-compliant carriers (Bunkers Port News, 2016). In addition to this, the quality of bunker fuel remains a touchy subject. Bunker suppliers tend to produce fuel on the borderline because diminishing additional sulphur content increases costs. Therefore they precisely produce fuel with 0.1 sulphur content (Interview KVNR, 2016). However, since the fuel is a liquid substance, samples vary (Interview IB, 2016). Although the carriers trusts on the bunker supplier's fuel quality and the bunker delivery note, still he, as the buyer is the prime responsible when the fuel exceeds limits by over 5% (Gard, 2014, Interview KVNR 2016). Especially when the SECA was just introduced, Intercontinental Bunkering received a lot of non-compliant fuel claims demanding testing and retesting (Interview IB, 2016).

4.2.3.4 Intercontinental Bunkering – Bunker Broker

Intercontinental Bunkering (IB) is a bunker broker and functions as a mediator between bunker stations and carriers. It ensures that its customers, who are all situated in North Western Europe, are able to bunker globally in a reliable manner. The interviewee was the commercial manager of IB. IB operates via a large database with local suppliers, through which it arranges that carriers can bunker globally with trusted suppliers. Since it varies between locations which kind of fuel is available, IB also assists in planning trips as efficient as possible for carriers.

The introduction of the sulphur limits posed interesting challenges to IB. Compliant fuel is not readily available thus some carriers will have to change their routes. IB assisted them in finding the most efficient trade. Since the sulphur limits pose additional challenges in finding the most efficient route without non-compliance, they provided IB with some additional 'added-value' in their work for carriers (Interview IB, 2016).

From a bunker fuel availability perspective, compliance is not as straightforward as it seems for several reasons. To start with, non-compliance is sometimes more beneficial than complying to the regulations because changing routes is very costly for carriers. Herewith, the competitive position of compliant carriers is weakened as compared to non-compliant carriers (ECSA, 2015a). Also, sometimes it is simply not possible for carriers to obtain compliant fuel on their trade. In this cases, guidelines for exemption to support the carriers' fuel non-availability claim were developed by Paris MoU apply (Paris MoU, 2015a). Lastly, one sample can not always be used indicative for the entire bunkered fuel in the tank. Some carriers blend on

board, others bunker the readymade substance. In both case the substance is liquid. Some samples might contain 0.9% sulphur, others 0.11% (Interview IB, 2016). The margin of 0.05% is unchanged which substantially limits the bandwidth (Interview KVN, 2016). Currently, European policies for accidental non-compliance are still relatively lax and the ECSA emphasizes it should remain this way (ECSA, 2015a).

4.2.3.5 Insurance Agency - DUPI Insurance Group

The DUPI Insurance Group (DUPI) is a Dutch Maritime insurer. It became clear that the sulphur limits played no role in their insurance decisions. Even the track record of e.g. detentions a certain carrier is irrelevant to the insurer. There is no contact between DUPI and actors from the societal or political network with regards to the sulphur limits (Interview DUPI, 2016).

4.2.3.6 Bunker Storage Facility - Vopak

Vopak is a supplier and storage holder of bunker fuel. Their overarching organization, Intertanko, is an NGO with a consultative status at the IMO (International Maritime Organization, 2015c). It was indicated that Vopak solely follows market developments. In other words, if demand for LSFO rises, Vopak makes proper arrangements for supply and storage. It fits its own storage units accordingly. There is no contact between Vopak and actors from the societal or political network with regards to the sulphur limits (Interview Vopak, 2016).

4.2.3.7 Financers

Financers decide on basis of a variety of criteria whether provide the necessary funds to finance a vessel. Such criteria include fuel use, ballast water treatment, flag states, emissions and the pro-activeness of carriers with regards to legislation (Interview Financer X, 2016) For example some carriers may reserve space in their vessel for future retrofitting. Although LNG is considered the marine fuel of the future, some organizations pointed at financers for their unwillingness to finance e.g. LNG vessels (ECSA, 2015b; Interview KVN, 2016; Interview Damen Shipyards, 2016; Interview NSF, 2016). However financers follow market developments as well. Considering the LNG case, if no LNG-bunker network is available and no charterers are willing to use these vessels, there is no sense in financing them. By deciding whether or not to finance a vessel, strictly speaking financers do interact over the economic rules and resources in the economic network. But in practice they follow market developments and solely fulfil a facilitative role within the by the market, provided boundaries.

4.2.3.8 Charterers – BICEPS initiative

Charterers are economic partners of carriers by providing the cargo for a vessel to transport. Being the sole customers of carriers instead of the other way around, charterers are powerful players in the economic network. Charterers are able to provide the market push for carriers to gradually shift to more environmentally friendly modes of shipping. The majority of charterers aims to transport their cargo as cheap as possible but initiatives going beyond this are popping up. This is due to the increasing interest of Life Cycle Assessment from customers, for which they need to get acquainted with the entire line of production of a specific product (van Koppen, 2014). In this line of reasoning, charterers can influence a

ship operators' environmental policies (Bloor et al., 2013). The Biceps initiative is an example of such an initiative and provides the angle for this key player. Part of this 'pledge' are five multinational business namely AB InBev, AkzoNobel, DSM, Friesland Campina and Huntsman. These business have joined forces in developed a common and concurrent approach in their procurement with regards to selecting carriers for their ocean freight (Huntsman, 2015). For this analysis, it is focused on these 'environmentally progressive' charterers.

4.2.3.9 The Trident Alliance

The Trident Alliance is a group of carriers striving for equal and strict enforcement of the Sulphur limits for environmental and human health benefits and responsible business. It is acknowledged that enforcement methods vary per country, however overall enforcement of the sulphur limits should be robust and transparent (Trident Alliance, 2015).

The Trident Alliance is an alliance of carriers that was initiated in July 2014. While preparing to comply with the limits on sulphur emissions, Vice-President Environment of Wallenius Wilhelmsen at that time, Roger Strevens Logistics was “..struck by the complete silence from the authorities responsible with regard to how the regulations would be enforced.”. Exchanging experiences with fellow representatives in the shipping sector made clear that they shared his concern. The Trident Alliance was initiated to put the desire for robust enforcement of the sulphur regulations globally, on the agenda. Nowadays the Trident Alliance is composed out of 35 companies that are working towards a level playing field with regards to the sulphur regulations.

4.2.4 The Societal Network

The societal network is composed out of civil society organizations led by public awareness. For this case it solely consists of one organization.

4.2.5 The Northsea Foundation and Clean Shipping Coalition

Stichting de Noordzee or the North Sea Foundation (NSF) is the sole Dutch organization that was actively involved in the 'sulphur debate'. They were part of the Dutch delegation that was deputed to the IMO during discussions on the topic. In addition to that, as a member of 'Platform Schone Scheepvaart' this organization is intensely involved in discussions on more sustainable shipping at a national level (Interview KVNR, 2016; Interview NSF, 2016). Besides their national involvement, they are also a Dutch member of CSC. CSC is a coalition of several environmental NGOs founded in 2009, who jointly fulfil one consultative status at the IMO. It is a self-claimed: “..global environmental coalition exclusively dedicated to shipping.”. The CSC employs a cooperative attitude and a holistic view in reaching a cleaner shipping sector which performs above what is lawfully desired (Clean Shipping Coalition, 2015). The interview was conducted with an employee of both NSF and CSC. Since the position of NSF is in line with the position of the CSC, depending on the (inter)national context either one of them is mentioned. If both are meant, CSC is mentioned.

Before the introduction of the limits on sulphur emissions, the CSC experienced the increase in counter-expertise from organizations trying to slow down the implementation date of the limits. Overall, the CSC desires the limits to become more stringent than is planned currently (Interview NSF, 2016). Since the limits on sulphur emissions have been introduced, the case is considered a 'done deal' by the CSC. Nor the CSC, nor NSF involve in the discussions between policy making organizations and carriers on solid enforcement methods. For the CSC, the debate will be reopened once the fuel availability study is completed and the debate 2020/2025 starts.

5. Analytical Chapters

This chapter analyses all organizations based on the relevant triad-network model criteria. First it highlights the core of the network, the carriers. Hereafter the roles and dynamics within the three networks are set forth. It exposes the ways in which the networks are connected by highlighting their key activities and issues. Lastly, it draws conclusions on the ecological rationality, ecological modernisation theory and the theoretical problem statement.

5.1 Carriers

The carrier are at the core of the triad-network model as can be seen in figure 7.

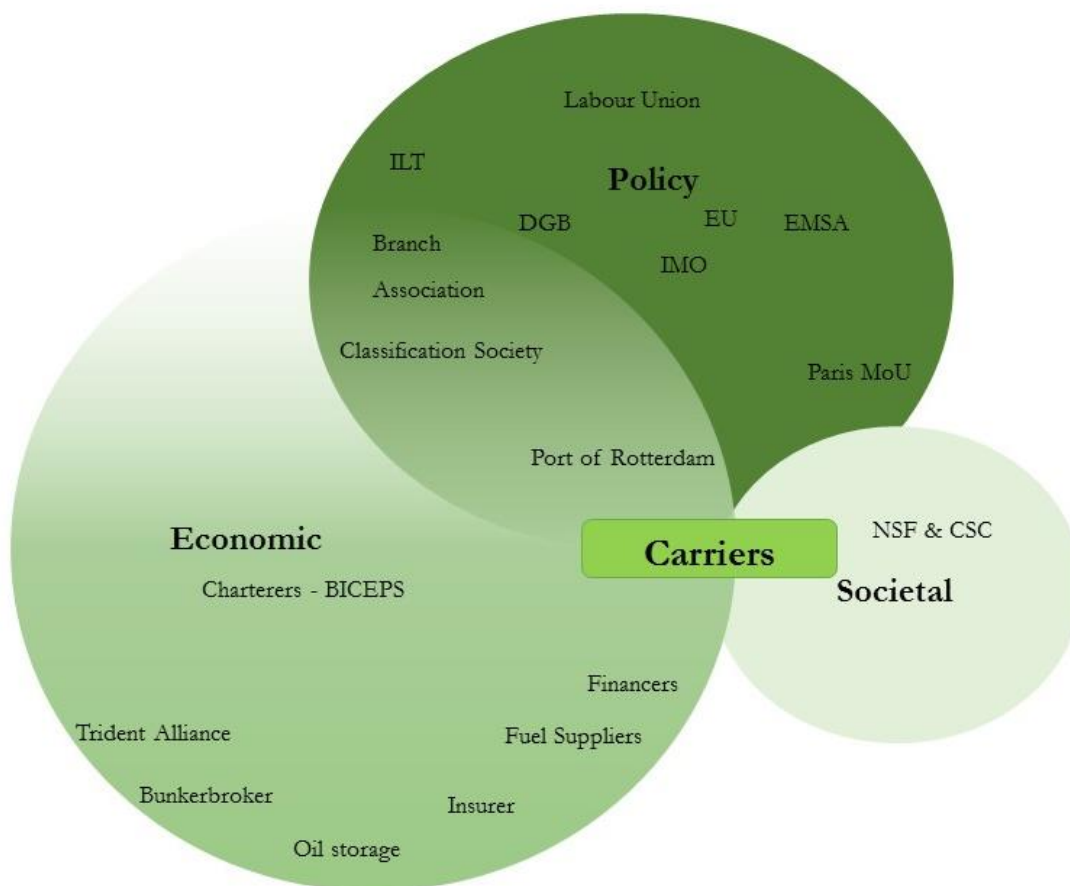


Figure 7. Overview of all networks and their organizations.

Carriers influence policy development via their overarching organizations. Although non-compliance is no option for these carriers and the polluting effects of sulphur emissions are undeniable, performing extra-legal is out of questioning. Carriers that aim to operate more sustainably, ensure to do it in a profitable manner (Interview Paris MoU, 2016). The main driver for selecting a compliance strategy is economic. As long as non-compliance pays off, carriers that do comply obtain a competitive disadvantage. In other words,

there remains an unequal level playing field. Thus not solely global standards but also global robust enforcement to eliminate non-compliance is desired by (these) carriers (van Leeuwen, 2010).

5.2 The Policy Network

The policy network consists out of nine organizations whom in a diverse way influence policy making and implementation.

5.2.1 Roles

Organizations from the policy network have varying roles in policy elaboration and/or enforcement. Policy elaboration starts with the IMO, the most central actor, responsible for international policy elaboration. Prior to discussing topics at the IMO, a DGB led delegation constitutes a national opinion through combining input from representatives from all networks and constitutes a national opinion (Interview ILT, 2016). The EU develops its own policies on the scientific bases provided by the EMSA (Interview EMSA, 2016). EU and IMO policies are translated into national legislation and concrete inspection methods in a joint effort of DGB, ILT and Paris MoU. Paris MoU ensures that the inspection methods are harmonized amongst its member states (Interview Paris MoU, 2016). The union, NI aims to incorporate solid labour conditions in policy elaboration and implementation (Interview NI, 2016). Classification societies, such as Lloyd's register, function both as a business partner for carriers, to certify their vessel in the most efficient way and as an enforcing entity via the Dutch flag state (Interview Lloyd's Register, 2016). The Port of Rotterdam aims to optimally provide the necessary facilities to carriers and inspects vessels arriving in their port as well (Interview Port of Rotterdam, 2016). Within the policy network, authority is designated to institutions with differing interests. The IMO solely introduced a sulphur cap, without a solid management plan for enforcement. Hence the enforcing entities are still struggling with how to solidly implement enforcing methods (Gritsenko & Yliskylä-Peuralahti, 2013).

It is chosen to operate a strict definition of a core and a periphery for this study as proposed by Mol (1995). As can be seen in figure 8, the EU, DGB and the IMO belong to the core of the international policy network since these governmental authorities can influence day to day policymaking and thus influence the policy outcome by voting. The other organizations engage in lobbying activities and are consulted so these belong to the periphery of the policy network.

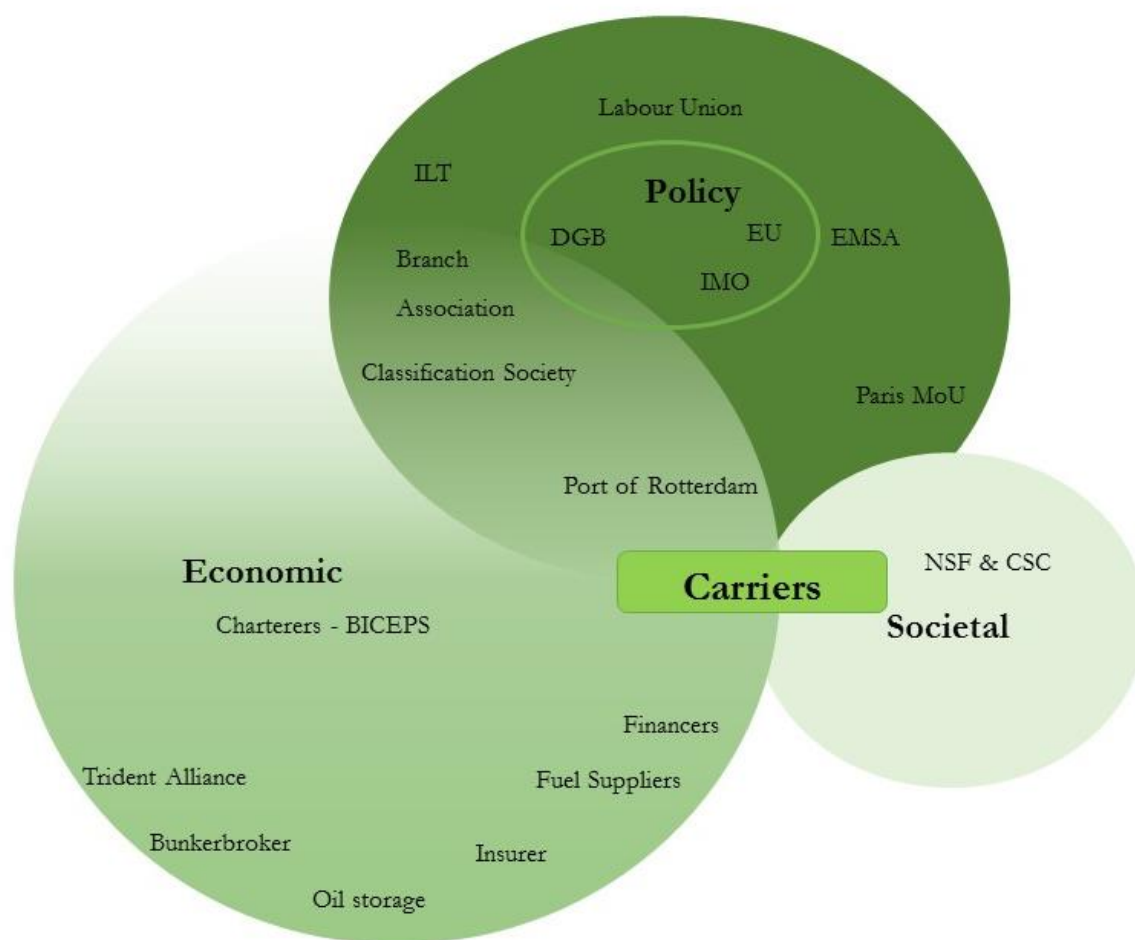


Figure 8. The triad-network model showing the policy network's core.

5.2.2 Relations

The representation of national and industrial interests is thoroughly intertwined in the policy network. The EU is a dominant actor by influencing policy making at IMO level by using its authority to implement local legislation as a stick. During the negotiations on amending Marpol Annex VI, the EU threatened to use new EU standards on SOx emissions if the global standards would not be satisfactory (van Leeuwen, 2010). The omnipresent desire for an equal level playing field among the IMO's 'more progressive' member states, IGOs and NGOs prevailed and globally 'acceptable' limits were introduced. With global limits on sulphur content in marine fuels from 2008 onwards, the level playing field was, at least on paper, restored (Interview Sander den Heijer, 2016).

Lloyd's register and the Port of Rotterdam have a special role since they are also business partners from the carrier. Besides enforcing legislation upon carriers, carriers are also their customers which makes them financially dependent of the carrier. Hence these organizations balance between enforcing policies and assisting the carrier in operating in the most efficient way and to its fullest capacity.

The remaining policy implementing organizations, EMSA, Paris MoU, DGB and ILT focus on finding a way in effective implementation of the sulphur regulations. In the shipping sector, coherent enforcement is dependent on the diversity of chosen compliance-strategies. For achieving robust enforcement, organizations from the policy network are dependent on carriers via their branch association (KVNR) to obtain information and experiences from the field (Interview ILT, 2016). And since carriers implemented a variety of solutions, this remains a complex challenge (Gritsenko & Yliskylä-Peuralahti, 2013).

The Dutch government is financially ‘dependent’ of the shipping sector to remain a competitive actor. If the Dutch government fiercely enforces the sulphur limits and neighbouring countries lag behind, a modal shift could occur (Interview ILT, 2016). Hence implementing policies for the shipping sector always occurs in thorough consultation with organizations from the field (Interview Port of Rotterdam, 2016). A consultation round for actors from the field, led by either DGB or ILT, is always executed before implementing policies (Interview Port of Rotterdam, 2016). On their turn, carriers are dependent on the policy network to enforce policies in a workable manner. But the consultative approach of the policy network towards carriers and other networks, ensures that no unworkable enforcement methods are implemented. In this sense, the policy network is at least equally dependent on carriers as the other way around.

5.2.3 Mechanisms

Maritime actors have much influence in the formal and informal policy elaboration processes and enforcement appears to be a complicated task. During the policy elaboration process, policy making is not solely up to the policy network. Influencing processes at policy level in the shipping sector does not go through one individual organization. All actors that haven been identified in the network are united in an international, and sometimes a European, association that is representing their collective interests at IMO level. Besides proactively engaging in these debates, these overarching organizations are also consulted by the Dutch government to form a national opinion as a member state of the IMO. This process of influencing IMO policy proposals is shown in figure 9, since the KVNR is a key player from both the economic and policy network, it is used as an example.

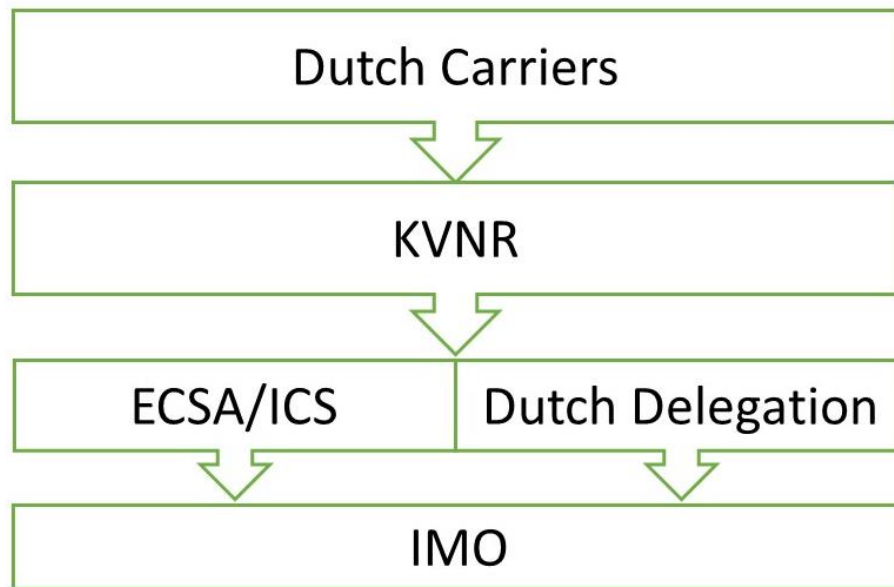


Figure 9. Ways of influencing policy making in the maritime sector.

Dutch carriers are united in the Dutch branch organization, the KVNRR. The KVNRR influences processes at the IMO via two channels. First, via its overarching European association, European Community of Shipowners' Association (ECSA) and its overarching international association, International Chamber of (ICS) which are both NGOs in consultative status of the IMO. Second, the KVNRR is consulted as part of the Dutch delegation that is represented by the right to vote as a Dutch member state. Besides these formal mechanisms, there are also informal mechanisms at work. At IMO level, the IGOs and NGOs host side-meetings during IMO conferences in which they aim to convince or inform policy makers from the member states (Interview Sander den Heijer, 2016). And although NGOs and IGOs can represent any maritime-related organization at IMO level, the industry-based ones are in the great majority (van Leeuwen, 2010). In this sense, an organization primarily representing carriers' interests possesses multiple resources to influence decisions on policy making.

Once policy is in place, enforcement is arranged by a variety of organizations and processes. The formal mechanisms for enforcing the sulphur limits arrive for Dutch carriers via two ways. The EMSA provides the EU with the scientific and technological basis for policy elaboration and inspection guidelines in accordance with the Sulphur Directive (European Commission, 2012). ILT combines, based on inspection guidelines provided by Paris MoU, the Sulphur Directive with Marpol Annex VI into one practical inspection (International Maritime Organization, 2005; Interview Paris MoU, 2016). Registering results from the inspection requires some administration efforts since these are registered in two databases, an EU and international one. This process is depicted in figure 10.

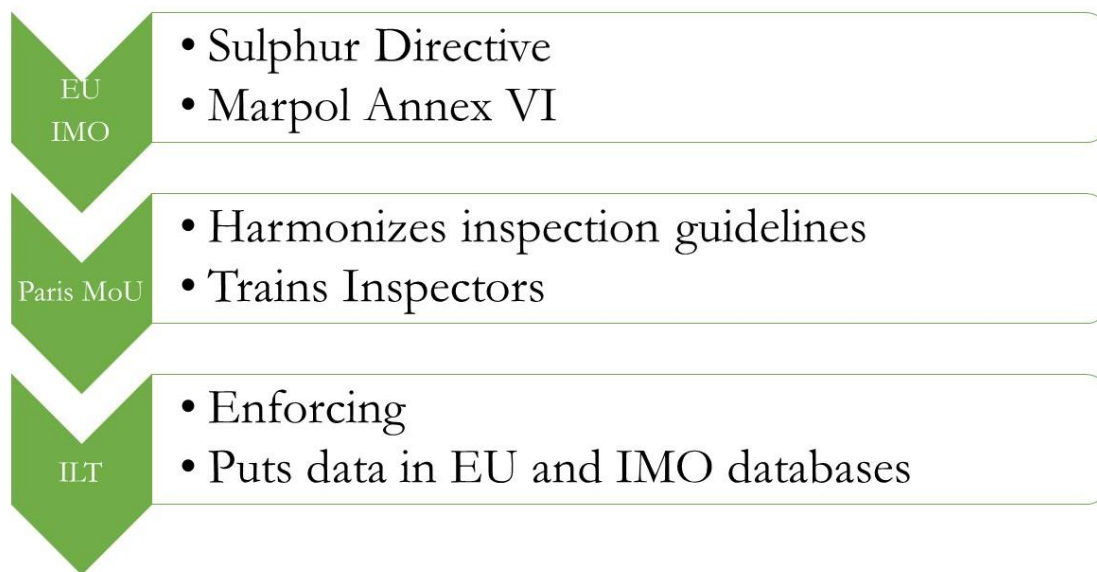


Figure 10. Policy implementation process of EU and International legislation.

Lloyd's functions as a standard setting authority during the construction or retrofit of a vessel. The Port of Rotterdam and ILT conduct general port state inspection in which the latter organization has the authority to stand a vessel ground. ILT currently uses the registration detention system, is still developing a consistent measuring method and has not yet implemented a fine-based penalty yet (Interview ILT, 2016). Besides ILT, the Port of Rotterdam also has the mandate to inspect vessels but is unable to detain them. Since the port is in some way also a partner of the carrier, it mainly relies on carriers 'professional attitude' to steer them into compliance (Interview Port of Rotterdam, 2016). Paris MoU executed Concentrated Inspection Campaigns testing a carrier with specific emphasis on a certain topic. If results are below-standard, these are sent to the IMO (Interview Paris MoU, 2016). It is important to note that Paris MoU is the sole organization that besides sending these reports, does not influence policy making at IMO level in any way. It is clear that carriers have influence on the policy elaboration and implementation process in various stages of the process and via various channels. Enforcement mechanisms have not been solidly arranged yet and the involvement of two legislative bodies puts additional administrative pressure on inspectors.

5.2.4 Worldviews

Organizations in the policy network aim for implementing an effective and workable version of the sulphur requirements. To achieve this, on a national level DGB, ILT and classification societies work together with the KVMR to translate IMO and EU law into national policies. In this sense, the joint communication strategy of organizations from the policy network aims for implementing effective and workable environmental policy. But on an international level, worldviews differ amongst the IMOs member states. Along with carriers' attitude, some member states are in favour of more stringent regulation whereas other have a more conservative attitude towards regulation. On top of that, if certain member states implement

local more stringent regulation, their associated carriers will jointly strive for a global equivalent to restore the equal level playing field (Interview Sander den Heijer, 2016).

5.2.5 Type of Policy Network

The policy network with regards to decisions made on the sulphur requirements can be considered a hybrid of a closed policy community and an open issue network. In official terms, the amount, composition and degree to which stakeholder organizations are able to influence the policy making process is limited. But the informal and unofficial ways, extent and composition of non-members influencing the decision making process is at least equally large. This section compares IMO decision-making procedures with the characteristics of the policy networks as defined by Mol (1995). The characteristics that are analysed are the amount of members, the way of getting access, the long term viability, way of interaction, consensus seeking procedures, ideologies, policy issues, relationships, relation to the government, interaction with the government and 'power games'. Applying these characteristics gives the following conclusions.

The amount of members in the official decision-making procedures is limited but there is a large preparatory lobby 'phase' to the process in which a large group from both the governmental and interest group site is represented. Actual participation in the IMO is limited to its member states which must either be UN member states or follow a strict selection process. IGOs and NGOs that would like to have a consultative role with the IMO are also obliged to follow a strict selection process (International Maritime Organization, 2015a). Herewith access is restricted by stringent entry criteria in which expert knowledge and the occupation of a certain position is specifically emphasized (International Maritime Organization, 2015a). However, informally non-IMO-member states such as IGOs and NGOs, can influence the IMOs members through preparatory meetings. On the long term, the IMO can be considered a stable organization with a stable official membership which expresses continuity. Official IMO meetings are infrequent in absolute terms but this is logical given the number and type of members that need to be present (Mitroussi, 2004). The informal interactions are numerous and hard to map. The IMO is consensus-based and highly values procedures and rules of the game in decision-making. But the high number of members, with varying perspectives prevents easy consensus as well. Although the IMO as an institution defined a common worldview, there is no common worldview or ideology amongst the IMOs members. The topics that are discussed are technical but not at all de-politicized, national politics plays a large role in international rule-making at the IMO (Interview Sander den Heijer, 2016). Within the IMO there is much exchange of information but not of authority and economic values. Lobbying also plays a big role, especially when actors need reach consensus without such authoritative power tools. The member states are in need of expert and practical knowledge from interest groups in order to make decisions. Classification societies often possess more technological information and carriers more information from the field than governments. This is illustrated by the national, preparatory phase prior to the meeting of the assembly. During this phase, all kinds of (sub) committees with experts and interest groups prepare a policy proposal that is discussed by the assembly (the governmental representatives) only in its final form. During this preparatory phase also

governments (in) directly join the discussions and once the policy proposal is discussed in the assembly, IGOs and NGOs can still influence governments by asking for ‘speaking time’ during the discussions. Evidently, IGOs and NGOs are dependent on member states for voting. Thus member states and IGOs & NGOs at the IMO are interdependent in information provision and decision making. One could consider these consensus-based procedures of the IMO, to reach international legislation as a balanced and positive sum game since implementing globally equivalent limits on sulphur emissions has in principle globally equivalent consequences (Interview Sander den Heijer, 2016).

5.3 The Economic Network

The economic network consists out of nine organizations. Together these organizations constitute economic relations within the network and with carriers.

5.3.1 Roles

The majority of organizations in the economic network has a reactive role towards carriers. The most influential actor in the economic network from a carrier’s perspective is the KVNR. The KVNR functions to inform carriers about policy developments and stimulates them into proactive compliance. For example, the KVNR influences carriers’ corporate strategies by demanding all Dutch carriers to be on the low-risk list of Paris MoU (Interview KVNR, 2016). The KVNR is a relatively autonomous branch association focusing on QHS, CAOs, is involved in the ‘platform Schone Scheepvaart and hosts expert seminars. The KVNR thus fulfils three roles of branch associations as mentioned by Mol (1995). Another influential role actor in the economic network is found in the role of charterers as united in the BICEPS initiative, aiming for sustainable transport (Huntsman, 2015).

A less influential role is designated to the remaining organizations. Shipyards such as Damen shipyards search for the technologically and financially most feasible option for compliance (Interview Damen Shipyards, 2016). Bunker suppliers follow carrier-led demand by supplying specific fuel where needed. Bunker brokers advise carriers on how to effectively, from an economic point of view, organize their trades while ensuring they bunker compliant fuel (Interview IB, 2016). Financers decide on a variety of criteria, within given market boundaries such as the availability of bunker terminals, which vessels are financed (Interview Financer X, 2016). Insurance agencies and bunker storage facilities perceive carriers’ decisions with regards to the limits on sulphur emissions irrelevant and thus do not play a substantial role. The Trident Alliance stimulates solid enforcement through governmental channels (Interview Trident Alliance, 2016).

5.3.2 Relations

Relations within the economic network are dominated by carriers. There are only two organizations on which the carrier is dependent. Charterer’s initiatives like BICEPS are customers from carriers and able to influence carriers via their decisions. But the ones pursuing sustainability goals are few in number (Huntsman, 2015). And financers have a say in whether or not a vessel is financed but this is mainly based on multiple criteria that are provided by the boundaries of the market (Interview Financer X, 2016).

Carriers are customers of the remaining organizations and thus decide which organizations are selected to do business with. For example, if a carrier aims to buy a new vessel, a tender is organized in which shipyards can send in proposals. The carrier decides which shipyard is selected (Interview Anthony Veder, 2016). Hence, shipyards supply vessels within by the carrier determined boundaries. Carriers are also leading the other organizations' markets. Bunker brokers, bunker suppliers and bunker storage facilities follow demand from the carrier-led market (Interview IB, 2016; Interview Vopak 2016). This also counts for classification societies and ports, whom simultaneously belong to the policy network. Their role is thus both enforcing legislation from the policy network and assisting the carrier as a business partner out of their function in the economic network. In this sense, the ports assist the carrier in operating to its fullest capacity (Interview Port of Rotterdam, 2016). It also means that the market position of classification societies solely allows them to advise carriers in accordance with the carriers' desires. In practice, this comes down to economic considerations (Interview Lloyd's Register, 2016). The same counts for the KVNRR. Although it is also part of the policy network and stimulates carriers into pro-activeness, as a branch association it is constituted out of carriers whom have a final say by voting. The choices a carrier makes, determines the network's continuity and it is clear that power and resources are at carriers' side in the economic network. The majority is dependent on carriers for their continuity. Carriers thus structure the economic network. Since carriers have such a dominant position with regards to organizations in the economic network, on their turn these organizations take a responsive role towards carriers.

5.3.3 Way of Interaction

The economic network interacts vertically and horizontally as depicted in figure 11.

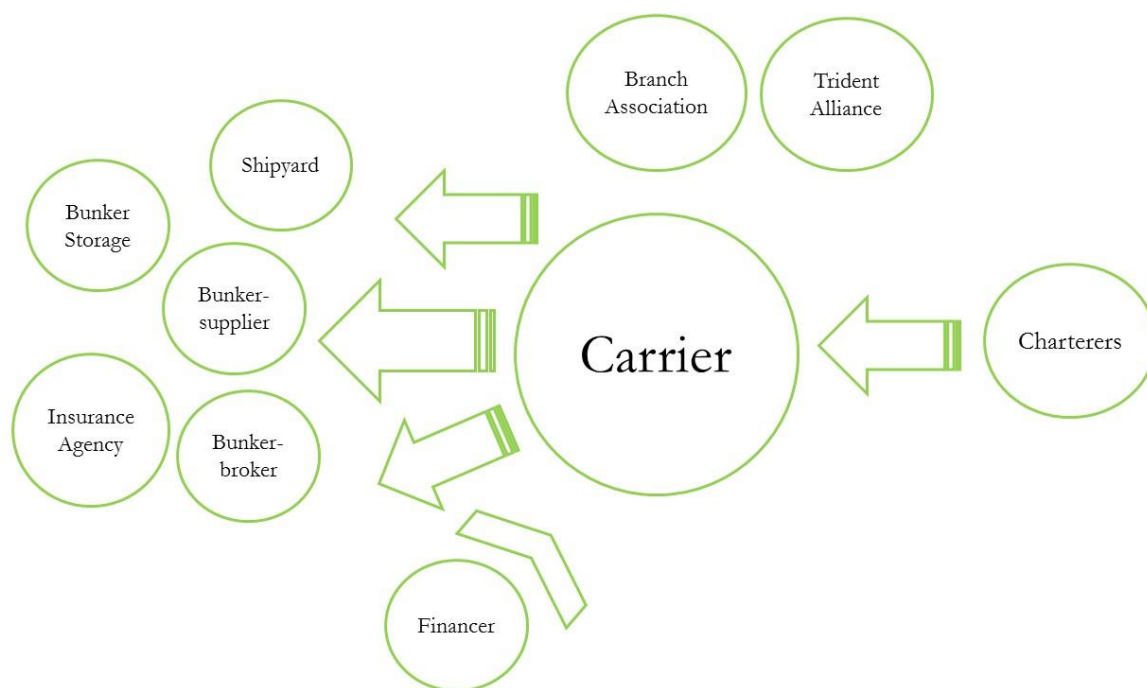


Figure 11. Vertical and horizontal interaction in the economic network.

Vertical interaction involves several organizations along the production line such as insurance agencies, bunker storage, shipyards, bunker suppliers, bunker brokers, charterers and financiers. The carrier is the central actor in the vertical line of production and can, as a customer, select any of the organizations left from the three arrows. Financers have a special role since strictly speaking they influence carriers but decide based on the market's boundaries which are provided by all the other organizations in the vertical line of production. And the majority of these organizations follows carrier's developments. Solely charterers are customers of carriers and hence able to influence their way of doing business. Some instances of integration in the network could be indicated but the diversity of the shipping sector does not allow for much integration. A tender for new vessels is always open for any shipyard to enter and thus does not involve contracts beyond one vessel (Interview Anthony Veder, 2016). The carrier operates based on contracts with charterers and fuel suppliers but these are all temporarily. Actual joint product development is found with none of the organizations in the economic network. This figure clearly shows the rather central and dominant role of carriers in the economic network.

Horizontal interaction in the economic network is designated to KVNR and the Trident Alliance as shown by their position in figure 11. The Trident Alliance is a typical strategic alliance in which research and development constitutes the basis for stimulating authorities into solid enforcement. The KVNR has a rather central role as a branch association linking carriers to each other for constituting a joint effort. This study did not found much integration in the horizontal network.

Considering the degree and characteristics of horizontal and vertical integration of the economic network, conclusions can be drawn on the network's core and periphery. The vast majority of actors in the economic network is not able to influence interaction over economic rules and resources and belongs to the periphery of the network, as can be seen in figure 12.

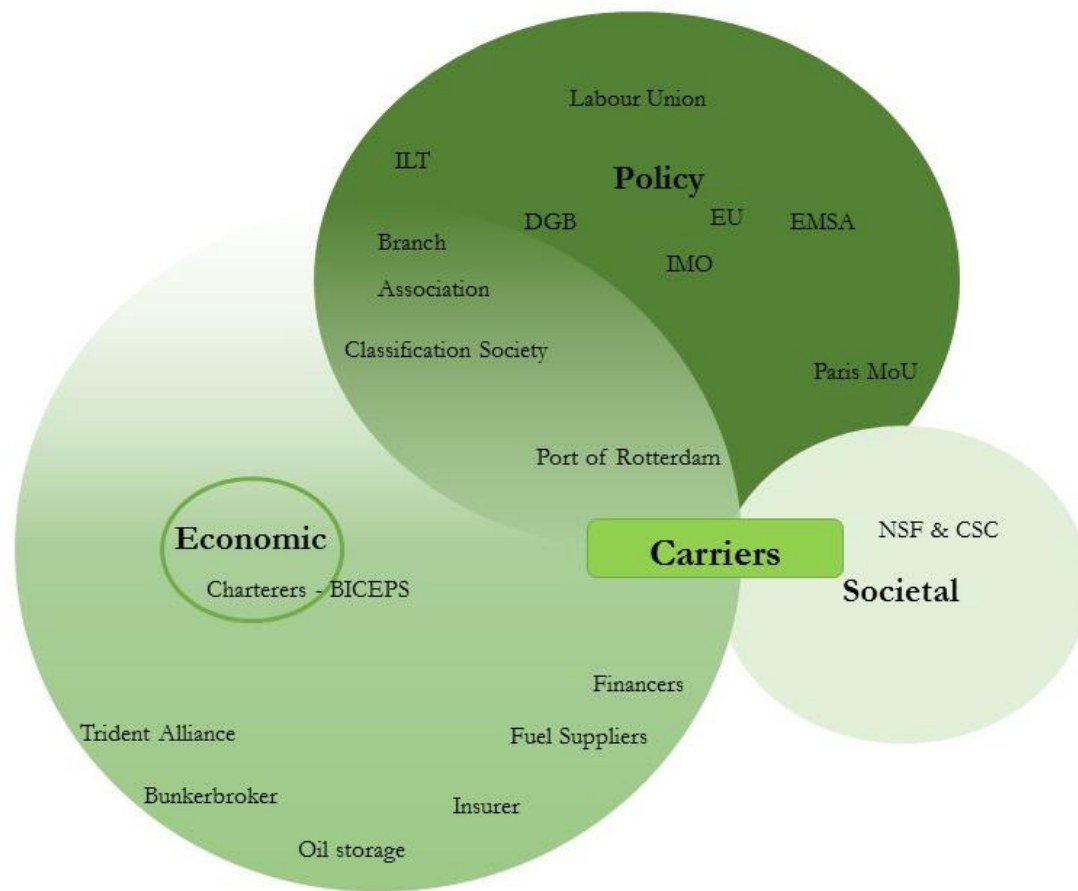


Figure 12. Triad-network model showing the economic network's core.

Organizations in the core of the economic network are able to directly interact over economic rules and resources. It turns out that in the economic network, solely charterers are able to do so. The remaining actors in the economic network are surrounding agents, only able to indirectly influence interactions and transactions of carriers. In business related decisions, these organizations follow their customer's (carriers) demand.

5.4 The Societal Network

The societal network is composed out of solely one organization and its international equivalent. The complexity of the sulphur emissions makes that public interests are more indirectly represented.

5.4.1 Public Awareness

Creating public awareness in the sulphur debate appears to be a challenge. The majority of key players that have been interviewed for this study emphasized that norms and values on sulphur emissions from the shipping sector are not yet disseminated in 'civil society'. Consequently the sulphur limits are not perceived

as a popular marketing strategy for carriers and there are only few organizations part of the societal network (Interview Paris MoU, 2016; Interview NSF, 2016).

The sulphur regulations do not have much political or societal attention. In general, the public prefers topics that relate to their cognitive, affective and behavioural elements for engagement (Manzo, 2010). A topic with cognitive elements is defined as a topic that the public is able to understand. Affective elements allow them to sympathize with the topic. And behavioural elements allow them act upon the topic themselves. First, the effects of sulphur emissions from shipping are difficult to understand. Second, the effects are not directly seen or felt which prohibits the public to sympathize with the topic. Whereas a small oil spill is very visible and tangible, the long term climatic and health effects of emitting sulphur are more complex to explain (Interview Paris MoU, 2016). And lastly, with increasing interest for methods such as life cycle assessment, consumers could increase their influence on carriers. But in practice, consumers are often unaware about the way their products are transported which makes it far removed from their consumer behaviour. If the public shows no interest in a topic, political or media attention also remains largely absent. Consequently, it is not perceived as a popular marketing strategy for carriers. On their turn, organizations from the societal network are unable to employ public opinion in their contact with carriers. They rather have direct contact with carriers and much less focus on creating awareness amongst civil society.

5.4.2 Relations and Arrangements

Within the societal network contact occurs between carriers, NSF and the CSC. The relation between NSF/CSC and carriers is cooperative and focusses on keeping an open dialogue. Most friction on arrangements is found not so much in the content but the pace of implementing environmental legislation. Both NGOs employ content-wise discussions with carriers for reaching their goals. Arrangements mainly evolve from organization to organization without public involvement. Contact over such arrangements is both direct and indirect.

Since the public opinion cannot be used as a tool by the societal network, most contact is direct with the industry and its representatives. For example, NSF and Spliethoff executed a joint trajectory in which they analysed their vessels and strived for environmental improvements. The success they had in creating environmental awareness amongst employees was already perceived huge by both Spliethoff and NSF (Interview NSF, 2016). NSF is also part of 'Platform Schone Scheepvaart' which is a composition of actors from all networks that work towards a cleaner shipping sector (Platform Schone Scheepvaart, 2015). NSF regularly joins KVNR hosted meetings or seminars for carriers and industry representatives. On international level, the CSC organizes side-meetings during the regular IMO meetings to convince policy makers and industry representatives. However, contact is in this sense also limited to these NGOs and the industry. It does not involve the public via responsible care- or product campaigns since the absence of public awareness makes it an uninteresting marketing strategy for carriers.

Indirect contact within the societal network occurs in meetings including the government, the societal network and industry representatives. The government fulfils a intermediary role and legislative role. In the preparatory phase of the IMO meetings about the limits on sulphur emissions, the government fulfilled an intermediary role in finding compromises for bringing forth a Dutch point of view at IMO level. After the international approval of Marpol Annex VI, the government's role was strictly legislative as its main duty was to translate the international legislation into national legislation. No actors from the societal network were involved in the discussions on enforcement, making it a topic dealt with by organizations from the policy and economic network only (Interview NSF, 2016).

5.4.3 Interaction Patterns

Interaction patterns in the societal network solely focus on the policy elaboration process and employs the state as an intermediary in this process. The societal network employs several resources to establish a change in the intended rules. First, scientific information is disseminated through the side-meetings at the IMO, the meetings at the KVNR and the platforms (Interview NSF, 2016; Interview KVNR, 2016; Friends of the Earth International, 2001). And second state intervention is used as a resource. It is mobilized during the preparatory meetings of the Dutch delegation and at IMO level. In some cases, the media is used to reach the public and politics but due to the limited public awareness, this proved not entirely suitable for the sulphur debate.

A change in the rules, the breakthrough of implementing sulphur limits, was reached through a combination of factors that involve actors beyond the societal network. To start with, organizations from the societal network aimed to induce a change in the ideological framework in two ways. Frequent, constructive, direct and content-wise discussions with carriers (representatives) (Interview KVNR 2016; Interview NSF, 2016). And via continuously presenting scientific information about the harmful effects of sulphur emissions prior, during and after IMO meetings. The last 'little' push came from the EU pressuring IMO member states with the threat of local legislation. This is a clear example of a change in the way of interaction at IMO level since it obliged member states to adjust their strategies. Modifications of the social environment have not been part of a particular strategy in the sulphur debate. But if organizations in the societal network would aim for enhancing public awareness, additional pathways for influencing carriers are generated. And since the most publicly visible charterers increasingly engage in sustainability initiatives to uphold their image, the pathway of partly and temporarily becoming a 'critical outsider' should be considered.

5.5 Interaction Between the Networks

A combination of organizations from several networks is often involved in dealing with the issues arising out of the sulphur limits. Interaction between all networks is first explored. Implementation, enforcement and ensuring compliance is dealt with in close cooperation between the policy and economic network. Some initiatives are popping up involving direct contact between the economic and societal network. However, besides meetings that are open to a larger public, there was no cooperation or partnerships strictly involving the policy and societal network found.

5.5.1 All Networks

All networks cooperate in a structural manner in the platform ‘Schone Scheepvaart’ and during the policy elaboration process.

The organizations working together in platform ‘Schone Scheepvaart’ are shown in figure 13. This platform is a cooperation between KVNR, the North Sea foundation, Netherlands Maritime Technology, the Port of Rotterdam, TNO and Maren.

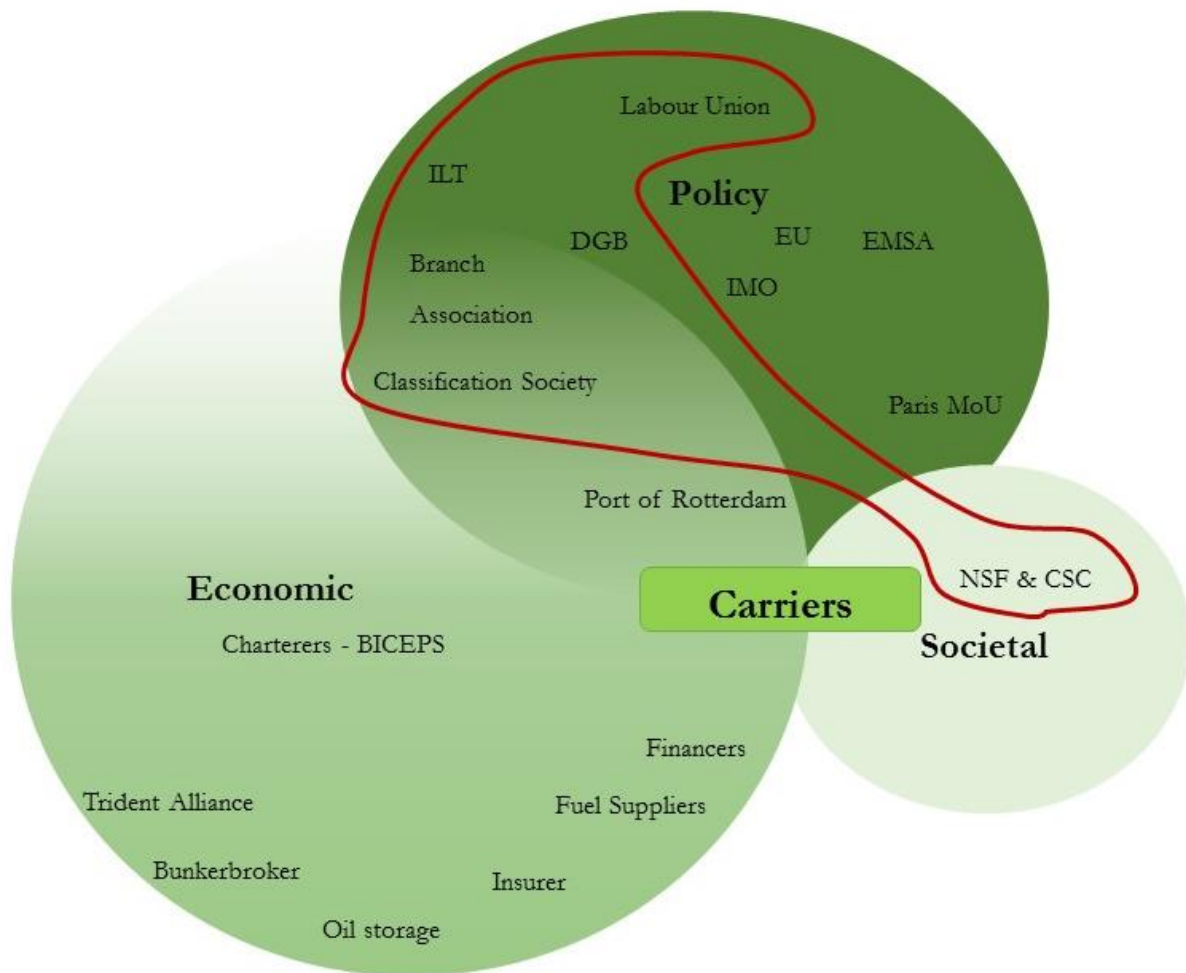


Figure 13. Triad-network model showing cooperation between the policy and economic network.

It organizes seminars, publishes laws and regulations for information purposes and aims to bring maritime actors from science, technology, the field and policy together (Platform Schone Scheepvaart, 2015). The European version of ‘platform Schone Scheepvaart’ is the European Sustainable Shipping Forum (ESSF) (ESSF, 2013).

During the policy elaboration process, organizations from all networks work closely together in preparing IMO meetings within a Dutch delegation. When the limits on sulphur emissions reached the agenda of IMO (sub) committees, a Dutch delegation able to constitute a Dutch opinion was formed. The Dutch

governmental stakeholders from the policy network were ILT and DGB. Stakeholders from the economic network were the KVNR, NI, the Port of Rotterdam and fuel suppliers. And from the societal network, the NSF was consulted (Interview KVNR, 2016). Simultaneously to establishing a Dutch opinion, these stakeholders individually influenced the process through their overarching International organizations at IMO level, as explained in figure 9. In this sense, actors from the maritime sector and industry are very influential during IMO discussions having a say in the process in multiple ways. Some of the main flag states are so tightly connected to the shipping industry that by representing national interests, industry's interests are represented at IMO level. There is a vast array of NGOs and IGOs with an observer role at the IMO that backs these lobbying organizations up. Although in principle every organizations can apply to join the IMO, the industry associations are in much larger number (van Leeuwen, 2010). Hence if more stringent environmental regulations are discussed, one can imagine that during IMO discussions, there is an emphasis on the downsides instead of the benefits (Interview Paris MoU, 2016). Moreover, these simultaneously occurring processes blur the line between representation of industry and/or governmental interests. On top of that, whereas in the policy elaboration process all networks are involved, the remaining steps of implementation, enforcement and ensuring compliance are dealt with solely by a cooperation between the policy and economic network.

5.5.2 Policy and Economic Network

Solely the policy and economic network are involved in implementation and enforcement. A major problem with the global sulphur cap is that implementation is left entirely up to individual member states. Once the IMO commissioned the negotiated sulphur limits, these were simply technological requirements for the sulphur content in fuel. The nature of the shipping sector and the unreliability on member states' implementation and solid enforcement raised justly concern both on how to implement and how to enforce the limits (Sampson & Bloor, 2007).

5.5.2.1 Technological Development

Prior to the introduction of the global sulphur limits, many organizations voiced concerns about whether the necessary technologies for compliance would be available (ECSA, 2015a). Developing compliant technologies occurs in cooperation between the policy and economic network. From the policy network, classification societies provide statutory boundaries for building new and retrofitting existing vessels in accordance with the sulphur requirements (Interview Lloyd's Register, 2016). The Port of Rotterdam supports new technologies by providing the necessary facilities like LNG bunker terminals (Interview Port of Rotterdam, 2016). Organizations from the economic network could function in the same steering way by being ahead of legislation. But it turns out that the competitive nature of the economic network obliges the organizations to follow a reactive strategy.

The dominant position of carriers in the economic network prohibits organizations to proactively develop new technologies or establish the infrastructure for supplying compliant fuel. A chicken-and-egg story applies. Since these actors solely follow carriers' desires, no-one invests in proactively developing

progressive, innovative technologies or infrastructure since there is downright no demand. Hence, no superior compliant technologies were available once the limits were announced. Technologies were improved and developed once the enter-into-force date of the limits became clear. After over one year into SECA enforcement, it can be concluded that (temporary) technological solutions have been found (ECSA, 2015a). However, the relatively short time frame for developing these technologies resulted in many varying, ad-hoc and creative solutions. In the shipping sector the strategies of carriers and organizations from the policy and economic network are thoroughly entangled. There is much interdependence between optimal strategies and their enforcement (Gritsenko & Yliskylä-Peuralahti, 2013). Exactly the combination of carriers whom solely do the minimum and a likewise reactive economic network leads to the current impasse of fragmented enforcement of a diversity of solutions. The LNG case fits as a perfect example. Although LNG is considered the marine fuel of the future, the infrastructure to bunker LNG is still absent and the technology remains too expensive (ECSA, 2015b). As a result, carriers cannot obtain funds to finance an LNG equipped vessel (Interview KVNR, 2016). Carriers switch to temporary solutions like scrubbers or oil-based technologies and no investments are made in further developing LNG technologies. But scrubbers are under scrutiny are already banned in Belgium and several places in Germany whereas these are, after lobbying efforts of the KVNR, specifically allowed in the Netherlands (Interview KVNR, 2016). Another temporary solutions is found in dual fuel engines which are solely profitable due to the low oil price (ECSA, 2015a). The wide variety of selected temporary solutions by carriers and the omission of any global management strategy for enforcement further impedes implementation.

5.5.2.2 Implementation Struggles

The absence of an implementation strategy for enforcing compliance at IMO and national level raised concern. There was no structural anticipation with a comprehensive management plan at IMO level to ensure smooth implementation in such a differentiated work field. The shipping sector is often referred to as a governance structure containing local and sectoral, conflicting interests and with multiple centres of authority (Gritsenko & Yliskylä-Peuralahti, 2013). As was confirmed by this study, the shipping sector is too complex to design a globally fitting implementation and enforcement scheme. But leaving enforcement up to the member states is no option as well, since there are vast inconsistencies in inspection practices. In this sense, enforced self-regulation is ineffective as well, due to the cross-national differences in resources for and commitment to enforcement (Sampson & Bloor, 2007).

If one approaches it on the level of member states, the framework still hampers. Even in the Netherlands, there was no comprehensive management strategy for enforcement designed, prior to the limits entered into force (Interview KVNR, 2016; Interview ILT, 2016). This could be attributable to the absence of one single actor in charge of the full authority and capability to implement enforcement mechanisms. Enforcement is discussed during OOR meetings involving solely organizations from the policy and economic network as can be seen in figure 14.

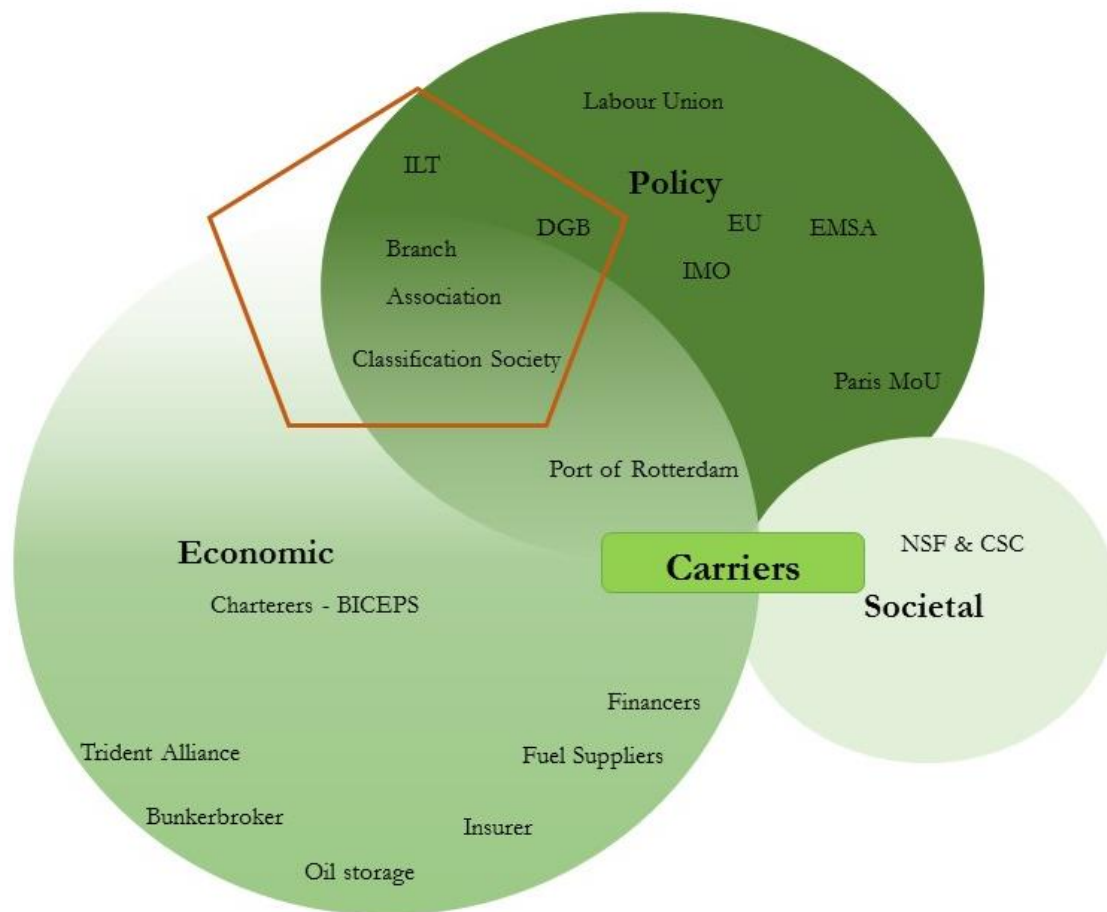


Figure 14. Triad-network model showing cooperation between the policy and economic network.

Both the EU and IMO impose legislation in the form of the EU Sulphur Directive and Marpol Annex VI on the Dutch government (European Environment Agency, 2015; International Maritime Organization, 2005). The KVNR, classification societies, ILT and DGB discuss the practical implications of EU or IMO negotiated policies. This process is shown in figure 15.

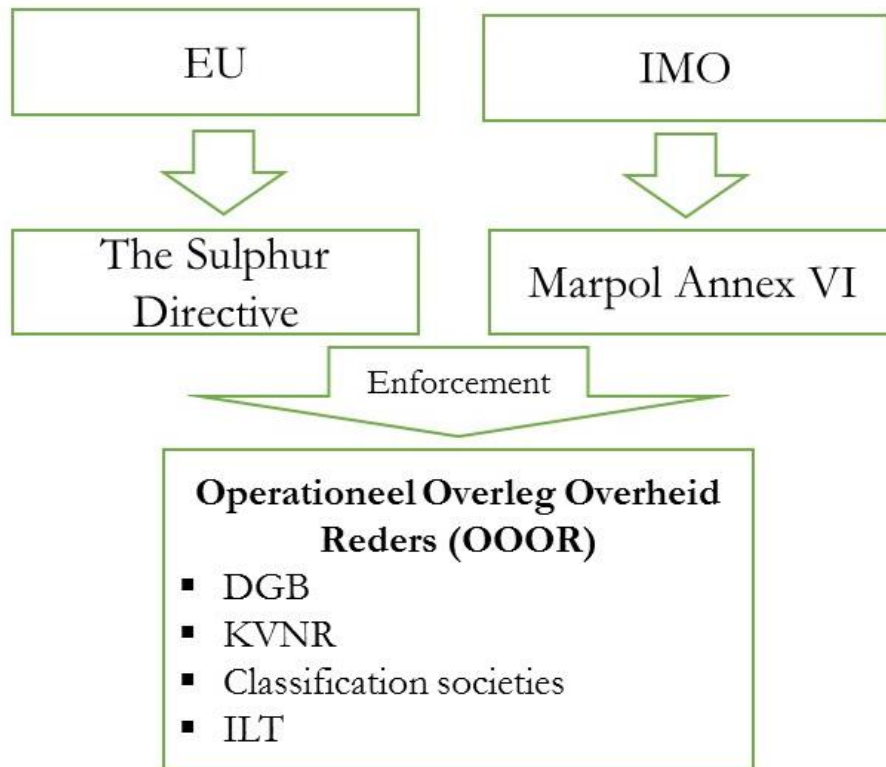


Figure 15. The process of translating legislation to enforcement.

Resulting out of the OOOR meetings, several national mechanisms were put into practice to monitor, certify and control carriers. However the involved actors have conflicting agendas. DGB leads discussions and aims to find compromises between the involved organizations. ILT is hesitant with implementing stringent policies since it takes into account the nation's competitive position (Interview ILT, 2016). It is not up to classification societies to value certifications on 'environmentally friendliness' hence they only assess the feasibility of proposed enforcing methods (Interview Lloyd's Register, 2016). Although the KVNR steers solid enforcement, it mainly desires so for the badly performing carriers (Interview KVNR, 2016). In this sense, while discussing enforcement, commercial and economic interests resonate with public interests with the latter often loosing out (Sampson & Bloor, 2007). Organizations from the societal network were not part of this delegation (Interview NSF, 2016). But it is argued that they could play a substantial role in breaching through the impasse created by the sole representation of national and economic interests in policy implementation matters.

5.5.2.3 Enforcement and Compliance

Carriers and organizations from both the economic and the policy network desire an equal level playing field through solid enforcement. But the sector's highly mobile and globalized characteristics make it a seedbed for ineffective enforcement (Alderton, 2004; Bloor et al., 2013). The registration system allow carriers to switch to lax jurisdictions. Although initiatives as Paris MoU seem to turn the tide, there is still a

large gap between ‘good’ and ‘bad’ vessels. The badly performing vessels that seem to be able to just go ahead, make carriers for whom non-compliance is no option hesitant to additional legislation.

Without a global action plan for enforcement, it is up to member states’ flag and port states to pick up this responsibility. But as described above, even in the Netherlands the implementation of robust enforcement mechanisms occurs at a rather slow pace. Regular inspections of port state are fairly well-covered through the risk-based system and coherently trained surveyors of Paris MoU (Interview Paris MoU, 2016). However, sampling is solely done when the handwritten, non-statutory BDN and Chief Engineers Oil Record seem suspicious. In 2011 this resulted in 0.06% of all vessels berthing in the Port of Rotterdam, being sampled. Thus, the actual chances of being caught are relatively low, especially for vessels that do not berth in Dutch ports (Bloor et al., 2013; Helfre et al., 2013). For these vessels, ILT plans visual inspections above the North Sea. But these are also non-statutory and solely form the fundament for selecting vessels whenever they berth in any port in the future (Interview ILT, 2016). Enforcement is in that case, still up to that particular port state.

Besides hampering enforcement, the currently employed methods for enforcement are also contested. Fafaliou et al., (2006) showed that governmental steering is essential in stimulating the shipping sector into improved environmental performance. But as described above, in practice government’s way of dealing with the shipping sector focusses on inspections and thus remains rather controlling instead of steering. Detentions are rare and fines vary highly between neighbouring countries (Paris MoU, 2016; Interview KVNR, 2016). And although obliged by the EU Sulphur Directive, there is still no fine in place yet in the Netherlands. The Dutch government is planning to install a ‘proportional’ fine and a tool which can calculate what fuel is used on sea by comparing bunkered fuel with used and sampled fuel by the end of 2016. However this is not applicable for vessels that use scrubbers and can still only be applied to vessels that berth in Dutch ports (Interview ILT, 2016; European Commission, 2012). Also on EU an international level, the lack of guidance and overall absence of smooth enforcement is an issue (Hollman, Fenwick, 2015). Current installed fines differ from US\$7,000 to US\$62,000 which is still not proportional with benefits of non-compliance up to US\$250,000 (Interview IB, 2016; Hollman, Fenwick, 2015). With such low fines, the financial rewards for non-compliance increase steadily (Helfre et al., 2013). Overall, tools that are currently employed by the policy network still mainly rely on naming and shaming. As explained above, a system of naming and shaming as used by Paris MoU, solely works with more progressive carriers for whom the consequences of a registration are substantial. But for more conservative carriers, naming and shaming poses no stick at all (Bloor et al., 2013). While port- and flag states struggle to tackle effective enforcement, the gap between compliant and non-compliant carriers enlarges.

In the shipping sector, carriers have differing perspectives towards compliance. Companies can have a corporate culture of compliance, compliance can be conditional or they employ a ‘social license’ in their way of doing business (Bloor et al., 2013). In a corporate culture of compliance, naming-and-shaming stimulates compliance. Pushed by the KVNR to be registered as a highly performing carrier and being situated and

flagged in the Netherlands, the ‘more progressive’ carriers are obliged to have a corporate culture of compliance. Although these carriers fiercely desire conditional compliance, the characteristics of ‘more progressive’ carriers does not allow them to practice it. Conditional compliance means that a carrier is willing to comply if others comply as well. But due to the large inconsistencies in ensuring compliance compliant despite the fact that global solid enforcement is still not the case. The last form of compliance, a social license, was not even found with these Dutch carriers. Operating on a ‘social license’ requires an intrinsic motivation and a corresponding thorough investment to be more environmentally friendly. For example Wallenius Wilhelmsen, the founder of the Trident Alliance, operates its vessels continuously on low sulphur fuel, although not required (Bloor et al., 2013). But the carriers in this study solely selected the economically most viable option to comply after the regulations entered into force hence the social license is clearly missing (Interview AV, 2016; Interview Spliethoff, 2016).

The roles of the networks in achieving solid enforcement after the sulphur limits entered into place are shown in figure 16. The societal network has no role in ensuring enforcement. The policy network awaits implementing robust methods because they fear the nation’s competitive position. And the competitive nature of the carrier-led economic network is reactive with developing suitable technologies. The combination of the roles of these networks results in a vicious circle. Without a management plan for enforcement, which is conclusive about allowing certain technologies or not, it is difficult for the carrier to make strategic investments. Correspondingly technology development stagnates. Ad hoc, creative and above all temporary solution are implemented which further diversifies the palette of appropriate enforcement methods. The vicious circle further widens the gap between non-compliant and compliant carriers, making the ones for whom non-compliance is no option hesitant to additional (environmental) policy.

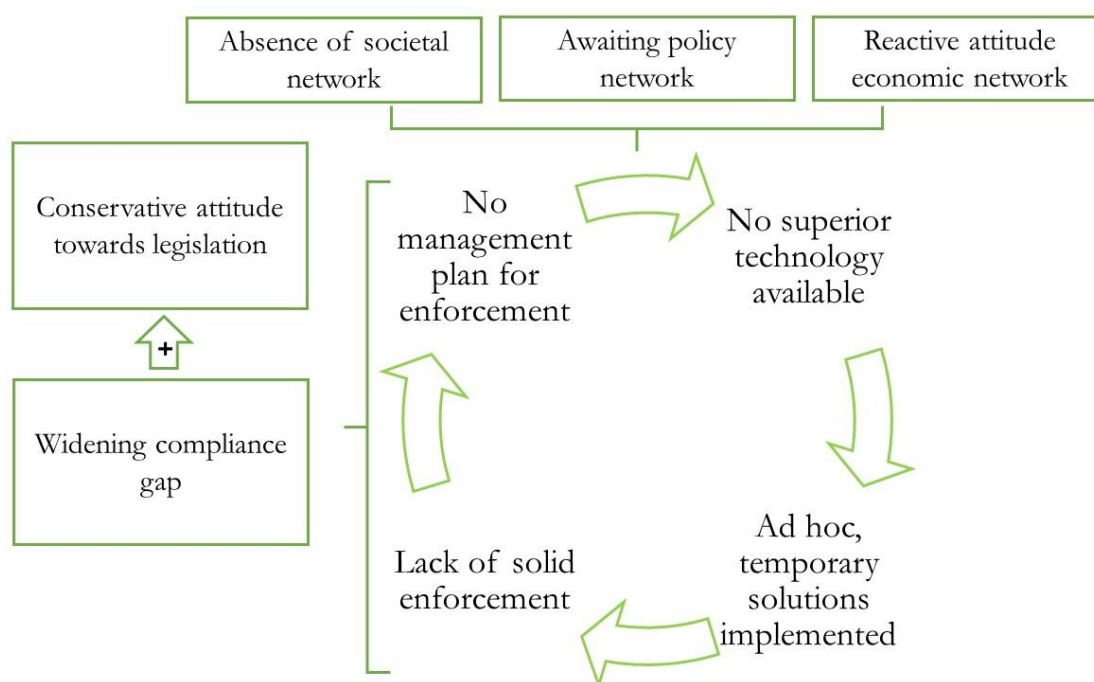


Figure 16. The contribution of the individual networks to the impasse of ineffective environmental policy in the shipping sector.

In sum, the lack of clarity on enforcement methods and the variety of implemented solutions are mutually enforcing and further complicating the implementation of effective environmental policy in the shipping sector. With so little clarity on enforcement strategies, the sulphur limits caused great concern in the sector and resulted in increasing gaps in cultures of compliance and enforcement regimes between countries.

When in fact all carriers are supposed to comply to the sulphur limits, the current system allows the gap between compliant and non-compliant carriers to widen. Chances of detection are small and if detected the system lacks accurate measuring methods for the checking the wide palette of compliant technologies, proportional punishment and it relies on naming and shaming. Taking into account the characteristics of both typologies of carriers as set forth in table 6, 'more progressive' carriers are obliged to comply anyhow not so much because the system enforces them to do so but the image and institutional embedding of their business. 'More conservative' carriers are not threatened by the current system and continue business as usual. The ever-continuing unequal level playing field enlarges which results in carriers employing an averse attitude to increased legislation.

5.5.3 Economic and Societal Network

Contact between the societal network and organizations in the shipping sector mainly occurs business to business. As described by Mol (1995) contact between the societal and economic network is led by business representatives. There is regular and intense contact between business representatives from the KVNRR and the CSC and NSF (Interview KVNRR, 2016; Interview NSF, 2016). Moreover, some environmental initiatives pop up in cooperation between the economic and societal network. These NGOs stimulate the shipping sector via ports, charterers and financiers. The Port of Rotterdam created a financial incentive for carriers

by providing cleaner vessels with a (small) discount. However, in order to make this incentive self-regulating the discount should be substantial. Charterers are pushed by the societal network to create a market incentive for carriers to ship their cargo more sustainably. And financiers are stimulated by NSF to incorporate more (environmentally focussed) corporate social responsibility considerations, in financing decisions (Interview NSF, 2016).

Having thoroughly analysed all networks separately and collectively, the next sections answer the subsequent research questions.

6. Ecological Rationality

The vast majority of actors in the shipping sector lack the integration of an ecological rationality in their way of doing business. Ecological Modernisation Theory prescribes a certain pathway that the ecological rationale takes in achieving ecological goals and criteria. It assumes that the ecological sphere detaches from the economic sphere in a process called emancipation (Mol, 1996). The established sphere forms a solid fundament for an ecological rationale to integrate into the political, socio-ideological and economic sphere. The ecological rationale gains prominence for environmental interests, considerations, representations and ideas in social practices and institutions in a modern society (Mol et al., 2009b). With an ecological rationale present, organizations in either of the three network are to a certain degree influenced by and subjected to environmental interests, considerations or ideas. This section analyses the presence of an ecological rationale, starting with the carriers, continuing with the policy, economic and concluding with the societal network.

There is no sign of an ecological rationality found with the carriers that have been interviewed for this study. After the entry into force date for sulphur limits became clear, both carriers solely used economic criteria to select a compliant option. And the selected compliance option fail to either intentionally or unintentionally pursue or achieve ecological goals and criteria. In general, performing extra-legal prior or after the entry-into-force date of the sulphur cap is out of questioning for the majority of carriers. Sustainability strategies in the shipping sector are designated to a selected group of well-known carriers whom can and are obliged to employ sustainability as a marketing strategy due to excess capital and to uphold their image (Interview Paris MoU, 2016).

Within the policy network, in some instances ecological goals and criteria are strived for. However, this occurs while the ecological rationale is still tightly connected to the economic rationale and causes disturbance. The ever continuing fear for an enlarging unequal level playing field made the introduction of the sulphur limits a difficult and lengthy process. Pressured by the EU, the limits were accepted at the IMO. On a national level, implementation is decided upon by organizations from solely the policy and economic network through finding compromises. A major theme remains solid enforcement, which awaited itself from the governmental side due to the fear of pricing the Netherlands out of the market. Moreover, the desire for solid enforcement is by all actors solely based on an economic rationale striving for an equal level playing field. In absence of public support striving for ecological goals and criteria, the ecological rationale rather disturbs the market fragmentally than achieves processes of ecological modernisation. Both are clear examples of the economic rationale prevailing over the ecological one. Taking a closer look at single organizations in the policy network shows that the an ecological rationale is fragmentally present. The services of classification societies are primarily based on, by carriers, selected criteria which comes down to choosing the economically most viable strategy. However, Paris MoU employs an ecological rationale in their practices to some degree by stimulating carriers' pro-activeness through concentrated inspection campaigns. The Port of Rotterdam is working on sustainability and investing in LNG projects. The

incentives for the port's investments in LNG are based on EU laws, an economic rationale that desires the port to be ahead of other ports with facilities and their 'public' function and visibility as biggest port of Europe desires them to do so. Although these drivers purely stem from an economic rationale, their long-term strategy achieves ecological goals and criteria and thus shows an instance of the ecological sphere trying to emancipate from its economic counterpart. Overall, a distinction can be made between the ecological rationale on the short- and long term. Some instances of an ecological rationale pursuing ecological goals and criteria on the long term can be indicated. But on the short term, an economic rationale constitutes the norm in decision-making in the policy network. Thus although the ecological rationale is (un) intentionally strived for on the long term, its appearance does not fit the prescribed picture as set forth in EMT literature.

Within the economic network, some initiatives are popping up but the majority of actors follow carrier-led market developments. The greater part of organizations that horizontally interact with carriers are carriers' suppliers. Hence they follow carrier-led demand and this makes them rather reactive. There are some initiatives of charterers and financiers, pushed by environmental NGOs and the reputation of their own business, stimulating more sustainable shipping. This shows the first signs of the actual emancipation of the ecological from the economic sphere and follows the by EMT assumed trajectory. The vertical line, entails strategic alliances put into practice by the Trident Alliance and the KVNRR, that aim for again more robust enforcement. However, this is again solely based on economic pretences which is in essence no problem but surely not in line with the trajectory for the ecological rationale as described by EMT. Thus as for the economic network, the ecological rationale is largely absent due to the dominance of carriers in the market.

Evidently, an ecological rationale is present at environmental NGOs in the shipping sector but public opinion lags behind. Accordingly such NGOs are few in number and contact occurs business-business. NSF and CSC pro-actively demand the sector to perform environmentally extra-legal. This is done by addressing matters at carriers and the economic network. However, these organizations are not involved in enforcement whereas they could play a substantial role in this policy- and economic network dominated area.

In all networks only a few, emerging signs of the ecological rationale influencing practices in the shipping sector on the long term are visible. The recurring theme of solid enforcement eventually fulfils environmental purposes but is purely driven by a short term economic rationale. In this sense, the shipping sector follows a deviating trajectory than assumed in EMT. EMT first assumes an emancipation of the ecological sphere from its economic counterpart. Hereafter equal interaction between the ecological rationale and the economic, political and socio-ideological rationale occurs. But carriers, the policy and economic network employ economic considerations on the short term. By doing so ecological goals and criteria are achieved on the long term. Whether these short term economic considerations, achieving ecological goals and criteria on the long term result out of (un)intentionally taken into account ecological criteria needs further in-depth research on decision-making within these individual organizations.

The developments in the shipping sector are not in line with the proposed pathway of the applied theory. And an outlook shows that as long as the ones that could provide a market push, the public or charterers, remain largely uninterested in the sulphur limits or environmental performance of the shipping sector as a whole and the problems with regulating this sector remain unsolved, carriers or carrier-dependent organizations will not obtain a proactive attitude towards increased environmental legislation. In absence of solid supportive mechanisms, this means that the ecological rationale that is supposed to stimulate ecological modernisation remains largely missing in the shipping sector.

7. The Core Elements of Ecological Modernisation Theory

The shipping sector fragmentally shows some elements of the core principles of EMT but no structural trend of ecological modernisation could be identified. Based on the above presented analysis, conclusions are drawn in this section about whether the shipping sector is ecologically modernizing. All five key elements of the theory will be contrasted to the findings of this study.

First, in EMT, science and technology are considered key institutions in bringing about two major shifts. The first shift occurs from end-of-pipe to integrated technologies and is only partially taking place. For example AV switched to dual fuel engines, which is to a certain extent shifting to new integrated technologies, although these are still oil-based engines. But evidently operating on scrubbers is a real end-of-pipe technology. The second shift, the emergence of new transport modes is not considered by any of the organizations. Overall, carriers aim for the economically most viable option and do not structurally and deliberately choose for process-integrated technologies.

Second, EMT values economic agents and market dynamics for their stake in overcoming the fundamental counter-positioning of economy and ecology. But *economizing ecology* via economic mechanisms to stimulate compliance is missing. Initiatives of the Port of Rotterdam like the LNG terminal and discount for environmentally friendly vessel are clear examples of the importance of an economic agent. The pathway is not in line with EMT though. These initiatives achieve ecological goals and one of the core elements but are not performed based on an ecological rationale. The degree to which the *economy* is *ecologized* is also limited. Although the EU is supporting the shift towards LNG via its EU alternative fuel directive. More general solid and harmonized mechanisms to specifically stimulate compliance on the sulphur limits are still lacking. Environmental management systems such as ISO are used in the shipping sector but are not largely employed as marketing strategies as is the case in the chemical sector. Some eco-labels involve carriers via charterers by applying life cycle assessment practices but these initiatives are few in number. Nor classification societies, nor shipyards proactively steer carriers to perform environmentally extra-legal. In this sense, charterer's initiatives, the Port of Rotterdam's discount and the alternative fuel directive are outstanding examples and one can certainly not speak of processes that are '*economizing ecology*' or '*ecologizing economy*' in the shipping sector.

Third, EMT assumes that the state's role transforms through political modernisation processes initiated by two paradigm shifts. To start with, a resource preserving mode of production is obtained. There is no explanation needed that this is clearly missing in the shipping sector. In addition to that, the diminishing steering potential of politics is acknowledged resulting in state failure. The shipping sector is one step before acknowledging state failure. Organizations from all networks rely on the IMO as international rule-maker and member states for implementing enforcement locally. However, due to a combination of mutually enforcing factors as described in section 5.5.2.3, implementation at national level is hampering. The state employs a supportive role by involving many organizations to ensure implementation is done in a workable manner. But as this study has shown, this did not yet result in supportive, stimulating mechanisms to ensure

smooth or pro-active implementation of the sulphur limits or environmental policy for the shipping sector in general. The, by EMT forecasted, consequential emerging political modernisation process supposed to transform the role of the state from a bureaucratic enforcing, command-and-control entity towards a supportive, preventive entity is not occurring.

Fourth, the position of social movements is transformed from critical outsiders into critical insiders. Social movements in the shipping sector are a special case. There is very limited public awareness on the sulphur limits due to its 'invisibility' and complexity. This makes the role of social movements small and cooperative. Most contact between the societal network and the industry is direct without involving the public. Social movements are thus currently critical insiders and are not so much backed up by the public which diminishes their actual influence. Only in a very limited amount of cases, the media is used to influence the industry. Whereas the increasing amount of sustainability initiatives from publicly visible carriers shows that carriers are sensitive to public attention. In this sense, social movements should increasingly use the media to focus on agenda-setting the issue of pollution from the shipping sector. By doing so additional public awareness is generated which enables more and substantial trajectories to influence carriers.

Lastly, intergenerational solidarity is the dominant ideology resulting out of the occurrence of these four elements. But since the majority of elements is not or almost not present in the shipping sector, neither is this one. In absence of an ecological rationale stimulating striving for ecological goals due to the realisation of the polluting effects of the shipping sector. There is no awareness that future generations should receive a similar quality of life since the public does not feel their quality of life is negatively affected by the shipping sector.

The lack of an ecological rationale hampers the development of the core elements of ecological modernisation theory. Some instances of EMT's core elements could be indicated. However the absence of a coherently functioning policy arena due to fragmented authority and inconsistent enforcement hampers the development of an ecological rationale and its associated ecological modernisation processes.

8. Discussion and Conclusions

This study applied the triad-network model to explore the roles of the organizations situated around a Dutch carrier whom is obliged to implement the sulphur requirements. The research questions were formulated as follows. The main research question was:

Is the shipping sector ecologically modernising?

The sub research questions were:

1. How are the policy, economic and societal network surrounding Dutch carriers represented?
2. How is the ecological rationale represented in the shipping sector?
3. How do the core elements of ecological modernisation theory relate to the shipping sector?
4. How should future environmental policy be improved in the shipping sector?

This section first elaborates on the sub research questions in the abovementioned order. It starts by summarizing the outcomes of applying the triad-network model. Based on these results, the presence of both an ecological rationale and the key elements of ecological modernisation theory are set forth. After answering the first three research questions, this chapter highlights the way ecological modernisation theory relates to this case study and how the theory could be adjusted to enhance it. Finally, the last research question on how future environmental policy for the shipping sector can be improved is answered. Before going into the conclusions, it is important to mention one restraint to the study. It is analysed from a Dutch perspective which means that statements made in this study about the entire shipping sector can be too bluntly about their applicability for the entire shipping sector.

The first sub research question is answered by presenting the characteristics of all networks individually and jointly. It was shown that compliant-carriers mainly focus on solid and harmonized enforcement to restore an equal level playing field. The policy network has strictly speaking, a small core with policy-decisions limited to member states at IMO-level. However the EU has substantial steering capacity at IMO level. Maritime actors are formally and informally powerful since they have a say in member states votes and there is a vast array of lobbying organizations influencing member states, prior, during and after IMO meetings. Implementation decisions are discussed at national level in DGB-led OOOR meeting. Members from the economic and policy network jointly discuss enforcement with the KVNR stimulating efforts of solid enforcement. The societal network is rather absent in these discussions whereas they could play a substantial role in pursuing more solid enforcement which achieves ecological goals in the end as well. Organizations in the economic network follow carrier-led market developments and thus have a reactive attitude. Solely charterers are able to influence carriers' rules and resources but only a selected groups employs this to steer them into sustainability. Since vessels are always tailor-made, the network is not so much vertically integrated. Horizontal interaction is covered by the KVNR and the Trident alliance but horizontal

integration was not found. The societal network focusses on stimulating organizations from the economic network that can provide a market push towards carriers and cooperates directly with carriers on a content-based manner. Public awareness on the sulphur limits is lacking which limits the amount of organizations in the network and consumer awareness. Moreover it prohibits the societal network from using the public as a tool to pressure carriers. The combination of characteristics of these networks led to an impasse of enforcement efforts. This impasse started when the IMO limited itself to solely introducing a global sulphur cap. It left a solid management plan for enforcement up to the policy network and the development of fitting compliant technologies to the economic network. The expectant attitude of the economic network led to the implementation of temporary, ad-hoc and most of all, differing solutions amongst carriers. This further complicated solid and harmonized enforcement methods for the policy network. And without clarity on enforcement, carriers are unable to make strategic investments and look for temporary solutions. Above all, in absence of public awareness compliance remains an uninteresting marketing strategy for carriers and the societal network solely focussing on direct contact with industrial representatives. Moreover, in absence of robust enforcement, the gap between ‘more progressive’ carriers that need to comply in any case and ‘more conservative’ carriers for whom non-compliance remains an attractive option widens. In the fear of an ever enlarging unequal level playing field, the ‘more progressive’ carriers are even more hesitant to additional (environmental) legislation. Both elements do not contribute to finding a way to breach through the impasse. This interplay of organizations from the three networks led to the current gridlock that hampers the implementation of effective environmental policy in the shipping sector.

Considering the second and third research question, it seems that for this study the ecological rationale and the core elements of ecological modernisation theory are only fragmentally present in the shipping sector. Environmental NGOs evidently operate, based on an ecological rationale. But in carriers’ practices, the policy and economic network, decision-making is largely based on an economic rationale. Achieving ecological goals and criteria on the long term, based on an economic rationale on the short term is essentially no problem in EMT. It remains the case that a real, proactive, intrinsic emergence of an ecological rationale in the shipping sector is absent and the prescribed pathway of the emancipation of the economic rationale is not followed. Since the core elements of ecological modernisation theory are steered by an ecological rationale they are likewise fragmentally present. The shifts in science and technology are not structurally occurring. Both robust and supportive enforcement mechanisms are lacking which leaves little room for economic agents and market dynamics to overcome the counter-positioning of economy and ecology. Hence the role of the state is still developing towards a rather command-and-control one. Although social movements are considered critical insiders in the shipping sector, they never occupied a ‘critical outsider’ role towards the shipping sector since the topic was uncovered in public opinion. Evidently without the majority of core elements present, the notion of intergenerational solidarity is lacking as well.

8.1 Ecological Modernisation Theory and the Shipping Sector

With so few of the elements of ecological modernisation theory apparent in the shipping sector, it seems appropriate to explore the theory's applicability to the case. The theoretical problem statement as set forth in section 3.3.7 was illustrated and confirmed by this study. The study showed that bluntly assuming the emergence of an ecological rationale in every capitalist liberal democracy is not applicable to all sectors and societies. Also, the ecological rationale in the shipping sector is certainly in need of steering and embedding during its emergence. Especially these processes get little attention in the theory but do pose the shipping sector for a larger challenge. All elements are elaborated on separately, after which overarching abbreviations are formulated.

To start with, the overall assumption that an ecological rationale develops in every modernizing society does not fit this case. As was shown in the previous section, the ecological rationale is only incidentally and not deliberately present in the shipping sector. Although the shipping sector operates in a modernizing society and some instances of an ecological rationale are shown, the economic rationale still often prevails. In essence, such instances based on economic pretences are in line with EMT since they include action from economic agents and rely on market dynamics and (partly) achieve ecological goals and criteria. But an ecological rationale as described by the literature, entailing a proactive attitude and intrinsic motivation for striving for ecological goals and criteria is absent. And without an ecological rationale penetrating the other rationales, the emergence of ecological modernisation processes is piecemeal. To continue with, it was also indicated that several authors foresee a challenge in steering the emergence of an ecological rationale. Steering the ecological rationale occurs through socio-political processes. EMT is too bluntly over these processes to occur. This study illustrated that if the state is malfunctioning in developing coherent steering mechanisms as supportive frameworks for the industry to comply, the rather prescriptive pathways for the emergence of the ecological rationale as described in EMT do not apply anymore. Reasons for this instance of failure of the state in the shipping sector are illustrated by the presented diversified palette of involved actors with conflicting interests, fragmented authority and the absence of consumer awareness the shipping sector. And indeed, additional insight in the socio-political processes that steer or hamper the development of an ecological rationale could reveal the reasons why in some instances an ecological rationale develops and in some instances not. And lastly, the assumed challenge to embed an ecological rationale in consumer practices is confirmed by this study. A closer look at consumer practices with regards to the shipping sector shows there is no salvation in taking the consumer initiated pathway. Both carriers and actors from the policy, economic and societal network indicated that pollution from the shipping sector stays largely unnoticed by consumers. Sulphur emissions are a complex topic for the general public, their polluting effects are not directly seen or felt by consumers and consumers are several steps away from the actual act of shipping. The unawareness of consumers makes the sulphur limits an uninteresting marketing strategy for most carriers and charterers. Initiatives for more sustainable shipping arrive from a market push created by environmental NGOs and charterers that need to include shipping in larger projects of life cycle assessment. Embedding the ecological rationale in consumer practices should evolve out of an intrinsic consumer's

motivation but without consumer awareness or essential steering mechanisms from the government there is no way this will occur. Thus the self-steered occurrence of an ecological rationale on sulphur emissions into consumer practices appears to be too challenging in this setting.

Considering the abovementioned shortcomings, some abbreviations with regards to ecological modernisation theory could be formulated based on this study. This study showed that both the emergence process of the ecological rationale and its core elements should not be approached as a timeline with a set order but rather as an interactive continuum. Overall, for sectors with largely ‘invisible’ pollution like the shipping sector, a supportive state is essential in achieving change since the steering, embedding and emergence of the ecological rationale cannot depend on public awareness. In the shipping sector, the ecological rationale emerges without following the designated pathway of emergence from the economic rationale prior to integrating itself in the ‘way of doing business’ of organizations. The facilitative role of the Port of Rotterdam showed that in absence of deliberate state-steering, the ecological rationale is integrated before it is actually emancipated from its economic counterpart. On the long term ecological goals and criteria are achieved by the port’s policies but the key driver is the economic rationale. In this sense, the prescribed pathway as shown in figure 2 does not uphold. Analysing where intervention is needed can be done based on the already available core elements of EMT. The individual core elements should in that case not be approached as a ‘final stage’ of ecological modernisation but as indicators that show in what way the society is ecologically modernising and where intervention is needed. For example, the genuine ‘critical insider’ position of social movements in the shipping sector does not mean the sector is ecologically modernised with regards to this core element. It means that public awareness is lacking and in need of additional (governmental) steering. If all core elements are reconsidered by analysing and contrasting them with successful and failed cases of ‘ecological modernisation’, the theory can be transformed from a hindsight, less broadly applicable theory towards a hands-on theory that can be used as a fundament for policy elaboration.

8.2 Future Environmental Policy

The last research question which was not answered yet, is about how to improve future environmental policy in the shipping sector. Based on the findings of this study, it can be concluded that future (environmental) policy should put more emphasis on practical matters of implementation and enforcement. The IMO possibly in cooperation with Paris MoU should take the first step in establishing a solid fundament including globally harmonized implementation and enforcement. If this is established, an ‘equal level playing field’ is restored. Overall, governmental authorities should transform their role into supporting towards the more progressive carriers and robustly controlling the more conservative ones. The risk-based inspection system as employed by Paris MoU forms a solid fundament for increasingly formulating policies based on this principle. A next step would be to provide clarity on long term enforcement plans enabling carriers to make strategic long term investments. Such a long term perspective could also push the economic network into developing innovative (greener) technologies. Since public opinion certainly influences carriers’

corporate decision, organizations from the societal network should increasingly focus on enhancing public awareness from the societal network on the polluting effects of the shipping sector. Such changes could make the above-described mutually enforcing effects turn around and work in favour of the environment.

It indeed seems that the shipping sector is not yet ecologically modernising, which answers the main research question of this study. Steering and embedding the ecological rationale in an industry, this far away from consumers is perceived to be a challenge about which EMT is too bluntly. Organizations from the policy network are muddling through with implementing globally harmonized, solid enforcement. This is further complicated due to the carrier-dominated economic network and the absence of public awareness in the societal network. As a result, the ecological rationale and the core elements of EMT are only fragmentally present. International governance in the shipping sector should increasingly focus on developing harmonized enforcement and steering and embedding an ecological rationale in industry and consumer practices through government induced supportive policies. The combined effects of these focusses would aid in securing a solid fundament for effective environmental policy in the shipping sector that supports progressive environmental entrepreneurs and challenges the sector's laggards.

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Appendices

Appendix A: List of interviewees.

(2) : 2 persons were present during the interview

| Nr. | Institution | Date | Interview Type |
|-----|--|------------|----------------|
| 1 | Spliethoff | 22-01-2016 | Skype |
| 2 | Paris MoU | 26-01-2016 | In person |
| 3 | Anthony Veder | 27-01-2016 | In person (2) |
| 4 | Inspectie Leefomgeving en Transport | 28-01-2016 | In person |
| 5 | Intercontinental Bunkering | 01-02-2016 | In person |
| 6 | Dupi Insurance Group | 03-02-2016 | Telephone |
| 7 | Vopak | 04-02-2016 | Telephone |
| 8 | Nautilus International | 05-02-2016 | In person |
| 9 | Koninklijke Vereniging voor Nederlandse Reders | 08-02-2016 | In person |
| 10 | Lloyd's Register | 09-02-2016 | In person (2) |
| 11 | Damen Shipyards | 10-02-2016 | In person |
| 12 | Sander den Heijer – IMO/NMT | 11-02-2016 | In person |
| 13 | European Maritime Safety Agency | 15-02-2016 | E-mail |
| 14 | The North Sea Foundation | 15-02-2016 | In person |
| 15 | Port of Rotterdam | 17-02-2016 | In person (2) |
| 16 | Trident Alliance | 18-02-2016 | E-mail |
| 17 | Directoraat-Generaal Bereikbaarheid | 29-02-2016 | E-mail |
| 18 | Financer X (anonymous) | 02-03-2016 | Telephone |