

River cruise tourism and the environmental protection of the Rhine

Exploring policy arrangements and river cruise companies' practices related to plastics



Demi van Klink

RADBOUD UNIVERSITY | NIJMEGEN SCHOOL OF MANAGEMENT

MASTER'S THESIS FOR THE ENVIRONMENT AND SOCIETY STUDIES PROGRAMME

NOVEMBER 2021

Colophon

Document Master's Thesis
Programme Environment and Society Studies
Specialisation Global Environment and Sustainability
Date of submission November 19, 2021

Name Demi van Klink
Student number s4788044

First supervisor dr. M.A. Wiering
Radboud University Nijmegen

Second supervisor dr. J.D. Liefferink
Radboud University Nijmegen

Internship coordinator M. Schoor
Rijkswaterstaat Oost-Nederland



Radboud Universiteit



Rijkswaterstaat

Acknowledgements

Dear Reader,

This thesis marks the end of my master's specialisation in Global Environment and Sustainability at Radboud University. Rijkswaterstaat offered me the excellent opportunity to do an internship in plastic pollution. Even though the coronavirus pandemic affected society tremendously and working from home has become the new normal, it was an enlightening experience and a chance to network with professionals in the field.

I want to take the opportunity to express gratitude to my supervisor of the Radboud University, Mark Wiering, for his valuable insights and support during the writing process. His expertise in water governance was a great source of inspiration. Furthermore, I am thankful for the guidance of my internship supervisor at Rijkswaterstaat, Margriet Schoor, who provided insightful background information about the issue of plastic pollution in the freshwater environment. Her input helped me to combine existing ideas with a fresh approach. Additionally, I would like to thank the experts and shipowners for sharing their experiences and knowledge during the exploratory interviews.

I will carry the acquired knowledge to my future endeavours as this thesis propels my career forward.

Enjoy reading!

Demi van Klink
November 19, 2021

Executive summary

Since 2013, the river cruise sector is booming in Europe, especially Romantic Rhine cruises are very popular among tourists. However, these tourism operations generate large amounts of waste, possibly increasing plastic pollution in the freshwater environment. There is a research gap with respect to Rhine River cruise companies' practices related to plastics. To gain more insights into these practices, first the political arena in which these vessels operate must be investigated by applying the Policy Arrangement Approach introduced by Arts, van Tatenhove and Leroy (2000). The policy domains of *environmental protection of the Rhine* and *river cruise tourism* are studied to see whether there are dynamics of interaction between these domains. Besides that, case interviews are included with nautical experts and shipowners to explore river cruise companies' practices related to plastics. These practices are investigated with the help of the elements *meaning*, *material*, and *competence* (and interconnections between these elements) of the Social Practice Theory of Shove, Pantzar and Watson (2012). In addition, the researcher unravels the influence of policies on practices. The findings are used to develop policy recommendations to improve Rhine River cruise companies' plastic waste practices.

The results of this study revealed that to date the market took responsibility for the river cruise sectors' management of waste as state regulation in this area is limited. Notably, the river cruise sector wants their operations to be environmentally sound, as demonstrated by their waste separation practices on board. However, a lack of adequate waste management facilities on shore dampens their motivation. Moreover, the regulations inconsistency between harbours and lack of a dense network of waste facilities along the international waterways is a further deterrent. Furthermore, passengers may add to the plastic waste problem by flushing feminine hygiene products and incontinence materials down the toilets on a structural basis, which could end up in the river. Additionally, river cruise vessels leave a trail of microplastics in the water because no microfiltration system is used on board.

In the river cruise sector, some trailblazers aim to set codes of conducts for the entire sector. The issue of plastic pollution in the river environment is not really taken up at a policy level as responsibilities are shifted to other actors. Rijkswaterstaat (RWS) is responsible for the water quality in the rivers, therefore policy recommendations are predominantly developed for RWS so that this actor will take the lead in coping with this problem. This thesis considers the potential for interaction between the two policy domains in the recommendations chapter. To make a real transition, the novel working group Waste Amenities River Cruises (WARC) combines the state, market, and civil society governance spheres. Also, new interconnections between *meaning*, *material*, and *competence* are examined to change Rhine cruise companies' practices in a sustainable way. The policy interventions will ensure that the plastic waste influx in the Rhine River diminishes, and that tourism and environmental protection of the Rhine converge for the greater good of our planet.

List of acronyms

CBRB	Centraal Bureau voor Rijn- en Binnenvaart
CCNR	Central Commission for the Navigation of the Rhine
CDNI	Convention on the collection, deposit and reception of waste generated during navigation on the Rhine and other inland waterways
ICPR	International Commission for the Protection of the Rhine
MSFD	Marine Strategy Framework Directive
PA	Policy Arrangement
PAA	Policy Arrangement Approach
RBMP	River Basin Management Plan
RWS	Rijkswaterstaat
SAB	Stichting Afvalstoffen & Vaardocumenten Binnenvaart
SP	Social Practice
SPT	Social Practice Theory
SUP	Single-Use Plastics
WARC	Waste Amenities River Cruises (new working group)
WFD	Water Framework Directive
WMA	Water Management Act

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1. Introduction

1.1 Research problem statement

Plastic pollution in freshwater and marine ecosystems is a major environmental issue of modern times. It causes a risk for human health and the ecology (van Emmerik & Schwarz, 2020). According to estimates, between 4.8 and 12.7 million metric tons of plastic waste flows into the Earth's oceanic zones annually (Jambeck et al., 2015). A substantial proportion of plastic waste from land-based sources flows through rivers into the marine environment (Blettler et al., 2018; Jambeck et al., 2015; van Emmerik & Schwarz, 2020).

In Western Europe, the largest river basin is the Rhine River, which transposes approximately 20 to 30 tons of plastic waste to the North Sea on a yearly basis (van der Wal et al., 2015). A variety of aspects influence the amount of plastics entering the river environment in different countries, such as regulations regarding plastic use, waste management systems, and consumption patterns surrounding plastics and waste (Lebreton & Andrady, 2019; United Nations Environmental Programme, 2018). Water-based sources of plastic pollution in inland waters and oceans can be fishing, shipping, recreation, and transport (Lebreton et al., 2017). Over time, such plastic waste – which is called macroplastics (> 0.5 cm) – present in the aquatic environment degrade into smaller particles of microplastics (< 0.5 cm), due to factors such as photodegradation and oxidation (Lebreton et al., 2019). Amongst regulators, scientists, and civil society there is a rising interest on the ecological risk posed by microplastics (Law, 2017; Syberg et al., 2015).

Governments have developed different policies to regulate and diminish the harmful impact of plastics on the marine environment. For instance, the Single-Use Plastics Directive was adopted in Europe. This Directive is based on data highlighting the 10 most frequently found plastic items on beaches. As a result, it restricted the use of single-use plastic products such as straws and cotton buds in July 2021 (European Union, 2019). Nevertheless, there are a few aspects that prevent global governance of plastics from being effective. As such, the fragmented nature of its governance (across sectors and jurisdictions) is considered a hindrance (Boas et al., 2018; Dauvergne, 2018). Furthermore, between states there is limited policy coordination and there are conflicting regulations on a national and subnational level (Dauvergne, 2018). What makes global governance of plastics even more complicated is the wide range of pollution sources and the dispersal of microplastics (Dauvergne, 2018). To cope with the serious problem of plastic pollution in aquatic systems, several actors involved acknowledge that knowledge should be expanded about the origins, disposal and degradation of plastic (Lebreton et al., 2017).

An example of such actor is the Dutch Ministry of Infrastructure and Water Management, which recently developed a joint approach to manage plastic waste in rivers (Rijkswaterstaat, n.d.-a). This novel approach was announced in a letter to the House of Representatives on 6 November 2018. The Ministry of Infrastructure and Water Management emphasised that the policy aims at preventing the spread of macro- and microplastics in the river environment (Minister en Staatssecretaris van Infrastructuur en Waterstaat, 2018). This requires mapping out the problem, determining the concentrations of plastics in rivers, and analysing which technologies could be used to eliminate plastics in rivers (Minister en Staatssecretaris van Infrastructuur en Waterstaat, 2018). The Ministry of Infrastructure and Water Management also stressed that their policy is aimed at identifying the largest sources of (plastic) litter on riverbanks.

Accordingly, research was conducted in 2019 on behalf of Rijkswaterstaat (RWS), the executive agency of the Ministry of Infrastructure and Water Management, to identify the main sources of plastic pollution. The following sources were identified: *recreational beaches along major rivers, business parks and construction sites, inland shipping, leisure navigation, sport fishing, and city quays* (Rijkswaterstaat, n.d.-a).

Inland shipping was considered a major source of water-based plastic pollution. However, this report made no reference to the wide range of sub-sectors of inland shipping (Werner, 2019). According to the Central Commission for the Navigation of the Rhine (CCNR), the Rhine fleet comprises of five different sectors of inland shipping: dry cargo, tanker vessels, tugs and pusher craft, passenger vessels and day-trip vessels, and river cruise vessels (Centrale Commissie voor de Rijnvaart, 2018). The latter sub-sector has the largest passenger capacity of up to 194 passengers per vessel (CCNR, 2018). The European River cruise sector consists of 378 vessels and is rapidly expanding since 2013. The CCNR stressed that with respect to the worldwide river cruise market, Europe's river cruise market is most dominant and represents 41% of the active river cruises worldwide (CCNR, 2019). In 2019, over 1.79 million people opted for a journey on a river cruise in Europe, which is a 9.9% increase of passengers in one single year (CCNR, 2020). Passengers on board European river cruise vessels were mostly from the United States of America, followed by Canada, Germany, the United Kingdom, and Ireland (CCNR, 2019). The industry's growth is also observed in the number of passages of river cruise vessels through the lock in Iffezheim (Germany). Accordingly, 2929 Rhine River cruises passed the lock in 2019, which is a significant increase of 24% in comparison to 2018 (CCNR, 2020). RWS is also monitoring vessels' movements at a lock in Lobith, where the Rhine River enters the Netherlands. At this monitoring point, 106,598 inland vessels (representing all sub-sectors of inland shipping) passed in 2019, of which 4,120 were river cruise vessels (Rijkswaterstaat, 2021).

However, the coronavirus pandemic had an adverse effect on the river cruise sector with a drop in vessel movements to 746 in Lobith (Rijkswaterstaat, 2021). In addition, this sector faced a 90–95% decline of its passengers in 2020. Nonetheless, it is fundamental to gain insights into Rhine River cruise companies' practices related to plastics before this tourism sector thrives again once the restrictions are lifted. The rise in the number of river cruise vessels and in the number of passengers may worsen social, economic and environmental impacts (Sanches et al., 2020). Therefore, it is essential that the river cruise operators manage and reduce their plastic waste responsibly and sustainably.

Research to date has not yet determined how river cruise companies deal with plastics. To add, the policy context influencing their practices has not been examined. Therefore, this study aims to broaden insights into Rhine River cruise companies' practices related to plastics and to gain an understand of the political arena (context) in which these vessels operate (i.e., policy domains of *environmental protection of the Rhine* and *river cruise tourism*). The researcher focuses on both the micro-level (practices) and the meso-level (policy arrangements) to explore the interrelationship between policy and practice. As a result, this study makes general policy recommendations and suggests how RWS can promote sustainable changes to the river cruise companies' plastic waste management practices.

This focus leads to the main research question:

What are the dynamics of interaction between the policy domains of *environmental protection of the Rhine* and *river cruise tourism* and how can policies be enhanced to improve Rhine River cruise companies' practices related to plastics?

The next sub-questions are necessary for answering the main research question:

1. How are the dimensions of the Policy Arrangement Approach, *rules of the game*, *actors*, *resources*, and *discourses*, interrelated within the policy domains of the environmental protection of the Rhine and river cruise tourism, and do these policy domains reinforce or hinder each other?
2. What practices are adopted by Rhine River cruise companies to prevent plastic pollution in the freshwater environment?
3. Which challenges do Rhine River cruise companies meet when dealing with plastics?
4. What are the experiences of Rhine River cruise companies regarding practices related to plastics of their passengers?
5. What role could Rijkswaterstaat play in preventing plastics, originated from Rhine River cruise vessels, from entering the Rhine?

1.2 Scientific relevance

Research on plastic pollution focuses mainly on the marine environment (Blettler et al., 2018; Vriend et al., 2020). However, most plastics enter the oceans through rivers (Blettler et al., 2018; Jambeck et al., 2015; Vriend et al., 2020). Therefore, scholars indicate a need to acquire data on plastics (both large and small sizes) in river environments to estimate the emissions of plastics from rivers to the Earth's oceanic zones (Blettler et al., 2018). Considering plastic pollution in the Rhine River, scholars conducted more research on microplastics (Klein et al., 2015; Leslie et al., 2017; Mani et al., 2015) than macroplastics (van der Wal et al., 2015). There is a lack of data about macroplastics in the freshwater environment, whilst macroplastics contribute significantly to the plastic weight input in rivers (Blettler et al., 2018).

Literature research revealed that more research has been conducted on sea cruises and their environmental impact than on river cruises' effect on the environment. The strong focus on sea cruises is also observed when paying attention to (plastic) waste management practices (Dixon & Hughes, 2000; Herz & Davis, 2002; Sanches et al., 2020). For instance, scholars estimated that on a weekly basis 50 tons of solid waste is produced by one ocean cruise vessel with a capacity of approximately 3,000 passengers (Herz & Davis, 2002).

Nevertheless, data on (plastic) waste generated by river cruise vessels is absent. River cruise tourism is mainly investigated in the Danube River area (Dragin et al., 2007; Jászberényi & Miskolczi, 2020; Poletan Jugović et al., 2020; Ştefan et al., 2015). However, the Rhine River is considered one of the most popular destinations for cruise tourism worldwide (CCNR, 2010), which indicates a research gap considering Rhine River cruise tourism and its plastic waste management practices. Therefore, these practices related to plastics should be explored in more detail. River cruise tourism impacts its natural environment and affects a large number of stakeholders (Tomej & Lund-Durlacher, 2020). Therefore, and because of the expected growing impact, it is essential that research will be conducted on this topic.

1.3 Societal relevance

Plastic waste that enters the aquatic environment remains persistent for several decades (van Emmerik & Schwarz, 2020). Over time, macroplastics degrade into smaller particles of microplastics, both having a harmful impact on living organisms. Animals ingesting plastics is an environmental threat as it can cause decreased health and starvation due to a deceptive sense of satiety (Gall & Thompson, 2015, p. 175). Tiny plastic particles also pose a human risk as they infiltrate into water supplies and food chains (Boucher & Friot, 2017). Researchers showed that microplastic particles are present in tap water, sea food, and beer (Kosuth et al., 2018). Therefore, the presence of microplastics severely impacts food safety and food security (Barboza et al., 2018).

Additionally, the presence of litter on surface waters negatively influences tourism industries, as it affects water users' experiences (McIlgorm et al., 2011; Ministerie van Infrastructuur en Milieu, 2015). As such, plastic waste, mostly visible on riverbanks where it accumulates, influences the aesthetic value of the river environment (van Emmerik & Schwarz, 2020). Research indicated that plastic pollution in the marine environment may reduce tourism because it influences tourists' destination choices (Brouwer et al., 2017). Eventually, this possibly causes a loss of turnover in the tourism industry (Kenniscentrum Circulaire Economie, n.d.).

In the Netherlands, third parties such as the non-governmental organisation Schone Rivieren arranges cleaning operations at riverbanks. Rijkswaterstaat funds the removal and processing of the collected litter (Rijkswaterstaat, n.d.-d). It was estimated that municipalities spent over 157 million euros on litter prevention, monitoring, waste collection, and processing in 2018. Plastic pollution in the freshwater environment can also damage inland vessels when plastic items get twisted around propellers (McIlgorm et al., 2011). In this case, economic costs are associated with plastic-related damage to vessels, and this is considered a loss to our society (McIlgorm et al., 2011).

It is essential to gain insights into sources of plastic pollution and mismanaged waste practices to diminish the environmental, social, health, and economic consequences. More knowledge about sources could help to prevent plastics from being disposed into the freshwater environment. Therefore, this study focuses on river cruise companies' practices related to plastics to establish whether this tourism segment is a source of plastic pollution in the Rhine River. Moreover, this study supplies policy recommendations to improve the current plastic waste management practices and diminish environmental damage caused by plastic pollution.

2. Literature review and theoretical framework

The researcher will use relevant theories to address the identified knowledge gaps. These theories include the Social Practice Theory and the Policy Arrangement Approach, which are explained in more detail in this section. Moreover, these theories combined in the conceptual model guide this research. Additionally, the researcher discusses the Governance Theory, which forms an extension to the theoretical base for this study.

2.1 An introduction to Social Practice Theory

This study uses the Social Practice Theory (SPT) to gain knowledge of Rhine River cruise companies' practices related to plastics. Additionally, the researcher explores whether sustainable transformations of existing practices are required. Social practice theorists like Giddens, Bourdieu, Reckwitz, Schatzki, and Shove can be placed between *structure* and *agency* (Hargreaves, 2011). The practice becomes the fundamental unit of analysis, as opposed to surrounding structures and the people who execute the practice (Hargreaves, 2011). Even though the family of social practice theorists have different viewpoints on practices, they all oppose dualisms (i.e., the *structure-agency* divide) and provide alternatives (Reckwitz, 2016).

It is interesting to provide more insights into different viewpoints on social practices. Firstly, Reckwitz indicates that individuals (*agents*) become the 'carriers' of the social practice (Reckwitz, 2002). He stresses that practice theory is an example of cultural theory, opposing classical models of social theory, namely '*homo economicus*' and '*homo sociologicus*' (Reckwitz, 2002). The *homo economicus* model provides explanations of actions based on individual interests, while the *homo sociologicus* considers collective norms and values as important (Reckwitz, 2002). Instead, practice theory indicates that actions are influenced by symbolic structures of knowledge. In other words, these structures influence the way in which the world is interpreted by the agent.

Moreover, by engaging with practices, people can discern their surrounding world (Warde, 2005). When more environmentally friendly patterns of consumption are desired, the practices should be altered to make them more sustainable instead of teaching people to make different choices (Southerton et al., 2004). This is in line with Elizabeth Shove's thinking about practices. She emphasized that comprehension of the elements of practice and their interconnectedness should be at the core of policy initiatives on sustainable living (Shove et al., 2012).

The book, 'The Dynamics of Social Practice', by Shove et al. (2012) will be used as a fundamental basis for the analysis of social practices because of their valuable insights in sustainable transformations. In this study, these practices include Rhine River cruise companies' policies and measurements to prevent plastic pollution in the environment. Shove et al. (2012) suggest that their analysis is of importance when coping with challenging topics like consumption patterns or climate change. Figure 1 shows the elements of a social practice, comprising of *material*, *competence*, and *meaning*. The interdependent relations between these elements define practices (Shove et al., 2012). The *material* element consists of items, the human body, apparatus, tools, and infrastructures (Shove et al., 2012). Shove et al. (2012) define *competence* as a combination of having practical knowledge and several tiers of understanding. Finally, *meaning* is used to illustrate symbolic and social importance concerning participation at any point in time (Shove et al., 2012).

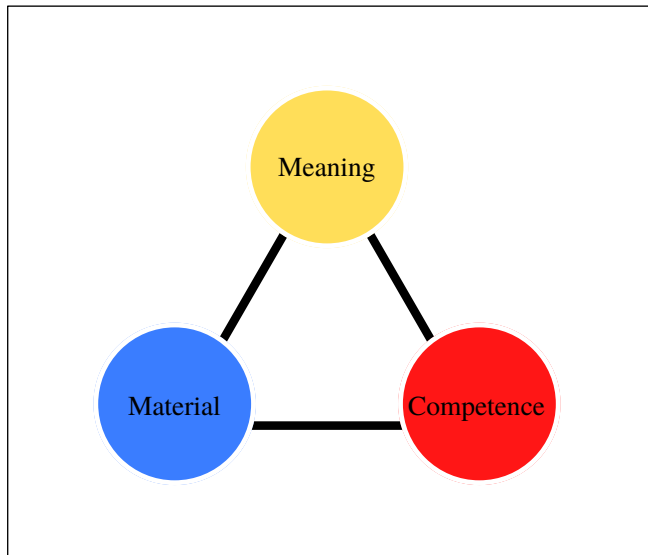


Figure 1. *Visualisation of the elements of a social practice (Shove et al., 2012, p. 29)*

According to Shove et al. (2012) there are three scenarios considering the integration of the three elements of practice, namely proto-practices (elements are not yet linked), practices (elements are linked) and ex-practices (linkages between different elements are no longer sustained) (Shove et al., 2012). These scenarios emphasise that linkages are central in social practices. Within routinised and stable practices, the same elements are continuously linked in a similar manner. When effectiveness of particular configurations is desirable, connections between elements should be re-established regularly, otherwise these connections dissolve (Shove et al., 2012). Policymakers can influence elements, interrelatedness, and trajectories of practice and processes of reproduction. Practice theory offers a conceptual and intellectual foundation for developing action plans and policy interventions to deal with complex challenges such as giving rise to routines with higher sustainability (Shove et al., 2012). The conceptual foundation provided by the SPT is useful for exploring Rhine River cruise companies' practices when dealing with plastics. This foundation also helps the researcher to develop policy recommendations that encourage more sustainable practices in this tourism segment. In this case, unsustainable practices related to plastics are disserted (i.e., linkages between elements are no longer sustained), and new interconnections between *material*, *competence*, and *meaning* are sought.

2.2 An introduction to Policy Arrangement Approach

This study uses the Policy Arrangement Approach (PAA) to understand the dynamics of interaction between the Policy Arrangement on *environmental protection of the Rhine and river cruise tourism* and their influence on the cruise companies' practices related to plastics. This approach helps to gain a broader understanding of policy practices and policy change (Veenman et al., 2009). The PAA was introduced by Arts, van Tatenhove, and Leroy in 2000. These scholars defined a policy arrangement (PA) as “the temporary stabilisation of the organisation and substance of a policy domain at a specific level of policymaking” (Arts et al., 2000, p. 54). Policy arrangements have a multi-level character, especially because of internationalisation processes which enhances its dynamics (Arts et al., 2006).

The dimensions of the PAA are *actors*, *resources*, *rules of the game* and *discourses* (Liefferink, 2006). These dimensions are interlinked (see Figure 2), which means that a change in one dimension affects other dimension(s). Firstly, the dimension *actors*, highlights the important stakeholders within a specific policy domain. This dimension also describes the coalitions in which *actors* participate (Arts et al., 2006). Secondly, *resources* refers to the division of resources among actors within the policy domain (Arts et al., 2006). Arts et al. (2006) distinguish between the concept of *influence* and *power*. *Influence* explains which actors make policy decisions and how, while *power* points at how resources are divided, put in place and mobilised (Arts et al., 2006). Thirdly, *rules of the game* encompasses active rules for (political) interaction, and formally accepted procedures for policy formation and decision making (Arts et al., 2006). Lastly, *discourses* refer to contemporary narratives used in the policy domain (Arts et al., 2006). Within the *discourses* dimension, actors' problem definition, values, norms, and viewpoints are central (Arts et al., 2006).

According to Liefferink (2006), there are two different levels of *discourses*. “The first level refers to general ideas about the organisation of society, particularly the relationship between state, market and civil society, i.e. about the preferred mode of governance” (Liefferink, 2006, p. 58). In addition, the second level of *discourses* refers to actors' ideas on policy issues, for instance, about the character of an issue or potential solutions (Liefferink, 2006). In short, *discourses* are related to the substantial aspects of policies, while the other three dimensions are associated with the organisational aspect (Liefferink, 2006). Researchers can enter the tetrahedron via each dimension, however choosing a starting point influences how the policy arrangement is explained (Liefferink, 2006). According to Liefferink (2006), departing from the *actor* dimension is reasonable to outline the policy arrangement around a particular problem.

Interconnections between the four dimensions of the PAA form the basis for exploring stabilising factors and change agents, plus their combination (Wiering et al., 2018). Stabilising factors are, for instance, fixed costs or path dependency, while a change agent might be an upcoming actor coalition (Wiering et al., 2018). Boonstra (2004) distinguished between *internal congruence* and *external congruence* of a PA, which helps to broaden insights into its stability and its potential for change. To give an example, *internal congruence* might occur when *discourses* are not aligned with *coalitions* or *rules of the game* (Wiering et al., 2018). Contrarily, *external congruence* might be observed when “the policy arrangement does not or no longer respond to broader political or societal demands” (Wiering et al., 2018, p. 236).

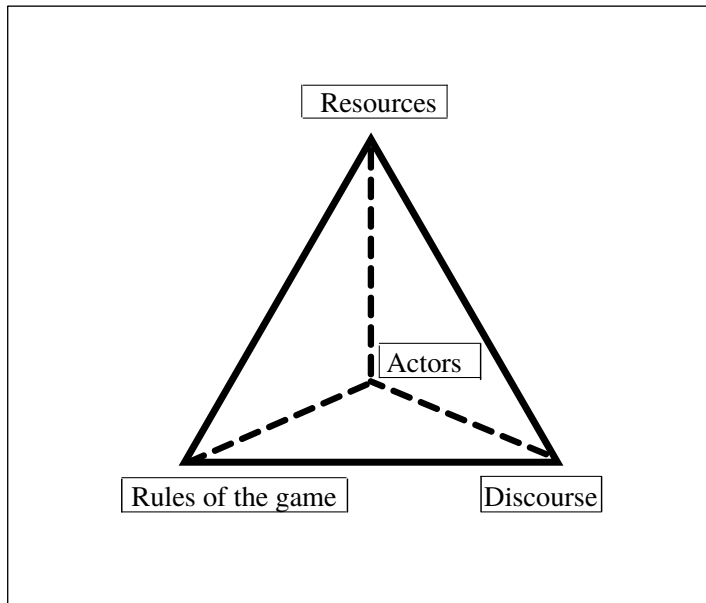


Figure 2. *The dimensions of a policy arrangement depicted as a tetrahedron (Liefferink, 2006, p. 48)*

The PAA helps researchers to analyse dynamic processes in policy arrangements by focusing on differences between the dimensions and how these dimensions are interlinked. By concentrating on these connections, the expected effectiveness of policy interventions is considered (Arts et al., 2006). Overall, the PAA provides favourable circumstances for developing policy improvements (Arts et al., 2006). Additionally, the link between specific structural developments and policy arrangements permits long term examination of policy intervention proposals (Arts et al., 2006).

Thus, this theoretical framework is essential for examining the dynamics of interaction between the policy arrangements of *environmental protection of the Rhine* and *river cruise tourism*. This approach helps the researcher to unravel whether these arrangements reinforce or hinder each other. Considering the hindrance factors, it is intended to transform those by opting for new connections between the dimensions, offering prospects for constructive change of the policy context where river cruise companies thrive. To conclude, the PAA is valuable in developing policy improvements to make Rhine River cruise companies' and passengers' practices related to plastics more sustainable.

2.3 Operationalisation of theoretical concepts used

The SPT and PAA are operationalised in a conceptual framework to explore the relation between policy domains (i.e., the Rhine environmental protection [PA1] and river cruise tourism [PA2]) and river cruise companies' practices related to plastics (see Figure 3). Elizabeth Shove's (2012) elements of social practices (i.e., *meaning*, *material*, and *competence*) and the dimensions of the PAA (i.e., *actors*, *resources*, *rules of the game*, and *discourses*) are incorporated in the conceptual model (Liefferink, 2006). Initially, PA1 and PA2 does not appear intricately linked; river cruise tourism focuses strongly on economic development, while environmental protection of the Rhine aims to conserve the freshwater environment. Nonetheless, river cruise tourism is dependent on a clean and attractive natural environment. Furthermore, river cruise tourism must be responsible for their share in the environmental protection of the Rhine. Therefore, these policy domains are interrelated. Both policy arrangements – PA1 and PA2 (meso-level) – are surrounding Rhine River cruise companies' and passengers' practices related to plastics (micro-level).

Because of the extended river cruise operations caused by COVID-19 restrictions, the researcher could not observe passengers on board a river cruise vessel, nor was it possible to interview this group about their practices related to plastics because of the high sensitivity to recall bias. Therefore, practices related to plastics of passengers as experienced by Rhine River cruise companies are incorporated in this study, indicated by the translucent practice circle SP2. During operations social practices of Rhine River cruise companies concerning plastics influence passengers' practices, and vice versa; therefore, it is relevant to shed some light on passengers' practices related to plastics (SP2).

Earlier scholars like Foucault already linked discourse (dimension of the PAA) to social practices (Bhatia et al., 2008). Therefore, Foucauldian discourse analysis is useful in environmental policy analysis, focusing on policymakers, agencies' implementing policies, and actors affected by a policy (Khan & MacEachen, 2021). Foucault tries to scrutinise discursive power struggles inherent within environmental politics (Hajer & Versteeg, 2005). "Discourse is defined here as an ensemble of ideas, concepts, and categories through which meaning is given to social and physical phenomena, and which is produced and reproduced through an identifiable set of practices." (Hajer & Versteeg, 2005, p. 175). This argument indicates that policy discourses influence conceptualisation in SP1 and SP2.

The work of Cohen et al. (2007) shows other relations between policies and practices. These scholars discussed that *resources* are effective if used in a correct way, which is influenced by people's understanding, and the circumstances affecting this understanding. Here, *competence* influences *resource* allocation and effectiveness. In addition, *materials* can be successful change agents when policymakers are able to let them work in loose structures (Cohen & Ball, 1990). This suggest that *actors* and *materials* influence one another. Additionally, the interplay of different *actors* influences all elements of the SPT. Policy actors "are often found to adhere to highly abstract, prescriptive discourses of sustainability, participation and collaboration that produce formalistic systems and technocratic solutions which do little justice to the practical, experiential, and contingent complexities on the ground or the informal practices" (Bartels, 2018, p. 16). Therefore, investigation is needed on policies relevant to river cruise operations to explore whether it is supporting river cruise companies' plastic waste management practices. Practices and policies have the potential to collaborate or to antagonise (Cohen et al., 2007). By investigating the relationship between policy and practice, the opportunities for cooperation will be unravelled to improve Rhine River cruise companies' practices related to plastics.

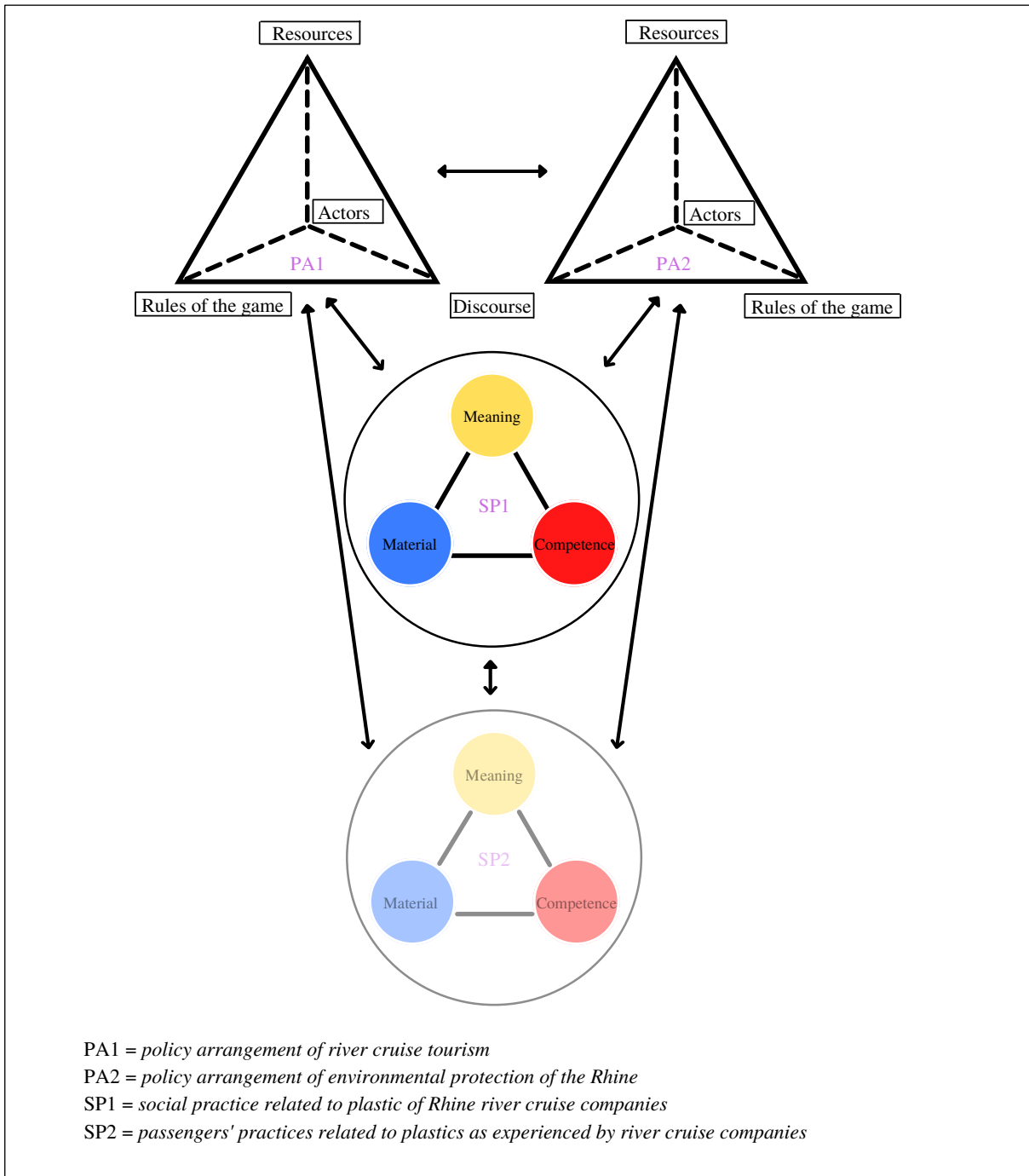


Figure 3. Conceptual framework

2.4 Conceptualisation of the context

The research process clarified the relevance of extending the theoretical basis of this study to broaden insights into the wider context of *environmental protection of the Rhine* and *river cruise tourism* policy. An interesting theory that could circumscribe the PAA is the Governance Theory. Governance refers to the process of policymaking whereby state, market, and civil society interact; this opposes classical thinking about policymaking whereby government authority plays a key role (Stoker, 1998).

Liefferink (2006) linked a dimension of the PAA and governance, indicating that the first level of *discourses* refers to the organisation of society by focusing on the interactions between the governance spheres; specifically “the preferred mode of governance” (Liefferink, 2006, p. 58). This observation supplies some basis for linking the PAA to governance in this study. When operationalising these theoretical concepts, it seemed logical to incorporate the policy arrangements in each government sphere (portrayed in Figure 4). Therefore, the dimensions of the PAA are all present in the state, market, and civil society spheres.

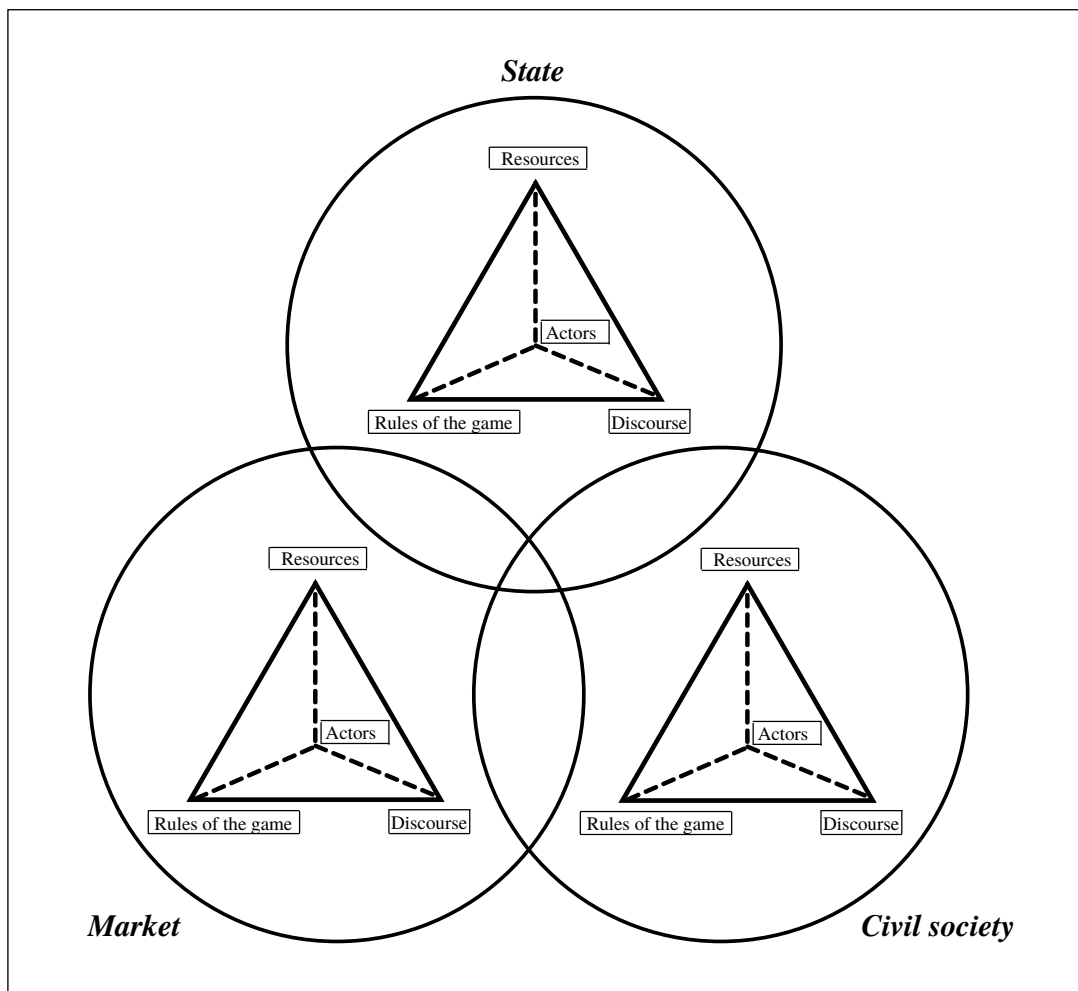


Figure 4. *The incorporation of the tetrahedron (Liefferink, 2006, p. 48) in the three governance spheres, and the interaction between spheres adapted from Steurer (2013, p. 398)*

Moreover, in the analysis of this focuses on several types of governance regulations. Steurer (2013) describes the interaction between the three governance spheres and different types of regulations applicable within and between spheres (Steurer, 2013). One can elaborate on the distinct types of regulations developed by Steurer (see Appendix A). For instance, in the state sphere actors might use *hard regulations* with legally binding rules. Tools that are used to execute hard regulations are for instance, directives, laws, and financial instruments (Steurer, 2013). The counterpart is *soft regulation*, such as policymakers developing non-legally binding rules. Examples of associated tools for soft regulation are persuasion, benchmarking, and modelling behaviour (i.e., lead by example). Additionally, subsidies are provided to promote desired behaviour (Steurer, 2013).

In the market sphere, *industry self-regulation* is applied to the entire industry; this regulation can refer to emission reduction goals or codes of conduct. Another commonly used regulation in the market sphere is *firm self-regulation*; code of conducts or Corporate Social Responsibility strategies are implemented at a single company level (Steurer, 2013). Furthermore, civil society organisations initiate *civil regulation* to pressure businesses and governments (lobby activities) and set formal standards with which industries or states should comply (Steurer, 2013). Appendix A mentions the regulations central within two or more spheres, further elaborated in the writing of Steurer (2013). This theoretical extension of the PAA will help visualise where (in which governance sphere or between spheres) the governance sphere regulations for this tourism segment concerning plastics are concentrated and where regulations are desired. This analytical inclusion is relevant for developing policy recommendations, aiming to improve Rhine River cruise companies' plastic waste management practices.

3. Methodology

This chapter discusses the research philosophy and research strategy, followed by the description of the case selection procedure. Furthermore, the different methods included in this study will be described. Finally, the research validity and reliability will be addressed.

3.1 Research philosophy and strategy

Research paradigm

The philosophical underpinning of this study reflects a combination of the *interpretivist* and *constructionist* paradigm. A research paradigm expresses a community of scholars' commonly accepted assumptions, values, and beliefs in relation to the nature of research and the way that research is carried out (Johnson & Onwuegbuzie, 2004, p. 24). It is important that the research paradigm aligns with the researcher's belief with respect to the 'nature of reality' (Mills et al., 2006, p. 26) to develop a solid research design.

Firstly, the *interpretivist* paradigm is characterised by a relativist ontology and subjectivist epistemology. The *relativist ontology* plays a central role in this study because of its subjective nature. It is important to note that "in this way of thinking, reality *is* human experience and human experience is reality" (Levers, 2013, p. 2). This implies that there are different realities, depending on the meaning attached to it by people (Levers, 2013). Accordingly, the researcher explores the subjective nature of shipowners and nautical experts' experiences and challenges regarding practices related to plastics in the multiple case studies. So, the researcher interprets the respondents' multiple realities to unravel underlying meanings. Subjectivity is also observed in the epistemological stance of this study. To specify, *subjective epistemology* focuses on values attached to knowledge by the respondents (Levers, 2013). Congruently, knowledge affects people's interpretations and reflections. This epistemological stance is for instance adopted in the interviews with shipowners and (nautical) experts to explore river cruise companies' knowledge on how to reduce the use of plastics during operations. One should bear in mind that in this study knowledge is co-created by the respondent and the researcher when interacting. They both bring in prior knowledge and experiences regarding the research topic (Poucher et al., 2020).

Secondly, the *constructionist* paradigm is characterised by a critical realism ontology and subjectivist epistemology. Critical realism highlights that reality is independent of people's mind (Levers, 2013). This perspective helps the researcher to identify phenomena based on small fragments, so the world can only be accessed partially. Like in the *interpretivist* paradigm, the subjectivist epistemology also fits with the *constructionist* paradigm. The latter paradigm highlights that the researchers' interpretation of a phenomena cannot be separated from society and the phenomena itself (Levers, 2013). There is an interaction between the researcher, or the interpreter of the data, and the phenomena (i.e., the 'interpreted') (Levers, 2013). In this study, the *constructionist* paradigm is relevant when analysing discourses (PAA dimension) in the policy domains of *environmental protection of the Rhine* and *river cruise tourism*. As a result, discourses are considered 'schemata of interpretation' (Goffman, 1974, p. 21). This *constructionist* paradigm is used in in the document analysis and in the exploratory interviews to investigate discourses. Furthermore, the *constructionist* paradigm plays a significant role in the double-loop learning process whereby the researcher and phenomena that emerged during interviews interact to gain deeper insights into the findings.

Triangulation

Methodological triangulation is performed when several methods are integrated in research (Bryman, 2004). To be more specific, methodological triangulation is a method which uses two or more procedures of data collection (Bekhet & Zauszniewski, 2012). This study included the following qualitative methods: document analysis, exploratory interviews, fieldwork on board and double-loop learning. Combining these methods improves the validity of the findings and provides more comprehensive data (Casey & Murphy, 2009). It also offers more depth to the analysis (Heale & Forbes, 2013).

3.2 Case selection and justification

Characteristic – river cruise journey

Before concentrating on the cases included in this study, the researcher will briefly describe the characteristics of river cruises. In the literature, there is no single definition of river cruise journeys (Tomej & Lund-Durlacher, 2020). One scholar defines river cruises as journeys that have a duration of several days along attractive riverside locations (van Balen et al., 2014, p. 71), excluding passenger vessels with a duration of several hours and day-trips. This definition is suitable for this study, which focuses on multi-day Rhine River cruise journeys which often start in Amsterdam, continue the journey to Cologne, and finish in Basel (or vice versa) (Expert interview 2). Furthermore, IG River Cruise, the European River Cruise Association, indicated that a typical river cruise has a capacity of 143 passengers (vessel sizes: length 108 meters and breadth 11 meters) (Grammerstorf, 2013). The researcher considered these above-mentioned characteristics when selecting the case studies.

Multiple case study approach

The author adopted a multiple case study approach to broaden insights into the Rhine River cruise companies' practices related to plastics and their experiences of passenger behaviour. These companies are the core unit of analysis in this research. The case study approach allowed the researcher to investigate challenges the Rhine River cruise companies face concerning plastic waste management. Moreover, this method enabled the researcher to discover variations within and between cases (Hafiz, 2008). The case studies were exploratory (Hafiz, 2008) because of the knowledge gap regarding river cruise companies' practices related to plastics. This exploratory nature is seen in the questionnaire, which incorporated a combination of closed-ended and open-ended questions (further elaborated in section 3.2.2). The case selection procedure is described in detail in the following paragraphs.

In Europe, 24 river cruise organisations are members of the Community of Interest, IG River Cruise. Criterion for IG River Cruise membership are ownership or management of a river cruise vessel. Tour operators that offer voyages on board a river cruise vessel are not eligible because it is a prerequisite to operate vessels (Expert interview 8). IG River Cruise members currently operate 326 vessels which represents 83% of the European market (IG River Cruise, n.d.). Only four European river cruise companies are not affiliated with IG River Cruise (Expert interview 8). For this study, a variety of IG River Cruise members were approached. As such, seven member organisations were willing to provide information about their practices related to plastics during a case interview. This ensured a coverage rate of 25% of all European companies. These river cruise companies represented the middle segment (3–4 stars) and upper segment (4–5 stars). The cases included Dutch, German, Swiss, American, and English fleets; reflecting a representative sample of the river cruise companies active in the catchment area of the Rhine. Table 1 shows an overview of the characteristics of the seven cases.

The researcher approached the river cruise companies' nautical experts because they handle information services, crew members management, safety and security, and clean shipping, among others. They are also closely involved in waste facilities on shore because they map out the routes of their operations. Moreover, this group is involved in communication with external parties such as IG River Cruise (Personal communication with Port of Amsterdam, April 22, 2021). In this research, nautical experts refer to both nautical directors, and nautical managers. However, often the researcher could not contact nautical experts directly, therefore applied the recruitment method, snowball sampling, using social networks of the respondents to access other nautical experts (Browne, 2005). A criterion for selection was experts with sufficient knowledge about the plastic waste management practices on board. In total, six nautical experts of different European and international river cruise companies were interviewed (case 2–7).

An exception to this is Case 1. A Dutch tour operator indicated that their nautical advisors were not directly involved with the practices related to plastics on board their vessels. Therefore, the researcher approached three shipowners. Each sub-case (case 1.1-1.3) represents a shipowner providing services to the same Dutch Rhine River cruise tour operator. In all three sub-cases the respondents also fulfilled the function of captain. A major advantage of including shipowners (and captains) in Case 1 is that they are often present on board, which helps to obtain accurate and detailed illustrations of on board practices and experiences with passengers.

Table 1. *Overview of case studies*

CASE	1 (1.1)	(1.2)	(1.3)	2	3	4	5	6	7
FLEET	Dutch	Dutch	Dutch	Dutch	Dutch	Swiss German	Swiss	American	American English German
NUMBER OF STARS	3-4	3-4	3-4	3-4	3-4	3-4	4-5	4-5	4-5
NUMBER OF VESSELS	1*	1*	3*	3*	4*	55*/66	19*/35	5*/19	28*
FUNCTION RESPONDENT	Ship owner & captain	Ship owner & captain	Ship owner & captain	Nautical Technical Manager	Nautical Technical Manager	Nautical Manager	Nautical Director	Nautical Director	Nautical Manager
GUIDED TOUR ON BOARD	Fieldwork on board	Fieldwork on board		Fieldwork on board	Fieldwork on board		Fieldwork on board		Fieldwork on board

* *Active river cruise vessels in the Rhine area*

3.3 Research methods

This study includes four research methods to answer the research questions, reflecting methodological triangulation. Firstly, document analysis was conducted on policy documents in the field of *environmental protection of the Rhine* (PA1) and *river cruise tourism* (PA2). Moreover, semi-structured expert interviews and case interviews were held. The researcher conducted fieldwork on board to gain more insights into the Rhine River cruise companies' practices related to plastics. Finally, a double-loop learning process was incorporated to broaden insights into the findings of this research.

3.3.1 Document analysis

First, the researcher conducted document analysis to investigate the policy contexts of both *environmental protection of the Rhine* (PA1) and *river cruise tourism* (PA2). Correspondingly, a variety of policy documents, reports, background papers and strategies were selected based on their expected relevance. The initial list of documents composed by the researcher based on an in-depth internet search was supplemented with policy documents addressed by experts during the interviews. Subsequently, policy documents were scanned and linkages to other policy documents were considered to develop a comprehensive list. Table 2 shows an overview of the documents analysed.

After close reading, the researcher analysed the 13 documents based on the dimensions of the PAA. Even though starting with the *actor* dimension seems a logical first step in analysing PA1 and PA2 (Lieverink, 2006), the researcher decided to enter the tetrahedron via the *rules of the game* dimension. This dimension is considered an essential starting point. Since the first month of internship at Rijkswaterstaat (before conducting research), policy officers shared knowledge on the lack of adequate rules to cope with the issue of plastic pollution in the rivers. Hence, this point of departure supplied valuable insights in the contextual aspects of the policy domains before the researcher conducted a detailed analysis on *actors'* roles. Therefore, in the analytical phase of this study, the researcher entered the tetrahedron via the *rules of the game* dimension, followed by the *actor*, *resources*, and *discourses* dimensions. The researcher considered these dimensions for PA1 and PA2.

The method of document analysis is suitable in this study because it helps to “obtain empirical data as part of a process that is unobtrusive and nonreactive” (Bowen, 2009, p. 38). The researcher paid attention to a broad range of aspects related to a policy document such as, the *presence*, *usefulness*, *accessibility*, *authenticity*, *purpose*, *context*, and *audience* (Bowen, 2009) to gain more insights in the document itself and the context. The researcher conducted the document analysis in a careful and transparent manner, especially when interpreting the data (Bowen, 2009).

Document analysis should provide information for answering the first sub-question:

- How are the dimensions of the Policy Arrangement Approach, *rules of the game*, *actors*, *resources*, and *discourses*, interrelated within the policy domains of the environmental protection of the Rhine and river cruise tourism, and do these policy domains reinforce or hinder each other?

Table 2. *Documents analysed*

NUMBER	DOCUMENT	FOCUS
1	Water Framework Directive (2000/60/EC)	<i>River environment</i>
2	Policy Discretion, Adaptation Pressure and Reloading Implementation Experiences in EU Water Governance: The Case of the Netherlands (van Eerd et al., 2019)	<i>Water Governance</i>
3	Dutch River Basin Management Plan Rhine 2016-2021	<i>Rhine River environment</i>
4	ICPR Rhine 2020 programme	<i>Rhine River environment</i>
5	ICPR Rhine 2040 programme	<i>Rhine River environment</i>
6	Marine Strategy Framework Directive (2008/56/EC)	<i>Marine environment</i>
7	Single-Use Plastics Directive (2019/904/EU)	<i>Reducing the impact of plastics on the environment</i>
8	CDNI Consolidated Convention (January 2019)	<i>Waste generated during navigation on Rhine and inland waterways</i>
9	Water Management Act	<i>Integral water management</i>
10	Treaty of Lisbon	<i>Legal basis tourism</i>
11	Europe, the world's No 1 tourist destination – a new political framework for tourism in Europe	<i>Tourism</i>
12	2030 Perspective: Destination Netherlands (2018)	<i>Tourism</i>
13	Green Award programme of requirements (January 2018)	<i>Inland shipping</i>

3.3.2 Exploratory interviews

This study included expert interviews (*N*8) and case interviews (*N*9). A substantial degree of satisfaction was reached about the number of interviewees included in this study, which gave sufficient ground in answering the research questions. Data was collected using semi-structured interviews, defined as a conversational interview method, allowing respondents to examine topics they consider essential (Longhurst, 2003). Semi-structured interviews help to broaden the researchers' insights into subjects' diverse experiences and behaviours (Longhurst, 2003).

When inviting the respondents via e-mail or telephone, the purpose of the research was clearly explained. The duration of one interview was around 45 minutes. The expert interviews were all completed online via MS Teams. Moreover, a few case interviews were conducted online, while the rest of the cases combined semi-structured interviews with fieldwork on board (see Table 1). The data were recorded on a digital audio recorder and transcribed using Amber Script. Subsequently, the transcripts were coded via Atlas Ti (version 8.4.5).

Expert interviews

The expert interviews focus on discovering which *rules of the game* are present, which *actors* are dominant, how *resources* are distributed among actors, and which *discourses* are commonly used within the policy arrangements of the environmental protection of the Rhine (PA1) and river cruise tourism (PA2). It is worthwhile mentioning that the tetrahedron is entered via the *rules of the game* dimension, like in the document analysis (section 3.1.1).

The selection criterion for expert interviews required subjects to be experts in the field of environmental protection of the Rhine or in the field of river cruise tourism, or both. The

researcher conducted interviews with experts from the Netherlands and other European countries to cover the entire catchment area of the Rhine to augment knowledge of the two policy domains, PA1 and PA2. A total number of eight experts were included in this study.

Two RWS water quality advisors, on the national level and the international level, were approached. Additionally, a member of the RWS department Waste and Circularity was interviewed. These experts were included to obtain further in-depth information about RWS' role in water quality protection and its task in preventing plastics from entering the freshwater systems. Moreover, an expert in multi-level water governance from the Utrecht University was selected to provide information on the interplay between national and international institutions in coping with water issues and about European policies of water quality. Furthermore, the researcher interviewed employees of the CCNR because of its contribution to the 'Convention on the collection, deposit, and Reception of waste generated during navigation on the Rhine and other inland waterways' (CDNI). This interview will give information about European and national policies related to plastic waste management for inland waterway vessels when sailing the Rhine River.

In addition, IG River Cruise – the European Community of Interest for river cruise organisations – was willing to supply information. This will contribute to capture the complexities of challenges the Rhine River cruise organisations face and how they are addressed, for instance, by European or national lobbying activities. Lastly, to gain more knowledge of plastics in the water column and at riverbanks, two interviews have been performed with researchers specialised in plastic monitoring from the Radboud University and Wageningen University & Research. These researchers are also engaged in plastic monitoring activities initiated by RWS. Monitoring data of plastics is necessary for policymakers and current days it is an important task for RWS. Table 3 shows an overview of the experts included in this study.

Experts should assist in answering the following sub-question:

- How are the dimensions of the Policy Arrangement Approach, *rules of the game, actors, resources, and discourses*, interrelated within the policy domains of the environmental protection of the Rhine and river cruise tourism, and do these policy domains reinforce or hinder each other?

Table 3. *Expert interviews respondents*

INTERVIEW	FUNCTION RESPONDENT
1	Advisor Ecology and Water Quality at Rijkswaterstaat
2	Policy officer Central Commission for the Navigation of the Rhine
3	Researcher plastic monitoring at Wageningen University & Research
4	Multi-level water governance expert at Utrecht University
5	Advisor Waste and Circularity at Rijkswaterstaat
6	Researcher plastic monitoring at Radboud University
7	Advisor Water Quality and International Coordination at Rijkswaterstaat
8	Vice-president of IG River Cruise

Case interviews

Within the case interviews, the elements *meaning*, *matter*, and *competence* of the SPT served as a basis for developing the interview questions. The primary aim of the inclusion of this research method was to gain profound knowledge of river cruise companies' practices related to plastics. For this purpose, questions were geared towards policies and measures implemented on board to prevent plastic pollution. Besides, case interviews helped to unravel river cruise companies' experiences and challenges related to practices on plastics. For instance, when a respondent put a lot of attention on a specific challenge or experiences, the researcher allowed this to appear.

In total, nine case interviews were included in this study; six interviews were completed on board a river cruise vessel. Table 1 provides an overview of the cases. The respondents are both nautical experts and shipowners, as described in the Section 3.2. The researcher divided the questions in the following sections: *plastic use*, *waste facilities on board* and *waste facilities on shore* to provide some structure to the interviews.

Fieldwork

Fieldwork was conducted on board six river cruise vessels. In the following cases, interviews were combined with fieldwork on board: case 1.1, 1.2, 2, 3, 5, and 7 (see Table 1). Due to the coronavirus pandemic, river cruise companies suspended their operations temporarily and berthed their vessels in Papendrecht, Dodewaard, Nijmegen, and Arnhem. Where it was not possible to visit the vessel, the interview was completed online (Case 1.3, 4 & 6). The fieldwork's purpose was to discover where plastics possibly could be lost to the environment. A guided tour was scheduled before the interview, which was of added value because the researcher could address certain aspects observed during the tour. This exploratory method helped to gain a detailed understanding of measures implemented on board concerning waste management. Additionally, it highlighted what the river cruise company's priorities are.

During the guided tour, the researcher paid attention to the following *material* elements used on board (Shove et al., 2012): *plastic products provided*, *tableware*, *waste facilities*, and lastly *icons, pictograms and/or text used* explaining waste management procedures. Moreover, the researcher investigated where plastics could pollute the environment (e.g., windows present in cabins). The researcher noted down observations in a booklet. During the tour, the researcher talked with the nautical experts and shipowners about their vessels. To build rapport and gain trust, the researcher also enquired about the impact of the coronavirus pandemic on this tourism segment. On average, the fieldwork took about 45 minutes on board each vessel.

The case interviews help to answer the following sub-questions:

1. How are the dimensions of the Policy Arrangement Approach, *rules of the game*, *actors*, *resources*, and *discourses*, interrelated within the policy domains of the environmental protection of the Rhine and river cruise tourism, and do these policy domains reinforce or hinder each other?
2. What practices are adopted by Rhine River cruise companies to prevent plastic pollution in the freshwater environment?
3. Which challenges do Rhine River cruise companies meet when dealing with plastics?
4. What are the experiences of Rhine River cruise companies regarding practices related to plastics of their passengers?
5. What role could Rijkswaterstaat play in preventing plastics, originated from Rhine River cruise vessels, from entering the Rhine?

3.3.3 Double-loop learning

After collecting data, the researcher integrated a double-loop learning process within this study to take a deeper look at the findings and to develop innovative interventions to change river cruise companies' practices related to plastics. Double-loop learning is explained as a reflection regarding important policy principles, values, and modus operandi (Cramer, 2005). Especially, the reflection on *discourses* played an essential role in this analytical phase. The researcher debated critical reflections of the findings with an RWS advisor in Behaviour and Circular Economy during an extensive session on 8 July 2021. Double-loop learning is important to create favourable social worlds, given that their concept relies on the reform of people's actions and social structures (Greenwood, 1998).

The RWS expert was included in this study because of its close involvement in pilot projects aimed at realising behavioural changes. Recently, this expert was engaged in a pilot project related to boatswain's waste disposal behaviour. Before the project, sailors often put waste bags next to waste containers at a Dutch harbour. After interventions, such as the application of *nudges* (e.g., covering waste containers with informative stickers about the waste subscription service), hardly any waste was placed near the container. This pilot project is a good example of a successful behavioural intervention. In addition, RWS is planning to expand this project to other locations in the Netherlands. Therefore, this expert seems fitting to help the researcher develop ideas for targeted interventions.

During the double-loop learning process, interventions are highlighted necessary for preventing plastics from river cruises polluting the environment. This double-loop learning method also helped the researcher to critically examine policy principles and legislations central within the policy domains of the environmental protection of the Rhine and river cruise tourism. Both reflections on practices (*human actions*) and on policies (*structures*) played a significant role when formulating policy recommendations for RWS.

The double-loop learning method contributes to answering the last sub-question:

- What role could Rijkswaterstaat play in preventing plastics, originated from Rhine River cruise vessels, from entering the Rhine?

3.4 Data analysis

A combination of deductive and inductive approaches is applied in this study. Firstly, the deductive approach is concept-driven (Schreier, 2012), which means that theory is necessary to retrieve data (Graneheim et al., 2017). The concepts *material*, *competence*, and *meaning* of the SPT are incorporated in a priority template of codes (Crabtree & Miller, 1992). These codes help the researcher to formulate interview questions based on these concepts to retrieve data on river cruise companies' practices related to plastics. Additionally, arguments founded upon principles, laws and regulations are conveyed effectively using deduction in reasoning (Soiferman, 2010, p. 3), which fit well with the dimensions of the PAA (*rules of the game*, *actors*, *resources*, and *discourses*). The PAA dimensions are also included in a priority template of codes, which helped the researcher to discover the policy domains of the environmental protection of the Rhine and river cruise tourism.

Secondly, this research used the grounded theory (inductive approach) to carry out qualitative research; also forcing the researcher to engage with the empirical world analysed (Charmaz & Smith, 2003). This inductive approach enables the researcher to explore patterns in social life guided by respondents' experiences (Engward, 2013). From the interpretative and constructionist perspective, the established scholars in the field of the grounded theory analyses research partakers' intentions, meanings, and actions taken. These aspects are investigated by observing, interviewing, or monitoring these partakers. Alternatively, other resources might be adopted (Charmaz & Smith, 2003). This method allows other topics or issues perceived as crucial to the respondents to emerge from interviews (Engward, 2013).

Social phenomena should be investigated focusing on three elements: respondents experiences, problems faced by respondents, and how respondents try to solve problems (Glaser & Holton, 2005). These three components are incorporated in the interview questionnaires designed to explore shipowners and nautical experts' experiences related to plastic waste management and challenges met. It is also worthwhile to explore inductive patterns in *discourses*, to gain a deeper understanding of political and public debates central to the policy domains of the environmental protection of the Rhine and river cruise tourism.

To summarise, the concepts of the PAA and the SPT were operationalised as measurable variables, this is in accordance with a more deductive approach (Van Thiel, 2014). The researcher opted for semi-structured interview questionnaires to allow other relevant topics to emerge. Adding this inductive approach is valuable because it enables the researcher to include new concepts in the findings of this study (Van Thiel, 2014), and eventually taking a more holistic view of the data.

3.5 Validity and reliability

The use of triangulation, by incorporating multiple methods, increases the validity of this study (Leung, 2015). Some methodologies improve the validity of the research, a good example of this is grounded theory, which uses participants' words to label themes and categories, rather than the labels provided by the researcher (Grossoehme, 2014). Hereby, biases caused by researcher interventions are diminished. Next to validity, reliability plays a key role in academic research. The researcher intended to conduct research in a consistent way with the aim to enable other scholars to replicate this study (Leung, 2015). Therefore, the researcher carefully described all steps involved in research, such as the design of the research, the collection of the data, and the procedures of data analysis.

4. Results

First, this chapter will focus on results of the policy domains, the *environmental protection of the Rhine* (PA1) and *river cruise tourism* (PA2), to see whether these domains reinforce or hinder each other. Subsequently, the results from river cruise companies' policies and measurements to prevent plastic losses in the environment are described. Additionally, the researcher addresses the findings on river cruise companies' challenges when coping with plastics, and their experiences considering passenger behaviour. Finally, the influence of policy on practice is discussed.

4.1 Policy Arrangements

To provide a concise overview of the information, the study makes a distinction between the elements of the PAA: *rules of the game*, *actors*, *resources*, and *discourses*. In each sub-division, both PA1 and PA2 are addressed in more detail. This chapter incorporates the findings of the document analysis, the expert interviews, and the case interviews. These different methods address the four dimensions of the PAA to varying degrees. For example, the document analysis focuses mainly on the *rules of the game*, while expert interviews focus more on *discourses*.

4.1.1 Rules of the game

Rules of the game for water protection

The European Water Framework Directive (2000/60/EC) was implemented in the year 2000 (European Commission, 2000). The Water Framework Directive (WFD) is to implement inclusive water protection in Europe's river districts, coastal waters, and groundwater, which also means reaching a '*good chemical status*' and a '*good ecological status*' of these waterbodies (European Commission, 2000). Therefore, this Directive encourages diminished polluting substances in the water environment. Annex X of the WFD incorporates the first scheme of priority substances. This list was amended two times, which eventually resulted in an overview of 45 priority substances, of which six are labelled as priority 'hazardous substances' (European Commission, 2000). These hazardous substances are "substances or groups of substances that are toxic, persistent and liable to bio-accumulate, and other substances or groups of substances which give rise to an equivalent level of concern." (Article 2, recital 29, WFD). Five years after the adoption of the WFD, this Directive had to be integrated into national law.

When focusing on the implementation process of the WFD (*Kaderrichtlijn Water*) in the Netherlands, one must consider the decentralised nature (bottom-up approach) of the Dutch water governance system (van Eerd et al., 2019). RWS and regional water authorities establish objectives and explore courses of actions necessary for the implementation of the WFD, while the ultimate responsibility lies with the Ministry of Infrastructure and Water Management (van Eerd et al., 2019). A policy expert of RWS indicated that to this day, plastics are not included in the WFD's list of priority substances (Expert interview 5). For policymakers it is essential that plastics are labelled as a priority substance because this helps to accomplish policy objectives (Expert interview 5). What might play a role here is the 'modestly ambitious' approach regarding the Dutch implementation of the WFD (van Eerd et al., 2019, p. 895). Factors influencing this perspective are, for instance, the knowledge gap considering water system behaviour, limited financial resources, high expenditures required for implementation, and the dependent relation between agencies responsible for implementation (van Eerd et al., 2019). The WFD allowed EU Member States to prolong the time frame for achieving its objectives (WFD, 2000/60/EC). In the case of the Netherlands, the benchmark date was moved forward from 2015 (indicated in the European WFD) to 2027 (Helpdesk Water, n.d.).

The WFD requires each Member State to develop a River Basin Management Plan (*Stroomgebiedbeheerplan*) every six years (European Commission, 2000). The River Basin Management Plan (RBMP) for the Rhine is an action plan under the Dutch integral vision on water policy. The measures necessary for the achievements of the objectives are addressed, focusing on both *chemical* components and *ecological* components (Ministerie van Infrastructuur en Milieu, 2015). The RBMP identified a variety of knowledge gaps (Chapter 4.5). For instance, this report highlights the issues of (plastic) littering and microplastics (Ministerie van Infrastructuur en Milieu, 2015). There is a strong demand for knowledge about sources of (plastic) litter and its effects on the natural surroundings (Ministerie van Infrastructuur en Milieu, 2015). In the RBMP it is highlighted that, on an international level researchers indicate ecological risks of plastic particles for aquatic systems' functioning. This example expresses the urge for expanding scientific knowledge on the issue of plastic pollution at a national level. The RBMP 2022–2027 (available in draft form), incorporates a measurement (Section 5.4.5) on litter and (micro)plastics, commenting on the WFD (Ministerie van Infrastructuur en Waterstaat, 2021): “WFD has the general objective of achieving a good chemical and ecological status, but does not address litter and (micro) plastics in the requirements for monitoring and assessment” (Section 5.4.5)

In addition, the Rhine 2020 programme of the International Commission for the Protection of the Rhine (ICPR) addressed the requirements of the WFD (International Commission for the Protection of the Rhine, 2001). This programme was endorsed in 2001 and focuses on sustainable development of the Rhine. According to the WFD, Rhine 2020 promotes the accomplishment of a ‘*good chemical and ecological state*’ regarding the Rhine catchment area (International Commission for the Protection of the Rhine, n.d.). This programme supports the new, more progressive, Rhine 2040 programme (International Commission for the Protection of the Rhine, 2020). Water quality, high and low water levels, and ecology form the basis of the Rhine 2040 programme. Several goals were developed for each focus area.

This study takes a deeper look at the water quality goals, because the topic plastics is covered there. For instance, goal six of the Rhine 2040 programme focuses on diminishing the (plastic) waste influx in the aquatic environment (International Commission for the Protection of the Rhine, 2020). To achieve this goal, a variety of measurements will be implemented: creating awareness by a waste collection campaign, collecting data on waste management, and improving waste management, to diminish the inflow of plastics at its source (International Commission for the Protection of the Rhine, 2020). The topic, plastics, is still in its infancy stage and is addressed, for the first time, by the ICPR in the Rhine 2040 programme (Expert interview 7). In the following excerpt, the process of putting ‘plastics’ on ICPR’s agenda is explained:

“The Rhine Commission often works like; you first want to know what there is. A comparison is made between different countries, and only then actions can be taken. So, international cooperation develops at a slow pace. We do take steps, but it is not from one day to another that we are going to catch plastics in the Rhine. [The subject plastics] now has attention and is included in the Rhine 2040 programme, but how we are going to fill that in or whether there will be an expert group is still open. Even so, we are glad that [the subject plastics] is receiving attention.” (Expert interview 5).

In the draft of the RBMP, the ability of the European Marine Strategy Framework Directive (MSFD) (2008/56/EC) to cope with the issue of plastic pollution is addressed (Ministerie van Infrastructuur en Waterstaat, 2021). “The European Marine Strategy Framework Directive offers starting points for tackling the problem [of litter and (micro)plastics], because it obliges

Member States to draw up measures that contribute to a good environmental status in marine waters.” (Section 5.4.5).

In 2008, the Marine Strategy Framework Directive (Directive 2008/56/EC) was adopted by the European Community. The objective of this Directive is to adequately safeguard European marine environments (European Commission, 2008). A framework was provided for EU Member States to ascertain that a ‘*good environmental status in the marine environment*’ is attained before 2021 (European Commission, 2008). Maintenance of biodiversity is fundamental for obtaining a good environmental status (European Commission, 2008). By 2014, each Member State had to develop monitoring programmes with clear targets.

In the year 2020, the European Commission provided a document referring to MSFD’s implementation (European Commission, 2020). The Commission highlighted that, albeit this framework is among the most extensive and aspiring on a global scale, it should be strengthened to cope with complex issues such as plastic pollution. The European Commission states that on the one hand, chemical regulation in the European Union resulted in the depletion of some chemicals present in the marine environment, while on the other hand (chemical) plastic particles accumulated in a variety of marine creatures (European Commission, n.d.-c). In recent years, the MSFD in the Netherlands (*Kaderrichtlijn Mariene Strategie*) focuses not only on monitoring plastics in the marine environment but also on scrutinising data on plastics originating from inland water areas. This is in line with a more source-based approach to prevent plastics from entering the North Sea (Expert interview 5).

Next to the MSFD, the Single-Use Plastics Directive (SUP)(2019/904/EU), and the circular economy are also considered viable leads on dealing with plastic litter (Ministerie van Infrastructuur en Waterstaat, 2021). The implementation of the MSFD boosted the enactment of the Directive on Single-Use Plastics (Directive 2019/904/EU), which came into force in 2019 (European Union, 2019). European rules in this area focus on diminishing the effect of plastic items on people’s health and on the (marine) environment. The 10 most frequently encountered plastic items on beaches were categorised to allow deeper insights into plastic pollution. This Directive restricts several single-use plastic items from entering the market, like cotton buds, plates, and straws (Article 5). Another objective is encouraging the move towards a more circular economy (for plastics) by opting for alternative materials (European Union, 2019). The Directive on Single-Use Plastics is thus associated with the Circular Economy Action Plan (adopted in 2015) and is part of the Plastics Strategy (adopted in 2018). The latter strategy’s main targets are the reduction of plastic waste, the promotion of sustainable production and consumption of plastics, and the revision of plastic recycling processes. This strategy also focuses on ameliorating separate waste collection of plastics (European Commission, 2018).

Rules of the game for inland vessels' waste management

In the second half of the 1990s, the 'Convention on the collection, deposit and reception of waste generated during navigation on the Rhine and other inland waterways' (CDNI) was signed (CDNI, n.d.-a). After ratifications, the Convention came into force in 2009. Switzerland, the Netherlands, Luxemburg, France, Belgium, and Germany are contracting states of the CDNI. In each of these contracting states the Convention was translated into national laws (CDNI, n.d.-a). The CDNI strive for "an ever more environmentally friendly inland navigation sector" (CDNI, n.d.-b). The CDNI has categorised waste in the following way: greasy and oily waste (*category a*), cargo-related waste (*category b*), and other waste (*category c*) (CDNI, n.d.-c). *Category c* includes household waste and wastewater from passengers ships (Rijkswaterstaat, n.d.-b). The contracting states of the CDNI are obliged to set up reception facilities for domestic waste and wastewater (Article 8.02). CDNI does not specify which actor is accountable for financing the construction of infrastructure for wastewater and sludge (Vermij & De Vries, 2020). RWS is responsible for the implementation of *categories a, b, and c* of the CDNI (Personal communication with RWS Advisor in Traffic and Water Management, June 9, 2021).

The Dutch institution SAB (*Stichting Afvalstoffen en Vaardocumenten Binnenvaart*) executes a number of implementation tasks of the CDNI (*Scheepsafvalstoffenverdrag*) on behalf of the Ministry of Infrastructure and Water Management (Rijkswaterstaat, n.d.-c; SAB, n.d.-c). SAB's task is to develop and take care of a network of waste reception facilities for waste derived from vessels along the Dutch waterways (SAB, n.d.-c). Since 2013, vessel owners can take out a subscription with SAB to dispose household waste (*category c*) along Dutch national waterways (Rijkswaterstaat, n.d.-b; SAB, n.d.-a). Vessel owners can opt for three types of subscriptions provided by SAB, namely *basis*, *basis+*, and *major consumers*. The latter subscription for *major consumers* sounds applicable to river cruise vessel. However, this subscription facilitates the disposal of 500 kilo of household waste per year, which does not cover the large quantities of waste produced by these vessels (Personal communication with RWS Advisor in Traffic and Water Management, June 9, 2021). Moreover, the capacity of each waste container is insufficient to cope with waste generated by river cruise vessels (Personal communication with RWS Advisor in Traffic and Water Management, June 9, 2021).

Regarding wastewater from passenger vessels, in Article 77 of the CDNI (*Scheepsafvalstoffenverdrag*) it is highlighted that wastewater discharge in rivers is allowed from vessels with a capacity of fewer than 50 passengers. Since 2011, vessels with a capacity of more than 50 passengers are only allowed to discharge wastewater when using a treatment plant on board, which follows regulations formulated by the Minister. The CDNI is planning to reduce this threshold to vessels with a capacity of 12 passengers or more by 2025 (CDNI, n.d.-b). These wastewater discharge standards are controversial to the Water Management Act (*Waterwet*), which stipulates that discharge of substances in the surface water is forbidden unless permits are granted (Article 6.2). The Water Management Act (WMA) replaced eight existing water management laws, of which the Pollution of Surface Water Act and the Marine Pollution Act are noteworthy. The key objectives of the WFD, such as reaching a '*good chemical and ecological status*' of waterbodies, are central within this Act. The WMA concentrates on the integral management of water bodies, while *actors* like municipalities, provinces, and waterboards counter issues of water pollution, flooding, and water scarcity.

When focusing on waste management of sludge and wastewater, the *Inspectie Leefomgeving Milieu* (ILM) signals that no regulation has yet been made for domestic wastewater and sludge for passenger ships (Inspectie Leefomgeving en Transport, n.d.-b). It appeared that liabilities were shifted to the river cruise sector because they always have arranged it by themselves (*routinised practice*) (Personal communication with RWS Advisor in Traffic and Water Management, June 9, 2021).

Rules of the game for river cruise tourism

The adoption of the Lisbon Treaty in 2009 was a crucial moment for the tourism sector because this was the first time a legal basis was provided for the tourism sector by the European Union. In Article 176 B of the Lisbon Treaty, the objectives for the tourism sector are stated: “The Union shall complement the action of the Member States in the tourism sector, in particular by promoting the competitiveness of Union undertakings in that sector”. Hence, the European Union’s actions strived to enhance Member States’ collaboration, especially by interchanging best practices. In addition, the European Union supported the shaping of a favourable environment in which the tourism sector had the potential to flourish (European Community, 2007). In 2010, the European Commission disclosed a novel political tourism agenda ‘*Europe the world’s No. 1 tourist destination*’. The main aim of this memorandum for Europe was, to remain the number one tourist destination in the entire world. An action plan for European tourism was developed. The Commission shed light on sustainable tourism, improvement of competing efforts, the perceptibility of tourist destination Europe, and the expansion of financial policies at a European level for the evolvement of the tourism industry. The following excerpt highlights the progressive standpoint of the European Commission:

“This consolidated framework is a first step. For this reason, the Commission will continue to discuss tourism initiatives between now and the European Forum on tourism in November 2010, when a more detailed action plan may be discussed with the Member States and with public and private European tourism operators. In the medium term, it will then take stock of the strategy to assess its success and move forward.” (Chapter 6)

In the Netherlands, the 2030 Perspective on tourism, started by NBTC Holland Marketing, was published in 2019. Sustainable development is one of the main pillars in the 2030 Perspective; this concept refers to processes like preventing waste and pollution, circularly using raw materials, and diminishing emissions (NBTC Holland Marketing, 2019). A variety of initiatives in line with this pillar are listed, such as “creating awareness of own behaviour” (Chapter 4.1). People must be conscious of their relationship with the environment. Better awareness about the impact of certain behaviours can stimulate people to make more sustainable choices. Furthermore, the 2030 Perspective indicates that “sustainable initiatives should be supported, while polluting activities must be taxed at a European level” (Chapter 4.2) (NBTC Holland Marketing, 2019). The 2030 Perspective expresses the relevance of financial resources, or other incentives to become available for rewarding sustainable initiatives (NBTC Holland Marketing, 2019).

River cruise vessels that meet environmental and safety standards can earn a Green Award. The Green Award aims to acknowledge and promote environmental friendly inland navigation (Green Award, n.d.-c). The Green Award focuses on reducing emissions and less on garbage, because this is harder to measure and control (Expert interview 8). There are three types of Green Awards, namely bronze, silver, and gold (Green Award, n.d.-a). Advantages of earning a Green Award are access to big ports, such as Amsterdam (expectedly from 2023 onwards) and discount on port fees and port services (Case Interview 1.3). It is interesting to take a deeper look at the different requirements developed by Green Award. Operating a ship with a wastewater treatment plant is a prerequisite to obtaining a Green Award [*Requirement 50g.*]. However, the prescribed requirements for such a water-purification plant are lacking on the website of Green Award. There is only one requirement focusing on river cruise tourism, specifically catering services and hotel facilities on board these vessels [*Requirement 70d.*]. Currently, Green Award is working on a separate certification system for river cruise vessels (Personal communication with organisation supplying purification system for vessels, August 24, 2021; Case interview 7).

Conclusion on rules of the game

Plastics is a relatively new topic in policy documents central to the *environmental protection of the Rhine and river cruise tourism*. With respect to plastic pollution in the water systems, there is an extensive focus on the marine environment which is seen in the inclusion of plastics in the MSFD. Also, the SUP-Directive includes data of plastics encountered on beaches, without considering data of the most encountered plastic items on riverbanks. The WFD does not incorporate plastics in the priority substances list, which hinders policymakers from coping with plastics in the freshwater environment. The slogan, 'Europe the world's No. 1 tourist destination' is used as a marketing tool by the European Commission to attract more tourists. A neglected issue is excluding the river cruise sector for household waste by CDNI, which is shifting the responsibilities to the market itself. Besides, in the CDNI, it is not clarified which actor is responsible for financing the construction of waste infrastructure. This ambiguity leaves river cruise companies to their own devices regarding waste management ashore, making it more difficult for the river cruise sector to ensure efficient and proper (plastic) waste treatment and disposal, which is essential for environmental protection. The Green Award focuses on safe shipping and environmental standards. Mostly, emissions and purification systems on board inland waterway vessels are of interest, while plastics remain out of focus in the requirements.

4.1.2 Actors

Actors relevant for environmental protection of the Rhine

The Directorate-General for the Environment (DG Environment) is a department of the European Commission, in charge of environmental policies. European water policies are an essential part of this department (Expert interview 7). Examples of topics addressed by the DG Environment are noise, chemicals, plastics, circular economy, waste and recycling (European Commission, n.d.-a).

In the Netherlands, the Ministry of Infrastructure and Water Management is responsible for a clean river environment (Expert interview 5). RWS performs tasks for the Ministry of Infrastructure and Water Management. RWS manages major waters (i.e., rivers and seas), while district water boards manage regional waters (Government of the Netherlands, n.d.). Other important actors who cooperate with RWS to protect the freshwater environment of the Rhine are provinces and regions (Expert interview 7). According to an RWS Advisor in Water Quality and International Coordination, the municipalities are less committed than these other actors (Expert interview 7).

Regarding plastic monitoring in the river environment, RWS works with the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Expert interview 5). Also, Stichting de Noordzee cooperates with RWS in plastic monitoring research and collects data for coastal areas and rivers (Expert interview 3). In addition, Schone Rivieren classifies pieces of plastics on the riverbanks with the OSPAR-method using citizen science. These non-governmental organisations use data to boost lobby strategies (Expert interview 3). The Plastic Soup Foundation, Greenpeace, World Nature Fund, and Soup Surfer are important stakeholders that lobby at a national, European, and international level and try to influence the political and public debate (Expert interviews 3, 5 & 7). Other stakeholders involved in plastic monitoring projects are Research Institutes like Wageningen University & Research and Radboud University (Expert interview 3). Different actors try to influence policymaking at a European level: “Member States themselves and all sorts of stakeholders, such as experts’ associations, business organisations and nature conservation groups try to upload their preferences, interests and ideas to the EU level”(van Eerd, 2020, p. 20).

Actors relevant for river cruise tourism

The Directorate-General for International Market, Industry Entrepreneurship and Small- and Medium-sized Enterprises (DG GROW) is accountable for tourism policies. The following excerpt describes the central goal of EU tourism policy:

“EU policy aims to maintain Europe's standing as a leading destination while maximising the industry's contribution to growth and employment and promoting cooperation between EU countries, particularly through the exchange of good practice.”
(European Commission, n.d.-d)

Both competitiveness and sustainable development play a central role within Europe’s tourism policies. The European Commission takes several initiatives in sustainable development and tries to overcome specific challenges, such as diminishing the use of resources and reducing the generation of waste at places of interest for the tourism industry (European Commission, n.d.-b). IG River Cruise represents the sector at a European level. This branch organisation can lobby at a national and European level when vessel owners encounter issues to gain favourable policy outcomes (Expert interview 8). IG River Cruise, other branch organisations, tour operators, and vessel owners are affiliated with the European Barge Union, an association representing freight and passenger transport industry in Europe (Expert interview 8).

In the Netherlands, tourism policy is in the scope of the Ministry of Economic Affairs and Climate Policy. The Ministry supports the Netherlands as an innovative nation with a healthy economic standing (i.e., competitive position) as well as its sustainability awareness (Ministry of Economic Affairs and Climate Policy, n.d.). As a result, attention is paid to the natural environment. The Ministry cooperates with The Netherlands Board of Tourism and Conventions (NBTC), an organisation working on branding, development, and improving the reputation and the positioning of the Netherlands as a beneficial tourist destination (Netherlands Board of Tourism and Conventions, n.d.). The Centraal Bureau voor Rijn- en Binnenvaart (CBRB) and the Koninklijke BLN-Schuttevaer are branch organisations for inland vessels, they represent the river cruise sector and try to influence policymaking. The CBRB works on issues such as the lack of sufficient wastewater reception facilities (Case interview 3). To promote sustainable waterborne transport, the Green Award tries to establish partnerships with actors like municipalities, ports, and a company offering purification systems on board vessels (Green Award, n.d.-b).

Conclusion on actors

There is a lack of cooperation between the various actors in the policy domain of *environmental protection of the Rhine* and *river cruise tourism* to cope with the issue of plastic pollution in the freshwater environment. Many actors collect data on plastics because this is considered a prerequisite to cope with the complex issue of plastic pollution in the freshwater environment. In both policy domains, non-governmental organisations and branch organisations try to influence the political and public debate by lobby activities, supported by data. For tourism policies, policymakers link competitiveness and sustainability at a European and at a national level. The European Commission stresses the importance of sharing good practices for tourism to evolve. The results show that market actors are dominant within the river cruise tourism sector. The organisation Green Award is a relevant actor in the market, setting codes of conducts for the entire inland waterway transport sector according to environmental standards. The fragmented nature of the river cruise tourism policy contributed to Green Award taking the lead in enhancing sustainable development for river cruise operations, while top-down steering by state actors remained behind.

4.1.3 Resources

Resources central to environmental protection of the Rhine

At a European level, there are limited *financial resources* for water policy at hand, therefore, the means, implementation and payment for this policy area lie more with the Member States themselves (Expert interview 6). Nevertheless, commonly used resources by the European Union are *knowledge, coordination, facilitation*, and a bit of *political power* (Expert interview 6). Employing these resources, the EU organises consultation structures, such as the Common Implementation Strategy, with various working groups for themes where the Member States can also discuss implementation (Expert interview 6). For instance, the reporting working groups meet with all Member States every three or four months to discuss implementation. The questions: “What problems are you experiencing? How do you solve that? And is it facilitated by the EU?”, are at the core of these meetings (Expert interview 6).

Policies regarding reducing plastics in the river environment are still in their infancy (Expert interview 5). RWS needs permission from the Ministry of Infrastructure and Water Management (*authority*) to act on plastic pollution in the freshwater environment (Expert interview 7). The Ministry of Infrastructure and Water Management has the *authority* to prioritise certain issues above others and decides how *financial resources* are distributed. An RWS Advisor Waste and Circularity stated: “It is one of our challenges to ensure that money from the Ministry goes to Rijkswaterstaat to cope with the issue of [plastic pollution in rivers].” (Expert interview 5). The Ministry’s *financial resources* are limited, therefore, it is necessary for RWS to expand *knowledge* on specific topics, for instance, via plastic monitoring in the water column or by setting up pilot projects in conjunction with knowledge institutions and market parties, so that this issue becomes more of a concern (Expert interviews 1 & 5). Eventually, *knowledge* influences policymaking at the Ministry’s level. It is intended to prioritise the issue of plastics on the political agenda (Expert interviews 1 & 5). The findings show that RWS prefers to *distribute responsibilities* among different actors, especially by putting issues on the agenda of others (Expert interviews 1 & 5). An Advisor in Waste and Circularity of RWS proposed a solution to the issue of plastic pollution, embracing the resources *distribution of responsibilities, collaborative efforts*, and *financial resources*:

“I think [the policy aimed at diminishing plastics in rivers] can be improved if Rijkswaterstaat collaborates much more with stakeholders, in which everyone works on solutions with their own responsibility. You really must do it together. I think it would be desirable if more financial resources were available so that you can start with those source-based measures, aimed at preventing plastics from entering the water environment. I think those are the main lines. And we need objectives because then you have a goal to work towards something.” (Expert interview 5)

Resources central to river cruise tourism

The organisation CCNR draws attention to the importance of having access to appropriate data (*knowledge*), by highlighting that this resource is necessary for coping with the issue of plastic pollution.

“So, we can work on professional qualifications and [awareness] campaigns on crew and on waste management from CDNI. For the moment as we do not have data about plastics from [Inland Waterway Transport] IWT. (...) we did not handle the topic.” (Expert interview 2)

The *financial resources* of IG River Cruise are limited due to the voluntary nature of this organisation (Expert interview 8). Within the lobby activities of the Community of Interest for the river cruise sector, *knowledge* and *time* are necessary:

“In general, (...) we have regular meetings with all the members, and we will bring up the issue of a subject that usually comes from the members and say, “We would like to work on that; who is interested to take part?”. You create a working group that identifies the issues, what area needs [solutions], and what solutions are there. And then you go out and lobby wherever that makes sense. Depending on the issues you try and find a solution to it. Sometimes successful, sometimes [it has] been less successful, sometimes politics just take over.” (Expert interview 8)

River cruise companies need to make investments on board its vessels to be eligible for a Green Award, for instance, by purchasing an approved wastewater treatment plant (*financial resources*) (Expert interview 8). In return, river cruise companies get discounts on docking fees, and these vessels can dock in the Port of Amsterdam. Soon, river cruise vessels without a Green Award are not allowed to moor at large harbours, like in Amsterdam (expectedly from 2023 onwards) (Case interview 1.3). A driving force for river cruise companies might be *recognition* for customers and *approval* within the inland shipping industry when possessing a Green Award. Moreover, they can use this certificate as a *marketing tool* to promote its green image (Case interview 1.3).

Conclusion on resources

Data is necessary for policymakers to set policy objectives in the area of plastic pollution. In the policy domain of *river cruise tourism*, the CCNR does not cope with plastics as it first wants to receive data on plastic waste streams generated by inland waterway vessels. This suggests that the urgency to cope with plastic pollution in the river environment is limited at a policy level. RWS prefers to *distribute responsibilities* to other actors by putting issues on their agenda. What is needed to cope with the issue of plastics in the water environment is the collaboration with different actors whereby the same goals are pursued. River cruise companies need financial resources to qualify for a Green Award. However, cruise companies with limited financial resources risk being excluded from large ports. The sustainable development of the entire sector is restrained as long as policymakers provide no financial resources to support the latter group in making this transition.

4.1.4 Discourses

Discourses related to environmental protection of the Rhine

The European Union strives for ecologically healthy and chemically clean water in the river environment (Case interview 6). In conformity with this, ‘*reaching a good ecological and chemical status*’ is central in the WFD, ICPR’s Rhine 2020 programme, and in the RBMPs. If plastics are not incorporated in the priority substance list of the WFD, this issue falls through the cracks. The discourse on ‘*reaching a good ecological and chemical status*’ has more or less an integral and river basin focus (Expert interview 6). The following excerpt elucidates this discourse:

“The goal of the Water Framework Directive is to reach a good ecological potential and a good chemical quality. (...). Good ecological potential, so the term ecology has come back very strongly. Water is not only there for people, (...) but water is also part of an ecosystem, and that should actually be captured.” (Expert interview 4)

On a national level, a discourse shift has taken place, which is described in greater detail by Expert 7:

“The discourse has changed over the years. I expect that things will change a bit when a new cabinet enters into force. [The discourse] depends on who will lead us, we are quite dependent on that. The past few years, water quality and ecology have become increasingly important. While 15 years ago, the focus was much more on flood protection, that is where all the money went to. In the last ten years, much more attention has been paid to the ecology of clean water and good water quality, and there is also money available for that. The discourse focuses more on ensuring that our water is as clean as possible for swimming, and for our drinking water.” (Expert interview 7)

The Polluter Pays Principle (*De vervuiler betaalt*) is widely used within policymaking and plays a vital role in the CDNI, RWS, Waste Framework Directive, and WFD (Expert interview 1). This guiding principle means that people who produce pollution must pay for this practice. For example, a containership produces less waste than a river cruise vessel with a larger passenger capacity; therefore, the latter must pay more for waste management.

The discourse – tackle the issue at its source (*Saneren bij de bron*) – is widely used within RWS. An RWS advisor defined the principle as follows: “You must ensure that [plastics] do not get in the water environment. And you need to understand what the major sources of pollution are.” (Expert interview 1). Removing plastics from water is not the focus of the Ministry of Infrastructure and Water Management and RWS’s focus, because this is an end-of-pipe solution before plastics enter the ocean (Expert interview 5). Tackling the issue at its source is considered a more effective strategy (Expert 5). In line with this principle, goal six of the Rhine 2040 programme focuses on diminishing plastic waste influx in the Rhine River. Also, in the context of the MSFD, the Dutch Ministry of Infrastructure and Water Management is engaged in preventing plastic litter from entering the marine environment. There is also a sizable ongoing discussion about RWS its responsibilities (Expert interview 5).

The following excerpt is an excellent example of this because RWS is still unravelling its tasks within the water part:

“In the water area, Rijkswaterstaat is still exploring what its tasks are; this is not enshrined. One of the tasks of Rijkswaterstaat is for example to ensure smooth transits of vessels. But the ‘clean’ task is not established. Based on general principles such as ‘environmental responsibility’ and ‘stewardship’ you can say you have a task. But what does that mean? Because the question has been posed to Rijkswaterstaat to devise measures you see that this is completed.” (Expert interview 5)

Furthermore, another discourse that might play a role is: “*How are you going to pay?*” (Expert interview 5). RWS is dependent on financial *resources* provided by the Ministry of Infrastructure and Water Management, therefore RWS must expose problems, so that money will become available to cope with specific issues.

A researcher specialised in plastic monitoring in the freshwater environment made a critical comment to discourses by indicating that discourses sometimes divert attention away from the bigger problem (Expert 3). From the 150,000 objects analysed by Schone Rivieren, the number of straws found on riverbanks were minimal. Nevertheless, much attention was paid to straws, and this product was even forbidden at a European level. Instead, attention should be paid to the more significant problem of food packaging (Expert 3).

Discourses related to river cruise tourism

CDNI is working on “*harmonisation of the sorting of household waste*” on board and along the waterways (CDNI, 2021). This organisation focuses on clear and recognisable symbols because this is considered a valuable tool for homogenous waste management practices on an international level. “Better sorting and separate collection of this waste throughout the disposal chain will encourage the recycling of useful materials, and the boat master can reduce the volume of waste. The environment and navigable waterways will benefit from this.” (CDNI, 2021). CDNI emphasizes that in 2022 resolutions in this field will come into effect (CDNI, 2021). Until then, the solutions are debated with involved stakeholders and the discourse will gradually shift to the standardisation of the sorting of waste.

One of the main projects of the CCNR is greening the inland navigation fleet (Expert interview 2). Greening in this respect means seeking a zero-emission fleet so that emissions in the water, and in the air reduce. Alternative fuels are essential for achieving this goal (Expert interview 2). Case interview 1.3 revealed that the interviewee linked the concept greening to the Green Award. When this vessel owner receives a Green Award for one of its vessels in the near future, this river cruise company plans to use this concept in their communication with prospective customers. This discourse will be used as a marketing tool to promote green journeys via social media, on the tour operator’s website and in the booklet (Case interview 1.3). Also, river cruise companies use this discourse to stand out from the competition in the market.

The river cruise sector is sometimes portrayed negatively. Some problem definitions associated with this tourism segment are, wastewater pollution, noise pollution, and air pollution (Case interview 6 & Expert interview 8). Moreover, this sector also links to mass tourism and deficiencies in labour practices, according to IG River Cruise (Expert interview 8). Noise pollution, air pollution, and wastewater are especially of concern for local communities living near harbours and mooring places because they want to live in a clean environment (Expert interview 8). Besides, IG River Cruise showed that plastic pollution is a vital topic in the Port of Amsterdam. River cruise companies were requested to avoid plastic pollution in the river environment and to contribute to improving the water quality (Expert interview 8)

Conclusion on discourses

The notion of *plastic pollution* is not rooted deeply in policy documents. It is considered a lost benefit that plastics are not included in the priority substances list of the WFD. The WFD forms the basis for other regulations, leaving room for policymakers to postpone taking responsibility for the issue of plastic pollution in the freshwater environment. The media strongly influences the discourse on *plastic pollution*, which increases the likelihood that issues are taken out of context. Therefore, public opinion must be informed correctly by using academic sources. The *Polluter Pays Principle* is widely used by policymakers; this principle is negatively formulated, which can be seen in the focus on a financial penalty instead of focusing on positive words to stimulate correct behaviour related to waste management. CDNI's initiative on *harmonisation of the sorting of household waste* is a favourable development for the inland waterway transport sector, however river cruise companies cannot participate in this debate as long as the CDNI excludes this tourism sector concerning *category c* household waste. River cruise companies use the discourse *greening* as a marketing tool to attract tourists and differentiate from the competition. This discourse creates the impression that *green* vessels also sustainably cope with plastics. However, plastics are not a focal point of the Green Award, which means that vessels with a certificate are partly *green*.

4.1.5 Dynamics of interaction

The results of this study revealed that there are some interactions between *environmental protection of the Rhine* (PA1) and *river cruise tourism* (PA2). There are a few dimensions positively influencing each other while others hinder each other. The analytical findings are discussed; also, an overview of the dimensions of PA1 and PA2 is provided in Appendix B.

The issue of plastics in the river environment is superficial in the dimension *rules of the game* in both PA1 and PA2. Nevertheless, the topic of plastics is integrated into the field of environmental protection of the marine environment. The exclusion of ‘plastics’ in the WFD contributes to the lack of policy objectives set to cope with this issue. If the WFD includes plastics, this will positively affect PA1 and PA2 because of the measurements taken to protect the water quality. This finding shows a discrepancy about European regulations on the freshwater environment and the marine environment. Regulations in PA1 focus on hazardous substances in rivers, while regulations in PA2 focus mainly on emissions and purification systems on board vessels. What is missing here is policy priority setting regarding plastics in freshwater ecosystems. Responsibilities lie in the market sphere because of the lack of state regulations for household waste management of the river cruise sector. If the market does not take up these responsibilities, this might do little justice to proper waste management practices, possibly negatively influencing PA1.

There is a lack of cooperation between *actors* involved in PA1 and PA2 to deal with the issue of plastics in the river environment. This lack of interaction is observed when concentrating on the Dutch Ministry of Infrastructure and Water Management and the Ministry of Economic Affairs and Climate Policy. When actors feel greater urgency in handling the topic of plastics in rivers, it is expected that more cooperation is sought, positively influencing both PA1 and PA2. At the core of PA1 are civil society actors who try to influence public and political debates on plastics in the water column. In PA2, market actors play a dominant role, however, what is needed is that state actors provide resources for the arrangement of waste facilities on shore.

In all three governance spheres, actors collect data (*resources*) on the issue of plastic pollution in rivers. A hindrance for both PA1 and PA2 might be that actors wait too long until sufficient data is collected before clear goals are set, and actions are taken to deal with this wicked problem. In PA1 and PA2, the lack of sufficient financial resources is considered a hampering factor, making it harder to manage plastics in the water column. In addition, sustainable development of the river cruise sector is restrained if no financial resources are supplied for purification systems on board to support this group in making this transition (obstructing PA1 and PA2). Furthermore, the absence of a widespread network of waste facilities on shore is influenced by the lack of responsibilities taken in the state sphere.

The media strongly influences the *discourse* on plastic pollution in the river environment; notably, issues might be taken out of context. The substantive discourse on plastic pollution (central in PA1) might positively affect PA2 when awareness is created on the severe impacts of macroplastics and microplastics on the freshwater ecosystems. There is a discrepancy regarding the *governance discourse* because, in the state sphere, the idea prevails that the market must resolve issues concerning waste management of river cruise companies. In contrast, in the market sphere, there is a general idea that responsibilities should be the scope of state actors. It is important to note that the market sphere does not have sufficient resources to resolve this problem. In the market sphere, Green Award sets codes of conduct; what is missing here is incorporating plastics in the requirements. Therefore, the idea that vessels are green should be interpreted with caution. Hence, within the Green Award there is immense potential for reinforcing PA1. For instance, there is ample room to link sustainable tourism to consciously dealing with plastics and diminishing the plastic footprint of river cruise operations.

4.2 River cruise companies' practices related to plastics

4.2.1 Rhine River cruise companies' policies to prevent plastic losses to the environment

Different policies are set by river cruise companies to prevent plastic losses to the environment. Waste policies and codes of conduct adopted by river cruise companies will be described in more detail in this section. The following colours are used to show elements of the SPT: *material*, *competence*, and *meaning*.

Uniworld is the river cruise company with the strongest environmental policy, therefore, it is interesting to zoom into this organisation more elaboratively. Uniworld is a member of the TreadRight Foundation and affiliated with the Travel Matter Strategy, whereby collaborative efforts are essential for pursuing the same ambitions:

“We call it the major Travel Matter Strategy. We are one part, one company of a whole group of 30 or 40 companies in that group, and the strategies were worked out for all travel groups, and we at Uniworld are one part of it and there are certain goals that apply to us and there are the goals that apply more to other companies. But it does not matter. We all work towards the same election again.” (Expert interview 8)

The TreadRight Foundation (*actor coalition*) identified 11 global goals, especially life below the water is worth mentioning (Case interview 6). Uniworld has a robust *environmental policy* and aims to diminish the impact of human activities on the environment (Case interview 6). Following this, Uniworld recently started collecting data about the consumption of products and materials during its operations, this *resource* helps to set reduction targets (Case interview 6). By collecting data on waste streams, Uniworld can see whether they are making progress; this feedback mechanism helps improve their skills of waste reduction (*competence*). Table 4 depicts an overview of these waste streams originating from one river cruise vessel in 2019.

Table 4. *Amount of waste produced on one river cruise vessel in 2019*

<i>Waste stream</i>	<i>Amount of waste in litres</i>
Plastics	50.000
Paper	100.000
Glass	40.000
Biomaterial	40.000
Metal	15.000
Chemical	5.000
Residual	150.000
Total	400.000

Note. Data of one river cruise vessel with a capacity of 130 passengers and 40 crew members.

Firm self-regulation applies to Uniworld because this organisation sets clear goals to reduce plastics. For instance, Uniworld's primary goal is to ban all single-use plastics in its operations by 2050 (Case interview 6). In line with this objective, “more than 60 identified types of single-use plastics across the entire operations, including straws, water bottles, plastics bags [needs to be banned by 2022]” (Case interview 6). Plastic reduction goals change the *meaning* of river companies' employees and their customers to the use of single-use plastics. Additionally, the *material* element changes when alternative materials replace certain types of single-use plastic,

a good example of this are paper straws (Case interview 1.3.). *Competences* are needed when shopping for alternative *materials*. Other river cruise companies also attempt to diminish plastics during their operations. The organisation Scylla aims to diminish its plastic use by 2030 (Case interview 5). This company wants to precede governments by operating as clean as possible. The company constructs their own vessels, which helps to pursue this ambition (Case interview 5).

River cruise companies' *code of conduct policy* focuses mainly on safety (Case interviews 1.1, 1.2, 1.3, 2, 3, 4, 5, 6 & 7). In the briefing, crew members inform passengers about calamities and the prevention of emergencies; for instance, throwing cigarette butts overboard is forbidden to prevent fires (Case interviews 1.1, 1.2, 1.3, 5 & 7). Moreover, crew members instruct passengers on how to act in case of an emergency. In addition, mostly the vacuum system on board river cruise vessels is elaboratively explained to prevent obstructions in the wastewater treatment system (Case interviews 1.3, 2, 4 & 7). As a result, it is underlined that unwanted waste should not be flushed down the toilet. These policies are not directly aimed at diminishing the impact on the environment, but indirectly this ensures less plastic pollution in the environment. For the inclusion of plastics in the code of conduct policy, it is necessary that awareness is created on the impact of plastics on the environment by altering the *meaning* element (i.e., the *discourse* on plastic pollution).

Because of the lack of state regulation, all river cruise companies have their *waste policy*. They have one thing in common: waste is separated by the crew members behind the scenes. In other words, waste is separated at non-public places (e.g., in the kitchen or behind the bar). Therefore, passengers do not have to separate their waste on board river cruise vessels. In general, the categories of waste separated on board by crew members are *plastic*, *paper*, *glass*, and *residual waste* (Case interviews 2, 1.2, 1.3 & 6) or the combination of *plastic*, *paper*, *glass*, and *biomaterials* (Case interviews 4, 7, 5 & 6). The provision of different waste bins facilitates waste separation (*material*).

4.2.2 Rhine River cruise companies' measurements implemented to prevent plastic pollution

Rhine River cruise companies took a variety of measures to prevent plastic losses to the environment. Opting for large-size food packaging, providing limited single-use plastics, showing a direct personal benefit of a change, talk with suppliers, and sharing knowledge are the core measures taken. These are discussed in more detail below.

First, the fieldwork revealed that *ceramic tableware* was provided on board all river cruise vessels. No plastic plates, cups, and cutlery were present in the kitchens, restaurants, and bars, neither in the cabins. Plastic tableware does not fit with the sector as its objective is to be luxurious (*discourse* dimension). The river cruise companies independently learned through trial and error; in this case, there is a robust connection between *meaning*, *material*, and *competences*.

Several river cruise companies tried to reduce their plastic use by opting for *large-size food and beverage packaging* instead of individual packaging. For example, Uniworld and Scylla offer coffee milk in a porcelain jug to diminish plastic waste and portray luxury (Case interviews 5 & 6). At the same time, other companies provide coffee milk mostly in plastic cups (Case interviews 1.1, 1.2, 1.3, 2, 3, & 4). After ordering at the bar, passengers can enjoy their cup of coffee at the outside deck. Two organisations indicated that cookies are provided in individual packaging because of community regulations on hygiene (Case interviews 1.3 & 3).

Fieldwork revealed that individual packaging is provided for some products (e.g., butter and jam) because these products have a limited shelf life after opening (Fieldwork case 1.1 & 1.2). Furthermore, it was mentioned that “individual packaging has a more luxurious presence than large-size packaging” (Case interview 1.3). This is following the *discourse* about luxury. Especially in the context of the coronavirus pandemic, individual packaging is considered more hygienic (Case interview 1.3). Among the river cruise companies, there is a different perception (*meaning*) on packaging; this perception influences the choice for an individual or large-size packaging (*material*).

Another way to reduce plastic use is by *providing as few single-use plastic products* as possible to passengers (*material*) (Case interview 6). With its robust *firm self-regulation*, Uniworld is the most progressive in providing only few single-use plastic products. Refillable aluminium bottles replace plastic water bottles, and this organisation eliminates plastic straws during their operations. Furthermore, small presents wrapped in plastics are no longer offered (Case interview 6). It is interesting to focus on water bottles and personal care products here because they are present in each cabin (*material*). It is important to mention that due to COVID-19 restrictions and the limitations of operations, these products were not present in the cabins during the guided tours. Four river cruise companies indicated that glass water bottles are used instead of plastic ones (Case interviews 1.3, 3, 5 & 7). Advantages are that: “A glass bottle looks more proper [than a single-use plastic bottle], and it can be reused.” (Case interview 1.3). Other respondents also indicated that glass water bottles are classier compared to PET-bottles (Case interviews 3 & 5). In Case interview 4 it was mentioned that PET-bottles are provided to the passengers (Case interview 4). Considering personal care products, four river cruise companies replaced small single-use plastic bottles with shampoo and soap with large refillable containers (Case interviews 2, 4, 6 & 7). Even though, a few companies still give small single-use plastic bottles of soap and shampoo to their passengers (*material*) (Case interviews 1.1, 1.2, 3 & 7).

Investments (*resources*) are necessary when replacing a single-use plastic product with a reusable product (Expert interview 8). Therefore, Uniworld wants to convince people that a specific change makes sense. However, this is considered a real challenge (Expert interview 8). Uniworld emphasises that *showing direct personal benefits* helps to convince people because people always ask themselves: “What is in it for me?” (Expert interview 8). Uniworld illustrated that potable water is much cheaper than buying bottled water, hereby knowledge (*competence*) about the benefits is essential to spread the message and to encourage a transition, altering stakeholders’ *meaning*, and finally opting for alternative *materials*.

Collaborative efforts between *actors* are also necessary when river cruise companies shift to alternative packaging materials. Often, there is a strong dependence on plastic packaging *materials*, therefore some river cruise companies *enter discussion with suppliers* to try and find alternatives (*competence*) aiming to make a real difference (*meaning*) (Case interviews 2 & 6):

“A few years ago, we already chose to ban single-use plastics; then we switched from plastic straws to paper straws. Besides, we focus on banishing [plastic] packaging materials. We are in conversation with subcontractors of suppliers so that [where it is possible] we have [plastic] packaging converted to paper packaging. Those are all things that we are active with.” (Case interview 6)

Case interview 7 also highlighted that there is a strong dependence on plastic packaging. Contrarily, this interviewee mentioned that when suppliers offer products packed in plastics (*material*), one cannot change this (*meaning*) (Case interview 7).

Uniworld also indicated that *sharing knowledge* is important for them. Customers are being informed via the website about Uniworld's philosophy before they book a trip. They also provide lectures on board to passengers (*material*), whereby the underlying reasons for certain actions are explained in an environmental context (*meaning*). Data is not only shared with passengers, but also at the level of IG River Cruise (*actor cooperation*), however, the excerpt suggests that a feedback mechanism is lacking:

“[A working group at IG River Cruise level], that is something that is missing. (...) I mean, we at Uniworld we have shared our knowledge or our findings always, but if it has been taken up as such. I do not know.” (Expert interview 8)

On board all vessels, *waste bins* (*material*) are placed at the upper deck to ensure that no plastics pollute the environment. The number of bins present at the deck varies per river cruise company, for instance, Case interview 1.3 stressed that there are 10 bins present, while Case interview 6 underlined that there is only one bin present on the entire deck. On board two vessels, fire-prevention waste bins with an open lit were used on the deck (Case interviews 1.1 & 1.2). The only place on board where smoking was allowed was on one specific part of the outside deck (the result of fieldwork), ashtrays are only available in these smoking areas. Fieldwork proved that non-smoking signs were used on board (*material*), mostly these signs were visible in the cabins.

Except for two vessels (1.1 & 1.2), a sanitary waste bin is present in the bathroom of each vessel (*material*). To ensure that less plastic waste is flushed down the toilet, river cruise companies sometimes depict a pictogram or text in the bathroom (*material*) (Case interviews 3, 5 & 7). For example, on board one vessel, in each bathroom the text “only toilet paper”, is shown (Case interview 7). On board another vessel, pictograms, on the toilet lids, portray which items cannot be flushed (Case interviews 3 & 5).

During the guided tours, no *waste signs* (pictograms) were depicted on board related to plastic waste management. Even though, fieldwork on board Case 5 shows that for each waste bin located in the kitchen, the appropriate category of waste was indicated with an English word, such as *paper*, *plastic*, *bio*, *food*, and *garbage* (*material*) (see Appendix C). This categorisation helps to improve the skills (*competence*) needed to separate waste. In this case, a collection of waste bins is depicted, similar to how they were arranged during operations. It is important to note that, during the fieldwork on board other vessels waste facilities in the cabins, at the deck and in the kitchen were arranged differently (during the coronavirus pandemic) compared to their routine touring operations (when having passengers on board). It became clear that in the timeframe in which fieldwork was conducted by the researcher (May-June 2021), these waste facilities were mainly used by crew members that were conducting construction work at the vessels. In this way, the encountered waste facilities were not a realistic representation of the waste facility arrangement during a river cruise tour.

Different waste bins are used for each category (*material*) to *separate waste on board*. Various river cruise companies put a plasticised sheet of paper with a text on the bins to indicate a category of waste. For instance, the word *plastics* is used (*material*) (Case interviews 1.3, 2, 5, 6 & 7). Overall, they use English due to the international character of the crew. There is one river cruise company that uses trash bins in different colours. “The blue bin is intended for (...), yellow waste bins, we have green waste bins, and a grey one” (Case interview 7). In addition,

product pictograms (*material*) are placed on the outside of these bins (Case interview 7). The findings reveal that in the rooms of the passengers, there are no separate waste bins present. The *meaning* aligned with this is addressed in the following excerpt:

“That was a choice, that we did not want to put a bin in the rooms where waste will be separated in this way, because we are in the five-class service segment after all, and we sell a luxury product, so we have chosen to not separate waste in passengers’ rooms.”
(Case interview 6)

Another respondent highlighted that due to the limited space on board the vessels it is not desirable to place four bins for different waste categories in each cabin (Case interview 1.3). Access to space (*material*) is seen as a prerequisite to recycling.

4.2.3 Locations where plastics could be lost

Despite measurements taken to prevent plastic pollution, the fieldwork suggests that macroplastics and microplastics, originating from river cruise vessels, could end up in the river in six different ways:

1. In each cabin, a *window* is present where plastics might be discarded. Vessels from the middle segment generally have cabins with small or normal size windows. Upper segment vessels often have cabins with larger windows, sometimes even a French balcony. In these more luxurious cabins with large windows, plastic litter is more likely to blow away.
2. The wind also plays a significant role on the upper deck. All vessels are equipped with a large terrace and sunbeds at the *deck*. If passengers lose sight of their waste, plastics may blow away over the railing.
3. Plastics could be lost when *open waste bins* are provided on the deck. Case study 1.2 showed these fireproof waste bins having a lid with an opening. If the waste bin is overflowing, light-weighted plastic packaging may blow away.
4. During the guided tours, it became clear that crew members manually *transfer waste* bags to the reception facilities on shore. Crew members throw waste bags from one to the other. When they make an act of poor judgement, the waste bag can fall in the water.
5. Suppose sanitary products like incontinence material, tampons, or sanitary napkins, which often contain plastics, are flushed down the *toilet* (on board vessels with a wastewater tank). In that case, these products could end up in the aquatic environment. If the wastewater tank is full, wastewater can be discharged in the river, and plastic products present in the tank along with it. Specifically, when sanitary waste bins are absent in the bathroom, it is plausible that passengers flush sanitary products down the toilet.
6. *Microplastics* originating from river cruise vessels could end up in the river environment. Fieldwork implies that, *personal care products* and *cleaning products* (often containing microplastics) can flow through the sink, shower, or toilet into the storage tank or sewage treatment system. Besides that, each vessel was provided with a large laundry room equipped with around four industrial washing machines. After washing bed linens, towels, tablecloths, and crew members’ clothing, *textile fibres* which might hold microplastics, enter the vessel’s sewer systems. Consequently, there might be an influx of microplastic particles in the freshwater environment.

Figure 5 depicts the three scenarios on how macroplastics and microplastics used by passengers in their cabins can flow from a vessel into the aquatic environment. These scenarios are described below. In this Figure, there is a strong focus on macroplastics (e.g., incontinence materials and feminine hygiene products), and microplastics (knowingly added to personal care products).

River cruise vessel type 1

In general, modern river cruise vessels have a purification system on board. Purification plants are intended for removing organic matter and nutrients, not for the filtration of micropollutant (Derksen & Roex, 2015). Nevertheless, biological purification removes large parts of the micropollutants when sludge (a by-product of wastewater treatment) is generated (Derksen & Roex, 2015). Subsequently, when the purified water flows into the river, a proportion of microplastics is spilled into the environment. Wastewater treatment systems with a microplastic filter exist for vessels, however, this technique is rarely used due to the absence of a legal framework and *hard regulations* (Personal communication with organisation supplying purification system for vessels, August 16, 2021).

River cruise vessel type 2

There is an indirect flow of microplastics into nature after wastewater is discharged from river cruises with a wastewater tank (older vessels) at the municipal wastewater treatment plant. Microplastic particles are released in the river environment because of the absence of a micropollutants filtration system at municipal sewage plants. Besides, municipal sewage overflows also cause an indirect flow of macroplastics in the freshwater environment.

River cruise vessel type 2 (illegal wastewater discharge)

There is a direct flow of macro- and microplastics in the river environment when wastewater is illegally discharged from vessels with a wastewater tank. In this case, the total concentration of plastics (e.g., incontinence materials and feminine hygiene products flushed through the toilet) will enter the river. This type of vessel seems a significant plastic pollution source in the freshwater ecosystem.

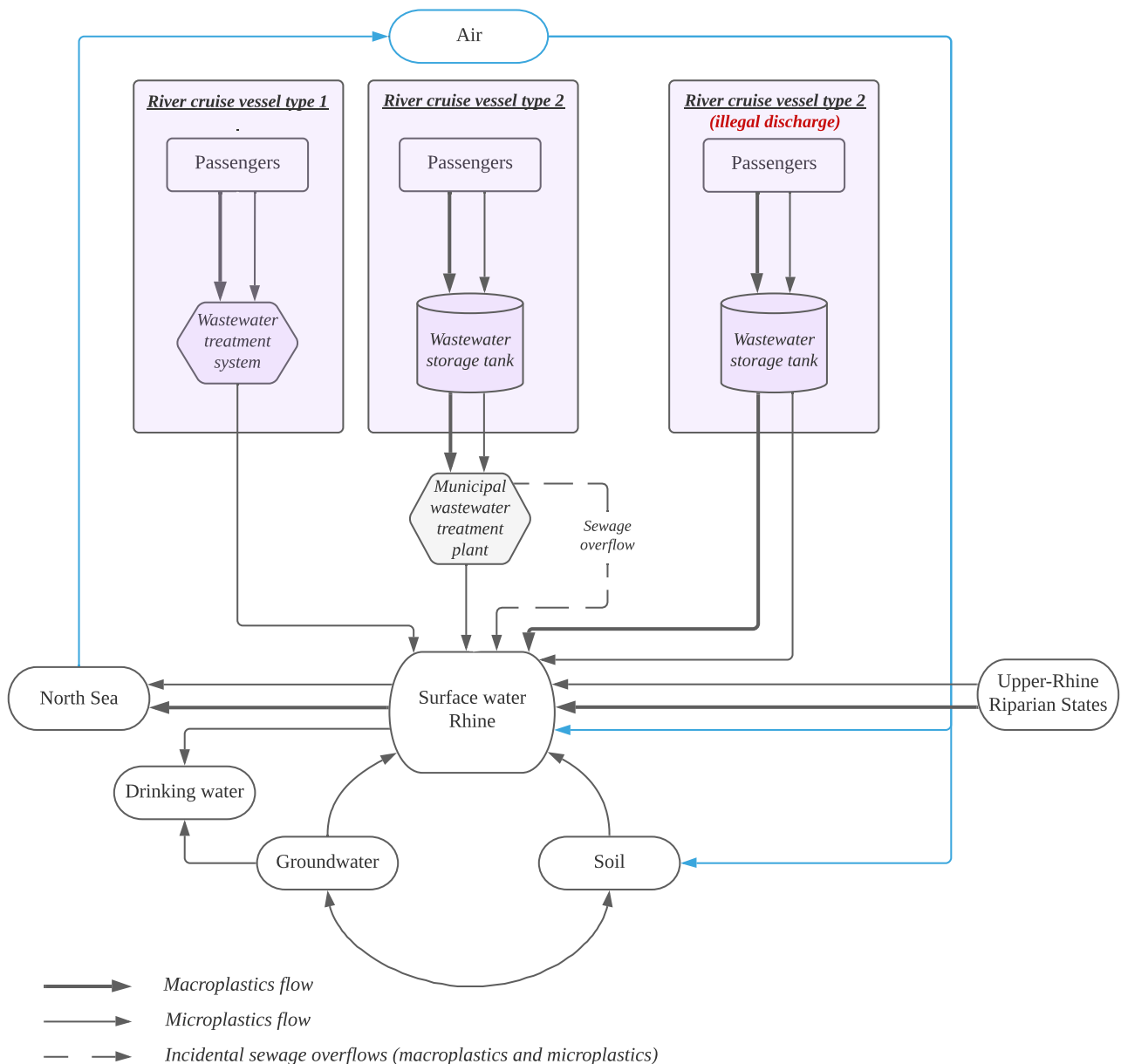


Figure 5. *Distribution of macroplastics and microplastics from wastewater generated on board river cruise vessels to aquatic environments, adapted from (Derksen, 2014, p. 16)*

River cruise vessel type 1:

A purification plant on board has a capacity of approximately 15 cubic meters, which is comparable to one cabin (Vermij & De Vries, 2020).

River cruise vessel type 2:

A wastewater storage tank on board has a capacity of 20 cubic meters (Case interview 3).

Rule of thumb:

Each passenger produces around 70 litres of black and grey wastewater per day on board a river cruise vessel (Vermij & De Vries, 2020). Black water is wastewater from toilets. Grey water drains from the shower, bathroom, and kitchen sinks.

4.2.4 River cruise companies' challenges encountered when dealing with plastics

River cruise companies face different challenges when coping with plastics. In this section the main challenges are described.

Daily, river cruise vessels berth at the quay in various places. During operation, these vessels cross different national borders. Due to the lack of regulations in the state sphere, there are *different community regulations* with respect to waste management at each harbour, which is considered a challenge (*meaning*) (Case interviews 1.3, 3, 4, 6, 7). At some locations, river cruise companies pay per trash bag, at other places per kilo, or per cub meters. Now and then, river cruise companies pay per passenger (e.g., 2 euros per passenger in Arnhem) (Case interview 1.2), or prices for waste management are included in port fees (Case interview 1.3). The prices for waste disposal also vary at each mooring place; sometimes 8 euros are charged for one trash bag (Case interview 1.1.), while others charge 18 euros (Case interview 1.3). The latter is considered an outlier (Case interview 1.3). River cruise companies try to deal with these widely varying prices for waste disposal in their way:

“There are some ports where we do not deliver our waste. We have a list from all over Europe, from everywhere we go. Then you have places that are green, there you can always [dispose your waste], [some] places are orange these are only [used] when [the storage place] is almost full, and red [places are] never [accessed].” (Case interview 7)

River cruise companies depend on whether harbours supply waste facilities and how these are arranged (*material*) (Case interview 1.3). In this respect, regulations and the provision of waste reception facilities (*resources*) in the state sphere are lacking. For instance, in Vienna, there is strict enforcement; the harbour master checks whether waste is separated correctly by river cruise companies and disposed in the right waste container (Case interview 1.3). In Germany, there is a place where the harbour master collects waste with his car and brings the waste to a waste treatment company (Case interview 1.3). There are different regulations per federal state in Germany, which makes it even more ambiguous (Case interview 7). In a personal communication with the harbour master of Arnhem and Nijmegen, it was also shown that waste is collected differently in these two cities. All waste streams (except glass) are disposed of in one big container in Arnhem (see Appendix D) while the DAR (a waste collector company) collects waste from river cruise vessels with a truck in Nijmegen (Personal communication with harbour master of Arnhem-Nijmegen, July 8, 2021).

The river cruise companies separate their waste on board the vessels, however, there is often only *one waste container* (*material*) provided in harbours where all waste streams come together (Case interviews 1.1, 1.2, 1.3, 3, 5, 4, 6, 7). Uniworld indicates that they have data about different waste streams, however, the places where they can deliver these waste streams in separate containers is limited (Case interview 6). Particularly, in large harbours like Vienna, Amsterdam, and Wurzburg there is strong *community self-regulation* seen in the well-organised waste facilities; for instance, these harbours have separate containers for different waste streams (Case interview 6). The harbour master expressed his astonishment about the finding that all river cruise companies included in this study separate their waste on board. He assumed that these companies do not separate waste on board (Personal communication with harbour master of Arnhem-Nijmegen, July 8, 2021). This finding indicates a lack of communication between these above-mentioned *actors*. Uniworld stressed that “every two or three days, you have to dispose of your waste [ashore]. On board a vessel, you easily have one and a half cubic meters of waste per day” (Case interview 6). More facilities for waste separation should be provided along the waterway (*material*) (Case interview 6). Therefore, Uniworld has discussions with

the ports (*competence*), indicating the need for these facilities. Accordingly, projects with a truck that has multiple openings for different waste flows is considered. This finding shows that river cruise companies are willing to cope with waste in an environmentally friendly manner in the market sphere. Uniworld also underlines that more pressure should be exerted by the branch (*competence*), because this is currently too limited (Case interview 6).

Several river cruise companies expressed that there is a *lack of sufficient waste reception facilities* on shore (*material*) (Case interviews 1.1, 1.3, 2, 3 & 7). For instance, it was mentioned that “The places where waste can be disposed on shore are no longer omnipresent, that is the biggest issue” (Case interview 2). This is an obstacle, because after a few days waste must be discharged at a reception facility, otherwise the waste will smell which is unpleasant and unhygienic for passengers (Case interviews 1.1, 1.2, 3 & 5). The findings also suggest that there are limited wastewater and sludge reception facilities (*material*). One river cruise company indicated that wastewater is discharged in the river when there is no reception facility nearby and the wastewater tank is full (Case interview 2):

“On board the other vessel we have a wastewater tank, and the wastewater is disposed at places where it is possible. And if this is not possible, and the tank is full, wastewater is discharged in the river environment.” (Case interview 2)

In the state sphere, there is a lack of *hard regulations* (i.e., enforcement) regarding illegal wastewater discharge by river cruise vessels in the river environment (Personal communication with RWS advisor in enforcement, June 10, 2021). Another interviewee considers wastewater discharge in rivers a solution when reception facilities on shore are nowhere near:

“It can also happen, and I do not know whether that also happens in practice that wastewater will be discharged [in the river] when the tank is full while sailing. So, if you cannot drop it off anywhere, that is a solution.” (Case interview 3)

As an additional layer to this research, the researcher contacted several institutions to explore how many sludge and wastewater reception facilities are located in the Rhine catchment area and where. The researcher approached RWS, CDNI, SAB, a company offering waste reception installations on shore, and the harbour master of Arnhem-Nijmegen. None of these actors could provide an overview of these amenities. This finding is confirmed in the personal communication with the harbour master of Arnhem and Nijmegen: “Boatman often say to us, the harbour of Arnhem is one of the few locations in the Netherlands with a wastewater reception facility.” (Personal communication with harbour master of Arnhem-Nijmegen, July 8, 2021). Additionally, there is also a river cruise company experiencing difficulties finding sludge reception facilities ashore (Case interview 7). After analysing the data on August 30, the researcher found an overview of the locations of wastewater reception facilities for inland waterway vessels (*material*) provided by Royal HaskoningDHV to the Ministry of Infrastructure and Water Management (Vermij & De Vries, 2020). Appendix E shows RoyalHaskoningDHV’s maps of wastewater reception facilities along the Rhine River. Notably, these maps do not show where sludge can be discharged. Overall, there is limited general knowledge with respect to the wastewater and sludge reception infrastructure. These additional findings point out that there is a lack of cooperation and information sharing between the different *actors* involved.

During the Expert interview 8, the researcher asked whether IG River Cruise was duly aware about *illegal wastewater discharge* and the lack of sufficient reception facilities. IG River Cruise was not but indicated that river cruise companies could opt for a mobile site (truck) when it is not possible to discharge wastewater at a fixed place in the harbour (*material*) (Expert interview 8). However, the costs for ordering a truck can amount 1000 euros for 20 cubic meters wastewater at a time (Case interview 3). Besides, a respondent stressed that trucks are often too heavy to access the docking area (Case interview 3). The harbour master affirmed this by highlighting that offering a truck cost 1000 euros, while in Arnhem wastewater discharge costs 35 euros for the same quantity (Personal communication with the harbour master of Arnhem-Nijmegen, July 8, 2021). Paying these substantial fees for ordering a truck is not considered an option (*meaning*) (Case interview 3).

The *Green Award* sets requirements for a wastewater treatment plant (*code of conduct*); this means that vessels with a wastewater tank are not eligible for this certificate (Case interview 1.3). Soon, only vessels with a Green Award (*material*), will be allowed in large harbours (expectedly by 2023), like in the Port of Amsterdam (Case interview 1.3). The requirements for a wastewater treatment plant are ambiguous, and it is not guaranteed that a wastewater treatment plant installed in 2021 will still be approved in 15-or 20-years' time (Case interview 2). For instance, interviewee 2 explained that there are river cruise vessels that were constructed around six years ago, and the owners recently installed a new purification system because the initial treatment plant did not meet new requirements (Case interview 2). This anecdote fits with respondent 1.3; its vessel was constructed in 2012, but after nine years in operation, a new wastewater treatment plant was built in, because the initial purification system no longer met current requirements. It was a whole operation because the plant was built in the vessels' casco (Case interview 1.3). The investment costs for a new wastewater treatment plant are approximately between 400.000 and 500.000 euros (Case interview 2). As a result, interviewee 2 is hesitant to replace its wastewater tank with a purification system and expressed the urge for long-term guarantees (Case interview 2). The Green Awards assigns the same number of points to older and newer river cruise vessels when installing a wastewater treatment plant (Case interview 7). This is seen as unfair because it is much harder to install a purification plant on board older vessels. In addition, the investments are about 200.000 or 300.000 euros extra. Therefore, older vessels should gain more points when succeeding (implementing *soft regulations*) (Case interview 7).

Findings show that *crew members are not always consciously dealing with waste* on board, which was ascribed to their diverse cultural backgrounds (Case interviews 2 & 7). Most crew members come from Eastern European countries like Romania, Hungary, and Bulgaria, where they deal with waste differently (Case interview 7). Case interview 7 revealed that there is a cabin check every two weeks to ensure that crew members do not make a total mess of their rooms. Overall, crew members try to improve their living conditions by working in Western European countries, and they are less focused on the natural environment (*meaning*) (Case interview 2). When crew members transfer waste to shore, they line up and toss trash bags from one to the other (Case interview 1.3). It happens now and then that a trash bag falls into the water due to an act of poor judgement (*competence*) (Case interviews 1.1, 1.3, 3 & 7). If a waste bag falls in the water, they do everything to get this trash bag back on board. By giving instructions to crew members on waste transfer (*competence*), one river cruise company focuses on ensuring that crew members do not carry an excessive amount of waste bags at a time (Case interview 5). The company prefers to carry waste bags properly, over taking the risk for losses of waste into the environment (Case interview 5). Uniworld is educating its crew members to ensure that they become more aware of the environment (*meaning*) and manage waste correctly

(competence). For example, this is seen in the data collected of the waste streams by the crew members, which aligns with Uniworld's philosophy *(meaning)*, and helps to convey its message to its passengers and to the outside world (Case interview 6). Nevertheless, some companies do not educate crew members about the environment. However, they focus on setting the right example to passengers instead *(firm self-regulation)* (Case interviews 1.3 & 7):

“[When waste is not correctly managed by crew members] and the captain sees it, he says something about it, but then he does not immediately say something about the environment, [because crew members] are not interested in this anyway. Then we say: “You are an example for the guests. The guests see that you throw your rubbish on the street, that is unacceptable.” That is how it is communicated, it is not communicated as an environmental issue, but it is always brought as setting the right example for your guest.” (Case interview 7)

Not only crew members but also some shipowners and nautical experts are also not aware of the impact of plastics on the environment *(meaning)*. Case interview 3 highlighted that plastics are digested and that this process will take a few decades. Another shipowner illustrated that he was not aware that plastics break down into microplastics and that these particles remain present in the environment (Fieldwork Case 1.2).

4.2.5 Passengers' practices related to plastics as experienced by river cruise companies

Passengers' practices related to plastics as experienced by river cruise companies are described in the following paragraphs.

All river cruise companies stress that passengers do not generate much waste in the cabins because of the all-inclusive arrangement. In Case interview 1.3, it was mentioned that passengers sometimes eat candy, a biscuit, or a delicacy in their room. Every day, crew members change the trash bin bags in all cabins (Case study 1.3).

The findings show that passengers do not throw plastics overboard intentionally because of the social pressure at the upper deck (Case interviews 1.2, 1.3, 2 & 3). In the case this happens, fellow passengers will automatically correct this practice (Case interview 1.3). What may happen is that plastics blow overboard when passengers lose sight of their waste (Case interviews 4 & 5). In earlier times, when Scylla provided plastic products at the outside deck, this happened more often (Case interview 5).

“In the past, when plastics were still used, we immediately received a complaint if something went overboard. [Passengers asked] “Why do you not put more garbage cans [at the deck]? So, the guests who generally [opt for a] river cruise, but also a sea cruise focus on this a lot.” (Case interview 5)

On board most vessels, there is a designated smoking area for passengers where ashtrays are provided (Case study 1.2, 1.3, 2, 5, 6 & 7). The findings reveal that river cruise companies give instructions to passengers about fire safety. In this respect, the rules considering smoking are also addressed. Despite this, passengers sometimes throw cigarette butts over the railing (Case interviews 1.3 & 5). When this happens, extra attention is paid to this behaviour in terms of fire safety because it is hazardous when a cigarette butt enters a window one floor below (Case interviews 1.3 & 5). Case interview 2 highlighted that currently this occurs less often because fewer people smoke.

In Case interview 8 it was stressed that weekly, sanitary napkins, tampons, incontinence materials and other stuff is flushed down the toilets. This incorrect disposal of sanitary products was also addressed during Case interview 1.2. Another interviewee mentioned that “if toilets are clogged, nine times out of ten the blockages are caused by sanitary napkins” (Case interview 2). Additionally, guest towels were discontinued because passengers also flushed these down the toilets (Case interviews 1.3 & 2). Therefore, a barb was placed behind each toilet so that these products could not cause obstructions in the entire system (Case interview 2). Nevertheless, when cleaning the tank during winter times, many feminine hygiene products are still found. The researcher contacted a company supplying purification systems on board vessels to gain more knowledge of processes related to wastewater treatment (Personal communication, August 9, 2021). In this communication, it was highlighted that incontinence materials, feminine hygiene products, underwear, and jewellery often end up in purification system grinders. Even though the river cruise company provides instructions about the vacuum system and what belongs in the toilet, passengers still flush all kinds of products down the toilet (Case interviews 1.2, 2 & 3). When vessels with a wastewater tank, illegally discharge wastewater, feminine hygiene products (containing plastics) end up in the river environment (Case interview 3).

4.3 The effect of policies on practices

The policy context in which river cruises operate affects the Rhine River cruise companies' practices around plastic waste management. Besides that, governance spheres and the associated regulations that influence Rhine River cruise companies' practices related to plastics are discussed in this section with the help of Steurer's Governance Theory (2013). In this section, the SPT, PAA and Steurer's Governance Theory come together.

When analysing the dynamics of interaction between the policy domains on *environmental protection of the Rhine* and *river cruise tourism*, hindrance and reinforcing factors between the dimensions are discussed; both tendencies lead to a different outcome of social practices. In the state sphere, top-down regulations are implemented when coping with hazardous substances in the river environment. In this case, *hard regulations* are formulated at a European level and transposed to the national level where implementation is required. However, regulations on plastic pollution in the river environment are limited. For this reason, a critical note is added to the exclusion of plastics in the WFD. On the other hand, the Single-Use Plastics Directive (*hard regulation*) positively affects the Rhine River cruise companies' sustainable practices related to plastics, as for instance plastic straws can no longer be provided to passengers, altering *meaning*, *material*, and *competences*.

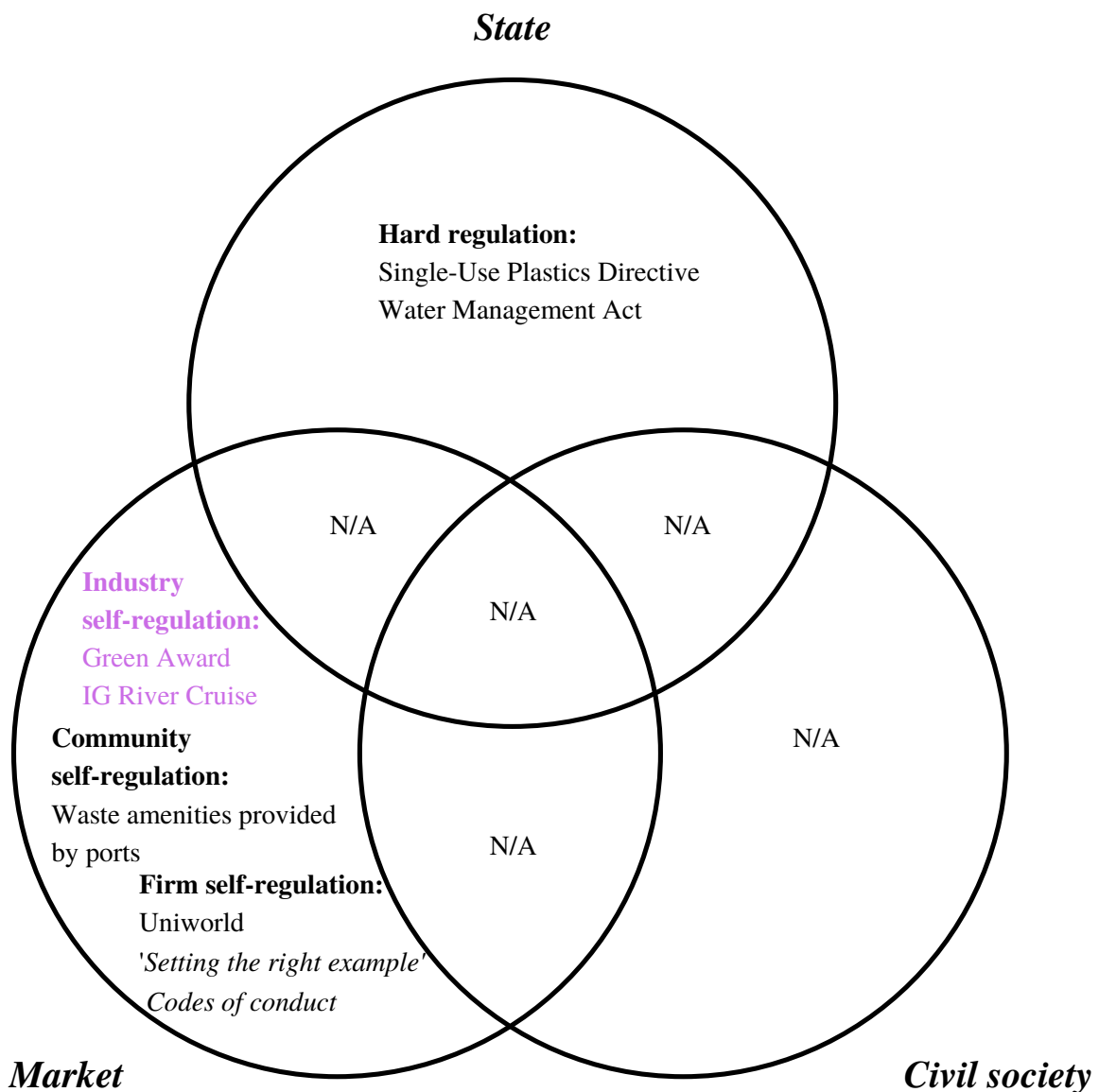
Responsibilities for waste management for this tourism sector are concentrated in the market sphere, which can be seen in *community self-regulations* at harbours. The lack of orchestration and *hard regulations* in the state sphere has contributed to dependence on market regulations. Each port organises its waste collection autonomously, resulting in different playing fields within national borders and when crossing these borders. The sector has a strong will to do the right thing, however as the separate waste collection is often not facilitated (*material* element), their motivation to separate waste on board diminishes, altering the *meaning* element. A dense network of waste infrastructure along the waterway is absent (lack of *material*), hindering proper waste management practices, contributing to the influx of (plastic) waste in the environment. An example of these practices is the illegal discharge of wastewater by vessels with a wastewater tank whereby plastic products, such as incontinence materials, pollute the freshwater environment. There is a discrepancy regarding *governance discourses* in the state and market sphere. *Actors* in the state sphere emphasise that the provision of waste reception facilities lies in the market sphere while the market is dependent on *resources* put into place by state *actors*. Figure 6 shows the imbalance between regulations in the state and market sphere.

Prosperous river cruise companies are more prompt to *firm self-regulation* concerning plastic use and disposal. Uniworld sets clear plastic reduction goals and collects data (*resources*) on their waste streams, increasing their *competencies*. Furthermore, Uniworld tries to set the right example and promotes sustainable river cruise tourism by modelling best practices to the entire industry (The Travel Foundation, 2013). However, it is questionable whether other river cruise companies take up this initiative. IG Rive Cruise tries to solve common issues around the operations of river cruise ships. Emissions and wastewater treatment (*discourses*) are solid subjects for IG River Cruise, while plastic pollution is still outside the focus area. When promoting the transition towards purification systems on board, this *actor* indirectly contributes to diminishing the influx of plastics in the environment.

Green Award reflects *industry self-regulation*; this organisation uses benchmarking whereby river cruise companies' performances are compared to best practices within the industry. Not complying with these best practices (i.e., obtaining a purification system) will exclude less prosperous vessels from large ports like Amsterdam. When no one acknowledges the latter phenomena, it is likely that river cruise companies from the upper-class segment remain in place and dominate the market. Besides that, a vital wastewater reception facility in

the Port of Amsterdam could not be reached anymore (see Appendix E), obstructing the access to *materials*. As it is the case with IG River Cruise, plastic pollution is not in the scope of the Green Award. What is striking in Figure 6 is the considerable potential for cooperation between state, market, and civil society spheres (further elaborated in chapter 5.2).

Figure 6. *Governance regulations applicable to river cruise companies' practices related to plastics, adapted from Steurer (2013)*



Note. The purple colour indicates a type of regulation with an indirect effect on river cruise companies' practices related to plastics.

5. Conclusion and discussion

This chapter addresses the most important results of this study, and explains how these results contribute to answering the main research question:

What are the dynamics of interaction between the policy domains of *environmental protection of the Rhine* and *river cruise tourism* and how can policies be enhanced to improve Rhine River cruise companies' practices related to plastics?

Based on the findings, policy recommendations are provided to change the policy arena in which Rhine River cruise companies operate and improve their practices related to plastics. Afterwards, research interpretations, limitations, and recommendations are discussed.

5.1 Conclusion

This research revealed that the policy domains of *environmental protection of the Rhine* and *river cruise tourism* do not deviate substantially. It is important to note that the policy domains reinforce each other, in some cases, while in other cases these two hinder each other. First, green thinking underpins the policy domain on *river cruise tourism*. River cruise companies might use the concept greening as a marketing tool to promote river cruise operations. When river cruise vessels obtain a Green Award, it is suggested that practices related to plastics on board are also sustainable, however, this discourse should be interpreted with caution as plastics is not included in the list of prerequisites for acquiring such award. Instead, this green discourse has a strong focus on emissions and waste-water purification systems on board river cruise vessels. However, within green thinking there is immense potential for linking sustainable river cruise tourism to consciously dealing with plastics to protect the freshwater environment.

Moreover, there is a discrepancy about the *governance discourse* in the state and market sphere considering the provision of waste facilities for the river cruise sector along with the international waterway network, which leads to imbalanced governance regulations in these spheres. State actors emphasise that liabilities are concentrated in the market sphere (*community self-regulation*). However, the market is unable to follow regulations because their *financial resources* are limited. Due to the lack of responsibilities taken in the state sphere, a dense network of waste reception facilities is absent (lack of *materials*). River cruise companies' intrinsic will to deal with plastic in an environmentally friendly way is present (*meaning*), but the lack of external *materials* obstructs them. This intrinsic will can be seen in the separation of waste on board all vessels. However, separate waste containers are not provided in most harbours along international waterways.

Next to this, the illegal discharge of wastewater by river cruise vessels with a wastewater tank is also ascribed to the absence of sufficient wastewater reception locations. Illegal wastewater discharge leads to an influx of macroplastics and microplastics in the freshwater environment. Macroplastics is lost in the river environment because passengers flush incontinence materials and feminine hygiene products down the toilet on a structural basis. This unsustainable waste disposal practice reflects a lack of environmental awareness amongst passengers (*meaning*). Also, microplastics intentionally added to personal care products and cleaning products flow into nature. Aboard modern river cruise vessels with a purification plant, macroplastics will be captured. Nevertheless, microplastics still spill into the environment because of the absence of microfiltration systems. Such systems exist for vessels, but it is not implemented in practice due to the lack of a legal framework.

In the market sphere, some frontrunners (mostly profitable companies) try to set the right example regarding practices related to plastics for the entire river cruise sector. One of these companies has a robust environmental policy and collects data on their waste streams

which helps them to set clear plastic reduction goals (*competences*). Nonetheless, initiatives taken by frontrunners do not spread throughout the entire market. In both policy domains there is limited information sharing between actors.

Overall, the urgency to cope with the issue of plastic pollution in the river environment is restricted. What hinders policymaking in this field is the exclusion of plastics as a priority substance in the Water Framework Directive. This shortcoming of legislation makes it difficult for policymakers to set clear objectives and take targeted measures. To fill this gap, a general policy recommendation is developed to improve policymaking in this area. Moreover, Rijkswaterstaat is responsible for the water quality of large rivers, therefore policy recommendations are developed for this actor. In the policy recommendations for RWS, the researcher seeks new linkages between *meaning*, *materials*, and *competence* to change Rhine River cruise companies' practices related to plastics in a more sustainable way. In addition, this research explores cooperation between state, market, and civil society.

5.2 General policy recommendations

Results revealed different land-based (*dry*) policies in place to cope with plastic pollution, such as the SUP-Directive. However, water-based (*wet*) policies on plastic waste in the freshwater environment are lacking. It is important to note that many plastics from land-based sources flow through rivers into marine environments. Therefore, there is an urgent need to tackle the issue at its source in the freshwater environment.

The ICPR and the International Commission for the Protection of the Danube River (ICPDR) must launch an ***Action Programme on Plastics***. This cooperation is fruitful because the Rhine and the Danube are the most popular European cruising rivers. To date, ICPR has not yet determined whether an expert group on plastics will be formed. Bearing this 'gap' in mind, it would be valuable when the ICPR creates a working group in this field. When the ICPR and the ICPDR take the lead on managing plastics in the river environment, this will make other actors in the field more aware of the urgency of this serious problem and puts more pressure on the European Commission to take responsibility.

At the European level, a key policy priority should be the introduction of a ***European Directive on Plastics in the Freshwater Environment***. What is essential here is that Member States reach a consensus first. Subsequently, the European Commission should take the initiative in preparing this Directive as it fits well with the Commission's core tasks.

During the implementation process of this novel Directive, the river Commissions (ICPR & ICPDR) should play an exemplary role for the Member States because of their focus on data collection, awareness creation, and waste management improvements. For instance, when the Netherlands implements this Directive in the future, a database must be created to overcome the fragmented nature of data collection in the field. This database will help policymakers set clear goals, take measurements, and monitor data in a more efficient way. Moreover, following the thinking on tackling the issue at its source (*discourse*), a large-scale awareness-raising campaign must be launched to promote more sustainable practices related to plastics by citizens. A crucial topic could be *the relation between the bathroom and the plastic soup*. Increasing awareness on the severe problem of plastic pollution in the freshwater environment is crucial. It will change the *meaning* element (consciousness about the impact of plastics on the ecosystem), and alter the *material* element (e.g., shopping biodegradable products) and *competence* element (e.g., improved knowledge on how to dispose sanitary products correctly).

5.3 Practical recommendations for Rijkswaterstaat

The findings of this study suggest several courses of action for Rijkswaterstaat to improve Rhine River cruise companies' practices related to plastics and to prevent plastics from being lost into the environment. Based on the most prevalent results of this study, recommendations for Rijkswaterstaat are formulated, which assists RWS to take on a leading role in transforming Rhine River cruise practices related to plastics in a more environmentally friendly way.

Setting up a working group

First, Rijkswaterstaat should take the initiative to set up the working group Waste Amenities for River Cruises (WARC) to discuss issues related to plastic waste management practices of river cruise companies with *actors* from the state, market, and civil society sphere. The type of regulation associated with this is *tripartite co-regulation* whereby all governance spheres assemble (Steurer, 2013). RWS should take the lead and guide this new actor coalition because of its responsibility for clean water in rivers and the provision of information about water quality on an (inter)national level. The following stakeholders should be included in the WARC: RWS' department Waste and Circularity, CCNR, ICPR, CBRB, IG River Cruise, river cruise companies, Vereniging van Havenmeesters (VHM), Vereniging van Afvalbedrijven (VA), Green Award, CDNI, SAB, municipalities and Schone Rivieren. Based on this study, it is essential for the WARC (*change agent*) to make an in-depth inventory of the different stakeholders' interests and modus operandi related to the subject (plastic) waste management. Subsequently, substantiated arguments should be used in consultation to find common solutions to specific issues. Stakeholders should gather monthly to discuss common issues of the river cruise sector related to waste management practices. In this way, the WARC ensures fruitful communication between the different parties. Moreover, this working group will contribute to a balanced distribution of responsibilities amongst the involved *actors*. Subjects addressed by WARC are, for instance, illegal wastewater discharge and the lack of uniform waste collection systems, among others. The WARC plays an essential role in some of the recommendations described below.

Sanitary waste bin in each cabin

The lack of a sanitary waste bin in each cabin could lead to passengers' incorrect waste disposal practices through the toilet. The provision of a waste bin in each bathroom (*material*) will enhance correct waste disposal of feminine hygiene products, such as incontinence products or sanitary napkins which often contain plastics. Passengers flush these products down the toilets on a structural basis. Especially, on board vessels with a wastewater tank, whereby wastewater is sometimes discharged in the river, it is likely that this preventive measurement will reduce plastic losses to the environment. Macroplastics originating from vessels with a wastewater tank could also spill into the environment due to sewer overflows after wastewater disposal at the municipal sewer system. Therefore, plastic products must not be flushed down the toilets. The norm to have a sanitary waste bin in each cabin should be communicated to all river cruise companies, changing the *meaning* element. The pressure exerted by IG River Cruise is necessary to ensure that all river cruise companies implement this preventive measurement. Rijkswaterstaat needs to make the first move and should discuss this issue with IG River Cruise.

Plastic free zones where the wind blows

This study revealed that individual plastic packaging is provided on the outside deck of some vessels. Due to the lightweight characteristic of plastics, this blows overboard when passengers lose sight of their waste. Therefore, plastics should be banned on the outside deck. Additionally, food and beverages should be prepared inside, preferably from large-size packaging, before entering the outside deck.

The normative discourse of – plastic-free zones where the wind blows – should be applied on all river cruise vessels. At this moment, river cruise companies that have already implemented this standard, like Scylla, could be an example to inspire other companies to implement this norm and improve their *competencies*. Besides, awareness should be created about the impact of plastic litter on the aquatic environment, altering the *meaning* of different actors.

Preventing illegal wastewater discharge

The results of this study reveal that in current days wastewater is illegally discharged by some river cruise vessels with a wastewater storage tank and a capacity of more than 50 passengers. The practice of illegal discharge was often ascribed to the lack of sufficient wastewater reception facilities on shore. Moreover, it is sometimes also an arduous process for river cruise companies operating vessels with a sewage treatment plant to find sludge reception facilities. The findings suggest a lack of facilities (*material*) and a knowledge gap (*competence*) in this field. Rijkswaterstaat should investigate, in cooperation with the working group WARC, where current amenities are located and at which locations amenities are needed. The maps provided by Royal HaskoningDHV can be used as a starting point (see Appendix E). After this, an infrastructure improvement might be needed, adapting the *material* element.

Moreover, a clear map or digital application should be developed that supplies an overview of the locations of wastewater and sludge reception facilities. The map of SAB waste facilities could serve as a source of inspiration (SAB, n.d.-b). The overview will broaden the scope of nautical experts who are often responsible for working out the itinerary. Furthermore, their *competences* will improve. Nautical experts mostly opt to travel fixed routes (routinised practice). It is possible that wastewater reception facilities are in their vicinity, but they are not aware of its presence. It is expected that enhanced visibility of these reception facilities changes the nautical experts' perception about wastewater discharge and encourages correct disposal of wastewater and sludge. The WARC requires significant effort to facilitate the coordination regarding the construction of these facilities.

Uniform waste management on board and on shore

There is a need for a uniform waste collection system along the catchment area of the Rhine and for the harmonisation of waste facilities on board river cruise vessels. Currently, different community regulations are applicable at each harbour. This can, for example, be seen in how prices are determined: per trash bag, per litre, per cubic meter, per passenger, among others. River cruise companies see these different community regulations as obstacles because they want to know what to expect.

Furthermore, at many harbours, it is only possible to dispose of all waste streams in just one container (*material*), which leads to frustrations among nautical experts and shipowners due to the efforts put in waste separation on board (*meaning*). The harbour master of Arnhem and Nijmegen assumed that river cruise companies do not separate waste on board. The latter finding indicates a knowledge gap between the receptor and the waste producer. Within the WARC, knowledge gaps should be resolved during interactive sessions to explore other stakeholders' interests. A key policy priority should be to plan for the long-term care of uniform waste reception along the waterway network (provision of *materials*). At this moment, CDNI is working on harmonising the sorting of household waste on board vessels along the international waterways. They focus mainly on clear and recognisable symbols because this is considered an important tool for homogenous waste management practices on an international level. The WARC should support the CDNI on these harmonisation processes along the network.

Discourse change Polluter Pays Principle

The Polluter Pays Principle is widely used within policymaking and plays a central role within the CDNI. The three categories of waste, *category a*, *b*, and *c* are based on this principle. On a more critical note, this principle is somewhat negatively formulated. The definition of the Polluter Pays Principle refers to a person who causes damage or pollution (Van Dale, n.d.). Based on this definition the researcher poses the following question: *Is a person who disposes their waste correctly and who pays for it a polluter?* This person ensures that waste does not end up as litter in the environment and that, in some cases, the separated waste can be reused as raw material. It makes more sense to label a person who illegally discharges its waste in the environment without paying for it as a polluter. This principle was formulated in 1972 by the Organisation for Economic Co-Operation and Development (OECD) (Pearce, 1989). Nowadays, people are more conscious about their waste, making this principle obsolete and outdated. Therefore, a more positive approach is desirable because good behaviour should be encouraged; finding the right words for this can certainly help. The working group WARC should organise a creative session with all involved parties to produce a positively formulated *discourse* that suits better current thinking about waste. RWS' department Waste and Circularity should take the lead during this meeting because of their familiarity with behavioural change and creative thinking processes during pilot projects.

Inclusion of 'plastics' in WFD

When examining the definition of hazardous substance explained in the WFD. Plastics fits well with this description because plastics bio-accumulate and remain persistent in the aquatic environment (Lithner et al., 2011). Also, the presence of microplastics in the environment raises severe concerns for public health. It is contradictory that presently, plastics are not included within the WFD, while the MSFD focuses on plastics more deliberately. Plastics must be included in the WFD's list of priority substances. This transformation is essential for policymaking; when plastics are included in the WFD's priority substances list, RWS could set clear objectives to prevent plastics losses into the environment. The inclusion also promotes the achievement of MSFD's aims. Hence, this modification clarifies RWS's clean task in the water area. It contributes to streamlining national policy lines with respect to coping with plastic pollution, both in freshwater environments and in saltwater environments. The WARC needs to exert pressure at the European Commission so that this is taken up at a European level and implemented by all Member States.

Inclusion river cruise sector category c

In the Netherlands, inland waterway operators can take out a subscription to dispose of household waste at reception facilities offered by CDNI. Despite this, waste subscriptions are not suitable for river cruise companies because of the large amount of waste produced on board river cruise vessels. Besides, the capacity of the waste containers is too limited. The findings suggest the exclusion of the river cruise sector with respect to *category c*. On paper, wastewater from river cruise vessels is also covered by *category c*, however, no regulations have been made for domestic wastewater and sludge for passenger ships. Responsibilities were shifted to the river cruise sector itself. The CDNI convention covers waste and wastewater from river cruise vessels, therefore, it is questionable why in practice, waste facilities provided by CDNI do not comprise waste(water) produced by this tourism sector.

RWS is responsible for the implementation of *categories a*, *b*, and *c* of the CDNI, therefore, RWS should take the first step in tackling issues related to household waste reception of river cruises. In conjunction with the working group WARC, RWS should ensure that in practice the river cruise sector is included within *category c*.

Future requirements for Green Award

Operating a ship with a wastewater treatment plant meeting all environmental requirements is a prerequisite to obtaining a Green Award. River cruise companies with a wastewater tank mentioned that investment costs of a wastewater treatment plant could be a deterrent, costing between 400.000 euros and 500.000 euros. For older vessels, it is a more extensive operation to install new plants compared to ships under construction. Furthermore, the lack of precise long-term requirements can create a barrier. River cruise companies seem to limbo because it is unclear whether a new wastewater treatment plant will continue to meet the requirements in the next 15 to 20 years.

The working group WARC should address this matter and stipulate clear future requirements for the river cruise sector. When making this transition, requirements should include a microfiltration system for microplastics as river cruise vessels discharge microplastics in the river environment. Even though these microfiltration systems exist, this tourism sector does not use them due to the absence of a legal framework.

Subsequently, these future requirements need to be communicated by the Green Award to all companies operating within this tourism segment. Rijkswaterstaat must prioritise this issue at the Ministry of Infrastructure and Water Management and apply for a subsidy. The subsidy must be provided for older river cruise vessels with a wastewater tank integrated into the vessels' casco. Moreover, grants should be provided for newer vessels with a treatment plant to incorporate a microfiltration system. Financial support will draw in the river cruise companies. Suppose the group of vessel owners with a wastewater tank makes the switch to a wastewater treatment plant. In this case, this will ensure that less (macro)plastic products like sanitary products end up in the aquatic environment. In addition, when the entire sector uses a microfiltration system, the microplastics emissions will be reduced to zero, a crucial step in protecting the river environment.

Branch campaign river cruise sector

River cruise companies need to be encouraged to adopt best practices related to plastics. A reasonable approach could be setting up a public campaign for this sector through an informative videoclip. In this video, Uniworld should play a substantial role and serve as a source of inspiration because they appear most progressive with their practices related to plastics. As such, Uniworld sets clear goals for single-use plastics, and its objective is to eliminate around 60 types of single-use plastics during their operations before 2023. Following, this company enter the discussion with suppliers to explore an alternative material for plastic (changing *materials*). Next to plastic use, waste streams are also of concern for this business, and they collect structural data of their vessels' waste streams. Collecting this data helps this organisation to set objectives for waste reduction (*competence*).

Other Rhine River cruise companies attempt to diminish their plastic use by changing PET- bottles to refillable water bottles or replacing amenities for refillable shampoo and soap containers. However, some companies do not set clear reduction goals and sometimes experience difficulties in achieving their goals. Using this branch campaign, other river cruise companies should be inspired and motivated to develop an environmental policy and define concrete and achievable goals.

The second objective of this campaign is to increase river cruise companies' awareness of macro- and microplastic pollution in rivers and the long-term ecological consequences. For instance, shipowners and nautical experts must learn more about the harmful impact of plastics in the environment to ensure that river cruise companies become more motivated to diminish their plastic use (*meaning*) and improve their practices related to plastics. Due to socio-cultural differences, crew members deal with conservation and waste disposal differently. Some focus mainly on making a living (achieve economic independence) and less on the environment.

Hence, this branch campaign is also suitable for crew members to increase their understanding of the adverse consequences of plastics in our ecosystem and to urge them to enhance their practices related to plastics.

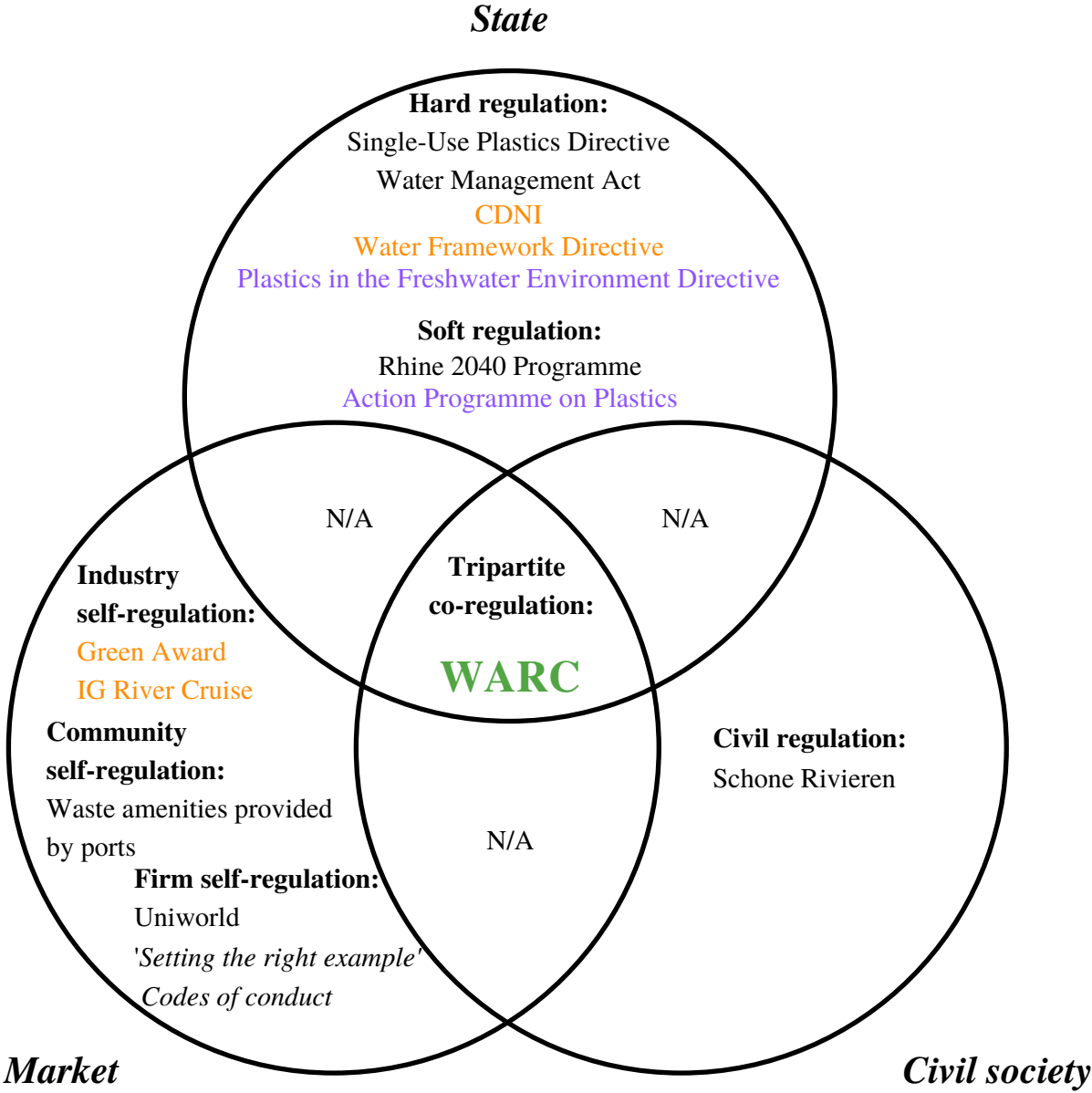
The RWS department Waste and Circularity should take the lead in developing this branch campaign because of their expertise in achieving behavioural changes within society. The WARC should organise sessions to develop innovative ideas for this campaign, inviting Uniworld to provide insights into their progressive practices on plastics. The targeted intervention in terms of the branch campaign will ensure that river cruise companies' practices ameliorate to help reduce plastic pollution to the aquatic environment.

5.4 Reflections and interpretations

This study has filled the knowledge gaps concerning the river cruise companies' practices related to plastics. Moreover, the researcher formulated policy recommendations to improve connections between policies and practices to ameliorate these practices. For the Policy Arrangement Approach, the researcher decided to enter the tetrahedron via the dimension *rules of the game*, even though the scholar Liefferink (2006) considered the *actor* dimension the most appropriate starting point. This decision helped the researcher to gain valuable knowledge of contextual factors of the Policy Arrangements before exploring specific *actor* roles. This was a fruitful way of accessing the tetrahedron, especially because the researcher considered it essential to become acquainted with rules and regulations first. Therefore, it is advisable that other researchers also depart from the *rules of the game* dimension if familiarity with a specific policy theme is desired before going into a detailed analysis.

This research embodies practices at a micro-level and policy arrangements at a meso-level. However, during the research process, the researcher noticed that an extension to the PAA was needed for gaining a deeper understanding of its broader policy context. Therefore, the researcher incorporated Steurer's Governance Theory (2013); this theoretical extension focuses on regulations central to the PAA and helped visualising in which governance sphere regulations are concentrated. For researchers who also opt to study the relationship between policies and practices, it is advisable to incorporate the PAA in the governance spheres and expand the conceptual framework of this research. The Steurer's Governance Theory (2013) adds value for developing policy recommendations because it highlights where (in which sphere or between spheres) regulations should be operationalised to change certain plastic waste management practices. Based on the recommendations provided in this study, a new overview of Steurer's model is provided in Figure 7 to envision desired policy interventions. There is a strong focus on the co-operative form of steering (*tri-partite co-regulation*) by the WARC whereby the state, market, and civil society spheres converge.

Figure 7. Governance regulations necessary to improve river cruise companies' practices related to plastics, adapted from Steurer (2013)



Note. The orange colour indicates regulations that are currently in place but should incorporate the topic plastics. The purple colour shows new regulations aimed at coping with the issue of plastics in the freshwater environment. The green colour indicates a new type of regulation whereby state, market, and civil society assemble.

5.5 Research limitations

In this research, some limitations could have affected the findings of river cruise companies' practices related to plastics. This section discusses recall bias and social responsibility bias in more detail.

It was not possible to conduct visual observations of passengers' practices related to plastics on board active Rhine River cruise vessels because of the COVID-19 restrictions and the suspended operations within the river cruise tourism segment. Therefore, the experiences of ship owners and nautical experts concerning passengers' practices were incorporated in this study. The responses related to passengers' practices of handling plastics were of a subjective nature; these responses were susceptible to recall bias. The case interviews showed that river cruise companies' last operations occurred around July-August 2020 (in amended form regarding COVID-19 restrictions) while the interviews with shipowners and nautical experts were conducted in May and June 2021. It might be the case that the respondents do not remember key details of passengers' practices around plastics during former operations, which may have affected responses.

Furthermore, the researcher noted that the subject wastewater discharge was sensitive. Various respondents, operating vessels with a wastewater tank openly discussed this topic during the guided tour. However, when questions related to wastewater discharge were posed during the interview, some respondents were hesitant to talk about this subject. What seems undesirable behaviour is underreported by some respondents (Neeley & Cronley, 2004). To overcome this social desirability bias, the researcher used the indirect questioning technique by which a reference was made to a third party when addressing this sensitive topic (Fisher, 1993). This method permitted the respondents to project their practices on the practices of a third party, which enabled to acquire more sincere responses (Fisher, 1993).

5.6 Recommendations for future research

The findings of this research provide a variety of suggestions for future research in the field of river cruise companies' practices related to plastics. There is abundant room for further progress in exploring passengers' practices, and other inland waterway operators' practices, with respect to dealing with plastics. Also, the lack of uniform waste facilities ashore is a critical issue for further research. The following paragraphs will discuss these aspects in more detail.

Firstly, further investigation into these practices is highly recommended to develop a full picture of passengers' practices related to plastics in a real-life setting. Therefore, visual observations of passengers should be performed on board river cruise vessels in a COVID-19 restriction-free context. One of the most conspicuous findings of this study is that on a structural basis, passengers flush incontinence products and feminine hygiene products down the toilets, risking the loss of single-use plastic products into the environment from vessels with a wastewater tank. Monitoring data shows that sanitary towels are the fifth most encountered plastic items on beaches (European Parliament, 2018). Besides, in the water column of the Rhine branches (Upper Rhine, Waal, and Ijssel), tampons and their packaging rank third on the list of most found macroplastic items (Collas et al., 2021). The researcher got the opportunity to gain more insights into the issue of plastic pollution in the water column and observed the plastic items found in the latter research commissioned by RWS. Appendix F depicts tampons, tampon packages, and sanitary napkins collected in the Rhine river in the research of Collas et al. (2021). The issue of feminine hygiene products ending up in the water environment calls for an immediate change in behaviour. This unsustainable waste disposal practice should be transformed into a sustainable practice, whereby *meaning*, *materials*, and *competence* must be

altered (Shove et al., 2012). Future research on this wicked problem is essential to protect our environment and public health.

Additionally, this study revealed a demand for uniform waste collection systems along the Rhine catchment area. What is now needed is a transnational study involving the countries in the catchment area of the Rhine. Waste reception facilities on shore could be explored in more detail in different countries. By making a cross-border comparison one can dive deeper into best practices regarding waste collection systems along the waterway network. In addition, this aids international policymaking and consensus building in the longer-term.

Finally, practices related to plastics of other sub-sectors of inland waterway navigation would be a fruitful area for further work. The Dutch inland waterway fleet consists of approximately 9,000 vessels, of which more than half consists of cargo vessels (Inspectie Leefomgeving en Transport, n.d.-a). Therefore, research in this sub-sector is essential in broadening the knowledge of inland vessels' practices related to plastics. For policymakers, it is also important that more light be shed on the arrangement of waste reception facilities on shore for cargo ships to fill knowledge gaps in this area.

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7. Appendices

Appendix A: Steurer's Governance spheres

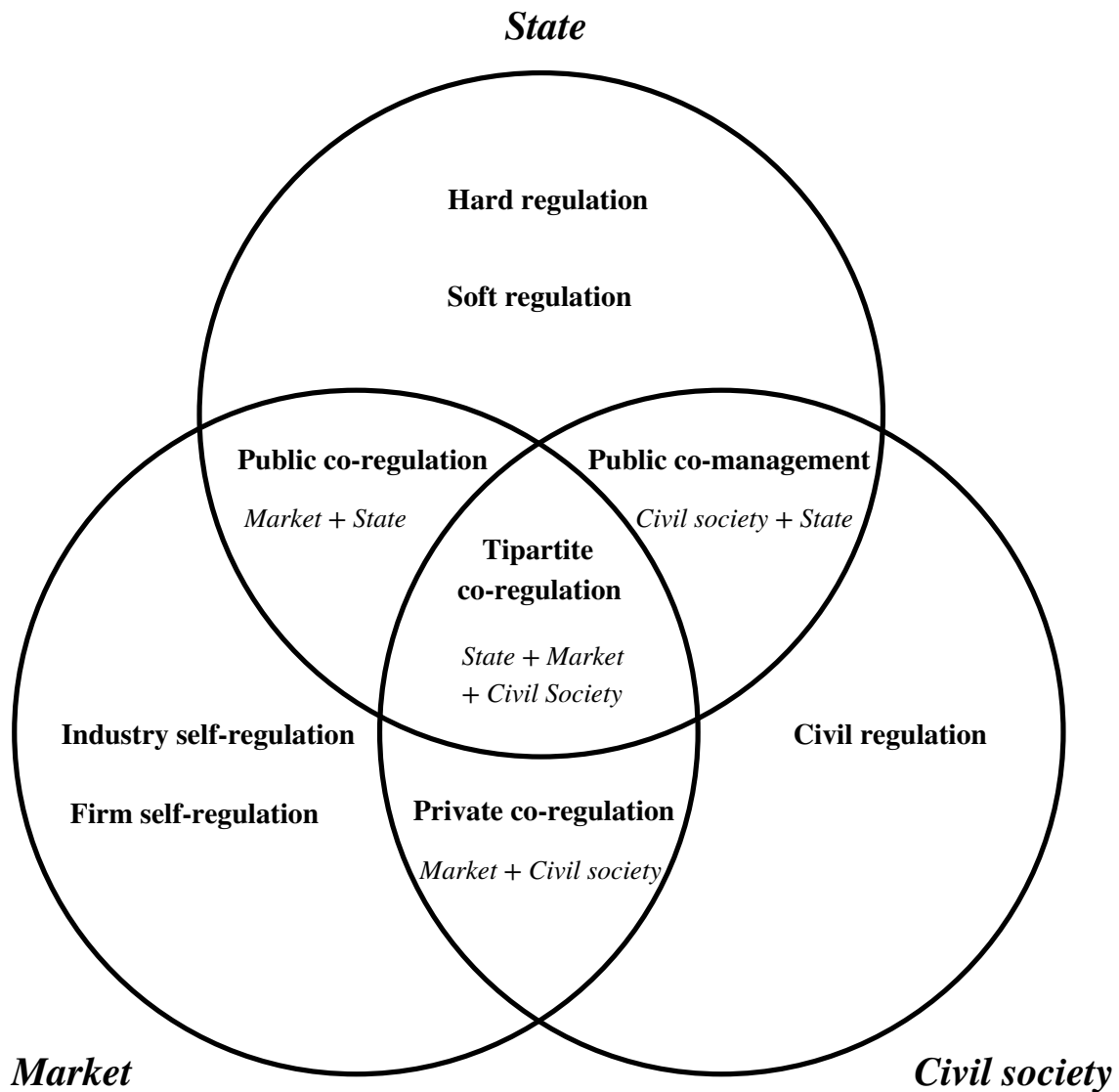


Figure 1. *Three governance spheres and interactions between spheres, adapted from Steurer (2013, p. 398)*

Appendix B: Overview of Policy Arrangements

Table 1. *Overview of the dimensions of PA1 and PA2*

Dimensions	Environmental protection of the Rhine (PA1)	River cruise tourism (PA2)
Rules of the game	<p>EU: Water Framework Directive Marine Strategy Framework Directive Single-Use Plastics Directive</p> <p>The Netherlands: Water Management Act Dutch River Basin Management Plan Rhine 2016-2021</p> <p>Rhine area: ICPR Rhine 2020 & 2040 programme CDNI</p>	<p>EU: Treaty of Lisbon Water Framework Directive Marine Strategy Framework Directive Single-Use Plastics Directive Europe the world's No. 1 tourist destination</p> <p>The Netherlands: Water Management Act Dutch River Basin Management Plan Rijn 2016-2021 Green Award 2030 Perspective: Destination Netherlands Community regulation waste management</p> <p>Rhine area: ICPR Rhine 2020 & 2040 programme CDNI</p>
Actors	<p>EU: European Commission: DG Environment, Member States CCNR ICPR CDNI</p> <p>The Netherlands: Ministry of Infrastructure & Water Management Water boards, provinces, municipalities, SAB</p> <p>Non-governmental organisations: Plastic Soup Surfer, Greenpeace, World Nature Fund, Stichting de Noordzee, Schone Rivieren, Ocean Cleanup</p> <p>Knowledge institutions</p> <p>RWS: Department Waste and Circularity</p>	<p>EU: European Commission: DG GROW, Member States European Barge Union CCNR ICPR CDNI IG River Cruise</p> <p>The Netherlands: Ministry of Economic Affairs and Climate Policy Netherlands Board of Tourism and Conventions CBRB, Koninklijke BLN-Schuttevaer, SAB Green Award Ports, harbour masters, local community River cruise companies, tour operators, passengers</p>
Resources	<p>EU: Financial resources, knowledge, coordinated effort, facilitation & political power</p> <p>Ministry of Infrastructure and Water Management: Financial resources & authority</p> <p>RWS: Financial resources, knowledge, collaborative effort & distribution of responsibilities</p>	<p>IG River Cruise: Knowledge & time</p> <p>CCNR: Knowledge</p> <p>Green Award: Approval, recognition, marketing tool & financial resources</p>
Discourses	<p>Problem definition: Plastic pollution What are RWS' responsibilities? How are you going to pay? (<i>RWS</i>)</p> <p>Goal: Good ecological and chemical status Improvement water quality Clean water (<i>e.g., for drinking and swimming</i>)</p> <p>Policy programmes and strategies: Tackle the issue at its source Polluter Pays Principle</p>	<p>Problem definition: Wastewater pollution, noise pollution air pollution, mass tourism & labour practices</p> <p>Goal: Avoid plastic pollution (<i>Port of Amsterdam</i>) Europe, the world's No 1 tourist destination Harmonised rules waste management (<i>CDNI</i>) Promoting river cruise companies' 'green' operations</p> <p>Policy programmes and strategies: Green Award, Green fleet Polluter Pays Principle</p>

Appendix C: Waste bins on board

Separate waste bins kitchen Case study 5

Figure 1. *Three different waste bins*



Note. Photo taken during fieldwork on the 20th of May 2021 (Case 5).

Figure 2. *Waste bins for food and garbage*



Note. Photo taken during fieldwork on board on the 20th of May 2021 (Case 5).

Figure 3. *Waste bin for bio waste*



Note. Photo taken during fieldwork on board on the 20th of May 2021 (Case 5).

Figure 4. *Waste bins for paper and plastic waste*



Note. Photo taken during fieldwork on board on the 20th of May 2021 (Case 5).

Appendix D: Waste containers on shore

Waste containers in the port of Arnhem

Figure 1. *Waste containers used by river cruise vessels in Arnhem*



Note. White container suitable for glass and green containers applicable for residual waste. Photo taken in port of Arnhem on the 18th of June 2021.

Appendix E: Maps of wastewater reception facilities

Wastewater reception facilities along the Rhine

Figure 1. *Wastewater reception facilities in the Netherlands*



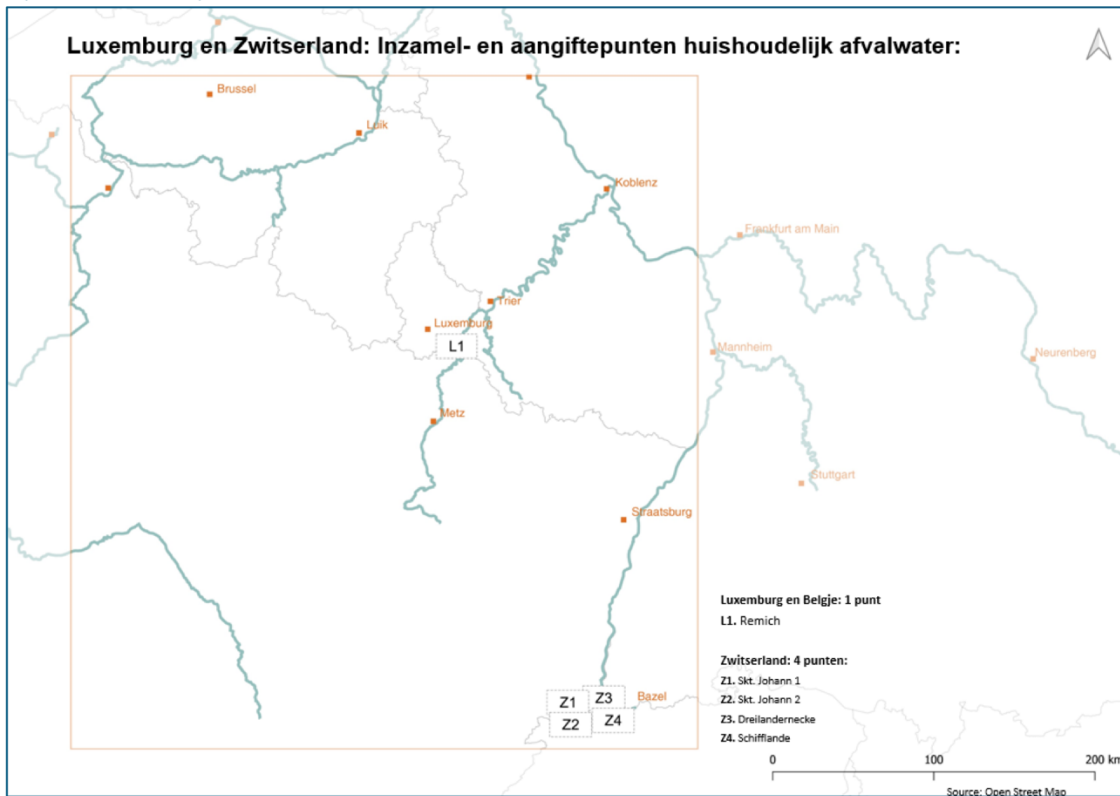
Note. Retrieved from Effectrapportage uitbreiding lozingsverbod passagiersschepen, by H. Vermij & W. Klomp, Royal HaskoningDHV, p. 27. Copyright by H. Vermij.

Figure 2. *Wastewater reception facilities in Germany*



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Figure 3. *Wastewater reception facilities in Luxembourg and Switzerland*



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Appendix F: Feminine hygiene products collected in the Rhine River

Figure 1. *Sanitary napkins found in the water column of the Rhine near Tiel in 2019*



Note. Plastic items categorised by Collas et al. (2021). Own photo taken on April 30, 2021.

Figure 2. *Tampons and tampon packages found in the water column of the Rhine near Tiel in 2019*



Note. Plastic items categorised by Collas et al. (2021). Own photo taken on April 30, 2021.