

Exploring the (re-) configuration  
of environmentally  
unsustainable practices  
Antifouling in the Baltic Sea

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To *Christian*



# List of papers

This dissertation is based on the following papers:

## **Paper I**

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## **Paper II**

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## **Paper III**

Solér C., Koroschetz, B. & Salminen, E. (2019). An infrastructural perspective on sustainable consumption - How can infrastructures support the purchase and use of sustainable products? Submitted to the *Journal of Cleaner Production*.

## **Paper IV**

Koroschetz, B. & Hagberg, J. (2019). Exploring market boundaries: The case of barnacle detachment. Submitted to *Consumption Markets & Culture (CMC)*

## **Paper V**

Koroschetz, B. (2019). Creating the (Un) sustainable consumer: How advertising meanings shape different types of consumers. Submitted to *Consumption Markets & Culture (CMC)*

# Foreword

This PhD was part of the BONUS CHANGE project “Changing Antifouling Practices for Leisure Boats in the Baltic Sea”. This international research project was funded by the BONUS program ([www.bonusportal.org](http://www.bonusportal.org)) and was carried out between 2014-2017. The participating countries were Sweden, Finland, Denmark and Germany. A unique feature of this project is its interdisciplinary approach, combining knowledge from the Natural Science, Business Administration and Environmental Law fields to study how the toxic compounds resulting from antifouling paints can be reduced to a minimum. The School of Business, Law and Economics in Gothenburg was responsible to study consumption and market practices involved with antifouling products.

Results from this project have been summarized in a popular science book:

Strand, H., Solér, C., & Dahlström, M. (Eds.) (2018). *Changing leisure boat antifouling practices in the Baltic Sea: Results from the BONUS CHANGE project*.

It can be found on the website of the Center for Sea and Society, University of Gothenburg.

[https://havochsamhalle.gu.se/digitalAssets/1703/1703741\\_rise\\_bonus-change\\_book-final\\_180307.pdf](https://havochsamhalle.gu.se/digitalAssets/1703/1703741_rise_bonus-change_book-final_180307.pdf)

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*“It always seems impossible until it’s done.”* –Nelson Mandela

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# Abstract

This thesis explores how to (re-)configure environmentally unsustainable practices into more sustainable forms in the empirical context of leisure boat antifouling. Current antifouling practices predominantly involve the use of biocide-based paint to avoid the adherence of marine organisms to boats. However, antifouling paints are harmful to marine life, and therefore policy makers and businesses seek options to replace the toxic paint through more environmental alternatives.

This thesis uses a practice theoretical-perspective to study the reconfiguration of environmentally unsustainable practices. Practices can be understood as routinized human activity, consisting of various interconnected practice elements. Previous research explains that the reconfiguration process is initiated by breaking or loosening the linkages between practice elements, but in practice, various aspects keep practice elements glued together. To learn more about the persistence of unsustainable practices and how we can reconfigure them, for example through exchanging an unsustainable material element with an environmentally friendly one, it is vital to elucidate the linkages between practice elements sustaining the eco-unfriendly practice. A multi-method approach consisting of observations, interviews, visual and textual materials has been used to explore these linkages.

The collective findings and analysis reveal several ‘configurators’ that impact and sustain the linkages between practice elements of unsustainable practices and ‘re-configurators’ that can loosen these linkages. This study suggests a framework that facilitates the reconfiguration of environmentally unsustainable practices, based on four ‘re-configurators’: eco-innovation, regulation, marketing practices and infrastructures.

This thesis contributes to the field of researching sustainable consumption by proposing a combinational approach of several ‘re-configurators’ to facilitate more sustainable practices. Additionally, this study contributes to practice theory by expanding the knowledge on the under-theorized concept of linkages. With regard to marketing, this thesis has implications for the adoption of new products in practices and how sustainable products should be marketed.

**Keywords:** Sustainable consumption, reconfiguration of practices, linkages, configurators, re-configurators





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# Introduction

This thesis explores the (re-)configuration of environmentally unsustainable practices in the case of leisure boat antifouling. This is an example of unsustainable consumption which persists despite the availability of more sustainable solutions. This thesis applies a practice theoretical approach in order to move beyond the more individualist approaches that have so far dominated the research within this area but often have shortcomings in the understanding and impact on unsustainable consumption. By investigating the case of antifouling, this work provides an understanding of practice dynamics and how unsustainable consumption practices can be reconfigured into more sustainable versions. Antifouling includes different measures that are designed to avoid marine fouling organisms adhering to the boat hull. In the following section, the practical and theoretical problems that abound are introduced and elaborated on how they are addressed in this thesis.

Many patterns of consumption are considered to be fundamentally unsustainable and create wide-ranging environmental problems. Today, news media and public debates devote increased attention to sustainability in the consumption sphere. For example, consider the following headlines:

*How and why does consumer behavior change?* (www.forbes.com; 06.09.2018)

*Making sustainable consumption of palm oil the norm in Asia*  
(www.thejakartapost.com; 10.04.2019)

*How to stop climate change: six ways to make the world a better place*  
(www.theconversation.com; 01.05.2019)

*This is how you become a climate-smart fashionista* (www.aftonbladet.com; 23.04.2017)

*How Does Your Love of Wine Contribute to Climate Change?*  
(www.newyorktimes.com; 30.04.2019)

While in recent years, an increasing array of sustainable products and services have been offered in various markets, an important challenge is still to normalize the consumption of eco-friendly offerings (Evans et al., 2012; Spaargaren, 2011) and reconfigure unsustainable consumption practices into more sustainable versions.

One example is the food sector, in which the organic food market has expanded and the number of organic food products is constantly increasing, but the market share of eco-friendly products nevertheless remains rather low compared to that of conventional products (Aertsens et al., 2011; 2006; Röö

& Tjärnemo, 2011; Rousseau & Vranken, 2013; Vermeir & Verbeke, 2006). In Sweden, the market share of organic food in 2016 was 7.7%.<sup>1</sup> There has been a positive development of eco-friendly food consumption over the years in Sweden, but a recent report (2019) reveals slow growth in the consumption of ecofriendly food at the moment.<sup>2</sup>

Another example is the introduction of the e-bike, which has improved already existing sustainable products to attract more consumers. E-bikes address many of consumers' excuses regarding why biking to work is difficult (e.g., distance, inclination, and physical effort) even though it offers several benefits (e.g., avoiding the rush hour and offering flexibility) (Fyhri & Fearnley, 2015). However, the introduction of e-bikes has not led to a substantial increase in commuting with bikes, even though e-bikes have several advantages over conventional bikes. A study of the Swedish Transport Administration (2016) has shown that, for distances up to 10km, the trips made by Swedish citizens by bicycle only increased by one percent, from 11% (2011-2013) to 12% (2014-2016). These examples show that the improvement of traditional bicycles with motorized support and the related convenience aspects (faster, less physical stress on the body, ability to arrive more relaxed and not sweating) has only led to a slight increase in biking, thus emphasizing how difficult it is to encourage consumers to change unsustainable lifestyles, like commuting to work by car.

Several streams of research have investigated how to encourage people to adopt more sustainable lifestyles. Currently, the academic debate revolves around the promotion of sustainable consumption in two relevant streams of research, which can broadly be classified as individualistic and non-individualistic approaches.

Individualistic approaches in sustainable consumption target the individual person and their behavior to achieve social change (Shove et al., 2012). Individualistic approaches focus on attitudes, beliefs, norms, emotions, and values to promote sustainable consumption (Bamberg & Möser, 2007; Rezvani et al., 2017; Stern, 2000; Tanner & Kast, 2003). This stream of literature focuses on supporting consumers to make better choices (Keller et al., 2016) by providing consumers with product-related environmental information, such as informative campaigns or eco-labeling, to help change their unsustainable consumption patterns (Boström & Uggla, 2016; Rezabakhsh et al., 2006; Valor, 2008). Information and awareness campaigns have been the preferred tool among policy makers to persuade consumers to change their individual

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<sup>1</sup> [www.statista.com](http://www.statista.com)

<sup>2</sup> <https://www.svd.se/miljoengagemanget--ett-bakslag-for-ekologisk-mat> 31.01.2019



consumption behavior in more sustainable directions (John et al., 2016; Windahl et al., 2008) In particular the ABC model, in which A stands for attitude, B for behavior and C for choice, has been rather popular among policy makers (Shove, 2010: 1274).

Another tool to support the adoption of more sustainable products is eco-labeling. Eco-labeling focuses on guiding consumers to make eco-friendly purchase decisions as well as informing consumers about the pro-environmental benefits of the firm's products and services (Soneryd & Uggla, 2015; Boström & Klintman, 2008). An evaluation of the Swan label, the Nordic Eco label, has shown that eco-labels influence sustainable purchase decisions only in a few product groups, such as printing paper and laundry towels (Pedersen & Neergaard, 2006; TemaNord, 2001). A particular study about the Swan label in the Danish market has provided the same conclusion. Labelling had a positive effect on sustainable purchase decisions only for the product groups of toilet paper and detergents (AKF, 2002). This example shows the limited impact of eco-labeling, which is connected to the discrepancy between environmental consciousness and sustainable purchase decisions (Grankvist et al., 2004; Pedersen & Neergaard, 2006; Sammer & Wüstenhagen, 2006; Torjusen et al., 2004).

Several studies have shown that common individual-based approaches in sustainable consumption have shortcomings (Evans et al., 2012; McMeekin & Southerton, 2012; Strengers et al., 2014; Spurling et al., 2013). Even though consumers may have positive attitudes towards the environment or may have been provided with product-related environmental information, such attitudes do not automatically lead to sustainable purchase decisions; this inconsistency has been referred to as the attitude-behavior gap (Young & Middlemiss, 2012) and the knowledge-to-action gap (Markkula & Moisander, 2012). This gap arises because only single-person and subjective interests, attitudes, and values are targeted, and less attention is paid to the surrounding environment (e.g., materials, infrastructures, culture) (Keller et al., 2016). To avoid the pitfalls of such individualistic approaches, a shift towards cultural and practice theoretical approaches is a promising occurrence within sustainable consumption efforts. Recent research in sustainable consumption has shifted from an individualistic approach to a more general (non-individualistic) approach, studying the social context in which consumption is embedded (Spaargaren, 2003; Welch, 2017) and considering the role of cultural aspects and social materiality in influencing consumer behavior. From a cultural perspective, sustainable consumption can be promoted by changing the socio-cultural meanings of specific consumption practices (Connolly & Prothero, 2003; Dolan, 2002).

Practice theory offers a new lens through which to examine issues related to sustainable consumption. A practice can be understood as “a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion, and motivational knowledge” (Reckwitz, 2002: 249). Practice theory recognizes the significant role of things, or material elements in practices (Spaargaren, 2011; Shove, 2010) and considers human actors as mutually influencing and co-shaping the practice (Spaargaren, 2011). Compared to individual approaches in sustainable consumption, which target individual choice, practice theory investigates the social processes that have led to this choice (Spaargaren, 2011).

Practice theory is suitable for the investigation of the (re-)configuration of environmentally unsustainable practices for the following reasons. First, a practice theoretical approach offers a different direction for understanding environmental behaviors (Spaargaren, 2011) by focusing on people’s actions and thus offering a way to fill the attitude-behavior and value-action gap (Welch & Warde, 2015). Efforts to change the practice thus do not target the individual person, but rather a group of practitioners (Keller et al., 2016; Blue et al., 2016). Second, practice theory does not consider practices as isolated but rather acknowledges a range of aspects and conditions that can influence how practices are carried out and considers the dynamics of social life, habits, and routines and their interconnectedness with other practices as important (Evans et al., 2012; Shove et al., 2012).

The practice lens has been widely applied to study matters with environmental impacts related to consumption, such as showering (Hand et al., 2005), driving (Shove et al., 2012), energy practices (Wilhite, 2008), water consumption practices (Strengers, 2011), cycling (Spotswood et al., 2015), recycling (Holmberg et al., 2016), and food practices (Halkier & Jensen, 2011; Stigzelius, 2017). These studies have drawn attention to some particular conditions and aspects that have an influential role in changing practices. Research on showering practices has shown that a change in technological and infrastructural settings in bathrooms, in combination with a change in the cultural expectation to shower every day, were affecting the reconfiguration of the showering practice (Hand et al., 2005; Burke, 1996). Similarly, Spotswood and colleagues (2015) have shown that the majority of potential cyclists want suitable infrastructures, such as showers and lockers, in order to consider shifting from commuting by car to commuting by bicycle.

Previous research on sustainable consumption has expressed interest in the organization of practices as well as their constitutive elements (Spotswood et

al., 2015, Shove et al., 2012). A basic notion of practices is that they consist of interconnected practice elements. Different groupings of practice elements exist (Magaudda, 2011; Schau et. al., 2009; Shove & Pantzar, 2005). According to Shove and colleagues (2012), practices consist of the practice elements material, meaning, and competence, which are connected with each other through linkages. Practices are shaped through the active integration of practice elements (Shove, 2014). For example, the practice of driving is composed of several *material* elements, such as cars and traffic lights; certain *competences*, like the knowledge and skills required to drive a car; and *meanings*, such as mobility and flexibility.

A reconfiguration describes a new constellation of material, meaning, and competence, which can be either a combination of already existing practice elements integrating new elements or a combination of entirely new practice elements. Before reconfiguring practices, we must first develop an understanding of how the current unsustainable practices are shaped in terms of their practice elements. Identifying the various elements and learning more about their history can help to increase our understanding of why practitioners want to continue with the practice (Shove, 2014).

In this thesis, I suggest that we analyze not only the composition of the environmentally unsustainable practice but also the different versions of sustainable practices and their practice elements in order to understand the practice dynamics involved in the reconfiguration of practices. Detecting differences in the key elements composing different versions of a practice is important in order to comprehend how much the practice versions differ from each other and to what degree the more sustainable practice interferes with routines, habits, and patterns.

In order to enable the reconfiguration process, the links between existing practice elements must be broken or loosened in order to allow for the creation of new links between new or existing practice elements (Shove et al., 2012). Previous studies dealing with the reconfiguration of practices have studied the practice dynamics that occur if a new element, like an iPod, is introduced to an existing practice, like music consumption (Magaudda, 2011). Kuijer (2014) has illuminated the reconfiguration of practices from a sustainable design perspective (Kuijer, 2014). Other studies have demonstrated how the configuration of a new practice, like Nordic walking, has been supported by marketing practices, emphasizing its positive effects on health, fitness, and well-being (Shove & Pantzar, 2005). Limited studies are explaining explicitly the reconfiguration of unsustainable practices (including the consumption of unsustainable products) in more sustainable directions (including the consumption of environmentally sustainable products).

Prior work explains that the reconfiguration process is initiated by breaking or loosening the linkages between practice elements (Shove et al., 2012), but in practice, various aspects keep practice elements glued together. Several practical examples have shown that the mere introduction of new green products (sustainable antifouling solutions, e-bikes, eco-friendly food) is not sufficient to initiate a reconfiguration of a social practice that includes the consumption of sustainable products and services. To learn more about the persistence of unsustainable practices and how we can reconfigure them, for example through exchanging an unsustainable material element through a sustainable one, it is vital to elucidate the linkages between practice elements sustaining the unsustainable practice. The concept of linkages has been under-theorized in practice theory. However, in order to determine why particular environmentally unsustainable practices are sustained, it is important to look at the linkages that keep the practices in place.

Therefore, this thesis investigates in particular the linkages between practice elements and identifies what I will refer to as the “configurators” that stabilize those linkages and make them “sticky.” Breaking or loosening the linkages between practice elements is essential to enable a reconfiguration process. In this thesis, I introduce and develop the concept of configurators and re-configurators. Configurators are various aspects such as actors, conditions, or particular contexts that have a dominant impact on maintaining and stabilizing the linkages between practice elements. In contrast, re-configurators are various aspects such as actors, conditions, or particular contexts that can enable or facilitate the reconfiguration process of practices by breaking the links between the elements.

Against this backdrop of the slow adoption of eco-friendly products, this thesis explores the (re-) configuration of environmentally unsustainable practices in the case of leisure boat antifouling. Antifouling refers to all activities directed toward keeping a boat hull free from marine fouling, such as algae, barnacles, or mussels (Ytreberg et al. 2010). More than 3.5 million leisure boats are active in the Baltic Sea (BalticLINes, 2016), and all leisure boat owners are concerned about marine fouling organisms attaching themselves to the hull below the waterline. Marine fouling has negative impacts on boating, as increased encrustation interferes with the maneuverability of the boat, creates friction, and leads to an increase in fuel consumption (Holm, 2012). A Swedish questionnaire among leisure boaters has shown that 80% of the boaters use toxic antifouling paints (Dahlström et al., 2014). These paints contain biocides like copper and zinc, which leak into the marine environment and cause the pollution of the coastal ecosystem in the Baltic Sea (Dahlström et al., 2014).

In this thesis, I am particularly interested in reconfiguring current unsustainable antifouling practices towards more sustainable forms. Reconfiguration refers to the rearrangement of practice elements (material, meaning, and competence) in a more sustainable manner, such as through exchanging an unsustainable material element with a sustainable one. Simply put, I am interested in identifying how to encourage boaters to stop using toxic paints and to shift to environmentally sustainable antifouling practices. In this thesis, an environmentally sustainable antifouling practice is understood as a practice in which sustainable antifouling products and/or services are integrated that have a minimal impact on the environment. By studying the reconfiguration of practices, I provide an understanding of practice dynamics that have strong implications for re-orienting consumer behavior in a more sustainable direction.

Antifouling practice represents an appropriate empirical context in which one can study the reconfiguration of practices and the persisting linkages between practice elements for two main reasons. First, painting with biocide-based paint is a well-established practice, and there is widespread interest among policy makers and businesses to encourage practitioners to shift to more sustainable antifouling practices. Second, antifouling practice represents a case in which several innovative sustainable products are available, but these new products are only integrated into existing antifouling practices to a small degree. New practice versions of antifouling have developed that contain different materials, such as a boat wash for boats, which can make the antifouling practice less labor intensive and more convenient. Nevertheless, the practice of painting with biocide-based paint is still predominant among leisure boat owners.

Therefore the purpose of this thesis is as follows:

*To explore the (re-)configuration of environmentally unsustainable practices in the case of leisure boat antifouling.*

The aim is to investigate the configuration of the current dominantly environmentally unsustainable antifouling practices and to determine how this practice can be reconfigured in a more sustainable way.

Three research questions guide this exploration. In order to determine how to transform current environmentally unsustainable antifouling practice, it is first important to understand how dominant antifouling practices are shaped and of what essential practice elements they are composed. Second, in order to learn more about the persistence of the unsustainable practice, it is vital to elucidate the linkages between the practice elements sustaining the unsustainable

practice. These insights then build a platform for the development of a framework that specifies how re-configurators facilitate the reorientation of unsustainable antifouling practices. In particular, this framework foregrounds a discussion of the role of these re-configurators in the reorientation and rearrangement of unsustainable practices, as well as the relations between different re-configurators. Against this backdrop, my research questions are as follows:

### **Research Questions:**

1. What are the different versions of antifouling practice, of what elements do they consist, and how are they linked?
2. What configurators stabilize the linkages between the practice elements of environmentally unsustainable and sustainable antifouling practice?
3. How can the reconfiguration of environmentally unsustainable antifouling practices into more sustainable practices be facilitated?

### **Overview of the thesis**

This thesis is designed as a compilation thesis, consisting of a cover text and five research papers, as illustrated in Figure 1. Together, the papers contribute to exploring and illustrating the (re-)configuration of environmentally unsustainable practices. The papers differ in terms of the methods and analyzing tools used. My thesis is guided by three general research questions. In order to answer these questions, I have specific research questions in each paper, which are designed to create knowledge to answer the general research questions. However, the specific research questions were designed to explore sustainable consumption beyond the general research questions. After writing my five papers, I revisited and reinterpreted my findings to create a framework of how the reconfiguration of environmentally unsustainable practices can be facilitated.

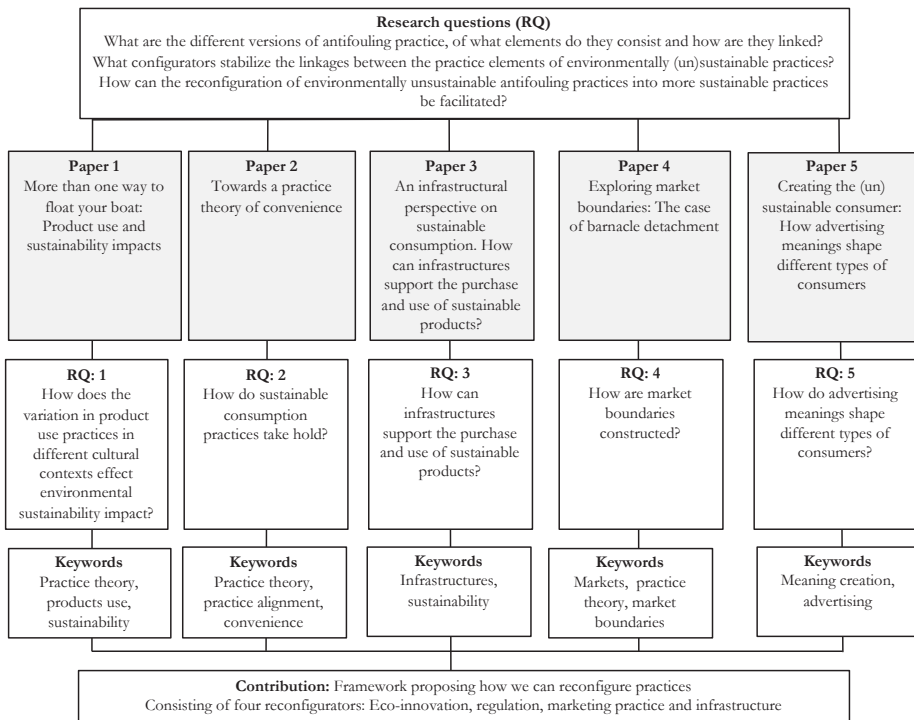


Figure 1: Overview of thesis structure

By using a practice lens, **Paper 1** begins to explore the different variations in product use of antifouling practices and shows how these variations of material, meaning and competence result in different sustainability impacts. Four different configurations of antifouling use – the Proper Boater, Opportunist, Green boater and Negotiator – are identified. The first article helps me to understand the motifs of the most unsustainable and most common practice configuration, the Proper boater, who believes that toxic paint is the only way to keep the boat hull clean. Moreover, the article gives us more insights on the meanings associated with the unsustainable painting practice. Furthermore, the paper shows how macro level institutional actors can influence consumer use practices. Paper 1 is co-authored with Diane Martin, Anu Harju and Emma Salminen and has been published in the *Journal of Macromarketing*.

**Paper 2** studies different types of convenience linked to antifouling practices. Two types of convenience have been identified: conservative and progressive convenience. Our paper shows that a single practice can be perceived either as convenient or inconvenient depending on the individual experience and



demonstrates which practice elements (material set-up, bodily skills and routines, rules, teleoaffective structures and general cultural understandings) shape the convenience experiences. From paper 2, we learn that the decision to engage in unsustainable practices is often shaped by social interactions and emotions tied to a practice. The illustration of conservative convenience has shown that boaters want to maintain the physically demanding practice of painting, even though there exist less labor-intensive and more time-saving practices. This paper is co-authored with Benjamin Hartmann and Cecilia Solér. The paper has been revised and resubmitted to *Marketing Theory*.

**Paper 3** focuses on the role of infrastructure supporting the circulation of sustainable products and services. A single case study of a boat club in Sweden is used to illustrate how the interconnection of material and institutional infrastructure can shape antifouling practices in a more sustainable direction. The analysis of the case study is shaped by three infrastructural perspectives: the economic perspective, the social-material perspective and the socio-technical perspective. This paper is co-authored with Cecilia Solér and Emma Salminen. The paper has been submitted to the *Journal of Cleaner Production*.

**Paper 4** uses a market studies approach to explore market boundaries in the case of antifouling, i.e. the market for the detachment of barnacles. The paper identifies and discusses five different types of market boundaries in the case of antifouling: place, time, offering, actor, and mode of exchange. Specifically, market boundaries can separate the market into multiple and related markets, which can hinder sustainable purchase decisions. In Paper 4, we can see that the availability of sustainable and unsustainable products differs significantly. The easy availability of toxic paints and the hindered access to sustainable alternatives, like biocide-free paints and other biocide-free antifouling techniques, contributes to the continuation of the unsustainable practice of painting with biocide-based paint. The paper is co-authored with Johan Hagberg. The paper has been submitted to *Consumption Markets & Culture (CMC)*.

**Paper 5** explores and illustrates how advertising meanings are created for sustainable and unsustainable antifouling products by analyzing the verbal and pictorial narratives communicated to boaters. A semiotic approach is used to study the different layers of meanings created through advertisements and to identify the variance in meanings between sustainable and unsustainable antifouling products and services. In particular, this paper theorizes on how advertising meanings construct various types of consumers within the Swedish market for antifouling. These insights are providing an increased understanding of the ways in which advertising meanings are able to shape



consumption in an unsustainable direction and proposes recommendations on how sustainable products can be presented more attractively to the consumers. The paper has been submitted to *Consumption Markets & Culture* (CMC).

The thesis is structured as follows. Chapter 2 gives an overview of the different theoretical concepts that are used in this thesis. Thereafter, chapter 3 describes the study context in more detail and gives additional information about the case of antifouling. Chapter 4, the method chapter, provides insight into how the study has been conducted and how the empirical material has been collected and analyzed. Chapter 5 discusses and presents the different versions of antifouling practices, presents a detailed analysis of their practice elements and answers the first research question. Chapter 6 explores the linkages between practice elements for the practice of painting with biocide-based paint and the practice of boat washing as well as provides answers to research question two. In particular, the configurators creating and shaping the linkages between the practice elements are discussed. With the knowledge gathered about the essential linkages of practice elements of the painting practice, I propose in chapter 7 how the linkages between the elements can be disrupted in order to support a reorganization of practice elements in a more environmentally friendly direction. Moreover, the chapter introduces a framework that can support the reconfiguration of unsustainable practices and answers research question three. Chapter 8 consists of a concluding discussion and offers directions and recommendations for future research.



## Chapter 2: Theoretical framework

This chapter introduces the theoretical framework. A practice theoretical lens is used to study the (re-)configuration of unsustainable practices. This chapter starts by giving a short introduction to practice theory. Thereafter, I present four concepts of practice theory which are important for studying and theorizing the reorientation of practice elements. First, I elaborate on the importance of distinguishing between practice-as-entity and practice-as-performance. Next, I introduce the concept of elements forming a practice and elaborate more on the specific linkages between the elements. Finally, I will present different approaches through which practices can be reconfigured.

### Introduction to practice theory

Practice theory is not a unified theory (Schatzki et al., 2001; Nicolini, 2012, 2017; Reckwitz, 2017). There exist different variations of practice theory, but they all share a common interest in explaining how social action is undertaken (Halkier & Jensen, 2011). According to Postill (2010), there exist two generations of practice theorists. The first generation of practice theorists laid the groundwork for practice theory and were influenced by the work of Bourdieu (1977), Foucault (1979), Giddens (1979, 1984), and de Certeau (1984). In the beginnings of practice theory, the human body played a central role in practice (Postill, 2010). The second generation of practice theorists has tested and expanded previous literature on practice theory. In this group of theorists, we can count Ortner (1984, 2006), Schatzki (1996), and Knorr Cetina and von Savigny (2001). Instead of focusing only on the human body, they also pay attention to other aspects, including non-humans entities, culture and history and their role in shaping practices. Moreover, the second generation of practice theorists have developed new concepts and applied practice theory to different fields of research (Postill, 2010).

One of the commonalities with social practice theory is that practices are viewed as “routinized types of behavior” (Reckwitz: 250), which consist of several interrelated practice elements connected through linkages (Schatzki 1996; Shove et al. 2012;). The focus of practice theory does not lie on the individual person, instead people are considered to be ‘carriers of practices’ that contribute with their repeatedly performances that practices persist (Keller et. al 2016).

Using a practice-theoretical approach involves focusing on practices as the unit of analysis (Giddens, 1984; Reckwitz, 2002; Schatzki, 1996), without accentuating the individual. However, a practice theoretical approach does not

consider individuals to be irrelevant; rather, it emphasizes that the individual behavior cannot be used to explain a general phenomenon. According to Schatzki, “Practices are non-individualist phenomena. It is people, to be sure that perform actions that compose a practice. But the organization of a practice is not a collection of properties of individual people. It is a feature of the practice, expressed in the open-ended set of actions that composes the practice” (2005: 480). The framework of practice theory makes it possible to provide a “general and abstract account” (Schatzki, 2001:4) of the particular phenomenon under study.

Practice theory has circulated widely, and the practice ‘lens’ has been considered a useful tool in different disciplines (Warde, 2016), such as organizational studies (Nicolini, 2012), marketing (Schau et al., 2009), linguistics (Pennycook, 2010), and planning (Binder, 2012) and consumption (Warde, 2005). In marketing, practice theory has made inroads into the studies of markets (Araujo & Kjellberg, 2009, Araujo et al., 2008). The market practice approach combines knowledge from marketing, economic sociology and the sociology of science and technology (Araujo et al., 2010). Markets are considered to be shaped through a bundle of practices (Callon, 1998), referred to as market practices, which can be defined as “all activities that contribute to constitute markets” (Kjellberg & Helgesson, 2006: 842). In addition, Kjellberg and Helgesson have further developed a threefold conceptualization of market practice including exchange practices, representational practices and normalizing practices (2006, 2007a, 2007b). This practice-based model borrows concepts from Actor network Theory to study the making of markets, as the model proposes that market practices are interlinked through chains of translation. The concept of translation can be used to explain how something is transformed into something else or how something is replicated (Callon, 1986).

Especially in consumption studies, practice theoretical approaches have been repeatedly used in sustainability contexts (Shove et al., 2012, Spurling et al., 2013; Spootswood et al., 2015). The practice lens offers new directions for understanding environmental behaviors (Spaargaren, 2011). Looking at sustainable consumption through the lens of practice involves shifting the focus from the individual’s attitudes and behaviors to a broader perspective, where social-technical systems and the cultural world practices are embedded into the target of inquiry (Spaargaren, 2011).

The practice lens has been proven to be especially suitable for sustainable consumption studies for several reasons. First, from a sustainability perspective, it is interesting to study mundane practices, such as driving (Shove et al., 2012) because the majority of everyday practices have considerable

environmental impacts (Welch & Warde, 2015). Second, goods and services are purchased to make it possible to partake in a particular practice. This particular view on practices draws attention to the dynamics of practices, as certain objects are not purchased for consumption *per se*, but rather in order to participate in practices (Welch & Warde, 2015). For example, a boat is necessary to be able to participate in the practice of boating. Finally, practice theory offers a new understanding of sustainable consumption and a way out of the attitude-behavior and value-action gap (Welch & Warde, 2015). These examples highlight the advantages of a practice theoretical approach applied to consumption contexts.

Several definitions of practices exist. One of the most commonly cited definitions comes from Reckwitz, who defines practice as “a routinized type of behavior which consists of several elements, interconnected to one other” (2002: 249). Following the definition of Reckwitz, regularity and repetition are vital for the classification of a practice. Reckwitz further emphasizes that a practice exists as a “block” or “pattern which can be filled out by a multitude of single or unique actions” (2002: 250). On the other hand, Warde (2014) introduces a model based on four indicators to define whether an activity is simply a random activity or can be identified as a practice. Only one of the four indicators must be present to conclude that an activity is a practice. One indicator is whether an operation manual could be written about how to perform an activity. Another indicator is that a significant number of people actively reserve time for the activity and afterward recall that they have actively invested a certain time to undertake the activity. The third indicator involves discussions about the performance of the activity in the practitioner community. The fourth indicator is the existence of specialized material needed for the activity. With these four aforementioned indicators, Warde (2014) provides an alternative way of determining whether an activity is a practice if it does not meet the common characteristics of practice definitions.

### **Practice-as-entity and practice-as-performance**

Practices can be further be divided into practice-as-entity and practice-as-performance (Schatzki, 1996; Shove et al., 2012; Warde, 2005). The practice-as-entity has a history or some sort of development over time (Welch & Warde, 2015). According to Schatzki, practice-as-(coordinated)-entity can be defined as “a temporally unfolding and spatially dispersed nexus of doings and sayings. Examples are cooking practices, voting practices, industrial practices, recreational practices and correctional practices” (Schatzki, 1996: 89). The second notion of practice, practice-as-performance, refers to the recurrent performance of the practice (practice as doing) “which actualizes and sustains practices in the sense of nexuses” (Schatzki, 1996: 90). Practice-as-

performance refers to the individual performance and unique enactment of the practice by a practitioner at a specific time and place (Hui, 2017; Huttunen & Oosterveer, 2017). Kuijer notes that “a single performance is only one manifestation of a practice-as-entity” (2014: 52). For example, consider the practice of making a sandwich. At a specific day and time (e.g., the 5<sup>th</sup> of June, 2019, at 1:15 p.m.), I make a sandwich in my kitchen using different utensils like a knife, plate and groceries like bread and cheese. Multiple performances carried out in different kitchens or other places at other times can be brought together and considered to be a practice-as-entity. The practice performance could either be the practice of making lunch or the practice of making sandwiches (Hui, 2017).

There is also an essential relationship between these two central notions of practice. The practice-as-entity only persists through recurrent performances of the practice, because if practices are not performed, they disappear (Shove & Pantzar, 2005). Consequently, the performances of practices shape the stabilization, reproduction and enhancement of existing practices (Southerton, 2012). If practice performances are recurrently and frequently reproduced, they are referred to as habitual and routine practices (Shove et al., 2012). Tensions and dynamics are inevitable if habitual practices need to change in order to achieve a more sustainable outcome of the practice (Evans et al., 2012).

The collective view on practices enables us to speak of practices-as-entity (Spurling et al., 2013) and is helpful for analytical purposes. For example, by agreeing that driving is a practice-as-entity, we can make statements about how the practice has developed over time. Individuals can identify a number of practices-as-entity and recall certain practice elements even though they might never have participated in the particular practice (Spurling et al., 2013). For instance, the majority of people can describe the practice of hosting a dinner party, even if they have never done so themselves (Spurling et al., 2013).

The relationship between practice-as-entity and practice-as-performance is illustrated by Spurling and colleagues (2013) using the image of an iceberg (see Figure 2). The practice-as-performance is understood as the observable behaviour of individuals carrying out the practice and is illustrated as the tip of the iceberg.

Within the practice-as-performance there also exist variations. For example, increasing the temperature on the thermostat or putting on some warm clothes are both performances of the practice of staying warm at home but can be considered as variations of such performance. Compared with the example of making a sandwich, these performances consist of completely different

combinations of interconnected elements (Kuijjer, 2014) and are referred to as variations within a performance (Hui, 2017). Multiple elements are needed for the performance of a practice, and there are different combinations of practice elements possible. For instance, the practice of making toast can be done using a toaster, a grill or a wood fire (Hui, 2017).

Instead of speaking of variations of performance, Woermann and Rokka (2015) speak of *versions of practice*. For example, freestyle skiing is a practice, but for the Olympic games special rules apply which affect how the practice is carried out, consequently leading to a specific version of the practice. In different consumption studies, it has been acknowledged that multiple versions of the same consumption practice can exist side-by-side (Woermann & Rokka, 2015). For example, there exist different versions of cooking, such as cooking with the multi-food processor Bimby (Truninger, 2011), traditional cooking on a stove or barbecuing on a grill. Likewise, different versions of surfing (Canniford & Shankar, 2013); running (Thomas et al., 2012) or riding motorcycles (Martin & Shouten, 2013) have been identified. By looking more closely at the practice of eating, we can note that it can be performed with a fork and knife, chopsticks or hands. These versions are composed of different practice elements, but practitioners would agree that all these versions belong to the practice of eating (Warde, 2013).

For the purpose of studying the reconfiguration of the unsustainable practice of painting with biocide-based paint, it makes sense to refer to *versions* of practice instead of performances of practice, because the term performance is used to describe an individual performance at a specific time and place but also for the variety within a performance including a different constellation of practice elements (Hui, 2017). In order to make a clearer distinction, I thus prefer the term *versions of practice*. With this term, I do not only mean a variation in the constituent elements; rather, I consider versions of practices as patterns of performing, which consists of a recurring arrangement of practice elements every time. In chapter 5 I explore different versions of antifouling practice and identify six different versions of antifouling: painting with biocide-based paint, painting with biocide-free paint, using boat washers, using hand-scrubbers and using boat lifts. Some practice versions are very similar in terms of their composition of practice elements as they share a number of practice elements (e.g. painting with biocide-based or biocide-free paint). Whereas other versions are distinct from each other (e.g. using boat washers, using hand-scrubbers and using boat lifts). By using the version of painting with biocide-based paint I will showcase what I mean with patterns of performing. To have an effective boat hull protection against marine fouling, the painting needs to follow the same procedure every year. First some preparation work needs to be done, such as washing the boat hull and scrapping

off old paint flakes. In a next step masking tape is used to mask the area of the boat that is supposed to be painted. Then the boater needs to put on protection ,like gloves and air masks before he starts painting the boat hull with a paint roller. Painting the boat hull consists of the same routine every year, but every year the individual performance might vary. For example one year the boater will use more or less paint.

To summarize, in my view there are three ways of understanding practice: practice-as-entity (e.g., antifouling), practice-as-performance (e.g., the individual carrying out the practice in a specific time and place or variety within a performance including a different constellation of practice elements) and versions of practice (e.g., different patterns of performing a practice including a variation in the constituent elements). Figure 2 illustrates this line of thought. I have adapted the iceberg model of Spurling and colleagues (2013) and included my view on versions, which is partly inspired by a visualization of Kuijer (2014:79). In the present study, these versions of practice emphasize the different ways antifouling can be carried out and therefore illustrated with version A, version B etc. Each version of practice consists of individual performances of practitioners (illustrated with small bubbles), and all versions of antifouling compose the practice-as-entity. The empty space in the model also consists of practice performances which do not belong to one of the versions. In chapter 5, I will introduce the different versions of antifouling. Some of the versions contain overlapping practice elements, whereas others have totally different elements.

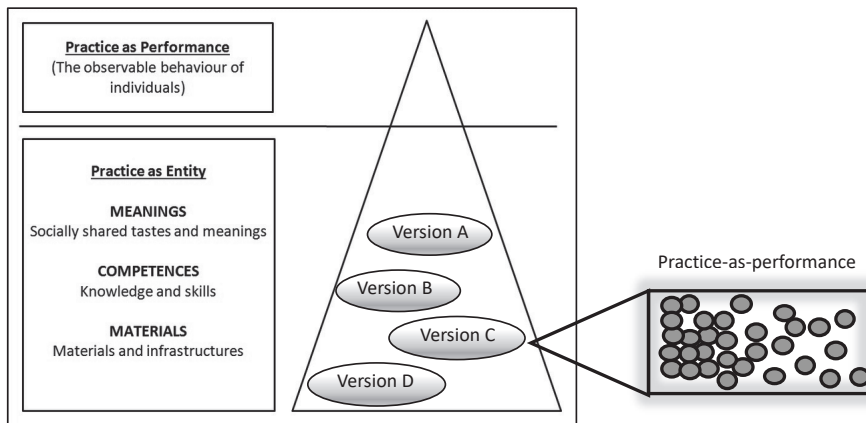


Figure 2: Relationship between practice-as-entity, versions of practice and practice-as-performance (inspired by Spurling et al., 2013, p. 8; Kuijer 2014, p. 79).



## The elements of social practice

A basic notion of practice theory is that practices consist of a constellation of different practice elements that are connected with each other (Kuijjer et al., 2013). Various theorists have studied the key elements composing a practice (Schatzki, 2002; Reckwitz, 2002; Warde, 2005; Shove et al., 2005). Broadly, there is a common view that the nexus of practices consists of a tripartite structure. Scholars have introduced conceptualizations consisting of understandings, procedures and engagements (Schau et al., 2009; Warde, 2005), materials, images, and skills (Shove & Pantzar, 2005) or encompassing objects, doings and meanings (Magaudda, 2011). These conceptualizations of practice elements have explicitly been introduced as a “reductive scheme” *and* a “simplifying move” for practices (Shove & Pantzar, 2005; Shove et al., 2012: 15, 23).

According to Reckwitz, practices consist of “forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge” (2002: 249). This thesis draws upon the most cited ‘three element model’ of Shove and colleagues (2012) which is based on Reckwitz (2002) and at the same time simplifies his view on practice elements. Shove and colleagues (2012) have created a model where practices are conceptualized as an arrangement of material, meaning and competence (Shove et al. 2012), as illustrated in the following figure.

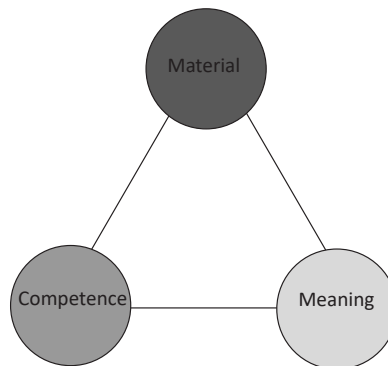


Figure 3: Three element model (reproduced from Shove et al., 2012: 83).

### **Material**

Reckwitz notes that “Carrying out a practice very often means using particular *things* in a certain way. It might sound trivial but to stress that in order to play football we need a ball and goals as indispensable ‘resources’” (2002: 252-

253). Shove and colleagues (2012) have specified the term ‘things’ and use it to refer to material. The material element includes objects, infrastructures, tools, hardware and the body itself (bodily time spent). The human body is not only relevant for the material element but also plays a role in other elements, such as competence, where practices are embodied (Røpke, 2009). Additionally, the incorporation of human and non-humans entities into the material element, is inspired by the work of Latour (1993). The importance of material elements in practices is supported by other literature. Schatzki points out that “practices are intrinsically connected to and interwoven with objects” (2002: 106).

### ***Meaning***

The meaning component is about “making sense of the activities” (Røpke, 2009:2492) or, as Shove describes it, “the social and symbolic significance of participation in any moment” (Shove et al., 2012: 22). This practice element describes reasons for the practitioner to engage in the practice in the first place and elucidates socially shared perceptions and views of a certain practice. Several practices can have common meanings. For example, the meaning ‘healthy’ can be used to describe several practices, such as cooking or exercising (Røpke, 2009). However, meanings of practices are not always stable and might develop over time. In former times, smoking was generally reserved for the upper social classes, and was considered to be a relatively healthy practice. Today, the meanings of smoking have shifted, and smoking is considered to be an unhealthy practice that is associated with less healthy people from underprivileged social groups (Blue et al., 2016).

### ***Competence***

The competence element includes the skills or the practical knowledge needed to perform a particular practice. There are also differences between having theoretical knowledge about how a practice could be carried out and having the necessary skills to perform that particular practice (Warde, 2005). Through performing a practice, the body is trained in a certain way, and competence, knowledge and skills become embodied (Røpke, 2009: 2492). According to Kuijter (2014), competence elements can be described as bodily and mental routines as well as the feelings that are learned and expressed when doing a certain practice. For example, for the practice performance of cycling, certain competences and skills are required. Besides having the knowledge of how to cycle and the necessary personal fitness, practitioners also need to know how to navigate through road traffic and how to dress properly for biking (Spotswood et al., 2015).

Besides the threefold model of practices, other conceptualizations have developed. Schatzki (2001, 2002) proposes a structure of three different practice elements consisting of practical understandings, rules and teleoaffective structure. Distinct from other conceptualizations is teleoaffective structure, which emphasizes that bodily activities are also strongly shaped by specific ends and emotions. Inspired by the work of Schatzki's conceptualization, Woermann and Rokka (2015) have introduced a fivefold model of practice elements to study how the alignment and misalignment of practice elements interferes with the timeflow experience of extraordinary recreational practices like free skiing and paintballing. In the model of Woermann and Rokka (2015), the 'meaning' category of Shove and colleagues 2012 is divided further into three categories: rules, teleoaffective structures and general cultural understandings (see Table 1). The additional division of the 'meaning' element has also been recommended by Schatzki (2002). Moreover, different category names are used; for example, the term 'objects' is replaced by 'material set up' and 'doings' is replaced by 'bodily routines and skills'. Table 1 gives an overview of the different conceptualizations of practice elements.

Table 1: Key elements in the understandings of practices (adapted from Higginson et al., 2016).

Schatzki (2002)	Reckwitz (2002)	Warde (2005)	Shove et al. 2012	Woermann and Rokka (2015)
Practical understanding	Body	Understandings	Competence	Bodily routines and skills
	Mind			
	The agent			
	Structure/process			
Rules	Knowledge Discourse/language	Procedures		
Teleoaffective structure		Engagement	Meanings	Teleoaffective structure, rules, general cultural understandings
	Things	Items of consumption	Material	Material Set-Up

No matter which practice conceptualization is chosen, they all have in common that they are considered to be key elements of the practice. Missing practice elements hinder the performance of practices. According to Blue et al. (2016), the practice of smoking requires the integration of certain *material* elements (cigarettes, lighter, purchase possibility), *competence* (practitioner needs to know how to smoke the cigarette, how to inhale) and *meanings* (multiple meanings: coolness, relaxation, classy, sociability). If, for example, matches or lighters are missing or the practitioner does not know how to smoke a cigarette, then the practice of smoking cannot be performed or carried out.

Previous literature shows that it is quite common to adapt the labeling of the practice element categories to the purpose of the paper and the data. According to Woermann and Rokka, “Drawing boundaries between discrete elements is accordingly a matter of adequate theoretical definition rather than ontological givenness” (2015: 1494). The aim of Woermann and Rokka’s paper (2015) was to study timeflow experiences during free skiing and paint balling. For that purpose, it was a necessity to study the individual experiences of a group of practitioners connected to these activities and to study time ‘in action’ (Woermann & Rokka, 2015). For the purpose of Woermann and Rokka’s article, only studying the meaning element would not have given them information about teleoaffective structures and the emotions involved in paintballing and free skiing. To study the individual experience and emotions, it seemed to make more sense to further analyze the category of meaning in sub-categories such as rules, teleoaffective structures and general cultural understandings.

Likewise, in this thesis, different practice element configurations have been used depending on the purpose and aim of the individual papers. In Paper 1, I use the tripartite structure by Shove and colleagues (material, meaning and competence) to analyze the different variations in product use of antifouling practice variations and their sustainability impacts in different countries. The focus here is on zooming out to detect cultural differences in material, meaning and competence. In Paper 2, I make use of the fivefold practice conceptualization of Woermann and Rokka (2015) to analyze the individual convenience experiences of boaters using sustainable as well as unsustainable antifouling solutions. The model of Woermann and Rokka (2015) was useful for the purpose of zooming into the practice, as they divide the meaning element further into subcategories (rules, teleoaffective structures and general cultural understandings). Instead of using the concept of alignment to explain temporal experiences (Woermann & Rokka, 2015) within practices, I use the idea of alignment and misalignment to unfold and critique the concept of ‘convenience’ in order to explain practice dynamics (Paper 2). Convenience is subjectively understood, and to gain information about individual convenience experiences the model of Woermann and Rokka (2015) was more suitable than the three fold model of Shove and colleagues (2012), consisting of material, meaning and competence. In the findings chapters (5, 6 and 7), I return to the threefold model of Shove and colleagues (2012) to elaborate on the reconfiguration of unsustainable practices. To facilitate the dialogue with policy makers and businesses, it made sense to choose the model of Shove and colleagues, as the reduced scheme with three practice elements makes it easy to understand for people who are not familiar with practice theory.

In the field of sustainable consumption, the identification of the different specific practice elements of practices, as well as their organization, history and development over time, has been a central point in the analysis of practices (e.g., Halkier & Jensen, 2011). The ways in which material, meanings and competences configure consumption practice and the dynamics between these have transformational potential in sustainable consumption (Shove et al., 2012). In order to be able to theorize about opportunities to reconfigure practices, it is important to understand how unsustainable and sustainable practices are constituted (and how they relate to other practices across space and time). Learning more about the different elements can help us detect patterns for distribution and persistence (Blue et al., 2016). For example, detailed accounts about the characteristics of material elements in antifouling practice, such as the benefits of a particular material, may give insights regarding why particular unsustainable material elements are preferred over other sustainable ones and therefore still persist as part of the practice.

### **Linkages between practice elements**

While various conceptualizations of practice elements exist, what they all have in common is that the practice elements are somehow connected or linked. However, the notion of linkages has been under-theorized. Understanding linkages and connections between practice elements is essential to change existing practices (Higgenson et al., 2016). Studying these linkages in this thesis will help me to understand what keeps the practice elements of unsustainable antifouling practices linked or glued together. This knowledge is essential in order to be able to propose suggestions of how current unsustainable practices can be reconfigured in more sustainable directions.

Only a small number of studies have touched on the investigation of the linkages between practice elements. Two different approaches or schools of thought have developed around this concept. First, Schatzki refers to a practice-arrangement nexus, implying that the practice itself is the link between the practice elements (Schatzki, 1996).

*To say that the doings and sayings forming a practice constitute a nexus is to say that they are linked in certain ways. Three major avenues of linkage are involved: (1) through understandings, for example, of what to say and do; (2) through explicit rules, principles, precepts and instructions; and (3) through what I will call 'teleoaffective' structures embracing ends, projects, tasks, purposes, beliefs, emotions and moods (Schatzki, 1996: 89).*

Schatzki states that a practice consists of three different elements: practical understandings, rules, teleoaffective structure (1996). These practice elements ‘hang together’, and in so doing they form the practice. By following this theoretical approach, I learn that practice elements ‘hang together’, but I understand relatively little about what makes the practice elements connect to each other. Knowledge about the actual linkages between the elements and how these linkages are sustained is relatively absent.

Second, Shove and colleagues (2012) emphasize that practices can be seen as bundles of different elements linked together, which “emerge, persist, and disappear as links between their defining elements are made and broken” (Shove et al., 2012: 21). Relevant elements of practices might exist, but if they are not linked, the practice is referred to as a ‘proto-practice’, stressing that these elements could compose a practice in the future. Stabilized practices are those that are constantly reproduced (Scott 2012) and in which elements are linked in similar ways (Shove et al., 2012). In contrast, ‘ex-practices’ are practices that no longer exist, because the links are no longer made between the elements. Figure 5 visualizes the different types of practices.

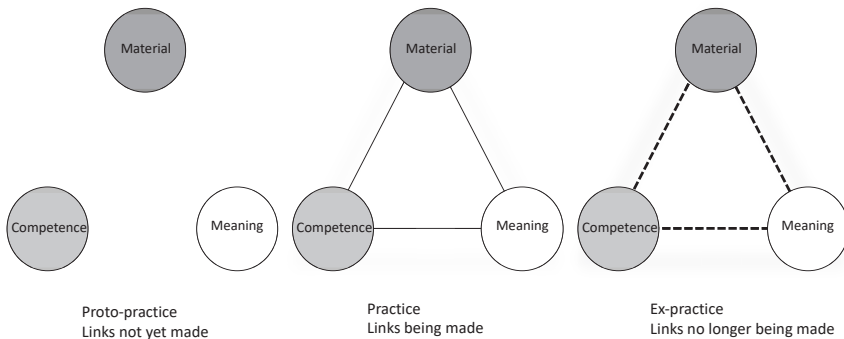


Figure 4: Proto-practices, practices and ex-practices (Reproduced from Shove et al., 2012: 25).

Bodily performance plays an important role in the creation of linkages (Røpke, 2009). As asserted by Shove and Pantzar “Innovations in practice depend on the active integration of elements, some new, some already well established, that together constitute what we might think of as innovations-in-waiting or proto-practices” (2005:48). The integration of elements and creation of linkages occurs through the active performance of the human body (Kuijjer et al. 2013; Røpke, 2009) as the practitioners are linking the practice elements with their actions.

Kuijer (2014) suggests to visualize practices as *groupings of elements* and *multitude of links* shaping these practices. This type of illustration is especially suitable for explaining the processes behind the reconfiguration, because it enables to show which specific elements are replaced or linked together. In this thesis I adopt the idea of multiple links and groupings of practice elements, but for visualizing I prefer to illustrate the practice elements all consisting of the same size, because it allows for more space for denoting in detail the particular practice elements.

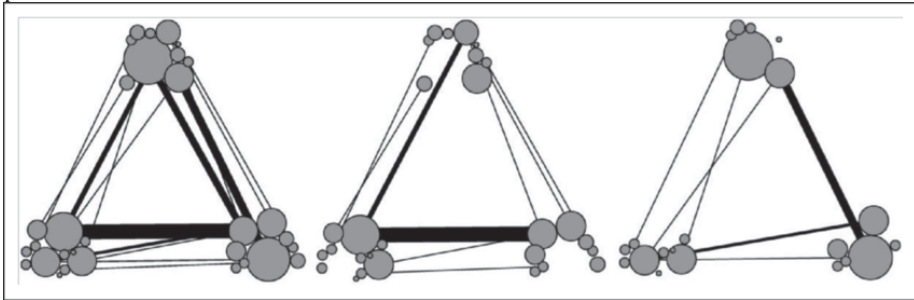


Figure 5: Practice-as-entity (left) and two illustrations of practice performances (centre and right)(Higginson et al. 2015, based on Kuijer 2014)

Shove and Pantzar (2005) investigated the emergence of a new practice, Nordic walking, and have especially highlighted the essential role of producers and consumers in shaping this practice. Nordic Walking describes a physical activity, where poles similar to skiing poles are used for the training. Walking is a practice in itself, but walking with sticks was something completely new at the time the Nordic walking practice was introduced. Originally, Shove and Pantzar (2005) used the nexus of materials, images and skills to describe how the new practice was composed. Later image was replaced through meaning and skill through competence (Shove et al., 2012). Through the integration of material, images (meaning) and skills (competence), a new practice was created. In the paper, they explain that three linkages were especially important for the success of the establishment of Nordic walking. First, a link between image (meaning) and skill (competence) needed to be established, which was achieved by practitioners being trained in walking with sticks, being part of a community and seeing Nordic walking as healthy exercise for the body. Second, the link between material and skill (competence) was achieved when the practitioners learned how to walk with sticks and at the same time had a positive experience, which people wanted to repeat. Third, the link between material and image (meaning) was the most important link. Walking with sticks needed to appear ‘normal’ instead of looking ridiculous. This normalization effort was undertaken in different forms. Public health organization in Finland supported the new practice, as did the producers of sports equipment. Additionally, media coverage, in forms such as videos,



books and scientific articles, has helped to successfully reconfigure the 'walking practice' with the inclusion of sticks (Shove & Pantzar, 2005).

## **Reconfiguration of practices**

According to Warde (2005), the process of reconfiguration of the performance of a practice can take place through 'adaptation, improvisation and experimentation' within practices. Adaptation and improvisation take place in a non-standard situation, where the "normal configuration" of the nexus of practice elements needs to be modified to be able to carry out the practice (Kuijer, 2014). For example, in nature, several practices usually performed in a household need to be adjusted for the nature setting. People that are camping need to improvise their bathing or cooking practices. In contrast, experimentation occurs when there is an intention to change the 'normal practice', and this process involves planning and carrying out the practice as well as testing and appraising the practice (Kuijer, 2014).

In general, practices are flexible and change over time. Reckwitz speaks of the 'crisis of routine': "everyday crises of routines, in constellations of interpretative interdeterminacy and of the inadequacy of knowledge with which the agent, carrying out the practice, is confronted in the face of the 'situation'" (Reckwitz, 2002: 255). The described crisis occurs when there is a change or shift in the constellation of practice elements (Strengers, 2011), when the practitioner combines totally new practice elements with each other or combines existing elements with new elements.

Reconfiguration in a sustainability context aims for a permanent reorganization of the 'normal unsustainable practice', which can occur in two different ways. Practices are transformed either through the inclusion of new elements or through a new arrangement of already existing elements together with new elements (Shove et al., 2012). Before practices can be reorganized, the links between the elements (e.g., material, competence and meaning) need to be broken or loosened to enable the practice to absorb new elements into the practice (Shove et al., 2012). The new elements referred to in this reorientation process of practice elements may not be completely new but are new for the specific practice-as-entity (Kuijer, 2014). Instead of new or existing elements, Kuijer (2014) speaks of familiar or unfamiliar elements being integrated into an individual performance (2014). Through the rearrangement of practice elements, already existing elements (familiar elements) are either replaced with or combined with unfamiliar elements. These unfamiliar elements do not necessarily need to be of a material nature; they can also be unfamiliar elements of competence and meaning (Kuijer, 2014). The idea of familiar and



unfamiliar elements impacting the reconfiguration process is illustrated in the following Figure 6.

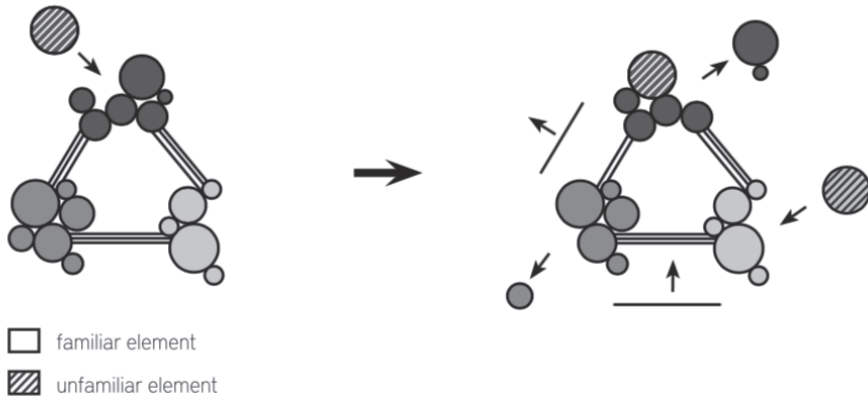


Figure 6: Reconfiguring practices (Kuijer 2014:76.)

The reconfiguring of practices and the nature of linkages has been illustrated by using the historical example of car driving (Shove et al., 2012). In particular, the study of driving shows how material changes in the automotive industry and changes in the necessary skills for driving have resulted in breaking the links between practice elements and composing them into new practices. For example, early car models did not have a roof, and the driver needed to wear goggles, gloves and warm clothes while driving in the winter. After some time, the design of the cars changed to include a roof, which caused certain material elements, such as gloves and goggles, to vanish from the car driving practice. The link between these particular material elements was broken, and gloves and goggles were no longer part of the car driving practice. The car driving example shows how innovations and technological development can lead to a disruption of linkages between practice elements.

Kuijer (2014) has studied possible ways how the current resource water and energy intensive practice of bathing can be reconfigured towards less resource intensive forms by following a sustainable design perspective. The aim of the design project was to reduce water consumption from an average of 340 liters per week to 105 liters per week. This should be achieved by a bucket bath, which is a combination of a shower and a bucket. Her approach focuses on practices as unit of analysis (with a focus what currently is) and taking practices as unit of design (with a focus what could be).

## **Examples of reconfiguration**

As mentioned before, the new or unfamiliar element does not need to be a new material element; other elements can also initiate or support the reconfiguration process. The following section will give some examples from studies in which the reconfiguration was supported through the introduction of a new material element, new competences or new meanings.

### ***Introducing material elements***

Several studies have elucidated various ways in which the introduction of material elements has initiated a reorientation of practices. Following the definition of Shove and colleagues (2012) the material element encompasses objects, infrastructures, tools, hardware and the body itself (bodily time). Magaudda (2011) studied the practice dynamics involved if a new material element (i.e., an object) is integrated into an existing practice. In his study, he investigated the reconfiguration of practice elements (objects, meaning and doings) in digital music consumption by introducing a new object (iPod) into existing music consumption practices. Different studies in sustainable consumption have shown the transformational potential of infrastructures in practices. For example, exchanging the material infrastructures of tumble dryers in big apartment complexes with a special room designed for air-drying has helped to decrease energy consumption and reduce costs for laundry (Spurling et al., 2013).

### ***Requiring competences***

The introduction of a new material element into an existing practice does not lead automatically to the reorganization of practice elements. Truninger (2011) illustrates in her study that the introduction of a new cooking device, a multi-food processor (referred to as Bimby or Thermomix), is dependent on showing practitioners how to use the device. This cooking device is not sold in regular stores. Instead, it is often demonstrated and sold in people's homes, similar to Tupperware parties. To be able to use Bimby, new competences in cooking must be acquired. Practitioners were involved in the cooking, and the competences for using the Thermomix were developed in practice. The demonstrations of how to use the Bimby at home or in TV cooking shows (often with famous chefs) were among the main components for communicating the competence needed and recruiting new practitioners. Even though the cooking device is designed to deskill cooking, new skills must first be accomplished in order to experience the convenient and easy way of cooking with Bimby.

### ***Creating new meanings***

Shove and Pantzar's (2005) prominent example of Nordic walking shows the importance of the combination of a new material elements and promotional efforts to achieve a reconfiguration of practices. When Nordic walking was first introduced, many people thought it looked silly to see people walking with sticks. However, after various marketing campaigns promoted the benefits for health and well-being of the practice, the image of Nordic walking changed, and the practice found more supporters (Shove and Pantzar, 2005). The more practitioners take up a certain practice, the more it becomes accepted and considered to be a normal way of doing things, such as walking with poles.

Sahakian and Wilhite (2014) have illustrated the importance of the image of practices when encouraging people to order tap water instead of bottled water in restaurants. Several marketing campaigns to increase the consumption of tap water in high-class restaurants in London failed. Interviewing restaurant guests revealed that the majority of people were embarrassed to ask for tap water and that ordering tap water in the United Kingdom was not socially accepted. To solve this problem, a new material object, a stylish carafe for serving tap water, in combination with an automatic donation of one pound to the organization 'Water Aid', made ordering tap water socially accepted, and the number of ordered water bottles in restaurants decreased (Sahakian & Wilhite, 2014). This case illustrates that the more sustainable practice of ordering tap water only took hold through the combination of a new material element (stylish carafe) and a transformation of meanings associated with ordering tap water, which was necessary to reconfigure the water ordering practice in restaurants.

After presenting my theoretical framework I will continue showcasing the empirical context of leisure boat antifouling and introducing the environmental issues related to the consumption of unsustainable antifouling solutions as well as presenting the available sustainable biocide-free antifouling techniques.



## Chapter 3: The case of antifouling in the Baltic Sea

In this chapter, I will present the research context of antifouling for the purpose of exploring and illustrating the (re-)configuration of unsustainable practices. Of significant concern for boaters is the fact that marine fouling organisms, like mussels and barnacles, frequently become attached to boat hulls. Antifouling includes different measures that are designed to avoid marine organisms from adhering to boats (Ytreberg et al., 2010). More than 3.5 million leisure boats are using the Baltic sea for recreational boating (Baltic LINES, 2016). In general, leisure boats in Sweden are defined as being up to 12 meters in length (Kemikalieinspektionen, 2014). The majority of these leisure boats use biocide-based paints to keep marine fouling organisms from attaching to the boat hull. However, the use of toxic antifouling paints has negative effects on the marine environment (Solér et al., 2018).

### Baltic Sea

The Baltic Sea is a unique interdependent brackish-water ecosystem that is very sensitive to pollution of any kind (Solér et al., 2018). This sensitivity results from the limited water exchange, as the Baltic sea is predominantly land-locked, with fresh sea water inflows originating only from the northeast Atlantic. Environmental pollution in the water thus remains in the Baltic Sea for a long time (Helcom, 2010). The water composition of the Baltic sea is also unique, with salinity varying from 20 PSU (Practical Salinity Unit) in the northwest, where the Atlantic enters through the Kattegat, to only about 2 PSU in the Bothnian Sea in the north of the Baltic Sea (Dahlström et al., 2018). This wide range of salinity contributes to the unique flora and fauna in the Baltic Sea. For example, the brown algae called *Fucus radicans* is found only in the Baltic Sea (Wennerström et al., 2013). The following Figure 7 illustrates the richness of species in the Baltic Sea and in which particular salinity area they can be found. In most cases, more species are found in high salinity waters. The high salinity areas are thus marked in red in the figure.

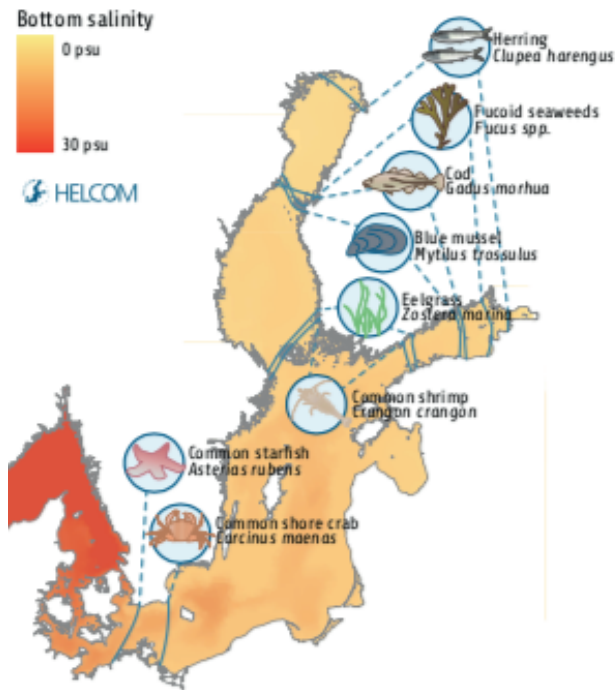


Figure 7 : Overview of richness of species in different water salinity (Helcom, 2011-2016:13).

The special geographical and oceanographic characteristics of the Baltic Sea, in combination with the environmental impacts of the 85 million people and human activities in the surrounding area, create special pressures on the marine environment. Today, the Baltic Sea is one of the most contaminated seas in the world, with a potential high risk of damage to the marine environment (Helcom, 2010). Contamination and pollution result from aircraft emissions, shipping transport and related discharges, and construction activities such as digging and the disposal of dredged material (Helcom, 2010). Moreover, in addition to these key threats, the use of biocide-based antifouling paints on leisure boats causes an additional threat to the marine ecosystem of the Baltic Sea.

The current condition of the Baltic Sea can be seen in Figure 8, which illustrates the chemical status of the Baltic Sea. A large portion of the Baltic Sea suffers from high levels of pollution. In the figure, orange and red areas represent poor and bad chemical status, respectively. Green areas, mainly found in the Bothnian Bay, indicate a more positive status for the marine environment (Helcom, 2010). In general, the overall high toxicity is very

alarming, as the Baltic Sea is home to a wide range of fish, algae and invertebrates. In addition, the Baltic Sea is an important feeding ground for pelagic fish and a preferred area for recreational boating.

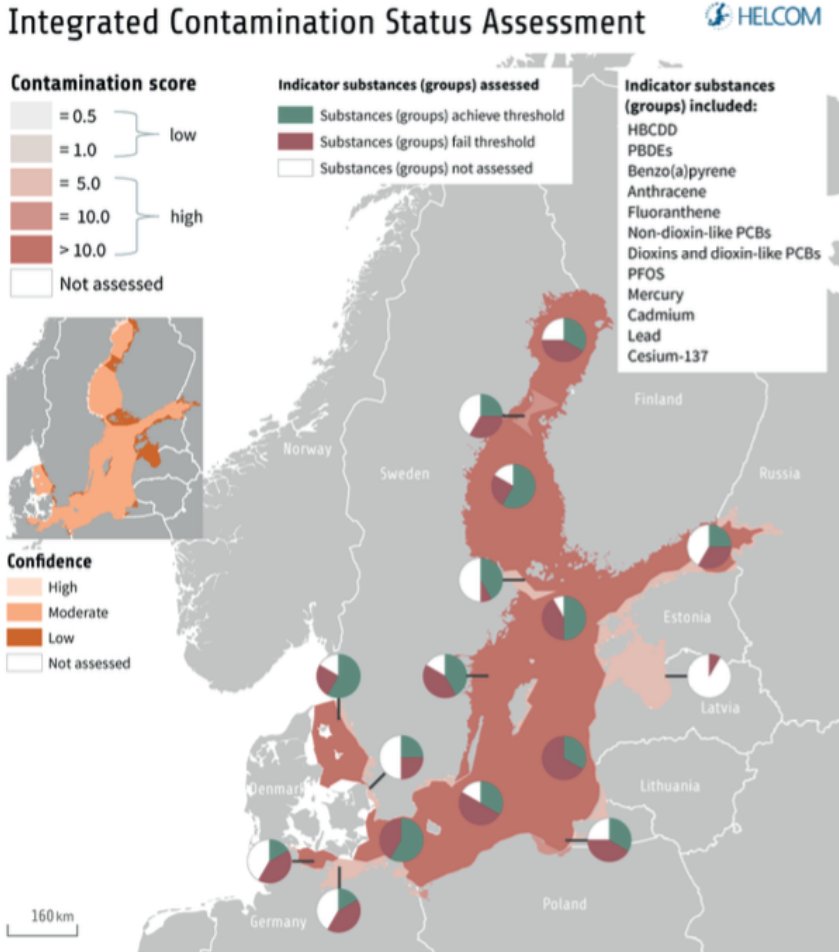


Figure 8 : Chemical Status of the Baltic Sea (Helcom, 2011-2016:31).

## Biofouling

All boaters in the Baltic Sea region struggle with marine biofouling, which can be defined as the “the attachment and growth of organisms on submerged, man-made surfaces” (Holm, 2012: 348). Clean surfaces, like boats or other underwater constructions, are quickly affected by marine fouling when they come into contact with sea water. Different types of fouling can occur, such as soft fouling (algae and invertebrates) and hard fouling (barnacles, mussels and

tubeworms) (Callow & Callow, 2002). Fouling organisms compete for space on the boat to attach, affected by important factors including light, water temperature and water salinity. Figure 9 below shows an image of a boat hull that has not been treated with biocide-based paint. The boat hull is covered with barnacles, and mussels can be seen around the keel area.



*Figure 9: Picture of marine fouling on a boat hull which has not been treated with biocide-based paint (Photo: Bianca Koroschetz, 2016)*

There are several problems related to marine biofouling. First, it has a negative influence on boating, as the growth interferes with the maneuverability of the boat and creates friction, resulting in increased fuel consumption (Holm, 2012). In addition, biofouling can cause violations on the boat surface. The barnacle has been chosen as a representative organism for biofouling in this thesis, as it is a common biofouling organism that can be found around the world. Figure 10 below shows fully-grown barnacles with their shells. Barnacles are arthropods and are related to crustaceans like crabs, lobsters and prawns. Barnacles can differ in appearance, as some have shells while others, do not (Anil et al., 2012). For boaters, barnacles with shells like those in Figure 10 represent the greatest problem, as they firmly attach to the boat hull and are very difficult to remove. However, despite causing difficulty for boaters, barnacles are vital for the marine environment, as they help to filter the water (Anil et al., 2012).





*Figure 10: Barnacle ( <https://www.pugetsound.edu/academics/academic-resources/slater-museum/exhibits/marine-panel/acorn-barnacle/>), 20.02.2019.*

The different gradients of salinity in the Baltic Sea correlate to the growth of marine organisms on boat hulls (Dahlström et al., 2014). For boats located in a high-salinity area, the marine fouling is generally more intense. Figure 11 below shows the different fouling pressure in the Baltic Sea. Metal panels were placed in the sea for one season to identify the marine creatures dominating the specific regions. On the Strömstad panel, representing the West Coast of Sweden, large numbers of mussels and barnacles can be seen. Conversely, on the Stockholm panel, representing the East Coast, smaller barnacles can be seen. These differences in fouling pressure indicate that some boaters in low fouling areas do not need highly toxic paints to avoid marine fouling which has led to a regulation restricting the paint use. Legislation exists in Sweden requiring boaters to use boat paint that is suitable for the location of their boat. Specifically, boaters on the West Coast of Sweden are allowed to use copper-based paints containing 25%-35% copper, whereas boaters on the Swedish East Coast are only allowed use paints containing 3-7% of copper, as boats in less salty water can control marine fouling using products with lower levels of biocides. As guidance for boaters, the Swedish Chemicals Agency has approved only nine of 28 available antifouling paints for use on the East Coast (Swedish Chemicals Agency, 2014).

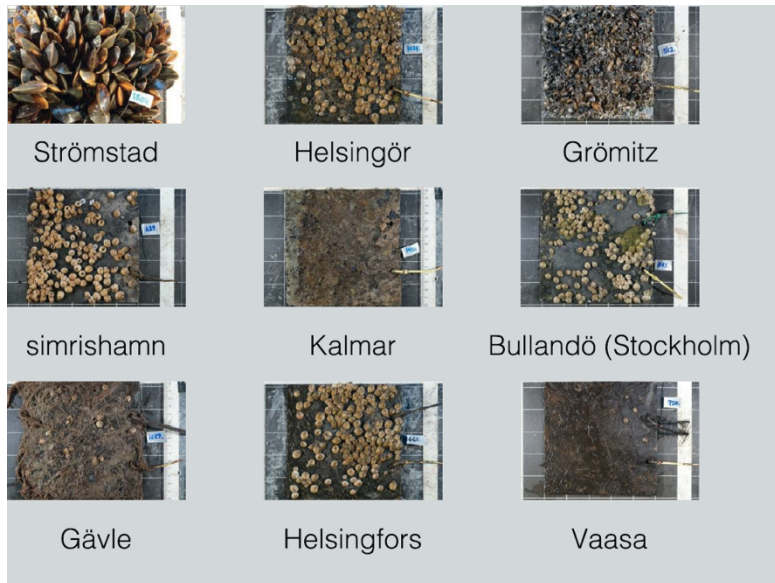


Figure 11: Overview of fouling pressure in the Baltic Sea (Internal material from the Change project)

### **Antifouling offerings**

Different antifouling solutions are available to help boaters keep their boat hulls free from marine bio fouling. Two main types of offerings can be distinguished: unsustainable and sustainable methods. Unsustainable methods include biocidal paints, which contain biocides like copper and zinc. Conversely, environmentally sustainable antifouling solutions include biocide-free paints and techniques, which have a minimal impact on the marine environment.

#### ***Unsustainable products– Antifouling paints***

In the 1960's, Tributyltin (TBT) was the dominant biocide used in antifouling paints (Dafforn et al., 2011). Twenty years later, the negative effects of these paints were detected, including malformations on oysters in France (Alzieu et al., 1986; Alzieu, 2000) and the development of male characteristics on female gastropods, which resulted in reproductive problems. Because of the severe environmental impacts of TBT, its use was prohibited in 1989, especially for vessels under 25 meters, as smaller leisure boats are not moved as often as big ferry ships and therefore were considered to be the main contributors to the pollution. However, even though TBT was banned in 1989, research conducted in 2008 showed that it was still present in old layers of paint on nearly 50% of the leisure boats in the Baltic Sea (Eklund et al., 2008). The reason for this is

that boaters tend to paint over old paint layers and only scrape off old layers if too much paint accumulates, which can easily take up to 25 years.

Today, the metal component most often found in antifouling products is copper. Copper is not inherently harmful to the marine environment; in fact, it is naturally found in the marine environment and for many species is a necessary component for growth or metamorphosis (Lewis & Cave, 1982). However, copper is harmful when it is present in amounts that exceed the tolerance level of a specific organism (Xie et al., 2005). Marine biologists have examined the effects of copper on marine organisms and discovered that even relatively low levels of copper are problematic, because they interfere with the olfactory sense of crustaceans and fish, making it difficult for these creatures to find nourishment and thus decreasing their rate of survival (Baldin et al. 2003; McIntyre et al. 2012; Beyers et al. 2001).

A study in Sweden has investigated the different sources of copper in Swedish surface waters. Forest land, with 50 tons per year and storm water with 38 tones per year have been identified as sources of copper. But the main sources of copper are antifouling paints, which are contributing with 104 tons of copper per year to the pollution of the marine environment (Eijhed et al. 2011). With the regulation on antifouling paints for the different locations Sweden has already taken precautions to reduce the amount of copper released through antifouling paints. Regulation is an issue, however, as these West coast paints are available all over in Sweden; thus, some east coast leisure boat owners purchase and use these products, even though the higher amounts of copper they contain are not needed or approved for use on the East coast (Swedish Chemicals Agency, 2014).

A survey was carried out to investigate the use of antifouling paint in the Baltic Sea from a Swedish perspective (Dahlström et al., 2014). Of the respondents, 55% use copper paints that are approved for the Baltic Sea. However, 16% use non-approved copper paints and 13% use ship paint, both of which contain more biocides than are needed or approved for recreational boating. Furthermore 16% of the respondents indicated that they did not even know which paint they used.

### ***Sustainable antifouling products and services***

The boating industry has already acknowledged the negative effects of copper paints and developed a wide range of alternative products. Sustainable antifouling solutions can be divided into two groups: biocide-free paints and biocide-free antifouling techniques. Both categories will only be introduced briefly here, as a more detailed description will follow in chapter 5. Biocide-

free paints include silicon-based and teflon-like coatings. Silicone paints have a low adhesion surface, making it difficult for fouling organisms to attach or remain attached to the boat hull. Biocide-free antifouling techniques include innovations that remove barnacles mechanically, like boat washes or hand-scrubbing devices like Scrubbis, and technical innovations, like hull covers and boat lifts. The effectiveness of sustainable antifouling products is dependent on a variety of factors, including the location of the boat, the salinity and temperature of the water, the fouling pressure, and how the techniques are applied (Wrange et al., 2018).

For this study, I selected the most dominant biocide-free antifouling techniques that have been on the market for some time and are commonly used by the boaters. The following techniques were included in the study: boat washers, hand scrubbing devices, hull covers and boat lifts. A boat wash (see Figure 12) is a cleaning station similar to a car wash, usually situated at a marina and is equipped with rotating brushes in the water. Hand scrubbing devices (see Figure 13) primarily consist of brushes or sponges connected to a long shaft, which enable the boat owner to clean the boat hull from the outside (e.g., while standing on the jetty). A hull cover (see Figure 14) is a plastic membrane floating in the water that covers the boat hull and creates a dark environment that is not preferred by marine organisms. Boat lifts (see Figure 15) are equipped with either a hydraulic pump or a mechanical device to lift the boat from the water. Without contact with water, fouling organisms will not attach to the hull. Boat lifts are currently only available for motor boats.



*Figure 12: Boat wash ([www.boatwasher.se](http://www.boatwasher.se))*

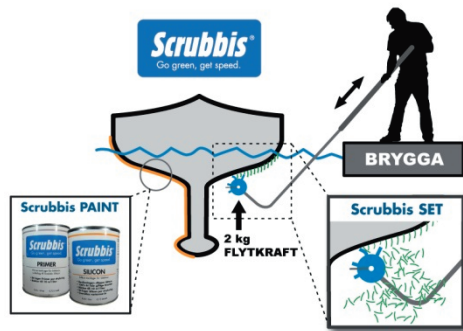


Figure 13: Handscrubbing device "Scrubbis" ([www.scrubbis.se](http://www.scrubbis.se))



Figure 14: Hull cover Cleanmarine (Bianca Koroschetz)



*Figure 15: Mechanical Boat lift ([www.sunstreamboatlifts.se](http://www.sunstreamboatlifts.se))*

This chapter has presented an overview of marine fouling and different available antifouling solutions. The next chapter will present how the empirical material for this study has been collected and analyzed.



## Chapter 4: Methodological considerations and empirical material

In this chapter, I describe the selection of methods I have chosen for exploring the (re-)configuration of environmentally unsustainable practices. All five research articles of the thesis contain a detailed method section. Therefore, in this chapter, I present the methodological considerations for the thesis as a whole. I explain how the empirical material for this study has been collected and analyzed, as well as what precautions I have carried out to ensure the trustworthiness of the study.

The choice of methods has been influenced by the purpose of my study and also through the different courses I have taken throughout my PhD such as *'Practice Theory and the Study of Consumption and Markets'*, *'ANT in Business Administration Research'*, *'From Field to Desk: A Transdisciplinary Qualitative Method course'* as well as *'Marketing and Consumer Experiences'*.

### Research approach

Practices are the unit of my analysis (Giddens, 1984; Reckwitz, 2002; Schatzki, 1996). Studying and researching practices means to understand how practices are organized in terms of their elements, how the practice elements are linked and investigate the dynamics between the practice elements. In order to learn more about the organization of practices it is essential to come as close as possible to the practitioners, as they are the 'carriers of practices' (Reckwitz, 2002). It has been acknowledged that qualitative methods are especially suitable for studying practices (Halkier & Jensen, 2011; Halkier et al., 2011), because they help the researcher to understand how and why practices are performed. This means that I am interested in what practitioners are doing and what they say they are doing (Reckwitz, 2002; Warde, 2005).

Observations are among the preferred methods for collecting empirical material on practices, as they enable the researcher directly to observe the activity (Halkier & Jensen, 2011). Other scholars emphasize that observation data as well as interview data need to be combined for social interpretations (Atkinson & Coffey, 2003). As this thesis aims to study the (re-)configuration of environmentally unsustainable practices, a context in which it is essential to gain knowledge about the organization, the linkages and alternative versions of practices, I have chosen a multimethod approach. The variety of methods

combines participant and non-participant observations (Czarniawska, 2014) with interviews (Atkinson & Coffey, 2003) and visual and textual materials (Eriksson & Kovalainen, 2008).

When studying the (re-) configuration of practices it is not enough to study the organization of the already established unsustainable practice (the target practice). It is also essential to learn more about the alternative ways of performing the target practice and how they are organized. Learning more about the different versions of a practice make it possible to understand to what degree the unsustainable and sustainable versions of antifouling practice differ from each other. In other words, this means that knowledge about practice versions helps us to make assumptions about the practice version with the greatest potential to be flexible or most dominant in the future (Higginson et al., 2015).

In my case, I studied antifouling practices in similar settings, marinas or boat clubs, but in different countries and in different cultural contexts. I spent a full day each at different marinas and boat clubs (Kiel-Germany, Lidingö-Stockholm, Björlanda Kile-Gothenburg, Helsinki-Finland) and observed and talked to people while they were, for example, painting or maintaining their boats. This can be described as a form of ethnographic inspired research, which refers to the first-hand exploration of what people are doing and saying in particular research contexts (Hammersley, 2006). An ethnographer is interested in what people do and why. He or she actively takes part in their lives, observes them, asks questions and takes notes in order to understand the phenomenon she or he is studying (Hammersley & Atkinson 1983). By spending an extended period of time with the people face-to-face while they are performing a practice, ethnographers can develop an increased understanding of the research context (Moisander & Valtonen, 2006).

While visiting different marinas and boat clubs in different countries to carry out interviews with leisure boat owners, I realized that material infrastructures (boat wash, recycling station) and institutional infrastructures (regulations, boat club rules) in marinas and boat clubs differed substantially. These observations led to the ideas for the first article (Paper 1: More than one way to float your boat: Product use and sustainability impacts) and the third article (Paper 3: An infrastructural perspective on sustainable consumption-How can infrastructures support the purchase and use of sustainable products?).

Learning more about the different biocide-free antifouling techniques through observations at boat clubs and marinas was somewhat difficult, because the majority of boaters used biocide-based paint. To learn more about the practice elements (material, meaning and competence) shaping the biocide-free



antifouling techniques like boat washers, hull covers, boat lifts and hand scrubbers, I watched videos on YouTube from the producers of these products. The producers have made videos about their products to visualize to boaters how the product works and have included other important materials, such as instruction manuals on their homepages, that are important for the efficient use of the product. This helped me to identify the composing practice elements of the different versions of antifouling.

Thereafter, I wanted to explore the meanings connected to the use of biocide-free antifouling techniques, specifically which practices are involved and what problems may occur. I especially searched for interviewees that were using biocide-free techniques. In several cases, the producers of these biocide-free antifouling techniques helped me to find interviewees. This led to the idea for the second article (Paper 2: Towards a practice theory of convenience), which discusses the significant role of convenience in sustainable consumption. When I was collecting data for Paper 2, I realized that emotions played an important role in my studies. During my literature research for the second article, I came across the fivefold practice model introduced by Woermann and Rokka (2015), who further divided the meaning category elements into rules, teleoaffective structures and general cultural understandings in order to study timeflow experiences in paintballing and free skiing rules, teleoaffective structures and general cultural understandings. For the second article, it made sense to work with the fivefold practice element conceptualization instead of the three element model of Shove and colleagues (2012).

Besides looking at the organization of practices, their elements (material, meaning and competence) and versions it is important to look at the larger context to learn more about the linkages between practice elements. It is necessary to study other actors, conditions or particular contexts that can shape and reconfigure practices. For example Shove and Pantzar (2005) have shown that macro-actors such as the Public health organization in Finland and their different marketing campaigns influenced the establishment of Nordic Walking. Woermann and Rokka (2015) illustrate how different rules, such as tournament rules in Olympic games can lead to different versions of free-skiing.

To study the context in which the practice takes place I have used an ANT-lens (Actor network theory). Already in Paper 4 an ANT-lens has been especially helpful to study the various market practices and interrelated market boundaries that shape the market the 'detachment of barnacles'. In particular the flat ontology of ANT, where human and non-human entities are treated symmetrically with the potential of being equally important (Latour, 2005) have been helpful for studying practices, because the broader focus allowed

me to discover certain aspects and conditions that are influential on the reconfiguration of practices that are not of human nature, such as marketing practices or regulations.

For the thesis as a whole this means it that I am partly inspired by an ANT-lens. ANT is for me a theoretical thinking tool to study practices and their reconfiguration. The ANT-lens inspired me to “follow the antifouling practices”, which can be described as a sort of snowballing technique. Other researchers point out that it is useful to “follow the object” (Czarniawska, 2014) or “follow the actor”, which both are based on Actor Network theory and intent to trace and map various associations (Krarup & Blok, 2011). Instead of following a particular object or actor, I adapted this approach and “followed the antifouling practices”, which means that I followed anything interesting related to antifouling practices. When starting my PhD, I did not have any experience or knowledge about boat maintenance in general or antifouling in particular. Therefore, I started my fieldwork where the antifouling practices are carried out, at the marina during maintenance time. In the beginning of my study, I wanted to understand more about the antifouling procedure. I started my fieldwork by observing what boaters were doing and how they prepared the boat hull. Parallel to these observations, I interviewed boat owners about their antifouling practices. Every interviewee told me new interesting facts about antifouling, and these interviews led me to certain antifouling-related Internet blogs, YouTube videos, stores, other products, documents and reports. All of these interviews revealed new connections. I traced these relations and identified new practice elements that are shaping the antifouling practice.

One particular context I studied was the market for antifouling solutions. Studying the antifouling practices at boat clubs and marinas alone was not sufficient to learn how the unsustainable practice of painting with biocide-based paint can be reconfigured. Therefore, I shifted to a market practice perspective to investigate whether certain market practices, like supply, presentation and marketing, have an influence on consumers’ purchase decisions. By visiting different boat supply shops and boat fairs and by studying the offerings on the Internet, I discovered that there is a big difference between the assortment of unsustainable and sustainable antifouling solutions creating the impression that the market for antifouling does not consist of only one market, but rather of several multiple and related markets. The idea for the fourth article developed from this insight (Paper 4 : Exploring market boundaries: The case of barnacle detachment). When I was collecting data for Paper 4 in different retail stores, I saw different advertisements for sustainable and unsustainable products; this sparked my interest in studying the advertisements for antifouling products, leading to the fifth article (Paper 5:

Creating the (un)sustainable consumer: How advertising meanings shape different types of consumers).

### **Collection of empirical material**

The empirical material for this thesis has been collected through four different methods: observations, interviews, visual and textual materials. Table 3 below summarizes the empirical materials used and the purpose for the usage of each. In the following section these four different methods will be described more in detail.

Table 2: *Types of empirical material*

<b>Types of empirical material</b>		
Source	Type	Purpose of usage
Observations	<ul style="list-style-type: none"> <li>• Marinas and boat clubs (Germany, Finland, Sweden)</li> <li>• Retail stores (Sweden)</li> <li>• Boat fairs (Germany, Sweden)</li> </ul>	<ul style="list-style-type: none"> <li>• to study the different practice elements</li> <li>• to study the availability of AF products and how they are presented</li> <li>• to study the availability of AF products and how they are presented</li> </ul>
Interviews	<ul style="list-style-type: none"> <li>• Boaters (51)</li> <li>• Harbour masters (2)</li> <li>• Board members of boat clubs (2)</li> <li>• Producers of environmental friendly products (5)</li> </ul>	<ul style="list-style-type: none"> <li>• to learn more about the different AF practices</li> <li>• to learn more about the infrastructure in marinas and boat clubs</li> <li>• to learn more about the infrastructure in marinas and boat clubs</li> <li>• to understand more about the market for AF products and services</li> </ul>
Visual materials	<ul style="list-style-type: none"> <li>• 150 photographs</li> <li>• 10 YouTube videos about antifouling techniques</li> <li>• 43 print advertisements</li> <li>• 3 screenshots of advertisements from homepages</li> </ul>	<ul style="list-style-type: none"> <li>• to document the different ways of performing AF and the different infrastructural settings in marinas and boat clubs</li> <li>• to learn more about the different AF techniques</li> <li>• to study the differences in advertising between sustainable and unsustainable products</li> <li>• to study the differences in advertising between sustainable and unsustainable products</li> </ul>
Textual materials	<ul style="list-style-type: none"> <li>• Internal research reports</li> <li>• Annual research reports</li> <li>• Boat club rules</li> </ul>	<ul style="list-style-type: none"> <li>• to learn more about the performance of sustainable alternatives</li> <li>• to learn more about important actors in the AF market</li> <li>• to learn more about the regulations concerning AF use</li> </ul>

## **Observations**

To learn more about antifouling practices and their elements I carried out observations in various settings, including boat clubs and marinas, boat fairs and different retailers specializing in selling antifouling products. I made approximately 30 hours of observations in boatyards in Sweden (Gothenburg and Stockholm), Germany (Kiel) and Finland (Helsinki). The fieldwork only concentrated on these three countries, because these countries were project partners. Moreover, I made 15 hours of observations at boat fairs (Stockholm, Gothenburg and Hamburg) and retail stores in Sweden (Stockholm, Gothenburg).

### **Observations at boat clubs and marinas**

First, I began carrying out non-participant observations in boat clubs and marinas. Non-participant observations refer to observation activities that take place from the outside, without the observer being part of the observed phenomenon (Czarniawska, 2014). Boat clubs and marinas offer boat berths to

members where they can securely store their boats during the boating season, and they offer other facilities such as winter storage, a place to maintain the boat and associated services on a voluntary basis. They differ in terms of their organization. Boat clubs are non-profit organization, which are financed through membership and have a board responsible for all important decisions concerning the boat club. In contrast, a marina is a commercial business with employees which often offers full boat service options (lifting, antifouling) to those who have boats in the marina.

I observed boaters in boat yards and marinas in the spring, when they were preparing their boat hulls, and I also took photographs of their activities. Afterwards, I realized that it could be helpful for my study to more actively participate in the antifouling procedure and shifted to participant observations (i.e., as an observer being part of the observed phenomenon) (Czarniawska, 2014). On two occasions, I participated in painting a boat hull. This allowed me to observe as a participant and understand better the different steps involved in the antifouling practice. Moreover, participating in the practice made it possible for me to generate a more thorough description of the practice and the elements involved. While performing the observations, I took notes and transcribed them carefully 1-2 days after the observation, in order to describe the observed actions in a very detailed way, capturing the various nuances (Martin & Thurner, 1986). The observation data on different antifouling methods and their practices were supplemented by photography, which is a common method in the Social Sciences (Czarniawska, 2014). Photos can help during the process of transcribing the observed situations and can also be used afterward to help the researcher recall the setting and special circumstances, especially when the observation has taken place some time ago. Both participant and non-participant observations were guided by the following questions: What are practitioners doing to avoid marine fouling on their boats? Why and how are they doing it? (Atkinson & Coffey 2003).

Through participant observation, it was possible to study the relationships among people, the organization of their activities, different patterns within practices and the immediate sociocultural context (Jorgensen, 1989, p. 12). Painting a boat hull can take several hours, depending on the size of the boat. During the time I spent with the boaters, I learned more about the meanings they assigned to the painting and the problems and concerns they experienced. Furthermore, I was able to gain a better understanding of the social interactions taking place at the boatyards during boat maintenance.

At the beginning of my fieldwork, I collected empirical material purely as a researcher, but after two years in the project I shifted from being a researcher to being a practitioner myself. Some might argue that this can be considered as

















**Endast tillåten**  
 för svenska ostkusten  
 (från Örskär-norska gränsen),  
 norska farvatten samt danska farvatten.

Artikelnr  
 30-630 till 30-636

**BILTEMA**

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**Endast tillåten**  
 för svenska västkusten  
 (från Trelleborg till  
 norska gränsen),  
 norska farvatten samt  
 danska farvatten.

Artikelnr  
 30-600 till 30-607

**BILTEMA**



**MÄSSKAMPANJ**

Köp 2,5 liter valfri  
 Hempel bottenfärg\* &  
 få 100 SEK rabatt vid köp  
 av ytterligare  
 Hempel-produkt!

\*Utom Basic &  
 Classic bottenfärg  
 Giltigt från 1 februari till 30 april 2017.

**HEMPEL**  
 Keep Sailing



autoethnographic research (Bochner & Ellis, 2003). Becoming a co-owner of a boat and engaging in boat maintenance myself helped me to learn more about the different practice elements (material, meaning and competence) and to develop an understanding about the traditions and routines connected to boat maintenance. We (me and my husband) co-owned a boat for two years with a couple that is very experienced in boating and boat maintenance. We have tested the hand scrubber, which is a cleaning device that is used in combination with a silicone-based paint. Through preparing the boat for the next season together with my co-owners I increased my understanding about the materials needed for this practice version, I learned how to gain the skills and competences and I learned more about the meanings related to this practice version. Furthermore I was able to observe how my co-owners performed certain maintenance steps and ask questions directly, and they explained a great deal about the antifouling procedure. The results of our testing biocide-free silicone paints on our boat are also part of this thesis, as my co-owners have been interviewed as well.

### ***Observations from boat fairs and retail stores***

In addition to observations in boat yards, I obtained observation material in other settings, such as visits to boat fairs and retail stores to study different market practices. Observation data were gathered at boat fairs in Stockholm (twice), Gothenburg and Hamburg. In addition, I studied the supply of antifouling products in Swedish retail stores such as Jula, Biltema and SeaSea on the Swedish West and East Coast.

Observations at boat fairs and retail stores were made to study market practices related to the promotion of antifouling practices and services. The focus of these observations was on the particular market practices that can influence boaters when they purchase antifouling products. I was investigating whether there are differences in terms of the supplied products and prices or in terms of the availability of sustainable products in boat supply stores and hardware stores. Furthermore, I wanted to learn whether there was a distinction between the presentation of sustainable and unsustainable products in terms of product space in stores and at boat fairs. I took field notes and photographs to capture the differences.

### **Interviews**

I interviewed boat owners, harbor masters, board members of boat clubs and producers of environmentally friendly products. In total, my fieldwork consists of 60 in-depth, semi-structured, which were conducted either face-to-face or via phone and varied in length. I conducted interviews in three different

countries and in three different languages. Initially, I was concerned about potential language barriers, but we found good solutions for these within the project. As German is my native tongue and I conducted most of the interviews with German boaters, there were no language barriers for the majority of the interviews. However, even though I started to learn Swedish at the beginning of my PhD, my Swedish language skills were not sufficient to conduct interviews in Swedish. Therefore, I sought boaters who were comfortable giving interviews in English. As this was not always possible, some interviews were conducted in Swedish by my colleague and supervisor, Cecilia Solér, who afterward translated the interviews to English. Additionally, five interviews were conducted by my Finnish colleague Emma Salminen in Finland, which were afterward translated into English by a professional translation company. It is possible that some linguistic limitations may have occurred in the interviews that were not conducted in the interviewees' native languages, as interviewees can generally express themselves more clearly and describe their feelings and experiences more precisely in their native language. While this situation may have had some influence on the richness of the data, it was decided that it was preferable to the alternative of entirely forgoing the knowledge that could be gained from these interviews.

In my case, the interviews were very helpful in enabling me to gain information about the cultural understanding of painting and to learn more about the routines and traditions linked to the painting practice. This helped me to get a better understanding of the configurators sustaining the use of the unsustainable practice of painting.

Next, an overview of the different interview participant groups is presented, and an explanation is offered regarding why and how interviews were carried out with these particular participants.

### ***Boat owners***

In total 51 leisure boat owners in Sweden, Finland and Germany were interviewed. From the 51 interviews with boaters 41 interviews were carried out by myself. The aim of these interviews was to learn more about sustainable and unsustainable antifouling practices and how the practices are organized and performed. A special focus was also placed on the efficiency of the biocide-free antifouling techniques.

Most of the interviews with boat owners were planned beforehand and carried out either in marinas or boat clubs or over the phone. I explicitly met with some boaters at the marina so they could, for example, show me how biocide-free antifouling techniques work (e.g., how a hull cover is installed). Of the 51

interviews with boaters, 39 were planned beforehand, lasted on average between 30-45 minutes and combining interviews and observations. During non-participant observations, I often had short interviews with boaters and asked them which antifouling methods they were using. These kinds of interviews were not planned in advance and usually took around 10-15 minutes. In total, I have 12 of these shorter interviews. All of the interviews were recorded with the permission of the interviewees.

The majority of the interviewees knew that I was part of the BONUS Change project, with the aim to change the antifouling practices from toxic paint to more sustainable alternatives. Nevertheless, the interviewees' responses about painting with biocide-based paint were very neutral. They did not respond to me as if they felt I had a sustainability agenda. Their responses seemed honest, and they did not seem to be saying what they thought I wanted to hear.

The following Table 2 gives an overview of the boaters I interviewed, which shows that the majority of interviewees were male boaters. I tried to recruit more female interviewees to correct this gender imbalance, but this was very difficult to achieve. From my ethnographic work in the boating culture and community, I found that boat maintenance practices are typically undertaken by men, which explains why most of the boaters who were willing to discuss antifouling practices with me were male.

The table shows additional important information such as the type of boat the interviewee had, where they lived and what method they used. In the table, the water type is also mentioned. The salinity of the water was especially important in my study for the efficiency of the antifouling products and services. The names of the interviewees have been changed to preserve their anonymity.

Table 3: Overview of interviewed boaters

Boattype	Antifouling technique	Location	Watertype	Duration	Year	Interviewer	Type of interview
Sailing boat	biocide-based Paint	Helsinki	low salty	30-45 min	2015	Emma	Face-to-face
Sailing boat	biocide-based Paint	Helsinki	low salty	30-45 min	2015	Emma	Face-to-face
Sailing boat	biocide-based Paint	Helsinki	low salty	30-45 min	2015	Emma	Face-to-face
Sailing boat	biocide-based Paint	Helsinki	low salty	30-45 min	2015	Emma	Face-to-face
Sailing boat	biocide-based Paint	Helsinki	low salty	30-45 min	2015	Emma	Face-to-face
Motor boat	Cleanboatprotector	Gothenburg	high salty	30-45 min	2015	Bianca	Face-to-face
Motor boat	Cleanboatprotector	Stockholm	low salty	30-45 min	2015	Cecilia	Telephone
Motor boat	Cleanboatprotector	Gothenburg	high salty	30-45 min	2015	Bianca	Telephone
Motor boat	Cleanboatprotector	Gothenburg	high salty	30-45 min	2015	Bianca	Telephone
Rib boat	Boat lift	Stockholm	low salty	30-45 min	2016	Bianca	Telephone
Motor boat	Scrubbis	Stockholm	low salty	30-45 min	2015	Bianca	Telephone
Sailing boat	Scrubbis	Helsinki	low salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	Scrubbis	Turku	low salty	30-45 min	2015	Bianca	Face-to-face
Sailing boat	Scrubbis	Gothenburg	high salty	30-45 min	2015	Bianca	Telephone
Sailing boat	Scrubbis	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	Scrubbis	Gothenburg	high salty	30-45 min	2016	Bianca	Telephone
Motor boat	Scrubbis	Stockholm	low salty	30-45 min	2015	Bianca	Telephone
Sailing boat	biocide-based Paint	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Gothenburg	high salty	30-45 min	2016	Bianca	Face-to-face
Motor boat	Boat washer	Nynäshamn	low salty	30-45 min	2016	Bianca	Face-to-face
Motor boat	Boat washer	Stenungsund	high salty	30-45 min	2016	Cecilia	Telephone
Motor boat	Boat washer	Stenungsund	high salty	30-45 min	2016	Cecilia	Telephone
Motor boat	Boat washer	Stenungsund	high salty	30-45 min	2016	Cecilia	Telephone
ribboat	Boat washer	Stenungsund	high salty	30-45 min	2016	Cecilia	Telephone
Motor boat	Boat washer	Lidingö	low salty	30-45 min	2016	Bianca	Face-to-face
Motor boat	Boat washer	Mallären	low salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	Boat washer	Stockholm	low salty	30-45 min	2016	Bianca	Face-to-face
Sailing boat	Boat washer	Stockholm	low salty	30-45 min	2016	Bianca	Face-to-face
Rib boat	Boat lift	Stockholm	low salty	30-45 min	2016	Bianca	Face-to-face
Motor boat	Seaboost	Nynäshamn	low salty	30-45 min	2015	Bianca	Telephone
Rib boat	Boat lift	Stockholm	low salty	30-45 min	2016	Bianca	Telephone
Sailing boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Motor boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Motor boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Motor boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Motor boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Motor boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Motor boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face
Sailing boat	biocide-based Paint	Kiel	high salty	10-15 min	2016	Bianca	Face-to-face

### Harbor masters

Two harbor masters were interviewed. Harbor masters work at marinas and are responsible for the daily operations in marinas, like assigning boat spots to boat

owners, taking care of the facilities and making sure that everything is working. With these interviews, I aimed to learn more about material and institutional infrastructures at the marinas. With the harbor masters, I arranged a time beforehand to make sure that they had time to answer my questions. These interviews were undertaken directly in the marina.

### ***Board members of boat clubs***

Two board members of boat clubs were interviewed. Small boat clubs are normally organized privately and are managed by a board, which normally consists of boaters from the same boat club. The board makes all the important decisions regarding the boat club, such as the banning of antifouling paints. The aim of these interviews was to learn more about how marinas and boat clubs are organized and how these institutions can steer antifouling practices in a more sustainable way.

### ***Producers of environmentally friendly antifouling solutions***

Five producers of mechanical methods were interviewed. The aim of these interviews was to learn more about the functioning of their innovations and to identify potential barriers for the use of biocide-free antifouling techniques. Some of these interviews were planned beforehand, but very often I met the producers on different occasions, such as boat fairs or events like the European Maritime Day in Poole. I had the opportunity to discuss my research with them several times and to ask them what they believed was the reason for the unpopularity of biocide-free antifouling techniques among boaters. The interviews aimed to learn where the products were sold and any difficulties the producers faced in selling the products.

### **Visual materials**

Visual materials include empirical material captured through other media than the conventional written and spoken forms (Eriksson & Kovalainen, 2008). I have used four different types of visual materials: photos taken by me and my colleague Emma Salminen, videos on YouTube, advertisements and screenshots from websites of producers of environmentally friendly products. During my observations at marinas, boat fairs and different retailers, I have taken a total of 150 photos. The photos from marinas and boat clubs helped me to capture how the practice of painting is performed, including, for example, which material elements are involved in the practice. Photos taken at boat fairs and retailers helped me to recall how the products were presented to the consumers and to remember the different suppliers of antifouling products.

Videos on YouTube from different providers of sustainable methods were also used to understand how particular antifouling techniques function and of what practice elements the practice consists. Most of these videos also included instructions, such as how to install a hull cover in a marina or what preparation work needs to be done before biocide-free paint can be applied.

In total, I collected 43 print advertisements for sustainable and unsustainable antifouling products in the three most popular boating magazines in Sweden (*Båtmytt*, *På Kryss*, *Praktiskt Båtägande*). I went to the municipal library in Stockholm and Gothenburg as well as the office of the Swedish sailing organization to look through older boating magazines and to take pictures of the advertisements. These advertisements were studied to understand how particular meanings of antifouling products are shaped. For this reason, the pictorial and verbal narratives communicated to the boaters were analyzed. This was helpful in understanding why boaters want to maintain the unsustainable painting practice. Additionally, the advertisements helped me to get an overview over the different antifouling techniques available on the market.

Print advertisements for sustainable antifouling products were very scarce. Therefore, I collected screenshots of advertisements for sustainable products from the producers' websites. This allowed me to have more material to draw comparisons between the advertising strategies for sustainable and unsustainable products and services.

## **Textual materials**

Social life is influenced by a variety of written documents, such as laws and regulations (Atkinson & Coffey, 2003). For instance, road traffic would be very chaotic without traffic regulations, and education would not be possible without books and other written materials. Textual materials can be separated into two categories. The first includes written texts created within a research project, while the second includes textual materials that were produced without original data from the author's own project, such as annual reports (Eriksson & Kovalainen, 2008).

I used internal textual material that was produced in the interdisciplinary project (Change project) I was working with. Researchers from the Natural Science, Environmental Law and Business Administration fields have been working together to achieve a change in antifouling practices. Different research groups in the project were required to produce annual reports and various deliverables throughout the four-year period of the project, which have

been used in this thesis. For example, the internal reports from the natural scientists about the marine fouling pressure and salinity of the water have been helpful to explain the varying efficiency of sustainable antifouling solutions. Moreover, the reports from Environmental Law concerning how antifouling paints and boat maintenance are regulated in the different countries have been very helpful for article 3, which deals with material and institutional infrastructures in marinas. On a regular basis, we had various workshops within the project and presentations from the other disciplines, which have been used to support my material. The project has also produced a popular science book, titled 'Changing leisure antifouling practices in the Baltic Sea', which I refer to throughout this thesis.

External research reports from NGOs, such as Helcom, and national reports, like those from the Swedish Chemicals Agency, have also been used as part of the textual material. Additionally, I studied various written documents of boat clubs. For example, I studied boat club statutes, annual meeting minutes and the environmental plan of a particular boat club to learn more about how regulations in boat clubs shape antifouling practices.

### **Analysis and interpretation**

Spiggle (1994) argues that analysis and interpretation are two separate processes. The analysis has the aim to break down the material into smaller parts, such as grouping them into different categories. On the other hand, interpretation refers to 'making sense' of the empirical material. I would like to explain this by using an example. To analyze interviews and field notes from observations, I started with a thematic analysis, in which I read and examined the material in an effort to identify emerging themes and categories, and I created categories out of the empirical material (Czarniawska, 2014). For example, for learning more about the versions of antifouling practices and the differences among them (to answer research question 1), my analysis of the interview and observation material was guided by categorizing the empirical material into the different practice elements of material, meaning and competence (Shove et al., 2012). This analysis process had already started during my fieldwork, while I was studying the differences among practice versions. Multiple stops at different marinas and boat clubs were helpful for identifying the practice elements of the different versions of antifouling. After I had identified and categorized the different practice elements for the various practice versions, I started comparing them and I realized that some versions of antifouling practice were sharing a lot of practice elements whereas others had very distinct practice elements. Through visualizing the comparison between different practice versions the diversity between the versions became even clearer. I realized that some boaters might not voluntarily want to change



their current painting practice especially if it involves a bigger adjustment in their antifouling practices and started to think how external measures could support the reconfiguration process, which was the starting point for the development of my framework in chapter 7.

In the following section, I present how I have analyzed the different types of empirical material that I have collected. In the second paper, I studied how sustainable practices take hold and how they are influenced by convenience experiences. After reading through the interview transcriptions, I noticed that the interviewees described different emotions, such as fun, enjoyment, and a good balance to work. For analytical purposes, I was directed by the fivefold element model of Woermann and Rokka (2015), which further divides the meaning element into rules, teleoaffective structures (especially emotions) and general understandings.

The visual material was analyzed in two different ways. For some articles (Paper 1, 2, 3, and 4) I treated the images taken from observations at boat clubs and boat fairs like other empirical data and analyzed them using content analysis (Eriksson & Kovalainen, 2008). In contrast, for article 5 (Advertising), I used a semiotic approach to study the different meanings produced in advertisements. Semiotics, which is referred to the ‘science of signs’, provides specific tools to analyze images (Gillian, 2001; Mick, 1986). Semiotic approaches have especially been used by marketers to understand how consumers interpret meanings of advertisements (Mick, 1986; Solomon et al., 2010). In article 5, I analyzed the verbal and pictorial narratives of advertisements and their role in shaping different levels of meanings for the consumer.

The textual material used in this thesis, such as internal project-related (annual reports, project deliverables) and external research reports from NGOs (Helcom) were analyzed through carefully reading and interpretation (Bowen, 2009). I used a combination of content analysis and thematic analysis to analyze the documents (Bowen, 2009). The textual analysis of project deliverables concerning the use of antifouling paints and the examination of specific boat club rules has been relevant in this thesis to gain more knowledge about how regulation can be used to reconfigure environmentally unsustainable practices.

Systematic combining (Dubois & Gadde, 2002) is used to combine empirical material with theory in order to develop existing theory *further*, instead of generating *new* theory (Dubois & Gadde, 2002). With this type of analysis, existing theoretical models are further developed by being infused with new



empirical material. For example, this has been used to further develop the concept of linkages and market boundaries in Paper 4.

## **Analysis of re-configurators**

This section describes how I developed the framework for the reconfiguration of environmentally unsustainable practices based on four ‘re-configurators’, which will be presented in chapter 7. While I was doing fieldwork and collecting empirical material for my five papers, some specific conditions and aspects emerged which I found to be influential in sustaining the unsustainable practice of painting. Early on in the PhD I realized that the painting practice is a deeply rooted practices, with long standing traditions and routines. I got interested how we can convince boaters to switch from the environmentally unfriendly practice to a more sustainable practice version, like the hull cover or boat lift. The interest in the reconfiguration of practices emerged. After I finished writing my five papers I decided to revisit my papers and read them carefully and look for signs and input for how the reconfiguration of the painting practice can be facilitated. By reinterpreting the papers various aspects and conditions emerged to be important for the persistence of painting and I became interested in the links between the practice elements and how these linkages can be broken. The structure of simplifying practices into their three (material, meaning and competence) or more elements has been a useful tool for analyzing practices and gaining knowledge about the linkages holding the practice elements together. It is important to look at these linkages, because they can give us new insights on why certain environmentally unsustainable practices are persistent.

The knowledge about the linkages emerged post hoc. With my insights and ethnographic understanding created over a four-year long ethnography in the leisure boating culture context, I had gained an understanding of what was keeping certain practice elements glued together. I studied the linkages between practice elements for the practice of painting with biocide-based paint and boat washing. Through studying these practice versions I identified 10 different configurators, which are impacting and stabilizing the linkages between practice elements. After identifying these configurators I started to think about how linkages between practice elements can be broken or loosened. By looking closely at these configurators I realized that some of the configurators had specific instruments to influence different practice elements. I found regulation emerging as an important re-configurator. Regulation is responsible for providing the toxic paint, the material element needed for the painting practice. But at the same time regulation has the tools and instruments to also forbid or take away the biocide-based paint from the market. Another configurator, marketing practices, can influence the material and meaning

element. Advertising shapes and creates the meanings associated with biocide-based paints. Building on this knowledge I identified four different re-figurators, which I see as essential for enabling the reconfiguration process. Three of these re-figurators are also configurators of linkages.

## **Ethical considerations**

The reconfiguration of environmentally unsustainable practices is not considered to be a sensitive research area *per se*. However, during fieldwork several precautions were carried out to ensure ethical correctness. All of the interviewees were asked beforehand if they wanted to voluntarily participate in interviews. Additionally, interviewees were informed about the purpose of my study and how the collected empirical material would be used for academic purposes, such as scientific articles or for my dissertation. Furthermore, I told the interviewees that I would use pseudonyms to protect their identities.

During observations, I took photos of boaters maintaining their boats. To preserve anonymity, I have only included photos in which boaters' faces and the names of their boats are not visible.

## **Trustworthiness of the study**

Trustworthiness refers to the quality of the study in terms of the degree of confidence in the data, interpretation, and methods involved in the study (Pilot & Beck, 2014). The purpose of ensuring trustworthiness is to assure the reader that the findings of the study are “worth paying attention to” (Lincoln & Guba, 1985). To evaluate qualitative academic research, it is possible to use the criteria of reliability, validity and generalizability (Moisander & Valtonen, 2006). However, for discussing the trustworthiness of this study, I use the criteria introduced by Lincoln and Guba (1985), which have been acknowledged among qualitative researchers (Connelly, 2016): credibility, dependability confirmability, and transferability.

### **Credibility**

Credibility describes “whether the participants perception matches up with the researcher’s portrayal” (Lodico et al., 2010: 175). A study is credible if its descriptions of, for example, human behavior, practices or experiences are so precise that other people who have not participated for example in a particular practice could identify themselves by the presented descriptions (Sandelowski, 1986). Credibility is an essential criterion to establish trustworthiness (Lincoln & Guba, 1985), and there are different ways to ensure the credibility of a study. One way to enhance credibility is prolonged engagement in the field (Lincoln

& Guba, 1985; Lodico et al., 2010). I have undertaken an ethnographic-inspired study in the field of boating for a period of more than four years, which helped me to get insights into the boating culture and to understand the dynamics involved in the (re)configuration of environmentally unsustainable practices.

Additionally I used a wide range of informants (60 interviewees), who came from Germany, Finland and Sweden to enhance credibility. Collecting empirical material from different sites and from a larger number of interviewees allowed me to compare experiences and attitudes across countries and supported the collection of rich empirical material on antifouling practices, attitudes and behavior. I used the numerous interviews in different countries “to check out bits of information across informants” (Van Maanen, 1983) – that is, to compare the results between countries. Moreover, during the interview period, I reframed and expanded interview questions, which is another way of increasing credibility (May, 1989).

Another way to increase credibility is to select research methods that are suitable and highly recognized to study a certain phenomenon in the research area to which one wants to contribute. To study antifouling practices, I used methods such as observations, interviews, and photographs, which have been used in previous qualitative studies and recognized as suitable ways for studying practices (Halkier & Jensen, 2011; Halkier et al., 2011). For example, Magaudda (2011) used in-depth interviews to study digital music consumption practices, whereas Truninger (2011) combined participant observations, a video recording of observations, photography and interviews to study cooking practices with a multi-food processor better known as Bimby (2011). By using a combination of different qualitative methods, the individual limitations of each method (Guba, 1981; Brewer & Hunter, 1989) are counterbalanced and minimized. In most cases, I combined observations and interviews. First, I went to a marina and observed other boaters for one hour before meeting some of the interviewees. If I did not understand why the practitioners did certain things, I included specific questions about those things in my interview questions.

### ***Dependability***

Dependability refers to the consistency in the research process (Riege, 2003) and it can be supported by presenting how the empirical material has been collected and analyzed (Lodico et al., 2010). Several measures were taken to ensure dependability. First, in the beginning of the thesis I presented my three research questions, which have been guiding my study. Second, the research approach has been presented in the beginning of the method section and

furthermore I documented how empirical material has been collected and analyzed (Krefting, 1991, Lincoln & Guba, 1985). This description enables the reader to understand how insights concerning the reconfiguration process have been reached.

A multi-method approach can support to collect consistent empirical material (Merriam & Grenier, 2019). In my study I used a combination of observations, interviews, visual and textual material to study the (re-) configuration of environmentally unsustainable practices. Moreover, the documentation how interviewees were chosen can ensure dependability (Elo et al., 2014). Interviewees were selected in three ways. First, through the BONUS Change project, the researchers of the project had communication activities in different marinas and boat clubs, where we presented the aim of the project. We informed the boaters that we would like to interview them, and several people volunteered to be interviewed. Second, when observing boaters in marinas and boat clubs, I spontaneously picked random boaters for shorter interviews. Third, for biocide-free antifouling techniques, I had support from the producers of these products. Some of them advertised our project on their websites and stated that we were looking for interviewees. As a result, some boaters contacted me to say that they wanted to share their experiences with me.

### ***Confirmability***

The criterion of confirmability deals with the question if the methods in the study are described in detail and if the reader has the feeling to have the full picture of study (Miles & Hubermann, 1994). For example has the study presented in detail how empirical material has been collected, analyzed and interpreted. To increase the confirmability I described very detailed how I collected empirical material. Table 2 in this method section documents the various types of empirical material I have used in my study. Additionally in Table 3 I present an overview of the interviewed boaters and describe in detail the location, duration, year, type of interview, length, year and which antifouling technique was the topic of the interview.

To ensure the confirmability of the collected empirical material, all interviews were recorded and transcribed, and observations were documented by writing field notes and taking pictures of the observed phenomenon. The audio recordings, transcriptions, field notes and photos were saved and stored in case of later inspections (Guba, 1985; Riege, 2003). Additionally, I maintained a list with the names and contact details of all interviewees in the event that the same person needed to be interviewed again. However, to guarantee the anonymity of the interviewees, I used pseudonyms in the presented overview of interview respondents (Table 2).

## **Transferability**

“Transferability refers to the degree to which readers can transfer the results of the study to other contexts and situations they are familiar with” (Moisander & Valtonen, 2006: 29). Transferability in qualitative research is sometimes tricky, because of the situational uniqueness of the study might prevent it from being transferable to other study contexts (Krefting, 1991). However, according to Lincoln and Guba (1985), making a thorough description of the studied phenomenon is also a way of achieving transferability of the findings. Detailed descriptions and the conclusions drawn from them allow other researchers to transfer the findings to other study contexts. My study presents a thorough description of certain aspects and conditions involved with the (re)configuration of environmentally unsustainable practices, and certain parts of my findings can be applied to other settings that deal with a similar research question. Even though researchers cannot adopt the research findings one-to-one to their research context, it can be helpful for other researchers to draw connections between their research context and mine, and they may find similar findings emerge in their research. The framework in chapter seven is developed based on the findings of the study, but it has the potential to be helpful for other research contexts where a shift from unsustainable to sustainable practices is desired. My study shows that it is important to study carefully the multiple elements shaping the practice as well as the multiple links connecting the elements, because this knowledge can help to elucidate the differences and similarities between practice versions, which is necessary in order to understand the practice dynamics involved in the reconfiguration of practices. This created knowledge can be transferred to other practice-related studies interested in encouraging more sustainable practices.

In this chapter, I have described how the empirical material for my study have been collected and analyzed. Furthermore, I have shown how I ensured the trustworthiness of the data. After presenting my methodological approach, the next section will discuss and analyze the most dominant antifouling practices that I have identified in my study.



## Chapter 5: Versions of antifouling

This chapter addresses the first research question and discusses the versions of antifouling practices that exist, what they consist of, and how they are linked. The chapter elaborates on ‘antifouling as a practice’ and further introduces different ways of practicing antifouling, including the use of unsustainable and sustainable antifouling solutions. As defined in the introduction of this thesis, sustainable antifouling practices include the use of environmentally sustainable products and services, which have minimal impacts on the marine environment. When I refer to antifouling or versions I always mean *practice*, but I abstain from always highlighting it with the word practice.

Antifouling is part of boat maintenance practice, which includes a variety of practices such as maintenance of the boat hull as well as the preserving of the boat parts above the water (e.g., motor, deck, sails, etc.). According to Blue et al. (2016) it makes sense to delimit ‘a practice’ depending on the purpose of enquiry. For the purpose of this thesis, to explore and illustrate how dominant unsustainable antifouling practices can be reconfigured into more sustainable practice, it is reasonable to take antifouling as the central unit of inquiry because antifouling practice is especially harmful to the marine environment compared to other parts of the boat maintenance practice. Based on the ethnographic understanding of the antifouling context gathered through my four-year ethnographic study of antifouling, I define antifouling as practices consisting of interrelated elements (material, meaning and competence) including all activities related to either taking precautions to avoid marine organisms from attaching (e.g., painting with biocide-based paints) or using treatments to remove marine organisms after they have attached (e.g., mechanical methods like boat washers).

In chapter two, I introduced the concepts of practice-as-entity and practice-as-performance (Schatzki, 1996; Warde, 2005; Shove et al., 2012). Practice-as-performance refers to the individual performance of a practice, where the practice elements are integrated to perform a practice and these performances might differ to a small degree each time (Kuijer et al., 2013). For example, among many different boaters painting their boat hulls, the methods of painting might differ slightly from person to person. Previous studies in sustainable consumption have focused on looking at the practice-as-entity (e.g., showering or cycling; Hand et. al 2005; Spootswood et al. 2015). However, limited research has been carried out on different versions of practices, meaning different patterns of performing a practice. Regarding the reconfiguration of practices, we also need to take the different versions of antifouling into account

in order to see how the versions distinguish themselves from each other. Each of these versions of practice might compose a different set of material, meaning and competence, which make it either easier or more difficult for the practitioner to shift to a different version. Figure 16 illustrates this line of thought. I have chosen a model inspired by Kuijer (2014) to illustrate the different practice versions and their linkages. In her thesis, she proposes a modification of the model by Shove and Pantzar (2005) and suggests illustrating the practice elements as *groupings of elements*, which are connected through a *multitude of links*. Kuijer (2014) used this type of illustration to show differences between practice-as-entity and practice-as-performance. However, I use the illustration to present antifouling as practice-as-entity, and the various versions of antifouling practices shape the practice-as-entity.

The first illustration in Figure 16 shows the antifouling practice-as-entity and includes all the different versions of practices and ways in which antifouling can be performed. The second illustration in Figure 16 shows one particular version of antifouling practice with distinct material-meaning-competence configurations, including the linkages forming the specific practice version. The third illustration presents another version of antifouling and the elements and linkages shaping the practice. The section that follows describes the different versions of practices in more detail. The links are illustrated with either thick or thin lines, representing stronger or weaker links, respectively. This chapter focuses on the versions of antifouling practices and the practice elements composing the various versions. This allows me to see the differences between versions of practices and helps me to understand difficulties connected to the reconfiguration of practices. In chapter 6, a more detailed discussion of the linkages among the practice elements will follow. The description of the practice elements composing the different practice variations are not exhaustive. To facilitate the description of the practice versions, I assume a prototypical boater, who has no or little knowledge of the various versions of antifouling and undertakes them for the first time.



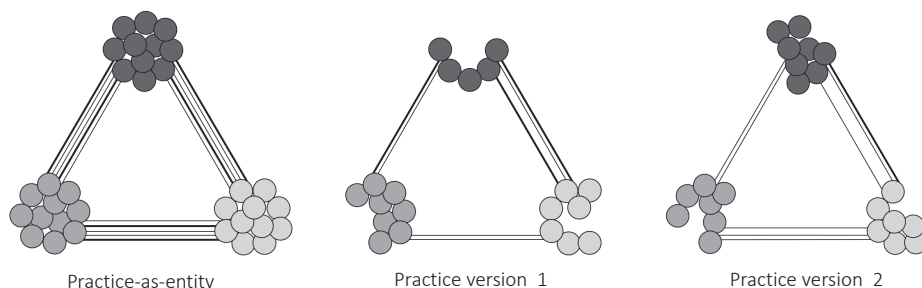


Figure 16: Illustration of practice entity with different versions of antifouling practice (adapted from Kuijer, 2014:53).

## Painting with biocide-based paint

As a version of antifouling, painting involves the application of one or more paint layers of biocide-based paint to the boat hull using a paint roller or a brush. Nordic boaters who own leisure boats (i.e., boats with a maximum length of 12 meters) tend to engage in antifouling practices independently, because hiring service companies to do this kind of work is quite expensive. Thus, the paint offerings on the market are designed for DIY use and include instruction manuals explaining how to apply the paint. For DIY products, the performance of a practice depends on the effective integrations of practitioner skills and competencies and the engagement of materials and tools (Shove & Araujo, 2010). Engaging in antifouling practices independently helps boaters to decrease the costs of antifouling, and thus inexpensive paint options are very attractive to boaters. The available biocide-based paints range in price from 159 SEK<sup>3</sup> (no-name products) to 350 SEK (well-known brands) for 0.75-liter can of paint. Depending on the size of the boat and how many layers are applied, either one or two cans of paint may be required. Furthermore, biocide-based paint has the advantage of being suitable for all types of boats, including motorboats and sailing boats.

The paint is applied once a year in the spring before the boat is launched into the water. Depending on the location of the boat and the strength of the fouling pressure (i.e., the amount of marine fouling in that region), boaters often apply two layers of paint. Before paint can be applied, some preparation work needs to be done, such as washing the boat hull and scraping off loose paint flakes in order to prepare a smooth surface to which the fresh paint will adhere well. The actual time required to apply one layer of paint depends on the size of the

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<sup>3</sup> 1 SEK is equivalent to approximately 0.1 Euro.

boat. Application of a single paint layer to a nine-meter boat by one person takes approximately one and a half hours.

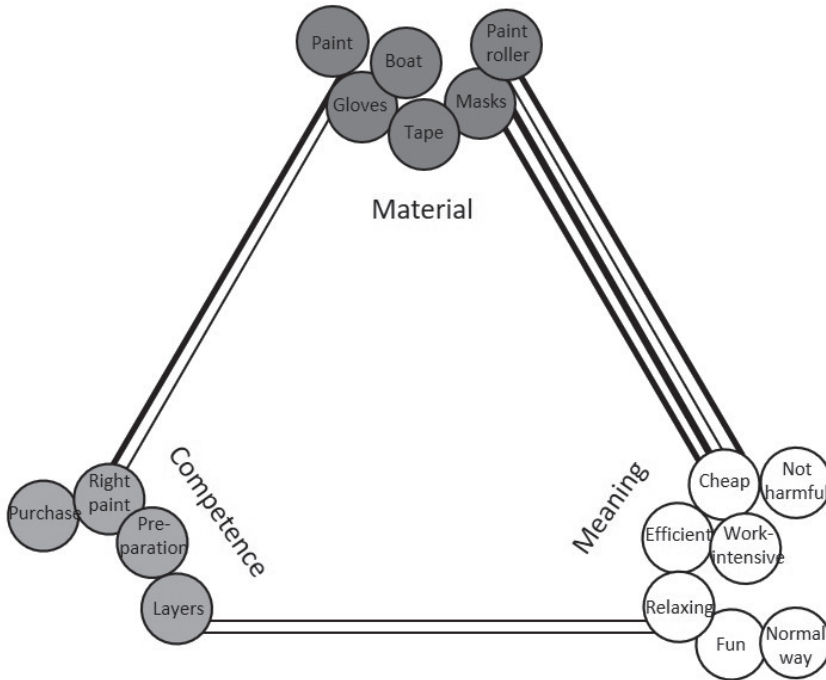


Figure 17: Practice of painting with biocide-based paint.

The description of painting with biocide-based paint included below assumes that the boater paints the boat her- or himself and does not use a service company to do the work. Furthermore the description of the practice version only includes the actual work that is connected to the painting, and does not include pre-steps like washing and scrapping the boat hull. For all the illustrations biocide-based paint is only referred to as paint, due to shortage of space in the bubbles.

Besides the material element of *biocide-based paint*, other *material elements* are needed for painting, including the *boat* itself, *paint rollers*, *gloves*, *masking tape* and *air masks*. I use only paint rollers in my description, because all boat owners I observed used a paint roller as it is faster than with a brush. The masking tape is used to mask the area of the boat that is supposed to be painted. Boaters should put on gloves and air masks before starting the painting. The boat is then painted with one or two layers of paint.

These material elements are recommended by the paint manufacturers for painting. However, the interviews conducted for this study show that not all boaters take the precautions suggested by the paint producers, like air masks or gloves, to protect themselves from the toxic paint; thus, some of these material elements are missing from individual boaters' practice. In terms of the practice element of *competence*, certain knowledge needs to be acquired, as this practice is mainly undertaken in a do-it-yourself (DIY) manner. For example, first practical know-how is needed to know where the antifouling products can be *purchased*, as there are specialized stores that sell those products. Secondly, the *right paint* for the boat needs to be chosen. Qualified personnel in the boat supply store or recommendations of other boaters or family members involved in boating can help boaters select the right paint. Additional knowledge about how *to prepare* the boat hull before painting and how many *layers* should be applied to the boat hull are necessary to guarantee ideal protection against marine fouling. There are controversial *meanings* associated with the painting, which results from the fact that some boaters really like the painting while others see it as a burden that must be undertaken in order to be able to experience boating. Thus, the description of this meaning category is not as homogenous as the other following portrayals of meanings. Interviewees described the painting as *efficient, the 'normal way' of doing antifouling, cheap, work intensive, (biocide-based paint) not harmful (to the environment), fun, and relaxing*.

### **Painting with biocide-free paint**

Painting with biocide-free paints is very similar to painting with biocide-based paints. One example of biocide-free paint is silicone paint. The Silic One paint from Hempel is designed as a foul-release coating with a self-cleaning function. This type of paint contains silicone and hydrogel and gives the coating surface-water-like properties. The idea behind silicone paint is that it forms a very slippery surface, which makes it difficult for marine fouling organisms to attach to the boat hull. Marine fouling organisms will attach to some degree, but the surface of the paint makes it difficult for them to attach firmly to the boat hull. The motion of the boat activates the self-cleaning function. Retailers offer this paint for 579SEK per can (0.75L).

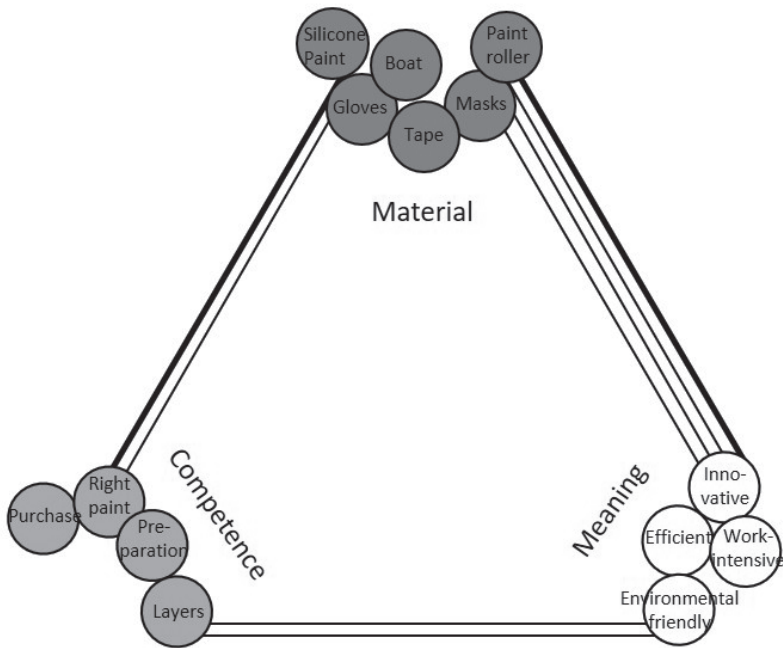


Figure 18: Practice of painting with biocide-free paint.

Some preparation work must be done in order to switch from biocide-based paint to biocide-free paint. Before the silicone paint can be applied, all old biocide-based paint needs to be removed, because biocide-free paints do not adhere to common biocide-based paint. This removal is mostly done by blasting the boat hull. This type of work is very time-consuming and expensive if left to a service company. After removing the old paint, a layer of light primer must be applied, followed by a layer of tie coat (which supports the adhesion of subsequent layers) and then two layers of silicone paint. Alternatively, it is possible to use a sealing paint over existing antifouling paint, which makes the transition from conventional paint to biocide-free paint easier.

*Material elements* needed for this practice are the *boat* itself, the *silicone paint* (biocide-free), *paint rollers*, *gloves*, *masking tape* and *air masks*. The primer, which acts as a base coat, has toxic ingredients, and therefore it is also necessary to wear air masks and gloves when preparing the boat hull for the silicone paint. *Competence* is similar to what is needed for painting with biocide-based paint. The boater needs to know where to *purchase* the biocide-free paint, needs to choose *the right paint* for the boat (as, in this case, multiple

options are possible: primer and silicone paint or sealing paint and silicone paint), and needs additional knowledge about the *preparation* of the boat hull; otherwise, the silicone paint will not adhere properly to the boat hull. As a fourth dimension of the competence element, the boater needs to be informed regarding how many *layers* of paint are needed and how to apply it. Silicone paint needs to be applied quickly; otherwise, the paint dries out. *Meanings* connected to the practice of painting with biocide-free paint are *work intensive*, *environmentally friendly*, *innovative*, and *efficient*.

## Using boat washers

A boat wash can be compared with a car wash for automobiles. Boat washers are installed in the water and are equipped with rotating brushes. The advantage of boat washing is that it works without any paint and is suitable for motor and sailing boats. Under the boat wash there is an underwater basin, which collects old paint flakes which might be removed through the washing process. The largest boat washers can wash motor- and sailboats up to 21 meters in length. The boat wash is normally provided as a service to the boater, meaning that the boater drives to a cleaning station where the personnel take over the boat and perform the cleaning. There is one exception to the service provision: In one boat club in Stockholm (Bosö), the board decided to invest in a boat washer and train the club's boaters to operate the machine themselves. The boat wash is normally used in combination with a barnacle warning SMS service, which informs the boater of the larva season for barnacles. Several times per season, the boater receives an SMS text reminding him or her to use the boat washer. Currently, this SMS service is only available on the East Coast of Sweden. Another option is to hang a metal or plastic panel into the water to observe the amount of fouling. If the metal panel is full with fouling it at the same time indicates that the boat hull is also covered with marine fouling.

Leisure boat owners pay per wash, and it is necessary to wash boat hulls approximately two to four times per season, depending on where the boat is located. Several factors influence the cleaning frequency, such as geographical location, regional variations, water temperature, water salinity, frequency and duration of boat usage and boat speed. The costs depend on the size of the boat and the frequency of use. A single wash for a four-meter-long boat costs 625 SEK. In low salinity waters, it is advisable to wash a boat 2-3 times per year. In high salinity waters, it is necessary to wash a boat 2-4 times per year. Regular boat washes are cheaper if a boat owner buys a season ticket or a clip card. However, the availability of the service can create issues. At the moment, boat washing services are only available in Sweden. Moreover, there are a large number of boat washers on the East Coast of Sweden but only two on the West Coast. Two main providers of boat washers can be found in the Swedish

market: Boat Washer ([www.boatwasher.se](http://www.boatwasher.se)) and Rentunder ([www.driveinboatwash.com](http://www.driveinboatwash.com)). Furthermore, some boat clubs in the Stockholm area have invested in boat washers for club members' use.

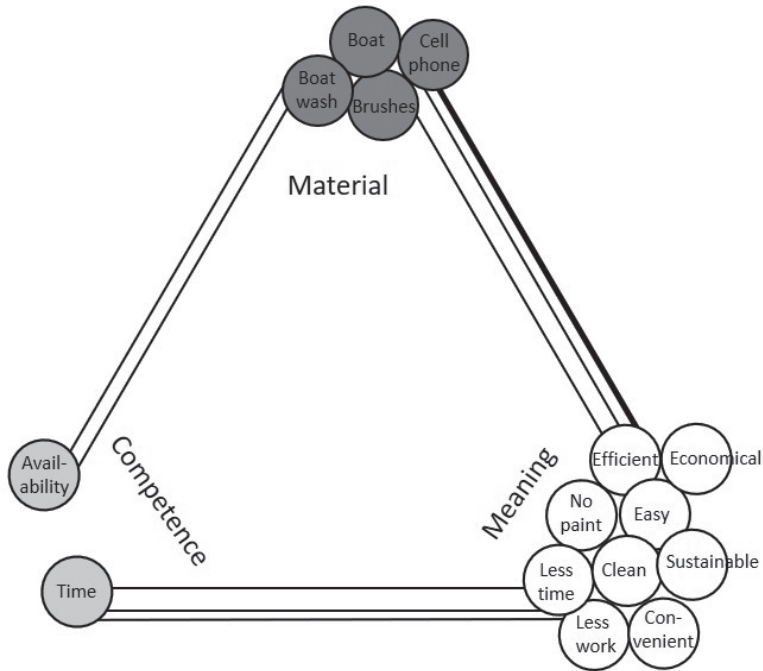


Figure 19: Practice of boat washing.

To simplify the illustration of the practice elements constituting boat washing, I present the analysis as it is offered as a service, because boat owners are rarely allowed to operate boat washers themselves. Using a boat washer includes a different constellation of practice elements compared to painting with biocide-based or biocide-free paints. This particular practice consists of several *material elements*, including the *boat* itself, the *boat wash machine*, *brushes* and (in the case of the SMS service) *cell phone*. In terms of *competence*, the boater needs to be informed about the *availability* and location of nearby boat washers, if none are located in the boater's marina. Secondly the boater needs to know the right *time* to wash the boat, because the washing process is only efficient if marine fouling has already grown on the boat hull. To know when to go to the boat wash, there is a SMS alert system on the Swedish East Coast

informing boaters when to use a boat washer. It is advisable to book a time slot for a boat wash before the boater drives to the boat wash. This is normally done through the website of the boat wash company. Then the boater needs to drive to the boat washer, and the boat wash company does the rest. My research indicated that different *meanings* are associated with boat washers, such as *efficient, clean boat hull, less work (compared to painting), convenient, easy, economical (same amount for paint), less time consuming (compared to painting, only two 20-minute washes per season), no painting necessary and sustainable.*

## **Using hand-scrubbers**

In addition to the already introduced biocide-free paints that are designed to have a self-cleaning function, there also exist silicone paints that do not have sufficient antifouling properties alone and need to be used in combination with other cleaning devices, such as a hand scrubbing tool. In this thesis, I have specifically examined a hand-scrubbing tool called Scrubbis, which was invented in Sweden.

In order to use this product, the boater needs to paint the whole underside of the boat with a primer and silicone paint. The non-toxic silicone paint creates a slippery surface on the boat hull and enables an easier cleaning procedure with the hand-scrubbing tool. However, silicone paints have a fragile and soft surface, so it is essential that the cleaning devices are not too rough. Therefore, the Scrubbis tool has a rubber surface. The hand-scrubbing device is used to clean the boat hull from the outside, while the boat is in the water. The cleaning head of the Scrubbis tool has a buoyancy of 2 kg, which continuously pushes it against the hull. It also has flexible flanges, which follows the shape of the hull around rails and edges. The cleaning procedure with the hand-scrubbing tool depends on the size of the boat as well as the amount of marine fouling that has attached to the boat hull. For a nine-meter boat, it can take up to 40 minutes to scrub the boat hull. This method is suitable for both motor and sailing boats.

The advantage of the Scrubbis tool is its availability. It can be bought in Sweden, Finland, Germany and Denmark for around 895 SEK. Furthermore, a primer is needed so the silicone paint sticks to the boat hull. The primer can be bought for 695 SEK (0.75L) and the silicone paint for 895SEK (0.75L). The amount of paint and primer needed depends on the size of the boat and how many layers of paint are applied.

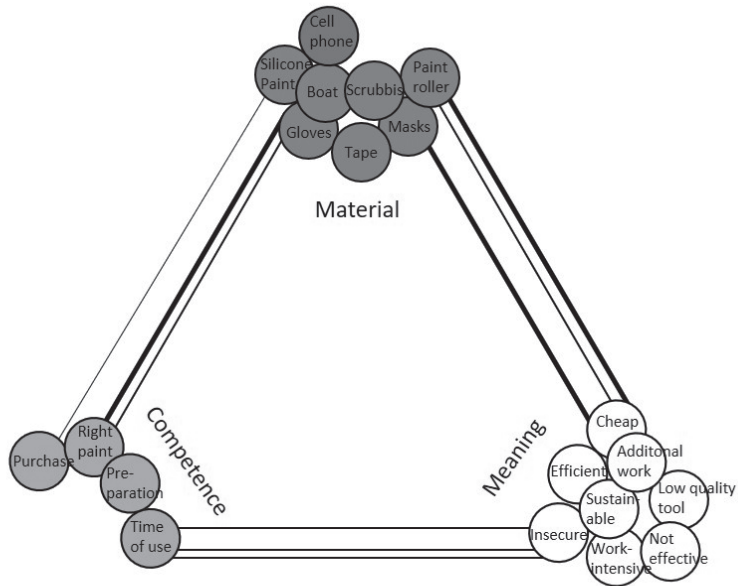


Figure 20: Practice of scrubbing the boat.

Several *material elements* are needed, such as a special *silicone paint*, *scrubbis* (*hand scrubbing device*), the *boat* itself, *paint rollers*, *gloves*, *masking tape*, *air masks* and (in most cases) *cell phones*. As already described in the sections on painting, painting with biocide-free paints also requires certain competence. Boaters need to find out where they can *purchase* the silicone paint and the scrubbing device, decide on the *right paint* and *prepare* the boat hull for the application of silicone paint in the correct way. Additionally, the boater needs to acquire knowledge regarding *time of use* to clean the boat hull with the scrubbing device. Most of the boaters on the East Coast use the SMS alert for barnacles to know when to scrub the boat. Instruction manuals for the use of the product can be found on the homepage of the producer, and there are also videos on YouTube explaining how to use the device. The producer of Scrubbis recommends using it from once a month to once a week during the boating season, depending on the location of the boat and the salinity of the water. SMS alerts are used by some boaters to identify the right time to scrub



the boat. It is important to use it frequently enough to prevent the growth of hard shells and barnacles. Proper use will clean the boat hull before the marine organisms are fully grown. If the shells are already hard, the hand scrubbing device can be damaged. The *meanings* associated with the Scrubbis tool among respondents were very ambivalent. For some boaters, it is too work-intensive to scrub the boat so frequently, while others were happy with the method and the cleaning result. Several meanings were thus associated with this practice: *Work-intensive, additional work (before using the boat), insecure method (hard to reach all parts of the boat hull), efficient, low quality tool (Scrubbis), sustainable, not effective, cheap.* Some boaters perceived cleaning with the hand scrubbing device as an acceptable amount of work, whereas other thought it required a lot of work before the boat could be used.

## Using hull covers

Hull covers are floating devices and come in different designs. Some hull covers consist of a blue plastic membrane that covers the hull of the boat while it is in use. There are currently two companies producing such covers: Cleanboat and Cleanmarine. The plastic membrane covering the boat hull creates a dark environment which is not favored by marine organisms. Moreover, marine fouling attaches on the plastic membrane rather than on the boat itself, and at the end of the season the hull cover is cleaned after it has been taken out of the sea, for example with high pressure cleaner.

Cleanboat offers customized hull covers that can be bought in selected boat supply stores. For a 4- to 6.5-meter boat, a Cleanboat cover costs 6495 SEK, whereas a cover for a 6.5- to 8.5-meter boat costs 7695 SEK and has a lifespan of 10 years.

Clean Marine covers are custom-made in half-meter steps for 5 to 10-meter long boats. These customized hull covers are intended to give better protection against marine fouling. As Clean Marine is a customized product, it is not available in hardware stores or boat supply stores but must be purchased directly through the company website or at boat fairs.

Another type of hull cover consists of a floating device with small cleaning brushes, called Sea Boost. Every time the boat drives on or off the device it is cleaned by the brushes, and an additional cleaning effect occurs through the movement of the waves. Additionally, the black mat also creates a dark environment, which is not favored by marine organisms. Sea Boost Powerturf costs 6550 SEK for 5.4 meters long and 2.3 meters wide boat. Currently, the

Sea Boost mat is available in Sweden and Finland. The company also offers renting options.

All of these innovations have in common that they need to be mounted every year in the spring and de-mounted in the winter. For the installation, the design of the boat berth plays a role. The hull cover needs to be attached to the jetty in the front and at two poles in the back. This method is not possible in the case of a boat berth where the boat is parked sideward. Moreover, this invention is only suitable for motorboats and not for sailing boats.

Regardless of the type of hull cover used, the configuration of material, meaning and competence elements is the same. *Material elements* needed for this practice version are the *boat* itself, the *hull cover*, *four poles* to attach the hull cover, *and ropes*. The boater needs certain *competence* to use the hull cover. In addition to finding out where the hull cover can be *purchased*, the boater needs to know *how to install* the hull cover correctly. Instead of painting the boat hull, the boater needs to install the hull cover in the marina. *Instruction manuals* for the installation are available on the website of the producer and are visually demonstrated in videos on YouTube. It is difficult for one person to properly position the hull cover alone, so it easier to do it with someone else. Several *meanings* are associated with using a hull cover: *skip painting*, *simple*, *convenient*, *stabilizes the boat*, *cleaning the hull cover (instead of the boat)*, *installation every year*, *sustainable*, and *less time consuming (than painting)*.

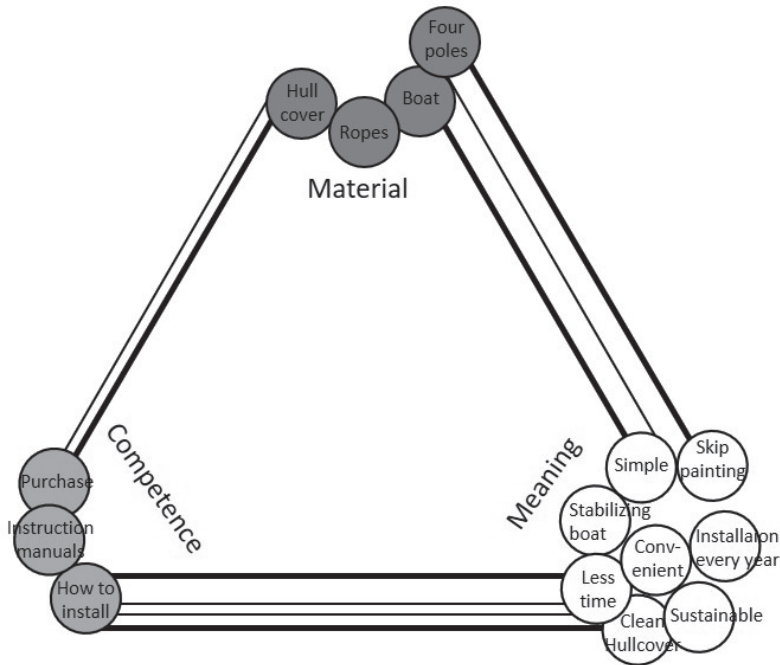


Figure 21: Practice of using the hull cover.

## Using boat lifts

Boat lifts are used to raise the boat out of the water to store it on land and then lower it back to the water for use. In this study, I have only looked at mechanical boat lifts and not the simpler constructions with which boats are manually pulled out of the water. In the case of mechanical boat lifts, the boat is driven onto a certain spot and then lifted out of the water automatically via remote control. The lifting process takes around 60 seconds, depending on the weight of the boat. Compared to the other types of antifouling practice, this type is the most expensive. In Sweden, there are different producers and providers of boat lifts. Boat lifts from the company Sunstream ([www.sunstreamboatlifts.se](http://www.sunstreamboatlifts.se)), for example, cost 62.400 SEK for a 2.41- to 7.32-meter boat. Mechanical boat lifts are not a new invention; they have been on the market for quite some time. For example, the company Sunstream has been selling their products since 2004.

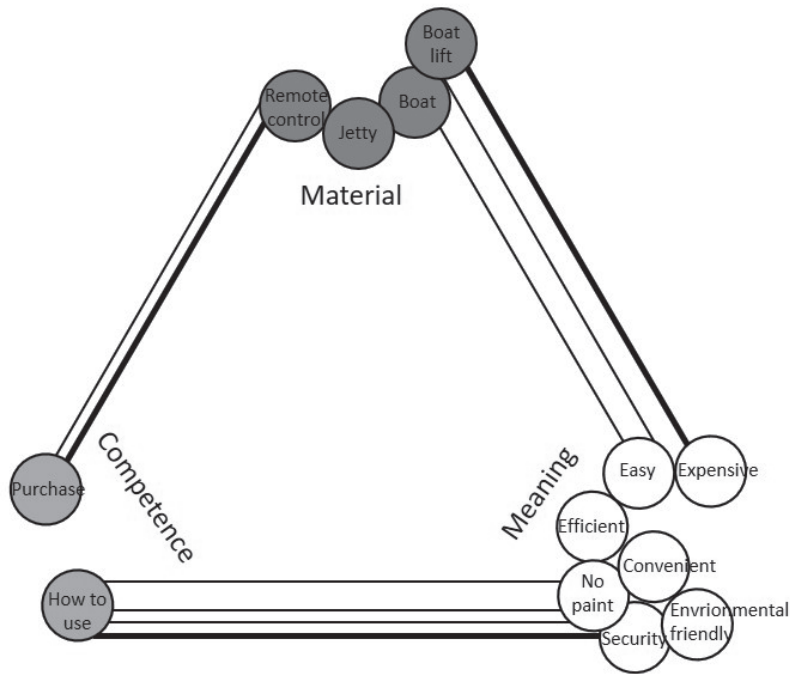


Figure 22: Practice of boat lifting.

The *material elements* consist of the *boat* itself, the *boat lift*, *remote control* and a *jetty* to which the boat lift can be attached. In terms of *competence*, few skills are necessary. The boater needs to know where he can *purchase* a boat lift, as this product is not offered at retailers. When buying a boat lift, the installation is included in the price, so no mechanical expertise is required. Similarly, for the operation of the boat lift, little competence is required. The boater only needs to know *how to use* it, which involves pressing a button so that the boat is lifted automatically. It only takes about one minute to lift the boat. *Meanings* associated with boat lifting include *easy*, *no painting*, *security for the boat*, *environmentally friendly*, *expensive*, *efficient*, and *convenient*.

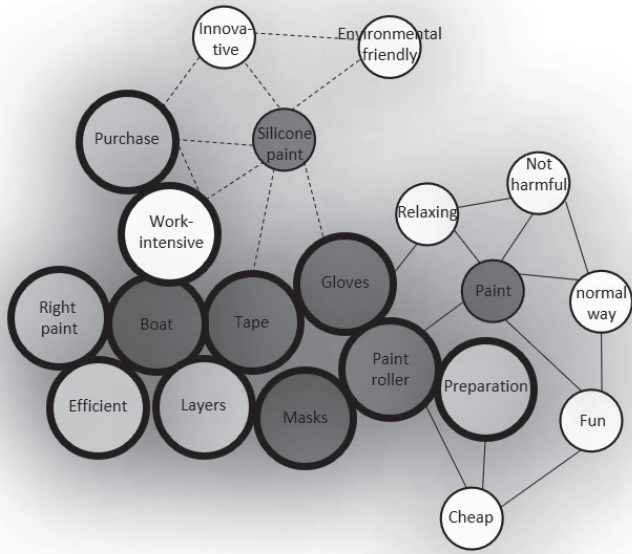
### Comparing the different versions of practice







All versions of antifouling practice are aimed at having a clean boat hull free from marine fouling. However, the way this is achieved includes different constellations of material, meaning and competence practice elements. By analyzing the different versions of practice, it becomes clear that some versions

share several elements. For example, painting with biocide-based paint and biocide-free paint are very similar approaches. These versions of practice involve similar material elements that are needed to apply paint, such as paint rollers and masking tape, while they differ in terms of the paint used. A new material element (biocide-free paint) is thus integrated into an existing practice without changing the practice itself to a significant degree. Figure 23 illustrates the similarities between the practice versions of painting with biocide-based and biocide-free paints. The visualization of similarities and differences between practice elements is inspired by Higginson and colleagues (2015), who visualize practices as networks. The shared elements are illustrated through the large circles with thick lines. Moreover, the elements that have more connections between them are closer together, while the elements with fewer connections are further apart (Higginson et al., 2015). The smaller circles depict practice elements that are not shared. The dotted line symbolizes the linkages between the practice elements of painting with biocide-based paint, while the continuous line illustrates the linkages of painting with biocide-free paint. Figure 23 shows that there are a lot of shared elements between the practice versions, which indicates that a shift from one practice version (Painting with biocide-based paint) to the other (Painting with biocide-free paint) would not involve a big adjustment of the practice for the practitioner. The boater has already the skills for performing the practice, which means he/she knows how to paint a boat hull. However, before the new material element of biocide-free paint can be used some preparation work needs to be done, such as grinding off old biocide-based paint, to enable the biocide-free paint to adhere. This preparation work is not part of the illustration.

Some versions of antifouling combine familiar practice elements with new practice elements. For instance using hand-scrubber combines the habitual painting practice and the practice elements connected to it with the new practice of cleaning the boat hull, as well as the use of a new tool, the hand scrubbing device. By using a new material element (the Scrubbis tool) along with silicone paint, the boater thus adapts his or her antifouling practice.

Other versions of practice have few elements in common, because they contain a new arrangement of material, meaning and competence and share only very few material practice elements, such as the *boat* and the meaning element of *efficient*. Examples for a new practice nexus include the use of boat washers, hull covers and boat lifts. Figure 24 compares painting with biocide-based paint and using boat washers. The large circles with thick lines depict the shared elements. The black lines symbolize the linkages between the practice elements of painting, and the dotted line presents the linkages between practice elements of boat washing. The figure shows the variation of versions of practice, not individual performance.



- |   |  |   |   |
|---|--|---|---|
|  | Shared material element                  |  | Not shared material element               |
|  | Shared competence element                |  | Not shared competence element             |
|  | Shared meaning element                   |  | Not shared meaning element                |
| -----   | Linkage painting with biocide-free paint | —   | Linkage painting with biocide-based paint |

*Figure 23: Shared elements between the practice of painting with biocide-based and biocide-free paints.*

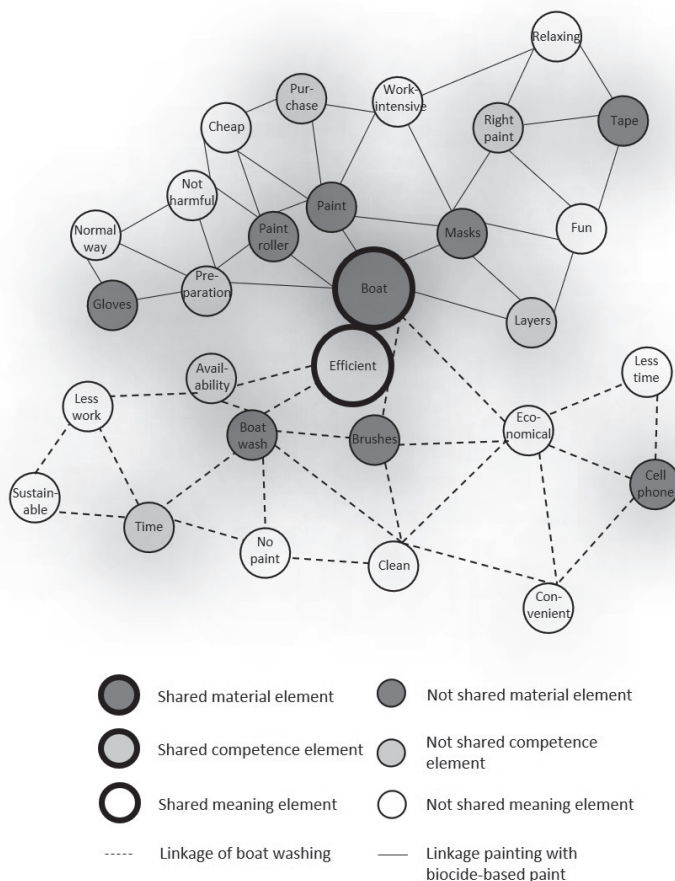


Figure 24: Shared and distinct practice elements between painting with biocide-based paint and boat washing

Furthermore, some material requirements are necessary for some versions of practice. Some antifouling practice versions are restricted to certain boat types. By studying the different practice versions, it became clear that all versions of antifouling are possible for motor boats, but only a few methods are applicable to sailing boats (biocide-based paint, biocide-free paint, boat washers).

The versions of antifouling practice also differ in terms of the time at which they are performed. The different versions either are intended to avoid marine fouling before it occurs (e.g., painting with biocide-based paints and using boat lifts), and thus are undertaken before the boat is placed in the water or after treatments, or are designed to remove the marine organisms after they have

attached and when the boat is located in the water (e.g., mechanical methods like boat washers, hand scrubbing devices, and hull covers).

The majority of antifouling practice include antifouling products and only one version is offered as a service. The boat washer is the only antifouling version that is offered as a service to boaters, while all other versions include products that must be purchased by boaters.

Meanings associated with the different antifouling types were very different. This is particularly the case when comparing the meanings of painting and boat washing. Boaters perceived painting as very work intensive and the practice of boat washing as less work intensive and less time consuming; however, only a very small group of boaters have adopted boat washing as a primary form of antifouling practice.

Competences also varied to some degree between the sustainable and unsustainable antifouling versions. The sustainable antifouling versions (including the use of environmentally sustainable products or services) required additional competence, as the boaters needed to learn how the new antifouling product or service needed to be applied. For using hull covers or using hand scrubbing devices, certain knowledge and skills were required, whereas for using the sustainable boat wash only very little competence (e.g., knowing how to drive the boat to the wash) was needed.

### ***Comparing practice versions combinations***

In this chapter, I illustrated how different versions of antifouling are composed by identifying the different practice elements, and I illustrated that some sustainable practice versions are similar in terms of their composition of practice elements whereas others are very distinct from each other. The following Figure 25 compares different practice versions comparisons. The first illustration shows the comparison of painting with biocide-based paint and painting with biocide-free paint as well as their shared and distinct elements. The second illustration shows the comparison of painting with biocide-based paint and boat washing. By comparing them, it becomes clear that more shared elements appear in the first constellation than in the second, indicating that these versions of practice are less distinct from each other in terms of the elements composing them. This emphasizes that the shift from one practice to another does not imply a significant change in the practice itself. In contrast, the number of shared elements in the second illustration is rather low, while the number of distinct element high, indicating that the new practice differs to a strong degree in terms of the composing elements. This knowledge is significant for the reconfiguration of practices, because it emphasizes that new adapted antifouling practice versions might involve either a small adjustment





In the following chapter, I will focus in particular on the linkages among the practice elements and introduce various aspects that have an impact on the creation and stabilization of linkages. For empirical and theoretical reasons, I have decided to study and analyze the linkages of two specific practice versions, painting with biocide-based paint and boat washing. From an empirical point of view it made sense to choose these two versions, because the feasibility of analysis of the linkages was greatest for painting and boat washing due to the amount of empirical material collected on these two antifouling versions in the course of the study. Theoretically it seemed interesting to choose two practice versions that had not much shared elements in common (see Figure 24) to explore the linkages, because distinct practice elements might also indicate distinct linkages.

Moreover, painting with biocide-based paint is the dominant practice with the most severe environmental impacts; thus, it is the version of practice that needs to be transformed in a more sustainable direction. Boat washing has been chosen for two reasons. First, it is one of the most sustainable alternatives, as it functions without any paint and the consumer satisfaction was the highest among sustainable alternatives (because boaters can skip the hard physical work of painting). Second, boat washing is offered as a service, and studies focusing on environmental service provision are rather scarce; however, in sustainability mindsets, the service component is increasing. Increasing numbers of sustainable services are entering the market, with a particular focus on sharing. Concepts like the Internet-based marketplace Airbnb for renting private homes (Hamari et. al. 2015) or bicycle renting services offered by cities are becoming increasingly popular (Evans et. al. 2012).

## Chapter 6: Exploring linkages between practice elements

Chapter 5 presented the different versions of antifouling and how they were composed in terms of the practice elements of material, meaning and competence. This chapter will focus especially on the linkages between practice elements. Through the individual performance of practitioners, the various practice elements are linked with each other and shape a practice (Röpke, 2009). However, we know very little about what stabilizes the linkage between practice elements and makes it “sticky”. Stickiness refers to the conditions that keep the existing practice elements in place and linked, making it difficult to enable a rearrangement of practice elements either through the integration of new or unfamiliar elements into an existing practice or through the shaping of a new practice. Studying linkages can help us to understand why certain unsustainable practices are sustained. In the case of antifouling, the unsustainable practice of painting with biocide-based paints is persistent and difficult to change. Research evidence shows that providing boat owners with information about the negative effects of antifouling paints on the marine environment does not guarantee a change towards pro-environmental behavior (Wester & Eklund, 2011). This brings up the question of what exactly is keeping the practice elements glued to each other. Based on the reasons presented in chapter 5, I have chosen two specific versions of antifouling (painting with biocide-based paint and boat washing) to investigate the linkages between practice elements and to identify what stabilizes those linkages and creates stickiness between the practice elements.

From a sustainability perspective, it is important to know how we can break or loosen the linkages between elements of current unsustainable practices and facilitate the reconfiguration process. An exploration of the linkages and the essential conditions affecting them can make it possible to identify where interventions through policy or marketing would make sense (Spotswood et al., 2015).

Before theorizing about the linkages of practices, I will briefly recall some principles from chapter two, which are helpful to understand the following section. First, Schatzki (2002) refers to a practice nexus, implying that the practice itself is the link between the practice elements and that the individual practice elements ‘*hang together*’. Secondly, Shove and colleagues (2012) emphasize that practices can be seen as bundles of different elements linked together, which “*emerge, persist, and disappear as links between their defining*

*elements are made and broken*” (Shove et al., 2012: 21). From these two presented approaches to linkages (Schatzi, 2002; Shove et al., 2012), we know that the practice elements are linked and refer to a nexus, but we have little understanding about the linkages, what forms they can take and what influences them.

From previous literature we know that practices can be reconfigured by breaking the links between elements and connecting new elements together (Shove et al., 2012). But what if certain practices cannot be easily reconfigured? It seems that there are some conditions that keep existing elements glued to each other and thus hinder the reconfiguration. While previous research has introduced the concept of linkages (Schatzi, 2002; Shove et al., 2012) and the existence of multiple links among practice elements (Kuijer, 2014), it has so far not provided us with a detailed understanding of the perpetuation of linkages or the stickiness of practice elements. Kuijer (2014) emphasizes that some links are more essential than others, but she does not further theorize how these links are stabilized or fixed. Thus, the following section is dedicated to identify the configurators that stabilize the linkages between two versions of antifouling (painting with biocide-based paint and boat washing) in detail and explore how the stickiness of the linkages is created and sustained. I use the term configurators to describe various aspects such as actors, conditions or a particular context that have an impact on shaping and stabilizing the linkages between practice elements. Exploring how the linkages between the practice elements are maintained may give us more insights into how current unsustainable practices can be reconfigured.

### **Linkages between practices elements within painting**

The identified practice elements composing the painting practice with biocide-based paint presented in Chapter 5 are shown in Figure 26 and supplemented along with the configurators (in boxes) impacting the linkages between the practice elements. Additionally Figure 26 visualizes the linkages between practice elements and particularly illustrates multiple linkages between material and meaning. Multiple linkages indicate that the linkage between material and meaning is difficult to break. Some linkages are even visualized with thicker lines, which illustrate that some linkages are stronger than others.

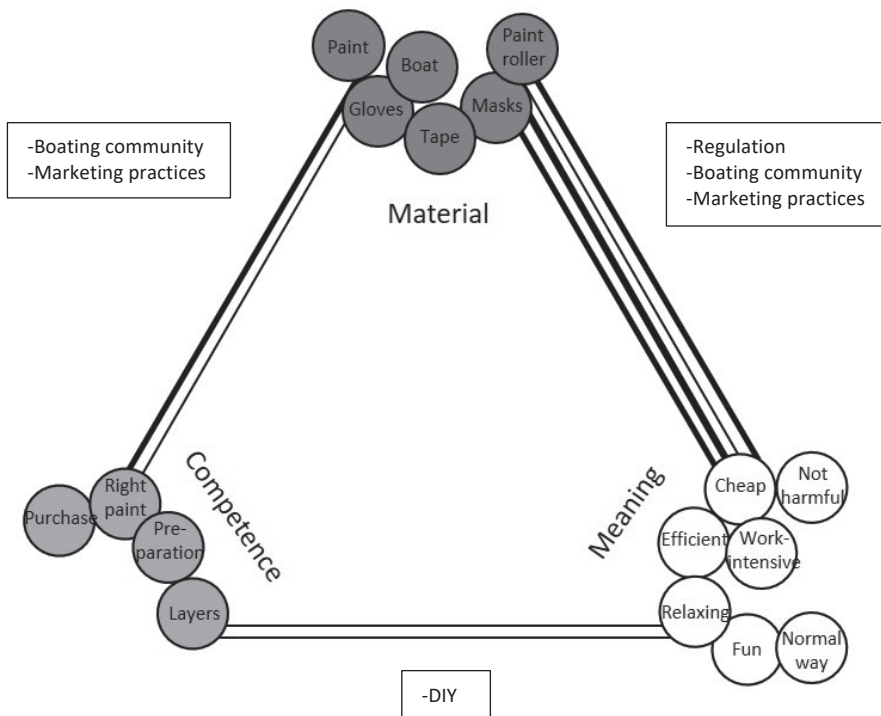


Figure 26: Painting with biocide-based paint including the configurators of linkages visualized in boxes.

### **Linkage between material and meaning**

The first configurator impacting the linkage between material and meaning is regulation. In our case, the European Biocidal Products Regulation provides the material element for painting, as it allows the sale of toxic paints. The regulation contributes to stabilize the link between the material *paint* and boaters' meaning that painting with toxic paint is the 'normal way' of doing antifouling. If regulation were to prohibit the sale of biocide-based paint on the market, the boater would not be able to buy toxic paints, and biocide-based paint would not be part of the painting practice and considered as the 'normal way' of performing antifouling. The European Biocidal Products Regulation specifies exactly which biocides can be used in antifouling paints and in what amounts. Currently, antifouling paints contain biocides like copper and zinc. Moreover, during my interviews with boaters, I discerned that allowing the sale of toxic paints contributes to shaping an overall image among boaters that biocide-based paints do not especially harm the marine environment.

Interviewees stated several times that the formerly used tributyltin (TBT) paints were highly toxic, and therefore they have been banned from the market due to their negative effects on the environment. However, boaters stated that they do not perceive current antifouling paints as highly toxic (Paper 1). A ban of current copper paints has not happened yet, which encourages the impression among boaters that biocide-paints are relatively safe to use.

The second configurator impacting the linkage between material and meaning is the boating community and the traditions and routines developed around painting within this community. As described in Paper 1, painting with toxic paint deeply rooted in the boating culture. The use of toxic paint is considered to be the correct way of doing antifouling, which creates normalized community-based routines and strengthens the perception in the boating community that painting is the ‘only option’. The social importance and meaning of the painting practice are shaped by long-standing traditions, habits and routines. In this boating community, a boater is considered to be a ‘proper boater’ if the boat is well-maintained, meaning that he or she makes sure that the boat hull is free from excessive marine fouling (Paper 1). A common view among boaters is that this is only achieved by using toxic antifouling paint that pollutes the marine environment. Thus, unsustainable painting practices are continued because they are considered to be the appropriate, right, or ‘normal’ way of doing the practice (Rouse, 2007). These insights regarding the boating culture illustrate that the boating community has an impact on the stickiness of the linkages between material and meaning. According to Kuijer (2014), linkages are difficult to break or loosen if they are made in an equivalent way among all practitioners, compared to links created by a small group of practitioners. In the case of antifouling in Sweden, 80% of the boaters use toxic paints (Dahlström et al., 2014), which indicates that this link is very sticky and hard to break.

Additionally, marketing practices such as advertising and supply present another configurator stabilizing the link between material and meaning in several ways. Marketing practices shape the image of a practice and how the practice is perceived among practitioners. As shown in chapter 5, the meanings of painting have been described by interviewees as, for instance, *efficient*, *cheap* and the ‘*normal way*’ of doing antifouling. Several of these meanings have been supported by pictorial and verbal narratives of advertisements. Advertising, supported by pictures, texts and ideas, have the ability to circulate meanings (Shove & Pantzar, 2005). Paper 5 shows that the main message in advertisements communicated to leisure boaters is that biocides are necessary to achieve a clean boat hull and to reach optimal efficiency and reduce drag. Moreover, the importance of high copper content is often advertised. It is likely that boaters who have been exposed to advertising texts promoting the use of

biocides in antifouling paint believe that antifouling products need to contain biocides in order to be efficient. Advertisements for paints also communicating that one layer of toxic paint (instead of two layers) is sufficient, implying that boaters can save money on paint and thus shaping the meaning of *cheap* associated with paints. Moreover, Paper 5 shows that biocide-paints are advertised in light of the boating experiences that the product can provide, whereas sustainable products only promote the functionality of the product. The combination of showing toxic paint with images of great boating experiences paired with textual descriptions (“*First days in freedom, put up your sails and let them fill up with wind for the first time in the season*”) has contributed to the overall view that a fantastic boating adventures can only be achieved by using biocides. The advertising shaping the meanings of paint being *cheap* and *efficient* paired with the experiences advertised thus creates stickiness by emphasizing that the paint is the best choice for boaters.

Another configurator affecting the linkage between material and meaning elements within the marketing practice is the supply of antifouling paints. The facilitated accessibility and overall availability of biocide-based paint shapes the meaning that painting with toxic paint is the ‘*normal way*’ to do antifouling. For example, the legislation in Sweden has not regulated where toxic paints can be sold. As a result, many retailers with little expertise in boat maintenance, such as hardware stores like Jula, Biltema or even grocery stores like Netto, sell antifouling paints. Additionally, biocide-based paints are available year-round in boat supply shops and retail stores, not just during the usual boat maintenance season. These retailers thus make it convenient for boaters to acquire the paint. This retail strategy contributes to the impression that antifouling with toxic paint is the regular way of doing antifouling and thus the stickiness of the linkage between the material and meaning element.

By studying the linkage between the material and meaning of painting, it becomes clear that several configurators stabilize the linkages between material and meaning. Multiple linkages connect material and meaning, which means that to enable reconfiguration all of these linkages need to be loosened or broken. The number of linkages between material and meaning indicates a certain stickiness, which makes it difficult for a new material element to come into the practice.

### ***Linkage between material and competence***

There is an important relationship between material and competence when practices are carried out in a DIY tradition (Shove et al., 2007). The practitioner needs to know how to use materials and tools in order to tackle the DIY project (Watson & Shove, 2008). The linkage between material and competence



describes the ways in which the knowledge for painting is generated, maintained and diffused to other people. Two configurators affect this link: the boating community and marketing practices.

The first configurator affecting this link is the boating community, which refers to fellow boaters from the marina as well as friends and family that are also involved in boating. Painting is a traditional facet of boating culture, and the knowledge about boat maintenance and antifouling measures is learned through the boating community. The cultural understanding of the necessity of toxic paint and how to prepare the boat hull for the next season is shaped by the boating community. Papers 1 and 2 show that ‘learning the ropes’ is achieved through learning the necessary practical skills from others in the boating community. This type of linkage can be either strong or weak, depending on the individual boater. Some boaters may be open to learning a new and more environmentally friendly way to protect their boat hull from marine fouling, which indicates that the link is rather weak. On the other hand, a boater who has been painting his boat for many years might find it disturbing to go to a boat washer and get the boat mechanically washed, which indicates that the link is rather strong. Additionally, there is a cultural understanding in the boating community that painting enables the boaters to ‘succeed’ at the performance of the antifouling practice.

The second configurator impacting the link between material and competence is that of marketing practices, such as the labeling of paints. Knowledge of how to properly use biocide-based paints is provided by the paint manufacturer, which contributes to diffusing the know-how among a bigger group of practitioners. Instructions for use and safety can be found on the back of the paint can. The instructions describe the necessary maintenance steps and preparation work, such as washing and scraping, to ensure efficient protection against marine fouling. The paint cans also contain warning symbols indicating the harm and irritation the toxic paint can cause to human health. Additionally, the symbol with a dead tree and dead fish emphasizes the environmental damage that biocidal paints can cause.

### ***Linkage between competence and meaning***

The first configurator affecting the link between competence and meaning is DIY (do-it-yourself). The practical skills and knowledge about painting and the meaning of *cheap* and *efficient* antifouling are linked through DIY. Commonly, DIY encompasses the practice of either producing something or making solutions for one’s own consumption (Wolf & McQuitty, 2011). The DIY tradition is reflected in the market, as the paints are designed for DIY use. My interviews with boaters showed that the DIY approach is popular among boaters, as it enables them to reduce the costs of antifouling measures and



constitutes the cheapest way of taking these measures to protect the boat hull from marine fouling.

Among leisure boaters, there is thus a tradition of preparing and painting the boat hull by themselves rather than paying a service company to do so. Furthermore, doing the painting procedure by themselves assures them that it is done in correctly, thus contributing to a feeling of security. Through the regular and repeated performance of the painting practice, boaters have learnt that toxic paint is a 'safe bet'. DIY is a case in which the effective performance of a practice depends on the effective integrations of practitioner skills and competencies and the engagement of materials and tools (Shove & Araujo, 2010). Through observing and interviewing boaters, I learned that the practical skills for painting are not so demanding, but it is more important that boaters are aware of the different maintenance steps (such as washing or scraping the boat hull) involved before the paint can be applied.

The DIY tradition also links competence with the meanings of fun and relaxation. Without paint, these meanings would not be created. Paper 2 highlights that a group of consumers prefer to continue painting the boat hull even though there are practice alternatives available that are potentially time-saving, less labor intensive, or superior in other ways. My interviews with boaters showed that the majority of boaters look forward to the boat maintenance period, as it is the time in which they gather with other boaters to prepare for the next season. Social interactions are tied to this preparation time, such as common barbecues or just chatting about boating and other themes. Of course, there are also other groups of boaters who do not like this type of work and merely see as a necessary work that needs to be done to be able to enjoy boating. The stickiness or persistence of the linkage between material and meaning shaped through DIY is thus dependent on the individual boater. For some boaters, the DIY practice of painting and the social interactions are very important, which make this link strong. On the other hand, if the boater dislikes the painting and would rather avoid this type of work, the link is weak and can be loosened easily.

### **Linkages between practices elements within boat washing**

The practice of using a boat washer includes a different constellation of practice elements than does painting with biocide-based paint. Figure 27 presents the practice elements composing this practice as well as the configurators (in boxes) shaping the linkages.

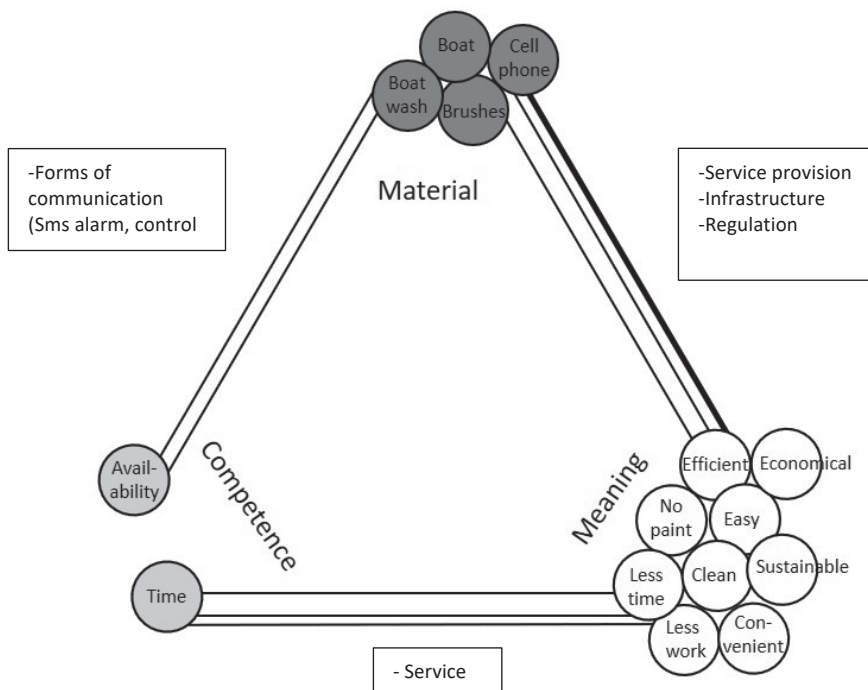


Figure 27: Boat wash practice including the configurators of linkages visualized in boxes.

### **Linkage between material and meaning of boat washing**

The first configurator stabilizing the linkage between the material element (boat washer) and the meanings of, for example, *less work* or *less time intensive* is service provision. The boat washer is not a product that can be purchased in a store; instead, it is offered as a service to the boater. The service provision facilitates the boat hull preparation, as the boater avoids the work of painting the boat hull. The boater just leaves the boat at the boat wash service station, and during the 20-minute washing process he or she can use the time to do something else. There is one exception to the service provision. In the boat club in Bosö, in Lidingö Stockholm, the boaters have been trained to use the boat wash by themselves (Paper 3) and thus there is no service provision.

As a second configurator, I identified infrastructure. Following Shove et al. (2012), infrastructure can be considered to be part of the material element. However, in this case infrastructure is considered a condition enabling the

service exchange of the boat washer. For the boaters to relate to the meanings of *less work* and *less time intensive*, the infrastructure of the boat washer needed to be in place. Only if the boat wash is situated in the home marina or very close to the boat club does the boater experience the practice of boat washing as less labor intense and less time consuming (Paper 2). Boat clubs and marinas providing the boat wash service to their members make the sustainable antifouling practice of boat washing a convenient option for the boater.

The third configurator stabilizing the linkages between material and meaning is that of regulations in a broader sense, like boat club rules and subsidies. In Paper 3, I show how the Bosö boat club has banned toxic paints. With this measure, they have taken away the main material element for antifouling. As a result, they needed to provide additional infrastructures, like a boat washer, to provide the boaters an alternative to painting. Subsidies play an important role in sustaining the linkage between material and meaning. The Swedish government offers financial support to marinas, boat clubs and municipalities that are willing to invest in environmentally friendly antifouling techniques, like a boat washer, in their marina. This subsidy is called 'LOVA bidrag' and supports initiatives that aim to prevent water pollution resulting from antifouling paints (Swedish Agency for Marine and Water Management, 2015).

### ***Linkage between material and competence***

The configurator impacting the linkages between material and competence is communication, in forms such as an SMS alarm service and control panels. These communication tools aim to inform and support the boater using the boat washer. Technical innovations like an SMS alarm for barnacle attachment informs the boater several times per season when he needs to use the boat washer. The SMS service helps to ensure that the boat will only be washed when necessary (i.e., if marine fouling has already developed on the boat hull). Currently, the SMS service is only available on the East Coast of Sweden.

There are also personal control mechanisms to indicate when to use the boat washer. The providers of boat washers advise boaters to hang a small metal panel in the water. As the metal panel will collect the same amount of fouling as the boat hull, observing the panel will enable the boat owner to determine when it is time to get the boat washed. Communication is an essential link, because boaters need to know when to use the new biocide-free antifouling techniques. If such information is not communicated, the boaters will not use the products and services in the right way and the efficiency and performance

of the sustainable products will not be satisfactory. Compared to painting with biocide-based paint, where the competence and necessary skills and knowledge are passed on from one boater to the next, the boat wash practice is dependent on external communication, such as with an SMS service or using a metal panel in the water to observe the fouling pressure.

### **Competence and the meaning of boat washing**

The knowledge about how to use the boat washer and the meaning of *less work* or *convenient* are linked through service. To use the boat washer, the boater needs few practical skills, as there is no direct contact with the technology, which is offered as a service to the boater. This results in a deskilling process in terms of the antifouling practice, as the boater only needs to drive to the boat washer, where a service person deals with the boat washing process. (As mentioned previously, one exception is Bosö Boat club in Stockholm where the boaters themselves are trained to use the boat washer.) This results in less physical work for boaters compared to painting the boat hull. The service provision is supported by an online booking service that helps boaters save time by avoiding lines at the boat-wash stations. The online booking service can also help the boater to find nearby boat wash stations.

### **Comparison between the configurators of linkages**

In this chapter I have identified configurators of linkages for the practice of painting with biocide-based paint and for the practice of boat washing. I suggested the term configurators to describe various aspects such as actors, conditions or a particular context that have an impact on shaping and stabilizing the linkages between practice elements. When comparing the configurators of both practices several differences become visible. Table 4 summarizes the different configurators for the various linkages.

*Table 4: Overview of configurators*

<b>Configurators painting</b>	<b>Configurators boat wash</b>
<b>Material-meaning link</b>	<b>Material-meaning link</b>
Regulation	Regulation
Boating community	Service
Marketing practices	Infrastructure
<b>Material-competence link</b>	<b>Material-competence link</b>
Boating community	Sms-alarm
Marketing practices	Control panel
<b>Competence-meaning link</b>	<b>Competence-meaning link</b>
DIY	Service

Both practice versions, have one configurator in common, which is regulation. With regard to painting, regulation refers to the EU legislation enabling the use

of paint. With regard to boat washing, regulation refers to subsidies for investments in sustainable antifouling solutions and boat club rules forbidding the use of paints. In addition, interesting for this study are the distinct configurators that have been identified.

The practice of painting is impacted by configurators like DIY, the boating community and marketing practices. In particular, the boating community teaches the necessary competences and aesthetic standards for a clean boat hull. Several traditions and routines have developed around painting, such as preparing the boat hull with family and friends or having social interactions (e.g., a barbeque) after the finished boat maintenance work. Marketing practices like advertising emphasize that paint is the only efficient solution for marine fouling and especially advertise the boating experiences that are enabled through the use of toxic paint.

In contrast, the practice of boat washing is a fairly new practice, and thus traditions and routines surrounding it have only started to develop. Instead of passing on the competences from boater to boater, the boat wash practice relies on external communication, like an SMS service or the use of metal panels, to supervise the amount of marine fouling on the boat. The configurators stabilizing the linkages are shaped by a strong service provision, which makes the practice more convenient. Configurators like the boating community, DIY and marketing practices were missing for the boat wash practice.

By comparing the practice versions, it becomes clear that there are different configurators maintaining the linkages between painting with biocide-based paint and for boat washing. On the one hand this is highly likely resulting from the different practice elements constituting the practice. On the other hand it is highly likely to be related to the fact that painting is a well-established practice, which has been carried out for decades, whereas boat washing is a fairly innovative practice. But also because they exist of completely different practice elements.

This chapter has focused on studying the linkages between the practice elements. The exploration of linkages has shown that different configurators affect the linkages as well as the stickiness of the linkages between practice elements. This knowledge is also important for the reconfiguration of practice, as it shows that different configurators need to be targeted to break the linkages and facilitate a reconfiguration of antifouling practice. The knowledge obtained about the configurators and the way they stabilize the linkages can give us a clue to how the linkages can be loosened or broken and reconfigured in more sustainable directions. The following chapter is dedicated to reconfiguring environmentally unsustainable practices by introducing a

framework that is dedicated to breaking the linkages between the practice elements of painting and enabling the integration of more sustainable antifouling products and services.

## Chapter 7: Opportunities for reconfiguring unsustainable practices

In this chapter, I will discuss how we can facilitate the reconfiguration of environmentally unsustainable antifouling practices into more sustainable practices by suggesting a framework that builds on the empirical data in chapter 5 and the theorization of linkages in chapter 6. This framework is tailored to break or loosen the linkages between the practice elements of the unsustainable practice of painting in order to allow new practice elements (sustainable products) to enter and be integrated into these practices.

Reconfiguration describes a new constellation of the practice elements of material, meaning and competence. The reconfiguration of unsustainable practices can occur in two distinct ways. The first of these is through the combination of already existing or familiar practice elements with new practice elements (Shove et al., 2012; Kuijer, 2014), such as the replacement of one material element (biocide-based paint) with another material element (biocide-free paint) to make the antifouling practice more sustainable. Second, the reconfiguration can occur through a combination of new or unfamiliar practice elements, which have not been part of a practice before (Shove et al., 2012; Kuijer, 2014). For example, through the intervention of the boat washer, an entirely new version of antifouling practice has emerged. In several cases, the use of a new material element requires new competence, such as new skills or practical understanding. For the reconfiguration of environmentally unsustainable practices, the first step involves loosening or breaking linkages between practice elements to enable the reconfiguration process. In this thesis I am interested in how the reconfiguration of replacing an unsustainable product or service with a more sustainable alternative can be initiated or facilitated.

Knowledge about the linkages between practice elements and in particular the configurators stabilizing those linkages is helpful to identify where interventions through policy or marketing would be supportive to loosen existing linkages and to enable reconfiguration. Sustainability efforts have focused mostly on individual behavior and have sought to inform and educate consumers with information campaigns and eco-labeling (Keller et al., 2016; Boström & Ugglå, 2016). However, sustainability transitions are complex, and thus the framework presented in this chapter follows a combinational approach, combining effects of different reconfigurators to break the linkages between practice elements of unsustainable practices and to enable a reconfiguration of practices with the inclusion of sustainable products and

services. Re-configurators can be thought of as various aspects (actors, conditions or a particular context) that enable or facilitate the reconfiguration process of practices by loosening the linkages between practice elements and enable a rearrangement of practice elements in a more sustainable way.

The framework I propose is based on these specific re-configurators: *eco-innovation, regulation, marketing practices, and infrastructures*. It is not a coincidence that three re-configurators overlap with the configurators of the practice, as the ones stabilize the links can also break or loosen these links and enable the reconfiguration of practice elements. In chapter 6, I identified a total of 10 different configurators for the practice performance of painting and boat washing, which describe various aspects (actors, conditions or a particular context) that are dominant in shaping and stabilizing the linkages between practice elements. By revisiting and reinterpreting the findings of the five papers, I noticed that some of these configurators sustaining the linkage can also be regarded as triggers for the breaking and loosening of the linkages between practice elements. For example, on the one hand, existing infrastructure can sustain a practice (e.g., tumble dryers can sustain the electrical drying of clothes), but on the other hand infrastructures can trigger a reconfiguration of practice (e.g., by exchanging tumble dryers in big apartment complexes to a special room designed for air-drying to help decrease energy consumption and reduce costs of laundry) (Spurling et al., 2013). Based on my ethnographic understanding of the antifouling context gathered through my four-year ethnography in the antifouling context and writing my five papers, I suggest that of the 10 identified configurators, three can be considered re-configurators, which have the potential to enable and facilitate the integration of sustainable products and services into existing antifouling practices. The identified configurators regulation, marketing practices and infrastructure are sustaining the linkages between practice elements and at the same time have certain tools that can steer the material elements used in practice. For example regulation has certain tools such as legislations, subsidies or taxes. On the other hand configurators, like DIY, Service or SMS service are affecting the linkages between practice elements, but they do not have any instruments or tools to impact for example the material elements used in practice.

The framework I will present is not a universal schema for reconfiguring practices, but it highlights multiple intersecting dynamics and relationships between different re-configurators. By studying the linkages between the practice elements of the painting practice, it became clear that there is a strong link between material and meaning. Changing the material element used in the antifouling practice is important, as the current material element used (biocide-based paint) is the main pollutant of the marine environment.



The following Figure 28 illustrates my framework, where the reconfiguration from an unsustainable practice (right-hand figure) towards a more sustainable practice version (left-hand figure) is presented. In our case, this refers to the reconfiguration of the painting practice to a more sustainable version, such as boat washing or using a hull cover. For visualizing the reconfiguration process I have been inspired by Kuijer (2014). The right-hand figure illustrates the current unsustainable practice, where a new material element is on the market and waiting to be integrated into the practice. The new material element is visualized through a circle with strips. The figure on the left side shows how the practice looks like after the reconfiguration. Particular elements have left the practice, and new or unfamiliar elements have taken their places. However, not only the practice elements have changed; existing linkages have also been disrupted and new ones created. To achieve this transition, I suggest combining the four aforementioned re-configurators – *eco-innovation*, *regulation*, *marketing practices*, and *infrastructures* – to facilitate the reconfiguration of environmentally unsustainable practices. Only the combination (or co-existence) of several re-configurators together creates opportunities to loosen existing linkages between practice elements of unsustainable practices and to allow new sustainable elements to enter the existing practice.

In the case of antifouling the eco-innovation has already taken place, but for other contexts where a reconfiguration is wished it is important to point out the necessity of eco-innovation. Eco-innovation can be considered to be a pre-step of the reconfiguration of practices. Without an sustainable alternative to the unsustainable product the reconfiguration process in a more sustainable direction will not be possible.

Infrastructure is considered to be part of the material practice element following the conceptualization of Shove & colleagues (2012). However, in this framework, it is considered to be a re-configurator. There also exist relationships between each of the re-configurators, which will be presented in the following section.

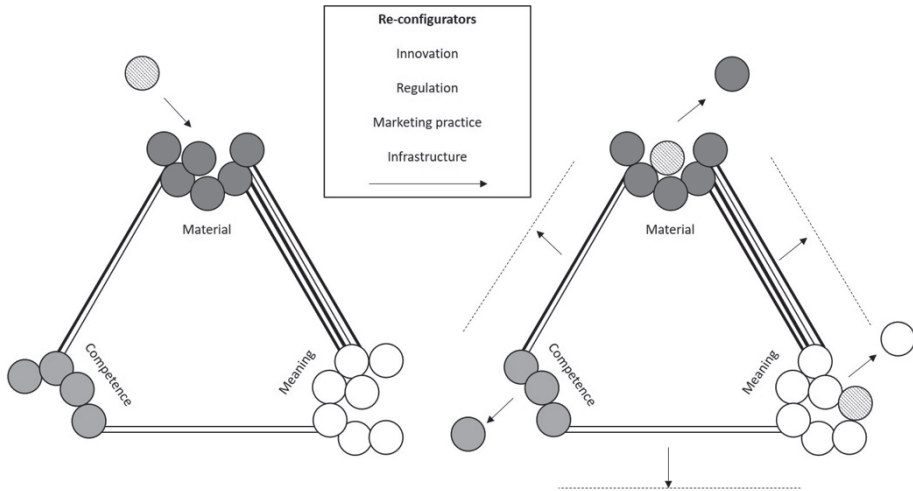


Figure 28: Reconfiguration of practices

The following sections will first present a general overview of each of the re-configurators and then show with examples from my antifouling study where multiple possible points of intervention for the reconfiguration of the painting practice towards more sustainable forms exist. Thereafter, I will show with a specific example why especially the combination and the interplay between these re-configurators is important for the reorganization of unsustainable practices into more sustainable practices.

## Eco-Innovation

The first reconfigurator presented in this model is eco-innovation, which has been defined by the European Commission (EC, 2008) as *“the production, assimilation or exploitation of a novelty in products, production processes, services or in management and business methods, which aims, throughout its lifecycle, to prevent or substantially reduce environmental risk, pollution and other negative impacts of resource use (including energy)”*. Eco-innovations encompass process innovations, organizational innovations and product innovations, all of which are tailored to reduce negative impacts on the environment (Beise & Rennings, 2005; OECD, 2005; Rennings, 2000). For this thesis, I am especially interested in product innovations, which include the improvement of existing products by reducing their environmental impact or the invention of a completely new product or service. For example, eco-innovations may include the use of recycled material or a reduce the amount of toxic ingredients (e.g., in antifouling paint) or the development of sustainable technologies such as renewable energy technologies (Hart & Milstein, 2003; van Hemel & Cramer, 2002) or, as in our case, new biocide-free antifouling techniques.

As described in chapter 2, the reconfiguration is initiated in many cases by the exchange of the material element. One way of breaking existing linkages between practice elements is by offering alternative products to the consumer, which may trigger the consumer to integrate a new material element into the existing practice. To enable a transition from an unsustainable to a sustainable practice, the innovation of green products or the development of products with reduced impacts on the environment it is a significant first step. However, the introduction of new material elements is not a guarantee for the reconfiguration of practices (Welch & Warde, 2015).

There are certain conditions that can stimulate the innovation process. One of these is the use of regulative measures, such as increasing taxes or forbidding certain substances or products on the market. For example, increasing the taxes on motor fuels can boost the demand for fuel-efficient cars or alternative vehicles (e.g., electric or hybrid cars). In Europe, such taxes are much higher (40-60%) than in the United States (20-25%) (Stevens, 2010). Historically, the banning of highly toxic paints has led to innovations in the antifouling market. Formerly, Tributyltin (TBT) was the dominant ingredient in antifouling paint (Dafforn et al., 2011). Due to its negative effects on the marine environment, such as the malformation of oysters in France (Alzieu, 2000), TBT paints were forbidden in 1989 for vessels under 25 meters. As a result of the regulation concerning TBT paints, new paints with different ingredients were developed and offered to consumers.

To ensure the long-term success of eco-innovations, it is important for the producers to be able to prove the effectiveness of their products and to show that their product ensures the same functional benefits as the unsustainable version of the product (Maxwell & van der Vorst, 2003; Hall, 2003; Fuller & Ottman, 2004; Pujari & Wright, 1999). In my study, I observed that many boaters were skeptical about the performance and effectiveness of sustainable products and services that claim to be able to provide a clean boat hull without the use of the familiar biocides. Boaters were worried that the biocide-free antifouling techniques would not have the same functional properties as the unsustainable products and often asked for proof of the effectiveness of these products and services.

The innovation process in practices is often dynamic and ongoing and does not automatically end with the invention (Franke & Shah, 2003). End-users play a role in designing and co-producing inventions (Shove et al., 2012) or may even be the inventors of a practice, as in the case of snowboarding. By using a new material object in practices, the practitioners may detect ways to improve the material from 'inside' the practice. To increase the acceptance of sustainable

products, it is important that these products are designed with reference to user practices; otherwise, the eco-friendly products are likely to fail or to not be approved by consumers (Schot, 2001; Heiskanen et al., 2005). In my study, I could see boaters didn't want to continue using the hand-scrubbing device, because the quality of the cleaning tool was not very good. The Scrubbis tool has a rubber surface and if boaters use the hand-scrubbing device to late, when the barnacles had already reached the adult stage and developed the hard outface, the rubber surface was damaged by the sharp shells of the barnacle.

It is evident that green innovations are important for the reconfiguration of practices in a more sustainable way. In the case of antifouling this has already happened. However, while emphasizing the need for innovation, I also want to highlight that there are several unsustainable practices that cannot be reconfigured because innovations in these areas are not yet present. One prominent example is traveling long distances by plane. Currently, there are no substitute practices available. Travelling by train can be a substitute practice for shorter distances, but for long distances there exists no alternative practice.

## **Regulation**

Regulation is a second re-configurator, here understood in a broader sense including legislation on a national or European level, as well as subsidies and regulative measures taken by boat clubs . Regulations encompass several tools to steer consumer behavior in a particular direction and therefore understood as another re-configurator of the painting practice. Regulations can discourage certain behavior, which is influential in the reproduction and reconfiguration of social practices (Welch & Warde, 2015). In general, most practices are embedded and developed in an institutional environment. For example, the practice of driving is dependent on road traffic regulations. Without regulations guiding the traffic the practice itself would be dangerous and difficult to perform.

Regulation can influence the elements of practices, especially by forbidding the 'bad elements' (Shove et. al., 2012) referring to specific material elements that are needed for performing an unsustainable practice or changing the availability of the materials that are needed for a practice (Hutonen & Oosterveer, 2017). For example, after forbidding traditional standard light bulbs, consumers could only buy an alternative like compact fluorescent lamps (Sahakian & Wilhite, 2014). In Sweden, regulative measures have already been undertaken to restrict the use of highly toxic antifouling paints. Boaters in high-salinity water, like those on the West Coast of Sweden, are allowed to use copper-based paints containing 25%-35% copper. Conversely, boaters in the low-salinity water on the Swedish East Coast are only allowed to use paints

containing 3-7% copper. High salinity water implies an increased growth of marine fouling on boat hulls and therefore boaters are allowed to use more toxic antifouling products.

Policy interventions can also influence the meaning elements of practices. For example, in Japan the government decided that government buildings would not be heated or cooled if the inside temperature was between 20 and 28 degree Celsius. This initiative was known as the ‘Cool Biz’ program and was undertaken to reduce CO<sub>2</sub> emissions resulting from air conditioning. Instead of suits and ties, employees were encouraged to wear loose-fitting clothes. This government intervention aimed at changing the meaning of office-wear, style and comfort (Shove et al. 2012). To support the change in meanings the prime minister and other delegates appeared with loose fitted clothes and short sleeved shirts to formal events (Shove, 2014). Changing the meanings of business clothes and making it socially accepted to wear casual clothes for business meetings was also impacting the material elements of clothing.

Second, policy makers can use other instruments, such as taxation and pricing schemes, to discourage the use of unsustainable products or direct behavior towards a more sustainable direction. Consumption taxes have been popular in influencing unsustainable lifestyles or consumption patterns – for example, to reduce emissions from vehicles (e.g., fuel or vehicle taxes) or household consumption (e.g., electricity taxes and water charges) (Stevens, 2010). In Gothenburg and Stockholm, congestion charges are used to make driving to the city unattractive to drivers, thus enhancing the appeal of public transport. In Ireland a tax of 0.15€ on each plastic shopping bag introduced in 2002 has led to a 90% decrease in the use of plastic bags (Convery et al., 2007). Similarly, extraordinary high electricity pricing schemes (10-40 times higher than usual) in Australia succeeded in reorganizing energy consumption practices. People shifted certain daily activities to another time of the day, where energy prices were lower, or they decided to turn off appliances or even leave their homes at certain times (Strengers, 2010).

Policy makers can also enhance sustainable consumption through subsidies. In general, subsidies can come in different forms and are not always easy to define (Pearce, 2003). One type of subsidy is intended to lower the market price through zero taxation for a particular product. Another form of subsidy is focused on payments for explicit environmental purposes (Pearce, 2003). Several countries (Netherlands, Italy, Canada, Norway) have offered monetary incentives for alternative vehicles, such as electric or hybrid cars, or for energy-efficient household investments such as solar panels (Germany) and energy-efficient solutions for heating, water and electricity (Sweden) (Stevens, 2010).

The Swedish government offers financial support to increase the use of sustainable antifouling solutions. Local measures for a better marine environment can receive support from the LOVA grant. This grant can be applied for at the county administrative board and goes mainly to municipalities, associations and other associations. Measures like reducing the environmental threats linked to leisure boating can be carried out with LOVA contributions. Subsidies can be used to expand infrastructural settings, which are necessary to facilitate the use and circulation of sustainable products and services (Buhr, 2003; Torrisi, 2009).

During collection of my empirical material, the interviewees emphasized several times that they used toxic paints because it was the cheapest and most efficient antifouling solution. Increasing taxes for unsustainable biocide-based paints while decreasing or even eliminating the tax for sustainable alternatives could make toxic paints less attractive to boaters and help to promote sustainable antifouling products and services.

In the case of antifouling, regulative measures taken by a boat club have been helpful to reconfigure practices in the case of antifouling. Specifically, a boat club in Stockholm (Bosö) implemented boat club rules forbidding the use of antifouling paints (referred to institutional infrastructures in Paper 3). Every boater who belongs to or joins the club must sign a contract that he or she will act according to these rules, and breaches are sanctioned by the exclusion of the boater from the boat club. As boat berth spots in Stockholm are rather scarce, these measures have proven useful in steering antifouling practices in a more sustainable direction.

## **Marketing practices**

The third re-configurator is marketing practices, which include activities promoting specific products and services needed for a practice. There are different ways of promoting products and services, such as advertising, TV shows, information campaigns, free samples, instruction manuals and SMS service. The distribution and supply of goods and services also plays a role in the reconfiguration of practices which will be highlighted in the following section.

Marketing practices create the image and meanings for emerging and new practices. The image of new practices is important for recruiting practitioners. For example, when the snowboarding practice emerged, practitioners switched from skiing to snowboarding because it was considered to be cool (Shove et al., 2012). In another case, when Nordic Walking was introduced, it was first perceived as silly, but after various marketing campaigns promoted the benefits

for health and well-being, the image of the practice changed and it found more supporters (Shove & Pantzar, 2005).

Second, marketing practices can support more sustainable purchase decisions by redesigning marketing campaigns for environmentally friendly products and services in several ways. A first step is for marketing campaigns to shift their focus from the price that a customer pays for a sustainable product or a service to the total cost to the customer in the long run (Peattie, 2001;2005). Many environmentally friendly products have higher purchase prices than conventional products (e.g., light bulbs, hybrid cars), but in the long term many are more cost-effective, which needs to be communicated to the consumer. In the case of antifouling, some sustainable solutions represent larger initial investments but are cost saving over time. For example, for a 4 to 6.5-meter boat, a Cleanboat hull cover costs 6495 SEK (650€), but it can be used for 10 years. The longevity and resultant eventual cost savings of this product is thus important to communicate to boaters in order to illustrate that sustainable solutions can also be budget-conscious.

Third, marketers should create advertisements for sustainable products that appeal to the majority of consumers. Thus, instead of advertising the utilitarian functions of sustainable products, it is beneficial to promote the experiences and emotions that are likely to be experienced during the consumption of sustainable products (Dhar & Wertenbroch, 2000; Voss et al. 2003). Companies producing sustainable products can benefit from focusing on the hedonic experiences possible with their product. For example, Tesla has successfully marketed the fun and aesthetics of an electric vehicle (Diane & Väistö, 2016). There are several ways in which marketing practices can be helpful to normalize a sustainable antifouling practice and thus reconfigure the current practice. For example, instead of advertising a sustainable antifouling product as an 'alternative', as illustrated in paper 5, advertisements may focus on compelling product attributes, such as environmental friendliness, effectiveness, and ease of use, to stimulate consumers to use the sustainable product. For example, the boat washer could be advertised with a stronger emphasis on the fact that the boater avoids the hard physical work of painting when using the boat washer. The use of the term 'alternative' in advertising for biocide-free paint is problematic, as it implies that another choice is available. Instead, marketers should promote the sustainable products as the 'new normal' for doing antifouling.

Fourth, marketing practices can be supportive in recruiting new practitioners, such as by offering free or reduced-price products or free trial periods. For example, to incentivize people to commute by bus instead of driving to work, free one-month bus cards were given out to 400 Danish car-driving commuters.



Through this initiative, an increase in bus travel occurred during the trial period (Thøgersen, 2009). In the case of antifouling, the Bosö boat club offer a self-service boat wash for the very low price of 50 SEK (5 Euros) per wash to the boater instead of 860 SEK (86 Euros) as offered by other providers. The reduced price combined with the opportunity to avoid the physical work of painting made the boat wash popular among the boaters.

Fifth, marketing practices can support the reconfiguration process of unsustainable practices by supporting the development of competences that are necessary to integrate new products into existing practices. When the Thermomix (a multi-food processor) was introduced, it made cooking easier, but it needed to be taught to consumers. TV cooking shows and home demonstrations have helped to transfer knowledge about the use of the product (Truninger, 2011). Additionally, in the case of antifouling, it is significant that producers of sustainable products communicate how their products need to be used in order to achieve efficient results. For example, consumers need to be informed of how often they should use the hand scrubbing tool Scrubbis to ensure a clean boat hull. Several communication forms exist, such as an SMS service that informs boaters when it is time to use the boat wash. My study has revealed that sustainable products often function differently than conventional antifouling paints, and thus consumers require additional information to use the product or service properly. If they are not provided with this information, there is a risk that consumers will not use the product or service correctly, potentially resulting in inefficient marine fouling protection and subsequent consumer dissatisfaction with the product or service.

Sixth, changes in supply practices can support the reconfiguration of practices by offering sustainable and unsustainable products and services at the same store and facilitating the access to sustainable products. Sustainable products are often separated from the “main” market and are offered on niche markets, as shown in Paper 4. As a result, consumers are seldom offered the choice between sustainable and unsustainable products directly in the same store. In the case of antifouling, I found that biocide-based paints were available in a wide range of retailers, such as boat supply shops, hardware stores and even some grocery stores. In contrast, boaters have limited access to sustainable solutions, as their distribution is largely restricted to boat fairs or producers’ websites. As Paper 4 describes, these supply practices have led to the creation of multiple related markets with different arrangements of suppliers and consumers, making it difficult for many boat owners to have practical access to the available sustainable antifouling solutions.

Moreover, there is a relationship between regulation and marketing practices that needs to be stressed. Regulating and forbidding unsustainable products,

such as toxic paints, also interferes with advertising. If toxic products are forbidden, they cannot be promoted or advertised. Another option would be for legislation to restrict advertising for toxic paints to some degree, as in the case of tobacco promotions (Cohen et al., 2011). According to regulations in Sweden, high copper content paints are only allowed on the Swedish West Coast. However, the advertising of the paints, such as in magazines, is not targeted only to boaters in this region. Therefore, promotional texts and advertising reach East Coast boaters, who are likely influenced by these messages. Thus, the combination of non-targeted advertising and the overall availability of West Coast paints all over Sweden likely contribute to an overuse of high-copper-content paints.

## **Infrastructures**

The fourth reconfigurator, infrastructure, can be broadly defined as “the basic physical and organizational structures and facilities needed for the operation of a society or enterprise” (OED, 1998, p. 937). Some infrastructures are massive technological systems and easy to detect, such as railways (Shove et al., 2015), whereas others are hidden and serve as the background for other types of work (Star, 1999). For example, electricity is an infrastructure that is needed for cooking practices. Infrastructural arrangements have the potential to shape practices (Shove et al., 2015). For example, for the practice of driving, the driver needs a car but also other material infrastructure like roads, traffic lights, parking space, gas stations, and so on (Shove et al., 2015).

On the one hand, infrastructures can support reconfiguration practices by enabling and supporting the purchase and use of environmentally sustainable products and services (Buhr, 2003; Fuenfschilling & Truffer, 2014; Seyfang, 2005; Spaargaren & Oosterveer, 2010; Torrisi, 2009). For example, the innovation of electric cars was not sufficient to support the practice of using them without a network of charging stations. Without the infrastructure behind the innovation, the use of the sustainable product would be hindered.

On the other hand, missing infrastructures can hinder sustainable practices. For example, Spotswood et al. (2015) have used a practice theoretical approach to understand why cycling to work is rather unpopular in the UK. In their study they revealed that especially female respondents were missing infrastructures like showers at work and for that reason were continuing to commute by car, as cleanliness at work is culturally expected and considered important. Besides showering possibilities, other infrastructural arrangements like cycling lanes and safe bike storage were also important to the potential cyclists (Spotswood et al., 2015). Policy makers in Manchester, understanding that infrastructures are important to encourage cycling in commuting practices, have built cycling

hubs in the middle of the city that provide bikers with bike storage facilities, lockers, and showers, as well as maintenance and service. In Manchester, 18 of these cycling hubs have been built ([www.tgfm.com](http://www.tgfm.com)).

In particular, the proximity of infrastructures to the practitioners can facilitate a reconfiguration of practices. Studies on consumers' recycling and sorting of waste emphasize that the convenience and proximity of recycling facilities and services play an important role in enhancing and encouraging consumers' recycling practices (Holmberg et al., 2016; Kang & Schoenung, 2005; Thøgersen, 1994; Ylä-Mella et al., 2015; Yli-Kauhaluoma et al., 2013; Wang et al., 2011). In the case of antifouling, the proximity of the boat wash played an important role in facilitating its use. In the Bosö boat club, the boater does not need to travel long distances to the boat wash, which facilitated its use by making it convenient for the boater.

## **Reconfiguration of an environmentally unsustainable practice**

The empirical context of antifouling shows how eco-innovation, regulation, marketing and infrastructures co-constitutively support the adoption of new sustainable antifouling versions. The example of the boat washer in the Bosö boat club (Lidingö, Stockholm) illustrates the interplay and importance of these re-configurators. Bosö boat club has 800 members and 670 boats.

In the case of antifouling, the innovation process has already been initiated and the eco-innovation of the boat washer was already in place. As discussed in chapter 6, one of the important configurators sustaining the linkages and keeping the practice of painting with biocide-based paints in place was that of the traditions and routines connected to painting. This particular linkage has been disrupted by regulation in two different ways. First, the Bosö boat club in Stockholm established 2014 a new environmental plan including the mission of the boat club “no paints on boat hulls by 2020”. One year later the ban of paints was implemented in the boat club rules. By forbidding the use of biocide-based paint from the boat club (Paper 3), the ‘bad element’, unsustainable material element paint was removed. Breaches of these boat club rules are sanctioned through exclusion of the boater from the boat club, making the regulative measures more effective. Additionally, by banning toxic paints from their boat club, the boat club increased the awareness of toxic paints and started a process of creating new social norms around antifouling, where antifouling measures can be carried out without the use of toxic ingredients.

Second, subsidies for environmentally sustainable products have played an important role. Forbidding painting with biocide-based paints in a boat club is difficult if no alternative is offered by the boat club to replace the unsustainable option. Therefore, subsidies from the Swedish government were important, as they enabled boat clubs to invest in a boat wash machine to offer boaters a more sustainable alternative to painting. A regular boat wash machine costs 2 million SEK (200,000€), and the boat club received 600,000 SEK (60,000€) in financial support. Through the state subsidies, the boat club could afford to provide the necessary material infrastructure for the boat washer directly in the boat club. The proximity of the infrastructure of the boat wash is essential to the boaters, as the boaters did not want to travel a long distance to the boat washer due to fuel costs, which could potentially make the total cost of using the boat washer higher than that of painting.

Furthermore, specific marketing practices, like offering the boat wash for a reduced price, supported boaters' use of the boat wash. Members of the Bosö Boat club are trained to operate the boat wash by themselves and only need to pay 50 SEK (5€) to wash a seven-meter long boat. In comparison, other (commercial) providers that only offer the boat wash as a service charge 860 SEK (86€) for a single wash for a seven-meter boat. The majority of boat owners have switched to the boat wash, because it is much cheaper than buying antifouling paint, saves them the physical work of painting and at the same time has positive effects on the environment.

In 2018 less than five boats out of 650 boats in total were painted with biocide-based paint. There is one exception in Bosö boat club that allows boaters to paint their boat. If boaters travel to areas, where the water salinity is higher, such as Germany, West Coast of Sweden and Norway they are allowed to paint their boat hull with antifouling paint.

This example shows that the combination of the *eco-innovation* in connection with *regulation* - state subsidies and boat club rules forbidding painting-, *marketing practices* -the reduced price for the boat wash - and the provided *infrastructure* directly in the boat club, have supported the circulation of sustainable antifouling services and reconfigured the unsustainable antifouling practice. Making sustainable alternatives available and at the same time penalizing the use of paint have played a central role in supporting the use of the boat washer. This suggested framework might not be fully generalizable to other study contexts, and the re-configurators might vary, but the idea of a combination of several re-configurators can be applied to other studies.



## Chapter 8: Concluding discussion

The purpose of this thesis has been to explore the (re-)configuration of environmentally unsustainable practices in the case of antifouling. Three research questions have guided this exploration:

1. What are the different versions of antifouling practice, of what elements do they consist, and how are they linked?
2. What configurators stabilize the linkages between the practice elements of environmentally unsustainable and sustainable antifouling practice?
3. How can the reconfiguration of environmentally unsustainable antifouling practices into more sustainable practices be facilitated?

Regarding the first question, this thesis has identified and presented six different versions of antifouling practice (painting with biocide-based paint, painting with biocide-free paint, using boat washers, using hand-scrubbers, using hull covers and using boat lifts). These versions of antifouling practice have been analyzed in terms of their composing material, meaning and competence elements and their linkages. By comparing the different versions of the practice, it became apparent that some versions are very similar in their composition of practice elements, whereas others were very distinct from each other. This knowledge has implications for the reconfiguration of unsustainable practices, as it makes it possible to understand why some practices are easily reconfigured whereas others might be more difficult to reconfigure.

Regarding the second research question, the thesis has explored the configurators sustaining and preserving the linkages between the practice elements, especially for two particular versions of practice: painting with biocide-based paint and boat washing. Building upon the understanding of the specific practice element compositions and additional knowledge gathered through studying the context in which antifouling practices are embedded (such as marina infrastructures, the market for antifouling and the legal landscape), I was able to theorize about the linkages between the practice elements of the environmentally unsustainable practice of painting with biocide-based paint and provide answers to the second research question.

Regarding the third research question, the thesis has developed a framework that presents opportunities for facilitating the transition from an environmentally unsustainable practice to a sustainable practice by highlighting four re-configurators on the basis of the case of antifouling: eco-

innovation, regulation, marketing practices and infrastructures. Eco-innovations concerning the product innovations include the manufacturing of commodities with a reduced impact on the environment, for example by using recycled material or reducing toxic ingredients in products. Marketing practices include activities promoting environmentally sustainable products and services as well as the exchange of these offerings. Infrastructures are understood as the basic material infrastructures that can facilitate the circulation of sustainable goods and services (Buhr, 2003; Torrisi, 2009). Only the combination of these four re-configurators can facilitate the reconfiguration of environmentally unsustainable practices.

By using the empirical context of antifouling I provided an increased understanding of practice dynamics related to the reconfiguration of environmentally unsustainable practices, which has strong implications for re-orienting consumer behavior in a more sustainable direction. The created knowledge about practice dynamics

## **Implications and contributions**

This following section offers a discussion of implications and potential contributions of this thesis with regard to sustainable consumption, practice theory, marketing and policy. These implications and contributions emerge both from the individual papers and from the collective findings and analysis of this cover text.

### ***Implications for and contributions to the field of researching sustainable consumption***

With regard to the area of researching sustainable consumption, this thesis offers three implications and contributions. First, this thesis contributes to the area of sustainable consumption by suggesting a combinational approach to pave the way towards more sustainable practices, defined as the inclusion of environmentally sustainable products and services in antifouling practices. As we have seen in several cases, the introduction and offering of sustainable products alone does not automatically lead to the purchase of these products nor to the integration of these products and services in existing practices (Spaargaren, 2011). The presented framework highlights the importance of addressing a number of re-configurators (eco-innovation, regulation, marketing practices and infrastructures) at the same time to achieve a disruption of stabilized linkages and to enable a reorientation of practice elements. While it is reasonable to assume that different empirical contexts would foreground different elements and relations of the framework I discerned within my context of antifouling, the framework suggests the idea of



using a combination of re-configurators rather than concentrating on one re-configurator. Consequently, it is my contention that this framework can be a helpful thinking tool for other empirical contexts and can contribute to sustainable consumption.

It is important to point out that, depending on the context, some re-configurators might have more relevance than others. In the presented framework, I emphasize that regulation matters, as it is an important re-configurator in the case of antifouling. The legal landscape and policy measures in place differ from country to country, which might limit the authority of individual consumers (Keller et al., 2016). However, there are also other cases where regulation is not important or plays only a minor role. By looking at the example of showering, it becomes obvious that regulative measures do not impact daily showering. Instead, a change of technological and infrastructural settings in the bathroom, in combination with the change of the cultural expectations concerning cleanliness with regard to showering every day, affected the reconfiguration of the practice of showering on a daily basis (Hand et al. 2005). Conversely, other cases have shown that the regulation of material elements can lead to a so-called '*rebound effect*' (Sahakian & Wilhite, 2014). For example, when traditional light bulbs were replaced with compact fluorescent lamps (CFLs), the CFLs' decreased lighting power led consumers to purchase and use more lamps than before to achieve the same lighting level. Thus, even though the unsustainable material element was exchanged with a more sustainable material element, the change still had negative effects on the environment.

Second, this thesis also illustrates the relevance of studying antifouling practices and market practices in combination to understand why certain environmentally unsustainable practices persist. Papers 4 and 5 illustrate how marketing practices, such as advertising and the supply of sustainable products and services, contribute to maintaining the unsustainable practice of painting with biocide-based paint. There is a growing research interest in combining market practice and practices related to consumption (Brembeck et al., 2015; Hagberg, 2016; Shove & Araujo, 2010). The incorporation of these two practice perspectives has made inroads into sustainable consumption. For example, Stigzelius (2017) combined market and consumer practices to understand the formation of consumer agency to go green in food practices. In her study, she illustrates how different market actors and different material devices can encourage consumers to move toward greener practices. More research incorporating both practice-oriented approaches can help us to gain new insights into various aspects (actors, conditions) impeding sustainable consumption.

Third, this thesis draws attention to the importance of convenience experiences for the continuation of unsustainable as well as the adoption of new sustainable practices. Paper 2 illustrates the significant role of teleoaffective structures in practices, which can be understood as the emotive ends and aspirations of practices (Schatzki, 2002). Paper 2 showcases that unsustainable antifouling practices are sustained and preserved even though there are other practice alternatives available which are potentially timesaving, less labor intensive, or superior in other ways. Key factors for the continuation of unsustainable practices include the social interactions and emotional aspects tied to the unsustainable practice. Looking more deeply into the convenience experiences of a group of practitioners can help to understand why particular practices are not adopted by practitioners. More research is needed on factors influencing or hindering the adoption of sustainable practices.

### ***Implications for and contributions to the field of practice theory***

By mobilizing a practice theoretical approach to explore and illustrate the (re-)configuration of environmentally unsustainable practices in the case of antifouling, my findings and analysis in the individual papers and in this cover text offer three vital implications and contributions.

First, this thesis contributes to current literature in practice theory in marketing as it shows the importance of a detailed analysis of different versions of practice for the reconfiguration of practices. This study provides a thorough analysis of a practice-as-entity (antifouling practice), with all the different versions of practice and their practice elements. Previous research has touched on versions of practice. For example, Woermann and Rokka (2015) used the example of free skiing to illustrate different versions of the practice. However, what is notably de-emphasized in their study is a detailed analysis of versions of practice with the practice elements shaping the practice. Identifying the different practice elements of the various versions of antifouling has enabled me to draw a comparison between the shared or distinct practice elements between the versions of practice and, subsequently, their role in the reconfiguration of the studied practice. Shared elements between practice versions may indicate that the versions of practice are not so diverse from each other in terms of the elements composing them. By contrast, distinct practice elements indicate a considerable change between the versions of practice and might result in a bigger adjustment for the consumer. Consequently, it is reasonable to expect that transitions from an existing practice to a new practice where several elements are shared might be easier for consumers than a switch to an entirely new practice with totally new practice elements involved. New practices might require new practical skills and knowledge and new material elements for the performance of an entirely new practice.

Second, my thesis unfolds the under-theorized concept of linkages between practice elements. Previous studies have touched on the notion of linkages and studied how linkages were shaped and broken by studying historical developments of practices over time, such as driving and smoking (Blue et al., 2016; Shove et al., 2012). Instead of studying the making and breaking of linkages retrospectively, this thesis studied linkages within a current empirical context in order to present a more detailed account of the forms the configurators of linkages can take. Future research that explores these linkages and configurators in different empirical settings is likely to contribute further to our understanding of the differential role of these configurators in stabilizing linkages. Consequently, the proposed framework contributes by offering an informed perspective for studying these issues in other contexts. More research is also needed to study the various possible forms of configurators that shape linkages. The configurators might vary depending on which practice is studied. For example, the linkages of particular food practices, such as eating meat, might have different configurators from those seen in antifouling painting practice. An expansion of my identified catalogue of configurators of linkages between practice elements could thus be beneficial for future research.

Third, in addition to illuminating the configuration of linkages, this thesis offers insights concerning the ‘stickiness’ of linkages between practice elements. The concept of stickiness refers to keeping the linkage between practice elements in place or ‘glued’ to each other. By investigating the linkages, this study illuminates various configurators making the linkages sticky, thus stabilizing and maintaining them. Multiple linkages between two elements indicate that the link is harder to break and has important implications for the reconfiguration of practices. This study thus serves as a starting point in exploring the stickiness between practice elements in the specific case of two versions of antifouling. Additional studies on the stickiness of linkages are needed.

Fourth, this thesis introduces the concept of re-configurators, which refers to the various aspects (actors, conditions, context) that impact the reconfiguration of practices. Four different re-configurators have been identified. Previous research has studied the reconfiguration of practices in other contexts, such as music consumption (Magaudda, 2011) or from a sustainable design perspective (Kuijer, 2014) but has not identified specific re-configurators that impact this process. This thesis shows in an empirical case how the reconfiguration of practices can be enabled. The presented model, with the introduction of re-configurators, can be beneficial to adapt to other research contexts, either within the field of sustainable consumption or in other practice-related contexts where a change in practices is desired.

### ***Implications for and contributions to marketing***

With regard to marketing, this thesis offers the following implications, which derive from elucidating how the market for antifouling products and services is constructed and from the market practices that contribute to shaping the market for antifouling products and services.

First, this thesis contributes to marketing by bringing insights into the adoption of new products in practices. Marketers need to understand that the introduction of a new or innovative product on the market is not only about replacing an unsustainable product with a sustainable one. Rather, there are certain dynamics tied to this process. The integration of new sustainable products into current practices might interfere with existing practices, and for that reason the products might not be adopted by the consumers. For example, changing from painting to using a hull cover results in considerable changes in the antifouling practice for the boater. For example, by switching to a hull cover, the boater misses out on social interactions with other boaters while painting the boat hull. This was one of the reasons why some boaters did not want to use a new sustainable product. This knowledge can be helpful for marketers to understand why some products do not succeed on the market.

Second, this thesis addresses the particularities of advertising for promoting the use of more sustainable products. Paper 5 has illustrated that advertising strategies for sustainable and unsustainable antifouling products were very distinct. While unsustainable antifouling products were advertised on an emotional level, highlighting the hedonic experiences possible with toxic products, sustainable products' advertising addressed the functionality and environmental friendliness of the products. Creating awareness of these distinct marketing strategies can help manufacturers, marketers and brands of sustainable products change their advertising strategies and incorporate illustrations and verbal descriptions emphasizing the possibility of hedonic experiences with green products in order to increase the success. For example, Tesla car advertisements have advertised the luxury and hedonic characteristics of the car instead of promoting the sustainability aspects of the car and have been very successful in increasing sales (Martin & Väistö, 2016). Thus, advertising the experiences and emotions that are likely to be experienced during the consumption process of sustainable products instead of their utilitarian functions can be a successful marketing strategy, especially for green products (Dhar & Wertenbroch, 2000, Voss et al., 2003).

Third, in paper 2 I illuminate and expand the notion of convenience by illustrating how convenience experiences are created. In traditional marketing, the notion of convenience is connected to resource-saving (e.g., time) benefits that are reflected in the price (Berry et al., 2002; Farquhar & Rowley, 2009;

Kelley, 1958; Kotler & Zaltman, 1971). Consumers often judge a product, service or practice based on whether it is convenient. However, we know relatively little about how convenience experiences are shaped. In paper 2, I have shed light on how convenience experiences are shaped and identified two types of convenience, conservative and progressive convenience. The knowledge gained from studying convenience experiences connected to the use of sustainable products can help marketers to comprehend how and why convenience experiences are created. This is especially helpful for marketers to tailor products, brands, and market infrastructures that can create convenient sustainable consumption practice experiences.

Fourth, my thesis offers a development of the concept of market boundaries by identifying five types of market boundaries: *place, time, offering, actor* and *mode of exchange*. Market boundaries have the nature of dividing markets into smaller entities where certain products and services might be excluded from the “main” market (Finch & Geiger, 2010). Such developments can have implications for sustainable consumption. Paper 4 shows that, depending on the place of purchase and mode of exchange (retail stores, online stores, boat fairs, service locations like boat washers or informal exchange possibilities), the supply of sustainable antifouling solutions varies to a strong degree, which could minimize the choice of sustainable antifouling solutions available to the consumer. In the case of antifouling, consumers need to make an extra effort to purchase the majority of biocide-free antifouling techniques. Paper 4 illustrates that sustainable products are often offered only in niche markets and in particular places, such as boat fairs and online stores or the producers’ websites. In comparison, the unsustainable biocide-based paints are offered in all types of modes of exchange and therefore are much more easily accessible to boaters. Depending on where the boaters decide to buy antifouling products, the availability of sustainable and unsustainable products might vary to a strong degree. Creating awareness of differences in supply and product presentation can be helpful for producers of sustainable antifouling solutions who want to increase their sales. Instead of offering sustainable products on niche markets, the producers should offer them in the mainstream market, where they will appear together with the unsustainable products and services to increase the consumers’ awareness of the existence of sustainable alternatives.

### ***Implications for and contributions to policy makers***

Drawing upon the findings of my papers and the cover text, I have identified two potential contributions which could be helpful for policy makers.

First, this thesis contributes to public policy by proposing a combinational approach to facilitate the reconfiguration of practices. Traditional policy measures directed to informing boaters and creating awareness about sustainability issues connected to antifouling have not had the desired outcome in the form of substantial change in current painting practices. Combining a variety of re-configurators can increase the chances of achieving such a change.

Second, identifying and pointing out the specific re-configurators of environmentally sustainable practices for antifouling is another practical contribution of this thesis. Policy makers can benefit from knowing the specific re-configurators and their linkages, because this knowledge can help to coordinate and support the transition from the traditional solutions of antifouling towards more sustainable forms by providing the structural setting for the transition. This study has especially shown the importance between regulation (subsidies) and the provision of infrastructures (boat washers). One approach could be to increase funding possibilities for sustainable antifouling methods, which will increase sustainable alternatives offered to boaters, and highly probably increase the use of sustainable services, as the example of the boat washer has shown. Providing boaters with an alternative to painting directly in the marina can also encourage or facilitate the use of sustainable antifouling methods like boat washers.

Additionally this study illuminates the potential a practice theory lens has for policy makers. Using a practice-theoretical perspective on environmental related issues and dissecting the practices into their elements has important implications for policy makers. By learning more about the different elements and their history, policy makers can identify where policy interventions can influence current practice elements of environmentally unsustainable practices. One approach could be to forbid the 'bad elements', such as biocide-free paints, which are part of current unsustainable practices (Shove, 2014). By forbidding biocide-based paints the circulation of the unsustainable material elements is restricted.

## **Implications for future research**

Drawing on the implications and contributions discussed in this chapter, I propose some specific suggestions for future research.

In my study, versions of a practice have been found to play an important role in understanding practice dynamics, and this finding is highly likely to be relevant for future studies. Some previous studies have touched on versions of practices, such as Woermann and Rokka's (2015) examination of versions of

free skiing and Shove and colleagues' (2012) exploration of versions of driving. Instead of studying the practice as an entity, this thesis shows that studying versions of practices can provide us with new knowledge, such as information regarding shared and distinct elements between versions of a practice and their relevance for the reconfiguration process. To date, there is a lack of studies in practice theory that use versions of practice as a point of departure and investigate them in detail.

This thesis invites future research to further explore the linkages of practice elements. Many studies in practice theory have focused on dissecting practices into their elements (Magaudda, 2011; Schau et al., 2009; Shove & Pantzar, 2005; Warde, 2005; Woermann & Rokka, 2015) instead of studying the linkages. There is some emerging literature on linkages (Kuijjer, 2014; Schatzki, 2002; Shove et al., 2012), but the notion of linkages is still under-theorized. My thesis provides insight into the linkages between practices elements and theorizes about the configurators that shape and stabilize those linkages. However, in order to learn more about the specificity and forming of linkages and the configurators shaping them, more empirical studies are needed. Additional studies could reveal if the configurators of linkages are similar in other studies (e.g., regulation) or if new configurators can be detected.

Additional research on re-configurators is needed, because this thesis has only started to theorize about reconfigurations, the forms they can take and their possible role in supporting the transition from unsustainable to more sustainable practices. Future empirical studies might detect other re-configurators that play an important role in other contexts. Alternatively, with time and further development, other re-configurators might be identified as important for reconfiguring practices, while some previously identified re-configurators might play a minor role in the future.

More research is needed on the adoption of practices and the role convenience plays in this process. Often, new material elements for practices are provided, but consumers do not integrate them into their practices. As described in Paper 2, particular convenience experiences have hindered the adoption of sustainable practices. Past research has recognized that convenience experiences can take on different forms (Yale & Venkatesh, 1986), but we have little knowledge about convenience experiences in practices and how these experiences are shaped. Therefore, more empirical studies on the convenience experiences of groups of practitioners are needed.





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