RESPONSEABLE

A critical review of existing knowledge

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A critical review of existing knowledge

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Introduction

How can ocean literacy lead to behavioural change supporting sustainable ocean management? This is the question that the ResponSEAble project has been answering through analysis, communication products and information to European citizens.

The goal of ResponSEAble has been to increase literacy about the links between Europeans and the oceans on which they depend. The project began by looking at what we know about the current state of the oceans, the direct or indirect effects of economic activities and people's perceptions and understanding of this connection. In this way, the project sought to identify knowledge gaps that need to be filled to expand ocean literacy in Europe.

"No matter where they live, Europeans are connected to the ocean," said Pierre Strosser (ACTeon), who coordinates the project. *"Europe is surrounded by the ocean and these bodies of water are used for wind farms, oil and gas exploration, transportation and recreation. These connections touch the lives of the people who live along coastlines and make their living from the sea, just as they affect people who live in the centre of the continent."*

1. How ResponSEAble contributes to changing behavior?

1.1 Ocean Literacy in ResponSEAble

To be "ocean literate" means to be aware of the importance of the ocean, to understand its influence on humans, and the influence humans have on the ocean. It means knowing how to protect the ocean, and to seize the opportunities it offers. Overall, an ocean literate person is a person who must understand the essential principles and fundamental concepts of the ocean and its resource, be able to communicate them, and be able to make informed and responsible decisions regarding the ocean and its resources.

The underlying assumption of ResponSEAble is that investing in literacy will help change how Europeans view their relationship with the ocean. This will pave the way for changes in behavior which will ultimately reduce pressures on coastal and marine ecosystems. By generating greater public debate and knowledge, ResponSEAble will assist all citizens and sectors of European society in making more informed choices that will help secure healthier and more sustainable oceans.

"*Our main goal was to understand the complexity of currently told narratives about the human ocean interactions to identify knowledge gaps and close them by target group tailored ocean literacy products*", said Heidrun Fammler (Baltic Environmental Forum), a project partner. "*The project has brought us as communication brokers a new understanding of the importance of looking at the whole value chain of actors and activities along an environmental issue and to carefully decide what knowledge to communicate to whom and how.*"

With 70% of the world's surface being covered by the ocean and much of the food, energy and transportation routers being directly linked to the ocean, ResponSEAble attempted to

answer some fundamental questions about European citizens regarding their relationship to the seas, including:

- Are Europeans aware of all these connections – to sometimes far away seas?
- How much do they know, and do they have the "right" knowledge?
- How can we encourage them to take interest in the ocean in their daily lives and to treat it with greater respect and understanding?

1.2 DAPSIWR: Developing the ResponSEAble analytical framework

The DPSIR (Drivers, Pressures, State, Impact and Response) causal framework was initially chosen to help better expand upon some of the above-mentioned questions and was subsequently expanded to also include *Activity* and *Welfare* and to better address specific activities within the framework, resulting in DAPSIWR (Figure 1).

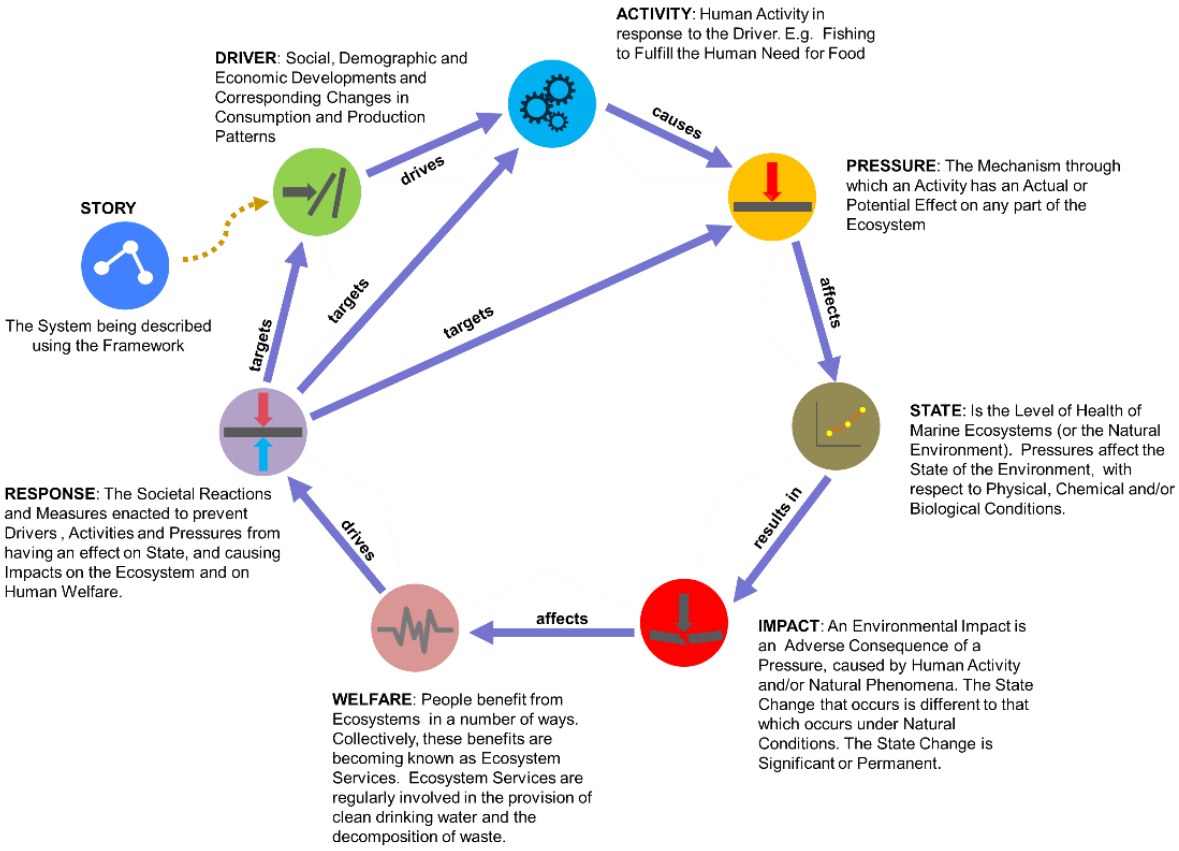

Figure 1: DAPSIWR Framework

2. Key stories

As a way of demonstrating how European citizens affect and benefit from the ocean and how increased ocean literacy might provide support, the project focused on six ocean issues that became ResponSEAble´s Key Stories.

It was essential that the Key Stories captured focus areas that could (i) serve as strong examples of human and ocean connections, (ii) were relevant in a European context, and (iii) could be applied in the development of ocean literacy products. Based on an evaluation of the European Union´s Marine Strategy Framework Directive (MSFD) Descriptors, the EU Blue Growth Strategies as well as the relevant European Regional Seas Programmes, the following six Key Stories were chosen:

i. Eutrophication and agriculture (Baltic Sea),
ii. Ballast water and invasive alien species (the Mediterranean Sea)
iii. Sustainable fisheries and aquaculture (EU Atlantic Ocean),
iv. Microplastics and cosmetics (EU-wide),
v. Coastal tourism (the Mediterranean Sea), and
vi. Marine renewable energy (EU-wide).

The Key Stories became the context in which the project could evaluate communication gaps and identify target audiences to receive new and specific ocean literacy outputs. They also set the frame in which the effectiveness of the new outputs was assessed by behaviour change analysis with diverse audiences.

2.1 Results of the key story analyses

While all Key Stories were analysed, there were four that yielded clear results relating to the application of the DAPSIWR framework: i) Eutrophication and agriculture, ii) Ballast water and invasive alien species, iii) Microplastics and cosmetics, and iv) Coastal tourism. These four key stories and the results of their analyses are described in detailed below. A summarized description of the remaining two Key Stories (Sustainable fisheries and aquaculture and Marine Renewable Energy) can be found in the Annex.

2.2 Key story: Eutrophication and agriculture

2.2.1. Background

Over 95% of the Baltic Sea is affected by eutrophication and agriculture is one of the main sources of the nutrient input. These disastrous environmental conditions of the Baltic Sea have been known for over 40 years and numerous regulations to combat eutrophication have been implemented. However, the goal expressed by the governments to achieve a Good Environmental Status (GES) by 2020 has failed. Therefore, eutrophication remains the biggest threat to the Baltic Sea and urgent action is needed.

Eutrophication results from the enrichment of water by nitrogen and phosphorus nutrients and causes a general degradation of marine ecosystems, including changes in water quality, harmful algal blooms and reduced oxygen concentrations in bottom waters. It directly effects people living on coastal areas who depend on marine ecosystem services for their livelihood, health and recreational opportunities.

Farming in the Baltic Sea region has gone through structural changes to meet the needs of globalization, economic and population growth. Conventional farm holdings have been replaced by large-scale agricultural enterprises specializing in intensive crop production with high needs for mineral fertilizers and livestock production with challenges in applying large quantities of manure on fields.

ResponSEAble chose “Eutrophication and agriculture” in the Baltic Sea as a key story to highlight the complexity of the agricultural value chain that globalisation mechanisms and consumer behaviour has turned into a pressure chain for the farmers and the environment – and how this has affected the public communication of the topic. From the field to the plate, many business and mediating actors are involved in the agriculture value chain, many of them located well outside of the Baltic Sea Region. Each building block of this chain contributes, directly or indirectly, to agriculture pressures on the environment.

2.2.2. How is the story usually told?

Currently, the narrative of the story of eutrophication is incomplete. It focuses on describing the eutrophication state (e.g. algal blooms leading to oxygen-minimum-zones) and links it to harmful agricultural practises. However, current narratives usually fail to communicate that globalisation mechanisms, the food system and consumer choices are the primary reasons behind the actual agricultural practises. Until now, the main target groups for communications have been private consumers and farmers. Seldom have big players within the food chain, such as retailers and wholesalers, policy and decision makers been involved in the discussions.

2.2.3. How can the story be told differently?

Telling the entire story about eutrophication is crucial to understand different roles and responsibilities of the actors within the system. Globalisation mechanisms, global markets, import and export balances of agricultural products as well as consumption patterns strongly impact land use practises and the different actors that are involved in the food system. Only if these parts of the story are discussed, solutions that tackle the sources of eutrophication can be developed. Evaluating the story within the DAPSIWR framework, allowed for a more holistic view of the issue as well as identifying new actors within the story.

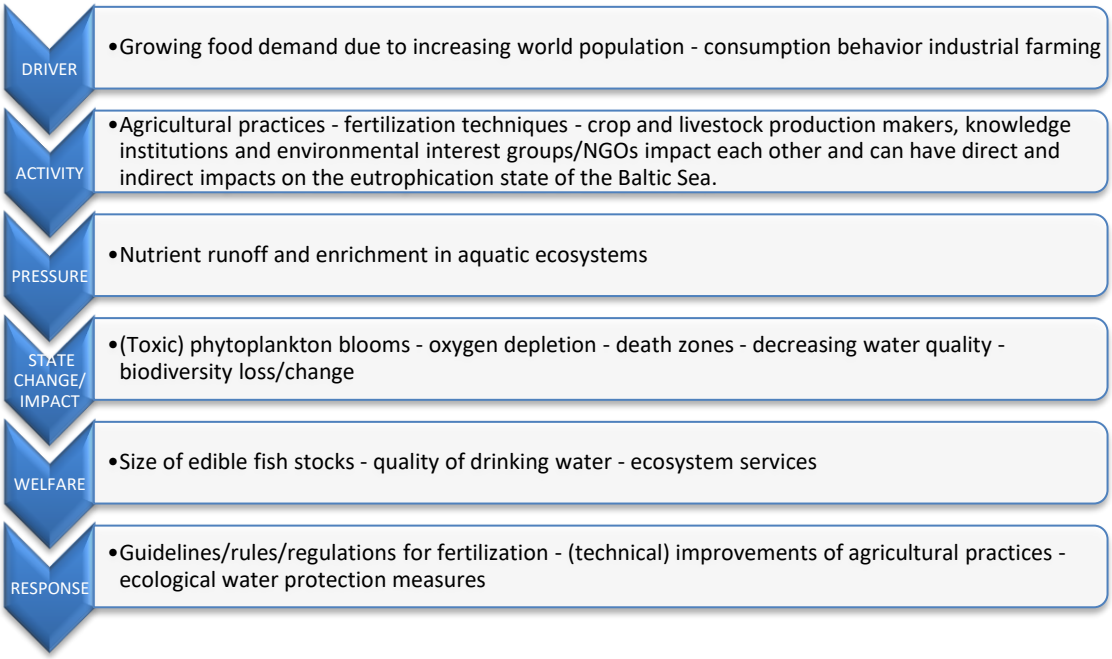

Figure 2: DAPSIRW Framework for the key story Eutrophication and agriculture

To initiate change from the source, the story of eutrophication must be told to all actors of the agricultural value chain, ranging from the farmers to the consumers, from the retailers and wholesalers to the policy makers. All actors must understand the urge and importance of their actions. Telling the story means to improve the narratives by telling the story completely. This includes discussing globalisation, the food system and trends in consumer choices and market responses. However, providing knowledge is not enough to change behaviour. Future ocean literacy must include target group specific social psychological factors that connect actors emotionally to the issue and motivate them to change behaviour and to take ownership for finding the best solutions. Thus, the power of effective communication lies in the combination of improved narratives that are told while addressing the social psychological factors of the target group. Even though all actors must act, policy makers do have key roles within the story and must lead by example: they must improve their communications, facilitate cross-sectoral dialogues and build capacities that find solutions at the source instead of end-of pipe.

Multiple tools and communication products must be produced to launch awareness raising activities and social campaigns. In order to empower target groups to act within their circles of influences, each group should be approached with tailored information to address their viewpoints. Hence, the more accurately target groups are defined (e.g. their needs are known), the more specifically the tools can be designed and the more effective they can be.

The project ResponSEAble developed diverse communication tools targeting consumers, advanced learners, educators and policy makers, and the international social media campaign #KeepTheBalticBlue. Social media as well as radio broadcasting were effective tools for reaching out to large audiences. Networking with media and educators was essential in reaching target groups. Improved ocean literacy can contribute to reducing eutrophication

by raising awareness on everybody's responsibility – be it farmers, retailers, decision-makers or consumers – as basis for a profound change in practices and behaviour throughout the agriculture value chain.

2.3 Key story: Ballast water and invasive alien species

2.3.1. Background

The global trade is growing constantly as goods produced in one part of the planet are transported and consumed in another. Overseas shipping carried out by large vessels, such as cargo carriers, tankers and cruise ships, has therefore become increasingly important in the global economy. Through ballast water of large transport vessels non-indigenous plant and animal species can be transported from one region to another, where they become invasive and compete with the local flora and fauna. Once populations of invasive species (IAS = invasive alien species) are established, they can spread easily, and severely damage the environment, human health and economic interests. To prevent the spread of harmful aquatic organisms through ballast waters, the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWMC) entered into force in September 2017. Applied to its 172 member states, it establishes standards and procedures for the management and control of ballast water and sediments. Challenges to control invasive species include the high cost of ballast water treatment systems: ship owners are reluctant to implement such systems due to technical difficulties and high cost and the effects of invasive species are not necessarily felt evenly between economic sectors. Technical developments to address the problem of invasive species have intensified, focusing on prevention (ballast water treatment systems), early detection (metagenomics) and eradication of invasive alien species (citizens in science).

2.3.2. How is the story usually told?

Currently most of the communication around this topic has been focused on pressure and impacts with very little being communicated on drivers and responses. Most of the information is directed towards the general public. Although not left out, insufficient information reaches maritime transport and service providers, legislators, and technological/engineer actors. In most countries, communication comes mostly from scientists while in some countries news producers and legislators do also communicate. Farmers are mainly approached by NGOs. For the most part, the story is not fully explained, leaving out the welfare impacts, which are the most relatable. As legislation measures seen as a top down approach to management, rather than a solution to a problem, Key actors (e.g. the maritime transport sector) often do not have a positive reaction towards new legislation.

2.3.3. How can the story be told differently?

All actors need to be addressed with the complete story. Communication to different actors should be temporally aligned, so there are no large time-laps between recognizing the problems and developing the corresponding solutions. There is a clear need to identify actors and to communicate ocean literacy for improving attitudes towards behavioural change. The

DAPSI(W)R synthesis allowed for a more in depth review of the connection between the ship´s ballast water (and hull fouling) and invasive alien species by reviewing the current knowledge on the pressures of invasive alien species, the state of the oceans, as well as the impact of the IAS on the local flora and fauna, and human welfare. It also explored different types of responses to the challenges, for example the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWMC), which entered into force in 2017.

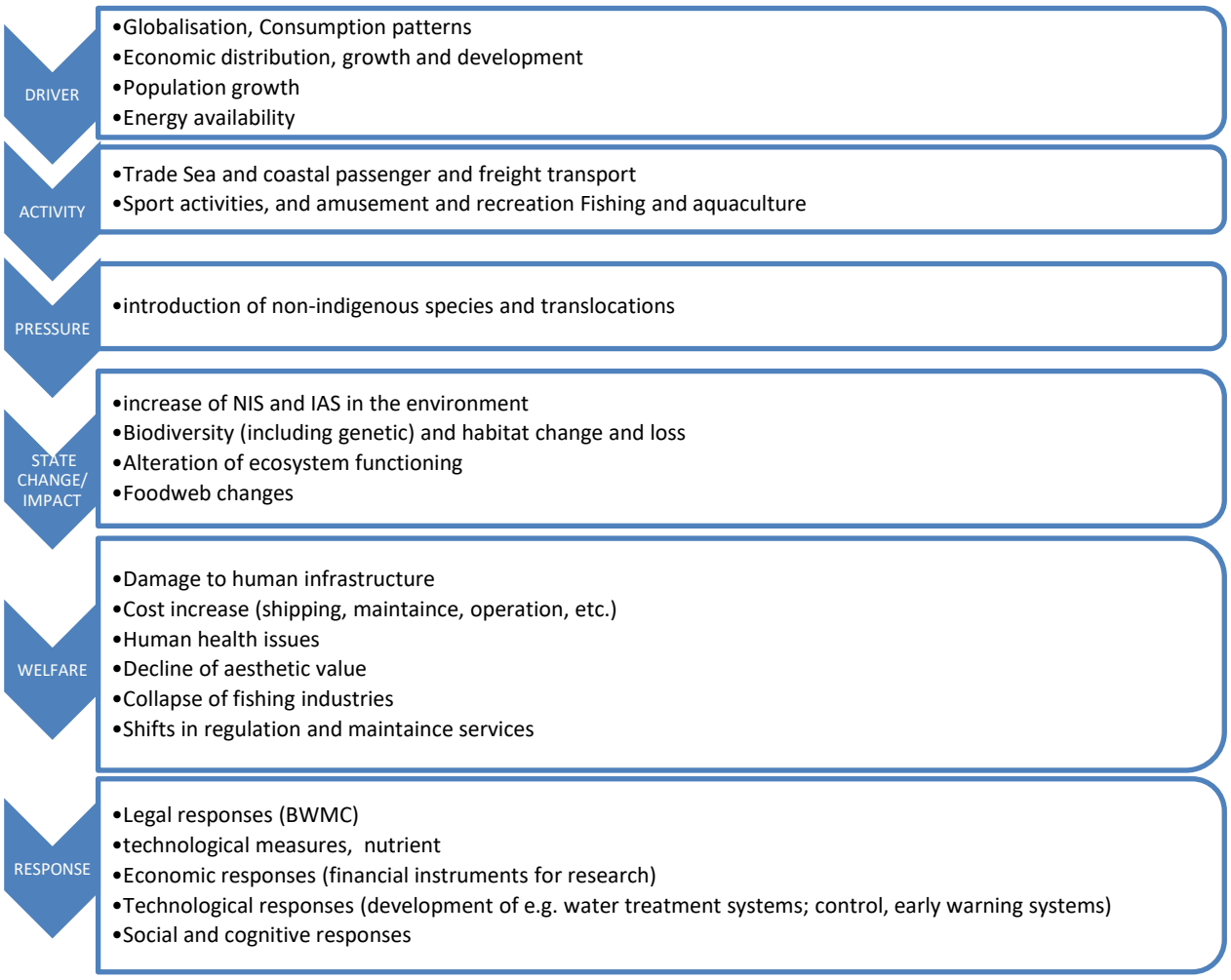

Figure 3: DAPSIRW Framework for the key story for Invasive Species

By using communication tools that are fit-for-actors, there is a higher likelihood of being able to trigger behavioural change. Improved ocean literacy can contribute to reducing alien invasive species by helping ship-owners to better understand the link between ballast water and invasive species and their effects, for better acceptancy of new regulations.

2.4 Key story: Microplastics and cosmetics

2.4.1. Background

Tiny plastic pieces, referred to as microplastics, are used in many personal care and cosmetic products like toothpaste, skin creams, baby products, sunscreen and shaving cream. In some

cases, the plastic pellets only represent a fraction of a percent, whereas in others, it can represent more than 90% of the product. Since most of these products are used in the bathroom, they go down the drain as part of household wastewater. Since wastewater treatment facilities do not “catch them”, a considerable amount of microplastics still find their way to the sea. Here, they can absorb and release pollutants and act as vectors for bacteria and viruses which can be harmful for marine and coastal organisms. Furthermore, microplastics can be ingested by animals and have negative impacts on their growth or feeding behaviour. While research on the impact of microplastics is at its early stages, there are early warning signs about their effects on the environment and human welfare.

Cosmetics are not the only source of microplastics in the oceans. But their use is so common and widespread that cosmetics is a key entry point to raise awareness on the microplastics issue. Initiatives by environmental NGOs and governments to address the risks and impacts of microplastic in the oceans are already under way.

2.4.2. How is the story usually told?

Many initiatives and associations have been established to communicate the topic. To date, almost all the key actors (cosmetic producers, NGOs/knowledge brokers, legislators, researchers, consumers) have been involved in some level of communication. The focus of this information varied, with some focus being on the proportion of MP from cosmetics in relation to other MP sources (people think it is a big source although it is a small one). There is also a strong mix of the communication of other plastics.

In the last 3-5 years, the outreach of the topic was very intense and often incorrect communication of science and false extrapolation of small data sets to large-scale assumption exist. As a result, there has been some dissemination of wrong information/assumptions, myths based on the rush to fill the communication gaps. Hence, there has been much communication around impacts on ecosystem services and the welfare on marine fauna and humans without much scientific evidence. Communications have often been solution oriented, but sometimes with wrong information. But this has resulted in consumer awareness and a shift in consumption behaviour.

NGOs/knowledge brokers/consumers have led the way in asking for legal regulations on state and EU level. As a result, the EU and state have created regulations banning microplastics in cosmetics in some countries such as the UK.

2.4.3. How can the story be told differently?

Overall, the communication efforts to date have been quite effective. Within a short amount of time, this topic has gathered an enormous amount of support and resulted in a number of awareness raising campaigns. These campaigns have resulted in an increasing amount of public pressure on decision makers, which in a short amount of time has resulted in the implementations of new laws/directives. This topic is an very clear example of the positive results of informed decision making.

The DAPSI(W)R synthesis investigated the drivers of the plastic industry and reasoning for using microplastic as additives in cosmetics. It also explored how microplastic from cosmetics end up in the ocean, via wastewater treatment systems. The synthesis also reviewed the current knowledge on the state of the oceans with this regard, and the impacts of microplastic on the environment, animal welfare and human welfare. While the DAPSI(W)R synthesis focused on the specific challenge of microplastic in cosmetics, it also evaluated indirectly the global marine plastics problem as the communications around these topics were often intertwined.

Figure 4: DAPSIRW Framework for the key story for Microplastics and Cosmetics

Improved ocean literacy can contribute to reducing microplastics by:

- strengthening the effectiveness of awareness-raising efforts while widening the support from all actors of the cosmetic value chain
- create a new demand to shift to the production of ocean-friendly products which do not contain microplastic components
- develop and introduce new technologies in water treatment systems that enables to limit the entry of microplastics into nature.

2.5 Key story: Coastal tourism

2.5.1. Background

Traditionally, coastal tourism in Europe has been based so far on the “3S model”: sea, sand and sun. Over the decades, the need to accommodate a growing number of tourists has led to the massive urbanization of portions of the Mediterranean coast, often in a rapid and uncontrolled manner. Nowadays, coastal development continues to expand along stretches of the Mediterranean coast, leading to the development of artificial coastal and marine ecosystems, habitat fragmentation and deterioration. Thus, the success of tourism itself can be a threat to its long-term economic viability. As a blue growth sector, however, it has the potential to create jobs and economic well-being.

2.5.2. How is the story usually told?

The outcome of the DAPSIWR analysis spotlights certain environmental impacts in the ecosystem as well as pressures and pressure exerting activities. It stays within the logic of the framework. Still, driving forces behind activities are not emphasized, therefore these activities appear arbitrary. Also, this narrative figure does not provide actual or potential responses to the problem. It purely raises awareness for the issue, without contextual explanations or potential responses. By this, it stays in the realm of morals, pointing towards certain activities or actors that harm nature, not necessarily us.

The groups which are more active in producing media contents are scientific knowledge producers, national legislators and individual actors. The two societal groups which are more often targeted are the general public and scientific knowledge producers, sometimes policy makers at the national and local level are also targeted.

Drivers and welfare aspects are often neglected by traditional communication. Very few of the key actor groups (e.g. (hoteliers, bars and restaurants, marina managers, leisure activities managers, beach resort managers, construction sector) are usually targeted substantially by media products and contents.

2.5.3. How can the story be told differently?

There is a strong need to highlight the immediate connection between the health of the ocean and welfare aspects. The DAPSI(W)R synthesis explored the connection between the global drive for tourism, the related activities and the potential pressures that they put on the marine and coastal environment, as well as the current state of region, and the impacts on the environment and human welfare. The synthesis also reviewed the responses to the how the

industry, as a Blue Growth sector, has the potential to create well-being and jobs while contributing to the good state of coastal and marine environments.

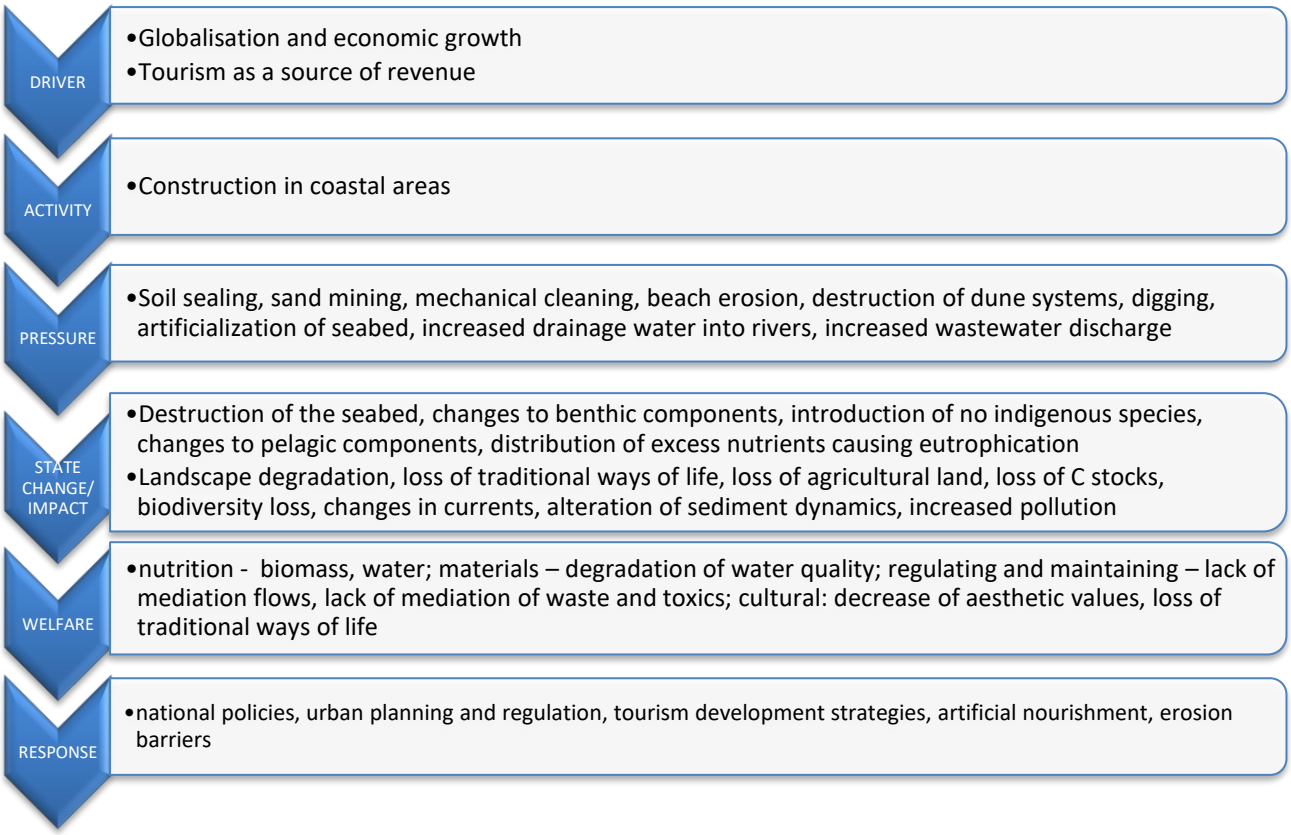

Figure 5: DAPSIRW Framework for the key story for Coastal Tourism

Improved ocean literacy can help guide tourism towards sustainable blue growth by:

- improving coordination among actors of a very fragmented tourism industry – hotel and restaurant owners, beach resort and marina managers, building companies, national and local policy makers and urban planners;
- targeting ocean literacy campaigns for tourists to raise awareness on how they can reduce their environmental effects; and
- informing local actors on tourists' expectations and wishes.

3. Closing the Knowledge Gaps

The project began with a concentrated effort to understand the Key Story topics, identifying focus areas and target groups and eventually developing specific (fit for purpose) products. The overall analysis indicated that traditional narratives of most stories were incomplete, both in terms of content as well as the outreach to the value chain of actors. Knowledge gaps can be grouped into three main areas.

i) Completeness of narrative

A knowledge gap that was evaluated in almost all of the Key Stories were those gaps around the completeness or incompleteness of the narrative being communicated. In most Key Stories, the knowledge that was being communicated most often focused on Pressures and State/Impact. Drivers, Welfare and Response were usually not included in the communications efforts. This skewed messaging focused often resulted in ineffective communication messages which then reduced the ability of the knowledge to impact decision-making. The use of a Knowledge Platform was essential in helping to visual these knowledge gaps. This open access tool would be valuable to be used for future communication efforts to help identify the gaps earlier on in design of the communication plan.

ii) Target groups

The primary knowledge gap around target groups seemed to be that often key target groups were not known or not approached. In some cases, only the end users were targeted while actors in different areas of the value chain were not included in the outreach efforts. As well, another observation that was made while identifying and analysing target groups through questionnaire surveys and media analysis was that the people in the groups of targeted audiences were also included in additional stakeholder groups. For example, when targeting policy makers in a specific country, it is important to keep in mind that these people are more than just policy makers. Each person plays different roles throughout the day, depending on life situation, interests and professional occupation. In the project, it was discovered that a clear distinction of target groups was not possible because roles are sometime overlapping. To make targeted messages to our audience, it was essential to keep in mind that the roles would vary from person to person.

iii) Type of interaction/communication channels

"*The most successful* [communication effort] *was where we communicated our approach, and demonstrated our tools directly to a live audience at conferences, fairs etc*." Project partner

Knowledge gaps in regards to communication efforts were focused on that there seemed to be a lack of different communication tools being used in traditional knowledge sharing efforts. Direct interactions with target groups resulted in more engagement and influence. It was also easier to receive feedback directly from the target group. Many of the project partners felt that people had become more ocean literate after they had discussions and interactions. As direct communication is more demanding in terms of resources, many of the project partners expressed the need for including ocean literacy in school curriculums. A variety of the products that the project produced were educational material and information for teachers and students to support such curriculum.

"*Ocean Literacy should be part of an Environmental Literacy programme , supported by a Systems Thinking approach, which should be part of the educational programme*," Project partner

Other communication channels seemed easier to use but did not have as clear results. Several methods and messages were used to try to reach different audiences and some were more successful than others. From the beginning of the project, the focus was on social media and interactive communication. For larger campaigns, this has been a very successful channel, reaching many people and highlighting different sides of the environmental issues. For social media campaigns, the project involved other organisations, NGOs and agencies to maximise the impact. The results clearly showed that more effort led to wider reach. This was also the best way to launch new products.

4. Conclusions

In order to more accurately address knowledge gaps it is crucial to better understand what knowledge is needed through the value chain so as to better engage with all key actors with appropriate and effective messaging. As well, when creating communication messages, there is great value added if messages are designed with a more holistic approach in mind, including incorporating social science policies, economic incentives.

While ResponSEAble has been making the case for expanding the concept of Ocean Literacy, the environmental crisis facing the world's oceans has received increasing attention in the media and public. The time is right for the next steps and begin to reframe the way we do communications. Through the Key Stories, ResponSEAble has simplified the term *ocean literacy* to successfully communicate ocean-human-interactions to targeted audiences. The results of this effort have made it possible to create outputs and tools that support ocean literacy but had adapted the language used by the audience. ResponSEAble has taken a fresh approach to a scientific topic.

Overall, the project summarized that everyone must act and limit their impact on the ocean. All individuals should be encouraged to share ocean literacy messages and become ocean literate. All European nations, whether coastal or land locked, depend on healthy oceans. It is recommended that future initiatives take a similar approach when addressing ocean literacy. An important overall conclusion from ResponSEAble is that no matter where a person is located, individual actions matter.