

Beach wrack of the Baltic Sea

Stakeholder awareness of beach wrack: A baseline report



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Foreword

Beach wrack – what is it?

There was some debate over the terms used to describe material that is washed offshore by the sea and deposited onto our beaches. Dozens of terms in national languages of the Baltic countries exist and often the various terms are colloquial, some are used interchangeably even on a local level and others in several different countries. The terminology does not seem so important at first glance; however, it plays a major role in the discussion when it comes to processing the material, e.g., with or without litter.

Extensive literature search allows us to identify two terms that are most used: beach cast and beach wrack. Both refer to the material that can be found all over the world in the swash zone, in lines along the foreshore and sometimes at the back of the beach, especially after storms. The amount and composition vary depending on the season, coastal landform, offshore substrates (determining algae/seagrass growth), currents, tidal forces, wind and wave action.

We therefore propose the following interpretation for better understanding our reports: beach cast as an umbrella term for all washed up material consisting of beach wrack as the largest component, terrestrial debris, litter and living animals that inhabit it, but excluding materials such as sand, stones or pebbles. Also, beach wrack as purely the marine organic component of beach cast that originates from the sea, e.g., torn off seagrass, macro- and microalgae, shells, dead fish etc.

Since it is very difficult to collect "pure beach wrack" from the beaches by machines without sand, we additionally refer that this is "collected beach wrack" if this is mentioned relating to the processing in our reports.

“As long as we have to compete with wide, pristine and white catalogue beaches, we have to present our beaches to tourists in the same way” (quote from a German spa manager Markus Frick, Island of Poel). Meeting the public expectations of ‘clean’ recreational beaches is an ongoing challenge for coastal communities. There is no doubt that beach wrack (cf. inbox) as a natural part of coastal ecosystems is often regarded as a nuisance, particularly when it lands unexpectedly and in large quantities on beaches. It can cover beaches for weeks, rotting to a smelly soup that leaches back into the water. Consequently, beach wrack can be an annoying problem particularly to those whose economies rely on beach tourism. During the summer season, it is already being regularly removed as part of expensive beach cleaning routines in most touristic regions along the southern and western Baltic Sea coast. But again, and again, the question is raised: what can be done with all the collected biomass that is invariably at differing stages of decay and comprises of 50-80% sand? Could it be used as a resource rather than being disposed as a waste?

The discussion about beach wrack treatment is not new, having been pursued, mostly on a local basis, during various past projects. Some solutions have already been found and applied, but they remain local and fragmented. Local authorities are trying hard to independently find affordable, legal, and worthwhile use options for this biomass, but are being restricted by regulatory barriers, the resources that can be spent, a lack of knowledge and cooperation.

We, the partnership of the EU-project CONTRA (**CO**nversion of a **N**uisance **T**o a **R**esource and **A**sset; 2019-2021) recognised from the outset that beach wrack management is not straightforward and needs a wide-ranging concept that transcends the boundaries of municipalities, regions and countries. Consequently, within the CONTRA project we gathered the knowledge and built the capacity required to exploit the potential of the usage of beach wrack for the whole Baltic Sea region.

The challenge of beach wrack removal is to find a balance between public demand for ‘clean’

beaches, environmental protection, and the economy. To address this and to balance opposing interests, the CONTRA conducted a comprehensive evaluation of all perspectives relating to beach wrack management on national as well as on international levels. The project consortium comprised of public authorities, businesses, academia, and NGOs from six countries (Denmark, Germany, Estonia, Poland, Sweden, Russia) covering marine systems, coastal tourism, sustainable development, as well as administrative structures of the Baltic Sea region.

Different aspects of beach wrack removal and usage have been studied thoroughly. A set of seven case-studies have been described in detail, including an overview of the applicability of the concept. Additionally, ideas for sustainable options for pollution and nutrient remediation of the Baltic Sea have been put forward.

The results of our work are presented in four thematically in-depth analyses (main reports) focusing on:

- **Socioeconomics**
- **Ecology**
- **Business**
- **Technology**

A "**Tool kit**", covering practical aspects of beach wrack management, provides guidance for local and regional decisions makers. It serves both as a reference, as well as a decision aid to help practitioners convert current beach wrack management schemes into more sustainable solutions.

Additional reports/documents relating to beach wrack management are available on our project website at <https://www.beachwrack-contra.eu/>, including:

- **Legal aspects of beach wrack management in the Baltic Sea region**
- **Policy brief "Towards sustainable solutions for beach wrack treatment"**

With the help of this information, we hope that you - coastal authorities, enterprises, researchers - are inspired to adopt beach wrack treatment strategies that are environmentally sound as well as socially and economically worthwhile.

You are invited to join the "Beach Wrack Network" (<https://www.eucc-d.de/beach-wrack-network.html>) founded for the exchange between experts, practitioners, and policy makers about beach wrack issues within the Baltic Sea Region and beyond.

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About the author

EUCC-D supports Integrated Coastal Zone Management (ICZM) by bridging the communication gap between research, policy and practice, and by facilitating stakeholder engagement. We offer advice, training, and development support to local authorities, as well as public outreach and awareness raising on socio-economic issues affecting the coast, sea and catchment areas of European waters. Within our profile area, the triangle of coastal tourism, environment, and sustainable development, EUCC-D works with coastal communities and creates partnerships and projects at the regional, national and international level.

EUCC-D's role in the CONTRA project

The CONTRA project was structured into four main work packages, each covering the beach wrack challenge from separate perspectives. EUCC-D's main task was to lead the work on socio-economics within the field of beach wrack management, with special attention on stakeholder involvement. During the project, EUCC-D led international surveys, the establishment of beach wrack working groups in each partner country and open interviews with beach managers and local experts. The aim of the working groups was to share knowledge and synchronise efforts towards improved understanding and management of beach wrack at the CONTRA case study sites. Local research activities were done in a collaborative fashion with help from designated national Working Group Coordinators. The results of these activities are a fundamental part of the research which this preliminary report builds on.

How to read this report

The aim of this report is to offer insights into stakeholder awareness and interests relating to beach wrack and its management at six case study sites within the Baltic Sea Region (BSR), including the municipality of the Island of Poel (DE), municipality of Juliusruh on the Island of Rugen (DE), Puck municipality (PL), Koege municipality (DK), Kristianstad (SE) and the municipality of Yantarny of the Kaliningrad Region (RU). The report includes findings from open interviews during the initial working group meetings at each case study site and information gathered from several CONTRA questionnaires, including a survey of the general public (2019), a questionnaire issued to beach managers (2019) and a survey of experts from the field of nature conservation (2020). Besides the introduction and conclusion, this report's body is divided into 5 sections each focusing on a specific socio-economic challenge or conflict that exists for beach wrack management.

- Building public-private cooperation
- Local authority awareness of the legal framework
- Aligning beach wrack as a resource with environmental protection
- Public interest and perception of beach wrack
- Conflicts between public demand for beach wrack removal and environmental concerns

The findings within this report offer the CONTRA partnership details about the current level of stakeholder awareness of beach wrack, the conflicts that occur and current management techniques at the case study sites. This information can be used as a foundation to improve local stakeholder engagement activities, open up discussions on topics of conflict and provide a stimulus for further investigation. The information held within is useful for a socio-economic impact assessment of beach wrack, it can help open up balanced talks on best practices and can also be used as a springboard to develop future stakeholder awareness raising strategies on the topic.

1. Introduction

For coastal communities within the Baltic Sea Region (BSR), one very challenging issue can be the organic marine material that gets washed up with wind and waves, namely beach wrack. This is particularly the case for resorts that promote beaches as their main attraction and for communities that are highly dependent on the economic revenue brought in by beach tourism related businesses. Here, there is a real threat of a loss in income if beaches fail to meet public expectations.

Since beach wrack is often perceived as a deterioration of beach quality (Mossbauer, 2012) it is regularly removed at beaches across the region. Part of the reason for this is that it is often smelly when it decomposes (Alves et al., 2014), it attracts insects and can even be linked to health hazards as in some cases it shelters bacteria. Beach wrack is even more of an issue within the BSR because of the lack of tides, meaning that anything that is washed up onto the beach will remain there until it decomposes or the next storm surge washes it away. However, beach wrack also plays an important role within the beach ecosystem. Its systematic removal from managed beaches can have long-term socioeconomic and environmental consequences that degrade ecosystem services such as biodiversity and coastal protection. Awareness of these consequences among the general public and beach managers is required. Failure to appreciate the negative impacts of unsustainable beach cleaning operations may lead to the long-term destruction of the beach itself.

At many coastal resorts, the conversation about sustainable beach wrack treatment has not even begun. Where effort is being made, beach managers are facing the difficult challenge of striking a balance between economic revenue, user safety / preferences and environmental preservation, with only limited academic knowledge, and technical capacity (Esteves, 2018). Regions where large amounts of beach wrack are washed ashore have multiple stakeholders sharing an interest to collect and remove the material. Such stakeholders are e.g., municipalities, private beach-health stakeholders (hotels, camping owners) and local businesses. Today management of beach wrack is seldom carried out with regional cooperation, rather the opposite. Mossbauer et al. (2012) describes the common management practices to be very site specific and points out that “communities own and maintain their own cleaning machinery”. Further Mossbauer (2012) describes that “gear or personnel exchange between authorities of different coastal sections is not common practice” and that “efficient operation of recycling facilities (requires) a regular supply of raw material of a nearby beach”.

Up until now, stakeholder awareness of beach wrack in the BSR has been scarcely researched. Existing studies have analysed various ecological aspects of beach wrack, but have rarely linked them to specific societal groups. When assessing awareness of beach wrack, it is important to recognise that stakeholder characteristics at each beach sites are unique and that there are factors to consider, including location, infrastructure, cultural identity, coastal landscape, and local flora etc.

This report aims to highlight the human dimension of beach wrack management on managed tourist resort beaches in the BSR with a specific focus on some of the common problems that many communities face, including the challenges associated with building public-private cooperation, the confusing legal framework, balancing a resource orientated approach with environmental protection, as well as looking at public behaviour and the conflict between public demand for clean beaches and environmental concerns. It summarises our own data that was gathered via several questionnaires put out to relevant stakeholders, including the general public, beach managers, and conservation experts from the region. It also includes initial findings from the working groups based in each participating country which organized unstructured interviews with relevant stakeholders.

The main takeaway of the report is that, across the board, stakeholder knowledge is lacking and stakeholder cooperation for beach wrack management is in its infancy. CONTRA recognised from

the outset that socioeconomic and environmental factors are in conflict at every case site, but it seems that pathways to resolve these conflicts are not being considered. The sheer complexity of the factors at play makes balancing stakeholder interests very difficult even in the short- and mid-term. This report is an important first step in establishing and increasing awareness of stakeholder opinions on the topic of beach wrack, however further research is required to develop any guidelines on a local level that beach managers can refer to while considering all relevant specificities of their beaches.



Large beach wrack quantities on Island of Fehmarn (DE)

2. Public – private cooperation to improve beach wrack practices and reduce costs I

Case study site: Køge, Denmark

Køge is a medium-large town located in Eastern Zealand, Denmark. Traditionally a market and trading town, it is today characterized by industry and transport connected to the harbour. Køge is branded to tourists on several qualities: the “hyggelig” medieval town and the natural recreational sites including the beach and marina areas.

The municipality of Køge owns and manages two beaches: North Beach and South Beach with a total beach length of 1.5km, of which 0.9km is managed. A lot of beach wrack gets washed up onto these beaches. The Danish Environmental Protection Agency (Mijøstyrelsen) prepares the legislation and guidelines including those for the coastal zone. The Danish Coastal Authority (Kystdirektoratet) analyses the coastal environment and secures the technical knowledge concerning coastal dynamics and coastal protection. The Danish Coastal Authority also manages functional and regulatory tasks for coastal protection, dune conservation, beach protection.

Main beach wrack management stakeholders (Municipality of Køge, Denmark)		
Stakeholder Type	Organisation	Role for beach wrack management
Public Authority	Municipality of Køge	Financial and logistical responsibility for beach management/cleaning and beach wrack treatment
Public Authority	Environmental Protection Agency	Prepares legislation and guidelines including those for the coastal zone
Public Authority	Danish Coastal Authority	Analyses the coastal environment and secures the technical knowledge concerning coastal dynamics and coastal protection
Public Authority	Ejendomme Teknik Køge, ETK	Køge Municipality's maintenance and service company.
Public Authority (joint municipality association)	Strandparken I/S	Renovation and refurbishment of large coastal facilities, such as buildings, roads, paths, bridges, dikes, locks

The managed sections of beaches in Køge are cleaned daily during summer from May to September and after storms during other months of the year. Beach wrack is collected with a tractor connected to mechanical beach cleaning equipment but is not transported off the beach. The collected beach wrack is piled up and left to decompose at the upper part of the beach. Fresh beach wrack closest to the waterline is pushed back into the water when winds are favourable, i.e. from the west, so that beach wrack is transported offshore from Køge bay. In answering the CONTRA management questionnaire (2019) the municipality reported that there is zero litter present in beach wrack washed up in Køge.

From discussions held during project meetings it can be seen that the municipality is aware that the current method of piling up the beach wrack and/or pushing it back in the water lacks an environmental impact assessment, including for example details on heavy metal flux, Greenhouse Gas (GHG) emissions, nutrient leaching etc. The Køge authorities have exchanged with neighbouring municipalities who test their beach wrack for Cadmium and have shared knowledge

on when during the year levels are high. Like for most other coastal municipalities there is a lack of local data to support the decision making process. The municipality also reports a lack of knowledge and clarity on the legal framework surrounding beach wrack management, particularly governing collection and storage. Information gathered from other DK municipalities has led to an understanding that actually, a permit (according to the environmental protection law paragraph 19) is required when storing it in piles. However, the lack of legal understanding means that many municipalities like Køge still go ahead and pile it up to decompose out of the main tourist beach area. Questions on local regulations need to be discussed with the Environmental Protection Agency.



Patchy beach wrack on tourist beach in Municipality of Køge Denmark (DK)

The CONTRA management questionnaire data shows that the costs incurred by the municipality of Køge have been increasing. In 2014 the community paid 75,000€ per km of beach length (annual figure) which had gone up year on year to 135,000€/km in 2018*. The financial cost of beach wrack collection is reported to be challenging for the municipality. One option to offset costs would be for them to cooperate with a local company. In fact, there is a determined will to turn beach wrack from Køge and other neighbouring municipalities into a resource. However, in open interviews, Køge municipality has stated that at the moment there is a lack of economical and practically feasible treatment options available to them for post processing of raw beach wrack material in the area. The local options for beach wrack treatment that apparently do exist, either utilize only cleaned and dry eelgrass (not mixed beach wrack) or they are not yet developed at a commercial level. This seems to be a common problem shared by many BSR authorities. Results from the management questionnaire show that just 5 out of the 40 responding municipalities cooperate or sometimes cooperate with private companies. Many of the others stated that they although they don't cooperate with a company at the moment, they would like to in the future. During the initial CONTRA working group meetings in Denmark, a small number of companies, incl. start-up companies Flex-feb and Coastgrass came forward to share with Køge some new options for beach wrack treatment. Køge municipality, a partner in CONTRA, will explore a number of different ways in which beach wrack material can be utilized, including for landfill covers (CONTRA case study WRACOVER). For working examples of public-private cooperation that are currently supporting beach wrack management, coastal communities can look to the examples of (1) Municipality of Poel in Germany which cooperates with a local fertilizer/soil improvement company, Hanseatische Umwelt GmbH (also partner in CONTRA), (2) Solrød Kommune in Denmark which cooperates with Solrød Blogas A / S, and (3) Island of Ærø who cooperates with the resource management company Miljøservice A/S.

3. Awareness of the legal framework for beach wrack management | Case study site: Kristianstad, Sweden

The beach Tälletstranden is situated in the medieval town of Åhus, a small village within the municipality of Kristianstad in Skåne, southeast Sweden. Åhus is one of the best preserved medieval towns in all of Sweden. Today Åhus is an “absolute” dream setting for around 12,000 permanent residents and at least as many summer visitors. The main attractions are the long sandy beaches, the excellent visitors’ marina and the medieval town centre. Tälletstranden is also famous for hosting large beach soccer and beach handball sporting events. Tälletstranden is purposefully maintained with recreation in mind. It has the Blue Flag award and has a high value for the municipality. The total tourist economical revenue for the municipality is around 900 million Swedish Kronor, based on 2 million visitors every year. The municipality estimates that the beaches in Åhus stand for at least 20 % of that. But they also say that it is just an estimation.



Tälletstranden, Åhus, Kristianstad, Sweden

Today, Tälletstranden is ‘cleaned’ by the municipality of Kristianstad from April to September. Between June and August, the beach is ‘cleaned’ every day. From open interviews and discussions with local actors during the initial local working group meetings, it seems that in general beach wrack is not yet a prioritized topic in the Swedish public sphere. The municipality, like many others within the region seem content with their current practices which in most cases is to remove and dispose without any further consideration for its potential value as a resource nor of the environmental consequences of its removal.

Main beach wrack management stakeholders (Municipality of Kristianstad, Sweden)		
Stakeholder Type	Organisation	Role for beach wrack management
Public authority	Municipality of Kristianstad	Beach cleaning, incl. logistics and finances
Public authority	County Administrative Board of Skåne	Implementation of parliament / Government decisions, incl. for nature conservation, environmental and public health
Public authority	Environmental Protection Agency	Proposing and implementing environmental policies under the Swedish Ministry of the Environment.

The collection of beach wrack on Tälletstranden is a discretionary decision made purely by the local authority of Kristianstad. As in most other tourist beaches within the BSR, beach wrack is treated here as waste and is understood by the municipality to only be regulated by a beach clean-up mandate. Unfortunately, as is common throughout the whole BSR region, beach wrack management decisions are not being supported with sound environmental knowledge – local data collection is missing. And, also like for most other coastal regions, there is a lack of understanding and clarity when it comes to the legal framework. Findings from the CONTRA management questionnaire (2019) show that just 15 from the 40 responding municipalities say that the laws concerning beach wrack are clear. More than half of all responding municipalities said that they would like more information on the legal framework.

The current County Administrative Board of Skåne's instructions for beach wrack collection and treatment, that concern the prerequisite for environmental data collection, are currently not fully being followed. However, the difference here to other regions within the BSR is that dialogue between stakeholders and the County Administrative Board of Southern Sweden has now started with a view to bring about clarity and to rework the county's policy on the handling of beach wrack. This unique policy is to be published during 2021. The policy is expected to reflect the Administrative Board's view that the collection of beach wrack must follow the principles of Sweden's Environmental Code and that as long as wildlife and other values are taken into account, then they are in favour of the collection of beach wrack for the utilisation of energy and nutrients.

Current instructions from the County Administrative board of Skåne

When beach wrack is collected, it is classified as waste and requires permission for further handling.

- **Cleaning beach wrack from the beach** – requires beach protection dispensation provided by the municipality. The County Administrative Board of Skåne finds that there should be knowledge about how wildlife, including threatened species, is affected by the cleaning. If wildlife and other values are taken into account, the County Administrative Board is in favour of the collection of beach wrack for the utilisation of energy and nutrients.
- **Dumping beach wrack back into the sea** – Requires permission from the County Administrative Board. The County Administrative Board of Skåne wants to avoid dumping and going forward will not grant permission other than in exceptional cases if very good reasons exist.
- **Use of beach wrack to build dunes/reinforce banks** – Requires permission from the County Administrative Board.
- **Intermediate storage of beach wrack at a location other than the beach** – Requires permission from the County Administrative Board.
The County Administrative Board of Skåne generally finds that intermediate storage of beach wrack should be avoided, especially when it will not be returned to the sea or the beach.
- **Return of beach wrack to the beach after intermediate storage at another location** – Requires beach protection dispensation provided by the municipality.
The County Administrative Board of Skåne generally finds that beach wrack that has been removed from the beach should not be returned to the beach. Materials that have been removed and then returned after intermediate storage do not have the same value for wildlife as materials that have been undisturbed on the beach.
- **Distribution of beach wrack or residues from treated beach wrack in fields** – Requires analysis of the material to ensure that it does not contain excessively high levels of environmental toxins, e.g. cadmium, lead, chromium or nickel.

Source: County Administrative Board of Skåne (CONTRA, 2020)

4. Aligning beach wrack as a resource with environmental protection | Case study site: Island of Poel, Germany

The island of Poel is located in the Wismar Bay within the northern German county of Mecklenburg-Vorpommern (MV). It was officially recognized as a tourist resort in 1997 and received the title Baltic Sea Spa in 2005. Most of the island is covered by the Natura 2000 framework, but the main tourist beaches are excluded because of their urban character. The whole island is also officially labelled a reservation area (“Vorbehaltsgebiet”) for nature and landscape conservation. Current and planned usage of the land and sea must be assessed with regards to the compatibility with protective purposes and the preservation goals. The island of Poel joined the “Freiwillige Vereinbarung Naturschutz, Wassersport und Angeln“ (author translation: voluntary agreement on nature conservation, water sports and fishing) in 2013. Given the importance of tourism already before the establishment of the island as a reservation area, tourism services on the island are preserved and should be combined with species and habitat conservation.

Main beach wrack management stakeholders (Municipality of Island of Poel, Germany)		
Stakeholder Type	Organisation	Role for beach wrack management
Public Authority	Municipality of Poel (Spa Director)	Financial and logistical management of beach cleaning and municipal beach wrack treatment.
Public Authority	Government Office for Agriculture and the Environment (StALU) Westmecklenburg	Local implementation of EU, federal and national law regulations from the fields of agriculture and the environment
Public Authority	Ministry of Environment M-V	

All beaches on the island are managed by the municipality of Poel, and the legal framework for this is provided by the county of Mecklenburg-Vorpommern. The Office for Environment, Nature Conservation and Geology (LUNG), under the National Ministry of Agriculture and the Environment, is answerable for data collection, documentation, assessment/advice on the state of the environment, and is also responsible for locally defining beach wrack as waste. The local Government Office for Agriculture and the Environment (StALU) Westmecklenburg (one of four MV county offices) is responsible for the local implementation of EU, federal and national law regulations from the fields of agriculture and the environment. At the municipality level, responsibility for beach cleaning operations, and therefore beach wrack removal lies with the municipality’s Spa Manager.



Beach wrack landing (left) and beach wrack removal operations (right) on Timmendorfer Strand, Island of Poel (DE)

Tourism plays an essential role on the Island of Poel and is the most important employer. Two main tourist beaches on Poel are Timmendorf Strand and Schwarzer Busch. Both are sandy and popular with tourists in the summer months. Both these main tourist beaches (approximately 3km out of a total 9km beach length on the island) are mechanically cleaned daily during the tourist season. With respect to the size of beach wrack landings on the main tourist beaches, the local Spa Manager regards a small monthly amount of beach wrack as being 100 tonnes per month, medium amount is 300 tonnes, large amount is 500 tonnes and an extreme event, could see amounts of 700 tonnes landing per month. In general, the local authority reports that beach wrack amounts have been increasing over the past 10 years. The municipality cooperates with a local fertilizer company Hanseatische Umwelt GmbH which is paid to periodically come and collect stored beach wrack (CONTRA, Management Questionnaire, 2019).

Both beaches and surrounding areas are vulnerable to storm surges and are affected by erosion. Both areas are protected somewhat by dunes, but there are no man-made structures like groyne. During open interviews, the Spa Manager on the Island of Poel stated that he is aware of the possible negative environmental implications of beach wrack removal on the beaches and their surrounding areas. He also said that he thinks that their beach wrack collection techniques could be improved from an environmental perspective. For example, in some beach areas where sand is eroding away, he assumes that the removal of beach wrack is exacerbating the problem. The municipality takes care to minimise sand uptake levels and arranges for sand to be returned back to the beach but it is unknown whether this fully compensates. Another aspect which the manager implies could be improved is spatial zoning. Currently, the managed beaches are cleaned in full apparently because of the inflexibility of local laws and because with such large machinery it's cheaper to just clean it all rather than clean small spaces. Also, like for many other local authorities in the BSR, knowledge on beach wrack contamination, e.g. heavy metals and micro plastics, greenhouse gas emissions and nutrient content etc. is lacking. Prior to CONTRA, the manager had had no direct contact with environmental experts to discuss these issues. From the expert survey conducted in 2020, we found that 5 out of the 6 responding conservationist experts working in the county of Mecklenburg Vorpommern said that beach wrack management is a topic for them. From these 5 respondents, just 1 said that beach wrack should never be removed from the beaches but 4 said that it should sometimes be removed.



Beach wrack storage facility (left) and beach wrack treatment operations (right) Island of Poel (DE)

Like for many other coastal communities, it is economics that has the main consideration where beach wrack management is concerned on the Island of Poel. Since it is classified as waste, beach wrack at the moment has no economic value at the point of beach collection. The value of beach wrack removal lies in the provision of ,cleaned‘ recreational beach space and the tourist activities on the Island that depend on it being attractive for visitors. However, the relationship that the municipality has built up with the local fertilizer company does bring some added value to beach wrack removal. Even though the community pays extra to be rid of the material, it does so in the knowledge that it will be treated and used in a worthwhile and environmentally friendly manner.

This public – private cooperation for beach wrack management is unfortunately fairly unique within the BSR. The unreliability in quality and quantity of beach wrack material means that there are very few private companies ready to cooperate in this way. From the CONTRA Management Questionnaire (2019) we found that just 2 out of 41 responding municipalities cooperate with private companies for beach wrack treatment. The business models of waste management companies rely on a certain quality and quantity of material but current beach wrack collection methods don't offer this. The company Hanseatische Umwelt is proactive and pressing for municipalities to introduce more resource orientated collection and storage methods so that beach wrack can be widely used as a bio-resource. The question whether beach wrack can be systematically collected as a resource without causing disproportionate damage to the (marine/beach) ecosystem is yet to be answered and needs to be addressed on a local level.

5. Public interest and perception of beach wrack I

Case study site: Yantarny, Kaliningrad, Russia

The Yantarnyi Urban Municipal District is located in the very west of the Sambia Peninsula on the shores of the Baltic Sea in the Kaliningrad Oblast (Figure 1). Wide sandy beaches with a length of about six kilometers, and a promenade along 2km of the beach, are some of the most attractive beach tourist sites in the district (Investment passport ..., 2019).

The development strategy of the Yantarny urban district defines tourism as one of the leading industries. This is associated with the development of another leading industry, namely amber trading.



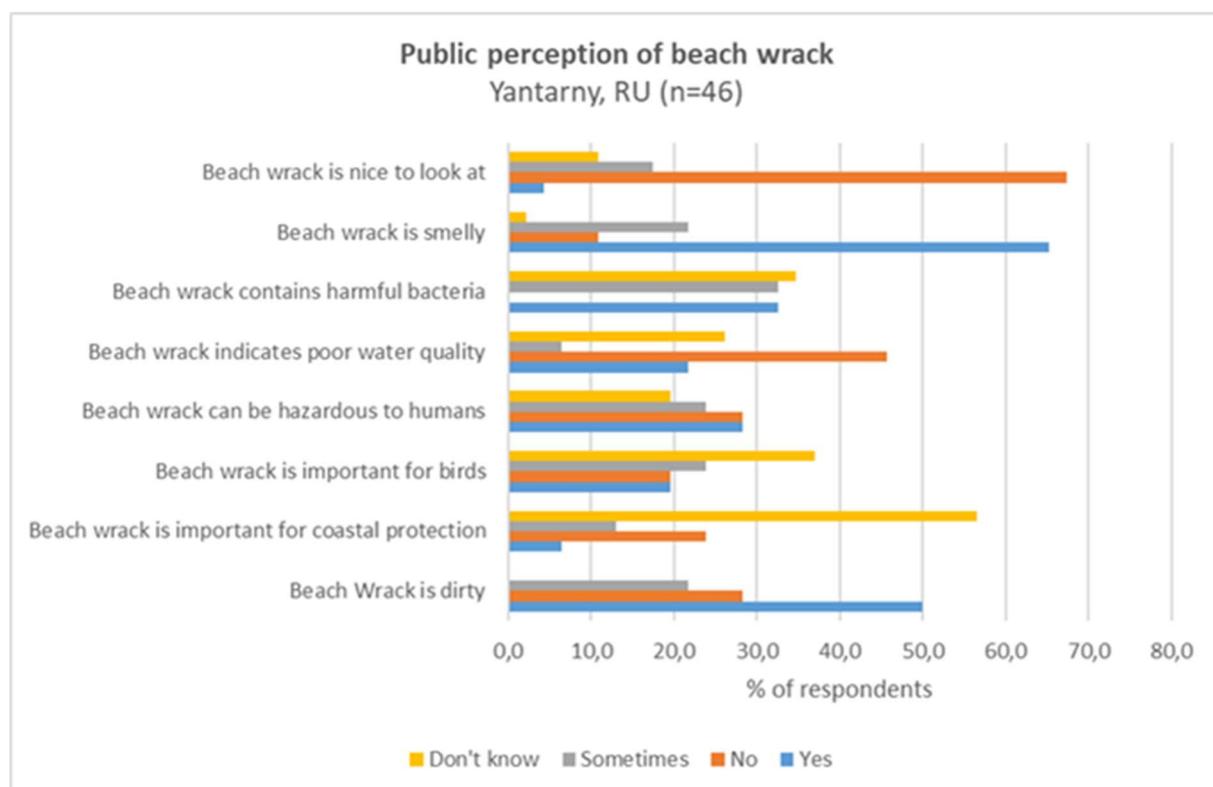
Yantarny beach, Kaliningrad (RU)

The beaches of Yantarny were significantly improved before 2016. Two of the Yantarny managed beaches received "Blue Flag" certification for the first time in 2016. The "Blue Flag" status for these two managed beaches in Yantarny was again confirmed in 2020.

The beaches are under the jurisdiction of the Yantarnyi Urban Municipal District. The state of the beaches is monitored by the municipal autonomous institution "Center for Integrated Tourism Development" Yantarny "under the administration of the Yantarnyi Urban Municipal District. The beaches are not located within any protected natural areas and the assignment of a protected status is not planned.

Main beach wrack management stakeholders (Municipality of Yantarny, Kaliningrad, RU)		
Stakeholder Type	Organisation	Role for beach wrack management
Public Authority	Yantarnyi Urban Municipal District	Environmental supervision of beaches
Public Authority	Center for Integrated Tourism Development	Recreation & sports service and coastal infrastructure
Public Authority	Federal State Budget Institution "National Park "Curonian Spit"	
Public Authority	Pionersky Urban District	

Beach wrack removal in Yantarny is done as part of activities to comply with the “Blue Flag” award criteria. Information gathered from open interviews with practitioners suggests that beach management activities cater primarily for tourists, both for day and multi-day visitors. Volunteer clean-ups are quite unpopular in Yantarny, as the public has the opinion that beach cleaning should be done as part of the regular municipal beach management activities. There is a local understanding that the centralised collection of beach wrack is publically accepted in the summertime when amber content of beach wrack is usually very poor. In other seasons this activity may cause complaints, particularly from local citizens. After storms, beach wrack sometimes contains small pieces of amber. Walking along the beach (especially in bad weather conditions or cold seasons), finding and collection of these pieces of amber is the one of the local touristic attractions. The amber collected from the BW is also used in local handcrafted jewelry. Information about any negative effects of BW on the health of people or domestic animals doesn’t exist for the region. Regardless of the possible presence of amber, a public opinion questionnaire undertaken within the project CONTRA during the summer months 2019 shows that the majority of beach goers in Yantarny have a rather negative perception of beach wrack. The data collected also shows that public knowledge about the eco-system services of beach wrack, i.e. its role for birds and coastal protection is also fairly low.



Public perception of beach wrack in Yantarny (RU). Data source - CONTRA Public Questionnaire (2019)

There is currently no video monitoring available to the public which allows for the notification of beach wrack landings. Like in many coastal tourist destinations, there is no public information available on the natural beach wrack cycle.

6. Conflict between public opinion and environmental concerns | Case study site: Puck, Poland

Beaches have high value for the Puck commune. The coast is an attractive area for housing, tourism, business and recreation. The total economic income from tourism for the commune is several million PLN, with 200-300 thousand visitors a year. The municipality estimates that the beaches located within Puck generate a significant level of this amount - nearly 10-15 percent, but this is only an estimate. The whole area is protected by the Natura 2000 framework - special area of conservation for habitats (Habitats Directive). The area was established under the Habitats Directive to protect the large, shallow sea bay and related marine habitats. The submarine meadows in the Bay of Puck are an important type of natural habitat within Europe. Along the shores of the Bay of Puck, beach wrack, known locally as "Kidzina" was once an important resource for residents. It was routinely used as fattening in the fields and feed for cattle. Nowadays, the use of beach wrack is more limited but it is still used locally as a natural fertilizer by some farmers.

Main beach wrack management stakeholders (Municipality of Puck, Poland)		
Stakeholder Type	Organisation	Role for beach wrack management
Public Authority	Faculty of Agriculture and Environmental Protection in Puck	Environmental supervision of beaches
Public Authority	Municipal Sports and Recreation Culture Center in Puck	Recreation & sports service and coastal infrastructure
Public Authority	Puck Municipal Economy Communal unit	Supervises the waste disposal and cleaning of the beach
Public Authority	Minister of Infrastructure, incl. Maritime Office in Gdynia	Issues permits for vehicle / machine access to beach areas.
	Regional Waste Management Installation	Bio-waste disposal

According to the Maritime Office - Coastal Protection Department, art.33 of the Act on Nature Conservation states that marine natural waste must not be collected. In response to the expert questionnaire (2020), a representative from Puck municipality stated that beach wrack plays an important ecosystem role and that it is a protected habitat. In open interviews, they have also stressed compliance with the Natura 2000 programme. However, conflict between environmental protection and the tourist industry still arises on the main tourist section (0.1km from a total 0.5km) of Puck city beach. Data from the management questionnaire (2019) shows that beach wrack is collected here on demand /as needed between May-August. In open interviews, the municipality also indicated that tourists, especially families with children, coming to Puck expect 'clean' beaches and that there are numerous instances in which visitors have complained about decomposing beach wrack and a characteristic smell that is emitted. The expectations of local companies, whose business models rely on the beach having a certain quality, are apparently similar. The cleanliness of the beach and adjacent areas significantly affects the attractiveness of the area, which translates directly into the number of people visiting adjacent service centres

including adjacent restaurants, rentals, sports equipment. The accumulation of marine waste generates a bad smell and this also negatively affects the number of people using beach related services.



Location of public questionnaire (2019) on Puck City beach, Poland

In 2019, the CONTRA partners questioned 20 members of the public about beach wrack on the Puck City beach, under conditions shown in the photo above when there was a small amount of beach wrack (sporadic clumps) present. 19 out of the 20 respondents said that beach wrack was not nice to look at and 16 said that it is smelly. Overall, tolerance of beach wrack on Puck City beach was found to be low compared, for example, to other sites in Germany. However, just one respondent stated that they were not satisfied with the standard of beach cleaning whereas 9 said they were totally satisfied and 7 said somewhat. The author acknowledges that there may be many factors influencing public opinion, e.g. personal experience, and that further work is required.

The Polish Society for the Protection of Birds has discussed beach wrack and/or beach wrack removal with various local authorities / beach managers in Poland when preparing protection plans for various forms of protected nature, e.g. protection plans for Natura 2000 refuges, nature reserves, and landscape parks. In response to the expert questionnaire (2019) they stated that beach wrack should sometimes be removed. A representative from WWF Poland who has worked with beach wrack whilst conducting litter monitoring on selected sections of the coast responded that beach wrack should be removed from tourist beaches in the summer months and that when collected it should be then treated as a resource to support the local economy. Initial working group discussions in CONTRA found that the separation of planning systems (land and sea) and clashing competences of various administrations and decision-making levels, mean that there can be difficulties in spatial management and development planning within the Puck region.

7. Conclusion

It is evident from the initial data gathering activities that there are progressive local authorities who are trying hard to independently find legal, affordable, and socially, environmentally and economically sustainable beach wrack management solutions. But it is also apparent that they are being restricted by having limited resources, a lack of knowledge and a lack of cooperation. We now know that there are multiple social and environmental factors at play at every case site, but we can also see that they are rarely being taken into account. In contrast, financial aspects are being measured or approximated and factored into decision making processes. This report is a first step in determining stakeholder opinions, interests and behaviour on the topic of beach wrack management and hopefully can be used as a springboard for further investigation on the topic.

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