PERFECT SMALL PORT

WITHIN RESOURCE EFFICIENCY

BEST PRACTICES AND SUSTAINABILITY

EUROPEAN UNION
European Regional Development Fund

Interreg
Central Baltic

PORT MATE

PERFECT SMALL PORT WITHIN RESOURCE EFFICIENCY

BEST PRACTICES AND SUSTAINABILITY

Satakunta University of Applied Sciences
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APPENDICES

1 INTRODUCTION

Recreational boating is becoming more and more common within the Central Baltic region, and new boaters are accessing the waters and visiting small ports. One common challenge for small ports, especially in the archipelago and islands, is the lack of sustainable and resource efficient services in ports.

Clean waters, fresh air and pure natural environment are at the heart of a good boating experience. During the years of 2016–2019, the PortMate project enhances safe access, suitable green services and marketing in small ports. In this report, a perfect small port within resource efficiency is defined.

1.1 About the PortMate project and the pilot ports

The PortMate project started on the 1st of November 2016, and will last until the 31st of December 2019. PortMate is a Central Baltic Programme project, with the priority of a well-connected region (P3), and the specific objective of “Improved services of existing small ports to improve local and regional mobility and contribute to tourism development” (3.2). The project is financed by the European Regional Development Fund (ERDF) and project partners.

In the Central Baltic Region, there are altogether 19 pilot small ports in the project: five in Rauma, Finland; four in both Kökar and Sottunga, Åland; three in Söderhamn and three in Gävle, Sweden (see figure 1). In addition to the lead partner of the project, Satakunta University of Applied Sciences in Finland, there are partners from each region mentioned above: City of Rauma, Municipality of Söderhamn, Municipality of Gävle, Municipality of Sottunga and Kökar Havspaviljong Ab.

Figure 1. PortMate project's pilot ports are located in the Baltic Sea area in Finland, Åland and Sweden.

From a boater's point of view, there is a vast variety of small ports in the project. Some of the small ports are situated in the city centre, some near the city, some on islands. Ports in the city centre are perfect for boaters who seek plenty of activities, but on the other hand, natural small ports are suitable for boaters that are looking for a quiet small port to stay. Some of the natural ports are totally without any services and lacking mobile phone and internet connections.

Even though the land of the natural ports may be privately owned, in the Nordic countries people may use bodies of water for passage and stay temporarily in areas accessible under everyman's right. However, according to the legislation and practices of everyman's right, the owner of permanent structures, for example piers, can determine whether other people have the right to use them or not. All the restrictions are usually marked on the structure or nearby the structure. If there are no signs of restriction, people are free to use the structure if it is not located in someone's private yard. (Ministry of Environment 2014.)

1.2 Study on small port sustainability and resource efficiency

Information in this report has been gathered from various sources – by benchmarking PortMate ports and other small ports in Finland, Åland and Sweden, collecting and sharing information in workshops with specialists of small port operations, examining publications and background materials of the subject, carrying out a survey for small port users and operators and studying its results and utilizing knowledge of sustainable technologies of the Satakunta University of Applied Sciences. So far, five PortMate partners' meetings handling sustainable resource efficient services of small ports (WP T2) have been held during the project, and the information gathered during these meetings has been collected in this report.

Benchmarking has been a valuable source of information when preparing this report, since every small port differs from each other. There are various types of small ports in all kinds of locations, with different infrastructure and accessibility. The natural environment of small ports, and the immediate vicinity of them, varies substantially – small ports may locate in city centres or next to protected nature areas. The number of visitors also varies, alongside the level of services available on small ports. We have put the small ports in five categories, which are presented in chapter 2.

The most significant sources, however, were the PortMate safety surveys conducted in spring 2018 (see attachments). There were two separate questionnaires: one for boaters and one for small port operators. The aim was to find out their opinion on a sustainable and resource efficient small port. The questionnaires were conducted using e-forms in Finnish, Swedish and English. The results of the resource efficiency questionnaires are presented in chapter 3.

1.3 Boating in the Northern Baltic Sea

The marine environment of Finland and Sweden, and Åland in between, offers excellent possibilities for boating. There are thousands of miles of waterways in this unique part of the Baltic Sea with thousands of islands to explore.

Recreational boating in this context can be roughly defined as going by boat from one small port to another. A trip may be for example a short journey from the homeport to another port and back. Sometimes people spend a night or two in the port and then continue the journey. The journey may take only a day, but on the other hand they may last a few weeks.

Recreational boating is a popular activity in the Nordic countries. Alongside the Nordic countries, only in New Zealand pleasure boating is as common (Sweboat 2015). There are 96 and 56 owned motorboats and 3 and 10 owned sailboats per 1000 inhabitants in Finland and Sweden respectively. (Taloustutkimus 2016 & Transportstyrelsen 2010).

According to a survey by the Swedish Transport Agency (Transportstyrelsen 2015), there are approximately 822 000 leisure boats in Sweden. Of these leisure boats, the sailboats and the motorboats with the opportunity for temporary overnight accommodation, were the most commonly used ones. In Finland, there are approximately 1.16 million boats, of which rowing boats are the most common boats followed by small motorboats that are used for day trips and fishing trips (Askola, Takala & Tefke 2016).

1.3 Definitions

BAT

Best Available Techniques (BAT) means using of the very best possible way to protect the environment that can be economically justified.

Boating

Boating and especially pleasure boating in this context can be roughly defined as sailing or cruising from one small port to another during the day. A trip can be for example a one-day trip from the homeport to another port and back or spending a night or more in the port and then continuing the journey to the next port. The duration of the boating trips can vary from day trips to a few weeks.

Small port

A small port in this document includes guest ports, natural ports and other small ports and piers providing services to local people and recreational boaters, excluding commercial and private boat club ports.

Resource efficiency

Resource efficiency means using the Earth's limited resources in a sustainable manner while minimizing impacts on the environment. It allows us to create more with less and to deliver greater value with less input. In practice this means using new, mostly technological, solutions to use less resources like water and energy and produce less waste.

Sustainability

Sustainability means in this document operations in small ports taking safety, environment and services equally into account.

2 TYPES OF SMALL PORTS

To estimate resource efficiency and sustainability of the small port, the type of port must be defined. In the PortMate project, small ports were classified into five different categories according to the location and accessability of the port: a guest port in a city or town center, a guest port on the coast and close to attractions or services, a guest port at a node in the archipelago, a guest port or pier in the natural archipelago and a natural port.

The PortMate project has listed, together with specialists during the workshop held in Gävle in February 2017, examples of services that are expected to be available in these five different types of small ports. Generally speaking, ports in the first category are expected to have a vast selection of services and ports in the fifth category are expected to have no services at all. These services are listed in the following chapters.

FIVE TYPES OF SMALL PORTS

1. a guest port in a city or town center
2. a guest port on the coast and close to attractions or services
3. a guest port at a node in the archipelago
4. a guest port or pier in the natural archipelago
5. a natural port

2.1 Guest port in a city or town centre

When arriving at a guest port in a city or town centre, a visitor can expect comprehensive services for boaters. These services could be for example a fuel station, a sauna, a café or a restaurant, a grocery store and suction drainage for septic tanks.

Of the PortMate small ports, Syväraumanlahti in Rauma, city guest port in Gävle (see figure 2) and city guest port in Söderhamn belong to this category.

EXAMPLES OF SERVICES AT A GUEST PORT IN A CITY OR TOWN CENTRE

- electricity
- fresh water for boat
- fuel station
- recycling station
- toilets
- shower, sauna
- suction drainage for septic tank
- gas service
- kiosk and/or grocery store
- café and/or restaurant
- laundry room
- cash machine
- WiFi
- parking for cars and caravans
- boatyard and mast crane
- trailer ramp/boat lift
- motor service
- boat washing service
- boat accessories for sale

Figure 2. Gävle guest port in the city centre has comprehensive services for boaters. © Kristiina Kortelainen

2.2 Guest port on the coast and close to attractions or services

A guest port on the coast and close to attractions or services can be expected to offer rather extensive services, such as toilets, sauna, a rest area, a restaurant and some tourist activities.

Of the PortMate small ports, Petäjäs and Poroholma in Rauma, and Furuvik and Axmar Brygga Havskrog (see figure 3) in Gävle belong to this second category.

Examples of services at a guest port on the coast and close to services

- electricity
- fresh water for boat
- recycling station
- toilets
- shower and sauna
- rest area and a campfire place
- kiosk, café and/or restaurant
- WiFi
- cottages for rent
- parking for cars and caravans
- tourist activities, such as zoo or museum
- essential boating services, such as boat repair/ maintenance

Figure 3. Axmar Brygga Havskrog is a guest port on the coast of Gävle. There is, for example, a restaurant and parking for caravans in the area. © Kristiina Kortelainen

2.3 Guest port at a node in the archipelago

In a guest port at a node in the archipelago, the services are usually more limited than on the coast. However, services may be also rather comprehensive in some of these archipelago ports. Often in these ports can be found for example fresh water, toilets, a sauna, a rest area and ferry connections to coast.

Of the PortMate ports, Sottunga port (see figure 4) and Kökar Havspaviljongen AB (Helsö island) in Åland belong to this third category.

Examples of services at a guest port at a node in the archipelago

- electricity
- fresh water for boat
- recycling station
- (dry) toilets
- shower and/or sauna
- rest area and campfire place
- kiosk, café and/or restaurant
- WiFi
- cottages for rent
- payment systems
- (car) ferry connections to coast

Figure 4. The port of Sottunga is located at a node in the Åland archipelago. You can find for example a restaurant, a shower and toilets in the port area, and a regular ferry connection to the main island in Åland and to the mainland in Finland. © Kristiina Kortelainen

2.4 Guest port or pier in the natural archipelago

In a guest port or a pier in the natural archipelago, boaters can expect only limited services. On the other hand, in some cases the services may be at the same level or even more comprehensive as in a guest at a node in the archipelago. There can be expected for example rest area and a campfire place, a place to swim, dry toilets and waste collection.

Of the PortMate small ports, Kylmäpihlaja (see figure 5) and Kuuskajaskari in Rauma, and Enskär and Storjungfrun Fyrhamn and Toppatall ports in Söderhamn belong to this fourth category.

Examples of services at a guest port or pier in the natural archipelago

- (dry) toilets
- rest area and campfire place
- place to swim
- waste collection
- (solar powered electricity)
- (fresh water)
- (WiFi)
- (water bus connections)
- (kiosk or a café)
- services and staff only during high boating season

Figure 5. Kylmäpihlaja island in Rauma has services and staff only during high boating season. The services are limited, but on the other hand there is also a restaurant and a hotel in Kylmäpihlaja. © Kristiina Kortelainen

2.5 Natural ports

Sheltered bays and lagoons deep enough, found on the coast line and in the archipelago, can be considered as natural ports. According to the rules of everyman's right, you can rest there or for example wait for a storm to calm down – even if the land is privately owned. The archipelago areas in the northern Baltic sea provides several natural ports for boaters in need of a temporary shelter (see figure 6).

In natural ports, there are no services available. Often these ports are in the shadow area of mobile and internet connection. In some cases, there might be a private pier or a buoy in the vicinity of natural port that can be accessed only in case of emergency.

Figure 6. The archipelagos in the northern Baltic Sea provide many natural ports for boaters to visit. © Kristiina Kortelainen

3 RESOURCE EFFICIENCY SURVEY

A PortMate resource efficiency survey was carried out during the Spring of 2018. The survey included questionnaires for both boaters and port operators. To enable a wider audience, the questionnaires were available online and in three languages: in English, in Finnish and in Swedish.

The survey for boaters was asking about how often and which kind of ports they use, what kind of boat they are using, what factors are important when choosing a small port to visit, and how important environment friendly factors of the port are to them. The port operator survey had a much broader variety of questions from detailed port information and services to specific questions about status of ports, existing resource efficiency and sustainability issues such as waste management and energy efficiency. The questionnaire forms in English can be found as appendix 1.

We received altogether 179 responses to the boater's questionnaire and 31 responses to the port operator's questionnaire. The respondents were from Sweden, Finland (including Åland), Estonia and Latvia.

3.1 Survey for boaters

Based on the survey results, a typical boater (respondent) is a 52-year-old male who uses a sailing boat or a motorsailer for boating. He regularly visits guest ports but also natural ports from time to time. Typically, when visiting a small port, he stays overnight and uses the services the port has to offer.

In the survey, we asked how important the given factors such as the location and the services are, when planning a boating trip and selecting the port or ports to visit. Figure 7 shows the results of this part of the survey.

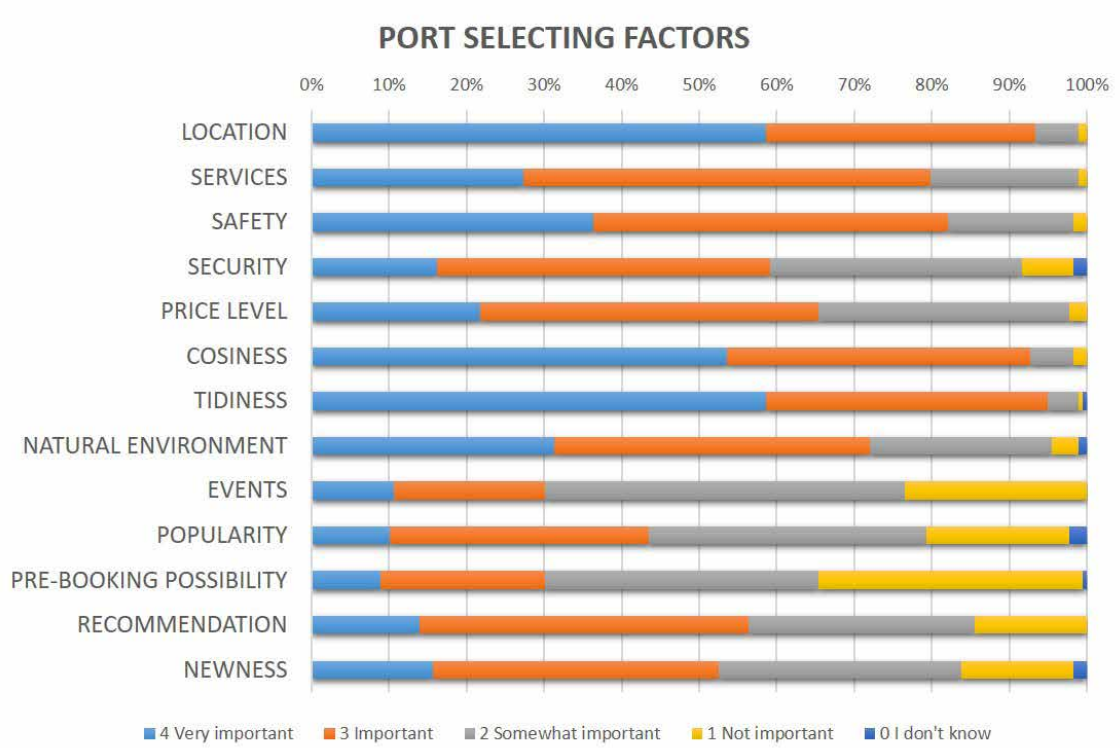

Figure 7. Importance of different factors when selecting a small port to visit.

According to the survey, tidiness, cosiness and location are the most valued port selecting factors. On the other hand, the popularity of the port or events in the port are something that boaters do not value that much. This supports the general understanding that people go boating mainly for other reasons than entertainment.

> According to the survey, tidiness, cosiness and location are the most valued port selecting factors.

Boaters were also asked, if they appreciate the environmental friendliness of the small port they visit. Results (see figure 8) show that the three most important things at a small port are that toilets and other facilities are clean, waste collection is arranged, and the waters are clean. In other words, the emphasis is on the things easily detectable by the visitor.

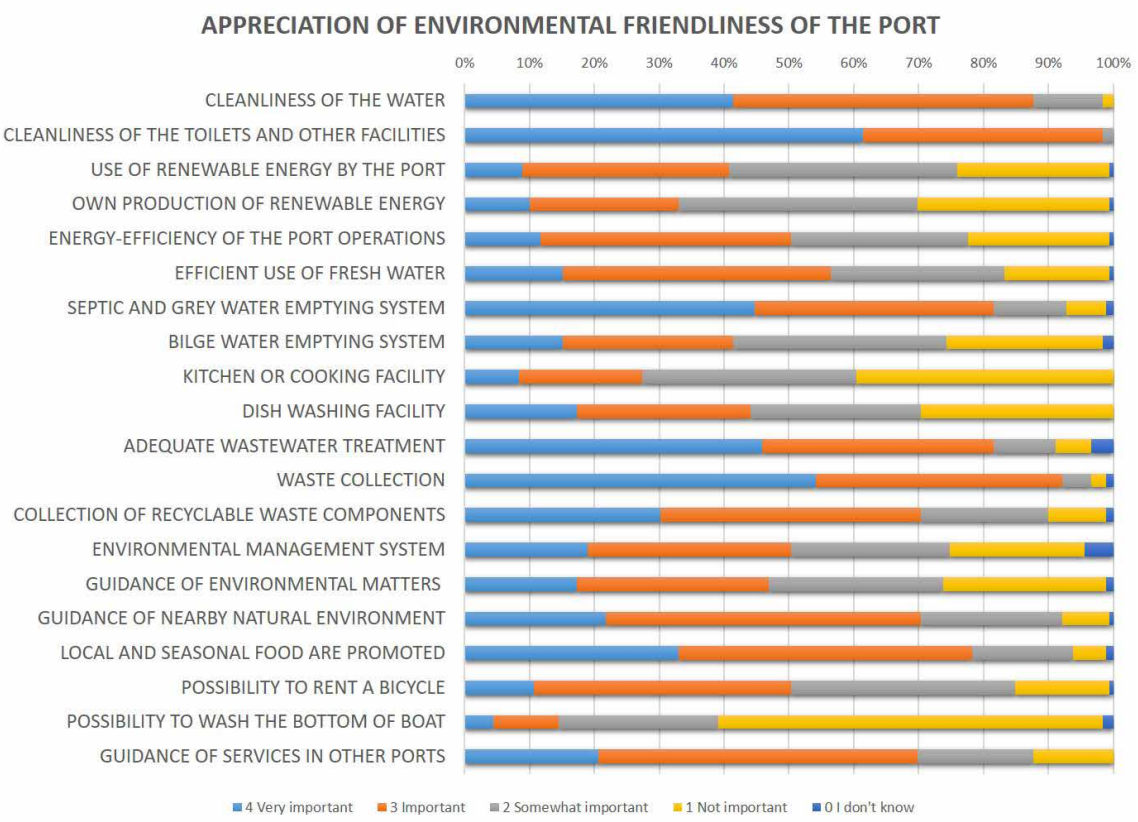

Figure 8. Importance of environmental friendliness when visiting a small port.

3.2 Survey for port operators

Generally it seems that small ports that took part in the survey are rather well equipped in terms of services. Over 80 percent of the ports have services such as waste and septic waste collection, sauna and a restaurant. Providing drinking water, toilets and electricity for boats were even more common. 80 percent of the ports are located either on the coast near the town services, or at node on an island with good accessibility also by other means than a private boat. The location also explains a little about the services provided, since it is easier and cheaper to manage the services when the port is easily accessible, i.e. if port or island has a road or ferry connection.

What comes to resource efficiency issues such as waste management, water and wastewater management and energy efficiency, the graphs in figures 9–11 show some highlights of the survey results.

Figure 9 shows that 80 percent of the ports have municipal water supply, and they also have drinking water service for boaters. It is noticeable that most ports are also monitoring their water consumption, but only half of the ports have taken actions to reduce water consumption. This may be partly explained with the seemingly abundant water supply due to the connection to municipal water supply.

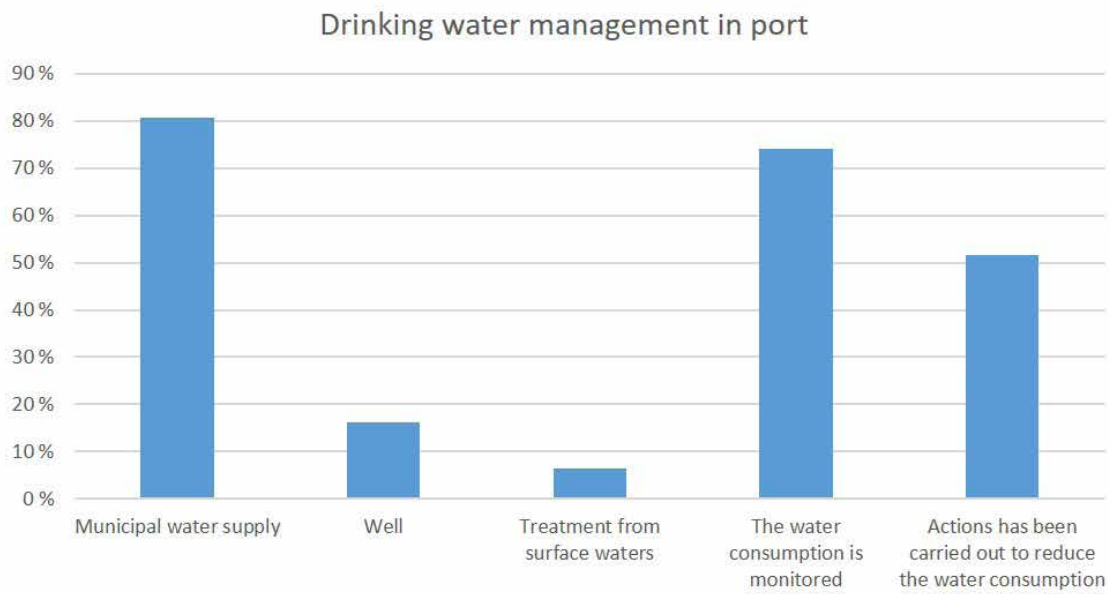

Figure 9. Drinking water supply and consumption in ports.

From the wastewater handling point of view, the situation is rather good. However, the ports could offer better facilities for dish washing and bilge water emptying. This would likely reduce the inflow of nutrients and hazardous substances into the Baltic sea, when less grey waters and bilge waters would be rinsed from boats straight to the sea. See figure 10 for more details.

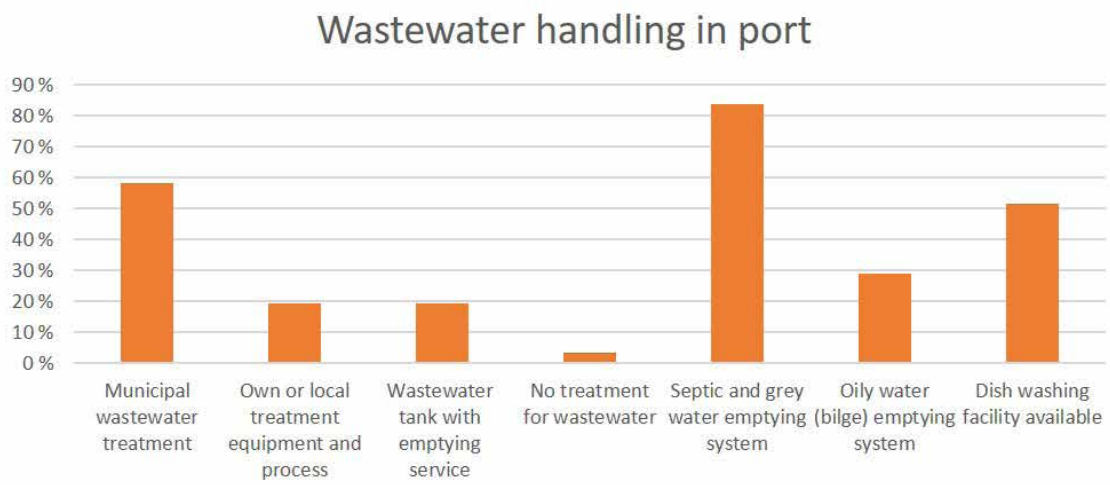

Figure 10. Wastewater handling in the port. Sources and treatment.

From the wastewater handling point of view, the situation is rather good. However, the ports could offer better facilities for dish washing and bilge water emptying.

Mixed waste is collected in every port, but the future of small ports waste handling should also be in recycling and collecting all different waste fractions. There is still some work to be done as can be seen from figure 11. Due to better awareness of environmental problems, people are recycling more and more. Especially when younger people and future generations go boating, they will expect they can recycle their waste in guest ports like they do in their homes. The limited space for waste fraction collection in boats means also that every port should have somewhat similar possibilities for recycling.

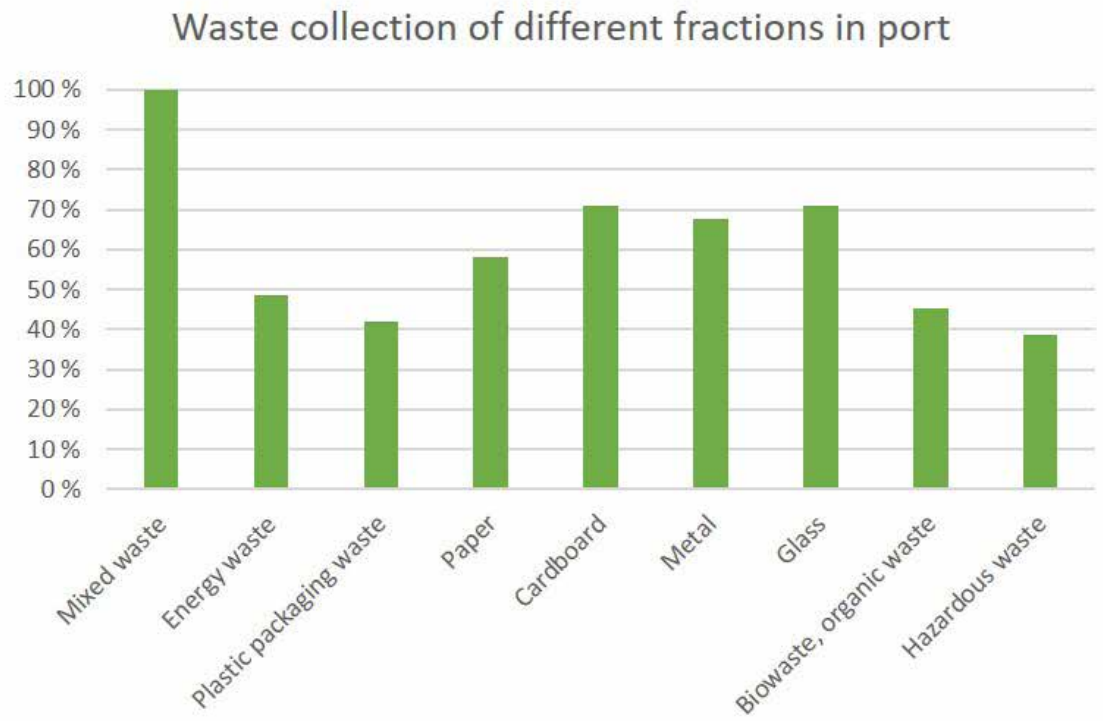

Figure 11. Different solid waste fractions collected in the port.

Figure 12 shows some points related to energy efficiency of the small ports. It shows that energy consumption is monitored and some lighting automation is in use. Otherwise ports are not very energy efficient yet. Since the boating season is in summer, the energy consumption of the ports are not very substantial compared to what they would be during the heating season, i.e. from autumn to spring. This explains partly why energy efficiency actions are not so popular, and they are mostly concentrated on the lighting. LED-lighting and lighting automation technologies are also readily available and thus easily applicable by ports. Additionally, investments for lighting are reasonably priced and therefore more affordable in small ports than for example investing in a heat pump.

Having their own energy production like solar energy for electricity and/or heating is not yet common in ports. This can change in the future when especially the PV systems' prices continue to fall. Solar energy production season also matches nicely with boating season. Normally the consumption of energy (high or low) is also not visible for visitors in the same way as it is to notice, how well or poorly waste management is handled. Solar panels could bring this energy image factor more visible in a positive way.

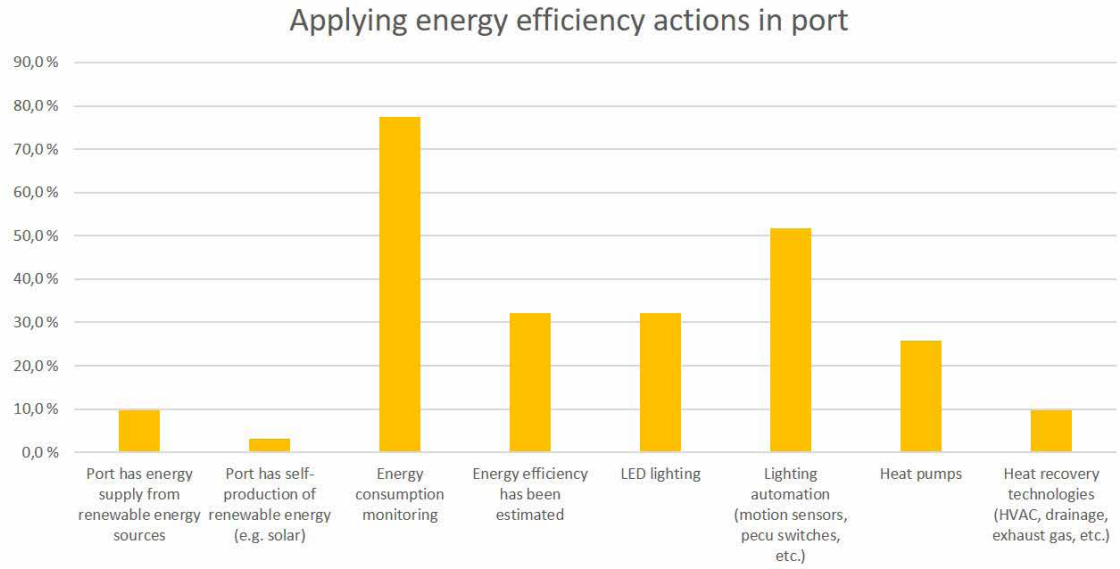

Figure 12. Energy efficiency actions in ports.

3.3 Survey conclusions

Since the amount of the responses in the port operator survey was rather small (31), conclusions of current resource efficiency status of the small ports in central Baltic area as a whole cannot be drawn. Still even from this sampling, it is seen that right actions have been done but there is still lot of work to do. Also data from answers will form a good basis for an ICT-tool developed during the PortMate project.

In addition to good services and location, boaters value tidiness and cosiness the most. Big issues undermining these values are for example poor waste and wastewater management in the port. These issues again are rather well handled in the ports. As an example, tidiness is about the same, whether there is only well-handled mixed waste collection or if there is additionally collection for different fractions.

Similarly, from the energy efficiency point of view the origin of the power supply is normally not visible for visitors, but automatically switched on lighting is convenient and easily noticeable. Hopefully, the easily detectable use of solar energy for own energy production will be the type of energy supply that makes it more attractive investment for port owners.

Project 30MILES (Small port every 30 miles apart – Development of services for lively water tourism in the Eastern Gulf of Finland) has also performed an online questionnaire for boaters to describe the guest port of their dreams and the sustainable small port. A waste disposal system, including pump-outs for sewage holding tank was the main issue for respondents of that survey regarding a sustainable small port. This partly indicated the respondents' preferences for a dream guest port are in line with what they consider sustainable. (Vantola, R., Luoma, E. Lehikoinen, A., 2018)

4 RESOURCE EFFICIENCY OF SMALL PORT OPERATIONS

Depending on the type of the small port, boaters expect a certain level of services available in the port. Essential services are related to water management, energy supply and use, and waste management (see figure 13). Those are also the services assessed to be the most significant in terms of resource efficiency of small port operation. Therefore, these services were selected to be studied in more detail later in this document. Investments in resource efficiency in the PortMate project are also related to these factors.

There are also miscellaneous other services which have smaller significance for resource efficiency but may be valuated high by visitors. These services are recognized during the PortMate project to guide port operators to also pay attention to them to attract more visitors.

Figure 13. Water and energy supply and use are essential services in small ports. © Kristiina Kortelainen

4.1 Factors affecting the selection of resource efficient solutions in small ports

There are four major factors affecting the selection of resource efficient solutions and technologies in small ports: the municipal infrastructure, the number of visitors, the sensitivity of nature and the accessibility of the port.

Four major factors affecting the selection of resource efficient solutions and technologies in small ports

1. municipal infrastructure
2. number of visitors
3. sensitivity of nature
4. accessibility

When a small port is connected into the municipal infrastructure, a small port can easily have and offer sustainable services for visitors. Water and wastewater management, energy supply and recycling are generally performed sustainably and resource efficiently on a large scale. If infrastructure must be organized by the port itself it may be more expensive, less efficient and limiting the level of services.

The more visitors there are using the services of the small port, the higher the impacts to the environment and the more important it is to provide resource efficient services. Not only the size of the small port and the number of the berth places but also the utilization rate of berth places can be used when estimating what investments for resource efficiency should be carried out.

Natural features of the port area are also the issue to study when considering resource efficiency. To experience the clean nature is one of the main reasons to go boating. Investments should support that expectation. The sensitivity of the nature around port areas, often shown as protected nature areas or closed areas during nesting season, may limit the number of visitors or prevent making an extension to the small port, but may also be the main reason for visitors to come to that area in the first place.

Accessibility defines the number of visitors and the means how they arrive to the port. On the coast, there usually is a possibility to access the small port by car. On a node of the archipelago there might be a bridge or a ferry providing the access to the port by car (see figure 14). Some ports cannot be accessed by car, but only by a public ferry, a tourist boat or a private boat. The accessibility defines also the quality of services a small port can offer for visitors.

Figure 14. People can access for example Sottunga port in Åland by public car ferries.

The way these factors affect the resource efficient solutions and technologies in five different types of small ports, are presented in table 1.

Table 1. Factors affecting the selection of resource efficient solutions and technologies in small ports.

TYPE OF THE SMALL PORT	Municipal infrastructure	Amount of visitors	Sensitivity of nature	Accessibility
A guest port in the city or town centre	available	high	low	high
A guest port on coast and close to attractions	available	high	low/medium	high/medium
A guest port at the node in the archipelago	limitedly available	high/medium	high/medium	medium
A guest port or pier in the natural archipelago	not available	medium/low	high	low
A natural port	not available	low	high	low

4.2 BAT-thinking and restrictions for making investments

Even though a port operator or port owner would be interested in developing the small port in terms of sustainability and resource efficiency, there can be issues that prevent or hinder the investments.

New investments should be viable economically. They should pay back financially in savings in a reasonable period of time or add value to the attraction or reputation of the port, and eventually attract more visitors and increase the revenue of the port. One option is to apply for funding from different development funds like in the case of PortMate. If a port operator or owner can get a part of the investment money via some funding instrument, investing in the best available technology (BAT) becomes easier.

Reliable information about the possibilities and costs of resource efficiency investments and actions are not always easy to reach. It requires time and effort to keep oneself up to date about all the possible solutions. Therefore, a port operator or owner network could be one important tool for getting information on matters concerning port investments. Via the network, joint purchasing of BAT or common services could be easily implemented.

To enable resource efficient investments, there might be a need for the port to operate not only during high boating season, but also in the low season and even offseason for other visitors than boaters. Some investments for infrastructure may enable operations even in the winter.

Especially in the archipelago, local service providers are needed to make profitable investments in ports. The local service providers have the workforce and equipment, and they acknowledge the special features of the area that might affect the implementation of the investments. Such features could be for example the exceptional weather conditions in marine environment.

4.3 Resource efficiency of water management

Water management is an important service of small ports. When planning a boat trip, it is important to know where it is possible to get fresh water. Depending on the boat, boaters and the port itself, there are different needs and expectations for water management services in the port. It can be filling the drinking water bottles or the boat's fresh water tank, cooking, using flush toilet, washing hands, washing dishes, taking a shower or using the sauna, emptying the boats' septic tank and bilge water, or even washing the boat.

A small port may be connected into municipal infrastructure for drinking water supply, especially when ports are located on the coast or nodes in the archipelago. In these cases, the supply of drinking water has no limitations. In the natural archipelago drinking water may be obtained from a well or it is purified from surface water or seawater with a desalination process. In these cases, the supply of drinking water may be limited, and visitors should use it sparingly.

Always when water is used also wastewaters are formed. The two most important things in handling of wastewater, especially in rural areas where there is no existing wastewater management infrastructure, are firstly to minimize the generation of the wastewater and secondly not to mix different types of wastewater (grey, black, bilge) together making it much more difficult and resource inefficient to purify them. Also, no matter what BAT is used, it is very important to educate the users to use it properly. Not to forget the maintenance of the technology or system used.

From the environmental point of view fresh water must be used sparingly and wastewaters must be handled properly on the shore to prevent untreated wastewaters emptied into the sea. In Finland, the draining of septic wastewaters from recreational boats into the watersheds has been illegal since 2005. In Sweden, it has been prohibited since 2015. This means that all the boats that have water toilets must have the possibility for suction unloading of their septic tank. Naturally, the infrastructure with septic tank emptying stations and their management must be in place too.

Best practices of water management in small ports

About drinking water supply it is important to know beforehand if there are drinking water available for boats in the port. Also, limitations of services related to usage of water, is relevant to know in advance. For example, there might not be a bathing room in the port.

People use less water for bathing if there is no water pipe coming into the bathing room or sauna and water must be carried from a well or tap further away. Small port visitors accept the lack of convenience more easily at ports in the natural archipelago and in traditional archipelago environments than at ports on the coast.

To limit the use of washing water in showers, shower heads with reduced flow could be used. Also, automatic shower timers can help reduce the water consumption. The use of showers could also be priced by the used amount of water. For the user the price is presented by the time of use, for example a five-minute shower could cost two euros.

Raising awareness of resource efficiency regarding water management is essential (see figure 15). The visitors must be aware of the reasons why they should reduce the use of water. Reminding visitors of the limited access to water could be effective since environmental awareness and general understanding of sustainability has increased.

Figure 15. It is important to raise awareness of sustainable use of water in ports.
© Riitta Dersten

Providing a convenient dishwashing place in a small port helps to reduce the discharge of wastewater from boats into water in the port. A sheltered dish washing place located near the piers, with warm fresh water supply encourages boaters to use it. (See figure 16.)

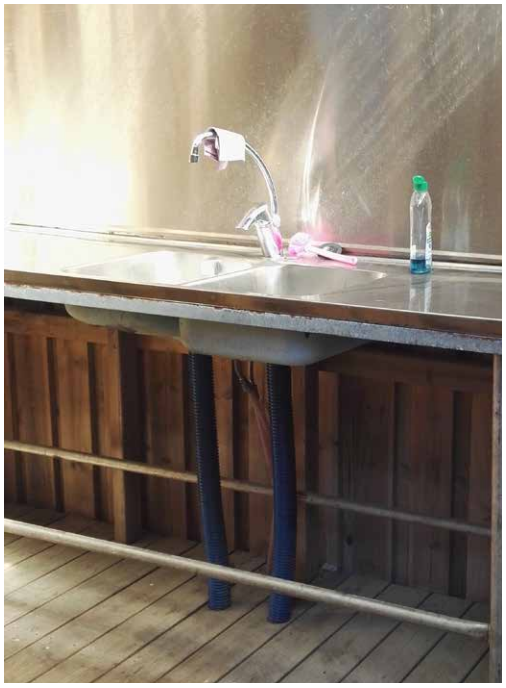

Figure 16. A proper dishwashing place helps to reduce the discharge of wastewater into the sea.

Water consumption in small port toilets can be reduced by selecting low-flush toilets. Seawater may be used for flushing to avoid using valuable freshwater. The grey and black waters should not be mixed but kept and handled separately. There is a wide selection of dry toilets available with composting, freezing, incinerating, and separating features. Dry toilets are preferable, if there is no connection to municipal sewerage system.

Connection into municipal wastewater treatment sewerage is recommended when possible. A port located in a city or town center, other coastal location and sometimes also at a node in the archipelago, commonly have that possibility. If connection is not possible, the small port can have a small private or collective treatment plant which contains a septic tank and treatment units or septic tanks and a treatment field. Treated water is then discharged into surface water or into the soil. In some ports, closed septic tanks with emptying service may be the only option.

For emptying the septic tanks of boats, a service with a pump station is needed. It is also important for boaters to know in which ports the emptying service is provided. Service is expected to be found in city or town ports, other coastal locations and at maritime nodes in the archipelago. At ports in the natural archipelago this service is not common. Some septic tank emptying systems can also provide emptying of bilge waters. It is important to maintain the septic pump station that it is functioning well.

Water management investments in PortMate ports

In the PortMate project, there are several investments related to water management. These investments improve the resource efficiency of water management. At Kuuskajaskari island in Rauma, a mobile floating septic tank emptying station was installed in the Summer of 2018 (see figure 17). Septic waters from boats are collected into a system holding tank, and the whole vessel is regularly hauled into a port on the coast and emptied there into the municipal sewage system. The pump-out station also includes a toilet, which is flushed with seawater into the tank. The whole system works without electricity. Also, the municipality of Gävle has invested into a septic wastewater system and Kökar Havspaviljongen will be investing in one during the PortMate project.

Other water management related investments in PortMate project are service buildings and saunas, a desalination plant, and a connection to the municipal sewerage system. In summer 2017, the municipality of Rauma installed a desalination plant to renew the supply of fresh water on Kylmäpihjala island. There will also be an investment in a service building on Kylmäpihlaja island. Kökar Havspaviljongen will invest in a service building, which will include showers and toilets. The Municipality of Sottunga has connected the small port to the municipal sewerage system, and they will invest in a sauna at the port of Sottunga.

Figure 17. At Kuuskajaskari island in Rauma, a mobile floating septic tank emptying station was installed in the Summer of 2018. © Markus Savolainen

4.4 Resource efficiency of energy management

Small ports often acquire electricity from the national grid. Some isolated ports produce electricity by generators, and some ports have solar photovoltaic systems or wind turbines for electricity production.

The source of heating energy depends on the location and local possibilities of the small port. For heat production, small ports are using district heating, electricity, oil boilers, solar thermal collectors, biofuel (wood, wood chips, pellets, biogas) burners and heat pump technology. During the high season, the heating energy mainly goes for domestic hot water production.

To improve energy efficiency of a port, traditional lighting can be changed to led lighting. Lighting can also be automated with movement sensors, photocell electronic switches or timers. Heat pumps can improve the energy efficiency of heating both of air and water. Air-to-air heat pumps are suitable for many places. Air-to-water heat pumps could be solutions for places where a lot of hot water is needed. Ground or water source heat pumps and exhaust air heat pumps could be solutions for big port buildings which are used all year around.

Figure 18. Good lighting in a port improves safety. Led lighting is a resource efficient solution. Picture from Storjungfrun island, Fyrhamn port. © Alberto Lanzanova

Best practices of supply and use of energy in small ports

Use of electricity on boats has increased because of electronic navigation and communication devices. For that reason, electricity for boats is in high demand and port operators, if they supply it, should offer the service properly and according to the safety requirements. To make boaters use it only when needed, it could be separated in port charges.

For resource efficient power supply, it is wise to choose low emission energy sources even when electricity is bought via a local electricity network provider. Renewable energy does not cause carbon dioxide emissions potentially accelerating climate change. A good choice is to use solar energy. Locally produced photovoltaic solar energy can also be used as off-grid i.e. without connection to the national grid for example on islands.

Hot water supply requires energy so if the boaters use hot water economically there will be savings in energy costs of the port.

Energy management investments in PortMate ports

In the small ports of the PortMate project, resource efficiency of energy supply will be improved by solar energy systems in Rauma, Kökar, Sottunga and Söderhamn. At Sottunga guest port a 5kWp on-grid PV (photovoltaic) system was installed in August 2017 (see figure 19).

Figure 19. An on-grid PV system was installed on the rooftop of a restaurant building in Sottunga port. © Kristiina Kortelainen

At the Fyrhamn guest port on Storjungfrun island in Söderhamn, two identical c. 100Wp off-grid PV systems were installed in June 2018 (see figure 20). The Kylmäpihlaja guest port in Rauma will have its on-grid PV system. Kökär Havspaviljong Ab will have a solar thermal system and a heat pump installed on the new service building to be built during the project.

Figure 20. Fyrhamn port in Storjungfru island in Söderhamn is not connected to the grid. An off-grid PV system was installed as an PortMate investment. © Alberto Lanzanova

In the PortMate project energy efficiency will be improved also with led lighting in the small ports of Rauma, Kökar, Sottunga, Söderhamn and Gävle (see figure 21).

Figure 21. Led lighting was installed in the Syväraumanlahti port in Rauma in Summer 2018. © Minna Keinänen-Toivola

4.5 Resource efficiency of waste management

All types of municipal waste are formed while boating. Some boaters may neglect waste sorting in boats due to the lack of storing space. Also storing of organic waste is problematic in boats since it rapidly starts to smell in warm weather. For that reason, boaters expect waste collection points to be widely available in the small ports they visit.

Best practices of waste management in small ports

Waste collection points reduce the risk that the waste ends up into nature or litters the water in the port. If it is not possible to offer a comprehensive sorting station, the port should concentrate on collecting the most common waste components. Also bottles and cans with deposit are commonly left in waste collection at small ports. Well installed and maintained sorting stations give the image of a sustainable small port. Information about what waste components are collected in the port, beforehand and upon arrival into the port, may encourage better sorting.

To diminish the environmental impact of the transportation of waste, local utilization of sorted waste components could be investigated. For organic waste, the composting can be done locally by the port operator or common solutions could be found together with other operators in the area. The purpose of the ongoing project Nutrient Cycle in the Resorts of Turku Archipelago (Ravinnekiertoa Saaristomeren matkailukohteissa, SaaRa) is to execute nutrient cycle by reducing the amount of food waste, and sorting and composting it (University of Turku, Brahea Center & Keep archipelago Tidy association 2018).

Sustainable waste management covers both solid and liquid waste. In this report wastewater management was discussed in detail as a part of resource efficient water management. Waste management needs to be planned comprehensively, especially when done for a small port with limited access, infrastructure and sensitive natural environment.

Waste management investments in PortMate ports

The Municipality of Rauma invested in waste management planning during the PortMate project. The results will be presented later during the project. The Municipality of Gävle invested in hazardous waste collection facilities. With this investment the city port of Gävle can offer more extensive waste management services for port users. The brand-new waste sorting station is presented in a figure 22.

Figure 22. In the port of Gävle the hazardous waste is taken care of in the service building, the door behind the regular waste sorting containers. © Maria Torung Fagerlund

5 SUSTAINABILITY OF SMALL PORT OPERATIONS

Environmental impacts of boating in Finland was studied comprehensively for the first time in the beginning of the nineties (Eloheimo 1992). Since then, boating has become more popular, and the environmental awareness of boaters has also increased (Askola, H., Takala, O., Tefke, J. 2017). Boaters are better aware of eutrophication of the Baltic Sea and their impact on it if septic wastewater is discharged into the sea. One good example of the decreased environmental impact of boating is the requirement of a septic tank for black wastewaters for boats and septic tank emptying systems in small ports.

Boaters' awareness of climate change has made them pay attention to the use and production of energy. For example, utilization of solar energy is noticed by boaters if a small port has solar panels or heat collectors on roofs of port buildings.

Figure 23. Utilization of solar energy can be easily noticed by boaters. For example in Sottunga port, there are solar panels installed on the restaurant building. © Kristiina Kortelainen

Keep Archipelago Tidy association, KAT, has an environmental programme called “Roope” for Finnish small ports. The idea of the programme is that services, environmental issues and safety all goes together and all need to be at a good level. If a small port fulfills the requirements KAT has set for its environmental programme, a small port may classify itself to be a sustainable small port. (Keep the Archipelago Tidy Association 2017.)

According to KAT, requirements for a sustainable small port are the following:

- appoint a director of environmental matters
- make an environmental plan
- organize waste disposal as appropriate
- dispose of wastewater as appropriate
- be clean and tidy
- focus on safety matters, rescue plan available, code of conduct of safety
- distribute information about safety and environmental matters
- proactively develop and be involved about level of services, environmental issues and safety

Also, the Swedish boat association Svenska båtunionen has published own-check instructions for small ports (Svenska båtunionen 2016). It covers environment issues, such as waste management and wastewater management.

By utilizing the experiences of the investment procedures of the Portmate project, guidance has been created for small ports to help decision making, realization and maintenance of resource efficiency investments. Before taking the first step to invest in resource efficiency, the port operator should go through the following list of thing to consider when planning resource efficiency investments in a port.

Making resource efficiency investments in a port:

1. Recognize the strengths and opportunities of your port. Define the reasons why visitors come to your port. Emphasize the special features of the port to stand out from the other similar small ports.

2. Be realistic of the weaknesses of your port and the threats you might have to encounter. Provide services that fit to your small port's characteristics. Consider the resource efficiency of the services to minimize their environmental impact.

3. Put an effort on the investments that your visitors highly value. Make sure that water and wastewater and recycling is well managed. Tell about the values and act according to them. Make sure that seasonal employees are also committed into them.

4. Remember maintenance and upkeeping. Make sure that all the equipment works properly, and both the property and the outdoor areas are clean and tidy during the whole operating season.

5. Expand operations outside the boating season by providing other services. All-year operation ensures the viability of the resource efficient investments.

6. Co-operate with other small ports and other service providers. There is no need for all the same services in all ports, if some of the ports nearby are already providing the service. Let the visitors of your port know about the services nearby.

7. Support the local know-how of resource efficient investments. Tell about your needs. Local service suppliers with local workforce, equipment and knowledge enables the profitable realization of the investments.

6 CONCLUSIONS

Resource efficiency and sustainability are two of the main topics of the PortMate project. There will be more effort to be put on resource efficiency and sustainability of boating since the possibility to experience the clean marine nature is one of the main reasons to go boating. This report presents views of resource efficient solutions and technologies for small port operations. The goal of the report is to enhance the knowledge of resource efficiency and sustainability of small ports so that the volume of boating can increase in the Baltic Sea without unbearable effects on the environment.

The PortMate resource efficiency questionnaires were conducted in the Spring of 2018. According to the survey results the most important factors for boaters when making the decision whether to visit a small port or not is tidiness, cosiness and location of the port. In terms of environmental friendliness, visitors pay the most attention to the cleanliness of the toilets and other facilities, the organisation of waste collection, and the purity of the water in the port.

Sustainable small ports offer the services that are in line with the results of the survey and that are easily visible for their visitors. Services that affect directly to the quality of water, wastewater management, waste management and tidiness, are at the top of the list and are well managed in a sustainable small port.

Sustainable small ports set the level of their services in line with the infrastructure, number of visitors, sensitivity of surrounding environment, and accessibility. If some service is not possible to perform resource efficiently, a sustainable small port is not offering it to their visitors.

A sustainable small port co-operates and communicates with visitors, other small ports and service suppliers to get and share information about resource efficiency. A sustainable small port has a willingness to develop its operations and facilities.

Sustainable small ports offer the resource efficient services that the environmentally aware visitor is requiring. A sustainable small port also guides other visitors to behave environmentally friendly. The same sustainable manners, such as waste sorting, will become a common practice also on boating as it is already in peoples' everyday life.

Among boaters and port operators, there is a need to raise awareness of resource efficiency and sustainability. PortMate will create educational video material for visitors and port operators about resource efficient and sustainable solutions. The material will explain, for example, why there might be limitations on the level of the services in the small ports, e.g. limited amount of energy and fresh water, limited wastewater treatment and challenges of waste management, and why there are some solutions which may cause inconveniences e.g. reasons to use a dry toilet instead of a water-flushing toilet if no wastewater treatment is available.

As a solution to provide the necessary information, the PortMate project is creating an interactive ICT tool, which includes among other functionalities, the video material mentioned above, and offers a platform to communicate and estimate resource efficiency and sustainability of small ports.

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APPENDIX 1

Survey for boaters on environmental issues of small ports.

Dear boater and/or user of small ports

We are inviting you to participate in a survey about the resource efficiency and sustainability of small ports.
It will take about 5 minutes to complete the feedback form below.

Questionnaire is part of the PortMate project. PortMate focuses on solutions to promote safety, sustainable services and on a joint marketing of small ports in the Central Baltic region.
For more information about the PortMate project: https://www.facebook.com/CBPortMate

NOTE: A solar charger will be raffled among the survey participants! The solar charger will be delivered without additional delivery costs to winner only to Finland, Åland, Sweden, Estonia and Latvia.

Thank you for your response!

Background information

	Female	Male	Other
Gender	○	○	○

Year of birth, select: 1900 ▾

Country of residence: _____

Home port, if any: _____

What type of small ports do you use?

	Frequently	Seldom	I don't use
Marina or pier for visitors	○	○	○
Natural ports	○	○	○

Which type of boat do you use?

- ○ Sailing boat or motorsailor
- ○ Inboard motorboat
- ○ Outboard motorboat with engine of max 20hp
- ○ Outboard motorboat with engine of over 20hp
- ○ Water scooter
- ○ Other boat without engine (rowing boat or kayak)
- ○ I don't do boating

Usage of small port services

	Frequently	Seldom	I don't use services
I stay overnight in the port	○	○	○
I use port services, but don't stay overnight	○	○	○
I don't do boating, but I use the port services	○	○	○

What would make you to use more the small port services?

Choosing the small port

Select how important following factors are to you when choosing a small port to visit

	Not important	Somewhat important	Important	Very important	I don't know
Location	○	○	○	○	○
Services	○	○	○	○	○
Safety	○	○	○	○	○
Security	○	○	○	○	○
Price level	○	○	○	○	○
Cosiness	○	○	○	○	○
Tidiness	○	○	○	○	○
Natural environment	○	○	○	○	○
Events	○	○	○	○	○
Popularity	○	○	○	○	○
Pre-booking possibility	○	○	○	○	○
Recommendations	○	○	○	○	○
Newness	○	○	○	○	○

Select how important the environment friendly factors are to you when visiting a small port?

	Not important	Somewhat important	Important	Very important	I don't know
Cleanness of the water	○	○	○	○	○
Cleanness of the toilets and other facilities	○	○	○	○	○
Use of renewable energy by the port	○	○	○	○	○
Self-production of renewable energy (e.g. solar electricity or solar heat) by the port	○	○	○	○	○
Energy-efficiency of the port operations	○	○	○	○	○
Efficient use of fresh/drinking water (water-saving faucet etc.)	○	○	○	○	○
There is septic and grey water emptying system	○	○	○	○	○
There is oily water (bilge) emptying system	○	○	○	○	○
There is kitchen or cooking facility	○	○	○	○	○
There is a dish washing facility	○	○	○	○	○
Treatment of waste waters is adequate	○	○	○	○	○
There is a waste collection	○	○	○	○	○
There is a collection of recyclable waste components	○	○	○	○	○
There is an environmental management system or updated environmental program	○	○	○	○	○
Visitors are guided of environmental matters	○	○	○	○	○
There is knowledge about features of the nearby natural environment and visitors are guided about it	○	○	○	○	○
Local and seasonal food are promoted in restaurant, cafe and shop	○	○	○	○	○
There is a possibility to rent a bicycle	○	○	○	○	○
There is a possibility to wash a bottom of boat	○	○	○	○	○
Visitors are guided of locations of service which are missing from the port services	○	○	○	○	○

What other factors matter from resource efficiency and sustainability point of view when you are choosing a small port to visit?

Solar charger raffle, contact information

If you want to take part the to the solar charger raffle, please leave your contact information. Contact information will be used for the purposes of the lottery only.

-

Name

Email or phone number

Proceed

Save

Thank you!

APPENDIX 2

Survey for port operators on environmental issues of small ports

Form is timed: publicity starts 1.3.2018 12.00 and ends 31.3.2018 23.59

Dear Port Operator

We are inviting you to participate in a survey about the resource efficiency and sustainability of small ports. We kindly ask you to use few minutes to share the information of the small port you are operating. If there are several small ports or natural ports you are responsible for, please fill in one form for each port. A similar survey is carried out among boaters.

Survey is part of the PortMate project. PortMate focuses on solutions to promote safety, sustainable services and on a joint marketing of small ports in the Central Baltic region.

For more information about the PortMate project: https://www.facebook.com/CBPortMate

NOTE: A solar charger will be raffled among the survey participants! The prize will be delivered to winner without additional delivery costs only to Finland, Åland, Sweden, Estonia and Latvia.

Thank you for your feedback.

General port information

Name of the port

ID number of the port, if any

Location of the port

	Degree	Minutes	Seconds
Latitude			
Longitude			

Country

- [ ] Finland
- [ ] Sweden
- [ ] Åland islands
- [ ] Estonia
- [ ] Latvia
- [ ] Other

Address

Phone number

E-mail

Web page or social media channels

	Yes	No	How is the booking done (by phone, via online booking service)?
Is it possible to book berth in advance?	○	○	

Overall description of the port (maximum of 500 characters)

Classification of the small port

- [ ] Marina for visitors
- [ ] Pier for visitors
- [ ] Outing port
- [ ] Natural port, mooring without services
- [ ] Service port (boat repair etc.)
- [ ] Home port

Services

	Yes	No
Toilet	○	○
Household waste	○	○
Electrics	○	○
Drinking water	○	○
Shop	○	○
Fuel	○	○
Septic waste / bilge	○	○
Restaurant	○	○
Laundry	○	○
Shower	○	○
Sauna	○	○
Pharmacy	○	○
Ramp	○	○
Information board	○	○
Café	○	○
Kiosk	○	○
Grocery kiosk	○	○
Nature trail	○	○
Swimming place / beach	○	○
Grilling place	○	○
Playground	○	○
Public transport	○	○
Sight	○	○
Event	○	○

Berths for visitors (units)

Berths for home port users (units)

Depth (meters)

Resource Efficiency and Sustainability

Location, accessibility and service level of the port

- ☐ Port is located on the coast in vicinity of city or town
- ☐ Port is located on the coast out of population center
- ☐ Port is located at the node on island, good accessibility and level of services
- ☐ Port is located at the island with limited accessibility and services

If port locates on island how transportation to coast is arranged

- ☐ Bridge or non-stop ferry
- ☐ Ferry with schedule
- ☐ Private boat (own or service company)

Utilization rate of berths for visitors, high season (midsummer until start of school year) Select ▾

Utilization rate of berths for visitors, low season (other time the port is open) Select ▾

Water quality

	Good	Moderate	Poor
Exchange of coastal water around the port	○	○	○
Water visibility or water clarity (algae growth, litter, etc.)	○	○	○

Natural environment

	Yes	No
Is there in near vicinity special natural features (e.g. untouched nature, special species, protected area, scenery)?	○	○
Is there guidance and information available about natural features (e.g. information boards, personal guidance, Website)?	○	○

Wastewaters from boats

	Yes	No
Is there septic and grey water emptying system?	○	○
Is there oily water (bilge) emptying system?	○	○
Is there dish washing facility available?	○	○

Boat bottom washing

	Yes	No
Is there possibility to wash boat bottom at the port?	○	○

Energy supply

	Yes	No
Is the energy supply from renewable energy sources?	○	○
Is there self-production of renewable energy (e.g. solar electricity or solar heat) at the port?	○	○

Energy efficiency

	Yes	No
Is the energy consumption monitored?	○	○
Has the energy efficiency of the port operations been estimated?	○	○
Is the port using technology to improve the energy efficiency, like	○	○
-- LED lighting?	○	○
-- Lighting automation (motion sensors, pecu switches, etc.)?	○	○
-- Heat pumps?	○	○
-- Heat recovery technologies (Air ventilation, drainage, exhaust gas, etc.)?	○	○

Has some other actions been performed to improve the energy efficiency?

Management of environmental issues

	Yes	No
Does the port have environmental management system, updated environmental program or plan?	○	○
Are the visitors guided (information board, web pages) about the environmental issues?	○	○
Is the tidiness of the port and the port's shoreline maintained regularly?	○	○

What types of toilets are used in the port?

- ☐ Flush toilet
- ☐ Dry toilets
- ☐ Composting toilets
- ☐ Other type of toilets

How the drinking water supply has been arranged?

- ☐ Municipal water supply
- ☐ Well
- ☐ Treatment from surface waters
- ☐ No drinking water available

How the wastewater is handled?

- [ ] Municipal wastewater treatment
- [ ] Own or local treatment equipment and process
- [ ] Tank with emptying service
- [ ] No treatment

Drinking water consumption

	Yes	No
Is the water consumption monitored?	○	○
Have any actions been carried out to reduce the water consumption?	○	○

What waste fractions are collected at the port?

	Yes	No
Mixed waste	○	○
Energy waste	○	○
Plastic packaging waste	○	○
Paper	○	○
Cardboard	○	○
Metal	○	○
Glass	○	○
Biowaste, organic waste	○	○
Hazardous waste (e.g. oily waste)	○	○

Other services

	Yes	No
Is local and seasonal food promoted in restaurant, café and/or shop?	○	○
Are there rental bicycles?	○	○
Are the visitors guided about locations of service which are missing from the port services?	○	○

Your feedback

Are there any plans to improve resource efficiency and sustainability of the port?

Do you have any comments or feedback about the survey?

Contact information for the raffle

If you want to take part the to the solar charger raffle, please leave your contact information.

-

Name

E-mail or phone number

Proceed

Save

Thank you!

This report provides general information about the relevant factors creating resource efficiency in ports, and it includes the perspectives of both the boaters and the port operators. Actions of the port operators play a big role in this matter, but also the boaters must keep in mind that it requires every visitor's contribution in creating resource efficiency.

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