Challenges and Opportunities for Strategic Sustainable Development of Shipping and Wallenius Marine

This report is a translation and a shorter version of the report "Utmaningar och möjligheter till strategisk hållbar utveckling för sjöfarten och Wallenius Marine" authored 2019 by Dr. Sven Borén after comments by involved staff at Wallenius Marine AB and Blekinge Institute of Technology.

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1 Introduction

As the earth's population grows and increases its consumption, resources such as oil, food, water, metals and energy will become scarce (UN World Commission on Environment and Development, 1987). Through well-designed and anchored goals of sustainable development, and a common understanding of how to move in that direction, a product or service can be developed to avoid costly changes and unsustainable societal development both locally and globally (G. Broman, Holmberg, & Robèrt, 2000). For example, vehicle manufacturers can switch to use more sustainable materials, reduce energy use and base it on renewable sources (Borén et al., 2017). An outline of the transition to sustainable personal road transport system has been given in the report 'On Track for 2030' (Ny et al., 2018) by BTH's research group SustainTrans within the project GreenCharge (Figure 1 summarises this).

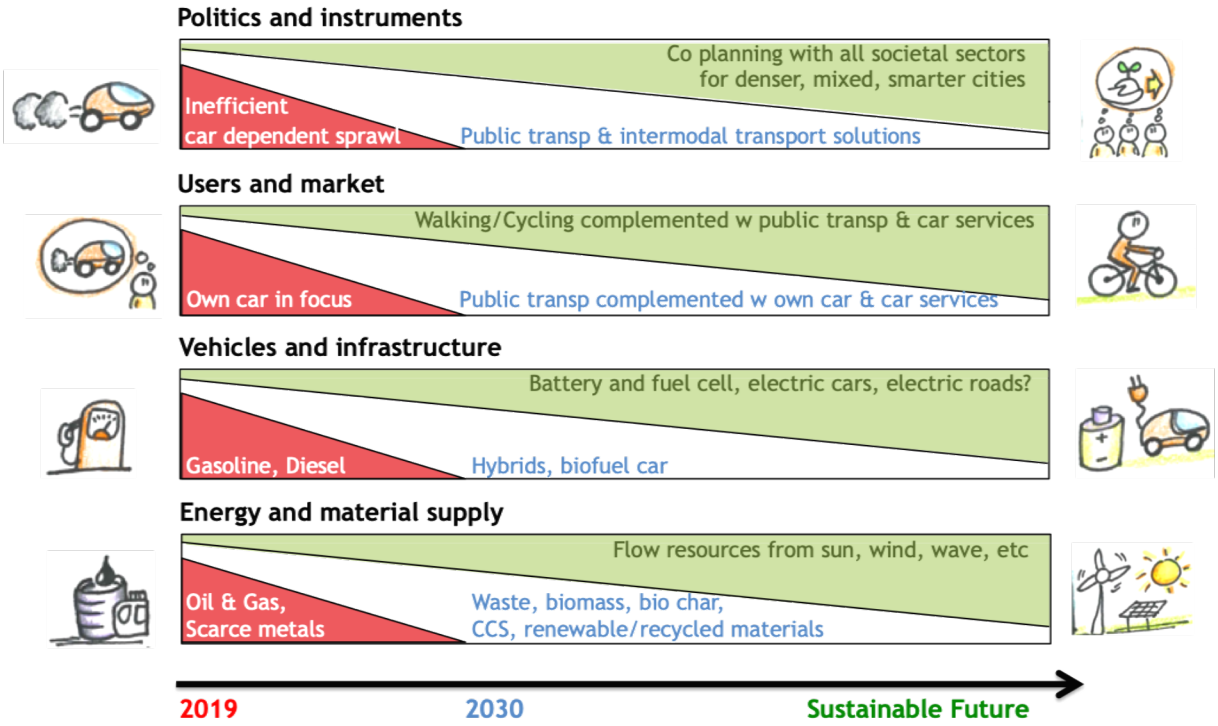

Figure 1: The road to a fossil free and sustainable personal road transport system. How the four identified sub systems can be developed to phase out fossil fuels by 2030 and pave the way for sustainability. Developed from Ny et al. (2018). Illustrations (left and right) by Carolina Willamil.

Shipping is contributing to a positive societal development as people can access resources in an energy efficient way when compared to other transport modes (Figure 2).

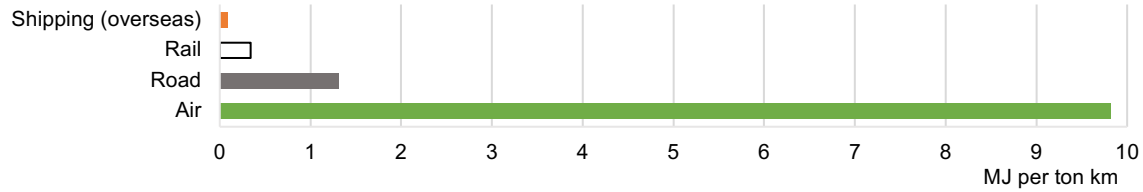

Figure 2: Goods transport energy efficiency by modes used within the Deutsche Bahn Group. Data source: Deutsche Bahn AG (2018)

However, shipping accounts for greenhouse gas emissions (Figure 4) and air pollution (Figure 3), in a way that counteracts a societal development towards Sweden's environmental goals (Naturvårdsverket, 2005) and that Sweden will become greenhouse gas neutral in 2045

(Regeringskansliet, 2017). The trend is increasing emissions for both greenhouse gases and air pollution, which is linked to increasing traffic. The latest sulfur directive for the North Sea, the Baltic and the English Channel, which allows a maximum of 0.1% sulfur in fuel by 2020 and 0.5% in areas classified by the International Maritime Organisation (IMO) as Emission Controlled Areas – ECA (IMO, 2018), is expected to reduce sulfur dioxide emissions in these areas around the major shipping lines and in ports drastically. The compliance has though been incomplete (The European Commission, 2018). Shipping also affects environmental impacts in the water from, among other things, emissions from fuel and hull painting, as well as agitation of bottom sediment from shallow waterways, noise, and in a few cases beach erosion from waves (Lindgren, 2018).

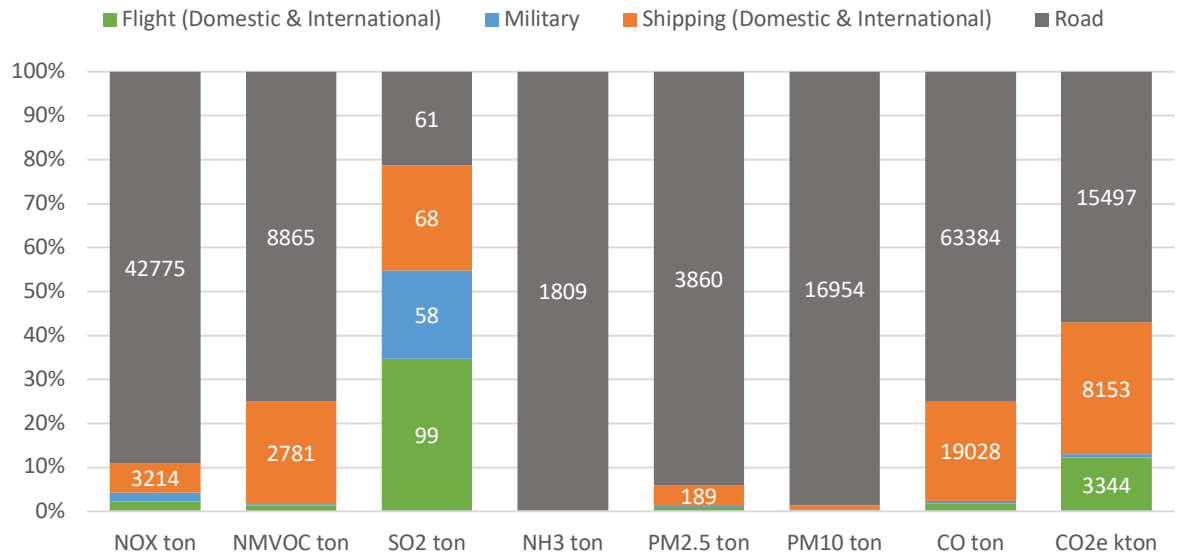

Figure 3: Share (%) and total emissions (ton) per Notrogen Oxides (NO_X), non-Methane Volatile Organic Compounds (NMVOC), Sulphur Oxides (SO_2), Ammonium (NH_3), Particulate matters dia 2.5 and 10 (PM2.5, PM 10), Carbon Monoxide (CO), and Greenhouse gas equvialents (CO_2e) by the four transport modes that created most airborne emissions and Greenhouse gases in Sweden during 2017. Data source: Statistics Sweden (2019).

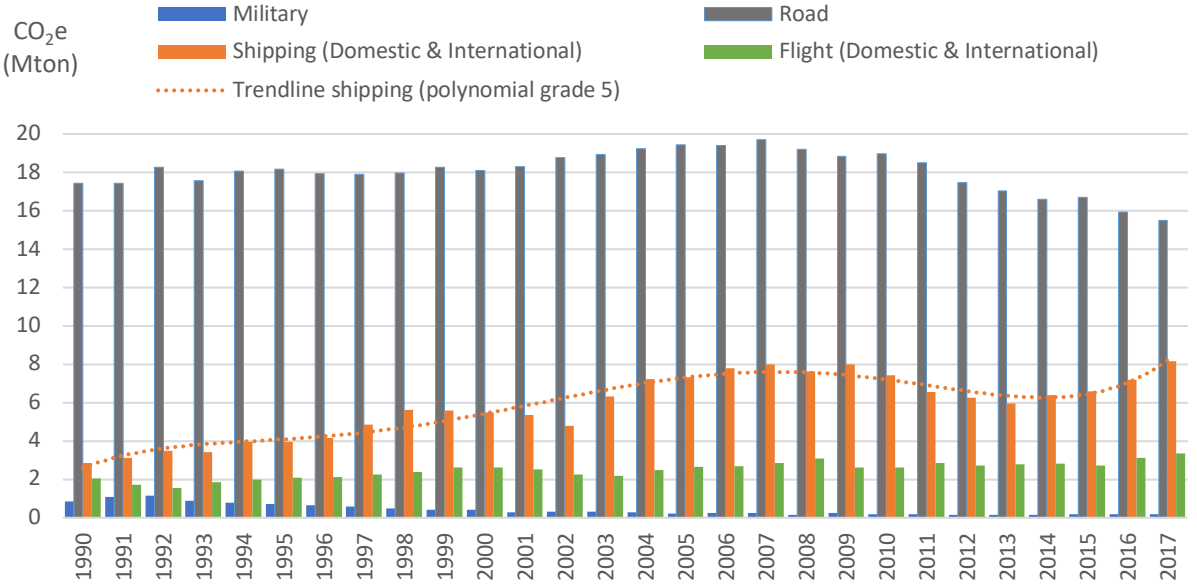

Figure 4: Emissions of Greenhouse gases from military transport, road transport, flight, shipping, and trendline for shipping in Sweden from 1997 to 2017. Data source: Statistics Sweden (2019).

1.1 About Wallenius Marine

The Soya Group consists of several different companies, which mainly focus on shipping, hourse stud and real estate (Soya Group, 2019). The companies work actively and with a long-term perspective on sustainability, including Wallenius Marine which has a long tradition of being a leader in environmentally friendly sea transport. This ambition has gradually been raised and resulted in 2010 in a road map 'ZERO' (Fagergren, 2018), which has been followed by ambitious development projects focusing on vessel systems. One example is the wind-powered concept “wPCC” (Figure 5), which can radically reduce energy use and travel with an average speed of 10 knots (Sjöström, 2018). The company has set a goal to operate renewable energy vessels by 2050, for example through a mix of electricity and biofuels. They have delivered ships to the shipping company United European Car Carriers (UECC) that are powered by Liquefied Natural Gas (LNG). Wallenius Marine sees LNG as part of the transition to lower environmental impact as emissions of nitrogen dioxide, sulfur dioxide, and particles become significantly lower, and there is also less greenhouse gases when compared to vessels powered by bunker oil (Wallenius Marine, 2016). These vessels can be operated with Liquefied Biogas (LBG) if the supply of LBG for vessels increase and if the price become sufficiently attractive. That could significantly reduce the climate impact and also the dependence on fossil fuels in the maritime sector. It should also be mentioned that the next generation vessels for the UECC will be equipped with a battery solution connected to the shaft generator. The battery solution then replaces one out of three engines for auxiliary systems.

Figure 5: Sketch of the wPCC concept. Source: Sjöström (2018)

Despite the efforts made by Wallenius Marine and some other actors in the shipping industry to make shipping sustainable, it is still unclear how this could be done so that some initiatives will not be isolated phenomenon, and so that solutions are not sub-optimized to solve one sustainability challenge while excluding other aspects of sustainable development. In other words, it is unclear how investments in shipping could be planned to cooperate, rather than counteract one another, and how these measures and goals could be guided by a holistic perspective on sustainability and that is sufficiently robust for many generations to come. Since it is very difficult to involve all actors in the shipping industry, it is also uncertain

which actors need to be involved and what roles they should play in order for sustainability-oriented initiatives to be as efficient as possible.

1.2 Purpose of the study

This study aims to gain knowledge about the current state of sustainable development of the shipping sector, and Wallenius Marine specifically, with emphasis on changing the existing fleet. The study is a part of a collaboration project between the Department of Strategic Sustainable Development at Blekinge Institute of Technology (BTH) and Wallenius Marine AB. It also aims to increase collaboration between the parties through the education programs at BTH, as well as create a basis for an application for a research project that aims to create roadmaps for sustainable development of Wallenius Marine and shipping in general.

2 Methods

In this study, a concept of sustainability that includes a comprehensive societal perspective was used: the Framework for Strategic Sustainable Development – FSSD. This includes the following eight system conditions for a sustainable future (G. I. Broman & Robèrt, 2017):

> "In a sustainable society, nature is not subject to systematically increasing …
>
> 1... concentrations of substances extracted from the Earth's crust;
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> 2... concentrations of substances produced by society;
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> 3... degradation by physical means;
>
> and people are not subject to structural obstacles to…
>
> 4... health;
>
> 5... influence;
>
> 6... competence;
>
> 7... impartiality;
>
> 8... meaning-making."

The FSSD also includes a methodology for application of FSSD in an organization, sector, or for a product/service, which can be briefly described by the following four step procedure (G. I. Broman & Robèrt, 2017):

A. Capturing a sustainability vision.
B. Analysing current challenges and assets in relation to the vision.
C. Finding possible steps towards the vision.
D. Prioritize into a strategic plan.

This study includes steps A and B of the procedure to create an understanding of challenges and opportunities for sustainable development of Wallenius Marine and shipping in general. Steps C and D are then preferably made with several other shipping stakeholders, as shipping includes many actors and global laws/regulations. It would be difficult for Wallenius Marine to act on this issue on their own without several other actors agreeing on how shipping in general should contribute to sustainable development.

In the work with the vision, the existing have been analyzed based on what is described on the Soya group's website and Wallenius Marine's website, as well as supplementary information from interviews with employees in each company. Proposals have then been made by the author to include a full sustainability perspective.

In step B, stakeholders were mapped to identify their different roles and relations to Wallenius Marine. An operational analysis was then conducted to identify what is needed for Wallenius Marine to carry out their business and what products & services they provide their customers with, as well as identification of residual products/waste. The results of these analyzes have then been the basis for the mapping of current strengths and weaknesses of Wallenius Marine (and shipping in general) towards the vision, as well as future challenges and opportunities to be able to reach the vision. The information for the analyzes has been obtained via literature studies by the author, as well as interviews and several workshops with Wallenius Marine employees, where the author was the discussion leader and then summarized the results. Since then, the results have been refined through the views of employees at Wallenius Marine.

3 Results

3.1 Vision for Sustainability

According to the website (Hållbarhet, 2018) the Soya group's strategic ambitions reflect an ambitious environmental perspective and social commitment. The companies in the Soya group (for example Wallenius Marine) pursue active and long-term sustainability work according to the following Group-wide principles (translated from Hållbarhet, 2018):

- All environmental work must be from a holistic perspective. It is important for us to be a pioneer and to show others what is possible to achieve.
- Everyone should work with upstream solutions. This means that we strive to solve issues at their source to avoid causing new problems.
- Everyone should contribute to sustainable development by optimizing resource consumption and by reducing the environmental impact in their respective operations.
- The environmental work is based on the principle of continuous improvement, and should be integrated with other business-related strategic objectives in each company.

The Soya Group is currently working on including more of social sustainability in the vision. A more complete sustainability perspective could be clarified by, for example, adding the following to the principles:

+ Operations should help to prevent structural obstacles from being built against human health, skills, influence, impartiality and meaning-making

Within the framework of the Soya Group's guidelines, Wallenius Marine have the following mission:

> ”Leading the way towards truly sustainable shipping”

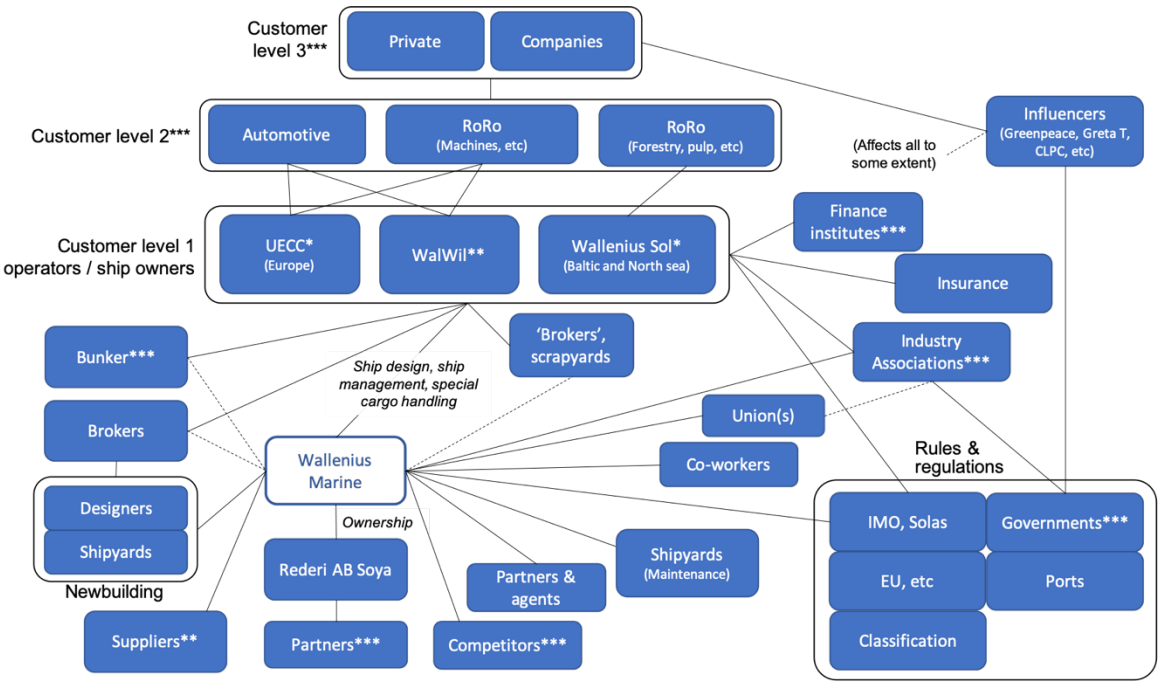
At Wallenius Marine, documents are available through internal computer systems (BASS / BMS), which describes the company's policy against corruption, alcohol and drugs, quality, environment, security and social work. There are also internally developed strategies towards the mission.

The environmental work in 2010 resulted in a roadmap 'ZERO' (Fagergren, 2018):

> “Wallenius Marine have a roadmap to eliminate emissions from shipping. The roadmap is focusing on energy consumption, energy carriers and emissions to the atmosphere. It shows that it is already possible to build completely emission-free vessels with today’s technology. However, there are other challenges that must be met.”

3.2 Stakeholder analysis

According to the stakeholder analysis in Figure 6, Wallenius Marine AB have one owner and several customers/shipping companies for different markets, which are partly owned by Wallenius Lines, who is a sister company to Wallenius Marine within the Soya group. Customers are available on several different levels, which means that the distance to the end customer is large. There are several world-wide stakeholders in the laws and regulations sector that affect operations to a great extent, but there are also influencers that affect all stakeholders to varying degrees. Several of the stakeholder groups (e.g. customers at level 2 and 3, subcontractors and partners) need to be further analysed to identify which of them who supports or counteracts the work towards the vision.



* 50% ownership by Wallenius Lines
** 38% ownership by Wallenius Lines
*** Need further breakdown to display underlying organisation.

Figure 6: Stakeholders to Wallenius Marine AB.

3.3 Operations analysis

The operational analysis in Figure 7 shows that there are many different dependencies on suppliers, but also that the business depends on employees and the environment, as well as what requirements the customers have. The multifaceted operations mainly stand on four pillars: ship management; ship design; feasibility studies; and consulting services related to ship design. Wallenius Marine offers customers/shipping companies to manage recruitment, further training of the crew, ship management, technical services, performance optimization, newbuilding, retrofitting and also the IT environment onboard (Wallenius Marine, 2019). Residual products and waste have the highest sustainability impacts, and stem mainly from ships' propulsion during operations, and also from the construction phase of the vessels. However, the recycling rate of vessels is up to 98%. It is in that category that Wallenius Marine considers to put most efforts towards the mission. However, emissions to air and sea from vessels during all life-cycle phases are difficult to influence since the customers specify

the major cost drivers (e.g. area of application, load capacity, propulsion system, fuel and speed).

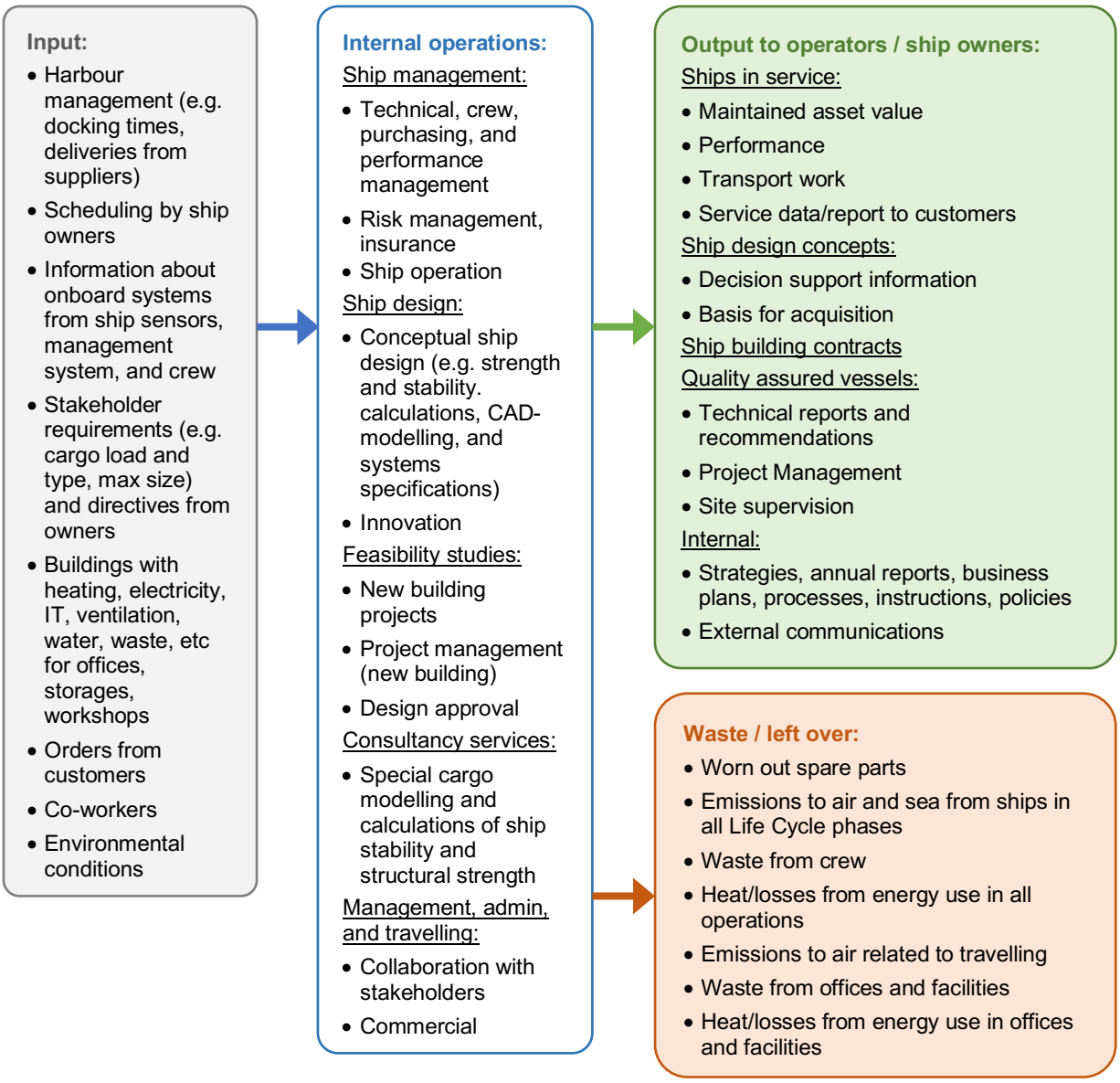


Figure 7: Operations analysis of Wallenius Marine that shows which the internal operations are, and what the company depends upon (i.e. input), what is delivered to customers as products/services (i.e. output), and what is left over from these operations (i.e. waste/left over).

3.4 Current strenghts and weaknesses in relation to the vision

The shipping industry has traditionally been slow to change due to long-term investments and a focus on costs, which is reflected in the analysis of current strengths and weaknesses in relation to the vision of sustainable shipping (Table 1). However, there are relatively large opportunities to achieve changes if many or significant shipping companies / decision makers / customers agree. It also becomes clear in the analysis of current strenghts and weaknesses that energy from fossil fuels is used in large quantities, despite the fact that energy use is low per load unit when compared to other transport modes. Material production for construction of the ships, and in the production processes of the vessels, is also largely done with energy based on fossil fuels. For example, in South Korea and China, 69% and 65% respectively of total energy use came from fossil fuels in 2017 (International Energy Agency, 2018).

Moreover, biodiesel can replace fossil diesel and bunker oil, and biogas that can be converted to LBG, but the availability of biofuels is limited to half of the global transport needs, and one third in Sweden, provided that production of biofuels is sustainable (Grahn & Sprei, 2015).

Table 1: Current strengths and weaknesses for Wallenius Marine (WM) and shipping at large in relation to the vision.

Strenghts	Weaknesses
Well established business with a lot of knowledge/experience	Slow changes in built-in decision structures and static regulations
Political willingness within EU to shift from road to sea transport	High energy use and consumption of fossil oil for propulsion and loading
Freedom to act within international laws / regulations and opportunities to influence	Use of unsustainable materials and high energy use for shipbuilding
Can choose subcontractor (WM)	Weak international environmental requirements
Flexible routes at sea	Ports use large areas in sensitive environments
Globally and cross-border	Homogeneous and male-dominated industry
Ships have long operational life	Short-term profit and focus on costs
98% recovery rate of vessels	Insufficient recycling in some countries
Energy efficient transport per load unit	Emissions to the sea and air in all life cycle phases
Renewable fuels are available	Biofuels are also needed for other applications

3.5 Future challenges and opportunities towards the vision

Despite identified current weaknesses with regards to a sustainable future in the previous analysis in Table 1, and future challenges identified in Table 2, a number of interesting future opportunities could be identified towards the vision.

Table 2: Future challenges and opportuntiies for Wallenius Marine (WM) and shipping at large towards the vision.

Challenges	Opportunities
Low visibility to end consumers makes it difficult to motivate sustainable choices	Impact on subcontractors and customers through ex. marketing and lobbying
Prescriptive regulations	Digitization and technology development
The logistics system - just in time	Modified / new business models
Disturbances in route planning (WM)	Cargo optimization on board and in port. Preloading?
Large capital tied up = inertia	Logistics and route optimization
Lighter vessels	Energy efficiency
Energy carriers with high energy density are required	Propulsion powered by renewable energy: • Battery propulsion in/out of harbours • LNG -> liquified biogas for shorter routes, e.g. in EU • Biodiesel instead of Marine Fuel/Diesel Oil • Wind powered vessels for longer routes

As stated earlier, the fossil fuel in current vessels can be exchanged to renewable fuel and new ships can run on LNG. The latter can at a later stage be changed to LBG when there could be sufficient supply of raw material and willingness among shipping companies to convert to fuels based of renewable sources. That needs to be preceded by either increased willingness to pay for products to be shipped with green energy, and/or political decisions so that it will be more expensive or not allowed to transport goods with fossil fuels.

Propulsion powered by wind, by means of wings, can radically reduce energy use. That needs to be preceded by new or modified business models that allow a speed reduction from today's 16 to 18 knots to about 10 knots on average and would have to consider weather conditions even more. This would to some extent contradict current business models, which are based on that the vessels will spend as short a time as possible with cargo onboard.

4 Summary of Results and Continuation

4.1 Key Results

The study aimed to land in a vision for a sustainable future for Wallenius Marine and shipping in general, as well as to identify challenges and opportunities towards such a vision. By the application of a strategic and comprehensive sustainability perspective through the ABCD methodology, it was identified that…

… the existing vision for the owners Soya AB (and thus Wallenius Marine) reflects a high ambition regarding ecological sustainability, but in line with ongoing internal audit work, the vision could be supplemented with regard to social sustainability. In the mission, Wallenius Marine has an ambition to be a leader in sustainable shipping.

… the business of Wallenius Marine has several pillars and several different customers and stakeholders, who in turn depend on global customers/stakeholders/regulations.

… business operations are slow to change, but opportunities to influence exist through collaboration with several other shipping companies/customers/decision makers. Sustainable energy carriers exist in the form of biofuels for existing fleets, and wind in the future, but this requires access to biofuels on a larger scale and changes in business models to allow slower speed when using wind propulsion.

4.2 Proposals for future studies

This study was also intended to lay the ground for a future study that could further clarify how shipping in general and specifically Wallenius Marine can approach a sustainable future. Such a future study could focus on the opportunities identified in this study, i.e. how the use of sustainable energy carriers, especially biofuels and wind, can become attractive to Wallenius Marine's customers (i.e. ship owners), as well as their customers (i.e. transport buyers). In the case of wind, the business models specifically need to be reviewed to enable slower and more weather-dependent propulsion. With regard to biofuels, it refers to how biodiesel and liquid biogas could be more attractive to use for propulsion of existing fleets and for the new vessels that are capable of being produced in the near future.

Since Wallenius Marine is dependent on many different stakeholders, such as transport buyers, shipping companies, international and national regulators, shipyards, and brokers, it is difficult to be a pioneer in the industry while maintaining competitiveness. Therefore, in addition to Wallenius Marine and relevant companies in the Soya group, a future study would need to include several other national and global players that can contribute to the sustainable development of shipping. The collaboration can advantageously be sought within networks established with Wallenius Marine and BTH, such as Lighthouse and the Swedish Marine Technology Forum at RISE. This collaboration should also include shipping companies/ customers, transport buyers, IMO, national governments and intergovernmental authorities, and other stakeholders identified in the stakeholder analysis, whom can contribute to a sustainable development. Such future study that includes several actors with different

business operations and future plans should preferably have long-term perspective with a sustainable future as a guiding star. The framework for strategic sustainable development - FSSD can then be used as it is designed to guide that type of study. Such a study should be preceded by a more profound global analysis than has been included in this study. Then a joint vision work for shipping towards a sustainable future should be done, followed by a survey to clarify further sub-studies / investigations (apart from the above) to cover, if possible, additional needs of other participating actors. Based on this result, the actors can then develop a common list of solutions and goals, which can, after prioritization, result in a joint roadmap for sustainable development of shipping, as well as tailormade roadmaps for each participating actor. These roadmaps could then be used as guidance or inspiration for the remaining actors in shipping.

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