

## SUSTAINABLE MARITIME TRANSPORTATION SYSTEM IN EUROPEAN UNION

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### ABSTRACT

Maritime transport is an efficient mode of transport and represents a key element of the multimodal transportation system. The main challenge of every nation is the sustainable development of each sector of activity. So, the actors involved in this process have to identify the best solutions to accomplish this goal. The present paper outlines which are the possibilities to create a maritime transportation system which is sustainable and especially, the importance of performance indicators' analysis. Indicators can help identify problems, find solutions, analyze options, compare and evaluate an organization. Also, the paper presents a statistical overview of indicators analyzed from the viewpoint of European Union' sustainable development goals and the sustainable transport indicator set, considering the dimensions of sustainable development: economic, social and environmental. Solutions to achieve sustainable maritime transportation, such as environmental management systems and differentiate port infrastructure charges based on environmental criteria are described.

**Keywords:** *sustainable development, sustainable transportation, maritime transport, European Union, environment, sustainable maritime transportation system, indicators*

### 1. INTRODUCTION

Maritime transport is the pillar of world trade and globalization. World trade and maritime transport are fundamental to sustain economic growth and to spread prosperity in every part of the world.

Maritime transportation system is an essential element of the intermodal transportation chain, bringing together the manufacturer and the consumer of the commodity.

The major problem of every economy is that it must develop only in a sustainable way. So, there is a great need to find more opportunities of sustainable development in every sector of the economy. Making transport sustainable, including maritime transportation system, is probably the most challenging aspect of sustainable development.

### 2. A STATISTICAL OVERVIEW ON SUSTAINABLE DEVELOPMENT GOALS IN EUROPEAN UNION

The 2030 Agenda for Sustainable Development addresses poverty eradication, economic, social and environmental dimensions of sustainable development and good governance. Focusing on the development of a global indicator framework for evaluating the accomplishment of sustainable development targets represents a serious challenge for Europe.

The most important indicators analyzed for European Union's member states from the viewpoint of sustainable development goals shows the following results [7]:

- 23,7% of European Union's population is at the limit of poor condition, according to 2015 data;
- organic farming makes up 6,2% of the European Union's agricultural land;
- 21,6% of European Union's population agree that their health is very good;

- 11% of European Union's population are leaving too soon from education programs and training;
- biochemical oxygen demand fell by 20,4% between 2002 and 2012, showing improvement in water quality;
- Real Gross Domestic Product (GDP) per capita in the European Union grew by 1% per year on average in the period 2000-2015;
- European Union spends 2,04% of GDP on research and development. Eco-innovation index takes different values from 50 in Bulgaria to 167 in Denmark;
- the concentration of particulate matter has decreased by 21,6% (22,5 micrograms per cubic meter);
- European Union recycles 43,5% of its municipal waste;
- 20,4% of the people in the European Union has various problems to access public transportation;
- greenhouse gas emissions have been reduced by 23% between 1990 and 2014 in the European Union;
- European Union had imports of almost 835 billion EUR in 2014 from developing countries;
- the number of homicide offences has decreasing by more than 100 a year since 2008;
- police institution has the highest credibility in European Union (5,9 out of 10 points), followed by legal system (4,6 out of 10 points) and political system (3,5 out of 10 points).

### 3. LITERATURE REVIEW REGARDING SUSTAINABLE DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

From the large framework of definitions for the concepts of sustainability, sustainable development and sustainable transportation, specialists agree that these should maintain an equilibrium between economic aspects, social issues and environmental health.

Sustainability is „the capacity for continuance into the long term future. Anything that can go on being done on an indefinite basis is sustainable. Anything that cannot go on being done indefinitely is unsustainable”. [10]

Sustainable development „meets the needs of the present without compromising the ability of future generations to meet their own needs”. [1]

Sustainable transportation is „transportation that does not endanger public health or ecosystems and meets needs for access consistent with use of renewable resources at below their rates of regeneration and use of non-renewable resources at below the rates of development of renewable substitutes”. [13]

A system of transportation which is sustainable is one that:

- allows the individuals and the societies to satisfy their primary access requirements;
- supports the economy through choices of transport modes, efficiency, affordability;
- limits emissions and waste;
- reduces the consumption of resources that are not renewable;
- takes care of the land and the noise. [10]

Sustainable transport indicators can include: planning process, options and incentives, travel behavior, physical impacts, human and environmental impacts, economic effects, performance targets. [12]

Having in view the economic aspects, social issues and environmental dimensions of the sustainable development, a set of indicators for sustainable transportation reflects the following impacts listed in the table below.

Table 1. Sustainable Transportation Impacts

Economic	Social	Environmental
Congestion of traffic	Equity/Fairness	Air pollution level
Costs of infrastructure	Impacts on mobility	Changes on climate
Consumers costs	Impacts on individuals	Noise level
Barriers of mobility	health	Pollution degree of water
Damages from accidents	Cohesion of the community	Loss of habitat level
Depletion of non-renewable resources	Aesthetics level	Impacts on hydrology
		Depletion of non-renewable resources

Source: [12]

The Reporting Mechanism of the European Union on Transport and Environment (TERM) identifies sustainable transportation indicators, such as:

Table 2. TERM Indicator List

Group	Indicators
Environmental issues	Primary energy consumption and share in total by mode of transport; Emissions from transportation and share in total emissions for CO <sub>2</sub> , NO <sub>x</sub> , NM, VOC <sub>s</sub> , PM <sub>10</sub> , SO <sub>x</sub> , by mode of transport; Exceedances of air quality objectives; Exposure to and annoyance by traffic noise;

	Effects of infrastructure on ecosystems and habitats; Land take by transport infrastructures.
The volume and intensity of transportation	Transportation of passenger (by mode and purpose) <ul style="list-style-type: none"> <li>- Total passengers;</li> <li>- Total passenger-kilometers;</li> <li>- Passenger-kilometers per capita;</li> <li>- Passenger-kilometers per GDP.</li> </ul>
	Transportation of freight (by mode and group of goods) <ul style="list-style-type: none"> <li>- Total tones;</li> <li>- Total ton-kilometers;</li> <li>- Ton-kilometers per capita;</li> <li>- Ton-kilometers per GDP.</li> </ul>

Source: [9], [12]

There are principles that can be used when we work with transportation performance indicators [12]: comprehensive indicators, data quality, comparable, easy to understand, accessible and transparent, cost effective, net effects, performance targets. Indicators have the power to measure progress toward purposes and targets. They can help identify problems, find solutions, analyze options, compare and evaluate an organization.

Canadian Centre for Sustainable Transportation exposed 14 performance indicators for sustainable transportation [4]:

- fossil fuel energy used for all mode of transport;
- greenhouse gas emissions from all transport;
- air pollutants emissions index from road transport;
- index of road fatalities and injuries;
- total motorized movement of people;
- total motorized movement of freight;
- movement of light-duty passenger vehicles;
- intensity of use of urban land;
- length of paved roads;
- index of relative cost of transport;
- energy intensity index of cars and trucks;
- index of fleet emissions intensity.

Port authorities and shipping lines are very interested to analyze performance indicators, according to a study of the authors Comtois and Slack. These indicators have to evaluate the human component and the financial implications on sustainability. Also, they must compare this performance over time and disseminate the results to shareholders, the community and the government. Governments have an important role in creating policies, strategies and measures to accomplish the most important purposes of sustainable development on social, economic and environmental levels.

#### 4. SUSTAINABLE DEVELOPMENT OF MARITIME TRANSPORTATION

Sustainable development strategies represent a necessity for every country, as it can boost the economic growth, while preserving the environment and the values of society. In this context, maritime transport is a key-

element in the process of the development in a sustainable way. This efficient kind of transport manipulates large quantities of cargo, but puts pressure on the environment through technological progress. Due to this fact, many sensible ecosystems suffer transformations, others may be destroyed or artificial ecosystems may be created. [3]

One solution is *the increasing application of environmental management systems (EMS)*, by port authorities and shipping companies all over the world, if it is possible. The structure of an EMS is complex and its adoption requires compliance with environmental legislation in the conduct of maritime operations. The best EMS involves international certification.

Another solution is proposed by European Commission – *differentiated port infrastructure charges* that can help to the accomplishment of sustainable transportation goals. [5]

According to UNCTAD (The United Nations Conference on Trade and Development), over 80% of international trade is carried by sea and this trend is exponential. Although maritime transport is environmentally-friendly it also has negative impacts on the environment and the members of the society from many points of view (health, climate). Regarding this, environmental charging received much more attention in the last years, determining port authorities to implement a series of bottom-up initiatives: the Environmental Ship Index (ESI), Clean Baltic Sea Shipping, Green Award and other.

European Commission through COM(2013)295 determined the necessity to increase „the environmental profile of European ports as a priority of the European Union Transport Policy in the future by considering whether to reward operators who anticipate or exceed the application of mandatory environmental standards and promote the use of door-to-door low carbon and energy efficient logistics chains”. [5]

Regarding the maritime transport, the International Maritime Organization (IMO) has assumed responsibility for pollution issues and adopted many conventions, regulations, decisions, measures in order to prevent pollution caused by maritime operations and to reduce the effects of this. Important researches established SECAs (Sulphur Emissions Control Areas) and NECAs (Nitrogen Oxide Emissions Control Areas) in several areas of the world: Baltic and the North Sea – SECA in 2005 and 2006, NECA from 2021. [5] In 2018 IMO will adopt a comprehensive strategy regarding the reduction of Green House Gas emissions from ships and from 2020, the Organization will approve the global low Sulphur fuel utilization.

The European Union Commission’s Directorate for Mobility and Transport conducted a study to evaluate the various options that are applied in order to differentiate port infrastructure charges, considering the environmental issues and sustainability dimensions. In this study were detected 30 ports applying an environmental charging scheme. This scheme has been used in Europe only since 2011. An exception is Sweden that has given the reward to green vessels in 1991. [5]

Even though it is a relatively new practice in Europe, an increasing number of ports are implementing

schemes that reward clean ships by charging them lower fees for port use. Environmental charging can also make investments in greener technologies more profitable, so the practice can influence the alternative fuels utilization, such as LNG.

Examples of European Union’s ports that apply different charges considering environmental aspects are:

- Amsterdam – ESI, Green Award;
- Ghent – ESI, Green Award, other;
- Gibraltar – Green Award;
- Gothenburg – Clean Shipping Index, ESI, other;
- Hamburg – Blue Angel, ESI, Green Award, other,
- Le Havre – ESI;
- Lisbon – Green Award;
- Riga – Green Award;
- Rotterdam – ESI, Green Award. [5]

According to IMO studies, a Maritime Transportation System is Sustainable only if [11] it:

- ✓ promotes a culture that is safe and respects global standards;
- ✓ minimizes the effects of maritime industries actions on the environment, by respecting international regulations on pollution prevention;
- ✓ supports seafarers through maritime education and training, including safety issues and environmental awareness;
- ✓ offers training for professionals in engineering, ship management and port careers;
- ✓ promotes energy efficiency, by improving coordination and by using electronic systems on ships;
- ✓ maintains the best operational level of ships through modern port facilities;
- ✓ gives access to ships to use alternative fuels, such as LNG and low-Sulphur fuel oils;
- ✓ promotes partnerships between energetic industry and maritime industry;
- ✓ seafarers, ships and shipping companies are protected by the society, considering the role of maritime transport in global trade chain;
- ✓ develops partnerships between ships and shore areas for technical co-operation in difficult fields of activity;
- ✓ requires a platform for the innovation and green technology exchange. This will lead to partnerships between governments, ship building industry, companies of classification, producers, research and development organizations and academic institutions;
- ✓ implements new standards for ships building, either for new ones or for the existing fleet;
- ✓ relies on international regulations in maritime insurance field that resolve the case of maritime accidents;
- ✓ harmonizes the initiatives, measures and conventions on the maritime transportation system; the coordination of all actors that use the oceans and seas of the world, to ensure the sustainability of this system.

## 5. CONCLUSIONS

A maritime transportation system can become sustainable only if it accomplishes simultaneously certain conditions, such as: to maximize its environmental performance, to enhance safety and to be prepared for new standards regarding ships building, cargo and fuel types.

According to IMO's vision, sustainable maritime transportation system must rely on: safety culture and environmental stewardship; education and training in maritime professions and support for seafarers; energy efficiency and port-ship interface; energy supply for ships; maritime traffic support and advisory systems; maritime security; technical co-operation; new technology and innovation; finance, liability and insurance mechanisms; ocean governance.

In order to measure and to evaluate the efforts 'impact of creating a sustainable maritime transport, port authorities and shipping lines analyze indicators of performance. These indicators outlines the economic, social and environmental effects of sustainable development of maritime transportation system and communicate the results to shareholders, community members and governments. Governments also have a particularly important role to play in developing national strategies and implementing them in order to meet the objectives of sustainable development.

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