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Table of Contents

Table of Figures	3
Table of Tables	3
1 Introduction	4
2 Importance of sustainability	4
2.1 Importance of sustainability for freight transport	4
2.2 Importance of sustainability in Danube ports	5
3 Environmental performance of inland port	8
3.1 Relevant Environmental dimension of sustainability	8
3.1.1 Measures to improve Environmental Performance of Danube ports	10
3.2 Policy Framework	13
3.2.1 European Level	13
3.2.2 Austria	14
3.2.3 Romania	14
3.2.4 Bulgaria	20
3.2.5 Croatia	22
3.2.6 Slovakia	23
3.3 Measuring Environmental Performance of Danube ports	26
3.3.1 European Level	26
3.3.2 Austria	32
3.3.3 Romania	33
3.3.4 Bulgaria	33
Ports are not identified as industrial sectors that have significant impact on the environment.	35
3.3.5 Croatia	35
3.3.6 Slovakia	35
3.3.7 Summary	37
4 Best Practice Examples	38
4.1 Current and past initiatives concerning sustainability in inland ports	38
4.1.1 Austria	38
4.1.2 Romania	38
4.1.3 Bulgaria	42
4.1.4 Croatia	43
4.1.5 Slovakia	43
5 Conclusion and Next Steps	46

Table of Figures

Figure 1- Freight transport in the EU-28: modal split of inland transport modes (% of total tonne-kilometres)	5
Figure 2 - Evolution of waterside traffic in European inland ports.....	6
Figure 3 - Sources for port pollution	8
Figure 4 - Location of service station pontoon P-65 in the port of Bratislava	37
Figure 5 - Opening of LNG petrol station	38

Table of Tables

Table 1 - Top 10 environmental priority issues over time (EcoPorts 2017).....	10
Table 2 - EcoPorts Environmental Key Performance Indicators (Klukas et al. 2015)	28
Table 3 - PPRISM environmental key performance indicators (Klukas et al. 2015)	30
Table 4 - Waste volume (annual comparison).....	34

1 Introduction

The aim of this report is to give an overview on the topic of environmental sustainability in inland ports. First the importance of sustainability in the transport sector in general will be explained and the impact on inland ports. Afterwards, projects and initiatives on how to measure the environmental performance of inland ports are described. In addition, some best practice examples concerning how sustainability is done in some ports is provided. In addition, current measurement methods in Austria, Romania, Bulgaria, Croatia and Slovakia are discussed. At the end of the report, some best practice examples on how to increase the environmental performance of Danube ports are described.

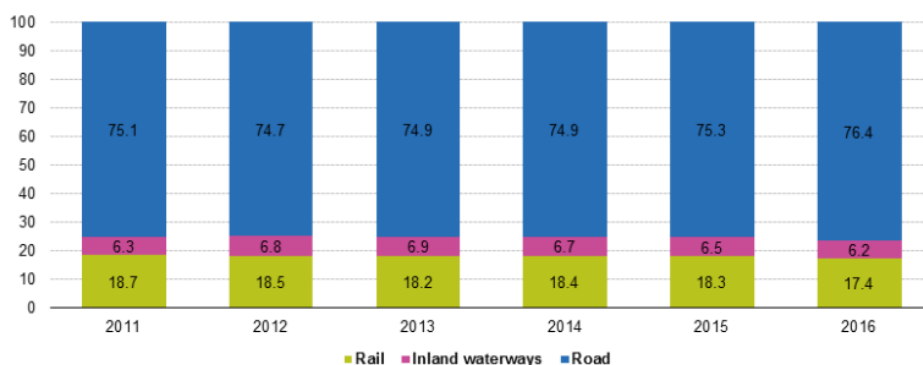
2 Importance of sustainability

2.1 Importance of sustainability for freight transport

Sustainable development can be defined as a development that is able to meet the needs of nowadays generation without jeopardizing future generations needs. It is about finding solutions that are beneficial in the long-term for people and the economy, but they do not burden the environment inappropriately. Addressing global environmental challenges and achieving sustainable development requires the effective integration of environmental principles into sectoral policies and, in this context, the harmonization of the transport and the environment. The impact on the environment and its protection must be taken into account when planning the construction and modernization of transport infrastructure.

Sustainability can be identified as a field of particular interest the field of logistics, and particular attention has been paid to sustainable development in the transport sector. Freight transport can be defined as one area, which can strongly contribute to a sustainable transport system (Whiteing 2010). In 2010, the transport sector caused 23% of worldwide carbon dioxide emissions and was responsible for 15% of overall greenhouse gas emissions (ITF 2010). Forecasts indicate that freight volume will increase in the future. In fact, freight transport is expected to quadruple by 2050. This also leads to an increase of greenhouse gas emissions (OECD/ITF 2015). In addition to these ecological problems, rises in energy costs, bottlenecks in transport infrastructure as well as the increasing demand of sustainable transport solutions by society and politics indicate a need for sustainable transport solutions (Bretzke & Barkawi 2013).

In order to achieve the greenhouse gas emissions goal set by the European Union a cut of 60% in emissions for the transport sector compared to 1990 level is required (European Commission 2011). One measure to reduce the carbon dioxide emissions of freight transport is a modal shift towards sustainable transport modes such as railways or inland waterways. As freight transport statistics show, inland navigation and railways have a relatively low share (namely 6% and 17%) of the European modal split compared to almost 77% share of road transport - see Figure 1 (Eurostat 2016).



Note: EU-28 includes rail transport estimates for Belgium and Croatia and does not include road freight transport for Malta (negligible). Figures may not add up to 100% due to rounding.

Figure 1- Freight transport in the EU-28: modal split of inland transport modes (% of total tonne-kilometres)

In general, water transport can be considered as one of the most advantageous modes of transport in terms of environmental, energy and social aspects. A single vessel on the river can replace several hundreds of trucks on the road, thus saving costs of transport, reducing emissions and relieving roads. Water transport has a high capacity and allows the transport of oversized cargo, which cannot be transported by road or rail because of technical limitations. The external costs of water transport, accidents, noise, air pollutants or climate-sensitive gases are significantly lower compared to road and rail transport. Also, the costs of the construction of infrastructure for each mode of transport, including its maintenance, are up to 4 times lower for inland waterways than for road or rail (Planco Consulting GmbH 2007).¹

Nevertheless, European rivers and canals are underutilized in freight transport and the transport of cargo by vessels participates on inland freight in a very small measure. Shipbuilding companies have been calling for innovation in this area for a long time in order to make this environmentally friendly mode of transport more competitive. The development of shipping needs to be planned in the future, inter alia, in the context of adaptation to climate changes. Inland waterway transport can make a significant contribution to the achievement of environment protection goals, for example reduction of greenhouse gas emissions as set out in the Kyoto Protocol.

2.2 Importance of sustainability in Danube ports

The Danube waterway is one of the main pillars of the water transport infrastructure in Europe. On a distance of 3,500km, the Danube connects 15 European countries (Dolinsek et al. 2013). There are more than 100 million inhabitants in the Danube river basin; capitals of countries in the Danube basin (Vienna, Bratislava, Budapest, Belgrade, Sofia and Bucharest) together form a strong economic development axis, the so-called Danube belt. Following the economic integration of the 'Danube' countries into the EU, demand for transport services has increased, and a further increase in economic growth in the 'Danube' countries that exceeds

¹ Based on the condition in Germany

the EU average can be expected. Inland waterway transport along the Danube could play an important role in this scenario.

Inland ports can play a major role in achieving the desired modal shift (Dooms et al. 2003). Inland ports link road, rail and waterways thus facilitating transshipment between these transport modes. Besides transshipment, inland ports are important service providers in the field of logistics offering services such as storage and logistics. In addition, logistical value-added services are often offered to customers in the port area: packaging, stuffing and stripping of containers, sanitary inspection, commissioning, distribution and quality control. As a consequence, ports have emerged as logistics platforms and driving forces for regional economic development in recent years (Dolinsek et al. 2013).

In Europe, Danube ports play a pivotal role in the freight transport system: On the Danube, 20 ports achieve an annual waterside goods traffic of more than 1 million tons per year. As can be seen in the following figure, nine of the largest Danube ports show an increase of waterside traffic between 2015 and 2016. This is due to the recovery of mass goods transports in 2016 after a low water period in 2015. The negative evolution in the port of Regensburg can be explained by the reduction in transshipment of foodstuff and agricultural products (CCNR 2017).

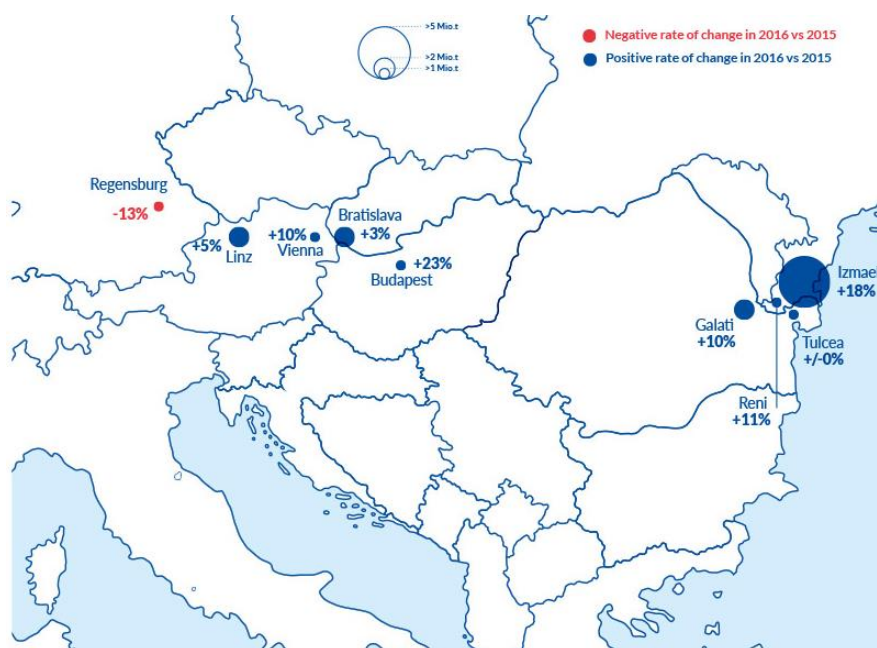


Figure 2 - Evolution of waterside traffic in European inland ports (CCNR 2017)

However, these increasing activities also cause external effects on the environment of Danube ports. These effects are discussed in the next chapter.

Inland ports on the Danube are confronted with various challenges such as scarcity of land, social-economic constraints and local political frameworks, which include regulations. This is due to the fact, that inland ports are located in densely populated regions and cities in most cases. Inland ports have played and still play a major role in city logistics and urban goods distribution. In recent years, inland ports and inland port authorities are under pressure from

a variety of stakeholders, such as urban residents, leisure industry and environmentalists to limit the negative environmental of inland port operations (Dooms et al. 2003).

Consequently, inland ports should develop strategies to adopt innovative practices and concepts to improve their overall environmental performance in order to assure sustainable services such as transshipment and to reduce negative effects on the environment. Furthermore, establishing efficient hinterland connects by rail and road are necessary to facilitate a modal shift towards inland waterways by consolidating enough volume in inland ports (Dooms et al. 2013).

In Europe, Danube ports can be identified as crucial centres of economic activities on an international level (Danube Region Strategy 2017). This is also recognized by the European commission, which supports initiatives to promote and improve sustainability along the Danube waterway and its ports (Mihic et al 2011). One concept which has emerged in recent years, in order to improve environmental performance, is the so called concept of a “green port”. The Danube port of Baja in Hungary can be identified as such a green port. Green ports aim to balance environmental impairments and economic interests (Dolinsek et al 2013). Another measure to evaluate and improve environmental performance of an inland port is to elaborate a set of environmental key performance indicators (EKPIs), which can be used as a basis for defining measures (Puig et al. 2014). Thus, environmental impacts of port activities should be measured and analysed to guarantee a safe and sustainable port performance and also to ensure that stakeholders continue their support for port and logistics chain operations and development (Puig et al. 2015b). A standardized set of EKPIs may result in benefit for port authorities since they demonstrate compliance and show commitment for continuous improvement through scientific evidence and quantifiable measures. By using EKPIs the environmental performance of inland ports can be tracked and appropriate measures can be defined to counteract negative developments. However, Danube ports offer various services and thus activities carried out within Danube ports may vary between them (Puig et al. 2014). In literature, EKPIs can mostly be found four seaports. However, there is no standardized set of EKPIs applied to Danube ports. Even though various inland ports are already measuring their environmental performance in order to

3 Environmental performance of inland ports

3.1 Relevant environmental dimensions of sustainability

As already mentioned in the last chapter, ports and their activities cause negative impacts on the environment (e.g. air and water pollution). The sources for these environmental impacts can be very diverse (see Figure 3). Thus, methods of environmental performance measurement in order to measure the level of pollution in terms of monitoring is required (Gupta et al. 2005), as ports have the objective of continual improvement of their environmental performance (Puig et al. 2015a).

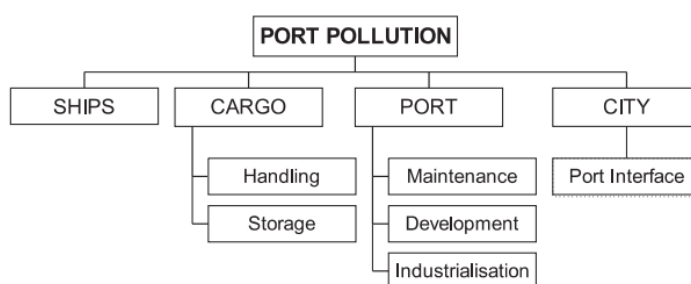


Figure 3 - Sources for port pollution (Goulielmos 2000)

There are around 70 ports along the 2.414 km length of the Danube. However, out of these ports it is only the ones in Germany and Austria that display an adequate level of infrastructure, facilities and hinterland connections that allow them to provide high-quality logistics services in record time and with a reduced effect on the environment (pro DANUBE International 2017). Due to an increase interest in environmental issues in society, effective environmental management becomes essential for inland ports (PPRISM 2012). Looking at the Danube ports' cargo turnover numbers of the last years, an increase in total turnover is visible. The highest cargo turnover in 2016 was more than 5.3 million tonnes at the Ukrainian port of Izmail (Danube Commission; Danube Commission 2017). Environmental management is especially important in port activities and operations related to the logistics chain, as the increasing port activities also cause negative impacts on air, water, soil and sediments (Puig et al. 2015b).

Hence, a method of environmental performance measurement in order to determine levels of pollution, control and predict pollution levels for future and regular monitoring and assessing the environment, is required (Gupta et al. 2005), as ports have the objective of continual improvement of their environmental performance (Puig et al. 2015a).

With the need to take the environmental concerns into consideration, the European Sea Port Organisation (ESPO), published the first ESPO Environmental Code of Practice in 1994 (ESPO n.d.b). This first Environmental ESPO Questionnaire was useful to obtain an overview of the most important environmental problems in ports. 281 ports from 15 different European countries responded to the questionnaire (Puig et al. 2015b). Besides updates and a replacement of the code of practice with the ESPO Green Guide in 2012, the organization has carried out periodical environmental surveys in order to study the environmental performance of ports (1996, 2004 and 2009). With the rising awareness of environmental impacts, several research projects have evolved. As a result of these research projects, useful

methodologies to assist ports in their environmental performance management have emerged (Puig et al. 2015b). Since 1996, ESPO has defined a top 10 list of priority environmental issues. A questionnaire, which aims at finding out the situation and progress of the ports regarding their environmental performance, is filled in by the ESPO port members every four years. The results of the top 10 priorities defined by the ports can be found on the ESPO website (Klukas et al. 2015).

In 2017, the following areas have been identified as the most important issues in terms of environmental performance of inland ports (ESPO 2017):

1. Air quality
2. Energy consumption
3. Noise
4. Water quality
5. Dredging operations
6. Garbage/Port waste
7. Port development (land related)
8. Relationship with local community
9. Ship waste
10. Climate change

Hereby it can be seen that the most important issue for European ports is the air quality. According to the survey this is the most important issues ports desire to improve. Second important is the energy consumption and as a third improvement field noise was chosen (ESPO 2017).

These top 10 priority issues are changing over time: in the table below there are the rankings of all the results since ESPO first defined the questionnaire (Puig et al. 2015b; EcoPorts 2017).

Most of the priorities of the 2016 top-10 remain in the top-10 of 2017. There are some changes in the order of priorities and a new entrance for the first time to the top-10, Climate Change (which as a category under EcoPorts covers energy efficiency, GHG emissions reduction and adaptation) (EcoPorts 2017). Since 2013, air quality remains the first priority of European ports. This is fully in line with the maintenance of air quality as a top priority also of the EU policy agenda and the various ongoing policy initiatives that include the implementation of the Sulphur Directive and the ongoing political process on the air quality package. Energy consumption becomes the second most important priority issue of the European ports. Since 2009, the importance of energy consumption rose poll by poll. One of the reasons for this increase is, of course, the direct link between energy consumption, and the carbon footprint of the ports and Climate Change. Noise is the third concern by priority and its importance has also risen smoothly since 2004. The relationship with local community climbs at the number four of priorities as the ports grant their license to operate and to grow from their local communities. Another interesting fact is that there are three issues that have appeared consistently in the priority list of the port sector over the last 20 years, although they are not in the top positions of the table. These issues are port development (land), dredging operations, and dust (PORTOPIA 2017).

	1996	2004	2009	2013	2016	2017
1	Port Development (Water)	Garbage/ Port waste	Noise	Air quality	Air quality	Air quality
2	Water quality	Dredging: operations	Air quality	Garbage/ Port waste	Energy consumption	Energy consumption
3	Dredging: disposal	Dredging: disposal	Garbage/ Port waste	Energy Consumption	Noise	Noise
4	Dredging: operations	Dust	Dredging: operations	Noise	Relationship with local community	Water quality
5	Dust	Noise	Dredging: disposal	Ship waste	Garbage/ Port waste	Dredging: operations
6	Port development (land)	Air quality	Relationship with local community	Relationship with local community	Ship waste	Garbage/ Port waste
7	Contaminated land	Hazardous cargo	Energy consumption	Dredging: operations	Port development (land)	Port development (land)
8	Habitant loss/ degradation	Bunkering	Dust	Dust	Water quality	Relationship with local community
9	Traffic volume	Port Development (land)	Port Development (water)	Port development (land)	Dust	Ship waste
10	Industrial effluent	Ship discharge (bilge)	Port Development (land)	Water quality	Dredging: operations	Climate Change

Table 1 - Top 10 environmental priority issues over time (EcoPorts 2017)

3.1.1 Measures to improve Environmental Performance of Danube ports

Based on the defined priorities in environmental performance, measures to improve the environmental performance may be defined. In the following, examples for improving air and water quality will be discussed.

Improvements for Air Quality

Air quality is an item of the highest priority on the environmental and political agenda. The impacts of air pollutants or volatile organic compounds, lead and range from locally based to regional and global effects. Ports are most usually situated within or in close proximity to densely populated urban areas that are often critically affected by air pollution. In addition, being major nodes linking and bringing together international transport chains and related economic activities, port areas are often part of critical geographical areas when it comes to air quality considerations. Although port-related emissions contribute only for a part to air quality problems in port and surrounding areas, these problems can affect negatively the image of ports vis-à-vis their surrounding residential zones and put serious pressure on port development ambitions. In fact, air quality is often at the heart of the political and societal debate about economic development plans and port development projects. The emissions of air pollutants by port operations are therefore of high priority to European port authorities. The main challenge that port authorities face is to apply appropriate control mechanisms in order to manage and reduce port related air pollution (ESPO 2012).

Firstly, the most obvious measure in order to improve the air quality around the port is by investing in low emission and fuel efficient own fleet (vehicles and vessels). It is also recommendable to use low emission fuels in the operating fleet and terminal equipment like moveable and non-movable cranes (ESPO 2012; Gupta et al. 2005). A widely promoted alternative to the usage of Diesel in vessels is LNG. Liquefied Natural Gas (LNG) is basically methane and will significantly reduce vessel emissions. Through the usage of LNG, inland navigation will be further promoted as the most environmentally friendly transport mode (Seitz 2013). Moreover restricted entrance can be applied to vehicles polluting the air far too much by establishing a low emission zone (ESPO 2012).

Secondly, providing the preparatory or the complete infrastructural facilities for Onshore Power Supply (OPS), like cabling, frequency, converters or transformers is also beneficial for further improvement of the sustainability of the air quality. Ports nowadays are not normally equipped to supply vessels with electricity from the dockside, nor are vessels usually equipped to receive power in this way. However, many activities in this direction are now underway and interest in the technology is rapidly growing, boosted by tougher environmental legislation, greater focus on emissions in ports from shipping, and, more recently, rising fuel prices. As an alternative to on-board power generation, vessels can be hooked up to an onshore power supply, i.e. connected to the local electricity grid. In this way ships' operations can proceed uninterrupted, while eliminating negative side-effects. (World Ports Climate Initiative 2018). To further promote OPS, incentives schemes that support ship owners as well as operators that use OPS, should be performed (ESPO 2012)

Thirdly, any form of incentive for outstanding environmental performance like ahead of what is required by legislation or investment in state of the art terminal equipment should be given (ESPO 2012).

Last but not least, beside the usage of EKPIs in order to monitor air pollution levels, a database on all port-related emissions and their contribution to air quality levels on local and regional scale should be created and maintained in close cooperation with port users. Another method to control the performance is by introducing expected standards regarding emissions into contract documents of contractors. All standards should be reviewed on a regular basis (ESPO 2012).

Water quality

Port authorities have a clear interest in water management both in terms of potable water consumption and water quality. Water is a valuable natural resource and as such needs to be used with caution. The significance of water consumption may vary between regions of Europe but the unnecessary consumption of a natural resource is not a sustainable practice. In addition, the use of water is linked to waste water treatment techniques while savings in water consumption represent an opportunity for port authorities also from an economic perspective. In parallel, good water quality is essential for ecosystems and biodiversity and the varied port operations can impact significantly in port waters. Ship ballast water discharges may introduce alien species, surface water runoff may carry contamination into the water bodies, while the same stands for port estate land and marine spillages including ones associated with cargo handling operations. (ESPO 2012)

In order to improve the water quality around Danube inland ports a water management plan should be established. Regular monitoring of water quality should be carried out within the port and in neighbouring waters during operation to identify environmental changes (Gupta et al. 2005). Collaboration between the port authorities and port operators is very much welcomed on topics like water quality, surface water runoff quality, river and sediment quality. Furthermore, ensuring that port authority staff are environmentally aware, trained and both proactive and exemplary in their behaviour (ESPO 2012) is as important as that the drains and outfalls should be cleaned regularly to avoid anaerobic decomposition and also for

proper flow of water/wastewater. This will also enable the characterization of wastewater and calculation of waste load (Gupta et al. 2005).

Any wastewater should be discharged only after proper treatment. The discharge of oil waste into the sea should be carefully controlled. This includes discharge of oil waste from chemical corridor area (This liquid waste is generated during tanker cleaning and oils spills during filling operations.), oil spills at berth during unloading operations and tanker ballast discharge from ships. Solid waste and sewage from ships should be discharged controlled. It should be discharged only after proper treatment. Bulk material should not be disposed into the water at all (Gupta et al. 2005).

Beside the correct discharge of water it is also important to set targets on reducing the own direct water usage and indirect consumption within the estate infrastructure using available technologies, like continuous monitoring of water demand to identify leakages, spray nozzles on water taps, sensor operated flows, dry basins. Furthermore, to ensure that own cargo handling equipment is in line with the best environmental practice that minimizes spillages is important too (ESPO 2012).

It is important to provide infrastructure, up to date knowledge on best equipment and technologies, support and training, operating and monitoring procedures necessary for good environmental performance to port authorities, port operators, port users and third party users. In addition incentives for the extra mile should be supported and positive experiences, such as proactively reducing port operators cost by reducing their water usage, should be promoted (ESPO 2012).

3.2 Policy Framework

In the following chapter the policy frameworks concerning the environmental impact of ports are described. In the beginning, a number of policies relevant on European level are described. Afterwards, policy frameworks on national level are described for Austria, Romania, Bulgaria, Croatia and Slovakia.

3.2.1 European Level

On European level, environmental policies were first discussed at the Paris European Summing meeting with the focus on water pollution. The environmental protection of ports was not included in discussions back then (Goulielmos 2000). However, due the increasing importance of ports as hubs in the European transport sector, more and more attention is payed on the environmental impact of port processes.² Thus, various regulations have been implemented on European level in order to protect the environment in ports such as:

- Directive 2000/59/EC of the European Parliament and of the Council of 27 November 2000 on port reception facilities for ship-generated waste and cargo residues - Commission declaration
- DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on port reception facilities for the delivery of waste from ships, repealing Directive 2000/59/EC and amending Directive 2009/16/EC and Directive 2010/65/EU

In addition, the Environmental Impact Policy in the Danube River Basin is regulated by international agreements and relevant legislation of the European Union (directives and action plans) such as:

- The International Commission for the Protection of the Danube River (ICPDR),
- The Danube River Shipping Convention (Belgrade Convention),
- The EU Biodiversity Strategy,
- The EU Strategy for the Danube Region (Danube Strategy).

In addition to these Conventions, the legal framework for river basin management and water management in Europe also includes several EU directives, the most important is:

- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (WFD).

Many other environmental directives, strategies and conventions are also linked to the WFD (Water Framework Directive), including:

- Council Directives on the conservation of wild birds (79/409/EEC)

² <http://www.europeanenergyinnovation.eu/Articles/Autumn-2017/The-EU-port-policy-and-green-ports>
[09.08.2018]

- Council Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC)
- Directive on the assessment of the effects of certain plans and programs on the environment (2001/42/EC)
- Directive on the assessment and management of flood risks (2007/60/EC)
- Directive on the assessment of the effects of certain public and private projects on the environment (2011/92/EU).

In addition to European regulations, there are also regulations which apply on national level. Thus, in the following chapter national regulations for Austria

3.2.2 Austria

An example in this context would be the following regulation: in ports, adequate facilities must be set up and operated for the reception of waste (e.g. kitchen waste, non-oily cargoes, unusable parts of marine equipment, etc.) on vehicles, which must be designed to be easy to handle, so that there is no water pollution nor harmful effects on the environment (e.g. by smell, dust). Waste generated must be properly collected and treated.³ There are several regulations in Austria, which refer to the environmental sustainability of port operations: Water Law and Navigation Act; Construction Law; Commercial Law. Relevant, due to the fact that inland transport places great emphasis on environmental awareness.⁴

3.2.3 Romania

Regarding transport infrastructure Romania will develop a zero risk policy while the existing risks will be continuously reevaluated for all types of transport⁵.

For a better management of environmental issues, the global impact of gas transport emissions will be progressively reduced so they will correspond with the national objectives in this matter.

To minimize the adverse effects of transport on the environment, a strategy on environmental protection in the field of transport will be developed. This strategy is correlated with new EU policies, including maritime regulation, focused on indicators on admissible levels, methods and means of monitoring and control for pollutant emissions, greenhouse gases and source noise of transport activities. Mapping of the noise emissions caused by transport in major urban agglomerations and high - traffic transport networks is necessary in order to establish optimal ways of protecting the population and the environment. Based on analysis of best

³ Source: §9 in "Order of the Federal Minister for Traffic, Innovation and Technology concerning Waterways Traffic Regulations (WVO)". Available under <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20005956> [16.11.2017]

⁴ Source: §9 in "Order of the Federal Minister for Traffic, Innovation and Technology concerning Waterways Traffic Regulations (WVO)". Available under <https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20005956> [15.11.2017]

⁵ National Strategy for sustainable development of Romania – Horizons 2013-2020-2030

practices in other EU countries, regulations will be developed for encouraging wider use of biofuels and alternative fuels in transport.⁶

The Environmental Impact Policy (the Logistics Activities in Ports) is established by Order of the Ministry of the Environment (in accordance with the requirements of the European legislation - EIA Directive) based on the assessment of the effects of certain public and private projects on the environment.

Briefly, Preliminary Environmental Requirements (Extending Surface / Building New Terminals) consist of going through the stages of the environmental impact assessment procedure.

The procedure is managed by the competent authority for environmental protection (Environmental Protection Agency) and includes:

- submitting a notification of the project's intent, accompanied by the urbanism certificate and a request for the issuance of the environmental agreement, to the Environmental Protection Agency by the owner of the investment before the work start;
- analyzing the request by the agency and determining the need for environmental impact assessment;
- if the Agency decides that the assessment is necessary, the investment holder will prepare an environmental impact study;
- from the analysis of the study, the Agency issues the "Environmental Agreement for the Realization of the Investment", a regulatory act, which mentions the environmental protection measures to be observed during the execution of the execution works.

The transposition of the EIA Directive⁷ in Romania was made by Government Decision no. 445/2009⁸ on the environmental impact assessment of certain public and private projects and by Order 135/2010⁹ on the approval of the methodology for the implementation of the environmental impact assessment for public and private projects.

The Environmental Impact Assessment (EIA) is carried out during the preparation of the documentation that substantiates the feasibility of the project. Consequently, according to the national legislation, the integrated environmental agreement is issued in the feasibility study stage, alongside other endorsements and approvals.

The Environmental Impact Assessment procedure is carried out in stages, as follows:

- the stage of project classification in the environmental impact assessment procedure;
- the stage of defining the scope of the assessment and of the implementation of the environmental impact report;

⁶ National Strategy for sustainable development of Romania – Horizons 2013-2020-2030

⁷ Directive 2011/92/EU, Environmental Impact Assessment – EIA Directive

⁸ Decision nr. 445/2009 on the environmental impact assessment of certain public and private projects, published in Official Gazette no. 481 of 13/07/2009

⁹ Order 135/2010 on the approval of the Methodology for the implementation of the environmental impact assessment for public and private projects

- the quality review stage of the environmental impact report.

The procedure is preceded by an initial assessment of the project carried out by the public authorities for environmental protection in which the location of the project is identified in relation to the protected natural areas of community interest. The environmental impact assessment procedure is conducted by central or regional public environmental authorities with the participation of central or local public authorities, as appropriate, with specific attributes and responsibilities in the field of environmental protection. The end of the EIA procedure is materialized by a positive or negative decision to issue the integrated environmental approval/agreement.

The environmental agreement is valid throughout the project implementation but loses its validity if the investment works for which it was issued do not commence within 2 years from the date of issue, except for projects with external financing.

Projects likely to have significant effects on the environment due, among other things, to their nature, size or location, are subject to a development approval and an environmental impact assessment application prior to the granting of this approval.

According to Government Decision 445/2009²², the following project categories are identified in Romania in terms of the necessity to obtain the environmental approval:

Projects subject to environmental impact assessment

To this category belong projects related to the port infrastructure or that can be built on the port domain, as follows:

- Inland waterways and river ports that provide traffic and operate vessels of over 1,350 tons.
- Merchant ports, loading and unloading quays linked to land and external ports (excluding ferry boat terminals) allowing ships of at least 1,350 tons to operate.
- Hazardous waste storage facilities or equipment for hazardous waste disposal by incineration or chemical treatment
- Equipment with a capacity exceeding 100 tons / day for non-hazardous waste disposal by incineration or chemical treatment
- Dams and other installations designed to permanently retain or permanently store water with a new or additional capacity of retained or stored water of minimum 10 million cubic meters.
- Pipelines for the transport of gases, petroleum or chemical products with a diameter of more than 800 mm and a length of at least 40 km.
- Crude oil refineries (except for those producing only crude oil lubricants) and gasification and liquefaction installations of at least 500 tons of coal or bituminous shale per day.
- Thermal power stations and other combustion plants with a thermal output of minimum 300 megawatts. Nuclear power stations and other nuclear reactors, including decommissioning or disassembly of these plants or reactors (except for research facilities for the production and conversion of fissionable and fertile materials whose maximum power does not exceed one kilowatt of continuous thermal power).

- Any modification or extension of the aforementioned projects, if said modification or extension meets the set threshold values.

Projects for which the necessity to carry out an environmental impact assessment is to be ascertained. Projects related to the port infrastructure or that infrastructure which is built in the port area are included belong to this category, this includes:

- fisheries for intensive fish farming;
- land recovery from the sea - extending ports territories by creating new land;
- in extractive industry: extraction of minerals by river or marine dredging; deep drilling, with the exception of soil stability investigation drilling;
- construction of roads, harbors and port facilities, including fishing ports other than those provided for in the first category;
- construction of inland waterways, other than those provided for in the first category, sewage works and flood prevention works;
- dams and other facilities designed for long-term retention or storage of water, other than those provided for in the first category;
- waste disposal equipment other than that referred to in the first category;
- gas and oil pipelines other than those referred to in the first category;
- works to combat coastal erosion and maritime works that may alter the coastline by constructing, for example, dikes, quays, pontoons, docks or other marine defense works, except for the maintenance and reconstruction of marinas.

Projects to which the provisions of national legislation on environmental impact assessment apply¹⁰. This category includes:

- projects that serve national defense purposes if the central public authority for national defense together with the central public authority for environmental protection establish, by means of a case-related analysis, that the environmental impact assessment would have a negative effect on those purposes;
- projects the details of which are adopted by a special normative act, when the objectives of the present decision, including the provision of information, are fulfilled by the respective legislative process.

In order to carry out public or private projects that may have significant environmental impacts, it is necessary to assess the impact on the environment. Environmental impact assessment is the process designed to identify, describe and establish, on a case-related basis and in accordance with the current legislation, the direct and indirect, synergetic, cumulative, primary and secondary effects of a project on human health and the environment.

The environmental impact assessment includes the impact of a project on the following factors:

- human beings, fauna and flora;
- soil, water, air, climate and landscape;

¹⁰ Government Decision no. 445/2009 on the assessment of the impact of certain public and private projects on the environment

- material goods and cultural heritage;
- the interaction between the above factors.

Government Decision no. 445/2009 defines the following terms:

- The Environmental Agreement is the administrative act issued by the competent authority for environmental protection setting out the conditions and, where appropriate, the environmental protection measures to be followed when a project is carried out.
- Development approval is the decision of the competent authority or authorities, which entitles the project owner to complete the project.
- The Environmental Impact Report is the document containing the information provided by the project owner.

The Environmental Impact Report is prepared by natural or legal persons who have this right, according to the law. The Environmental Impact Report is submitted to the environmental protection public authority. It is subject to comments by the interested public, whose proposals / recommendations are taken into account in the quality review stage. The Public Environmental Protection Authority, together with the authorities participating in the Technical Analysis Committee, analyses the quality of the Environmental Impact Report and decides to accept or return it for further preparation.

The competent authorities for issuing the development approval shall inform the public at the earliest opportunity and at the latest as soon as the information can be reasonably provided, by public announcement or by display on the website.

If a project to be carried out on the territory of Romania can have a significant effect on the environment of another state or when another state likely to be affected significantly requests information about the project, the central public authority for environmental protection shall pass on to the central public authority for environmental protection of that state project information. This must provide at least a description of the project together with the available information on its possible transboundary impact and information on the type of decision that may be taken.

The results of the consultations and the information are taken into account in the issuance of the environmental agreement and the development approval, respectively in the rejection of the application for the environmental agreement and of the development approval for the public or private projects in question.

The environmental authority, in consultation with the Technical Analysis Committee, issues the environmental agreement or decides to reject the application for the agreement on the basis of an analysis of the environmental impact report, the proposals / recommendations made by the public concerned and other relevant information, as appropriate.

The Environmental Agreement is attached to the development approval and forms an integral part thereof.

The competent public authorities for the implementation of the provisions of Government Decision 445/2009¹¹ and for the management of the environmental impact assessment

¹¹ Rules from 10th October 2008 regarding the underwater operations in ports and Romanian national navigable waters

procedures are: the National Environmental Protection Agency, the Local Environmental Protection Agencies and the Danube Delta Biosphere Reserve Administration.

In Romania, the legislation provides for the elaboration of environmental reports for the Zonal City Planning Sketch, in accordance with the requirements of GD no. 1076/08.07.2004¹² on establishing the procedure for carrying out the environmental assessment for sketches, plans and programs.

Port operators carrying out activities with an impact on the air environment factor have their activity regulated by the Environmental Authorization and have the obligation to monitor by regular measurements the quality of the affected environmental factors.

The Constanta Environmental Protection Agency is reorganized and operates in accordance with the provisions of Government Decision no.1000/2012¹³ on the reorganization and functioning of the National Environmental Protection Agency and of the public institutions under its subordination, of Government Decision no.44/2013¹⁴ on the organization and the operation of the Ministry of Environment and Forests, as well as other normative acts.

In accordance with the Regulation for the organization and functioning of the Environment Protection Agency¹⁵, Constanta and the Framework Regulation for the Organization and Functioning of the County Environmental Protection Agencies, approved by Decision no. 620/05.11.2012 of the National Environmental Protection Agency Chairman, modified by Decision no. 920/24.10.2016 of the Chairman of National Environmental Protection Agency Chairman, the agency ensures, through the specialized offices and departments, the carrying out of the environmental protection activities at the level of Constanta County.

The Constanta Environmental Protection Agency collaborates, upon request of the Ministry of Environment and Forests, with the implementation of the authorization/integrated authorization procedure for activities with a potential cross-border impact, as well as for projects falling under the EIA Directive¹⁶. The agency has specific attributions in the field of impact assessment. To this end, the agency:

- performs regulatory procedures and issues approvals/agreements/permits/integrated environmental authorizations in accordance with the legal provisions in force;
- cooperates with the National Environmental Guard in the process of issuing authorization documents and enforcing environmental legislation;
- analyzes the quality of EIA environmental impact assessment reports and /or the environmental report prepared by certified natural/legal persons and makes recommendations on request for their certification and retesting, or proposes the certification withdrawal;

¹² Government Decision no. 1076/2004 on establishing the procedure for carrying out the environmental assessment for sketches, plans and programs, published in Official Gazette no. 707 of 5/08/2004

¹³ Government Decision no. 1000/2012 on the reorganization and functioning of the National Environmental Protection Agency and of the public institutions under its subordination

¹⁴ Decision no. 48/2013 on the organization and the operation of the Ministry of Environment and Forests, as well as on the amendments of other normative acts on the environment and climate changes

¹⁵ Regulation for the organization and functioning of the Environment Protection Agency, Constanta, issued by the Environmental Protection Agency of Constanta, annex to Decision 58 of 26/06/2017

¹⁶ Regulation on the issuing of licenses and/or work permits necessary for carrying out activities in the ports of Constanta, Midia, Mangalia, Basarabi and the Tomis marina - the National Company "Maritime Ports Administration Co.", Constanta

- Provides assistance upon request of the Ministry of Environment and Forests, the National Environmental Protection Agency and/or the Romanian Environment Agency in the evaluation of the environmental reports for the plans and programs drawn up by other authorities and in the decision making regarding the issuance / rejection of the environmental approval.

The Environmental Authorizations issued by the Environmental Protection Agency of Constanta require compliance programs for the atmosphere and soil protection.

3.2.4 Bulgaria

With regard to environmental impact, logistical activities in ports are not separated in a single legislative document. Ports are accepted as industrial points, similar to every production company and are obliged to comply with the national and the international legislation in force. Policy framework is formed by many laws and by-laws in the Bulgarian legislation.

1. **Maritime spaces, inland waterways and ports in the Republic of Bulgaria Act:**

art. 75 a: Inland waterways shall be prohibited from discharging, disposal and submergence of ships of any type of solid and liquid waste and other substances harmful to human health or living resources on inland waterways and any other pollution, including air, except according to the norms provided in international conventions ratified by the Republic of Bulgaria and in the national legislation.

2. **Environment protection Act;**

3. **Waste management Act;**

4. The discharge of waste water from coastal sources is regulated by the **Water Act.**

5. **Ordinance No. 9 of 17.10.2013 on the requirements for exploitation suitability of ports and specialized port facilities**

art. 19: Each port must have: 1. appropriate reception facilities which ensure the acceptance of the waste without undue delay to the ships; 2. a plan for the reception and treatment of waste.

...

Art. 21. (1) The plan for the reception and treatment of waste shall contain a description of the compliance with the geographical location and size of the port, the number and type of ships normally residing therein as well as the type and volume of waste resulting from shipping activity, and cargo residues, procedures for the reception, collection, storage and pre-treatment of such waste without undue delay to the ship.

6. **Ordinance No 15 of 28 September 2004** on the submission and reception of waste - result of shipping activity and of cargo residues accordant to **Directive 2000/59/EC of the European Parliament and of the Council of 27 November 2000 on port reception facilities for ship-generated waste and cargo residues;**

7. **Ordinance No 16 Of 20 June 2006 for the processing and transport of dangerous cargo and / or pollutants by sea and dangerous goods by inland waterways;**

8. **Directive (Eu) 2016/802 Of The European Parliament And Of The Council of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels;**
9. **Regulation (EC) No 1221/2009** of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organizations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC

Expansion and/or building of new terminals is done in accordance to the relevant environmental requirements. It shall be carried out on the basis of a master plan elaborated in relevance with the Integrated Transport Strategy approved by the Council of Ministers for the period up to 2030, the concepts and schemes for spatial development and the development plans of a higher degree. Every master plan has to contain documents certifying the implementation of the applicable procedures under the Environmental Protection Act and the Biodiversity Act.

Environmental Protection Act (EPA) provides for an environmental assessment and environmental impact assessment to be carried out on plans, programs and investment proposals for construction, activities and technologies, or modifications or extensions thereof, where significant impacts on environment. The assessment of the environmental impact of the investment proposals for construction works is developed together with the procedures for preparation and approval of the investment proposal under a special law.

According to Art. 85, para. 1 of the EPA, the environmental assessment is mandatory for plans and programs in a number of areas, including transport, when these plans and programs outline the framework for the future development of investment proposals for:

- inland waterways and ports servicing inland waterway vessels which allow the acceptance of vessels with a displacement of more than 1350 tonnes.
- commercial ports, loading and unloading terminals, and public transport ports (excluding ferry terminals) that can accommodate ships with a displacement of more than 1350 tonnes.
- construction of ports and port facilities, including fishing ports.

In Art. 92 (1) of the EPA provides for a mandatory environmental impact assessment of investment proposals for construction, activities and technologies for:

- inland waterways and ports servicing inland waterway vessels which allow the acceptance of vessels with a displacement of more than 1350 tonnes.
- commercial ports, loading and unloading terminals, and public transport ports (excluding ferry terminals) that can accommodate ships with a displacement of more than 1350 tonnes.

Investment proposals for the construction of all other ports and port facilities are subject to an assessment of the need for an environmental impact assessment. The need for an environmental impact assessment shall be assessed by the Director of the relevant Regional Environment and Water Inspection on a case-by-case basis and according to the criteria specified in the EPA, which shall pronounce with a motivated decision.

The Minister of Environment and Waters is the competent authority for decision on the EIA for investment proposals, extensions or amendments to sites which are designated as sites of national importance by an act of the Council of Ministers.

3.2.5 Croatia

Environmental Impact Assessment (EIA) Directive¹⁷ content and principles are incorporated in Croatian Environmental protection strategic documents, in implementing laws and other regulations based on them.

The Strategy of the Sustainable Development of the Republic of Croatia (“Official Gazette” nr. 30/2009) considers environmental protection as one of three main goals of the sustainable development.

Environmental Impact Assessment regulations are part of the Environmental Protection Law (“Official Gazette” nr. 80/13, 153/13, 78/15). Environmental Impact Assessment is a document by which possible significant environmental impacts are identified based on their nature, size or location (Art. 76. Par. 1. EPL). The principle of precaution realization must be ensured in the early phase of the intervention in order that intervention impact would be on its lowest and to ensure highest possible quality of the environment protection what is achieved by the harmonization and adaptation of the planned intervention (Art. 76. Par. 3. EPL).

Environmental Impact Assessment is being done together with planned intervention preparation, before location or another necessary permit is issued. Procedure consists on:

- Request submitting;
- Examination of the opinion of the bodies/persons defined by the special regulation; opinions of the local government units on which area intervention is planned to be done;
- Informing and participation of public, if it is relevant;
- Decision issuing;
- Implementation of the environmental impact assessment results in the content of the necessary permissions.

Environmental Impact Assessment could contain also ecological network impact in accordance with special regulation (Art. 77 Par. 2 EPL).

Regulation on Environmental Impact Assessment (“Official Gazette” no. 61/2014, 3/2017) contains a list of the interventions for which an environmental impact assessment is obligatory and which body is in charge for the assessment. Body in charge could be the Ministry for the Environmental Protection and Energetics or administrative body within a county. Obligatory content of the Environmental Impact Study is listed in the Regulation. The body in charge appoints the members of the advisory professional committee of, at least 5 members, who are in charge for the professional opinion (Art. 9-11 REIA). A public discussion is in general part of the procedure. Thus, results of an environmental impact study are also accessible to the interested public.

¹⁷ The EIA Directive (85/337/EEC) is in force since 1985 and applies to a wide range of defined public and private projects

Building of the inland ports is part of the list of projects for which the Environmental Impact Assessment is obligatory (Addendum I, point 17 of the REIA). For the building of inland ports Ministry for the Environmental Protection and Energetics is in charge for the Environmental Impact Assessment.

3.2.6 Slovakia

In the Slovak Republic the main guarantor of water transport is The Ministry of Transport and Construction of the Slovak Republic. The Ministry of Environment of the Slovak Republic (MoE SR) is the responsible authority fulfilling the obligations in the area of environmental impact assessment. Environmental impact assessment is considered to be one of main instruments of international environmental policy of sustainable development.

It is based on following principles:

- complexity of the assessment of expected impacts of a proposed activity on the environment before deciding on its location or prior to its permission under special regulations and in case of a strategic document prior to its approval,
- impacts assessment is carried out by experts from various spheres,
- wide and active public participation in the assessment process,
- alternative solutions,
- the assessment process does not replace the permission process of a proposed activity.

In the Slovak Republic environmental assessments have been carried out since 1994 when the Act No. 127/1994 Coll. of the National Council of the Slovak Republic on environmental impact assessment came into force. In order to provide for the full harmonization of the Slovak legislation in the field of environmental impact assessment with the legislation of the European Union, the Act No. 391/2000 Coll. amending and supplementing the Act No. 127/1994 Coll. of the National Council of the Slovak Republic on environmental impact assessment was adopted in 2000. This Act regulates in detail the process of impact assessment of constructions, installations and other activities on the environment. It simplifies substantially the impact assessment of draft principal development conceptions, land-use planning documentations and generally binding legal regulations (Strategic Impact Assessment - SEA).

At present, the Act No. 24/2006 Coll. on environmental impact assessment and on amendments and supplements to certain acts applies, which entered into force on 1st February 2006. It regulates the process of expert and public assessment of expected impacts of strategic documents on the environment prior to their approval and impact assessment of proposed activities before their permission under special regulations. The Decree No. 113/2006 Coll. of the Ministry of Environment regulates the details of the professional qualification for the purposes of environmental impact assessment.

The assessment of impacts on the environment (Environmental Impact Assessment – EIA) is one of the main environmental policy instruments for the implementation of sustainable development. Its purpose is to prevent the negative impacts of various human activities on

the environment, including health. This is done by means of a comprehensive and professional assessment of proposed activity or its change expected impacts on the environment before deciding on its location, or prior to its authorization under special regulations.

The proposed activity or modification of the proposed activity is the realization of buildings, other facilities, an implementation plan or other intervention in the natural environment or to the country, changing the location's physical aspects, including mineral resource extraction.

The process of compulsory assessment of the proposed activity and its change impacts on the environment consists of the following basic steps:

- preliminary environmental study and comment on it,
- setting the scope of assessment and timetable,
- environmental impact statement and comment on it,
- public hearing of Environmental impact statement,
- expert review,
- final record.

Compulsory assessment is conducted in accordance with the Administrative Procedure Act. In the final record the competent authority shall state, in addition to the overall impact assessment of the proposed activity or its change, if it agrees or disagrees with its implementation, under which conditions it agrees with it and in which implementation alternative, as well as the desired extent of post-project analysis. The final record is binding for further authorization procedure, and it is valid for seven years from the date of its entry into force.

Screening procedure is conducted in accordance with the Administrative Procedure Act, and it begins with the presentation of preliminary environmental study, if the proposed activity or the notice of change should be a subject, or if the proposed activity change is to be a subject. The screening procedure ends by issuing a decision in which the competent authority shall decide whether the proposed activity or its change is to be assessed under the Act. If it is decided that the proposed activity or the change is not to be assessed under the Act, the authorization process under special regulations follows. If it is decided that the proposed activity or the change is to be assessed under the Act, the process moves to the step of compulsory assessment, and that is setting the scope of assessment and timetable. When making a decision, the competent authority shall use reasonable criteria for the screening procedure according to Annex no. 10 of the Act.

In the authorization procedure for the proposed activity or its change the competent authority is in the position of affected authority if it issued a decision on it, issued in the screening procedure, or a final record under the Act.

The assessment of strategy paper impacts on the environment (Strategic Environmental Assessment – **SEA**) is a tool for the assessment of the likely impact of strategy papers during

their development and before their adoption on the environment, including impacts on human health.

The strategy paper is a draft of plan or program, including the one co-financed by the European Union, as well as any change, that is prepared, approved or prepared and approved at the national, regional or local level, or which is prepared to be approved by the National Council of the Slovak Republic, municipal council, council of the higher territorial unit or by the Government of the Slovak Republic, and their development is required by a generally binding legal regulation, decision or resolution of the authority for which it is being prepared for the approval.

The process of compulsory assessment of the strategy document impacts on the environment consists of the following basic steps:

- notice and comment on it,
- setting the scope of strategy document assessment and timetable,
- environmental impact statement on strategy document assessment and comment on it,
- public hearing of environmental impact statement,
- expert review on a strategy document,
- final record from a strategy document assessment.

In the final record from the strategy document assessment the competent authority shall state, in addition to the overall impact assessment of the strategy document, if it recommends its adoption or not, or under which conditions, as well as the desired extent of its screening and evaluation.

Screening procedure begins with the submitting of the notice on a strategy document, and it ends by issuing a decision in which the competent authority shall decide whether the strategy document or its change is to be assessed under the act or not. If it is decided that the strategy document is to be assessed under the act, the process moves to the step of compulsory assessment, and that is determining the scope of strategy document assessment and timetable. When making a decision, the competent authority takes into account mainly the criteria for the screening procedure listed in Annex no. 3 of the Act.

Strategic Environmental Assessment process with a national environmental impact consists of those same steps as the compulsory assessment and screening procedure. The process ends by issuing the clause of environmental impact, where the result of impact assessment and presented opinions are evaluated.

Basic national legislation and documents regulating water transports in Slovakia are:

- Act No. 338/2000 Coll. on Inland Navigation,
- Act No. 364/2004 Coll. on Water

- Strategic Plan for Development of Transport Infrastructure of the Slovak Republic by 2020,
- Water Plan of the Slovak Republic - defining the framework of environmental targets enabling the long-term sustainable water management by 2021 for:
 - surface water bodies,
 - underground water bodies,
 - and measures in relation to the individual sectors of the economy for their achieving.
- The National position on the EU Strategy for the Danube Region,
- The Conception of the development of public ports Bratislava, Komárno and Štúrovo,

3.3 Measuring Environmental Performance of Danube ports

In recent years, the topic of sustainability has become increasingly important for Danube ports. In order to minimize the environmental impact of logistical activities in ports, measures to counteract negative effects are required. A first step to properly manage environmental issues in ports and to define adequate counter measures is to monitor the environmental performance. Thus, environmental management tools consisting of Environmental Key Performance Indicators (EKPIs) are required to access the current environmental status of ports.¹⁸

In the following chapter the current status of environmental management tools and implemented EKPIs are presented on European and national level.

3.3.1 European Level

After reviewing the methods of environmental performance measurements, it can be claimed that even though, seaports and inland ports differ in location and receipt of vessels (Notteboom 2016; Dolinsek et al. 2013), similarities in the different methods can be drawn. First, the generally formulated ISO 14001 is applicable also to ports. In order to tailor it more for the characteristics of ports the PERS was developed (ESPO n.d.a; EcoPorts n.d.b). Second, all presented performance measurements provide environmental key performance indicators (EKPIs). Furthermore, EcoPorts as well as PPRISM name categories the same “Operational Indicators” and “Management Indicators”. Thirdly, as already mentioned the only measurement for the environmental performance tailored for inland ports, PORTOPIA, is based on ESPO’s three performance measurement systems EcoPorts, PEARL and PPRISM (Seguí et al. 2016). Last but not least, there can be seen immense similarities in the top ten priority issues for seaports as well as inland ports. Comparing the top ten inland ports’ priorities to the top 10 priority issues of seaports (ESPO 2017), it can be observed that air quality plays an important role in both sectors. Generally 80% of inland ports’ priority issues overlap with ESPO’s top ten priority issues 2017. More important for inland ports than for seaports is according to the ranking hazardous cargo as well as soil contamination. In turn, seaports pay aim at putting more attention to the factors climate change as well as dredging (operations) (PORTOPIA 2017; ESPO 2017).

¹⁸ https://upcommons.upc.edu/bitstream/handle/2117/6234/Paper_IEM_revised_2.pdf;sequence=12
[09.08.2018]

What does “environmental” mean in terms of sustainability. What are the relevant environmental aspects which should be taken into account. Especially in Danube Ports.

On European level as a first standard, the International Organization of Standardization (ISO) has formulated the Environmental Management System (EMS) certificate under the ISO 14000 family.¹⁹ This certificate (ISO 14001) is an internationally agreed standard defining the requirements for an environmental management system (EMS). The standards aims to help organizations improving their environmental performance by using resources more efficiently and to reduce waste. This should lead to a competitive advantage compared to other inland ports and the trust of stakeholders.²⁰ Another standard is the Eco-Management and Audit Scheme (EMAS Regulation) which is a European scheme implemented by the European Commission since 1993 and it is also for the implementation of an Environmental Management System (EMS) by any organization.²¹

In 1994, the European Sea Port Organisation (ESPO), published the first ESPO Environmental Code of Practice. A survey with 281 ports from 15 different European countries was conducted which was useful to obtain an overview of the most important environmental problems in ports. In the years that follow, periodical environmental surveys were conducted in order to study the environmental performance of ports (in 1996, 2004 and 2009). As a result, the interest on environmental impact has increased in recent years and various methodologies to assist ports in their environmental performance management have emerged.²²

ESPO established three performance measurement systems, which aim to measure the environmental impact:

- ESPO EcoPorts Port Environmental Review – focusing on the environmental aspects of seaports
- Port Environmental infoRmation colLector (PEARL) - concentrating on the improvement of the understanding of environmental monitoring needs of European ports
- PPRISM - an EU funded project which identified a shortlist of indicators which form the basis of a future European Port Observatory and delivers a version of the first European Port Performance Dashboard.²³

EcoPorts

¹⁹ Gupta, A. K.; Gupta, S. K.; Patil, Rashmi S. 2005. Environmental management plan for port and harbour projects. In *Clean Techn Environ Policy* 7 (2), pp. 133–141.

²⁰ ISO 14000 family - Environmental management. ISO. Available online at <https://www.iso.org/iso-14001-environmental-management.html>, checked on 6/27/2018.

²¹ Iraldo, Fabio; Testa, Francesco; Frey, Marco. 2009. Is an environmental management system able to influence environmental and competitive performance? The case of the eco-management and audit scheme (EMAS) in the European union. In *Journal of Cleaner Production* 17 (16), pp. 1444–1452.

²² Puig, M.; Wooldridge, C.; Michail, A.; Darbra, R. M. 2015. Current status and trends of the environmental performance in European ports. In *Environmental Science & Policy* 48, pp. 57–66.

²³ Klukas, A.; Kirsch, D.; Darba, R. M.; Dooms, M.; Schepper, S. de 2015. KPI for inland ports (Pre-selection). With assistance of Doom. Portopia Consortium.

EcoPorts is the main environmental initiative of the European port sector. It was initiated by a number of proactive ports in 1996 and has been fully integrated into ESPO since 2011. The EcoPorts Network represents 23 countries and has 93 members (EcoPorts n.d.a).

The founding principle of EcoPorts is to create an equal level of competition conditions on environment through co-operation and knowledge sharing between ports. EcoPorts focuses on outcomes with applied practical value that support in the daily port activities. This can be achieved through two tools called “Self Diagnosis Method (SDM)” and “Port Environmental Review System (PERS)”. Both are subject to continuous development and refinement (ESPO n.d.a).

Klukas et al. (2015) states that any port being member of the ESPO can become a member of the EcoPort Network by completing the Self Diagnosis Method (SDM). The so called “passport” to the network includes a checklist to assess the environmental management programme of the port in relation to both the sector and international standards. As such, SDM assists ports in identifying environmental risks and establishing priorities for action and compliance. The data provided by the individual ports help to build up and update the sector’s benchmark of performance in environmental management (PPRISM 2012).

The second tool, the Port Environmental Review System (PERS) has firmly established its reputation as the only port sector specific environmental management standard. Developed by the ports themselves, PERS incorporates the main general requirements of recognised environmental management standards (e.g. ISO 14001), but is specifically adapted to the realities of port environmental management. The scheme effectively builds upon the policy recommendations of ESPO and gives ports clear objectives to aim for. A PERS certification is valid for two years (ESPO n.d.a; EcoPorts n.d.b).

The final result of the EcoPort project was also the elaboration of environmental key performance indicators. EcoPort divided them into three categories: Operational, Management and Condition Indicators. The list comprises 125 environmental performance indicators, however, the following table is just an excerpt and presents some examples of the environmental performance indicators in each category.

Operational Indicators	Management Indicators	Condition Indicators
<ul style="list-style-type: none"> • Dredging • Noise • Waste • Hazardous Materials • Dredged Materials • Pulse • Risk 	<ul style="list-style-type: none"> • Reports • Certifications • Compliance with Legislation • Information Exchange • Complaints • Environmental Training 	<ul style="list-style-type: none"> • Pollution to Air • Pollution to Water • Pollution to Soil

Table 2 - EcoPorts Environmental Key Performance Indicators (Klukas et al. 2015)

PEARL

The Port Environmental Information Collector (PEARL) is a European Commission funded project. It was developed and carried out between 2006 and 2008. PEARL seeks to combine current working practices and other options for data measurement within ports. The aim was to establish a port environmental information system platform capable of optimal exploitation of remotely sensed data, “in situ” data products and computer models. It should allow access to and interrogation of data by people responsible for environmental management and data users. Both, land based and marine environmental data types were investigated (Darbra et al. 2009).

The results of PEARL present the top 10 ranked environmental monitoring indicators/ requirements of European ports in form of a platform which helps ports to manage all their environmental data and supports environmental management:

1. Marine related issues
2. Water quality
3. Meteorological parameters
4. Turbidity and sediments
5. Oil spill
6. Air quality
7. Ballast water monitoring
8. Noise monitoring
9. Dust dispersion
10. Soil quality (Klukas et al. 2015; Darbra et al. 2009)

PRISM

With the Port Performance Indicators, Selection and Measurement (PPRISM) project (2011-2012), ESPO has taken a first step in establishing a culture of performance measurement in European ports. Another aim was to create a dashboard including the most important indicators (PPRISM n.d.; Klukas et al. 2015). The two year PPRISM project defines the basis of a European Port Observatory which will take the form of a Port Performance Dashboard. During the selection process, the number of indicators regarded as suitable for the Port Performance Dashboard was narrowed down from an initial 158 to 37 indicators on a first assessment (Klukas et al. 2015). The dashboard is not used to compare the performance of individual ports or terminals but focuses on the performance of the port performance system as a whole (PPRISM 2012).

All indicators are subdivided into five different fields:

- Market trends and structure
- Socio-economic impact
- Environmental performance
- Logistics chain and operational performance
- Governance (PPRISM 2012)

PPRISM then, set up five indicator criteria in order to ensure a decent indicator quality and to keep a manageable number of indicators:

- An indicator must be usable to monitor the key outcomes of strategies, policies, and legislation and measure progress towards policy goals. (“Policy relevance”)
- An indicator must supply relevant information with respect to the ports activities. (“Informative”)
- An indicator must be directly available, or at a sound cost-benefit ratio. Furthermore, a frequent data acquisition using reliable procedures must be possible. (“Measurable”)
- An indicator must deliver clear information, be simple to interpret, and finally publicly appealing. (“Representative”)
- An indicator must be built upon existing information wherever possible. All figures used must be simple to monitor. (“Feasible/Practical”) (Klukas et al. 2015)

After applying the indicator criteria, the remaining indicators were classified in three performance indicator categories:

- Management Performance Indicators (MPIs): Provide information about the management efforts that influence the environmental performance of the port.
- Operational Performance Indicators (OPIs): Provide information about the environmental performance of the port’s operations.
- Environmental Condition Indicators (ECIs): Provide information about the condition of the environment.

It is important to mention that the final result of the PPRISM project was a short list of twelve environmental performance indicators consisting of nine management performance indicators and three operational performance indicators (Klukas et al. 2015).

Management Indicators	Operational Indicators
<ul style="list-style-type: none"> • Environmental Management System • Environmental monitoring programme • Inventory of significant environmental aspects • Environmental policy • ESPO Code of Practice • Inventory of environmental legislation • Objectives and targets • Environmental training • Environmental Report 	<ul style="list-style-type: none"> • Carbon Footprint • Waste Management • Water Consumption

Table 3 - PPRISM environmental key performance indicators (Klukas et al. 2015)

PORTOPIA

Based on ESPO's projects EcoPorts, PEARL and PPRISM a project was launched with the purpose to select a list of environmental key performance indicators tailored for inland ports' needs and characteristics. The obtained data should then be integrated into the project database (ports observatory dashboard). In order to gather data on different environmental performance indicators. An environmental survey tailored for inland ports was developed. It takes into account their specific needs and characteristics in terms of functionalities and dedicated resources (Seguí et al. 2016).

The set of criteria established, is composed of a set of 15 qualitative questions divided in four categories that are related to any recognized environmental management system: Environmental management, environmental monitoring, environmental priorities and green actions.

- Environmental Management: the survey provided 10 question concerning environmental management including indicators like environmental policy, environmental management system, budget for environmental management, proper targets and definitions for environmental improvement etc.
- Environmental Monitoring: the majority of the sample ports do have some kind of monitoring system in place. Some have already established an environmental monitoring program while others still only monitor environmental parameters.
- Results on environmental priorities sets a baseline for environmental priorities in EU inland ports as this is the first time such a ranking has been developed for this specific sector. The results can be especially useful to the European Federation of Inland Ports (EFIP) and its members in terms of identifying key issues of international concern, assisting in the selection of major topics for conferences, workshops or training sessions, demonstrating trends over time as the priority issues change with legislation or incidents and focusing resources for significant areas of research (Seguí et al. 2016). The top ten priority issues for inland ports (2015) are as followed:

1. Air quality
2. Relationship with local communities
3. Water quality
4. Port development (land)
5. Garbage/Port waste
6. Soil contamination
7. Hazardous cargo
8. Energy consumption
9. Noise
10. Ship waste (PORTOPIA 2017)

- Questions included in the Green Action category were for example if the port applies initiatives to implement green actions or if the port recognizes green ship certificates or if the port applies differentiated fees for implanting green actions. Two thirds of the asked ports apply initiatives to implement green actions and almost half of the respondent inland ports also apply differentiated fees for implementing green actions, being the incentives for companies using the inland waterway the most common one. This may suggest that inland port authorities are devoted to foster the use of the inland waterway among their port operators in order to perform a sustainable freight distribution (Seguí et al. 2016).

After carefully reviewing the methods of environmental performance measurements, it can be claimed that even though, seaports and inland ports differ in location and receipt of vessels (Notteboom 2016; Dolinsek et al. 2013), similarities in the different methods can be drawn. First, the generally formulated ISO 14001 is applicable also to ports. In order to tailor it more for the characteristics of ports the PERS was developed (ESPO n.d.a; EcoPorts n.d.b). Second, all presented performance measurements provide environmental key performance indicators (EKPIs). Furthermore, EcoPorts as well as PPRISM name categories the same “Operational Indicators” and “Management Indicators”. Thirdly, as already mentioned the only measurement for the environmental performance tailored for inland ports, PORTOPIA, is based on ESPO’s three performance measurement systems EcoPorts, PEARL and PPRISM (Seguí et al. 2016). Last but not least, there can be seen immense similarities in the top ten priority issues for seaports as well as inland ports. Comparing the top ten inland ports’ priorities to the top 10 priority issues of seaports (ESPO 2017), it can be observed that air quality plays an important role in both sectors. Generally 80% of inland ports’ priority issues overlap with ESPO’s top ten priority issues 2017. More important for inland ports than for seaports is according to the ranking hazardous cargo as well as soil contamination. In turn, seaports pay aim at putting more attention to the factors climate change as well as dredging (operations) (PORTOPIA 2017; ESPO 2017).

The methods presented are the best established and present ones. Other similar projects and measurements have been for example the project INDAPORT (2002-2004), which comprises the establishment of a system of indicators in order to implement a sustainable environmental ports management or the Tool for the identification and assessment of Environmental Aspects in Ports (TEAP). This tool is specifically designed to assist ports in identifying significant environmental aspects and aims at assisting in the selection of the significant aspects, a compulsory requirement of ISO 14001 or EMAS(Puig et al. 2015a).

3.3.2 Austria

In Austria, so far no ports have implemented an environmental assessment tool including a standardized set of EKPIs. In addition, no reports are publically available on the environmental performance of ports in Austria.

3.3.3 Romania

In Romania a certified environmental management system (respecting policy objectives, including a program to achieve objectives, indicators, etc.) is included. In addition, waste management is respected in Romanian ports.

In this matter, the following are being monitored:

- For water:
 - o Indicators related to water quality of harbor basin
 - o Indicators related to spilled water through the pluvial and domestic sewerage networks in the port
 - o Indicators of underground water from the landfill area
- For air:
 - o Gas emissions from power plants
 - o Gas emissions from the landfill

MPAC for example does not have established a set of EKPIs which to be monitored regularly. However, environmental objectives are analyzed annually for internal purposes. This concerns environmental objectives included in the management program. For example, the 2018 management program includes the following:

- To ensure compliance with the regulations regarding hazardous waste and substances, water and atmospheric/air protection
- To prevent emergency situations that may have negative environmental impact
- To increase the environmental performance of the company's activities by measuring and monitoring environmental factors: water, air, soil
- To increase the awareness of the personnel and the economic agents regarding the environmental performance

EKPIs are also not defined in the current legislation and the organization is not aware of EKPIs of the companies located in the Port of Constantza, Midia or Mangalia.

3.3.4 Bulgaria

Each port has a waste management plan, which contains:

- Grounds for elaboration of the document, including legal background
- Geographical location of the port;
- Description of the port – general characteristics and size;
- Number and types of ships visiting the port;
- Assessment of the need for waste management;
- Waste disposal procedures;
- Reception facilities;
- Procedures for acceptance, storage, treatment and transport of waste;
- Applicable fees;
- Procedures of reporting of non-compliance;
- Procedures for collaboration with port users and stakeholders

Ports do not publish performance indicators related to environment. There are no companies located within ports' area.

The National statistical institute has a specialized part in its website: www.nsi.bg dedicated to environment. The parts, which contain information on the topic are:

- Sources of emissions;
- Waste from activity;
- Municipal and construction waste;
- Registered noise levels;
- Protected natural scenery;
- Expenditure on protection and restoration of the environment
- Tangible fixed assets with ecological use
- Water statistics;
- Total revenue from taxes and fees and expenditure for municipal waste
- Special part with regard to ports is pollution prevention of sea waters and the Danube river – contains annual data about carried out control activity on collected solid and liquid waste and ballast from ships, and on petrol floods and petrol products taken off from sea waters and the Danube River.

Indicator ²⁴ , all in tons	2010	2011	2012	2013	2014	2015
Received waste waters and ballast from ships	13441	16037	15262	17800	19766	22191
Black Sea	13210	15844	15078	17681	19682	22180
Danube river	231	192	184	119	84	11
Received Solid waste	445	490	761	617	678	821
From port aquatories	0	0	0	0	0	0
From ships	445	490	761	617	678	821
Collected petrol floods and petrol products	2,8	1,0	6,2	0	3,9	5,0

Table 4 - Waste volume (annual comparison)

According to the **Convention on cooperation for the protection and sustainable use of the river Danube (Convention for the protection of the Danube)**²⁵ there are certain substances that have to be monitored:

Guiding list of hazardous substances and groups of substances

A. Priority groups of substances

(a) heavy metals and their compounds;

(b) organohalogen compounds;

(c) organic compounds of phosphorus and tin;

²⁴ Source: www.nsi.bg

²⁵ Source: [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:21997A1212\(03\)](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:21997A1212(03))

(d) plant protection agents, pesticides (fungicides, herbicides, insecticides, algicides) and chemicals used for the preservation of wood, cellulose, paper, hides and textiles etc.;

(e) oils and hydrocarbons of petroleum origin;

(f) other organic compounds especially harmful to the aquatic environment;

(g) inorganic nitrogen and phosphorus compounds;

(h) radioactive substances, including wastes.

B. Single hazardous substances.....

Ports are not identified as industrial sectors that have significant impact on the environment.

3.3.5 Croatia

The port of Vukovar does not have any management system implemented in Port of Vukovar or for the passenger ports on Croatian part of Danube River.

3.3.6 Slovakia

According to Act no. 364/2004 Coll. on the waters the Slovak Hydrometeorological Institute (SHMI) is responsible for monitoring surface water quality at five basic and twelve operational points of the Danube river basin. Frequency of monitoring is evenly distributed during the calendar year, i.e., 12 times a year in accordance with the monitoring program.

Ecological status is evaluated using classification schemes based on the requirements of the Water Framework Directive by researchers. It consists of a comprehensive evaluation of three groups of quality elements, namely: biological, physicochemical and hydromorphological. Biological elements have priority status; other quality elements are supportive elements for water-bound organisms. The resulting classification of the ecological status is presented in the 5th class:

- very good ecological status,
- good ecological status, resp. good and higher ecological potential,
- average ecological status, resp. average environmental potential,
- bad ecological status, resp. poor ecological potential,
- very bad ecological status, resp. very bad ecological potential.

The assessment of the chemical status consists of comparing the observed concentrations of individual priority substances with the environmental quality standards established by the European Commission. The chemical status is classified into two classes:

- good condition,
- not achieving good status.

The requirements for achieving good status of waters are defined by Government Regulation no. 269/2010 Coll., which provides:

- requirements for surface water quality, quality objectives of surface water intended for the abstraction of drinking water, water intended for irrigation and water suitable for life and reproduction of the original fish species and the extent of monitoring of these waters,
- the classification of good ecological status of surface water, good chemical status of surface water and good ecological potential of surface water,
- the limit values of the indicators for pollution of sewage, municipal waste water and special waters discharged into surface water or groundwater,
- limit values for pollution indicators for industrial waste water containing harmful substances,
- requirements for discharging waste water from relief facilities and surface water runoff.

The emissions are monitored by the National Emission Information System (SHMI and MoE SR). However, the key figure for the calculation of emission from water transport is diesel fuel consumption in the Slovak section of the Danube basin.

Garbage collection: The issue of waste collection and monitoring of waste collection from vessels belonging to inland carriers (holding inland waterway licenses) and sailing on the Slovak section of the Danube is currently being solved. Vessels of Slovak shipping companies hand over waste in two ways:

- directly from ships through specialized companies
- within a stable collection station (service pontoon P-65 belonging to SPaP, a.s.).

Collection of waste from vessels belonging to foreign shipping companies: In this issue, it is necessary to solve the issue of collection of waste from vessels of foreign shipping companies in terms of legislation. Subsequently, the necessary infrastructure needs to be built.

Pontoon P-65: As one example of a waste management solution from ships in a port on the territory of the Slovak Republic, a system for the collection and treatment of ship-generated waste, which is carried out by the Slovak Shipping and Harbours company - the majority carrier and operator of water transport on the Danube in the Slovak Republic, which is in compliance with the Slovak legislation. It operates a pontoon P-65 service station also for shipments of wastes caused by the operation of vessels. Pontoon P-65 is a special self-propelled steel craft used for fuelling ships, oils and potable water and shipping waste generated by the operation of vessels.

Foreign shipping companies are currently only offered for sale of diesel, oil and potable water. The collection of any waste from other than its own vessels is not carried out.

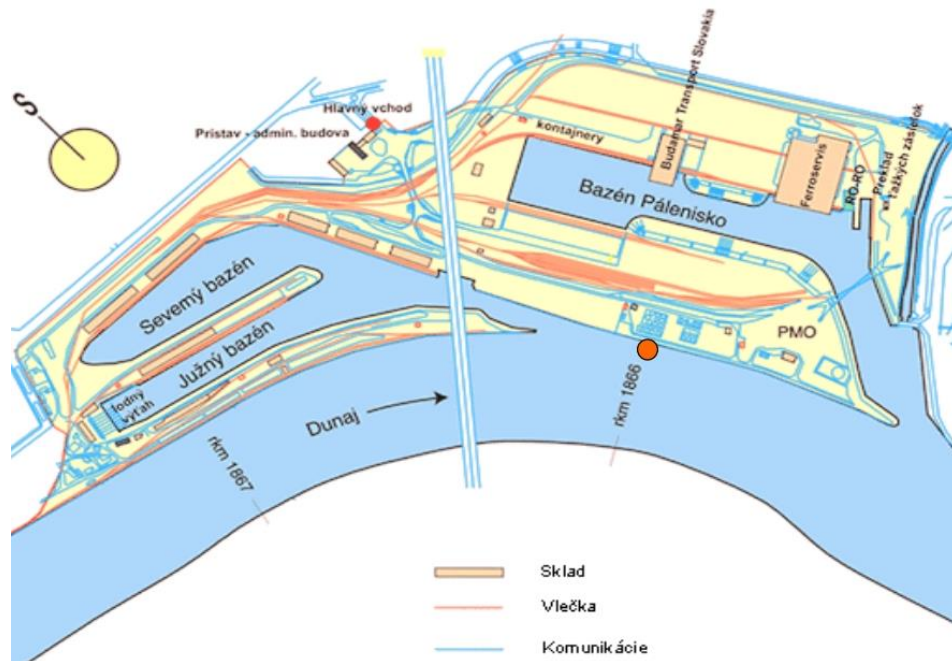


Figure 4 - Location of service station pontoon P-65 in the port of Bratislava

The VP a. s. does not monitor any KPIs related to ports, or water transport. The Slovak Environmental Agency has worked out and regularly evaluates the different categories of indicators (measurable quantities), which also represent a significant basis for the subsequent elaboration of different types of reports. The importance of indicators is primarily that they enable objective mapping of development trends, comparisons with the situation in the surrounding countries, and serve as a support tool for adopting major socio-economic decisions at regional or national level.

3.3.7 Summary

As can be seen from the previous paragraphs, in Austria, Romania, Bulgaria, Croatia and Slovakia there is no standardized environmental management system (EMS) consisting of a defined set of environmental key performance indicators (EKPIs). Only in Romania it was mentioned that an EMS is installed. It seems that ports focus a lot on how to handle different types of waste in the port area. This is in contrast to the results of EcoPorts survey, based on which waste/garbage is on not the main priority in terms of environmental management in ports. This also indicates that ports have different targets in terms of environmental sustainability on national level and on European level. This may be also affected by the industry located in the port area of each port and on the main industries on a national level. As a consequence, a flexible set of EKPIs may be necessary to make sure that this differences are taken into account. As a first step to develop this flexible set of EKPIs a better overview of current relevant environmental issues and measures in ports in the Danube region is necessary to develop relevant EKPIs for Danube ports. Thus, within the DAPhNE project a questionnaire was developed in order to survey the green port status of 10 Danube ports in order to get a better overview of current actions in terms of environmental performance. Results of the survey will be summarized in a questionnaire report including a recommendation for a set of EKPIs which could be used by Danube ports.

4 Best Practice Examples

4.1 Current and past initiatives concerning sustainability in inland ports

In the following chapter, best practice examples concerning sustainable initiatives in Danube ports are summarized.

4.1.1 Austria

In Austria, the container terminal of the port of Vienna has the goal to become the first CO₂ neutral trimodal terminal in Europe. Since August 2018, the terminal is fully supplied by hydropower. As a result, 160 tons of CO₂ emissions are avoided. In order to realize the CO₂ neutral trimodal terminal, as a first step a CO₂ balance will be developed which analyses the current CO₂ emissions. Based on the balance, measures for improvement will be defined.²⁶

In 2017, the first LNG (Liquefied Natural Gas) petrol station was installed at the port of Enns by RAG Rohöl-Aufsuchungs Aktiengesellschaft. As an environmentally friendly fuel for truck traffic, the petrol station can be seen as an important contribution to the achievement of Austrian and European climate protection targets. The port of Enns was chosen due to its accessibility by road, rail and inland waterway and its importance in the Upper Austrian transport logistics network. At the petrol station around 12 tonnes of LNG can be stored which equals 60-90 truck tank fillings.²⁷



Figure 5 - Opening of LNG petrol station²⁸

4.1.2 Romania

MPAC has a current initiative, the project „Upgrade of infrastructure and environmental protection in Constanta Port – PROTECT 2015-RO-TM-0046-M”. The project started on

²⁶ http://www.hafen-wien.com/media/file/147_WienCont_wird_Vorreiter_bei_Nachhaltigkeit.pdf [09.08.2018]

²⁷ <http://www.oevz.com/en/news-en/first-lng-petrol-station-in-austria-opened-in-ennshafen/> [09.08.2018]

²⁸ <http://www.oevz.com/en/news-en/first-lng-petrol-station-in-austria-opened-in-ennshafen/> [09.08.2018]

01.07.2016 and it is estimated to end on 31.07.2019. The Action entails upgrading basic port infrastructure, constructing a new state of the art on-shore waste collection and treatment facility, upgrading the signalling system in the port basin and the fairway, and purchasing one technical vessel (deployment of one technical vessel for ship waste collection). Through this Action, the Port of Constanța will improve safe navigation, offer better services for waste collection and be able to comply effectively with current and future ship waste and pollution prevention legislation, namely Directive 2000/59/EC.

One of the past initiatives was **Constantza Port Environment and Infrastructure Project** which was implemented between 2002 and 2007. The main components of this project were: infrastructure component – transformer station IV, New Waste Landfill and closure of the existing landfill, Waste Incineration Plant, Waste Collecting Ship, Waste Water Treatment Plant/ Landfill Leachate Treatment Plant. The project was financed by MPAC.

Another past initiative was Constantza Green Port Project: "The implementation of the proposed project would help Constanta Port to introduce an environmental management system (EMS) that would enhance its status as a sustainable green port in the global transport network. The project would rely on the application of cost-efficient innovative technological and operational concepts in order to reduce the port's carbon footprint and improve its overall environmental performance. These aspects would have a positive influence not only on the protection of the environment, but also on the reduction of external costs associated to transport. The proposal was submitted under the Multi-Annual Work Programme CEF Transport Call 2015 for Cohesion Countries, in line with the objectives of the priority on Deployment of innovation and new technology actions in all transport modes, according to the TEN-T Guidelines, Art.33 (a to d). The project was not approved for funding".

Also, efforts have been made in order to purchase new launches for recovery of oily and solid waste from port basins because a major need to replace the existing old ones has been identified.

At this moment, **APDM** carried out the necessary procedures for the preparation of the Financing Application Form for **Tulcea Port Development Project**, in order to receive European Union non-reimbursable funds under Large Infrastructure Operational Programme [POIM] 2014 – 2020, based on the **Feasibility Study** already elaborated during the period 2017 – 2018.

One of the objectives of the project is the construction of specialized port facilities for the mooring and stationing of the technical vessels, belonging to CN APDM SA Galati, for the collection of the waste and the collection of the waste generated by the ships passing through Tulcea port.

Port facility adequately equipped (Port basin, Office and administrative building, Technical building, Decontamination platform, Parking lots, etc) will be built, in order to fulfill the administration's obligations regarding the collection, storage and neutralization of collected residues as well as the capacities needed to provide the support and intervention activities in case of accidental hydrocarbon pollution of Danube waterway.

The past initiatives developed by APDM with significant environmental impact were:

System for Ship Generated Waste Collection and Processing in the Maritime Danube Ports – CODENAV

The implementation period of the project was December 2010 – December 2013

The project aimed to create a ship-generated waste collection system in the ports of the Maritime Danube stretch and to reduce the negative impact on the environment caused by river transport activities by using 5 new technical vessels which have been built in order to ensure the collection, the temporary storage, the treatment and the disposal of the waste and residues dangerous and non-dangerous (recyclable) generated by maritime and river ships operation on the main Maritime Danube Ports, namely: Galati, Braila and Tulcea.

Website: <https://www.danube-navigation.eu/projects/codenav-system-for-ship-generated-waste-collection-and-processing-in-the-maritime-danube-ports>

LNG Masterplan Rhine – Main – Danube.

The project has been initiated by Pro Danube International and Port of Rotterdam and was implemented between 1 January 2013 – 31 December 2015.

APDM was member of the Projects Consortium.

“The LNG Masterplan aims to create a platform for the cooperation of authorities and industry stakeholders with the purpose to facilitate the creation of a harmonized European regulatory framework considering LNG as fuel and cargo for inland navigation and to promote the introduction of LNG as a fuel and cargo for inland shipping. It delivers technical concepts for new and retrofitted vessels being propelled by LNG and transporting LNG as well as a significant number of pilot deployments of vessels and terminals. It also develops a comprehensive strategy together with a detailed roadmap for the implementation of LNG in line with the EU transport/energy/environmental policy goals and actions”

Funding Programme: Trans-European Transport Network Programme (TEN-T) of the European Union - Call 2012 / Priority Projects - 18 [Rhin - Main - Danube] [50% - EU and 50% - CN APDM SA Galati].

LNG is the most relevant alternative fuel for inland navigation offering high environmental and economic benefits. Only inland vessels can deliver high volumes of LNG cost-effectively from seaside import terminals to the economic-heartlands of Europe.

Within the LNG Masterplan Project, APDM elaborated a Pre-Feasibility Study for the construction of an LNG Small Scale Terminal [Bunkering Station] in the port of Galati.

Website: <http://www.lngmasterplan.eu/>

Waste Management for Inland Navigation on the Danube – WANDA.

The project has been initiated by via Donau and APDM was member of the Projects Consortium. The project has been funded under the European Union's South-East Europe (SEE) Transnational Cooperation Program, under Priority Axis 2 – "Environmental Protection and Enhancement" in Subchapter 2 - Prevention of Environmental Risks.

The project has been running for 3 years, was approved in June 2009.

Website: www.wandaproject.eu

Convention for Waste Management for Inland Navigation on the Danube – CO-WANDA

The project has been initiated by via donau and APDM was member of the project consortium. The project has been funded under the European Union's South-East Europe (SEE) Transnational Cooperation Program, under Priority Axis 2 – "Environmental Protection and Enhancement" in Subchapter 2 - Prevention of Environmental Risks. CO-WANDA was implemented between 2012 – September 2014

Based on the findings of the foregoing WANDA project, the main focus of CO-WANDA was to start initiative work for a binding treaty, which shall provide clear guidelines for ship waste management. The support of national and international authorities, stakeholders and opinion leaders was a driving force for the successful implementation of the international cooperation activities. In fact, the harmonisation and adaptation of currently running ship waste management systems will decrease the risk of illegal discharges of ship wastes and thereby support the protection of valuable river ecosystems and the means of livelihoods for future generations in the Danube region.

Website: <https://www.danube-navigation.eu/projects/co-wanda-convention-for-waste-management-for-inland-navigation-on-the-danube>

Green International Freight Transport – GIFT

The project has been initiated by the Ministry of Transport from Greece and APDM was member of the Projects Consortium.

The project has been funded under the European Union's South-East Europe (SEE) Transnational Cooperation Program and was implemented between 2012 – 2014

The main aim GIFT project was to map, analyse and evaluate the status of the transport sector in the South East Europe Regions and to propose new policies and strategies in infrastructure, processes, assets, ICT, legislation, norms and harmonization/ standardization issues, in order to promote innovative green intermodal freight transport corridors.

Website: <http://www.gift-project.eu/index.php/en/>

ILR is currently working on the project „*High Performance Green Port Giurgiu Stage II Construction -2014-RO-TMC-0313-W*“. The project started on September 2016 and it is estimated to end on March 2020. The project is implemented on the basis of a public private partnership between ILR Logistica Romania, Giurgiu Municipality and the Free Zone Administration Giurgiu. The Action aims to provide access to the inland port of Giurgiu and its connections with rail, road and inland waterway networks, upgrade the port basic's infrastructure and water-side terminal facilities. It is part of a Global project to upgrade the overall Rhine-Danube Corridor to reach stable navigation throughout the year.

The proposed Action is the implementation of the Study “High Performance Green Port Giurgiu – 2012-EU-18089-S” funded under the TEN-T program. The Study finalized in August 2015 represents stage 1 of the transformation of Giurgiu Port into a High Performance Green Port and provides all necessary preparatory work for the realization of the port development project. Stage 2 of the project will deploy the infrastructure as Action in the kind of a “works project”. The consortium displays a balanced relationship between the private sector representative (ILR Logistica Romania SRL) and the public entities (Giurgiu Municipality and the Free Zone Administration). Relying on the experience of the 1st stage project, the role of Coordinator of the Action will belong to the private company which will build and operate the intermodal terminal and its connections to the railway, waterway and road networks. Giurgiu Municipality will be responsible for land preparation operations needed for the construction of the intermodal terminal. Additionally, the Municipality will construct one railway level crossing and eco-restore the area around the intermodal terminal. The Free Zone Administration will rehabilitate the road network and a section of the old quay within the Free Zone Port. The works performed by the consortium members are expected to have the following results:

- Increased capacity of Free Zone Giurgiu Port: from 60,000 tons / year (2013) to 300,000 tons / year to be reached in a 10-year-interval since the finalization of the project
- Diversification of cargo flows in the port by introducing new types of cargo especially high-quality steel products
- Increased quality of the logistics services provided due to the building of a state of technology and eco-friendly all-weather terminal
- Increased interoperability of all transport and logistics processes within the port due to the implementation of advanced IT software for the warehouse management and the connection of the intermodal terminal to the rail and road services
- Improved safety and more fluent traffic within the port due to the rehabilitation of obsolete infrastructure: modernization of the quay infrastructure, upgrade of access and connecting roads, construction of new railway connection as well as capital dredging within the port basin to ensure unhindered all year access at cost-effective vessel draught
- Reduction of CO2 emissions from the port operations by: shifting transport primarily to environmentally friendly Danube navigation and by using new energy-efficient equipment (2 cranes and lifting equipment installed and ready for operations), eco-restoration of the adjoining area of the intermodal terminal
- Better energy efficiency of the port infra- and superstructure by applying specific measures: LED and sensor lighting, special insulation applied to the all-weather terminal, energy efficient heating and cooling systems
- Creation of new jobs: trained staff in the field of logistics and the operation of the intermodal terminal
- Providing the Danube port community as well as public authorities with a good-practice example on how an old port (brownfield investment) can be transformed into an intermodal high-performance logistics node.

The Action is in line with operational objectives set in the Romanian General Master Plan for Transport in regards to inland navigation. The Port of Giurgiu is included in the list of pre-identified sections and projects stipulated in Annex I, Part I.2 of the CEF Regulation. The Action also addresses key areas of intervention of the Naiades II policy framework meant to reinforce the contribution of the inland waterways and ports to a sustainable European Freight transport network namely developing quality infrastructure, improving the environmental quality of the port operations and high-lighting the need for skilled workforce. The Action significantly contributes to achieve the goals of the European Union Strategy for the Danube region (EUSDR) and contributes to create jobs and economic growth in the Danube region.

4.1.3 Bulgaria

On 20.02.2018 BPICo began the implementation of “Technical assistance for preparation and implementation of „Delivery, Installation and Implementation of the port reception facilities (PRF) in the Bulgarian public transport ports of national importance“ project. The main goal of this technical assistance project is to provide highly qualified and specific consultancy services for the preparation and the realization of an investment project that aims to improve the environmental management in the field of water transport in Bulgaria. The Consultant will update the Waste Acceptance and Processing Plans in the ports of national importance in Bulgaria. This will include extending the scope of the current Plans with an assessment of the need for and subsequent

deployment of facilities for prevention and response to operational or accidental pollution in closed waters and coastal zone in the port area and the reception of these wastes.

Finished initiatives include active participation of Bulgarian institutions and port terminals in EU projects, like for example:

- The Executive Agency for exploration and maintenance of the Danube river took part in the projects WANDA and CO WANDA – for common European waste management policy;
- Port Bulmarket has successfully participated in the LNG Masterplan project. The terminal already disposes of facilities for the storage and refueling of LNG-operated river vessels.

4.1.4 Croatia

The Public Institution Port Authority Vukovar (PAV) participated in the following international two projects, aiming to make inland navigation and ports more sustainable:

Waste Management for Inland Navigation on the Danube – WANDA.

PAV participated in WANDA project within the South East Europe Program, part of Transnational Cooperation Program, under Priority Axis 2 – "Environmental Protection and Enhancement" in Subchapter 2 - Prevention of Environmental Risks. Project has been initiated by via Donau who was the Lead Partner.

The project has been running for 3 years, was approved in June 2009.

Website: www.wandaproject.eu

Convention for Waste Management for Inland Navigation on the Danube – CO-WANDA

The project has been initiated by via Donau and PAV was member of the Projects Consortium. The project has been funded under the European Union's South-East Europe (SEE) Transnational Cooperation Program, under Priority Axis 2 – "Environmental Protection and Enhancement" in Subchapter 2 - Prevention of Environmental Risks. CO-WANDA project was implemented between 2012 – September 2014. Within the project as is situation, together with the legal framework and infrastructure research was done. The main goal of the project was to prepare an international binding treaty which shall provide clear guidelines for ship waste management and to decrease the risk of illegal discharges of ship wastes and also to support the protection of valuable river ecosystems. Pilot actions for the vignette system testing was done also in Croatia.

Website: <https://www.danube-navigation.eu/projects/co-wanda-convention-for-waste-management-for-inland-navigation-on-the-danube>

4.1.5 Slovakia

Specific plans include the actual reconstruction of ports, the improvement of services to their users and investments in the construction of a LNG terminal at the port of Bratislava. These measures can be considered as top priorities.

VP, a.s. has the ambition to invest in the development of ecological water transport. One of its priorities is the construction of the LNG terminal in Bratislava port. This could also lead to the establishment of environmental incentives for port users. The main problem connected with the development of the environmentally friendly port and water transportation in general in

port Bratislava is existing relationship between VP, a.s. and the port operator SPaP, a.s. Existing legal relations between VP, a.s. and SPaP, a.s make impossible to further finance the development of the port of Bratislava from EU sources.

List of projects to be implemented from OPII:

- Feasibility study - Modernization and construction of public port Bratislava
- Revitalization and completion of port edges and reinforced surfaces, project documentation
- Security Project and Emergency Plan of the Public Port Bratislava
- Construction of the LNG terminal at the public port Bratislava - pre-project preparation
- Port security - pre-project preparation
- Construction of the background for vessels in public port Bratislava - pre-project preparation

Projects implemented by VP a.s. for port and water transport development:

DaHar

The three-year **DaHar project** to develop inland ports on the Danube was successfully completed in March 2014. The project set out to create a common strategy for inland ports in small and medium-sized cities on the Danube to encourage additional development and to enhance their international importance, which has been achieved. The primary objective was to contribute towards improved integration of inland navigation into a universal logistics transportation chain focused on multi-modal and the logistics development of ports and port areas along the Danube in a European context by:

- creating effective international platforms for shared concepts and cooperation in the area of inland navigation,
- optimizing the use of logistics and multi-modal capacities in partner ports and port areas and the development of mutual synergies,
- creating the foundation for future development plans of ports with respect for the principles of specialisation and diversification in the logistics transportation chain.

Implementation of the DaHar project in the partnering port cities has increased the capacities of inland ports and driven improvements in key processes associated with logistics and multi-modal development in partnering ports. This was a major step forward towards functional specialisation and the diversification of small and medium-sized ports in the logistics transportation chain along the Danube, which provided the individual partnering ports with a more exact specification of roles and a more stable position in multi-modal logistics networks.

Primary activities completed within the project:

- thorough analysis of multi-modal ship transport,
- intensive exchange of information between project partners in the drafting of development programs for the individual ports,

- synthesis of the obtained knowledge and experience with benefits for all participating parties,
- completion of an integrated strategy for functional specialisation and diversification of partner ports in the logistics transportation chain,
- specific action plans for individual ports based on the adopted common strategy.

One of the most important outputs of the DaHar project was the Local Action Plan for VP, a.s., which defined action objectives, the primary areas of development and specific activities in the following areas:

- logistics infrastructure and models for operating public ports in the Slovak Republic,
- improved integration of Bratislava Port with domestic rail and road transport networks,
- integration of ports into the container and Ro - Ro services system on the Danube,
- radar information systems and information technologies supporting port management and cargo transport,
- navigability, remedy of environmental burdens and active environmental protection efforts.

The Local Action Plan includes specific financial requirements for the individual areas of development and represents a reference point for drafting investment activities completed in the European INWAPO project.

INWAPO

The INWAPO project was established to support improved coordination between official entities and other stakeholders towards increasing the competitiveness of waterborne transport as an alternative to road transport and developing intermodal logistics cooperation.

The general objective of the INWAPO project is to provide support for making investments into intermodal infrastructure and thereby creating opportunities to provide a broader range and higher level of quality services within intermodal logistics. The INWAPO project is focused on improving the connections of Central European ports to their surroundings and between one another. It creates the conditions for improved integration and coordination of various modes of transportation in the area of Central Europe with emphasis on investments into intermodal transportation, information and communication technologies and applications for inland and sea ports.

Individual activities within INWAPO are focused on fulfilling the specific goals of the project:

- improving the connections between ports in Central Europe and their catchment areas as well as connections with other ports,
- improving integration with various types of transportation in the region of Central Europe with particular emphasis on intermodal solutions and the use of modern information and communication systems in ports,

- securing the development of tri-modal centres, thereby contributing to the balanced development of road, rail and waterborne (maritime and inland) transport,
- creating an environment that fosters the establishment of new transportation services in the Danube region.

5 Conclusion and Next Steps

As indicated in the beginning of this report, the topic of sustainability is increasingly important in the transport sector. As a result, also inland ports face the challenge to become more environmentally sustainable. In order to set the right measures, as a first step the environmental performance needs to be measured to define areas for improvement. As shown in chapter three, on European level there are some initiatives and projects, aiming to get better insights into the main areas of interests in the field of environmental sustainability of inland ports. Some surveys have been conducted to assess the current standards for measuring the environmental performance of inland ports in Europe. However, there is a lack of information provided for Danube ports especially in the Eastern part of Europe in the survey conducted by EcoPorts. This is also reflected somewhat in the information provided by partners on national level from Austria, Romania, Bulgaria, Croatia and Slovakia. Only in Romania there is an environmental management system in place – but with no standardized set of EKPIs. In addition, even though air quality was surveyed as the most important area for environmental improvement, ports in the countries included in this report seem to focus on the treatment of waste (named only as the 6th important area for environmental improvement). Thus, it is necessary to get more insights into the current status of environmental measures and initiatives in ports in the Danube region. As a next step in the DAPhNE project, a survey will be conducted in 10 Danube ports to survey their current green level and to get more information about the main areas of interest for environmental improvement. Results of the survey will be summarized in a report, also providing recommendations for a suitable set of EKPIs to measure the environmental performance of Danube ports. Learnings from this report on the survey report are used as a basis to elaborate a Green Port Policy for Danube ports.

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