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DIONYSUS

Integrating Danube Region into Smart & Sustainable Intermodal Transport Chains

Port Development Plan

WPT4 (Pilot Cases)

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Development of Port of Dunaújváros, Hungary

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1 Introduction

The Danube and its navigable tributaries offer significant free capacity for cargo and passenger flows. A prospering waterborne transport sector contributes to a sustainable transport system and regional growth. Besides better fairway conditions, a more modern, energy-efficient fleet, better management of the transport system through comprehensive infrastructure planning and investment solutions are required. The investment needs refer to port infra and superstructure, multimodal connections to port hinterlands.

The project focuses on addressing main regional challenges in infrastructure governance and planning highlighting key actions needed to support Danube transport, port infrastructure planning. It builds on the results of DAPhNE project on port infrastructure development and Danube Ports Network cooperation.

DIONYSUS results will feed into the elaboration of transport corridor development policies by means of gap analysis reports and recommendations. It will provide a framework to identify shortcomings in rail & road access infrastructure of the Danube ports and consolidate investment needs based on Market Analyses. Matching port planning with transport infrastructure and Regional Economic Development Plans will deliver recommendations for their adaptations in line with sector priorities. Targeted and niche-specific case studies for Container Liner Services and Agricultural Products will be developed. Also, an Infrastructure Master Plan for the River Cruise Industry will be elaborated.

Essential outputs will consist of Port Development Plans and Operational and Business models to support quality, sustainable development, and investment decisions. All project's outputs will ensure alignment with specific EU Transport, TEN-T and Cohesion Policy objectives for the period 2014 - 2020 and beyond, including the next Multiannual Financial Framework (2021 - 2027), making DIONYSUS to a key instrument to contribute the EUSDR implementation.

2 Objectives of this document

Within the framework DIONYSUS project, the Hungarian partner HFIP (Hungarian Federation of Danube Ports) prepares a Port Development plan for the improvement of the Port of Dunaújváros.

The selection of the port was based on several decision criteria such as potential in terms of location, operation, transshipment infrastructure, hinterland connections as well as on factors such as regional economic development, freight flows outlook, business community profiles, etc. The Port Development Plan will comply with National or Regional Economic Strategies or Regional Development Plans of the relevant area.

The purpose of conducting a feasibility study is to provide decision-makers with sound information about the exploitability and viability of a planned business idea, opportunity, before it begins.

This preparatory work allows decision-makers to determine the scope of the planned task and to establish the rational decision needed to initiate it.

The subject of the present feasibility study is the investigation of the feasibility of a crane-covered, covered warehouse in the area of the Port of Dunaújváros.

For this work package 5 main target groups (indicators) are defined by EHOO:

1) Owners of the port; target value: 5

2) Local public authority / target value: 10

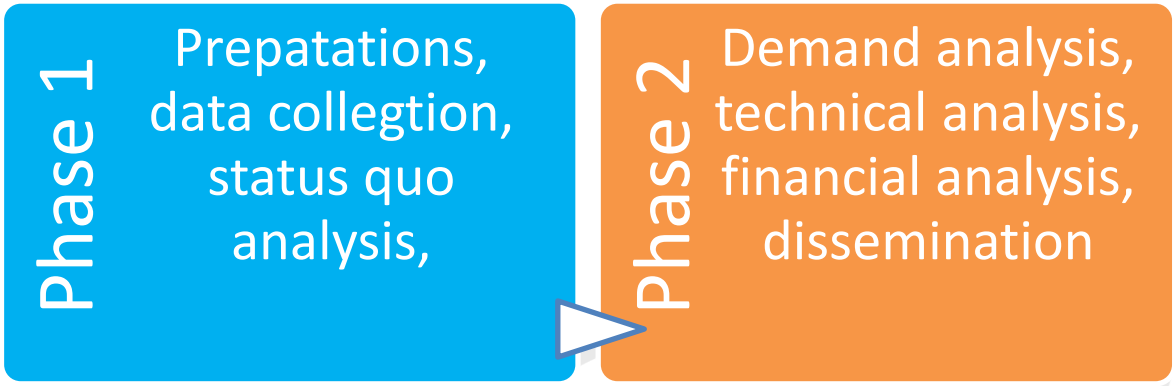
3) National public authority / target value: 5

4) Infrastructure and (public) service providers / target value: 5

5) SME (as existing and potential new clients of the ports): target value: 5

3 Structure/content

During the preparation of the study, the content is prepared in two phases for easier scheduling. The first phase will run until 15.12.2021, where we plan to complete half of the content of the entire document, in line with the performance of the subcontractors involved. Based on these, the status quo analysis chapters will be prepared in the first phase, followed by a technical and financial analysis of the specific development in the second phase, scheduled for 30.11.2022.



To determine the content, we considered Chapter 2.1 of the Masterplan "Port Development Plans" Internal working document for PP regarding WPT4 / "content".

Parts not relevant to the development plan of the Port of Dunaújváros, has not be elaborated.

4 Confidentiality

The masterplan is nor an official business plan, neither does it contain any confidential information. Therefore, content of this document can be freely published in the framework of the program communication.

5 Executive Summary

Port of Dunaújváros is a public port in the administrative area of Dunaújváros, located at the right riverside of the Danube at section 1578.600 km, suitable for managing large ships. In terms of its construction, it is an inland basin port, and its operation is public. Number of ship berths (continuous in operation) is 6 (95 m each), length of its quays is 563 m, its total land area is 5.2 ha. Water surface used by the port is 38.1 ha.

The port is meeting domestic and international transport needs related to road, rail, river and sea transport, as it has road, rail and water connections, and can handle all kinds of goods arriving at the port by any means of transport.

The city of Dunaújváros is located between the Danube and national highway no. 6. The road connections of the city all run towards highway no. 6., but the M6 and M8 motorways are also both within 3 km distance. The highway no. 62 provides connection to the county capital Székesfehérvár. Budapest is accessible by the motorway M6 (55 kms) and the highway no. 6. With the handover of the Pentele Danube bridge, which is part of the M8 motorway, road connection was also established to the areas towards Tisza River and the eastern part of Hungary.

The railway connection of Dunaújváros is provided by the „MÁV" Hungarian State Railway's Pusztaszabolcs – Dunaújváros-Paks railway line No. 42. The single-track railway line is electrified up to Dunaújváros. This line is connected to the Mezőfalva-Rétszilas railway line No. 43, which is actually a continuation of line 42 in the direction of Rétszilas. The industrial track running to the Danube Ironworks and the port is connected to the railway line No. 42 at the Dunaújváros railway station in the western part of the city.

By waterway, the Port of Dunaújváros can be approached on the Rhine-Danube Corridor, which is part of the TEN-T network.

The main activities of the Dunaújváros river port are the loading and unloading of goods transported via waterways, storage, maintenance and repair of port equipment, lifting machines and ships, and additional port services. The port is suitable for unloading both bulk and parcel goods from a ship to open railcars or road vehicles, as well as for loading goods from a road vehicle or open railway cars into a ship.

There are two owners of the port territory: ISD DUNAFERR Zrt. (4.8 ha area), and Centroport Kft. (0.3446 ha area). They cooperate on the basis of a contract, taking into

account the interests of both parties. The port authority is the same as the main port operator ISD DUNAFERR Dunai Vasmű Zrt..

When comparing the port to Port of Baja and Freeport Budapest we can conclude that Port of Dunaújváros is significantly smaller in size. Nevertheless, its lifting capacity is much better than that of Baja, almost equalling Freeport Budapest. With the development concerned, the storage capacity of the Port of Dunaújváros -that is by far the smallest now – is expected to approach that of Port of Baja.

The port's storage area is 1200 m2 as of now. Nevertheless, the protection of goods, the increased quality demands, from the weather independent loading of goods, the international expectations, the more efficient use of available capacity makes it necessary to build a roofed loading station and warehouse with cranes in the port area. This development will make it necessary to conduct some transformation on the berths.

Besides, some related developments are also to be implemented in the framework of this project, such as the modification of the shore wall, removal and upgrading of cranes, development of the adjusting railway, and establishing an inner traffic engineering network.

Furthermore, installation of a solar panel system on a surface area of approx. 5000 m2 (700 kW capacity) on the roofing of the new warehouse is also planned, that would make a significant contribution to the increase of green energy production, thus the transition to a low carbon society.

The area of the planned roofed loading station and warehouse with cranes is approximately 6000 m2. Besides, a roofed loading station with an area of approximately 3150 m2 is also planned to be built. At least 3000 m2 of this must be useful storage space. The majority of the remaining warehouse space is taken by the space requirement of the roads and rails needed for loading.

Planned net cost of the development is 25.2 million EUR. The most likely resource for the development is IKOP Plusz (Integrated Transport Development Operative Program Plus) in the framework of the 2021-27 EU planning, as it is the biggest (EU) financial resource for transport related developments, including port investments.

This project directly supports private businesses in the port hinterland, as improved services of the port provide them better logistic solutions. As the services of the port can be used by any businesses, we expect an increase in the number of business entities using the port services. Besides, the improved service level is likely to attract new industrial companies to the nearby area by providing better logistic solutions.

6 Status quo of European context with relevance to the port

- The inland waterway transport sector / strategic context

- Strategies, policies and programs of EU-level and international level
  - TEN-T, CEF, AFID, RED, …
  - Green Deal context
  - Water Frame Directive

In Hungary, transport accounts for 6% of GDP and, including the construction of transport networks and vehicle manufacturing, one in ten jobs is transport-related. The share of transport services in household consumption is 12%, and 21% including vehicle purchases and passenger vehicle operation. The value of transport infrastructure is about one fifth of the country's national wealth.

Transport is an integral service backbone of the economy and society. Its multiplier effect on economic and regional development is indisputable, it helps to balance territorial disparities and its direct contribution to GDP is significant (7-9%). It is important to note that transport has one of the best GDP/GNI ratios of all economic sectors in terms of income generation capacity, because a higher proportion of the companies involved in the value creation process in transport are Hungarian owned than in other economic sectors.

The improvement of the functioning of the transport system and its international integration is a prerequisite for the country's sustainable economic growth. To attract as much working capital as possible, it is necessary to improve and equalise transport accessibility throughout the country.

The main waterway transport corridor in our country is the Danube, part of the TEN-T Rhine-Danube core network corridor, the Danube-Main-Rhine waterway system, which is 3,500 km long.

Ports in Europe are not only important for maritime, river and intermodal transport, but also act as an economic hub and provide employment opportunities for the population. Given the international dimension of the sector, European ports policy requires a Community-level policy that exploits its comparative geopolitical advantages. European ports face a few challenges in the fields of the environment, globalisation, sustainable development, employment, and social conditions, particularly in terms of security, financing, market access, governance and anti-competitive and discriminatory measures taken by non-EU countries in specific geographical markets. In Europe, the lack of areas suitable for port development and the scarcity and vulnerability of natural habitats underline the importance for the legislator to achieve balance and legal clarity regarding its environmental, economic, and social obligations. The European port sector is highly diversified and is expected to grow strongly in the

coming years. Ports need modern infrastructure and efficient connections with the mainland and islands. [1]

Strategies, policies, and programs of EU-level and international level

The European Green Deal

On 11 December 2019, the Commission published its Communication on a Green Deal for Europe (COM (2019) 640), presenting the Green Deal as the EU's new growth strategy to make EU societies climate-neutral, equitable and prosperous, and its economies modern, resource-efficient and competitive.

The European Commission's Green Deal Communication sets out policy initiatives to help achieve climate neutrality by 2050.

The European Green Deal sets out an action plan for the following target areas. Promoting resource efficiency through the transition to a clean, circular economy. Restoring biodiversity and reducing pollution.

The plan identifies the investments needed and the financing instruments available and explains how to ensure that the transition is equitable and inclusive.

The EU wants to become climate-neutral by 2050. It proposes to make this political commitment legally binding through the European Climate Agenda.

All sectors of the economy must act to meet the climate neutrality target. Our joint tasks are:

- Invest in green technologies;

- promoting innovation among industry players;

- introducing cleaner, cheaper and healthier forms of transport, both private and public;

- decarbonising the energy sector;

- ensuring energy efficiency in buildings;

- working with our international partners to improve global environmental standards.

"Transport is responsible for a quarter of the EU's greenhouse gas emissions and this share is growing. Achieving climate neutrality requires a 90% reduction in transport emissions by 2050. Road, rail, air and water transport all have to contribute to this reduction. Achieving sustainable transport means putting users first and providing them with more affordable, accessible, healthier and cleaner alternatives to their

[1]Source: European Parliament resolution of 4 September 2008 on European ports policy 2008/2007 (INI) 2009/C 295 E/18

current mobility options. The Commission will adopt a strategy for sustainable and smart mobility in 2020 to meet this challenge and address all sources of emissions."

It states that "a significant share of road freight, which accounts for 75% of land freight transport, should be shifted to rail and inland waterways as a priority. This requires better management and increased capacity of railways and inland waterways."

Sustainable and Smart Mobility Strategy

On 11 December 2019, the Commission published its Communication on a Green Deal for Europe (COM (2019) 640), presenting the Green Deal as the EU's new growth strategy to make EU societies climate-neutral, equitable and prosperous, and its economies modern, resource-efficient, and competitive. The strategy sets out a vision for the future in which mobility and transport in Europe is a core value for all and must be managed in a sustainable way. The strategy plans for the long term, up to 2050, and sets targets for 2030 and 2035 and 2050.

It sets the following targets for 2030:

- at least 30 million zero-emission vehicles will be on Europe's roads.
- 100 European cities will be climate neutral.
- High-speed rail transport will have doubled.
- carbon-neutral scheduled public transport in the EU of less than 500 km.
- Automated mobility will be widely deployed.
- zero emission ships will be ready for market introduction.

By 2035:

- Large emission-free aircraft will be ready for market introduction.

By 2050:

- almost all cars, vans, buses, and new heavy-duty vehicles will be zero emission.
- rail freight traffic doubles
- high-speed rail traffic triples
- for the core network, a sustainable and intelligent trans-European transport network (TEN-T) equipped for high-speed intermodal transport will become operational.

TEN-T Regulation

In December 2013, the European Parliament and the Council adopted the European Union guidelines for the development of the TEN-T (Trans-European Transport Network), creating the TEN-T Regulation 1315/2013/EU defining road, rail and inland waterway corridors, their core and comprehensive network elements. The TEN-T policy strengthens the interconnection between the western and eastern parts of the continent, thus supporting European integration efforts, territorial cohesion and

improving the competitiveness of the new EU Member States. The design, development and operation of TEN-T networks contribute to the main strategic objectives of the EU's Europe 2020 Strategy and the White Paper.

The Trans-European Transport Network (TEN-T) is a single system that serves as a backbone for long-distance freight transport in the EU economy. The designated network covers about a quarter (74,500 km) of the road network in the Member States and about half (78,600 km) of the rail network. It also includes major airports and navigable inland waterways, river and sea ports.

The Budapest Freeport is Hungary's largest inland waterway freight port, located at the junction of the Rhine-Danube TEN-T core network corridor and the Mediterranean and Eastern/Eastern Mediterranean corridors.

The Rhine-Danube corridor provides better connections between the river and other inland waterways (the Rhine) and links Central Europe with Germany and France by rail and road. The Rhine-Danube corridor, whose main line is formed by the Main and the Danube, connects the Strasbourg and Frankfurt area through southern Germany to Vienna, Bratislava, Budapest and the Black Sea, with an important branch from Munich through Prague, Zsolna and Kassel to the Ukrainian border.

The Hungarian elements of the Trans-European Transport Network:

- Corridor IV runs from the Austrian and Slovakian borders through Budapest to Romania and includes 487 km of railways and 410 km of roads;

- Corridor V runs from the south-western border in a north-eastern direction. The main branch crosses Slovenia, the V/B branch Croatia, while the V/C branch enters Hungary from Bosnia and Herzegovina and joins at Budapest to continue towards Ukraine. The railway network is 996 km long and the road network 784 km long;

- Pan-European VI, the Mediterranean Corridor, connects the Iberian Peninsula with the Hungarian-Ukrainian border. The route first follows the Mediterranean coastline of Spain and France, then crosses the Alps in an easterly direction to northern Italy and the Adriatic coast of Slovenia and Croatia, before ending in Hungary;

- Corridor VII is the waterway of the Danube from Austria to Romania, with a length of 378 km in Hungary;

- The X/B branch of Corridor X starts from Budapest, with 156 km of rail sections and 171 km of road sections up to the border with Serbia and Montenegro;

- Three airports: Budapest-Ferihegy, Debrecen, Sármellék;

- Along Corridor VII there are six ports in Hungary: Győr-Gönyű, Komárom, Budapest-Csepel, Dunaújváros, Baja and Mohács.

Pan-European corridors in Hungary:

- Corridor IV: running from the Austrian and Slovak borders through Budapest to Romania, it includes 487 km of railways and 410 km of roads;

- Corridor V: runs from the south-western border in a north-eastern direction. The main branch crosses the border from Slovenia, the V/B branch from Croatia and the V/C branch from Serbia, joining at Budapest and continuing towards Ukraine. The railway network is 996 km long, the road network 784 km;

- Corridor VII is the waterway of the Danube from Austria to Romania, the Hungarian section of which is 378 km long;

- Corridor X, branch X/B, starts from Budapest, with 156 km of railway sections and 171 km of road sections up to the border with Serbia.

The map below illustrates the elements of the TEN-T network in Hungary:

Figure 1.: The TEN-T network, ports, rail and road terminals in Hungary

CEF Regulation – Connecting Europe Facility

Regulation (EU) No 1316/2013 of the European Parliament and of the Council establishing the European Network Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010. Under the European Network Facility (CEF), €24.05 billion is available from the EU budget for 2014-2020 to finance TEN-T development projects in EU Member States. Of this amount, €11.305 billion is allocated to countries eligible for funding from the Cohesion Fund. The priorities and the total amount of funding that can be allocated to each priority area in each year are set out in annual and multi-annual work programmes. 2014 was the first

programming year for the CEF. Alongside the European Fund for Strategic Investments (ESIF) and the European Structural and Investment Funds (ESIF), the CEF plays an important role in promoting the missing European investment, one of the Commission's top priorities.

In March 2021, the European Network Facility 2.0 (CEF 2.0), an EU programme with a budget of €33.71 billion, was adopted to finance the development of high-performance, sustainable infrastructure in the fields of transport, the digital economy and energy. This second version of the programme covers the period from 2021 to 2027.

In the field of transport, CEF 2.0 will promote interconnected and multimodal networks to develop and modernise rail, road, inland waterway and maritime infrastructure and enable safe and secure mobility. Priority will be given to the further development of the Trans-European Transport Networks (TEN-T), in particular missing links and cross-border projects with EU added value. The EU will allocate €1.38 billion (at 2018 prices) from the transport budget to major rail projects between cohesion countries.

The CEF 2.0 will also ensure that when infrastructure is modified to improve military mobility within the EU, it remains dual-use capable, i.e. it can be used for both civil and military purposes. 1.69 billion is earmarked for military mobility within the transport budget.

The European Strategy for the Danube Region

The EU Strategy for the Danube Region is a macro-regional strategy adopted by the European Commission in December 2010 and by the European Council in 2011. The main elements of the strategy are economic development, transport and transport, energy supply, environment, and security. The EU Member States in the Danube Region are Germany, Austria, Hungary, the Czech Republic, Slovakia, Slovenia, Bulgaria and Romania. Transport and environmental protection are also important issues for river navigation in the EU Strategy for the Danube Region. One of the objectives of the strategy is to increase the volume of freight transport on the Danube by 20% by 2020. Currently, the ageing Danube freight fleet is 80-90% older than the Rhine fleet. The development of the region's road and rail network is also a priority in the strategy. On the environmental front, the planned construction of new water treatment plants will improve water quality and reduce the amount of untreated wastewater and fertilisers entering and polluting rivers. The strategy also aims to implement projects to promote eco-technologies and protect biodiversity.

On 3 February 2011, the persons responsible for the priority areas of the EU Strategy for the Danube Region were appointed, which will facilitate the implementation of the Strategy. In the future, the countries responsible for these priorities will manage the implementation of the tasks, prepare the work programme and identify funding sources. Implementation may also involve other countries and partners, e.g. NGOs. Of the 11 priorities, the priorities that are also relevant for river navigation and the country responsible for each priority are listed in the table below.

Relevant priorities of the European Strategy for the Danube Region[2]

Priority area	Responsible countries
Developing mobility and intermodality	Inland waterways: Austria, Romania Rail, road, and air transport: Slovenia, Serbia (Ukraine)
Restoring and supporting water quality	Hungary, Slovakia
Environmental risk management	Hungary, Romania

Hungary has taken on a coordination role with the Czech Republic on the promotion of sustainable energy, Slovakia on the restoration and preservation of water quality and Romania on environmental risk management.

The final document of the Danube Region Strategy was adopted by EU Affairs Ministers on 13 April 2011. The document is intended to ensure sustainability and coherence for the future. The document shows that the focus is on the modernisation of fleets rather than on improving the quality of the Danube's navigability parameters, i.e. the structural problems of the Danube are not being addressed.

The 2014-2020 development period offers a realistic opportunity to implement the ideas mapped out in the first three years. 55 projects have been launched under the first call of the Danube Transnational Programme.

The first pillar of the Danube Region Strategy (EUSDR) "connects the Danube region with other regions", where one of the priorities is transport, the development of multimodal transport in relation to road, rail, air and inland connections. Accordingly, the project will serve sustainable mobility, which is an explicit objective of EU 2020 and the Common Transport Policy.

An essential part of the project is the "transformation of the Danube River basin into a multimodal logistics hub" and the "promotion of sustainable freight transport in the Danube region". The development also supports the economic and social objectives of the strategy, indirectly contributing to environmental protection, wealth creation and strengthening economic cooperation systems in the region.

The planned investment contributes to Pillar 1 of the EU Strategy for the Danube Region (Connecting the Danube Region) and to Priority Axis 1a ("Improving mobility and multimodality: improving inland waterways").

NAIADES II

In 2013, the European Commission adopted the NAIADES II "Towards quality in inland waterway transport" package, which aims to create the conditions for inland waterway

[2] Source: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/124&format=HTML&aged=0&language=EN&guiLanguage=en

transport to become a quality mode of transport. The programme sets out a programme of policy actions in the field of inland waterway transport for the period 2014-2020. Quality infrastructure is a key area of intervention.

The European Commission has taken a step towards revising NAIADES to focus on concrete measures that will help realise the potential of inland waterway transport and contribute to the creation of sustainable and efficient transport. For inland waterway services to be competitive, it is essential that both waterborne and port infrastructure meet the needs.

NAIADES III

In 2021, the European Commission adopted the NAIDES III package, an action plan for the development of inland waterway transport for the period 2021-2027, aligned with the Multiannual Financial Framework (MFF) and the Green Agreement. It focuses on:

(a) more and better transport by water

(b) a gradual shift to zero-emission ships

(c) strengthening incentives

To meet the three key challenges mentioned above, an integrated action plan is needed, covering the following relevant areas: fleet, infrastructure, digitalisation, personnel.

Alternative fuels infrastructure development

The European Commission has now published a report to the European Parliament and Council on the application of Directive 2014/94/EU on the deployment of alternative fuels infrastructure (AFID). The report assesses the national implementation reports from Member States received under AFID. It also includes an external support study from the Commission and considers state of the art alternative fuels infrastructure in the EU. The report is accompanied by a Staff Working Document on the Detailed Assessment of the Member States Implementation Reports on the National Policy Frameworks for the development of the market as regards alternative fuels in the transport sector and the deployment of the relevant infrastructure.[3]

Directive 2014/94/EU on the deployment of infrastructure for alternative fuels also sets an important deadline: “Shore-side electricity supply shall be installed as a priority in ports [maritime and inland] of the TEN-T Core Network, and in other ports [maritime and inland], by 31 December 2025, unless there is no demand and the costs are disproportionate to the benefits, including environmental benefits”.

Water Frame Directive

[3] Report on EU-wide alternative fuels infrastructure deployment | Eltis

The Water Framework Directive adopted in 2000 is a pioneering approach on naturally occurring geographical formations, river basins watersheds. It sets a precise timetable and in 2015 setting a deadline for the provision of all good status for all European waters. European waters are under severe pressure. The economic activities, population growth and urbanisation are increasing are putting pressure on Europe's freshwaters. Unless stronger action is taken, the EU's surface waters will not reach good ecological status by 2015. The chemical status of 25% of groundwater is affected by human activity is poor due to human activity. 40% of surface waters have a chemical status of is not known, suggesting that in many Member States it is inadequate water monitoring networks in many Member States. The 2012 EU plan to conserve Europe's water resources identifies the obstacles to better water management and offers concrete solutions and sets out the EU water policy for the coming years. a roadmap for the EU's water policy.

7 Project DAPhNE: DR-common-situation

DAPhNE – Danube Ports Network aimed to facilitate a balanced development of Danube Ports as eco-friendly, well accessible multimodal hubs for the transport system of the region and to turn them into buzzing economic centres functioning as catalysts for economic growth and creation of high value jobs.

The project has been a well-managed working platform which tackles the most urgent insufficiencies with the help of guidelines, recommendations and concrete pilot activities based on good practices leading into an overall development strategy and action plan for the Danube ports.

The activities aimed to improve port legislation, funding of port investments, port administration processes, port business strategies as well as port infrastructure and industrial development strategies. Special attention has been paid to human capacity building and eco-improvement options for the port sector.

The aspects of strengths, weaknesses, opportunities and threats are summarized below based on the findings of project DAPhNE.

Figure 2.: SWOT analysis of Hungarian Danube ports

Strengths	Weaknesses
• Good and guaranteed loading and unloading standards • Regular service outside of working time (more flexible than in the western countries) • The geographic location of the ports is logistically mostly favourable • The majority of ports are trimodal • Modern technologies and high-capacity loader machines	• Road and rail links are cumbersome in most cases • The amount of loadable goods depends on the water level of the Danube; in very low water conditions there are loading problems • There is a limited number of sheltered loads • No equipment suitable for container loading (only in Budapest) • Need of dredging (some ports are not affected) • Decisive role of price
Opportunities	**Threats**
• EU resources are available for port infrastructure development in Hungary • Increase storage capacity • Introduction of businesses/industries into ports • Development of road-rail connections • Construction of covered loaders • Designing modern equipment for handling container traffic • Training of port professionals, training of labour force suitable for any port • Taking advantage of free loading capacity • Improving shipping conditions (Danube waterway)	• Lack of labour supply • Clients can avoid water transport due to uncertain water levels, and may change to road/rail transport modes • Development of road infrastructure (roads, bridges) near the ports can divert part of the traffic

Source: project DAPhNE

Strengths

One of the strengths of the Hungarian ports is that they have good and guaranteed loading and unloading standards which guarantees a certain service level to their customers. Also, most Hungarian ports provide regular service outside of working time and are more flexible than the Danube ports in the western countries, for example in

Austria or Germany. Logistically favourable geographic location typical at the majority of Hungarian ports, and can be mentioned as a strength, also the majority of Hungarian ports have connection to rail and road. Most ports apply modern technologies and high-capacity loader machines which makes them competitive on the market, and most ports can operate with small staff, which means a strength from economical point of view. The general terms and conditions (established by HFIP in 2015) which applies to transactions between companies (port operators and clients) can also be mentioned among the strengths.

Weaknesses

Although most ports are trimodal, the road and rail links are cumbersome in many cases, which is a weakness and an opportunity for development. Most of the Hungarian ports' operation is influenced by the water level of the Danube, which determines the amount of loadable goods; in very low water conditions there are loading problems in many cases. It is also a weakness of the Hungarian ports, that there are limited possibilities of covered loading, so they cannot load vessels in rain or snow; covered loader only exists in Budapest. Lack of equipment and technology suitable for container loading is also representative at the Hungarian ports, therefore, only Port of Budapest has container traffic. It is a weakness that most ports need regular dredging which means increased operational costs, however some ports are not affected. Typical weakness at the Hungarian market, that the customers take high importance on the price of the services, and there is a significant price competition among the ports.

Opportunities

One of the most significant opportunities for ports in Hungary, that EU funds are available for port infrastructure development. Ports could be also developed by increasing their storage capacity; however, they should take the market demand into consideration. Another opportunity is to settle industrial companies into the ports which could generate a regular and balanced level of cargo. In most cases there is a need for development of the road-rail connections, which would be a great opportunity to increase the traffic at the ports, as well as construction of covered loaders or designing modern equipment for handling container traffic. From the human resource point of view, there is a great opportunity in training of port professionals as there are not many relevant potential employees or port managers in the labour market. Also, an opportunity to consider is taking advantage of free loading capacities. The Hungarian Federation of Danube Ports in cooperation with The University of Dunaújváros has already established a training course for port professionals, which could help in qualifying a labour force suitable for any ports. Construction of a sluice and passage channel that eliminates the need for dredging could be a great help for most of the ports. Finally, the improvement of shipping conditions on the Danube needs to be mentioned among the opportunities as it would provide better conditions for operation at all Hungarian ports.

Threats

One of the main threats concerning the Hungarian ports is the lack of labour supply, and therefore the challenge of finding suitable people in the labour market for companies operating in the port area. However, there are already some solutions (e.g., port operator training established by HFIP) which could help solving the human resource problem on a long term. Further threats are related to the competition, especially with different transport modes: clients can avoid water transport due to uncertain water levels, and may change to road / rail transport modes, also, development of road infrastructure (roads, bridges) near the ports can divert part of the traffic.

Action Plan 2020-2023 (in the frame of the National Port Development Master Plan)

A strategy document identifying the directions of commercial port developments needed along the Hungarian section of the Danube to ensure reaching the envisaged percentage share of IWT has been drafted as part of the Master Plan Project.

The strategy specifies 5 target areas with several associated points of intervention. To meet the strategic goal, i.e., to ensure that the percentage share of inland freight water transport reaches 10% of the total volume of freight by 2030, specific actions attached to the gools need to be planned and implemented as scheduled.

The Action Plan is clearly linked the Master Plan and formulates actions for each of the target areas specified in the Plan as laid out below. Feasibility study for the development of the port of Dunaújváros contributes to the actions and priorities marked with *italic*.

4 Motivating the modal shift
4.1 Improving the access to ports
4.2 Improving the efficiency of loading and storage
4.3 Digital ports
4.3 Sustainable ports
4.5 Promoting ports and the transport of freight by waterway
4.6 Monitoring freight transport trends
5 Generating demand for port services
5.1 Market accommodation of port services
5.2 Development of port services
6 System of ranking and supporting the development of ports
6.1 System of ranking ports
6.2 System of ranking and development support for ports
6.3 Joint advocacy for ports
7 Port related HR development
7.1 Managing the shortage of labour
7.2 HR development at public authorities
8 Review of regulations
8.1 Clarification of regulatory powers
8.2 Environmental sustainability

8 Project GRENDEL: Input from project results for future infrastructure development

The GRENDEL project supports the Danube vessel fleet operators and their public counterparts in modernisation of the sector. GRENDEL addresses various fleet modernisation aspects: [i] use of low carbon & alternative fuels, [ii] reduction of air pollutant emissions (CO2, NOx, PM) and [iii] overall energy consumption. Besides this, [iv] transport & logistics management processes are addressed to ensure better integration of the Danube IWT into logistics chains through new services (including River Information Services), digital data provision as well as dedicated tools to improve efficiency of fleet operations.

The project's overall goal is the improvement of the environmental and economic performance of the Danube fleet. This will be achieved through three specific objectives:

1. Know-how transfer for Danube fleet operators with the help of intensive transnational collaboration between private & public stakeholders and targeted know-how transfer activities in order to overcome the existing knowledge gap, lack of activities and absence of instruments to deploy innovative solutions

2. Elaboration of innovative technical vessel concepts and improved transport & logistic management processes of fleet operators and sharing these as good practices for wide-scale implementation to strengthen the competitive position of inland navigation and to exploit its market potential

3. Supporting development of favourable regulatory framework & well-designed public support measures by introducing Model State Aid Scheme & innovative financial instruments to design national public support measures which will clearly address the needs of the sector

With its activities, GRENDEL aims to achieve a higher acceptance and use of inland waterway transport (IWT) as an environmentally friendly transport mode contributing to economic growth and a more sustainable transport system in the Danube region.

9 Status quo of the port regarding its national/regional surroundings

The port is in Dunaújváros, Fejér County, in the Central Transdanubian region. A brief description of these territorial units is given below.

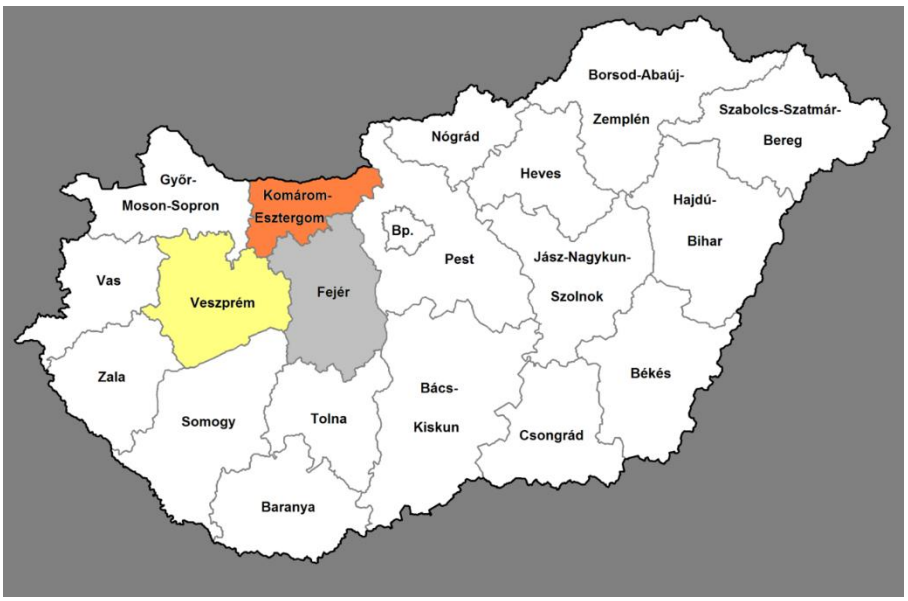


Figure 3.: Central Transdanubia region

The Central Transdanubia region is one of the seven statistical regions in Hungary. It is made up of three counties, Komárom-Esztergom, Fejér and Veszprém, with Székesfehérvár as its centre.

All three of the counties that make up the region have played a prominent role in Hungarian history: the regional centre, Székesfehérvár, known as the City of Kings, together with Esztergom in Komárom-Esztergom County, were the first capitals of the country; the former was the coronation city and royal seat for more than 500 years, the latter is still the centre of the Hungarian Catholic Church. The town of Veszprém is usually referred to as the town of the queens.

Central Transdanubia is the third most developed region of the country, Fejér County is the most developed county in the country and the driving force of the economy of the whole region. The regional centre is one of the largest economic hubs of the country and the centre of the whole Transdanubian region in terms of transport geography.

It has a population of about 1.1 million, an area of 11 237 km² and a population density of nearly 100 inhabitants per km², making it the fifth most populous, fifth largest and second most densely populated of the seven Hungarian regions.

Fejér county has one of the most diverse areas in Hungary. The larger southern part of the county is in the Mezőföld, the Transdanubian extension of the Great Plain. In

addition, the eastern part of the Bakony, the Bicskei hills, the Vértes and Gerecse in the south, Lake Velence with an area of 27 km² and the Velence Hills to the north and Székesfehérvár in the west, add to the topography of the area. The highest point is Csóka Hill, 479 metres above the Csókakő Castle in Vértes.

Fejér county is one of the largest counties in Hungary. Fejér county alone accounts for more than two thirds of the GDP of the Central Transdanubian region.

Its economic centre is Székesfehérvár, one of the country's leading economic cities, but the other major city, Dunaújváros, is also an important centre.

In 2014, the net sales turnover of Fejér County enterprises exceeded HUF 2884 billion. Of this, HUF 2381 billion was generated by the 300 most successful companies in the county. In terms of exports, the top 300 companies are even more important, together accounting for 97.3% of the county's export turnover.

The employment rate in Fejér County in the first half of 2021 is 64.1%, which is higher than the national average of 62.8%. Moreover, the unemployment rate measured over the same period is only 1.9% in Fejér County, less than half the national average of 4.1%.[4]

Dunaújváros is located on the eastern edge of the Mezőföld, on the right bank of the Danube, 67 kilometres from Budapest, near the triple border of Fejér, Bács-Kiskun and Tolna counties. The city is divided into three major parts. In the north, on the lower part of the town, surrounded by streams, lies the old town of Dunaújváros, the so-called Pentele district, which is the part of the former Dunapentele that has been built up for centuries. South of the Old Town, the so-called New Town ('the first socialist town') was built in the 1950s on the Pentelei plateau, which rises high above the Old Town, in the administrative area of Dunapentele, but it was never separated from Dunapentele, and they always formed a single administrative unit. South of the town, the Danube Ironworks was built, separated from the town by a substantial dike. The town is situated at an altitude of 116 m above sea level, bordered by the Danube for about 10 km to the east and by gentle hills to the west.

The port is located on the right bank of the Danube, in the bay between 1580-1579 rkm, on the Szalki island. The nearest port to the north is the port of Adony, on the right bank between rkm 1597 and 1598, and to the south is the port of Dunavecse, on the left bank of the Danube at rkm 1572.

Road transport links and development plans in the area

By road, the port is served by the M6 motorway (parallel with main road no. 6) and the ever-expanding M8 motorway and is also connected to important cities such as Székesfehérvár via the main road No. 62. M6 and main road no. 6 connect Budapest with the South Transdanubian region of the country via Dunaújváros. Preparations are

[4] Fókuszban a megyék (ksh.hu)

underway for the M8 motorway section between the M7 motorway - Dunaújváros (M6) junction and the Dunavecse - Kecskemét (M5) junction, which could be upgraded to a 2x2 lane motorway with a 20 m wide crown and dividing lane. This will also fulfil the planned function of the Pentele Bridge in Dunaújváros, connecting the east-west of the country.

Rail transport links and development plans in the area

The port can be reached by train No. 42, which connects Pusztaszabolcs and Dunaújváros. This railway is a single-track railway line on the right bank of the Danube (Pusztaszabolcs-Dunaújváros-Paks railway line), electrified as far as Dunaújváros, with a total length of 79 km. The railway line no. 42. between Pusztaszabolcs and Dunaújváros has been operation since 1951. The extension to Paks was handed over in 1976. There are currently no announced developments on the railway line concerned, but the location of the town and port provides good links to major rural towns. In the future, the expansion of the Paks nuclear power plant may justify the development of the railway line.

10 Description of the port

The port of Dunaújváros is one of the largest cargo ports in Hungary concerning the annual turnover (1,200,000 tons per year) and port capacities (loading capacity: 3,200,000 tons per year).

Figure 4. Port of Dunaújváros

Source: hfip.hu

10.1 History / development / existing situation / neighbourhood

The port of Dunaújváros has been operating since 1954. The need to build an ironworks in Dunaújváros was formulated by István Széchenyi in 1842, who wrote a letter to the English engineer William Tierney Clark on April 5, 1942. He wanted to increase trade on the Danube. From 1831 the navigation conditions in the direction of the Iron Gate were improved, a canal was constructed in 1846.

On March 6, 1950, the current location of the port was chosen from three options: the port of the Dunapentele on the Szalki Island, the construction of the port on the Kisapostag Island, the construction of the port on the Danube in the area below Kisapostag. The northern part of Szalki Island was designated for the works, and a wire rope track was planned to lead to the ironworks in the southern part. The State Institute of Industrial Planning was approached to design the port of Dunaújváros. It was adopted on March 8, 1950.

Works began at Tass, in the Soroksár Danube branch, 10 km from Dunapentele. Caissons were floated through the dam into the main ditch. By November 1951, three cabinets had been planted in the middle, and by June 1952, all 53 pieces had been completed.

In 1953, construction was suspended until the spring of 1954. In 1957, MAHART handed over the port to the ironworks, and this decision is considered flawed due to the further development of the port. In the same year, the clothing factory launched on the Szalki Island, where 300 people started working. From 2005, an entrepreneur bought the building of the port authority, which housed a clothing factory from 1957, to build a hotel.

The port became industrialized, and its continuation on the other side of the Danube was stopped. However, there were also plans for passenger transport on the Szalki Island, and the further developments in the Danube were too considered necessary due to the waterborne trade of agricultural products. On June 1, 1954 the port of Dunaújváros was unveiled, where they started working in July 1954.

The icy floods on the Danube caused damage in the port in the 1950s, which swelled the Danube, and the Hungarian Army blew it up with a cannon.

In 1954, the Hungarian state bought the Russian-owned part of MESZHART and founded the Hungarian Shipping Company on January 1, 1955.

In 1977, barge position 6 was restored.

With the construction of the Rhine-Main-Danube canal, ship traffic increased in the 1990s. As a result, there has been a need for drinking water infrastructure. In 1998, the port achieved excellent results in transporting increased food. 185,000 tons of wheat, barley, corn, canola and sunflower were loaded. They started using a grain storage container. Barley, malt, marble powder, paper bales, soybeans, wheat, cement,

fertilizers, sunflowers, bagged barley, bagged malt, corn pellets, olivine and corn products were loaded in the port of Dunaújváros.

In 2001, shipping on the Lower Danube increased.

Currently, the port is dealing with storing, warehousing, transshipping products transported on waterborne, maintenance and repair of port equipment, hoists and vessels, and provision of port services to ships using the port.

The port has a shoreline with 6 berths, where 7 gantry cranes operate, of which 3 have a maximum load capacity of 6 tons, 2 have 12 tons and 2 have a maximum load capacity of 27.5 tons.

The port is capable of unloading bulk and break bulk goods from ship to open railway wagon or road vehicle, and vice versa. In terms of cereals, a self-made container and hopper are available, as well as special grain wagons. If necessary, it is possible to store goods on the shore, in an open cargo area.

Figure 5.: Transhipment in the port of Dunaújváros

Source: logsped.hu

10.2 Port area

The port is a public port in the administrative area of Dunaújváros, located at the right riverside of the Danube at section 1578,600 km, suitable for managing large ships. In terms of its construction, it is an inland basin port, and its operation is public. Continuous in operation, number of ship berths is 6.

The main activities of the Dunaújváros river port are the loading and unloading of goods transported via waterways, storage, the maintenance, and repair of port equipment, lifting machines and ships, and additional port services.

Main data of the port:

- Total land area: 52.023 m².
- Water surface used by the port: 381.709 m².
- Number of pools: 1
- Length of quay: 563 m
- Terminals: 6 pieces, each approx. 95 m long.
- Data of the harbour basin: operating water depth 2.5 m, width 150 m, length 1600 m, width of the entrance channel 25 m, height of the water level "0" point 90,28 m (Baltic height).

10.3 Port organization and functions, owners, (key) stakeholders

Port authority's name is ISD DUNAFERR Dunai Vasmű Zrt., the same as port operator.

Owner of the port territory is ISD DUNAFERR Zrt. 4.8 HA, and Centroport Kft. 0.3446 HA. Cooperation on the basis of a contract, taking into account the interests of both parties.

Owner of the quays is ISD DUNAFERR Zrt. The quay is operated by Centroport Kft. at berth 6. and by ISD DUNAFERR Zrt. at berth No 1-5.

The port superstructure ownership looks as follows. Topographical number: Hrsz. 3361/2.

One terminal – operated by Centroport Kft. – is dedicated to agro-logistic river/rail/road, transshipments, covered (1,600 sqm) flat grain storage owned by Centroport Kft.

All other areas are as follows:

Topographical numbers Hrsz 3360, 3361/1,3363-67, 3369, 3371/7 owned by ISD Dunaferr Zrt.

357 m2 building is located at Hrsz.3363, 2926 m² building is located at Hrsz.3364.

The port bay is a state-owned area managed by the Central Danube Valley Water Authority Board of Directors and the Central Transdanubia Water Directorate.

Construction affecting the seafront works affect the Danube riverbed, i.e., the port bay, hence the consent of the water directorates is also required. The water management establishment permit is issued by Fejér County Disaster Management Directorate (Water Authority). The Ruhagyári út owned and operated by the municipality stretches longitudinally in the port area concerning which no change is expected by the parties. It provides among other things the accessibility of drinking water wells in the Szalki island.

10.4 Operational model

There are only two port operators. ISD Dunaferr Zrt. and Centroport Kft. work in the port in parallel.

Cooperation on the basis of a contract, taking into account the interests of both parties.

ISD Dunaferr Zrt. the steel works has Russian professional owners and the Russian state is also a shareholder in the company.

Centroport Kft. Ownership of Port-Grain Kft .: 51% and Glencore Netherlands BV. ownership: 49%

The average annual loading/discharging capacity is about 800,000 mto, depending on the import of raw materials, over 1 million mto, but, for example, last year it decreased by 600,000 mto.

Terminal 6 loads agricultural bulk products, Terminal 5 loads coke and steel in bulk, Terminal 3-4 loads steel goods, and Terminal 1-2 loads coal and ore.

10.5 Legal and regulatory framework

Based on D.T.2.3.2 report of DIONYSUS project, the followings can be stated. Port operations are regulated by the Act XLII of 2000 about water transportation. Act on Water Transportation regulates all IWW passenger, cargo traffic and leisure activities by any waterborne vehicles. (The Act was created by the national legislation.) The port regulations published in 2018 are in force. (http://www.portolan.hu/file/krend_hun.pdf)

10.6 Services within the port

ISD PORTOLAN Kft. and Centroport Kft. are the operators of the inland port of Dunaújváros. Their main activities are loading and unloading, storage, warehousing of goods transported by water, operation, maintenance and repair of equipment, lifting machines, watercraft and the provision of additional port services.

The port of Dunaújváros has 1,100-meter-long industrial sidings. The port is prepared for transhipping bulk and break-bulk cargo to and from open or closed but opening wagons.

One of the largest flow scales in Europe, with a throughput of 300 tons per hour certifies the current weight of the goods. Rail services are open for 24 hours a day on weekdays.

Wagon sorting is handled with own equipment. There is an organizer railway station in the port of Dunaújváros and 2 pairs of railway tracks on the vertical shore wall with a total length of 563 m.

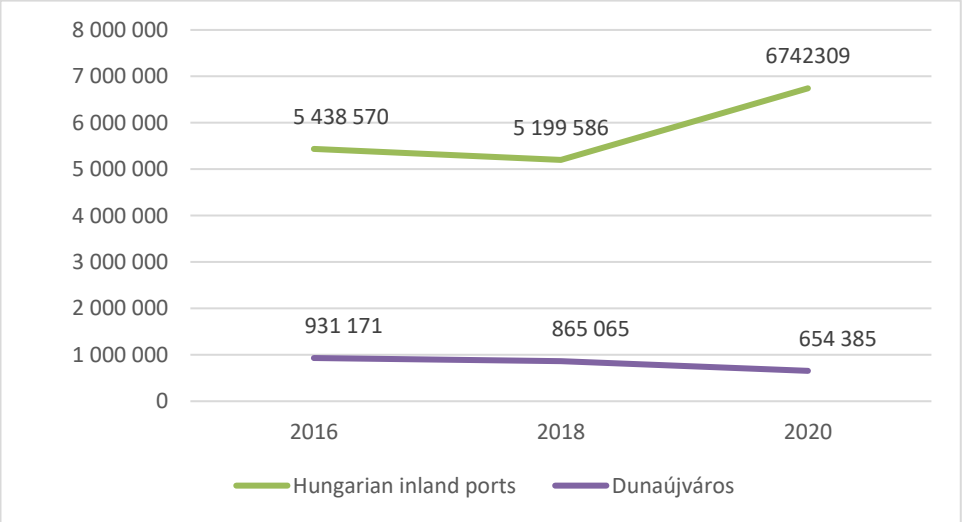
The port of Dunaújváros is easily accessible via M6 highway. Though there is a limitation of the development of the port, namely the narrow-capacity road and railway tracks passing through Szalki Island cannot be expanded.

- Loading and unloading trucks
- Electronic road bridge scale: capacity 60 tons, length 18 m.
- Number of parking space for trucks: 30

10.7 Transshipment figures and other relevant KPIs

According to KSH (Hungarian Central Statistical Office), the total amount of freight transshipped in the port has been slowly but continuously decreasing in recent years, though the national traffic is increasing.

Figure 6.: Annual freight transhipped (loaded and unloaded), ton



Source: self-edited based on KSH

A decade ago, the total capacity of the port of Dunaújváros was 3.2 million tons of loading and unloading per year, of which 1.4-1.6 million tons were currently used in two shifts. The ironworks receiver 700-800 thousand tons of annual turnover, the remaining capacity was grain and fertilizer loading and a few individual orders per month.

The most important role in the supply of the ironworks is still the unloading of coal and ore arriving on the Danube and the loading of finished steel products.[5] Annually, 600,000 tons of coal are loaded into freight wagons at the port, which covers roughly

[5] iho.hu (2021)

half of the needs of the coking subsidiary of the ironworks. Coal comes from American and Australian mines and is transferred to river vessels in Constanta. Most of the ironworks' ore demand comes by rail from the Russian and Ukrainian mines (with transshipment in Záhony), but also from the Adriatic ports. Certainly, the majority of the port's coal and ore also arrives at the ironworks by rail, and due to the large differences in level, an industrial track bypassing the city from the north connects the two sites.

In the port not only raw materials are transshipped, but the intermodal node is also involved in the delivery of the finished product of the ironworks. In 2011, a total of 1.7 million tons of finished products were shipped from the ironworks, of which the port contributed 310,000 tons. The vessels are crane plates, profiles and steel coils, which also arrive by rail from the ironworks in Tams and Shimms series trucks.

Even so, the port's traffic lags far behind the golden age before the change of regime.[6] The port, which has been in operation since 1954, served only the ironworks under socialism. In the peak year of 1989, 2.4 million tons of goods were loaded in the port, 50% of which was iron ore, 25% coal and 25% the finished product shipped. Steel products were mainly shipped to the Eastern Bloc countries, but Germany and Austria were already among the main buyers and sold to Japan and the United States.

However, after the change of regime, the Dunaferr cracked, and the role of the port continued to decline due to the Balkan wars. Already due to the South Slavic war between 1991-1995, traffic on the Danube fell, but after the bombing of the Danube bridges in Novi Sad in 1999, the affected section of the Danube became completely impassable for two years. The turnover of 1.2 million tons of the port of Dunaújváros in 1998 fell to 630 thousand tons in 1999, i.e., it decreased to a quarter of the volume before the change of regime in 10 years. The port reached the limit of 1 million in 2007.

In recent years, the port has been commuting between one and a half million tons, but a significant change is that it is no longer just the ironworks that delivers in the port. Although the port was opened to external companies in 1992, in 2013 the turnover of outsiders was still only 4%. This year, however, the rate is around 27%, due in large part to an improved fleet of machines. Outsider companies mainly load fertilizers, grain, and custom goods that they could not do so in other ports e.g., larger steel cells or transformers.

[6] g7.hu (2017)

10.8 Assessment with the relevant spatial/regional/urban development plans

10.8.1 Development and settlement plans of Dunaújváros municipality

The city's settlement plans classify the port as an industrial economic area called Gip. Industrial activities with minor noise and other disturbance may be carried out in the area, in connection with the intended use.

The main building regulations of the site area:

- Cultivation form: Free-standing
- Maximum permitted building percentage: 40 %
- Minimum green area: 25 %
- Maximum building height: 15,0 m

In addition to the port, two other plants belong to this industrial economic area. The industrial area is bounded by areas not intended for construction: the water management area of the Danube, the special area of the urban water base and the forest that makes out the rest of Szalki Island.

Figure 7.: Extract from the settlement plan and regulation plan of Dunaújváros

10.8.2 Environmental impacts

Landscape and nature protection: the area of the planned activity is located intraurban, it does not belong to any environmental protection area of national significance nor Natura 2000 area, and does not affect the protection zone of any cave. The area is already used as a port respectively as an industrial economic area. The area of the planned slope terraforming is not part of water bases, long-term water bases or water facilities for drinking water supply.

To the south of the harbour lays the city's drinking water base. No new investment may be made within the outer and inner protection areas indicated in the figure below. In the case of an investment in an internal hydrogeological protection area marked with red, a specific test procedure for water base protection must be carried out.

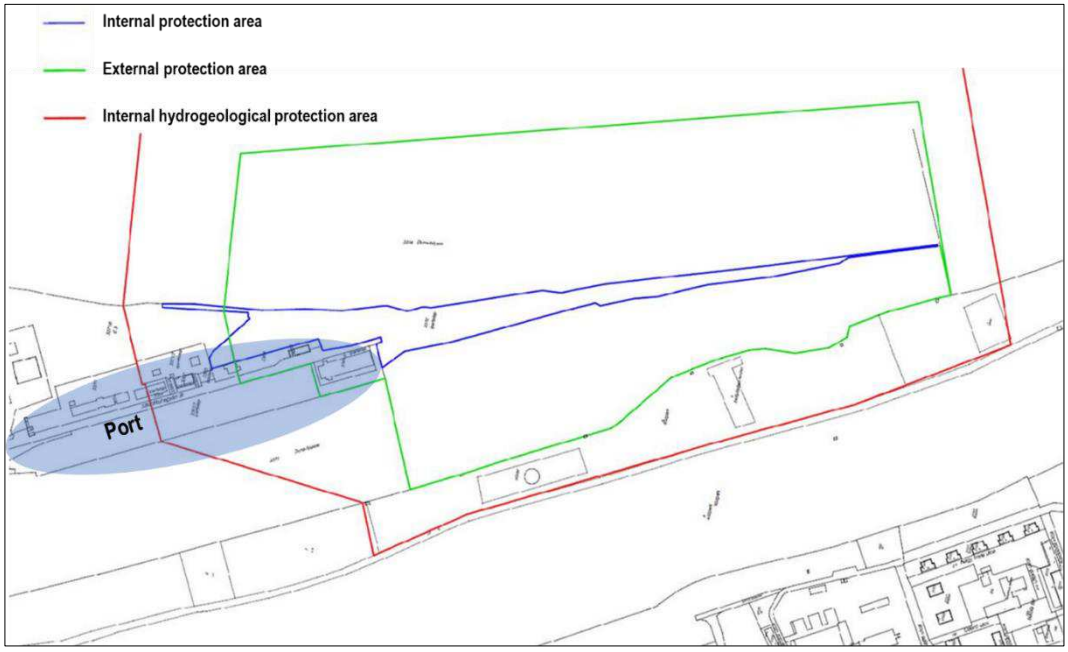


Figure 8.: Dunaújváros Szalki-Island urban water base safety distance restrictions

There are no residential areas or other areas to be protected from industrial activity near the port. The port has no direct negative environmental impact on the built environment.

No significant environmental impacts are expected from the operation with respect to the soil, surface and groundwater and nature conservation values, given that the environmental permit is kept. The operation of the port does not cause any conflict in this direction.

Negative effects to be mentioned may be caused by the road traffic to the port. The port can be accessed through the urban part of the city, trucks causing increase urban

road traffic. The road of interest is a national main road through the city, so the effects of traffic are significant regardless of the traffic to the port. It is not significantly affected by the traffic of the port.

10.9 Infrastructure and closer neighbourhood

10.9.1 Nautical data of the port

The port of the Danube is located between section 1580 and 1579 km on the Danube, in a bay built parallel to the right bank.

The relevant water level in the region is the one of the Dunaújváros water level station, which is part of the national level station network.

Level station	Section	Height zero of level	Low Navigation Level (LNL)	High Navigation Level (HNL)
	(km)	(m Baltic height)	(cm)	(cm)
Dunaújváros	1580,600	90,295	90,18	95,812

(Source: PAPER CHART OF HUNGARIAN DANUBE RIVER SECTION 1811.0 – 1708.4, June 2019.)

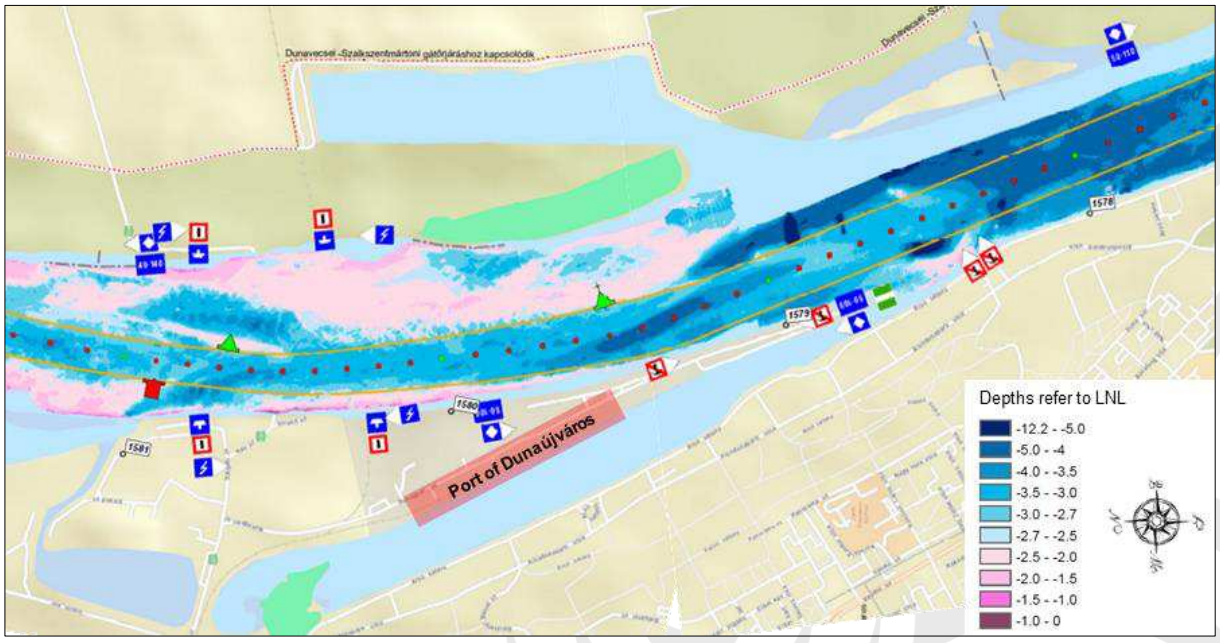


Figure 9: Nautical chart of the site

Hydrogeological data of the port:

- Flood level („MÁSZ"): 99,14 m Baltic height
- High Navigation Level (HNL): 95,68 m Baltic height
- Low Navigation Level (LNL): 91,43 m Baltic height
- Bedrock level: 87,63 m Baltic height
- Level of the shore wall: 98,93 m Baltic height
- Length of the port basin: 1.600 m
- Width of the port basin: 150 m
- Width of the entrance channel: 25 m

10.9.2 Port equipment and services

Cargo handling, transportation connections:

- Handling of parcel goods, bulk goods, and fluid goods
- The port is capable of unloading bulk and parcel goods from ships to open railcars and road vehicles as well, and loading from lorries or closed and open railcars to ships.
- Industrial railway tracks: length 1100 m; serviced 24h a day during weekdays.
- Railcar arrangement: performed by Rail Cargo with a charter locomotive
- Road connection: distance to the motorway M6 is 3 km
- Truck parking lots: 30 pcs

Loading possibilities, loading equipment:

- Gantry cranes: 7 pcs (capacity: 5 to 27,5 tons)
- Forklifts: 1 pc with front fork (5 t), 1 pc with side fork (6 t)
- Multi-purpose loaders: 4 pcs (0,8 t)
- Manoeuvring assistance: non-motorised barges are towed from berth positions to loading quay by a port-owned tugboat.
- Open storage area: 11.200 m² on paved surface where bulk goods as ore, coal or coke can be stored, and parcel goods as well. On request temporary shelters can be built to protect goods from weather.

- Warehouse: the port has a 1.200 m² area storage warehouse, unheated, steel structure with corrugated steel sheeting

Other services:

- Electric power supply
- Water supply
- Electronic truck weighting up to 60 metric tons, 18 m

Figure 10: Gantry cranes

10.9.3 Berth and waiting berth spots of the port

On the 563 m long quay shoreline of the port 6 pcs berth terminals are located, approx. 96m each.

terminal no. 1.	Location:	On the left bank shoreline of the port, 93 meters southbound, starting at section 0,00
	Width:	Maximum 3 vessels side-by-side
	Purpose:	Loading and unloading of bulk and parcel goods, berthing
terminal no. 2.	Location:	On the left bank shoreline of the port, between sections 93 and 183.
	Width:	Maximum 3 vessels side-by-side
	Purpose:	Loading and unloading of bulk and parcel goods, berthing
terminal no. 3.	Location:	On the left bank shoreline of the port, between sections 183 and 279.
	Width:	Maximum 3 vessels side-by-side

	Purpose:	Loading and unloading of bulk and parcel goods, berthing
terminal no. 4.	Location:	On the left bank shoreline of the port, between sections 279 and 372.
	Width:	Maximum 3 vessels side-by-side
	Purpose:	Loading and unloading of bulk and parcel goods, berthing
terminal no. 5.	Location:	On the left bank shoreline of the port, between sections 372 and 465.
	Width:	Maximum 3 vessels side-by-side
	Purpose:	Loading and unloading of bulk and parcel goods, berthing
terminal no. 6.	Location:	On the left bank shoreline of the port, between sections 465 and 558.
	Width:	Maximum 3 vessels side-by-side
	Purpose:	Vessel maintenance and bunkering

There are 5 waiting berths belonging to the port along the right bank of the Danube. There are also 2 more waiting berths on the west side of the port.

waiting berth spot no. 1.

- Location: Between sections 1581,5 and 1582,3 km of the Danube right shoreline. Width: Maximal 100m
- Purpose: For ships with and without crew carrying non-dangerous goods using the port of Dunaújváros.

waiting berth spot no.2.

- Location: Between sections 1578,9and 1580,0 km of the Danube right shoreline.
- Width: between 50- 100m
- Purpose: For ships with and without crew carrying non-dangerous goods using the port of Dunaújváros.
- Remark: Ships with crew have to use the upper end of the waiting berth spot, ships without crew have to use the lower end. On the part between section 1578,9 and 1579,45 km anchoring is forbidden.

waiting berth spot no.3.

- Location: Between sections 1580,8 and 1581,5 km of the Danube right shoreline.
- Width: between 40- 80 m

- Purpose: For ships with and without crew carrying non-dangerous goods using the port of Dunaújváros.

waiting berth spot no.4.

- Location: Between sections 1577,2 and 1577,9 km of the Danube right shoreline.
- Width: between 50m to 110m
- Purpose: For ships with and without crew carrying non-dangerous goods using the port of Dunaújváros.

waiting berth spot no.5.

- Location: Between sections 1574,9 and 1575,4 km of the Danube right shoreline.
- Width: Maximal 110m
- Purpose: For ships with and without crew carrying dangerous (flammable) material.

It is also permitted to wait and anchor on two sports parallel on the left bank of the port: Southbound along the shore wall slope from 300 to 420 m on spot no. 7, and 420 to 540 m on spot no. 8. These can be seen in the figure below.

Here, towed to the shore wall slope - a maximum of 2 vessels can wait to be loaded and inspected, and it is also possible to bunker the vessels with the permission of the port operator.

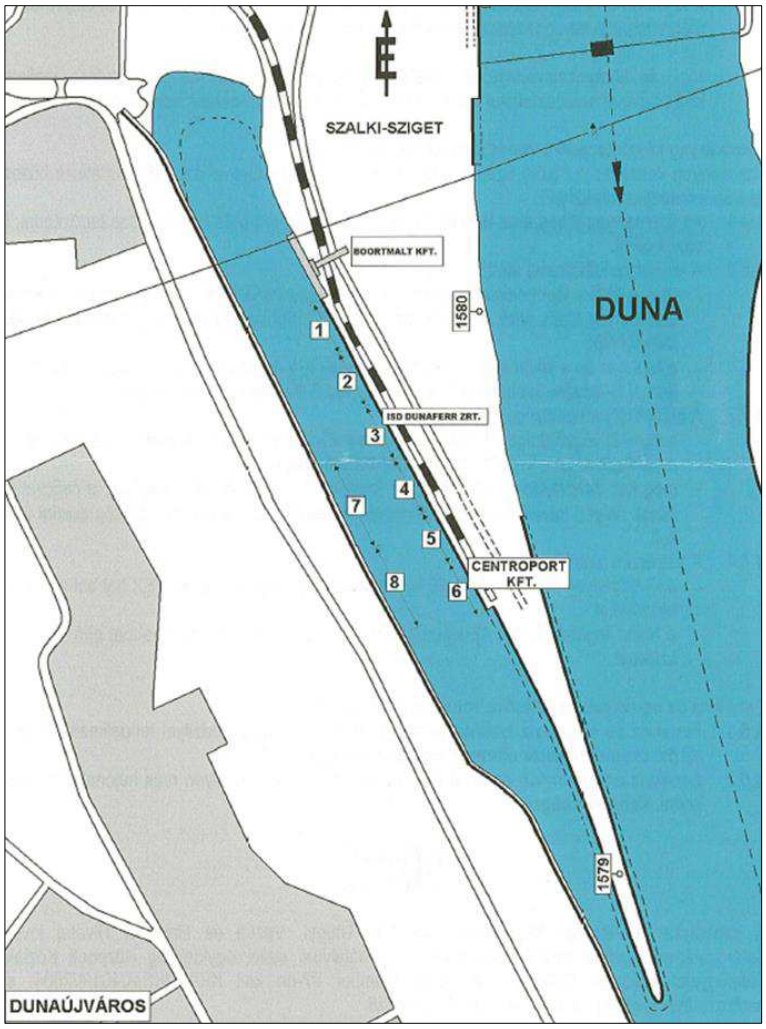


Figure 11: Sketch of the greater port area

10.9.4 Shore wall

The shore wall of the port is built on the length of 562,49 m between the -4.82 and +557.67 sections as a box hollow foundation. It consists of 51 pcs 10-meter and 2 pcs 22,69-meter-long wall sections. The bottom level of the port basin is 87,525 m Baltic height (88,20 m Adriatic height), The top edge of the shore wall is 98,825 m Baltic height (99,50 m Adriatic height). Therefore, the free height of the wall is 11,30 m. The base plane of the wall is 2,5 m below the bottom level of the port, so the total height of the wall is 13,80 m. The lower part of the wall consists of a reinforced concrete box section, on which the upper part is erected as a reinforced concrete wall. Each box has a floor area of 10,0 x 10,0 m and is 10,10 m high, with two cross and one longitudinal diaphragm. The thickness of the vertical walls varies between 20 and 28 cm.

Due to the 10,10 m overall height, the reinforced concrete boxes were built in five concreting steps. The lowest 4,00 m high part of the cabinets are precast.

Before the cabinets were floated to their final place, a channel with a bottom width of 11,30 m was excavated. Here a 1 m thick levelling layer was placed under the cabinets (50 cm stone paving of mixed natural stone, 30 cm sandy gravel, 20 cm road paving crushed stone). Due to some difficulties during the construction, the contractor could not follow up with the erection of the precast boxes to the laying of the levelling layer, so more or less sludge was depositing on top of the levelling layer.

10.9.5 Crane lifting

The port currently has partially refurbished Ganz gantry cranes with modern electrical equipment, installed by Ganz Danubius. Opinions on the renovated gantry cranes are good and the cranes are cheap to maintain.

Figure12.: Gantry cranes

10.9.6 Buildings

Following buildings can be found at the Dunaújváros port:

- 3360 topo no. property:
    - Rail station building (107 m2)
- 3361/1topo no.:
    - Válótőrház (34 m2)
    - Reception (41 m2)
    - Warehouse (1181 m2)
    - Oil storage (55 m2)
    - Transit warehouse (1226 m2)
- 3363 topo no. property:
    - Office (565 m2)
- 3364 topo no. property:
    - Bunker (365 m2)
    - Truck weighting facility (41 m2)
- 3367 topo no. property:

  - Transformator building (390 m2)
- 3369 topo no. property:
  - Workshop (494 m2)
- 3370 topo no. property:
  - Education building of the port (166 m2)
  - Education building of ISD Dunaferr Co. (212 m2)

Figure 13.: Port of ISD Dunaferr

10.9.7 Connectivity

The port is meeting domestic and international transport needs related to road, rail, river and sea transport as it has road, rail and water connections, and can handle all kind of goods arriving at the port by any means of transport.

The city is located in between the Danube and national highway no. 6. The road connections of the city all runs toward highway no. 6., but the M6 and M8 motorways are also both within 3 km distance. The highway no. 62 provides connection to the county capital Székesfehérvár, Budapest is accessible by the motorway M6 and the highway no. 6. With the handover of the Pentele Danube bridge, which is part of the M8 motorway, road connection was also established to the areas towards the Tisza.

The railway connection of Dunaújváros is provided by the „MÁV" Hungarian State Railway's Pusztaszabolcs – Dunaújváros-Paks railway line No. 42. The single-track railway line is electrified up to Dunaújváros. This line is connected to the Mezőfalva-Rétszilas railway line No. 43, which is actually a continuation of line 42 in the direction of Rétszilas. The industrial track running to the Danube Ironworks and the port is

connected to the railway line No. 42 at the Dunaújváros railway station in the western part of the city.

The port is suitable for unloading both bulk and parcel goods from a ship to open railcars or road vehicles, as well as for loading goods from a road vehicle or an open railway cars into a ship.

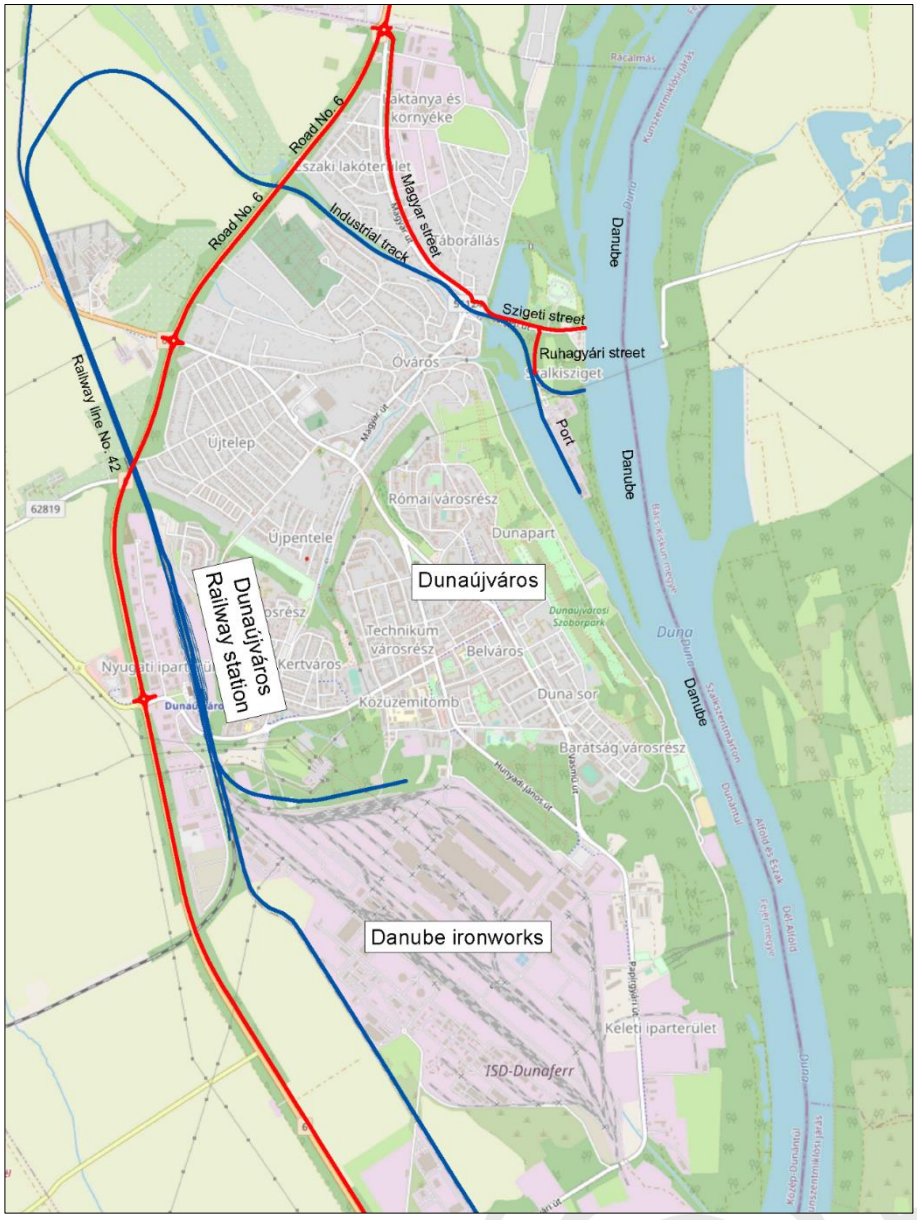


Figure 14.: The regional connections of the port

Road access

The port is connected by a public road owned by the Municipality of Dunaújváros to the highway no. 6, which is part of the national road network. The access point is north of the city at milestone „67 km" on the highway no. 6. The distance from the highway to the port is 1,5 km. Highway no. 6 is connected to the M6 motorway. The motorway has two possible access points, one 4km north, the other 4km south of the mentioned northern entrance on highway no.6. To the south it takes 12 km to the Pentele Bridge (part of the M8 motorway), which connects towards the east side of the Danube.

The Municipality owned „Ruhagyári road" connecting the port area to highway no. 6. is currently 5.5-6.0 m wide. Its pavement is in tolerable condition in means of acceptable evenness. It is not deformed except for minor local depressions. However, its surface is cracked at many spots. The slope of the road is in line with the theoretical plane. However, due to the ditch and the bench condition, the dewatering toward the ditches is unsatisfactory in some cases. The bench in uneven on many parts of the road, and the vegetation has grown. Due to the fact that heavy traffic is frequent on the road, and the width is narrow, truck drivers are forced to drive to the side of the road (and the bench). The bench is run out at many places, is pitted or loose.

The land area of the port is approximately 52.000 m^2. Its internal road network is moderately used, its quality is adequate. No traffic regulation is applied on these roadways. The number of truck parking lots is officially 30, but their location is not clearly marked. In the absence of road signs, the space utilization is not optimized either.

Railway access and local railway system

Dunaújváros can be reached by train via the railway line no.42. The line goes north to the city of Pusztaszabolcs, here it joins line no. 40, which creates a railway connection to Budapest in the northern direction. South of Dunaújváros, lines 42 and 43 diverge: line 42 continues in the direction of Előszállás, Dunaföldvár and ends at the city of Paks, line 43 turns west after Mezőfalva and joins line 40 at Rétszilas near Nagykarácsony.

The ports industrial track is connected to the national and international rail network through the station Dunaújváros of MÁV.

The port station has three marshalling tracks, and the port itself has two railway tracks, 550 meters each, directly next and parallel to the shore wall. The axis distance of these two port sidings is 4.75 m. The load limit is 21.0 kN per axle. The superstructure is 48.5 kg/m with so-called „MÁV Geo" rail fastenings, is fishplated and consists of mixed wooden and concrete sleepers. The superstructure is technically acceptable good condition. Parallel to the industrial tracks, there lays a 543 m long heavy-duty crane track, which encloses the industrial tracks and also allows the longitudinal movement of the cranes loading the railcars. The distance between the two crane rails is 10.5 m. In

between ship berth terminals 4 to 6, there spacing of the rail and crane tracks is paved, allowing trucks to drive in. The rest of the rail track is ballasted, no road vehicles can enter there. Due to the operational traffic of the port, the ballast of the superstructure is contaminated with coal and slag dust.

There are 6 berths terminals on the 563.1 m long shore wall at the port, each approx. 95 m long. The port, with its six loading berths, can provide continuous water service to ships entering the port. The industrial railway track is thus served 24 hours a day, currently a maximum of 5 times a week. One train is able to deliver a net weight of 800 tons from the port to the station Dunaújváros of MÁV. From there also bigger trains are possible. The limitation of the trains running from the port is mainly due to the capacity limitation of the locomotive owned by MÁV.

Figure 15.: Road and railway connections of the port

10.9.8 Utilities

Drinking water

The water supply of Dunaújváros is provided partially by the water wells of the city (Szalki Island), partially from the regional water utility system operated by DRV. The city owned freshwater plant supplies 11 000 m3/day, whereas DRV provides approx. 800-1 500 m3/day. 5 bank filtration wells are located south to the port on the Szalki Island. The extracted waters are transported via the NA500 and NA400 main pipe/pressure line that are located to the East of the port to the water storage pool of Apáczai Cs. J. Street with 2000 m3 capacity.

The water supply of the port – parallel the raw extracted water pipe – is provided by the NA200 freshwater pipe returning to the island, that continues with the diameter of NA150 in the areas of the port. The supply of the facilities (e.g., warehouses, porter's lodge, workshops, clothes factory etc.) is ensured with smaller diameter junctions from the NA150 main pipe. After the decanter, the NA150 pipe heading southwards changes to NA110, then to NA100, that provide the water supply of the office building and the warehouse buildings of the Centroport Ltd.

Stormwater canal system

The area has separated stormwater canal system. The main pipe of the stormwater system runs southwards parallel the Ruhagyári road with NA40/60 concrete eggprofile. This main pipe has connection to the transit warehouse, clothing factory warehouse, clothing factory, transformer house, bunker. Moreover, the rainwater from the rooftops of the current warehouse building and the warehouse of the Centroport Ltd. are flowing into the main pipe too. In addition to the "clean" rooftop waters, large areas of the stowage are connected into the pipe too via trenches and sinkholes. Due to the type of stored cargo (e.g., coke powder), deposited surface materials may be washed into the stormwater pipe system causing potential clogging risks.

The NA 40/60 main pipe near the hall of Centroport Ltd. changed to NA 300 pipe, that turns to eastwards in a utility tunnel to the centreline of the hall., then presumably flows into the main stream of the Danube. The concerned utility tunnel receives a presumably NA 40/60 concrete egg-profile stormwater canal too.

The southern part of the port has a 180-meter-long section of sinkholes along the crane track with an outlet into the port bay right at the end of the southern shore wall.

Part of the rooftop water of the northern warehouse building is lead into the port bay.

The stormwater system despite the steady efforts of the port management, is tends to clog due to the dusting of the loaded wares. According to the port management, despite the occasional problems with the stormwater system, there is no serious clogging that could stop actual work processes or cause damage in property in case of heavy precipitation events.

The stormwater system has numerous uncertainties, therefore during the detailed planning phase, the existing system needs to be precisely surveyed including pipe profiles and materials, gradient directions, the state of the elements of the system, their functionality etc.

The sewage of the open-air car wash facing the clothing factory warehouse is connected to the stormwater system following a cleaning in the steel oil separator.

Sewage system

The current sewage system of the port has no connection to the system of the city. The main pipe (NA200) of the system runs southwards parallel the Ruhagyári Street. Sewage outlets of the porter's lodge, existing warehouse, clothing factory and warehouse and office building are connected to the main pipe. The main pipe was originally connected to the two-storeyed layered decanter, that led into the Danube. The decanters stopped operation with time excluding the southern part of the main sewage pipe from the system (making a dead-end section), therefore the DVCSH regularly pumps the system in front of the office building, and transports the sewage to its sewage treatment facility by trucks.

The currently pumped quantity of water exceeds the quality that could be assumed from the consumption, deducing, that water is leaking into the system from outside. On the one hand, it results in excess quantity to the DVCSH, but on the other hand it means, the system is not closed, therefore sewage water can leak outwards as well threatening the water production wells.

The Centroport Ltd. collects its own sewage into a reservoir, and transports it from there at a regular basis.

At later stages of the planning detailed utility survey has to be carried out in order to reveal the operation of the existing sewage system, structure and joined users etc.

Gas system

The port is connected with a D90 P-6 gas pipe. The gas is used primarily for heating in the industrial zone. The current consumption lays around 45-47000 m3 per annum.

Electricity

The annual electricity consumption of the port is 500000 – 600000 kWh (based on 2012 – 2014 date). This electricity quantity was supplied before 2015. January 1. with a 350 kW rated connection power and since then with a 220 kW.

The port has a transformer station in order to provide electricity supply. The transformer station has 2 NA630 transformers, out of which one provides the factory supply, whereas the other one works as a backup feed. The transformer station contains a phase correction device too, that is meant to lower the excessive capacitive energy use.

Most of the consumption comes from the electricity consumed by the 7 gantry cranes, out of which 6 has frequency converter, therefore suitable for energy recuperation. Beyond the consumption of the cranes, the rest of the electricity consumption comes from the lighting of the port and the buildings, electric heating of the buildings, and the consumption of the machines in the workshops, halls and offices.

10.9.9 Situation regarding clean fuels ("AFID")

The port has no charging possibility for LNG/CNG fuels.

The main consumer of the port are the cranes, that are run on electricity. Additional considerable consumer is the locomotive moving the railway carriages. The port has no own locomotive, but can make a contract with any railway cargo supplier to move trains, carriages, but mostly Rail Cargo Hungaria Zrt. is commissioned for this work. Therefore, the port is independent of the type of locomotives and their energy use.

10.9.10 Environmental and energy KPIs, CO2-situation

The energy supply of the port is provided through the gas and electricity system. The current annual gas consumption is 45-47 000 m3. This quantity is made up by the consumption of the 2 pieces of 116 kW gas stoves (heating and hot water) in the workshops, and the 48 kW gas stove (heating) in the office building

The port consumes 500 000 - 600 000 kWh electricity per year. Most of the energy use comes from 7 cranes out of which 6 have frequency converters for electricity recuperation and feed into the system. The cranes feed into the public system, but the ISD Portolan Ltd does not receive any profit for that, but lower its own consumption (in case the crane operator can handle at once two opposite movements), the excessive energy is not utilized.

10.9.11 Digitalisation and automatization

The port has no modern, digital and automated management system.

11 Market Analysis

11.1 Capacity analysis

- Total land area: 52.023 m².

- Water surface used by the port: 381.709 m².

- Number of pools: 1

- Length of quay: 563 m

- Terminals: 6 pieces, each approx. 95 m long.

- Capacity of the harbour basin: operating water depth 2.5 m, width 150 m, length 1600 m, width of the entrance channel 25 m, height of the water level "0" point 90,28 m (Baltic height)

- Loading capacity: 3,200,000 tons per year

- Flow scales capacity: throughput of 300 tons per hour

Centroport agricultural logistic centre has a covered 1600 sqm flat grain storage capacity

- The port has a 1.200 m² area storage warehouse capacity, unheated, steel structure with corrugated steel sheeting

- An organizer railway station in the port of Dunaújváros and 2 pairs of railway tracks on the vertical shore wall with a total length of 563 m.

- 1,100-meter-long industrial sidings
- Electronic road bridge scale: capacity 60 tons, length 18 m.
- Number of parking space for trucks: 30

11.2 Demand analysis / estimated future cargo flows

11.2.1 for port & park companies

As a result of the development we expect at least a 10% increase in cargo flows by ISD DUNAFERR Zrt. and Centroport Kft the latest in the 3rd year of operation after this investment. This is due to the increase of useful storage space with at least 3000 m2 and the number of cranes and the quality improvement of port services achieved by related developments.

11.2.2 for port hinterland

This project directly supports private businesses in the port hinterland, as improved services of the port provide them better logistic solutions. As the services of the port can be used by any businesses, we expect an increase in the number of business entities using the port services. Besides, the improved service level is likely to attract new industrial companies to the nearby area by providing better logistic solutions. Especially businesses with agricultural products, metal raw materials and finished products can find the port more attractive.

11.2.3 socio-economic aspects of the port and its region (catchment area)

Dunaújváros has about 42 thousand residents showcasing a constant decline since the 80s. Majority of them are of Hungarian origin, less than 3% of the population belong to ethnic minorities (588 Gipsies, 431 Germans, 110 Russians, 94 Romanians, 69 Serbians).

When analysing the catchment are it is better to examine the Central Danube Region that consists of parts of Fejér, Tolna and Bács-Kiskun counties, 99 settlements altogether. Its population of about 250 thousand is also gradually decreasing and 2 to 3 times faster than the rest of the country.

In the agricultural sector 1657 legal entities are present in the region with an overall annual income of 81 billion HUF. The annual growth rate of the sector is about 3.3%

The industrial sector has a significant presence in the region, there are 58 companies with at least 50 employees. These companies experience a constant growth since 2014 that is a 7,3% increase yearly reaching 500 billion HUF. Based on the incomes of different activities the following proportions can be seen: 36.2% electric energy, gas, and steam providing and airconditioning, 14.9% food industry, 13.9% electric equipment manufacturing.

Wholesale activity is also important to mention in relation to the port. There are 773 of such legal entities present in the region with an overall annual income of 240 billion

HUF, representing a 6,5% annual growth rate. The proportion of different subsectors are the following:

- Grain, tobacco, seed, feed wholesale: 72 companies;
- Wholesale of mixed products: 71 companies;
- Wholesale of vegetables and fruits: 59 companies;
- Wholesale of wood, building materials, sanitary ware: 58 companies;
- Agent wholesale of agricultural products: 47 companies;
- Agent wholesale of mixed products: 38 companies;
- Wholesale of metal goods, fittings, heating equipment: 30 companies.

11.2.4 transport infrastructure of the region

Dunaújváros has excellent transport facilities, as it is easily accessible by road, rail and water. On the road, it is affected by the M6 motorway and the constantly expanding M8 motorway, and it is also connected to important cities such as Székesfehérvár, via main road number 6. It can be reached by train on line number 42 connecting Pusztaszabolcs and Dunaújváros. By waterway, the Port of Dunaújváros can be approached on the Rhine-Danube Corridor, which is part of the TEN-T network.

11.3 Analysis of competition/synergies with other ports (national and international)

Main characteristics and capacities of the port of Dunaújváros are compared with Freeport Budapest and Public Port Baja in the following table.

Location	Budapest	Baja	Dunaújváros
Port authority name	Budapesti Szabadkikötő Logisztikai Zrt	Baja Public Port Ltd	ISD Dunaferr Dunai Vasmű Zrt.
Number of operators (concessionaires)	1(lessors) 5	6	2
Total port area (ha)	153	20,8	5,2
Maximum draught (m) - natural or dredged	2,5	The definition of international water transport is 16 dm even for the smallest water.	dredged 3 mtrs
Total number of terminals	8	9	6

Heavy lift and out-of-gauge handling capacity (Yes/No)	no	yes	Yes
Ability to handle full block train along the quay (Yes/No)	yes	yes	Yes
Ability to handle full block train in the port area (Yes/No)	yes	yes	Yes
Transhipment equipment for intermodal transport (Yes/No)	yes	yes	Yes
Total quay length (vertical + sloped) (m)	4850	1300 m	563
Vertical quay length (m)	1650	444m	563
Sloped quay length (m)	3200	600m	0
Undeveloped quay length (m)	1200	350m	0
Max number of vessels handled at the same time	18	8	6
Max capacity of anchorage or waiting area for barges (number)	24	Anchoring is available with ample by full loading capacity too	5x4
Storage capacity (m2)	104000+40000	1500m2 open air, 4100m2 covered open storage, 7000m2 covered warehousing facilities	1600
Storage capacity for liquid cargos (m3)	no	no	-

Storage capacity (TEU)	6800	-	-
Storage capacity (CEU - car equivalent unit, for Ro-Ro terminals)	5000	Parking space for trucks in Ro-Ro 120, Other: 37	-
Bunkering facilities within the port area (Yes/No)	yes	no	No
Shore-side power supply for vessels (Yes/No)	yes	yes	Yes
Road conneection (Yes/No)	yes	yes	Yes
Rail connection (Yes/No)	yes	yes	Yes
Number of quay cranes of lifting capacity Q < 10 tons	3	1	3
Number of quay cranes of lifting capacity 10 < Q < 16 tons	3	-	2
Number of quay cranes of lifting capacity 16 < Q < 50 tons	2	1	2
Number of quay cranes of lifting capacity Q > 50 tons	0	-	0
Total number of quay cranes	8	2	7

When comparing the transport infrastructure with the above listed competitors, we can conclude, that Csepel freeport in Budapest has a much better connection to

highways, meanwhile that of Baja can be considered slightly weaker due to its distance from highway M6 and other highways.

When comparing the size of the ports, Dunaújváros is by far the smallest one. Comparing further data on capacity, like storage, handled vessels, number of terminals, total quay length Dunaújváros appears to have the smallest capacity. Nevertheless, its current size gives plenty of space for development. With the planned development the total warehouse capacity is going to approach that of Baja.

When comparing quay crane capacity, Dunaújváros appears to be much better equipped than Baja, almost equalling Budapest.

11.4 Market characteristics and trends - market research

As indicated in chapter 10.6, the weight of annual freight transhipped in Hungarian inland ports significantly (by 30%) increased between 2016 and 2020. This increasing trend indicates great opportunity for the port of Dunaújváros, especially when taking into consideration, that this figure significantly increased in case of Dunaújváros, by 24% between 2016 and 2020.

When taking a wider geographic perspective we can also see a gradual increase. According to the Inland Water Transport Global Market Report 2022 the market grew 5% between 2021 and 2022 and a 3.9% a compound annual growth rate (CAGR) is expected until 2026.

Furthermore the EU set a 10% target on the percentage share of inland freight water transport of the total volume of freight by 2030. This target is supported by financial incentives, in case of Hungary mainly via Integrated Transport Development Program Plus (IKOP Plusz). As a result, service development and expansion projects are expected in many inland ports, so the overall capacity and service level of EU inland ports are expected to improve.

The inland water freight market is characterized by a constant change toward a lean and green inland transportation. Companies put great emphases on improved efficiency, with a focus on natural gas in shipping, gradual improvement and innovation in vessel designs and efficient technics for loading and unloading of cargo.

12 National strategies and programs

The main strategies and programs are the National Port Development Master Plan, the National Transport Infrastructure Development Strategy, the National Danube Water Transport Strategic Plan, the National Shipping Strategy. All four were completed by or with an assignment from ministries and/or governmental bodies. Since Hungary's

National Hydrogen Strategy is part of the general green and environmentally friendly aspiration of the government, the document is on the following list as well.

The major goal of the **National Port Development Master Plan** is the to have an As-Is analyses and observation of development potentials of cargo ports on the Hungarian Danube section. In the framework of the Master Plan, detailed as-is analyses, thematic feasibility studies, strategy and action plan have been completed. The purpose of the As-Is analyses of the document is to establish the Master Plan on strengthening Danube transport through the infrastructural development of TEN-T ports, with a special regard to the port of Komárom. The strategic document is financed via CEF. Both primer and secondary data were used when completing the situation analyses.

The **National Transport Infrastructure Development Strategy** was prepared as a result of extensive expert work and social consultation under the leadership of the Ministry of National Development and the Transport Development Coordination Centre. Covering the period 2014-2050 the major goal of the strategy is to increase Hungary's competitiveness as much as possible by efficiently serving economic processes.

The **National Danube Water Transport Strategic Plan** and the connecting action plan (together: ProDuna strategy) are important outcomes of the ProDuna project supporting Hungarian inland navigation with several tools launched with EU co-fund. The document is a base to define the organizational and legal framework of inland navigation, its infrastructure and facilities, its public freight transport segment, education and R&D, eventually to improve the competitiveness of the industry.

The **National Shipping Strategy** was prepared by the transport workgroup of the State Secretary of Planning Coordination under the Ministry of National Economy in 2012. The two major declaration of the strategy are

- Southward shift of Budapest's water passenger and freight traffic
- Construction of a new type of low-draft Hungarian-designed ships

Hungary's National Hydrogen Strategy is for the introduction of clean hydrogen and hydrogen technologies to the domestic market and for establishing background infrastructure for the hydrogen industry. The strategy hardly touches IWT development. There are two relevant sentences amongst the top priority measures, namely:

4) Promoting hydrogen propulsion technologies in railroad transportation, where the implementation is economically feasible (mainly after 2030).
5) Promoting hydrogen propulsion technologies in water transportation to reduce the environmental impact on our bodies of water (on a larger scale after 2030).

13 Reflection of maintenance, technical assessments, … (long term forecast)

The Dunaújváros Port is managed by the ISD PORTOLAN Ltd. Main activities entail loading, unloading, storage of water transported goods, operation, maintenance and repair of port machinery, lifting machines, watercraft vehicles and provision of further port services.

There is no comprehensive report about the current technical conditions of the port infrastructure. In a detailed planning phase, the condition of buildings including elements of rail and road infrastructure and elements of the utilities could be surveyed.

Further important elements of the port are the 7 pieces of cranes, that undergo regular maintenance. Most of them has been upgraded, and run on modern electric technologies.

During the investigation of the port basin and the shore wall, the following statements have been settled:

Port basin

The necessary port bay depth (riverbed level) can be calculated from the lowest water level for shipping and the authoritative submerge of the watercraft (in this case 2,5 m), and in case of ports + 4 dm safety distance. The new operation permission for the low water level for shipping envisages 90,20 m Baltic height instead of the earlier lowest water level for shipping 91,43 m Baltic height, therefore the highest level of the riverbed must be 90,20 m Baltic height -2,5 m – 0,4 m = 87,30 m Baltic height.

The average port bed level in the port bay by the port wall is 87,50 m Baltic height, that is 2 dm higher than required. This means, the port bed of the port bay is not appropriate, that needs to be clarified during the detailed planning with the shipping authorities.

During the next regular maintenance dredging, the current port pool bed level shall be lowered to 87,3 m Baltic height. The expected amount of dredged sediment is 30-40000 m3.

The port bay wall has been exposed to numerous impacts, damage while having regular construction and maintenance. The current port wall, railways and port areas are well maintained.

Shore wall

The complete section of the wall of the port has to be investigated and necessary repairs must be taken in order to ensure the planned developments and the long-term safety of operation. The operator of the port carries out the check-ups and maintenance regularly.

Earlier statements concluded to eliminate the created holes and establish such a connection between the port wall cabinets, that reduces the amount of washed-away materials. It is worth to mention that the increase watertightness of the port wall is not appropriate, because water pressure to the port wall caused by a rapidly receding flood wave is a great excess pressure on the port wall. Therefore, it is almost impossible to avoid leaching, but its scale can be reduced. Despite that, with regular review and maintenance the port wall can be safely operated at a long run. In general, the state of the port was found adequate, the operator eliminated the deficiencies identified at an earlier review and maintained well the port. The considerable and diverse cargo traffic in the port therefore now causing damages in the repaired steel and concrete structures.

14 Overall reflection of the status quo of the port in form of a SWOT

SWOT for Centroport Ltd. terminal.

Strengths	Weaknesses
• Logistically favourable location • Good public and railway accessibility • Modern technology (flow chart, PLC control, etc.) • Storage depot system (30-40%) • Small staff • Flexible working time management • Stable, accustomed, experienced employees • Guaranteed loading standards • Tugboat service • Loading at the lowest and highest water level is also carefree and sustainable • Independent storage	• Dredging required • Limited access to railway due to missing railway track • Seasonality (hectic traffic but fix personnel costs) • Sensitivity to weather • Relative shortness of the available quay in case of congestion • Two internationally significant isoglucose and ethanol factories within 30 km of the harbour
Opportunities	**Threats**
• Building a railroad bypass on the siding • Putting a rail discharger system into operation • Usage of flowing balance as official railway weighing instrument	• The proximity of Port of Adony with great bulk grain storage capacity • Challenges in finding the next generation in the management and technology

• Equipment for discharge vessels/barges (e.g. mobile material handling machine – crawler/wheel) • Training of young people • Construction of a covered loader	

Source: HFIP

SWOT for ISD Dunaferr Ltd. terminal.

Strengths	**Weaknesses**
• Logistically favourable location • Good public and railway accessibility • Guaranteed loading standards • Tugboat service • Loading at the lowest and highest water level is also carefree and sustainable	• Dredging required • Seasonality (raw material costs affects volume) • Sensitivity to weather • Lack of storage
Opportunities	**Threats**
• Equipment for discharge vessels/barges (e.g. mobile material handling machine – crawler/wheel) • Construction of a covered loader	• Organizational risks • Changing the regulatory environment

Strengths

Centroport Ltd. (in Dunaújváros) has a logistically very favourable location, at the almost geometric middle of the country which means good public and railway accessibility (highway, main road, railway lines). The port applies modern technology, for example flowing balance and PLC control. Also, 30-40% of the stock can be removed from the storage depot system by built in transverse hopper chain conveyor, which option is rare in Hungarian cereal stores. Small staff means that managing, executing, documenting, trading records, billing of daily work (16 o), and all other ancillary activities are executed by 4 employees (plus 1 person leased). The port operates with flexible working time management and able to handle irregular customer orders. The port has stable, loyal and experienced employees and offers guaranteed loading standards for the customers. Also, tug boat service is available at Centroport which exists is only in Dunaújváros and Budapest in Hungary. Strength of the port that it can operate smoothly even in the events of floods; loading at the lowest and highest water level is

also carefree and sustainable. Another strength is that the port has an independent storage and can store cargo for three ships (covered storage, covered loading hopper chain conveyor).

The Dunaferr terminal has almost the same characteristics as Centroport, however on the modern technical side it is a bit lack behind.

Weaknesses

One of the weaknesses of the port is the need of regular dredging, which can cost € 65K a year. There is a railway track missing which would enable the port loading/unloading to rail in full value. The seasonality (hectic traffic, hectic quantity of tasks) can be mentioned as weakness at most of the ports in Hungary, people need to be constantly employed; therefore, during the period of weak commodity traffic personnel costs are relatively high. Another weakness, which can also be mentioned at most of the ports in Hungary, is the sensitivity to weather. Centroport cannot load ships in case of rain or snow. The quay is relatively short (90m), and the 100-115m self-propelled vessels are becoming more frequent, sometimes causing loading difficulties or causing failure. Within 30 km of the harbour, there are two internationally significant factories (isoglucose and ethanol) which absorb the maize production at a logistically acceptable supply distance (about 2,000,000 / year), which is perhaps the most significant export base bulk agricultural product, and thus the port loose a significant volume of orders.

Compared to Centroport, Dunaferr has fewer identified weaknesses, partly because it does not have any mentionable competition in the area. The terminal serves almost exclusively the logistics tasks of the ironworks, which would be difficult to replace from other locations.

Opportunities

By building a railroad bypass on the siding, the port could utilize their railroad technology with very good features proven in practice. If this was accomplished, with a smaller investment, also a rail removal system could be put into operation. The flowing balance, which was also mentioned among the strengths, once has already been accepted by Hungarian National Railways (MÁV) as official railway weighing instrument. It is also an opportunity for the port to establish equipment for discharge vessels/barges (e.g. mobile material handling machine – crawler/wheel). Lack of qualified port-professionals is a general problem in Hungary. For Centroport, training of young people is an opportunity to find their future employees and port managers. Another option for the future is the construction of a covered loader, because it can be found only in Budapest in Hungary.

The most significant development opportunity for the Dunaferr terminal is the construction of the covered loader(which is only available in Budapest and Győr-Gönyű right now), as well as the construction of buffer storage capacity.

Threats

One of the relevant threats for Centroport is the proximity of Port of Adony, which could take a part of the traffic. Adony has 500,000 tons of bulk grain storage capacity with three ship positions, meaning 600-700 tons/hour with total loading capacity. Lack of qualified port professionals on the labour market is a challenge for most Hungarian ports, including Centroport. The next generation must be found in the management and in the technology, but only a few suitable people are available.

Dunaferr faced some legal and financial issues recently, and the situation is not resolved yet and that is the major threat to the operation of the company. The Metropolitan Court appointed the National Reorganization Non-Profit Limited Liability Company as the temporary trustee of ISD DUNAFERR.

15 Other external reflections (ISO audits)

Certifications of ISD Portolan Ltd.

The port operator company has ISO 9002 certification, which is part of the ISO 9000 family of quality management systems.

The main difference between ISO 9001 and ISO 9002 is that ISO 9001 is a model for quality assurance in design, development, manufacturing, and installation, while ISO 9002 is a model for quality assurance in manufacturing, installation, and servicing.

Certifications of ISD Dunaferr Ltd. (the owner of ISD Portolan)[7]

ISD DUNAFERR Zrt. Operates an integrated management system based on the requirements of ISO 9001: 2015, ISO 14001: 2015, ISO 45001: 2018 and ISO 50001: 2011. Within the system, all the processes that can ensure the satisfaction of external and internal stakeholders (customers, owners, residents, employees, etc.) in the production of products and services are defined.

Processes are regularly monitored, measured and analysed.

Responsibilities and authorities, the structure of the system, the processes and their interactions are included in the Integrated Management System Manual.

Certifications of Centroport Ltd.

Centroport Ltd. does not currently have any ISO certifications, however, they previously had ISO 9001 certification. Their processes continued to be fully compliant with the requirements for the audit and, if there is an explicit customer need to obtain a certificate, they will be able to re-implement immediately.

[7] Sorce: http://dunaferr.hu/integralt-iranyitasi-rendszer-iir

16 Elaboration of resulting development/planning documents

a. Mission, vision, policies

The vision of this development is to significantly improve the service quality and capacity of the port. By 2030 the port shall provide the best quality services in Hungary with a storage and lifting capacity spearheading not only its Hungarian competitors, but also its other EU spears.

b. Strategic planning documents (strategic objectives, strategic focus, BSC, ….)

The National Port Development Masterplan Strategy By 2030 can be considered to be the most important strategic planning document for the development concerned. The National Port Development Plan Strategy was prepared within the framework of the 2015-HU-TM-0152-S CEF project, titled ”Developing a plan for the strengthening of the Danube freight transport through the development of the TEN-T port infrastructure, in particular the port of Komárom.”The strategy of the port development plan for the Hungarian section of the Danube is an essential, comprehensive policy document setting out directions for the development of port infrastructure and port services along the Danube by 2030.

According to its vision, the Danube freight ports will become essential and efficient multimodal hubs in their region's transport system, ready for the environmentally friendly transport of at least 10% of domestic freight traffic by inland waterway.

It sets the following strategic objectives:

1. Incentives for modal shift
2. Generating further demand
3. Developing a financing system
4. Developing human resources
5. Developing a sustainable regulatory environment

The above mentioned strategic objectives should be supported through the following intervention areas:

1. Intervention areas of the National Port Development Plan Strategy
2. Education, training Infrastructure development
3. Technological modernization Career model
4. Financing Digitization, automation
5. Investment incentive, industrial
6. establishment
7. Sustainability
8. Laws, concepts Market research, innovation

c. Results of rough prefeasibilities and strategic calculations for support of strategic decisions (establishment of decision papers/basic documents)

As part of the prefeasibility phase, we have taken into consideration different alternatives for the development in a conception plan. After that, 2 alternatives had been thoroughly examined before making decision. This masterplan describes the preferred option.

d. (rough) investment plan (infrastructure measures, equipment, facilities, digitalisation, automatisation, ...) and master plan for following key maintenance actions

Warehouse building

The design of the building

The area of the roofed loading station and warehouse with cranes is approx. 6000 m2 and in addition a roofed loading station with an area of approx. 3150 m2 is planned to be built. At least 3000 m2 of this must be useful storage space. The majority of the remaining warehouse space is taken by the space requirement of the roads and rails needed for loading. The roofed loading area must have an overhang of 20 metres over the port bay. There is no need for office space in the new warehouse building, only essential rooms for the function of a few warehouse personnel (e.g., toilet, locker room, shelter, room for warehouse management, etc.). These functions have a low floorspace demand and should be positioned on the areas out of the useful storage space (e.g., warehouse area without a crane).

The warehouse building must be designed so that its supporting pillar arrangement is favourable to forming passages and storage areas, and the floor area and headroom is suited to the loading and storing technology.

The load on the pillars of the planned building is not even, the standard load on the coastal pillars and the pillars near the shore is significantly higher than the pillars further back. The building can be designed multiple ways regarding the supporting structure (eg. truss girder, suspension structure, box girder), the load of the pillars depends significantly on the type of support frame. Due to the span, the cantilevered overhang and the heavy-duty crane, steel structure design is realistically possible.

The main aspects of the arrangement of the warehouse building:

- 3 30 metres long, roofed berths with cranes are needed
- the cranes must have a capacity of 50 tons
- the crane girders must be cantilevered over the water
- the cranes must be able to lift from a distance of 20 metres form the edge of the embankment
- the cranes must be able to grab the cargo from the vessel and place it directly in the warehouse and vice-verse
- Other aspects:
  - the expected height of the gantry crane rails: +8 metres from the edge of the embankment level
  - placing the existing and the by-passing railway tracks in the building
  - the railways must be accessible by road trucks

Based on the information available, there are three different warehouse designs:

- span roof variant
- suspension structure variant
- green roof variant

The most economical solution probably is the suspension structure design.

The building does not need to be heated, but as an important aspect, the condensing moisture must not drip onto the cargo.

In case of the new warehouse the existent loading order and the usual operation is also sustainable, later a detailed examination of this (the order of operations of the rebuilt port) is necessary (traffic direction, traffic ways, stowages, etc.).

The roofed loading station would be constructed near the planned berth No. 1 (the northernmost berth of the port), the length of which would be modified to 132 metres and its centreline would be the axis of symmetry of the transverse warehouse in the middle. The roofed loading station has an overhang of 20 metres over the port bay from the line of the shore wall. The 30 metres long berths of the roofed loading station would fit the pattern of the crates to be placed, which also consists of 30 metres long divisions, and has a 40 metres length. This way the 1200 m2 warehouse with cranes could be loaded directly from the water, and onto the trucks and railway carriages. There are three railway tracks and a road lane available under a gantry crane, the latter also

includes the tracks for the transfer carriage. There would be a fourth, longitudinal hall nave north of the three building. The connection between this hall and the other ones could be established by using the transfer carriage.

The gate could be placed at the northern part of the warehouse as a part of the building, or as a separate structure as well.

The old warehouse building and the gate at the northern part of the port has to be deconstructed to give place to the new warehouse. The currently used transit warehouse would be modified, in which new functions can take place as well (crawl space, workshop, social facility, etc.).

In this case the buildings containing currently used workshops and social facilities, would be deconstructed, they are in a bad state anyway.

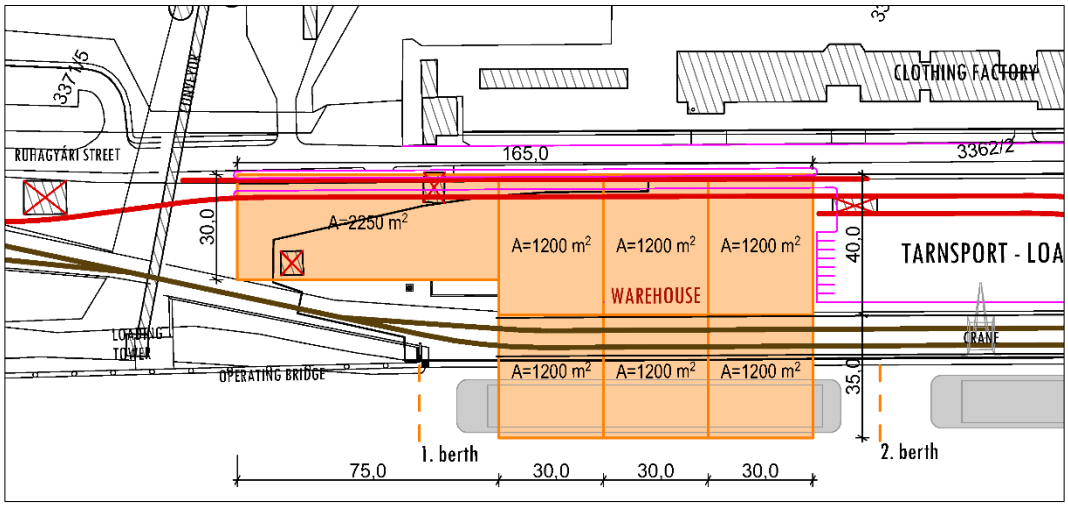


Figure 16.: New Warehouse building

Modification of the transit warehouse

The previous function exclusive to warehousing, will be supplemented with functions such as:

- office purpose
- social purpose (locker rooms, dining area)
- industrial purpose (workshop, assembly area)

The planned building units and their approximate floor plans are the following:

Ground floor	Heated	welding workshop	30	m²
		electrical operator room	30	m²
		washroom and lavatory	10	m²
		tool storage area	32	m²
		woodworking shop	56	m²
		assembly area	544	m²
	Unheated	warehouse (for loading equimpent, self-propelled machinery, sling devices)	378	m²
	Total		1080	m²
First floor	Heated	office	12	m²
		dining area	32	m²
		locker rooms	114	m²
	Total		158	m²

To serve the assembly area to be placed in the transit warehouse, the installation of a bridge crane with 10 m span, 50 kN capacity, moving on a 20 m length is necessary.

Support structures

According to the requirements the examination of the support structures of the building must be done by complying with the loading and stability requirements of the modified function. The special effects (vibration, increased humidity, etc.) originating from the modified function must not result in the decrease of lifespan, loading capacity, soundproofness or insulation of the supporting structure.

Energy-efficiency and heat retention - hull

The inner temperature necessary for the intended use must be provided with adequate heating and air-conditioning devices in the heated rooms.

Deconstructing the current hull, renovating the supporting structure based on examination and installing new hull was accounted in the plan. Since two-thirds of the warehouse will be heated, at these sections insulated corrugated sheets must be installed (sandwich-panels). The inner dividing elements must also be insulated, as the workshop and assembly area functions require different temperatures than the social blocks.

Nautical capabilities, conditions of the development

Nautical regulations of the port expansion

Nautical regulations to be considered:

- NFM Decree No. 57/2011. (XI. 22.) on the water traffic protocol ('Nautical Code')
- Government Decree No. 510/2017. (XII. 29.) on establishing, using, maintaining and terminating a port, ferry, and other nautical facilities.

The representative water level of Danube of the port's environment

The water levels of the Danube, detected at the Dunaújváros – Szalki island gauge (Danube 1580,6 RKM) (by the data report of VITUKI-OVSZ)

- The zero point of the gauge: 90,28 mBf (90,96 mAf)
- The standard flood level – $MÁSZ_{(2014)}$ 97,91 mBf (98,59 mAf)

The water levels of Danube in the recent years are characterised by these extreme values (LKV = lowest water level, NV = high water level, LNV = highest water level):

- LKV -54 cm 89,74 mBf (90,42 mAf)
- $NV_{(1965)}$ 742 cm 97,71 mBf (98,38 mAf) 1965. June 18.
- $LNV_{(2013)}$ 755 cm 97,83 mBf (98,51 mAf) 2013. June 11.
- |LNV| icy, 890 cm 99,19 mBf (99,86 mAf) 1956. March 8.

The standard water levels in terms of navigation at the port (HKV = navigable low water level, LKHV = lowest navigable water level, LNHV = highest navigable water level):

- HKV 90,20 mBf (90.88 mAf)
- LKHV 91,43 mBf (92,11 mAf)
- LNHV 95,79 mBf (96,47 mAf)

The average bed level of the port basin at the embankment: 87,50 mBf (88,20 mAf)

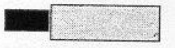
The average level of the edge of the vertical embankment: 98,85 mBf (99,50 mAf)

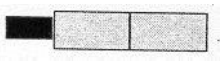
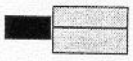
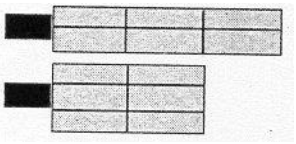
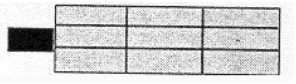
The main nautical data of the expansion

Classification of the waterway: According to the 'The classification of waterways' table in the 3. appendix of the KöViM Decree No. 17/2002. (III. 7.), the Danube at the estuary of the part basin (Danube 1578,6 RKM) is included in class VI/C waterway.

The name of the waterway		The length of the navigable section, river km	The length of the section (km), water surface area (km2)	Waterway class
1.	Danube (international waterway)	1812–1641	171	VI/B
2.	Danube (international waterway)	1641–1433	208	**VI/C**

Watercraft dimensions: according to the 1. appendix of the KöViM Decree No. 17/2002 (III. 7.), ship, vessel or pushed convoy dimensions which serve as a basis for navigable natural or artificial surface water classification are the following:

Waterway class	**Image of navigable vessels and pushed convoy**	**Power-driven vessel**			
		Length, m	**Width, m**	**Draught, m**	**Deadweight, tonnes**
I		40	5	1,4	200
II		57	7,5	1,6	500
III		70	8,2	2	650–1 000
IV		85	9,5	2,5	1 000–1 500
V/A		95–110	11,4	2,5	1 500–3 000

V/B		110	11,4	2,5	1 500–3 000
VI/A		110	15	2,5	3 000–3 500
VI/B		140	15	2,5	4 000–4 500
VI/C		140	15	2,5	4 000–6 200
VII		140	15	3,2	4 000–6 200

Note: The draught values presented in the table are only applicable at low navigable water level (HKV) or higher water levels.

The standard dimensions of the intended water craft:

- Length 110 m
- Width 15 m
- Draught 2,5 m

Berths: they remain according to the operating license. Nautical signals: they remain according to the operating license.

Vessel turning: according to the 1.7 point of the Government Decree No. 510/2017 (XII. 29.): „The vessel turning basin used for the transport of large vessels must be designed to fit a circle with a diameter of the length of the longest intended vessel times .1.2 (in water depth prescribed for the basin)"

The requirements are met in the current port basin.

Quay: According to the 1.9 point of the Government Decree No. 510/2017 (XII. 29.): „The dimensions of the port used for the transport of large vessels must be determined, so that as many vessels could be stationed as it is needed for the uninterrupted transport of the port. The length of the wharf should be at least the entire length of the cargo or passenger vessels staying at the loading bay times 1.2.

The vessels under the cantilevered part of the planned building have a significantly larger space requirements than a berth without cantilever: in case of loading on the line of the hall nave to the side, it might be possible that the vessels need to be extended to north or to the south.

The movement limits the usage of two adjacent berth simultaneously.

The movement is limited by the base riprap at the end section (0+00) (in low water level).

The level of the edge of the bank according to the 1.10 point of the Government Decree No. 510/2017 (XII. 29.): „The level of the wharf and the port operator bank has to be established at least 0.5 metres above the HNV (navigable high water) – in case of ports with national traffic and international significance („E" ports) at least 0.5 metres above the standard flood level. The wharf – taking into account the cargo to be loaded – could be established with multiple levels, in this case the condition defined in the first sentence should be applied to the highest level.

The standard flood level (MÁSZ) of the Danube is 97.91 mBf, and the MÁSZ+0.5 m is 98.41 mBf. The upper plane of the box girders is at 98.70-98.85 mBf, thus the port meets the requirements above.

Nautical structure gauge: the certain structure gauge dimensions of waterways according to the 2. appendix of the KöViM Decree No. 17/2002. (III. 7.):

	Waterway class				
	V/A	V/B	VI/A	VI/B	**VI/C**
The lowest structure gauge height at HNV (navigable high water) under bridges or other above-surface facilities, m	7,00– 9,50	7,00– 9,50	7,00– 9,50	7,00- 9,50	**7,00- 9,50**
The lowest width of the waterway in one or two-span spans, m	55 40-50	60 45-60	120 80- 100	180 80-100	**180 80- 100**
Safety distance depending on the riverbed material, dm *In case of rocky riverbed*	3	3	3	3	**3**

Safety distance depending on the riverbed material, dm *In case of riverbed with loose or soft consistency*	2	2	2	2	**2**

Expansion

The structural elements hanging over the water of the roofed loading station, according to the table above need to be built by the following lowest height placement: LNHV (95.79 mBf) +9.5 m=105.29 mBf. This level means a cleared space 6.44 metres above the level of the edge of the bank (98.85 mBf).

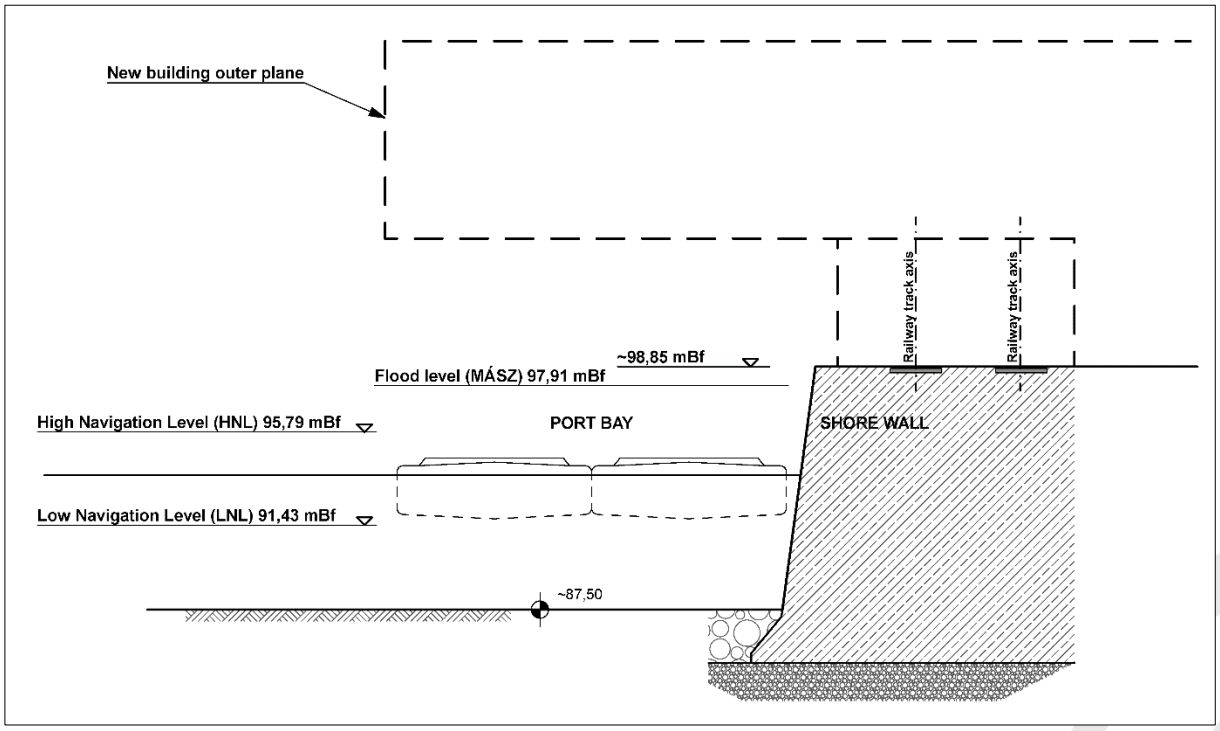


Figure 17.: Planned cross-section of the shorewall

The necessary water depth of the basin (the riverbed level) needs to be counted at HKV (navigable low water) by the draught of the standard watercraft (currently 2.5 m), and in case of ports +4 dm of safety distance. The new operating license determines navigable low water as 90.20 mBf – instead of the previous LKHV 91.43 mBf – thus the necessary highest height of the riverbed level should be HKV 90.20 mBf-2.5 m – 0.4 m = 87.30 mBf.

The average riverbed level of the basin is 87.50 mBf in front of the shore wall which is 2 dm higher than required. Therefore, the riverbed of the basin is not in accordance with

the requirements, the question about the level of the basin riverbed must be clarified with the authority during the permission planning phase.

During the next maintenance dredging we suggest the deepening of the basin riverbed to 87.30 mBf (expected dredging amount: 30-40 thousand m3).

Port accessories and equipment: In this planning phase we only mention that the required port accessories (stairs, hooks, perches, handrails, safety and rescue equipment, etc.) are also need to be modified in accordance with the modified port, the details must be specified in the permit planning phase.

Transformation of berths

Currently there are 6 (marked I-VI.) barge berths designated along the 563 m long vertical shore wall. The length of one berth is between 92 and 96 metres, which was designed given 80 metres long barges (the length of the watercraft x 1.2).

Conforming with the current typical dimensions of navigating water crafts, the new roofed berth with cranes was designed given 110 metres long water crafts, meaning a 132 metres long berth. Without lengthening the shore wall and by removing one berth, this allows four other berths to be designated. If only four berths would be designated, then every berth would get a 140-141 m long section of the shore wall but eliminating one third of the berths would probably mean the excessive contraction of loading possibilities, thus is ill-advised.

The length of the barge berths could be increased in merit by lengthening the shore wall to the north or south but taking the currently operating bulk cargo berths in account, this solution is not feasible. (For information, in case of designating the new roofed berth with cranes and 5 other berths with similar length, the shore wall should be lengthened by 50 metres.)

By relocating the berths, it is also necessary to relocate certain existing staircases recessed into the embankment plane. A new staircase recessed into the embankment plane must be built at berth IV. This comes with breaching the embankment structure, and possibly fortifying the crane rails. A new staircase recessed into the embankment plane must be built at berth III., in case the existing one is unable to serve the new berth.

At all berths the state of perches recessed into the wall and the ones at the edge of the embankment is to be verified, the damaged port accessories are to be repaired, replaced, and to be built in new places if need be.

The rearrangement of the berths and any other activity affecting the shore wall requires a permit, thus the nautical permit expiring in 2024 has to be modified at a later stage.

A change in terms of loading the vessels, the possibility to load with gantry cranes along the roofed hall discontinues. At these berths the loading will be done by bridge cranes.

A further break in the crane rails is necessary due to the construction of the planned railways (in front of berth III. for ~53 m length).

Regulations of the port bay riverbasin manager

The port bay is not part of the main river course. It is located at industrial area property gnr 3361/1., port bay not affected by the high water runoff property gnr 3373. According to the Administration-coordinated High Water Basin Management Plan, the classification of the subject area is 'flow dead zone', thus the regulations according to the 5. point of the 3. appendix (constructional requirements of drainage channels) of the Government Decree No. 83/2014 apply to it.

Nature of drainage channel: 5. Flow dead zone: Technical requirements of the structure: Is not involved in the water transport of high water amounts. The examination prior to the consent has to be carried out. The examination has to specifically address that the maximum volume of the requisitioned part of the flow dead zone is not reducing the volume of the reservoir area to an extent that harmfully increases the flood water level and address the water retention possibilities or the effects on other water management goals. The resistance to inundation and flood protection should be ensured of the structures under the safety line.

The crown level of the port embankment is at 98,85 mBf, which exceeds the MÁSZ 97,91 mBf value established by the Regulation No. 74/2014 BM by about 1,0 metres.

Related developments

Shore wall modification

The cantilevered parts of the planned warehouse hall overhanging the water must be supported by heavy-duty pillars along the edge of the shore. For this reason, a foundation of significant size must be established at the pillars supporting the cantilever, For the building of which the existing shore wall must be demolished and rebuilt adapting to the remaining parts after establishing the foundation.

Examination and fortification of the crane girder

Preventing the sinkage of the shore-side crane girder, the (northern) section between the profiles 0+000 and 0+275 (berths I-III) had been fortified with jet grouting procedure by forming jet columns every 5.7 meters. The measure of settlement results assessed since then reflect the efficiency of the fortification. The track maintenance operation of ISD DUNAFERR Zrt. also fixed the crane tracks on the shoreside. Based on the report of the port, there is no issue with the fortifications and renovations on this section (where gantry cranes operate with lower capacity).

The overall fortification of the southern section between the profiles 0+275 and 0+560 (berths IV-VI.) happened in 1990, before the acquisition of the heavy-duty gantry cranes. Concrete beams with 1.0 x 1.8 m cross-section measurements were built for the crane girders, one of which (the shore-side one) is mounted on the fortified concrete box girders of the shore wall with 80 x 100 cm cross-section columns every 10 metres and an 80 x 80 cm beam. The supporting points pressure in the middle of the box girders. The inner crane girder rests on 80 cm diameter Soil-mec columns every 10 metres. The planned loading capacity of the columns is 2900 kN. There is no need to further fortify the crane girders on this section.

In case a heavy-duty gantry crane gets transported from the southern section to the northern section, further fortification of the northern section might be necessary. In this case, the examination of the crane girders and the possibly necessary fortifications must be carried out.

Loading technology

Currently there are partially renewed Ganz gantry cranes, in which modern electrical engineering was installed in liaison with Ganz Danubius. The reviews are good on the operation of the renewed gantry cranes, and the maintenance fees are low. As a result of the planned development, the crane No. 3. of the seven existing (the one which has not been renovated) and one other has to be removed due to insufficient space. The number and position of the remaining cranes can only be determined after placing the warehouse.

The arrangement of the hall pillars is determined by the constraints and structural conditions. The free-usable headroom of the hall is expected to be around 6 metres. The lifting height of the crane is 8 metres, the difference between the two is the size of the lifting device. The free play of the crane rope is approx. 20 metres, which comes from the height of the shore wall and the lifting height.

The length of the crane rails belonging to the bridge cranes of the hall is expected to be approx. 75 m. The control type of the bridge crane is to be determined during the detailed planning.

The bridge cranes operating in the transverse halls must be prepared for outdoors work. Both the bridge cranes operating in the longitudinal hall would only work inside the warehouse. The design of the gantry crane: two-trolley gantry crane with a capacity of 25 tons per hook, with the two trolleys fixed on a central hook.

The bridge cranes must be equipped with the following accessories:

- 3 roll clamps
- 1 cca. 12 m3 grain grabs

- 1 12 metres long lifting beam with a capacity of 25 tons, 4 hooks and adjustable hook-span

The gripper device of the bridge cranes must be suitable for container loading as well.

The cargo movement between the halls is provided by transfer carriages. The heavy-rail track gauge of the transfer carriage would be established on the road lane of the warehouse, which extends beyond the warehouse in both directions (with a 15 metres long overhang). A self-propelled vehicle is needed for moving the transfer carriage (eg. UNIMOG).

e. (rough) investment plan for hinterland connections, port accessibility by rail and road

1. Railway development

Establishing the new by-passing railway of the port, the main aspect was that the expansion would be realised by keeping the existing railway tracks and adapting to them. Breaking up the existing network is still inevitable; at the southern reconnection of the new by-passing tracks, the industrial tracks used by gantry cranes must be physically intersected at the section where the new tracks reconnect. Choosing the place for the intersection, the restriction was that the length of the two existing tracks must be 150.0 metres.

On the tracks leading to the station the maximum speed limit is 40 km/h. Due to the fact that the station has limited development area, and because in case of industrial planning it is allowed, there are arcs without an overthrow in the plan. In accordance with the route planning regulations, arcs with 200 metres radius have been used, where the speed limit is 40 km/h.

The planned by-passing tracks branch out from the 79+43 section of the existing tracks with the XIII. turnout tracks to the left, then turning onto the long straight section running through the planned hall building with two 200 metres radius arcs. The straight segment between the two arcs with opposite directions is 20.5 metres long. The distance between the existing track centre-lines is 4.75 metres. There will be a 185.0 metres long transit track next to the tracks running through the hall with a distance of 4.75 metres between the two. There is no connection between the two tracks, both tracks end with a buffer stop. The straight segment connects to the southern headshunts with XIV double slip after two 150 m radius arcs. From the reconnection, a 167.7 m long useable headshunt – also with buffer stop at the end - branches out with XIII. turnout tracks, at a distance of 5.0 m between the track centre-lines.

The track profiling starts form the profile 79+43 (branching, 0+00.00), accordingly the horizontal geometrics of the planned new tracks are the following:

0+00,00:	start of turnout (1 – XIII-48)
0+28,13 – 36,13:	straight section 8,00 mh
1+73,31 – 2+21,81:	left arc R = 200,0 m α = 13°53'35" T = 24,37 m lh = 48,50 m
2+21,81 – 2+42,31:	straight section 20,50 mh
2+42,31 – 2+70,86:	right arc R = 200,0 m α = 8°10'39" T = 14,30 m lh = 28,55 m
2+70,86 – 4+89,86:	straight section 219,00 mh
4+89,86 – 5+42,71:	right arc R = 150,0 m α = 20°11'12" T = 26,70 m lh = 52,85 m
5+42,71 – 5+65,81:	straight section 23,10 mh
5+65,81 – 5+86,71:	left arc R = 150,0 m α = 7°40'28" T = 10,06 m lh = 20,09 m
5+86,71 – 6+17,91:	straight section 31,20 mh
6+46,04:	start of turnout (2 – XIII-48)

6+46,04 – 6+54,04: straight section 8,00 mh

6+71,57: start of turnout (3 – XIV-48)

Turnouts

The turnouts have been numbered continuously moving from the end of the station. The main data of the base turnouts used during the planning is in the following table.

Type	Dimensions (m)			Inclination of turnout		Radius	Speed limit (km/h)	
	a	b	b'	tg α	α	(m)	Ve	Vk
XI	16,616	17,525	16,616	1:9	6-20-25	300	160	40
XIII	10,625	17,525	16,360	1:9	6-20-25	192	100	40
XIV	-	17,525	16,360	1:9	6-20-25	200	100	40

Figure 18.: Main data of the base turnouts used during the planning

Shunting level signal

With the track connections, it is important to determine the place, which shows for how long can the railway vehicles rest on the divergent tracks after the turnout without disturbing the railway traffic on other tracks in any way. This place is where distance between the centre-lines of the divergent tracks is 4.00 m, the same as the width of the structure gauge, and this is where the shunting level signal is placed. The shunting level signal often determines the useable length of the tracks.

Useable length

The decisive parameters of the track's useable length

- place of the exit signal
- place of the insulated track alignment
- place of the shunting level signals at the ends of the tracks
- start of the turnout in case of a turnout connecting with its start
- tracks ending barrier
- derailer
- buffer stop
- in case a transit track does not have safety signal, the length where none of the tracks need overthrows
- fence gate or the end of the paved area in case of industrial tracks

Out of the upper-mentioned facilities the decisive criterion is the least favourable.

Recourse of the areas

A maintenance aisle must be provided along the tracks at least on one side. The space must be determined by providing 1.00 m width form the sweep limit. The sweep limit, measured from the centre-line is 2.00 m at 6-20 km/h, and 2.20 m at 21-40 km/h.

There must not be any building at the end of headshunts. If this is inevitable, the buffer stops must be measured to absorb the kinetic energy of the train. Inside buildings – if the technology does not need bigger distance – there must be a distance of at least 3000 mm between the centre-line of the outer tracks and the building wall or its protruding pillars (OKVPSZ).

A gate with 4400 x 4850 mm free dimensions can be planned for the tracks leading to the hall, if a door is built at the side of the maintenance aisle, which certainly provides entrance in the open position of the track gate

The distance from the service building next to the industrial tracks to the tracks centre-line must be at least 4000 mm. The roads, wires and their pillars must be placed according to the regulations on crossing and approaching trail-type facilities.

Signalling systems

Considering the service nature of the development, the tried and tested order of operations and the scale of the reconstruction, installing electrical signalling system on the railway station is not necessary.

Road development

External road connection

The roads leading to the port are in good condition. The renovation of Magyar street, Szigeti Street and Ruhagyári Street has happened recently. Wearing course replacement, curb building and shoulder adjustment had been done. Further development is not necessary regarding the accessibility of the port.

The inner traffic engineering of the port, logistical development

The transport connections make it possible to connect to national road and railway networks, to access the port with road and railway vehicles and to appropriately access the warehouse.

The width of the roads of the storage site must be determined so that the road traffic and loading will not interfere with each other. The width of the road depends on the dimensions of the transport vehicles (length, width, turning radius), the entry position for loading and the design of the loading area.

The loading areas are access areas established along the outer walls of the warehouse and lifted above the connected road and the level of the railway tracks. They make the loading in and out of the vehicle easier and provide suitable place for loading.

When establishing new facilities in the port, for optimising space utilisation among others, establishing an inner traffic engineering network is necessary. The markings, signs and other tools helping orientation and moving are not just to help safe traffic, but they also help the efficient loading processes logistically.

The assets to be realised include marking providing guidance, appointing loading and parking areas, determining traffic directions, placing information and regulatory signs. Regarding the movement in the port area, the turning radius and movement characteristics of all vehicles occurring must be taken into account.

The placement of traffic signalling on the layout conceptually includes the elements and solutions which can be relevant on a basic level for the expansion of the port with a new facility.

The examination of pavement type structures of traffic and no traffic purpose is certainly necessary in the aspect of surface and structure also. The surface aspect means the appropriateness of the pavement, which is damaged in many places over the port and the degradation process has started due to heavy use and weather conditions.

f. (rough) investment plan for utilities, other services

1. Public utilities development tasks

The hall placement has been determined on an area less affected by public utilities, therefore the utility replacements necessary specifically due to the construction have a cost that is negligible compared to the historical cost of the development.

2. Water supply network

The capacity of the current water supply network (excluding the fire water demand) is adequate in regards to the water supply of the port. There is not any industrial activity in the area, with significant water use. Typically, only water use for social purposes has to be reckoned with in the port.

The planned development also does also not demand significant excess amount of drinking water, as only a minimally increasing (necessary for 5-10 persons) social water demand has to be met. Based on the diameter of the pipes, there is no need to expand or improve the drinking water network. During the making of the authorisation plans the necessary water demand must be determined, therefore during the permit process the utility statement of the drinking water service provider must be requested that it can actually provide the increased water demand.

3. Stormwater canal system

The existing stormwater drainage system must be deconstructed in areas concerned by the new warehouse building, thus the current drainage system and the pressure will be reduced.

Since the rainwater of the newly built warehouse hall is considered to be clean, a direct connection to the port bay may be established. The amount of rainwater drained from the planned warehouse building is approx. 310 l/s. The rainwater drainage of the of the planned warehouse is easily solvable due to the proximity of the inlet.

The current stormwater canal system has no water establishment approval design or operating licence. There are no filters or separators built in the current system (except for leachate), thus the stormwater flows from the entire surface into the Danube uncleaned. During the authorisation of the new stormwater drainage system, the problem may arise that the modernisation of the system in accordance to the current legislation, in the entire port might be necessary. This would mean establishing oil interceptors, settling tanks, separators.

4. Sewage system

Since the area is situated in close proximity to the wells principally providing water for Dunaújváros, the renovation of the sewage system might also be necessary in case of the abandonment of the planned development.

The reparation of the sewage system is not adopted in the framework of this development, improving and maintaining the public utility network is the task of the service provider.

The amount of wastewater draining from the social blocks (with a capacity between 5 and 10 persons) to be established in the new warehouse is not significant, therefore it could be connected to the existing system regardless of its development.

5. Gas system

Since the planned warehouse is not heated (except for the social block with a low air m3), the increase in annual gas consumption will not be significant. The slightly increased demand can be met by the current gas system.

g. Potential analysis in terms of recycling matters, green energy matters, …. / energy master plan of the whole port&surrounding area

By installing a solar panel system on a surface area of approx. 5000 m2 (700 kW) on the roofing of the new warehouse the investment makes a significant contribution the increase of green energy production, thus the transition to low carbon society.

h. (rough) financial plan (prefeasibility based financial figures) for all predicted investments (rough cost/benefit analyses)

Activity	**Entire cost (m€)**	**Entire net cost (m€)**	**VAT (m€)**
1. Preparation (procurement costs, authorisation and execution design, authorisation)	1,229	0,968	0,261
2. Area preparation (deconstruction, utility replacement)	0,123	0,097	0,026
3. Construction, equipment acquisition	21,881	17,229	4,652

4. Services (engineering inspector, project management, development performing)	1,229	0,968	0,261
5. Margin	0,734	0,578	0,156
6. Total	**25,196**	**19,840**	**5,357**

i. conceptual work for improvement of water-related items (ship service unit, quay precipitation water, diffuse emissions, surface coverage of port areas, sewer system, ...)

As described by point f., since the area is situated in close proximity to the wells principally providing water for Dunaújváros, the renovation of the sewage system might also be necessary in case of the abandonment of the planned development.

The reparation of the sewage system is not adopted in the framework of this development, improving and maintaining the public utility network is the task of the service provider.

The amount of wastewater draining from the social blocks (with a capacity between 5 and 10 persons) to be established in the new warehouse is not significant, therefore it could be connected to the existing system regardless of its development.

j. conceptual work for noise reduction measures (where applicable)

The following relevant legislation has to be taken into consideration during the investment and operation period.

According to the 9. § (1) paragraph in the Government Decree No. 284/2007 (X 29.) on protection against environmental noise and vibration, facilities emitting noise and vibration need to be planned and realised so that the noise and vibration pollution in the protection area, in the building and in the premises are in accordance with the noise and vibration pollution requirements. According to the 9. § (2) paragraph the protection zones must be marked off so that the noise pollution limits are in accordance with the specific legislation. The buildings, or premises to be protected must be planned and built so that the indoor noise pollution limits are in accordance with the specific legislation for the time of use. The limit is provided by the combined decree No. 27/2008. (XII. 3.) KvVM-EüM on environmental noise and vibration pollution.

k. conceptual work for business settlement within the port area or nearby areas (industrial development)

This project directly supports private businesses in the port area and nearby (shippers, logistic services providers, fleet operators, other businesses using logistic services of the port). As the services of the port can be used by any businesses, we expect an increase in the number of business entities using the port services. Besides, the improved service level is likely to attract new industrial companies to the nearby area by providing better logistic solutions.

l. Conceptual work for application on funding programs (regional, national, international) for the most important selected actions of the port development plan (investments, …) – eg checklists for fulfilling the criteria, preparation of necessary information basis, …

As part of the 2021-27 EU planning the IKOP Plusz (Integrated Transport Development Operative Program Plus) is the biggest EU financial resource for transport related developments, including port investments.

This operative program has a budget of 1 559,7 billion HUF with co-financing at the date of finalizing this plan. 85% of it is EU resource (Cohesion Fund and European Regional Development Fund), and 15% is domestic resource (Hungarian state budget).

The 2nd priority of the program is the development of TEN-T railway and regional intermodal transport, including TEN-T port investments. This priority has a dedicated resource for Budapest, Pest county, the Middle Transdanubia and the West Transdanubia of 308,6 billion HUF (Cohesion Fund). Specific tenders for port development shall open in the near future.

Besides, the transportation development operative program of the previous EU planning period still has some available resources. IKOP-2.1.0-15 - International (TEN-T) railway and water accessibility improvement tender is still open until the end of 2023.

CEF (Connecting Europe Facility may also provide funding opportunities in the future. At the time of finalizing this plan no open tenders were available.

With the continuous development of the water transportation sector it is realistic to attract private equity and apply for bank loan also.

m. Estimation of impacts of investigated investments, projects and actions, … to all parameters (transshipment figures, incomes, environment, quality, social effects, …)

This development will increase the useful storage space with at least 3000 m2 and the number of cranes. As a result, transhipment figures are expected to grow by at least 10% by latest the 3rd year of operation. Incomes of the port are also expected to grow proportionally. Quality of the provided service will also improve by the enlarged storage

and lifting capacity and the related developments. By installing a solar panel system on a surface area of approx. 5000 m2 (700 kW) on the roofing of the new warehouse, the investment has a positive impact on the environment.

n. Selection of preferred options

A multi criteria evaluation had been conducted in order to choose the best available option. We had analyzed the following factors:

- technical feasibility
- enforceability of construction organization
- transport options (shipping, railway, road), advantages
- geotechnical environment
- possibilities of architectural design
- variants of the structural design of warehouse buildings
- optimization of the operation of the port, positive discrimination of important functions
- minimizing the amount of shore wall conversion
- taking into account the presence of other operators
- consideration of loading aspects

Beside many lower-ranking aspects had also been taken into consideration.

Taking the above mentioned factors into account, we conducted the following versions' comparison. We included the most important factors in a table. The factors were given a measure and weight, and a weighted metric, which shows the weighted value of the factor, was created as a result of two numbers.

For weight, a larger value indicates greater importance (the value is between 0 and 5). Since the goal of the comparison was the determination of weighted value for each factor we divided it between the two versions and multiplied it by the weighted metric. The versions shared between subtotals are added by factor to give a total weighted measure for a variant.

Based on the multi-criteria evaluation we choose the higher-scoring version presented in this masterplan.

o. Conclusion and recommendations

Even though the higher scoring version was chosen based on a sophisticated evaluation methodology, it has to be taken into consideration, that this method could

not efficiently handle all possible risks, so a risk assessment has to be conducted and necessary measures have to be taken to mitigate those risks of significance.

p. Action plan, workplan, PDCA-planning, reviews, …. Timetables, ….

At this stage of the project the following workplan has been made:

Years	2023												2024												2025												2026					
Months	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
Project kick off, project team set up																																										
Public procurement on planning																																										
Construction planning, detailing budget																																										
Public procurement on contractor																																										
Public communication																																										
Choosing technical controller																																										
Techincal controlling activity (can participate in the contractor procurement process)																																										
Implementation																																										
Management activity																																										
Project settlement of accounts																																										
Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42

17 Integration of outcomes of other DIONYSUS activities

Outcomes of D.T2.1.1 activity is less relevant for port of Dunaújváros, as it was not among the selected ports or this activity. Nevertheless, it is an important message, that the analysis of multimodal facilities in various ports along the Danube demonstrated heavy disbalance between the ports on the upper, and partly middle Danube (down to Budapest) on the one hand, and lower Danube ports, on the other, whereas the former are significantly better developed than the latter.

Scope of D.T2.1.2.was to identify current or future-potential multimodal container hubs in each DR country. Result of this activity are not relevant for port of Dunaújváros, as it is not container hub now.

Activity D.T4.1.1 gives recommendations on business development models of Danube ports. As the port authority is the same as one of the port operators (ISD Dunaferr Zrt.), so the port is a private one, the recommendations on PPP models for public ports is not relevant for port of Dunaújváros. Nevertheless, recommendations on effective port operation are relevant to the plan concerned. The recommendation regarding storage and warehous facilities emphasises the importance of marketing strategies and business plans to attract customers in order to utilize available capacities, and the maintenance and repairs of facilities.

Besides, the study also recommends that to outline business development strategy, port should understand it's current situation, market, competition and future developments. It recommends to undergo following steps when defining a business model as detailed in the study:

1. Analysis of current situation
2. Market and business opportunities analysis

3. Future developments
4. Finding the right stakeholders
5. Marketing and advertisement

18 Recommendations for further operation

18.1 Efficient transportation

18.1.1 Port basin deepening

The average bed level of the port basin in front of the shore wall is 87.50 mBf, which is 2 dm higher than the depth determined in the current regulation. This could complicate the loading during small water levels or reduce the amount of loadable cargo and further shorten the period of water-loading and transport.

During the next maintenance dredging we suggest the deepening of the basin riverbed to 87.30 mBf (expected dredging amount: 30-40 thousand m3).

18.1.2 Northern shore wall extension

Currently there is a sloped shore wall in the northern part of the port, which is suitable for mooring with the riprap. The railway tracks at the top of the embankment, places a significant strain on the shore wall, which might trigger stability issues. Previously a significant amount of riprap had to be installed to stabilise the embankment.

We recommend to rebuild the sloped section of the shore to the same design as the other sections. This would resolve the current stability issue, increase the accessibility of the roofed berth and the land area of the port could be increased with the shore wall modification.

For the safe accessibility of the port via railway, modifying the sloped shore wall to a vertical one is justified regardless of the other developments.

18.1.3 Expansion of truck waiting areas

The storage area of the port is finite, therefore the necessity of loading directly from the vehicle could arise. In order to efficiently perform this, establishing additional parking spaces is advised. Depending on the excess parking spaces in the port area, there might be a need to also establish parking spaces outside the port, along the Ruhagyári street.

18.2 Cargo handling equipment

18.2.1 Improvement of the port cranes

The significant part of the electricity consumption of the port comes from the 7 gantry cranes, 6 of which has frequency-regulators, so these are capable of feeding the power back to the power grid. The cranes are currently feeding back to the power grid, but this is not done as a small power plant, thus the power fed back is only suitable for reducing own consumption, the excess energy is not utilised.

Due to the new warehouse, the removal of a crane is necessary, therefore the renovation of the seventh crane should not be taken into account. Out of the 6 cranes with frequency-regulators, 2 has higher, and 4 has lower capacity. Further possible areas for improvement:

- Realization of the feedback to the power grid as a small power plant, in order to increase economic and energy production efficiency.
- Increasing the efficiency and lifting capacity of the cranes with a lower capacity.

Loading containers does not appear among the main cargo types of the port, even though the railway and road infrastructure and the port design could be suitable for it. In order to efficiently expand the scope of the services, replacing one of the gantry cranes with a container crane is advised. Primarily, creating the conditions of container loading is preferable in front of the berths 4 and 5, in the southern part of the port.

18.3 Storage facilities

18.3.1 Establishing energy utilisation system with solar panels

Regarding the development, establishing a solar panel system might be an option. On the roofing of the new warehouse, solar panels could be placed on a surface area of approx. 5000 m^2. In case of, for example polycrystalline solar panels, this would mean about 700 kW average power. The lifespan of polycrystalline solar panels is 25 years (power output guarantee of 95% in the first 5 years, 0,4%/year decrease for 25 years).

Due to the placement of the solar panels, the roofing has an excess load, which must be taken into account during the dimensioning of the support structure of the building. For positioning the solar panels in the most efficient way, the roof panels must be formed in way, so most parts have an incline towards a direction close to south. Based on experience, in case of a +/- 45° deviation from south, so in case of a southwest or southeast orientation, the annual energy “loss” is about 7%.

The electric power generated this way could be used for operating the port or, in case of generating surplus, could be fed back to the power grid.

18.4 Safety and security

18.4.1 The examination and renovation of the existing shore wall

The examination of the shore wall sections concerned must be done regarding the development, which applies first to the state of the supporting structures (reinforced concrete box girders), and second, to the analysis of the geotechnical conditions (cavities of the filling, reinforced concrete fill up materials). For the safe and long-term functioning of the shore wall, it is worthwhile to perform the examination and necessary improvements anyway, for the whole shore wall section. The already formed cavities must be filled, a connection that reduces the amount of leaching materials must be established for the dilations between the shore wall box girders. It should be noted, that increasing the waterproofness of the shore wall is not practical, because the water pressure forming due to the fast downstream means significant additional load on the shore wall. Therefore, the leaching cannot be entirely resolved, only its extent reduced. Nevertheless, with regular examination and maintenance, the shore wall is safely operational for the long-term.

There is an examination and action plan of the shore wall from 2017 available. The findings of that examination regarding the shore wall were the following:

During the examination done earlier, the state of the port was deemed adequate, however some highlighted tasks were set:

- removing the loose concrete parts found on the wall
- cutting or covering the rebars showing on the wall with concrete
- repairing the floor surface of the staircases
- repairing or replacing the mooring hooks built in the wall
- closing the dilation

18.4.2 Fire safety

The main regulations can be found in the BM Decree No. 54/2014. (XII. 5.) on National Fire Safety Regulations.

The purpose of the building: industrial and warehousing building with warehouses, offices, social and service rooms belonging to the main purpose.

Flammability and risk classification

The fire safety requirements must be determined by the flammability class of the materials, the risk class of the risk unit, the standard risk class of the building, the separate building part and the special structure.

1. The risk class of materials: According to the (3) point of the 9. section of the BM Decree No. 54/2014 (XII. 5.) the steel products to be stored in the warehouse, as not flammable materials fall within the no fire risk class.
2. Definition of the risk: The risk affecting the fire safety requirements was classified as medium risk class (KK), due to the trucks moving in the warehouse and the loading area, locomotives with diesel engine, and the vessels stationing under the cantilever, which class must be specified in the later stages of the planning. Knowing the final design, the risk class could probably shift to lower risk.

Establishing fire compartmentation

Fire compartment: the specified part of the building, special structure, outdoors storage, which has been designed to prevent fire spreading in regards to the neighbouring structure and area.

In case of industrial and storage-purpose risk units and in case of medium risk class, the maximum allowed floor area of the fire compartment:

- storage-purpose fire unit: 7000/14000 (m2, with/without fire-fighting equipment)
- industrial fire unit: 5000/10000/20000 (m2, without fire alarm and fire-fighting equipment/with fire alarm/with fire-fighting equipment)

Based on the upper mentioned, the planned facility can be designed with one fire compartment.

Accessibility of the building, placement

According to the applicable legislation, a fire-fighting parade ground must be provided in case of commercial and multi-purpose buildings with a floor area exceeding 3000 m^2 (combined by levels).

The roads providing access to the buildings and the fire-fighting parade roads and grounds must be primarily placed on public places. In this case Ruhagyári Street is suitable for fire-fighting parade road and ground.

The length of the fire-fighting parade ground provides conditions of intervention and rescue along the entire length of the facade of the building towards the parade ground, its width is at least 6.0 m. he rescues points on the facade agreed with department of the authority

Fire-extinguishing water supply

On the 16th of February in 2015 we had a consultation at the regional administration with lieutenant Gábor Somogyi on the fire safety requirements of the planned warehouse.

To provide fire-extinguishing water supply in this stage, based on the consultation and the rules of the regulation, we would like to highlight the following:

- in case of establishing water supply pipelines, the fire-extinguishing water must be provided by above-surface fire hydrants
- a hose-system network must be established in the planned warehouse
- the fire hydrants must not be placed further than 100 metres (measured on the access route), and within 5 metres of each other (except for hydrant groups)
- during the making of the authorisation plan, the amount of fire-extinguishing water necessary must be determined (expected amount between 4200 and 5100 l/min.)
- in case a fire-extinguishing pool becomes necessary, its capacity can not be lower than 30 m^3, and its bed level can not be lower than 7 metres from the ground level.
- the distance between the reservoir and the building or area to be protected can not be greater than 200 metres, and the access point of the reservoir must be accessible by fire-fighting vehicles
- with adequate design, the Danube can also be an access point for fire-extinguishing water.

Other remarks on fire safety

In this study level we only listed the most important regulations of the subject decree, which naturally includes several other regulations, however meeting those does not affect the placement, design, structures, etc. considerably, therefore these could be handled in further planning stages. The engineering and building electricity designs and the lightning protection must be planned during the architectural authorisation planning, with the fire safety requirements taken into account. During the making of the authorisation plans the regulations on escape routes, ventillation, gas detectors, heat and smoke dissipatio, fresh air supply, aisleways, fire safety and fire alarm equipments and evacuation must also be taken into account.

18.5 Environmental aspects

The project planned on the industrial area of the port will presumably reduce the environmental pressures associated with maintenance compared to the current state. Still the environmental aspects (horizontal wells providing the water supply of Dunaújváros, Natura 2000 sites, and the river Danube itself) play a significant role during the realisation of this project.

18.5.1 Requirements of the authority

According to the Government Decree No. 314/2005 (XII. 25.) on the procedure of the permission of environmental impact assessment and the uniform environmental use, the planned activity does not fall within the scope of preliminary examination procedure. The area of the planned activity, does not belong to any environmental protection area of national significance nor Natura 2000 area, and does not affect the protection zone of any cave, the planning area is already a port, and industrially-commercially utilised area, thus cannot be considered as an area of other purpose, the area of the embankment planning does not fall within the scope of legislation on the protection of current and future water catchments and water facilities providing drinking water. The subject area does not belong to any environmental protection area of local significance.

Landscape and nature conservation: The area of the planned activity is situated in urban land, and is not part of protected natural area of national significance, Natura 2000 sites, does not intersect surface protection zones of caves.

Noise and vibration protection: According to the 9. § (1) paragraph in the Government Decree No. 284/2007 (X 29.) on protection against environmental noise and vibration, facilities emitting noise and vibration need to be planned and realised so that the noise and vibration pollution in the protection area, in the building and in the premises are in accordance with the noise and vibration pollution requirements. According to the 9. § (2) paragraph the protection zones must be marked off so that the noise pollution

limits are in accordance with the specific legislation. The buildings, or premises to be protected must be planned and built so that the indoor noise pollution limits are in accordance with the specific legislation for the time of use. The limit is provided by the combined decree No. 27/2008. (XII. 3.) KvVM-EüM on environmental noise and vibration pollution.

Air quality protection: Based on the project, no new air polluting source is going to be established, then according to the 22. § (1) paragraph in the Government Decree No. 306/2010. (XII. 23.) on air protection, in case of establishing, performance-enhancing, applying lifespan-extending restoration of, changing the applied technology of, or putting into service an air polluting source in the jurisdiction of the Inspectorate, the Inspectorate determines the requirements for air protection in the air quality protection permit.

Before putting into operation, a notification about the air polluting point source assigned to the notification-obliged place, and the licence application about the operation of the point sources to be established has to be provided for the Authority.

18.5.2 The course of the procedure of the water catchment protection analysis

According to 14. § (2) paragraph of the Act. No. LVII. of the year 1995, waters providing drinking water supply, or waters assigned to it have to be kept safe and secure with assigning and maintaining the protective structures, protection zones. The legislative requirements of assigning and maintaining is provided by the Government Decree No. 123/1997. (VII. 18.) on the protection of future water catchments and water facilities providing drinking water supply.

According to the 15. § (2) paragraph of the Government Decree No. 123/1997. (VII. 18.), in case of an activity in the protection zone is permissible in the appendix No. 5 and is not specifically regulated in the Government Decree No. 123/1997. (VII. 18.), if it does not fall under environmental impact assessment, then the Inspectorate decides the conditions of carrying on the activities and the restrictions on an incidental basis according to the Government Decree No. 123/1997. (VII. 18.) as a result of a specific examination.

The protection of water catchments specific examination procedure starts with a permit. If during other procedure of permission, or as an administrative department the Inspectorate establishes that the realisation of the subject facility, or the carrying on of the planned activity is liable for specific examination, the client is invited to submit the permit by the Inspectorate, and indicates this establishment to the authority handling the case.

Sources

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EUROPEAN UNION

Danube Transnational Programme

DIONYSUS

Integrating Danube Region into Smart & Sustainable Multi-modal & Intermodal Transport Chains

Port development plan ENNSHAFEN port

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PORT DEVELOPMENT PLAN

ENNSHAFEN

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Abbreviations

Abbreviation	Explanation
PDP	Port development plan
LZE	Logistics centre Ennshafen (Office Building)
TEN-T	Trans-European Network - Transport
DTP	Danube Transnational Program
CEF	Connecting Europe Facility
DAPhNE	Danube Port Network
SME	Small or medium-sized enterprise
PPP principle	Public Private Partnership principle
EHOÖ	Ennshafen OÖ GmbH
LNG	Liquefied Natural Gas
RO-RO	Roll on – roll off
LPG	Liquefied Petroleum Gas
CEMT	*European Conference of Ministers of Transport*
OPS	Onshore Power Supply
AFID	Alternative Fuels Infrastructure Directive
SSMS	Smart & sustainable mobility strategy
CDNI	**C**ONVENTION ON THE COLLECTION, **D**EPOSIT AND RECEPTION OF WASTE GENERATED DURING **N**AVIGATION ON THE RHINE AND OTHER **I**NLAND WATERWAYS
bmvit/bmk	Federal Ministry Republic of Austria (dealing with transport affairs)
PV	Photovoltaic
GDP	Gross domestic product

1 Introduction – Scope of the report

Port development is a strong instrument to reach a catalyst function for stimulating economic growth and create jobs in the Danube Region [DR]. The main objective of WPT4 is the elaboration of concrete port development plans as well as operational and business development plans and models for strategically relevant DR ports in order to facilitate their integration into multi-/intermodal transport chains as well as improve their transport connections/links towards the hinterland. For this purpose, all findings of previously investigated WPs are reflected in this last work unit that delivers state-of-the-art development models and plans contributing to enhanced connectivity and following a transnational (corridor) approach. It acknowledges all findings of previously performed analyses and studies and capitalizes on the results delivered by DTP projects such as DBS Gateway and DAPhNE as well as TEN-T/CEF and nationally financed projects through operational programs. All development plans comply with national/regional economic strategies and regional development plans of the related areas and are deployed fully in line with the port owners' long-term strategies and investment plans. To begin with, the WP leader together with all activity leaders will define jointly a common structure which will be used as the basis for the preparation of the individual plans. Synergies and know-how exchange with national and transnational public and private stakeholders will be facilitated by means of formal get-togethers. The final documents will reflect all collected recommendations and are highly shaped by local economic, environmental and social factors. Furthermore, the operational and business development model will be shared at DR level which will be ensured by the participation of international organizations and sector organizations in the project consortium.

These Port Development Plans will comply with National or Regional Economic Strategies or Regional Development Plans of the relevant areas and be deployed from Business Strategies of the port owners. Substantial inputs and documents regarding technical and financial issues, market studies, legal aspects, etc. have to be considered and worked out in detail. The pilot case investigations shall deliver sound papers which can be the basis for future investment decisions. These plans shall contain particular development projects which have a real chance for execution until 2030. Each elaborated plan should be integrated into the normal business papers of the ports and should be prepared in a way that a yearly update is possible. At the same time, these plans shall be a central element of the yearly SWOT-analyses and budgeting processes of the ports.

For this work package 5 main target groups (indicators) are defined:

a. Owners of the port; target value: 5
b. Local public authority / target value: 10
c. National public authority / target value: 5
d. Infrastructure and (public) service providers / target value: 5
e. SME (as existing and potential new clients of the ports): target value: 5

The current document is a condensed version of the whole elaboration for Port Development Plan and appendixes which is more comprehensive and contains much more details. This condensed version is dedicated for publishing as a project output, the "long version" is for internal use only.

2 Executive Summary

The Ennshafen port is the newest public port in Austria. It links the main transport routes for international cargo, the Rhine-Main-Danube waterway from west to east and the north-south railway that extends from the North Sea to the Adriatic. Within the Trans-European Transport Network (TEN-T) of waterways, the Ennshafen port is defined as one of two Austrian core nodes in the Rhine-Danube Corridor.

With direct access to motorways and main roads, the Ennshafen port offers ideal road links. Waterways, rail and road connections empower the port as a transport hub for goods and commodities in international logistics operations and for local businesses.

The Ennshafen port is situated in Austria´s strongest industrial region. Serving the largest continuous industrial area on the Upper Danube, the Ennshafen port is a trimodal transhipment center spanning 3.5 million square meters; by water, it connects the business parks of Enns and Ennsdorf to a powerful economic hub.

Located in the heart of Europe, the port is ideally linked to the most important inland ports and sea ports of the continent. The Ennshafen port is a center of service, logistics and excellence in transhipment and warehousing. Its high-performance infrastructure, roads, quays and railway systems provide companies with neutral access to various modes of transportation. With a quayside extending some 2,500 meters, cargo handling conditions are ideal. Services such as transhipment, heavy cargo transhipment, warehousing, packaging and bunkering are provided by operators located in the Ennshafen port.

As a multi-modal logistic hub, the Container Terminal Enns is a major hinterland terminal for the big sea ports. Spanning some 245,000 square meters and with a capacity of 500,000 twenty-foot equivalent units (TEU), it has some of the most modern transhipment infrastructure in Austria. Block train rail connections, modern gantry cranes and a full range of services ensure optimum container handling.

The roll-on/roll-off terminal offers best-in-class service for heavy lift and project cargo; vehicles and agricultural machines can drive straight on and off vessels, with no need for additional facilities. At the Ennshafen port, special cranes are used to transfer high and heavy goods to heavy duty quays.

The Ennshafen port benefits from a central location in Austria and indeed Europe, with direct access to the Trans-European Transport Network. The port guarantees idea conditions thanks to an efficient infrastructure, roads, quays and railway systems. Upper Austria and the western part of Lower Austria are among the country´s strongest industrial and economic areas, with a key focus on exports. The region also offers a professionally qualified population and high levels of affluence, making it a place to do successful business and live well.

Even the Ennshafen port has got very good development since its founding in 1976, there is need to look into the future and investigate the next upcoming developments and needs for improvement to couple with the upcoming challenges of the next decades. For this reason the current Port Development Plan („PDP“) was elaborated within the framework of DIONYSUS project. As the Ennshafen port is highly developed and has done a lot of investments in basic infrastructure like railways or quays, the current PDP will give the focus on a broad check of items for improvement both in the sense of fulfilling of new upcoming obligations regarding decarbonisation of European business and continuous improvement in special topics and in general.

Therefore, a broad field of action fields have been checked and investigated and screened for needs of future action and developments. A broad field of investigation was given to the

involvement of and reflection with target group partners to bring in a broad external sight on the needs of development.

- International framework of regulations and strategies & programms
- National framework of regulations and strategies & programms
- Economic situation and market developments
- Clean fuels and green economy, environmental and energy KPIs, CO2-neutrality
- Infrastructure measures, equipment, facilities, digitalisation, automatisation
- Hinterland connections, port accessibility by rail and road
- Utilities and other services
- Recycling and production of green energy
- Improvement of water-related items (ship service unit, quay precipitation water, diffuse emissions, surface coverage of port areas, sewer system, …)
- Noise reduction measures (where applicable)
- Neighbourhood management system
- Business settlement within the port area or nearby areas (industrial development)
- Environmental certificates (ISO, EMAS, …)
- Overall financial planning for all predicted/identified investments

The new PDP was aligned along the strategic approach „Ennshafen4.clean“ in compliance with the existing vision and strategy documents of the port and will now be further integrated into the management processes. Thus, a sound development of the port which may fulfill the upcoming challenges of the next decades 2030-2050 shall be supported by this integrated approach and the new PDP will give a systematic check of upcoming investment needs for the port. The new PDP is grouped in the following action fields:

1) Low Carbon Port

a) Ongoing

- Shore-side electricity
- Debottlenecking for railway business
- LNG/CNG developments in the port
- CO2-neutrality plan
- Energy cooperation within the port

b) New

- eFuels for vessels
- Upcoming developments regarding Hydrogen within the port and other power2x applications
- Greater implementations of photovoltaics within the port
- Renewal of heating system in port building

- Sustainable „gas-hub“ situated in the port
- Green electricity and new applications of electricity within the port

2) Cargo & Core Infrastructure (increasing of transhipment, new cargo, core infrastructure parts of the port, truck-train-ship-shifting, containerisation of goods)

a) Ongoing

- Railway debottlenecking
- New concept for Kai21-part within the port
- Enhancing the transhipment of agro-products in the Ennshafen port
- Optimization work of several smaller port areas (e.g., area around Kai13)
- Transhipment of waste and recycling products
- Bi-functional system of vessel and rail

b) New

- Investigation of options regarding upcoming changes in transhipment („boxes“)
- Transhipment of new energy carrier in the port
- Pusher within the port – option check
- Enhancing of rail-system usage for smaller users
- Transhipment of trailers
- New (green) equipment for transhipment processes
- Further development of „Seveso-areal“ within the port

3) Digitalisation (digitalisation of core port processes and related processes)

a) Ongoing

- PMS installation (port management system)
- Preparation for enlargement into a PCS (port community system)
- Plannings for new integrated camera system and further port process integration

b) New

- Technical support for hybride-meeting equipment
- Investigations regarding installment of a „port-card“

4) **General topics and basic infrastructure** (cross-sectional items and basic elements with the port areal)

a) Ongoing

- Relability of waterway transport
- Roads and truck traffic within the port
- External raod connections (improvements)
- External rail connection (improvements)
- Additional free space for growing of the areal
- Port certification (environmental standards)
- Strategic maintenance and setup of financial reserve system for port infrastructure works
- E-mobility infrastructure within the port
- Utilities (renewals and unbundling)
- Neighborhood management
- Organisational developments (staff)
- Knowledge building for projects

b) New

- Waste water treatment of port business
- Lack of truck drivers and other specialists
- Protection system for port areal
- Public transport within the port
- Modernisation and new applications for two floors within the port building

The new PDP will be an integrated part of the yearly management cycle and will be investigated for necessary updates within the yearly management review steps.

3 Description of the Port

3.1 History and development up to now (overview)

The Ennshafen port enjoys a convenient geographic location at the nexus between two of Europe's main transportation corridors: the Rhine-Main-Danube canal system, which links the North Sea to the Black Sea, and the north-south connection from the Baltic Sea to the Adriatic. These same routes date all the way back to the time of the Celts and Romans, who used them to trade goods such as amber, salt, and bronze. In 1566, Enns even boasted the largest port between the Bavarian town of Passau and Vienna. But with the privatization of salt transportation, port operations in Enghagen were discontinued in 1826.

In the years around 1960, Prince Kraft-Alexander Hohenlohe-Oehringen came up with the idea of building a port at the point where the river Enns flows into the Danube. The implementation started in 1974.

Figure 1: History and development of Ennshafen port

3.2 Present situation

Position

Ennshafen port is located on river km 2112 in the mouth of river Enns to the Danube at the border between the federal states of Upper Austria and Lower Austria. With 352 ha Ennshafen port is the largest connected industrial area on the upper Danube, it is a combination of business park areas and port areas in close connection.

The Ennshafen port offers optimal trimodal transportation logistics for export and connects the entire region with international transportation network. Roundabout 65 companies with together approx. 2700 employees represent the whole conglomerate at present.

Ennshafen port is one of two TEN-T-core ports (Rhine-Danube corridor waterway) in Austria.

It benefits from a central location in Austria and indeed Europe, with direct access to the Trans-European Transport Network. It guarantees ideal conditions thanks to an efficient infrastructure, roads, quays, and railway systems.

Ownership, administration (governance) and operation

Ennshafen OÖ GmbH – a company owned by the federal district of Upper Austria - is the owner of the port and do all the administration of the port; Ennshafen port has the PPP-principle as a core part of his strategy, therefore it only builds the basic infrastructure, the suprastructure is invested by private companies, who have got special contracts with EHOÖ (license contracts, shipment contracts…); as well the core parts of the port (quays) are part of a greater mixed area, were a lot of other private companies are owners of ground, buildings and facilities.

In Lower Austria the port company Ennshafen NÖ GmbH is owned by the federal district and has got a quite similar structure like in Upper Austria.

Figure 2: Ennshafen port

Hinterland connections

The whole port area has six road entrances, each with double lines. There are also two main rail entrances accessing the port area from two different sides. Within the port area, there is a system of internal rail network with about 30 km total length.

The Ennshafen port is the main trimodal transport hub for the west to east and east to west arriving international cargo in the Rhine-Main-Danube waterway region and south to north and north to south arriving international cargo in the North Sea-Adriatic region by the railways. With its 6 road entrances, there is possibility of direct accesses to motorways and main roads that can boost international logistics operations and local businesses.

The Ennshafen port has the access to the most important seaports through the river Danube. It is connected with the A1 west expressway (Wien-St. Pölten-Linz-Salzburg), A9 (Graz-Wels-Passau), B1 federal highway (Wien-Amstetten-Linz-Salzburg) and B309 (Enns-Steyr) federal highway, what allows outstanding access to the international road network. The railway connections are directly derived from one of the most important Austrian lines – the West Railway (both normal line and high-speed line).

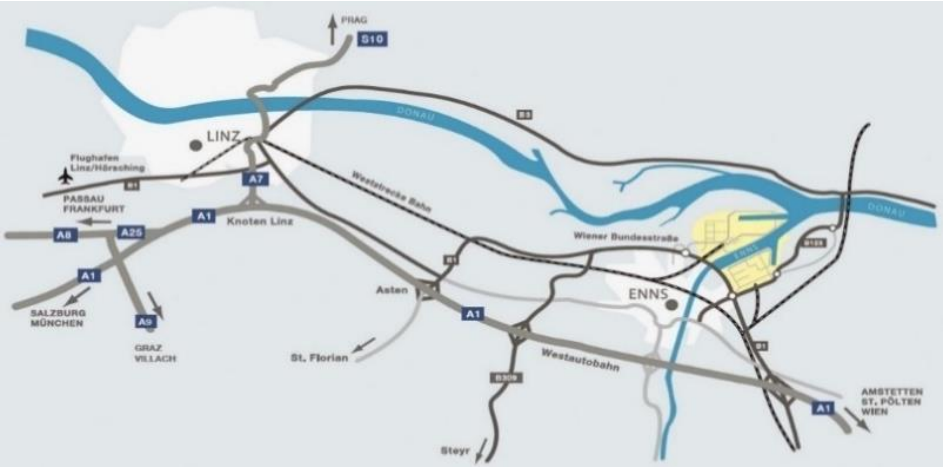


Figure 3: Trimodal infrastructure Ennshafen port

- Direct connection to the highway (A1 west expressway)
- Direct railway connection (west railway)
- Strategically favourable position on the Rhine-Main-Danube-waterway
- TEN-T Core Node
- Trimodal cargo handling
- Access to the neutral infrastructure

Port infrastructure

Port Area: total 352 ha; 110 ha are owned by the port authorities (Ennshafen OÖ GmbH und Ennshafen NÖ GmbH) and 242 ha are owned by other private companies; actual in total about 50 ha are not covered with assets or other investments.

- 2 basins (basin west-upper Austria, basin east-lower Austria) and several quays along the river side Enns
- Port service time 7/24 – 168h/w
- Cargo handling: over 1 mil t/a
- Container terminal: about 400.000 TEU/a with 4 gantry cranes (trimodal)
- Waterside terminals: 7 for block trains
- Heavy lift and out of gauge handling capacity is possible
- Total length of vertical quays 2780 m
- Max. number of vessels processed at the same time: 16
- Max. number of barges can be processed in waiting areas / undeveloped quays: 34
- Mooring area: 42.000 m²
- 6 road entrances, with double lines and two main rail entrances access
- 17 km rail tracks (rail network within the port area), many different users and owners

- Storage area with different dedication is available
- Special storage capacity for liquid cargo: 3000 m² for LPG, 6000 m³ for biodiesel and bio-oils, 600 units for cars (equivalent) near the RO-RO ramp
- Bunkering station vessel/barge
- Tank stop for trucks for LNG
- Shore side power supply and waste reception
- Maximum draught: the figure of 2,7 m everywhere in the port has to be fulfilled; there are a lot of spaces with more depth

Cargo handling

The Ennshafen port is a centre of service, logistics, and excellence in handling and warehousing. Its high-performance infrastructure, roads, quays, and railway systems provide companies with neutral access to various modes of transportation.

With a quayside extending some 2,500 meters, cargo handling conditions are ideal.

Services such as transhipment, heavy cargo transhipment, warehousing, packaging, and bunkering are provided by operators located in the Ennshafen port.

At Ennshafen port various types of goods can be handled like: fertilizers, animal feed stuff, grains, agricultural products, wood, salt, ores, iron and steel, scrap metal, high and heavy pieces, waste materials, gas (LPG), all kind of cargo in containers.

Figure 4: Handling companies of Ennshafen port

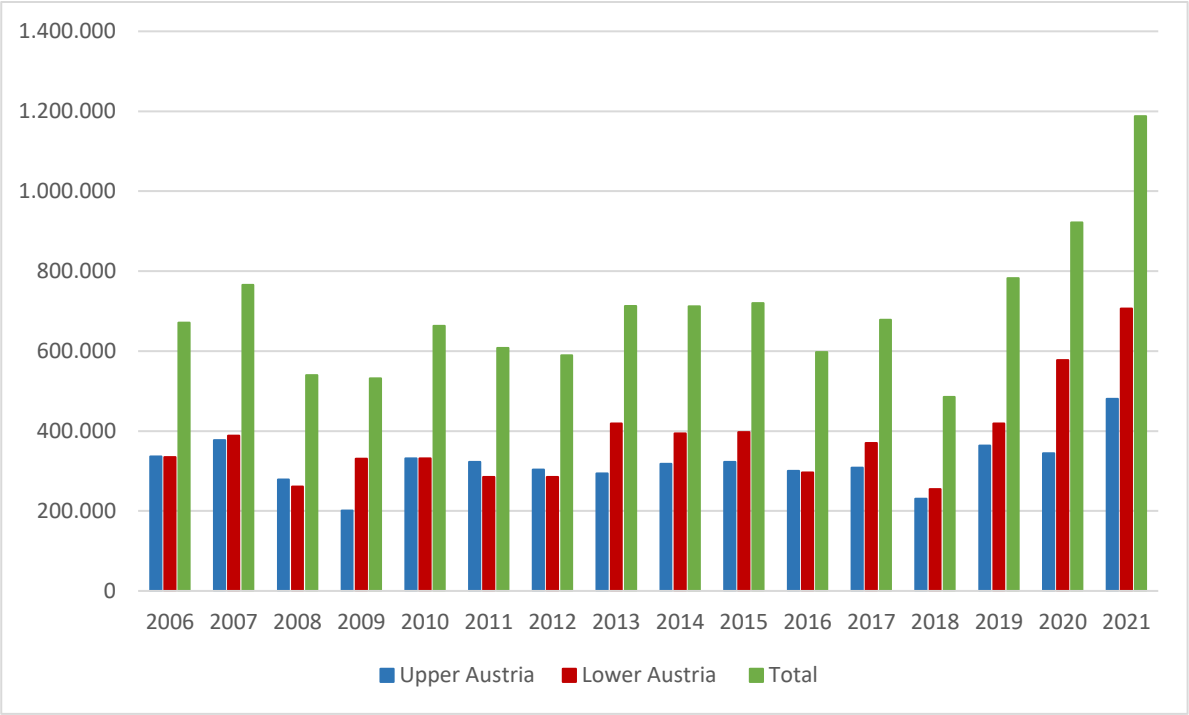


Figure 5: Transhipment Ennshafen port 2006-2021

Port storage facilities

The private business companies in Ennshafen port offer various storage (open/covered) possibilities, but no detailed information can be provided.

Container terminal

As a multi-modal logistics hub, the Container Terminal Enns (CTE) is a major hinterland terminal for the big sea ports. Spanning some 275,000 square meters and with a capacity of 500,000 twenty-foot equivalent units (TEUs), it has some of the most modern transhipment infrastructure in Austria. Block train rail connections, modern gantry cranes, and a full range of services ensure optimum container handling.

RO-RO Terminal

The RO-RO terminal offers best-in-class service for heavy lift and project cargo; vehicles and agricultural machines can drive straight on and off vessels, with no need for additional facilities. Transhipment to the last mile is an efficient method.
Our RO-RO terminal speeds up this transhipment process even further. RO-RO logistics makes it possible to avoid time-consuming and expensive road transportation over long distances with circuitous routes. The terminal guarantees frictionless and affordable passage of goods for RO-RO transportation, with fast truck access routes ensuring short customs clearance times. The transhipment operations are run on a flexible schedule, starting as soon as the vessel arrives.

ENNSHAFEN port SHORT FACTS

- perfect location in a strong economic area
- TEN-T core node in the Rhine-Danube-Corridor
- total area of 3,530,000 sqm
- quaylength of 2.5 km with direct access to the railway system
- feeder line with 38 km track length
- full service for transshipment by the settled companies and other partners
- roll-on/roll-off terminal
- most modern container terminal in Austria
- 65 companies with approx. 2,700 employees
- „public private partnership“ between the public sector and private enterprise
- logistics hub including two business parks
- free space to accomodate business startups and projects, current investments at the site

Figure 6: Ennshafen port - short facts

4 Status Quo of the port in its international context

4.1 European Context with relevance to the port

The Ennshafen port is embedded into the international strategic framework of inland waterway business on the river Danube and as such a part of the Rhine-Danube TEN-T Corridor; the Ennshafen port is one of two Core Nodes in the Austrian Section of the Danube on the RD-Corridor-waterway.

Thus, all the international European strategies, regulations, directives, programs and projects regarding the inland waterway and port business are relevant for Ennshafen development and play a key role in the frame and target setting for the next years / decades.

In the following section, an overview of some of the most important items of this international framework are given, especially those, which are more relevant for development of Ennshafen port for the future. Most of the (basic) conditions and requirements, which are compulsory for high-performing ports are fulfilled (in the Sense of TEN-T, etc) but still challenging items are left, which have been defined more recently and are coming up for the next future. Thus, the following paragraphs even give an overview what are missing links and need improvements or investments in the port in the coming years.

The following chapter gives only an excerpt, more details of the based documents.

TEN-T-Regulation / Regulation (EU) No 1315/2013 of 11.12.2013 on Union guidelines for the development of the trans-European network:

- The core network should be identified and appropriate measures should be taken for its development by 2030 as a priority within the framework provided by the comprehensive network. The core network should constitute the backbone of the development of a sustainable multimodal transport network and should stimulate the development of the entire comprehensive network. It should enable Union action to concentrate on those components of the trans-European transport network with the highest European added value, in particular cross-border sections, missing links, multimodal connecting points and major bottlenecks serving the objective, set out in the White Paper, of reducing greenhouse gas emissions from transport by 60 % below 1990 levels by 2050.
- In order to establish the core network in a coordinated and timely manner, thereby making it possible to maximise the network benefits, Member States concerned should ensure that appropriate measures are taken to finalise the projects of common interest by 2030. With respect to the comprehensive network, Member States should make all possible efforts with the aim of completing it and complying with the relevant provisions of the guidelines by 2050.
- In order to contribute to the climate reduction targets of the Transport White Paper of a 60 % cut in greenhouse gas emission below 1990 levels by 2050, the greenhouse gas impacts of projects of common interest I the form of new, extended or upgraded transport infrastructures should be assessed
- The trans-European transport network shall strengthen the social, economic and territorial cohesion of the Union and contribute to the creation of a single European transport area which is efficient and sustainable, increases the benefits for its users and supports inclusive growth. It shall demonstrate

European added value by contributing to the objectives laid down in the following categories:

- Cohesion trough:
  - Accessibility and connectivity of all regions of the Union, including remote, outermost, insular, peripheral and mountainous regions, as well as sparsely populated areas;
  - Reduction of infrastructure quality gaps between Member States, for both passenger and freight traffic;
  - Interconnection between transport infrastructure for, on the one hand, long-distance traffic and, on the other, regional and local traffic;
  - A transport infrastructure that reflects the specific situations in different parts of the Union and provides for a balanced coverage of all European regions;
- Efficiency trough:
  - The removal of bottlenecks and bridging of missing links, both within the transport infrastructures and at connecting points between these, within Member States´ territories and between them,
  - The interconnection and interoperability of national transport networks,
  - Optimal integration and interconnection of all transport modes,
  - The promotion of economically efficient, high-quality transport contributing to further economic growth and competitiveness,
  - Efficient use of new and existing infrastructure,
  - Cost-efficient application of innovative technological and operational concepts;
- Sustainability trough:
  - Development of all transport modes in a manner consistent with ensuring transport that is sustainable and economically efficient in the long term,
  - Contribution to the objectives of low greenhouse gas emissions, low-carbon and clean transport, fuel security, reduction of external costs and environmental protection,
  - Promotion of low-carbon transport with the aim of achieving by 2050 a significant reduction in CO2-emissions, in line with the relevant Union CO2 reduction targets;
- Increasing the benefits for its users through:
  - Meeting the mobility and transport needs of its users within the Union and in relations with third countries,
  - Ensuring safe, secure and high-quality standards, for both passenger and freight transport,
  - Supporting mobility even in the event of natural or man-made disasters, and ensuring accessibility to emergency and rescue services,
  - The establishment of infrastructure requirements, in particular in the field of interoperability, safety and security, which will ensure quality, efficiency and sustainability of transport services,
  - Accessibility for elderly people, persons of reduced mobility and disabled

The TEN-T regulation is currently in a revision process and may bring up some changes in the details of targets and framework setting. But the general direction is still the same the improve the quality of corridor elements (lines and nodes). This revision process is still under monitoring and can bring some changes in the details of requirements for the Ennshafen port development

plan, but no general new direction (e.g. requirement to erect an LNG bunkering possibility until 2030 may be changed to a more “open description”).

CEF / Connection Europe Facility - Regulation (EU) No 1316/2013 of 11.12.2013 establishing the Connecting Europe Facility (CEF)

- The Connecting Europe Facility (CEF) is a key EU funding instrument in delivering the European Green Deal and an important enabler towards the Union’s decarbonisation objectives for 2030 and 2050. It supports the development of high performing, sustainable and efficiently interconnected trans-European networks in the fields of transport, energy and digital services. CEF investments fill the missing links in Europe's energy, transport and digital backbone.
- The Connecting Europe Facility (CEF) for Transport is the funding instrument to realise European transport infrastructure policy. It aims at supporting investments in building new transport infrastructure in Europe or rehabilitating and upgrading the existing one.
- Trans-European Networks for Transport (TEN-T) policy objectives foresee:
    - completion by 2030 of the Core Network, structured around nine multimodal Core Network Corridors
    - completion by 2050 of the Comprehensive Network in order to facilitate accessibility to all European regions.
- CEF Transport focuses on cross-border projects and projects aiming at removing bottlenecks or bridging missing links in various sections of the Core Network and on the Comprehensive Network (link), as well as for horizontal priorities such as traffic management systems. CEF Transport also supports innovation in the transport system in order to improve the use of infrastructure, reduce the environmental impact of transport, enhance energy efficiency and increase safety.
- The budget for CEF Transport is of €25.81 billion (including €11.29 billion for cohesion countries).

Rhine-Danube Corridor / 4th Work Plan of the European Coordinator (May 2020)

- The 4th version of the work plan of the RD-Corridor highlights the main results of the development and defines the priority work areas to ensure a multimodal, seamless and environmentally friendly Rhine-Danube CNC by 2030. It is of utmost importance to use the remaining time to deliver a technically compliant and operationally functioning Corridor. Based on the objectives set in Regulation (EU) 1315/2013, the Corridor infrastructure focuses on greening the impact of transport to ensure growth and competitiveness, increasing energy efficiency and safety.
- Compliance 2019 with the technical infrastructure parameters of the TEN-T guidelines by 2030 (status quo): Regulation (EU) 1315/2013 lists compulsory targets to be reached for the infrastructure requirements per mode for the Core Network Corridors to be met by December 2030 at the latest. To assist the monitoring towards achieving these target values, Key Performance Indicators (KPI) are defined for all modes. A compliance analysis is regularly performed to determine for each Member State along the Rhine- Danube Corridor the current and expected status of the infrastructure and the actual compliance with the standards stipulated by the Regulation. The results of the analysis are shown in Table 1. It should be acknowledged that although infrastructure is compliant, other parameters and operational restrictions, such as safety, emission or capacity issues may still remain to be addressed, in order to reach the EU’s goal of an efficient and sustainable

single European transport area. This is, for example, highly relevant for improving the situation at border crossings, where long waiting times are a real obstacle for freight rail traffic (e.g., HU/RO border).

Port compliance / INLAND PORTS

KPI	AT	DE	SK	HU	RO	BG	HR	Total
Rail connection	100%	100%	100%	50%	83%	100%	100%	89%
CEMT connection	100%	100%	100%	100%	100%	100%	100%	100%
Clean fuels	50%	0%	0%	0%	0%	50%	0%	5%
Term. Availability	100%	100%	100%	100%	100%	100%	100%	100%

- Currently, 18 out 19 ports do not have supply alternative fuels. At the moment, only the Port of Ruse (BG) has LNG bunkering facilities (since 2016). In addition, the Port of Enns (AT) has LNG fuel supply facilities since 2018, but currently only for trucks as ships cannot berth on the water side of the facility, and the facility does not have the necessary equipment to supply LNG to vessels.

EU Green Deal Initiative - Overview (source: EFIP / Dec 2019)

- On 11 December 2019 the European Commission published its Communication (and Annex) on a European Green Deal, outlining the different initiatives that it plans to propose in the coming months and years. The Green Deal is meant to be a 'response' to the challenges stemming from climate change and the world population's impact on the planet and to make the EU economy more sustainable overall. Furthermore, all EU actions or policies are now expected to contribute to the European Green Deal objectives. The Communication focuses on several different policy areas including climate, energy, the circular economy, mobility, agriculture, biodiversity chemicals and funding. Some of the key headline initiatives include a Climate Law with a 2050 carbon neutrality goal (March 2020), an EU Industrial Strategy (March 2020), a new Circular Economy Action Plan (March 2020), a chemicals strategy for sustainability (summer 2020) and a strategy for sustainable and smart mobility (sometime in 2020). The Communication says that today's publication is an "initial roadmap of the key policies and measures needed to achieve the European Green Deal. It will be updated as needs evolve and the policy responses are formulated".
- The Communication outlines actions in several different policy areas, including climate action, energy, the circular economy, buildings and energy efficiency, mobility, an environmentally-friendly food system, biodiversity, pollution and chemicals, green finance, national budgets, research and innovation, education and training, the EU as a global climate leader, and engaging civil society. This document however acts more as a list of different actions and initiatives and more details of the content of these initiatives are expected at a later date.
- Increasing the EU's climate ambition for 2030 and 2050 by …. (excerpt): a European Climate Law; the Commission will present an impact assessment plan to increase the 2030 emission target of 40% to at least 50%; the Commission will review and propose revisions of any legislation that would need to be amended, including the Emissions Trading System (expanding it to new sectors), emission targets for sectors outside the

System; the Commission will review the bloc's 2030 renewable energy and energy efficiency targets; Energy Taxation Directive will be revised by June 2021 to focus on environmental issues; The Communication says that to achieve climate neutrality, a 90% reduction in transport emissions is needed by 2050; the Alternative Fuels Infrastructure Directive will be reviewed to accelerate the deployment of zero- and low-emission vehicles and vessels; ….

AFID / Directive 2014/94/EU of 22.10.2014 on the DEPLOYMENT OF ALTERNATIVE FUELS INFRASTRUCTURE

- The TEN-T guidelines also require that inland and seaports, airports and roads of the core network established by Regulation 1315/2013 provide for the availability of alternative fuels. In the CEF, the TEN-T funding instrument makes the deployment on the TEN-T Core Network of those new technologies and innovation, including infrastructure for alternative clean fuels, eligible for grants. In addition, the deployment of infrastructure for alternative clean fuels on the broader comprehensive network will be able to receive financial assistance from the CEF in the form of procurement and financial instruments, such as project bonds.
- Shore-side electricity can serve maritime and inland waterway transport as clean power supply, in particular in maritime and inland navigation ports where air quality or noise levels are poor. Shore-side electricity can contribute to reducing the environmental impact of sea-going ships and inland waterway vessels. Member States shall ensure that the need for shore-side electricity supply for inland waterway vessels and seagoing ships in maritime and inland ports is assessed in their national policy frameworks. Such shore-side electricity supply shall be installed as a priority in ports of the TEN-T Core Network, and in other ports, by 31.12.2025, unless there is no demand and the costs are disproportionate to the benefits, including environmental benefits.
- LNG is an attractive fuel alternative for vessels to meet the requirements for decreasing the sulphur content in content in marine fuels. ….. A core network of refuelling points for LNG at maritime and inland ports should be available at least by the end of 2025 and 2030, respectively. Refuelling points for LNG include, inter alia, LNG terminals, tanks, mobile containers, bunker vessels and barges. The initial focus on the core network should not rule out the possibility of LNG also being made available in the longer term at ports outside the core network, in particular those ports that are important for vessels not engaged in transport operations. The decision on the location of the LNG refuelling points at ports should be based on a cost-benefit analysis including an examination of the environmental benefits. Applicable safety-related provisions should also be taken into account. The deployment of LNG infrastructure provided for in this Directive should not hamper the development of other potentially upcoming energy-efficient alternative fuels.
- LNG, including liquefied biomethane, might also offer a cost-efficient technology allowing heavy-duty vehicles to meet the stringent pollutant emissions limits of Euro VI standards ….; the TEN-T Core Network should be the basis for the deployment of LNG infrastructure as it covers the main traffic flows and allows for network benefits. When establishing their networks for the supply of LNG to heavy-duty motor vehicles, Member States should ensure that refuelling points accessible to the public are put in place, at least along the existing TEN-T Core Network, within adequate distances taking into account the minimum range of LNG heavy-duty motor vehicles. As an indication, the

necessary average distance between refuelling points should be approximately 400 km; the deployment of the refuelling points both for LNG and CNG should be adequately coordinated with the implementation of the TEN-T Core Network; An appropriate number of LNG and CNG refuelling points accessible to the public should be put in place by 31.12.2025, at least along the TEN-T Core Network existing at that date, after that date, on the other parts of the TEN-T Core Network where these are made accessible to vehicles

- The AFID-Directive is currently under revision and may bring some changes in the detailed requirements (e.g., corridor approach instead of requirement for each TEN-T port alone). This process is still ongoing and under permanent monitoring to couple with the details of the elaborated port development plan – but the general direction of the port development plan will not be changed at all.

SSMS - Sustainable and Smart Mobility Strategy (9.12.2020 / European Commission COM(2020) 789 final)

- The European Commission presented its 'Sustainable and Smart Mobility Strategy' together with an Action Plan of 82 initiatives that will guide the work for the next four years. This strategy lays the foundation for how the EU transport system can achieve its green and digital transformation and become more resilient to future crises. As outlined in the European Green Deal, the result will be a 90% cut in emissions by 2050, delivered by a smart, competitive, safe, accessible and affordable transport system.
- The EU Green Deal and the Sustainable and Smart Mobility Strategy underline the need to increase the modal share of IWT by 25% by 2030 and by 50% by 2050 and recognize that IWT together with rail transport is central to the decarbonisation of the European transport system;
- Milestones for a smart and sustainable future
    - by 2030 ….
        - at least 30 million zero-emission cars will be in operation on European roads
        - 100 European cities will be climate neutral
        - high-speed rail traffic will double across Europe
        - scheduled collective travel for journeys under 500 km should be carbon neutral
        - automated mobility will be deployed at large scale
        - zero-emission marine vessels will be market-ready
    - by 2035 ….
        - zero-emission large aircraft will be market-ready
    - by 2050 ….
        - nearly all cars, vans, buses as well as new heavy-duty vehicles will be zero-emission
        - rail freight traffic will double
        - a fully operational, multimodal Trans-European Transport Network (TEN-T) for sustainable and smart transport with high-speed connectivity

Fit for 55 Program (14.7.2021) / "reducing net greenhouse gas emissions by at least 55 % by 2030"

- The Fit for 55 package consists of a set of inter-connected proposals, which all drive towards the same goal of ensuring a fair, competitive and green transition by 2030 and beyond. Where possible existing legislation is made more ambitious and where needed new proposals are put on the table. Overall, the package strengthens eight existing pieces of legislation and presents five new initiatives, across a range policy areas and economic sectors: climate, energy and fuels, transport, buildings, land use and forestry.
- The Fit for 55 Package aims to deliver the EU's increased emission reductions target to the benefit of all Europeans and to create opportunities to take part in the transition, help those most in need, and drive stronger overall emissions reductions. It will also support the EU's green recovery from the pandemic, help spread environmental standards beyond EU borders and boost innovation in the products and technologies of the future.
- Next to carbon pricing, other measures are needed to put transport on a firm path to zero emissions, and drive down air pollution as transport represents almost a quarter of the EU's greenhouse gas emissions and is the main cause of air pollution in cities. Emissions remain higher than in 1990 and a 90% reduction in overall transport emissions by 2050 will be required to reach climate neutrality.
- The Fit for 55 package therefore includes four proposals promoting cleaner vehicles and fuels in a technologically neutral way: the revision of the CO2 emission standards; the revision of the Alternative Fuels Infrastructure Regulation; ReFuelEU Aviation and FuelEU Maritime

NAIADES III (24.6.2021) / "Boosting future-proof European inland waterway transport" [COM(2021) 324]

- The communication outlines a total of 35 actions that will drive the IWT sector to growth and an expanded role in the European transport sector. A strong role is identified for inland ports and initiatives that support ports in achieving the European Green Deal. NAIADES III sets out the initiatives and actions that the EU will take over the coming years to ensure that the IWT sector improves and grows in a future-proof manner.
- Inland Waterway Transport Action Plan for 2021 – 2027 – focusing on two core objectives:
  - Shifting more freight transport to inland waterways
  - Setting the sector on an irreversible path to zero-emission

  underpinned by a paradigma shift towards further digitalisation as well as accompanying measures to support the current and future workforce.

European Green Deal [COM(2019)640 final]

- *Sustainable and Smart Mobility Strategy [COM(2020)789 final], adopted on 9.12.2020 "inland waterway transport should increase by 25 % by 2030 and by 50 % by 2050"*
- *Zero Emission Mobility is the major objective of the Zero Pollution Action Plan [COM(2021)400 final], adopted on 12.5.2021*

PLATINA3 (www.platina3.eu)

- The EU-funded PLATINA3 project will provide for targeted coordination and support activities to promote inland waterway transport (IWT) in Europe. Starting from January 2021, the project will run for 30 months. In this period the project will make the bridge towards future research, innovation and implementation needs within IWT in Europe.

The main objective is to provide the knowledge base for the implementation of the EU Green Deal in view of further development of the European Commissions' IWT action programm (NAIADES) towards 2030.

- The platform will be a catalyst for awareness, stakeholder engagement and uptake of outcomes from related national and European projects and initiatives. PLATINA3 will consolidate their findings, assess their impacts and gaps. Stakeholders are invited to participate actively in our series of 6 Stages, each of which will accentuate relevant topics.
- The consortium partners are actively involved in international research and innovation activities in the field of IWT. They have an excellent position in networks with other organizations and projects, facilitating the analysis of the state-of-play on the one hand, and the dissemination of the results of PLATINA3 on the other hand.
- The PLATINA3 consortium aims to improve the impact and broadening stakeholder engagement in support of transport research and innovation. Therefore, the project addresses priority topics for the success of IWT according to 4 segments:
    - Integration & digitalization of IWT in view of modal shift & synchromodality;
    - Zero-emission, automated & climate resilient fleet;
    - Skilled workforce anticipating to zero-emission & automation;
    - Smart & climate resilient waterway and port infrastructure with clean energy hubs.

WATER FRAMEWORK DIRECTIVE (June 2020)

- The EU Commission confirmed that the Water Framework Directive will remain as is. The deadline will remain 2027. Keeping this deadline will put pressure on Member States to reach good status in all water bodies. The Member States no longer have the right to exemptions to defer measures to the next planning cycle, meaning that all WDF measures are to be implemented by 2027. The ENVI Committee of the European Parliament has published a draft motion on the implementation of EU Water Policy.
- Regarding IWT, the document notes that "the shift from road freight to inland waterways should go hand in hand with support to sustainable, alternative fuels and technology for inland navigation to reduce GHG emissions and to avoid deterioration in the quality of water bodies." (e.g., OPS is forced).

EUSDR / Danube Region Strategy

The EU Strategy for the Danube Region (EUSDR) is a macro-regional strategy adopted by the European Commission in December 2010 and endorsed by the European Council in 2011. The Strategy was jointly developed by the Commission, together with the Danube Region countries and stakeholders, in order to address common challenges together. The Strategy seeks to create synergies and coordination between existing policies and initiatives taking place across the Danube Region.

4.2 Latest international project results / general situation for whole Danube region

DTP-project "DAPhNE"
A bunch of outcomes and results have been elaborated during this project. The following items represent a concluded summary of these deliverables and give the framework for port developments in the whole Danube region.

1) Connect Danube ports with new routes and new markets ("Belt & Road Initiative" - BRI)
2) Increase competitive position in respect to road and rail by attracting new markets and fostering multimodality
3) Use experience in project preparation to improve the situation by using public and EU funds
4) Use public, EU and private funds (PPP) to renew infrastructure, suprastructure, equipment and hinterland connections and prioritize investments
5) Increase coopetition levels between ports, and especially between ports in proximity
6) Attract industrial facilities in or adjacent to port areas
7) Move towards specialized markets
8) Provide life-long training and specialization in modern port operation and management
9) Proactive attitude towards "greening" of ports
10) Focus on multimodality (by offering a wide range of road and rail services in port areas)
11) Prepare mitigation measures to combat market volatility, seasonal effects and unpredictability
12) Use modern technologies and digitisation to reduce bureaucracy and increase efficiency
13) Create redevelopment policies to optimize the facilities and available space
14) Create long-term port strategies using skilled professionals and cooperation/networking possibilities
15) Join forces for common cause in port and shipping development
16) Optimize port development and capacity through pricing
17) Rehabilitation of port facilities (in order to lower the logistic costs and keep the industries in or near ports)
18) Matching the demand and development plans and seek for realistic investment options
19) Increase awareness of port importance and attract new skilled workforce
20) Improve and maintain the treatment of ports as public goods of strategic national importance

4.3 Findings & reflection of Ennshafen port regarding INTERNATIONAL context

- TEN-T: most of items are fulfilled; improvement for OPS is necessary (until 2025) to serve all kinds of vessels within the port
- plans regarding CO2-neutrality must be developed
- infrastructure for CO2-friendly fuels shall be developed (eg efuels)
- AFID (old version): LNG (and other forms of bio-LNG, … Hydrogen, …) for vessels [check revison]
- SSMS: Flagship 1 (boosting the uptake of zero-emission vehicles, vessels and aeroplanes, renewable & low-carbon fuels and related infrastructure), flagship 2 (creating zero-emission airports and ports) and flagship 4 (greening freight transport)
- prepare solutions for enforced waste water regulations (CDNI will get compulsory on the Danube)

5 Status Quo of the port in its national context

5.1 Strategies and programs in national, regional and local context

Ennshafen port is one of four public ports on the Austrian Danube (Linz, Enns, Krems and Vienna). On the one hand, these ports are subject to Austria-wide regulations (statutory regulations such as the Shipping Act) and special national programs (e.g., the Austrian government program), on the other hand federal state-specific issues and regional framework conditions also come into play. A selection of important relevant regulations is summarized below.

Current government program Austria 2020 – 2024 (relevant excerpts)

- Climate protection and energy: climate neutrality in Austria by 2040; by 2030 electricity to 100% (national balance sheet) from renewable energy sources; phase-out from fossil fuels in space heating; Austria consistently positions itself in the group of climate protection pioneers in Europe; Technology offensive, digitization and innovation – Austria to become number one hydrogen nation
- Transport and infrastructure: decarbonisation in line with the Paris climate goals is essential; mobility master plan; decarbonization of road transport; Strategy for the use of alternative energy sources in mobility and in freight transport with a focus on the climate balance (e-mobility, hydrogen, synthetic fuels)
- Expansion and support program for "green gas" (biomethane, green hydrogen and synthetic gas based on renewable electricity)
- Shore power: if technically possible, mandatory shore power connections at the public moorings on the federal waterway network and the examination of a package of measures by the federal government to promote shore power connections at private boat moorings on lakes and rivers)
- Checking the use of environmentally friendly alternative fuels for shipping
- Commitment to fair vessel diesel taxation at EU level
- Maintain good shipping conditions and integrate shipping into logistic chains

Austrian Recovery and Resilience Plan 2020 -2026, Vienna, 30.4.2021 (relevant excerpts)

- Due to the corona pandemic, the European Union launched the recovery instrument "Next Generation EU" in the amount of €750 billion and the recovery and resilience facility (ARF) contained therein with a volume of €672.5 billion (of which €312.5 billion in grants) created a joint financing instrument to cushion the effects of the pandemic on the economy and society in the coming years. The Recovery and Resilience Facility is based on six pillars:
    - Transition to a green economy
    - Digital transformation
    - Smart, sustainable and inclusive growth and jobs
    - Social and territorial cohesion
    - Health and resilience
    - Strategies for the next generation, children and young people, including education and skills.

Mobility Masterplan 2030 for Austria (15.7.2021) – relevant excerpts

- The mobility master plan 2030 shows ways to AVOID, SHIFT and IMPROVE traffic. The aim is to achieve climate neutrality by 2040. In order to achieve climate neutrality in 2040, CO2 emissions from transport must be reduced from around 24 million tCO2eq (as of 2019) to almost zero tCO2eq by 2040. This means that the previous sector target of 15.7 million tCO2eq in 2030 from the "mission2030 climate and energy strategy" must also be undercut (> will be adjusted in the new Austrian climate law).
- In the area of goods mobility, a decoupling of goods traffic growth and economic growth was assumed. Assuming economic growth of 40% by 2040, the goal is for freight traffic to increase only moderately by up to 10%.
  Modal split in freight transport according to transport performance (tonne-kilometres)

	2018	Target 2040 (EU-unanimity)
Road	67 %	63 -57 %
Rail	31 %	34 – 40 %
Waterway	2 %	3 %

- In freight transport (in the future / 2040), the range of up to around 300 km daily mileage will be largely battery-electric. Hydrogen will also play a role for heavier vehicles and longer ranges. In the transit area, apart from the particularly efficient freight transport on electrified rails, there are numerous activities in Europe in the direction of electric road systems. Here, the overhead contact line appears to be a promising technological option alongside the other zero-emission technologies. Technologically, the same applies to ships and aircraft in freight transport as to passenger transport: apart from a few niches for battery and hydrogen applications, this is where renewable and climate-neutral fuels are most likely to be used.
- By 2040, freight transport will be organized in a climate-neutral, sustainable and crisis-proof manner as the central basis of a modern, collaborative and inclusive economy. Appropriate European cooperation will increase the rail modal split to 40% (equivalent to around 35 billion tonne-kilometres); Austria alone could only achieve a moderate increase (34%). Rail freight transport and waterways are core elements for a sustainable Austrian and European freight transport system due to their system-related advantages (mass capacity, environmental compatibility, traffic safety, energy efficiency, resilience). Coupled with economic and energy efficiency, rail and inland waterways are to become central components of climate-neutral supply chains by 2040. Solutions include single wagonload traffic, which in Austria is mainly handled via railway sidings, unaccompanied combined traffic, accompanied combined traffic as rolling or floating country roads and freight transport in block trains (classic point-to-point connections) as well as ship transport in individual and group form. On a regional and urban level, new forms of transport organization with small-scale transhipment options and transport containers are required for the last mile. In addition, better framework conditions are necessary in the areas of cost efficiency, logistics chains and flexibility of transport services in terms of quantities, punctuality, adherence to schedules and reliability. Shifts to waterways also require reliable and internationally harmonized infrastructure development (“good navigation status”). The digitization of the modes of transport and their interfaces is intended to make transport capacities and multimodal supply chains more efficient. To this end, uniform technologies are being developed nationally and internationally that

facilitate access, processing and use of the rail and waterway systems (booking and usage platforms).

- In order to achieve climate neutrality by 2040, the vehicle population must be converted to emission-free drives in good time. This results in the following zero-emission targets for new registrations for road traffic (freight transport sector):
  - 100% of all new LNF- registrations emission-free from 2030 at the latest, with a consistent further reduction of the CO2 fleet limit values at European level, and earlier is possible
  - 100 % of all new SNF-registrations (less than 18 tons) emission-free from 2030,
  - 100 % of all new SNF-registrations (more than 18 tons) emission-free from 2035
- The vehicle run-up and the nationwide expansion of the infrastructure are taking place in parallel. As a result, the necessary infrastructure for emission-free operation for all vehicle types must be built in stages by 2035 at the latest.
- The goal of climate neutrality by 2040 must also be achieved in rail transport, inland waterway transport and air transport. In rail transport, this is mainly achieved with line electrification. In shipping and aviation, i.e., those areas in which emission-free technologies cannot cover all applications from today's perspective, climate-neutral fuels from renewable energies are also used:
  - 100 % Rail traffic by 2040 climate-neutral, extensive decarbonization by 2035
  - 100 % of inland vessels climate-neutral by 2040,
  - 100 % of aircraft to be climate-neutral by 2040.
- A path to climate neutrality in the transport sector by 2040 was described and calculated for Austria. The determined primary energy quantity of 135 petajoules in 2040 results in a final energy quantity of around 109 petajoules per year (for land transport including shipping, off-road) as a result of the technologies used. For the electricity sector, this means an additional expansion requirement of around 30 terawatt hours for the period up to 2040 (87% of this for direct electrification, almost 13% for the production of renewable hydrogen). This requires highly ambitious expansion plans for renewable energy in Austria, especially in the period from 2030 to 2040. From today's perspective, however, this ambitious goal can only be achieved if the kerosene used in air traffic in Austria does not also come from these renewable sources in Austria got to.
- Due to the high conversion losses and low efficiencies when using electricity-based synthetic fuels, disproportionately larger amounts of renewable energy are required for their production. From today's perspective, the aviation sector will therefore remain dependent on international imports.
- Inland navigation for people and goods: Inland vessels and their engines are very durable, which is why large-scale technology changes are associated with longer transition periods. There are currently different approaches towards zero-emission vessels, but the use of new technologies must be coordinated accordingly due to cross-border use. Renewable fuels could be used in the short term, provided they are economically available in the necessary quantities. Electric drives are particularly suitable for small vessels and short distances. For longer distances, interchangeable energy storage systems are an option, but require a corresponding onshore supply infrastructure. Their expansion for idle vessels and possibly also for charging battery systems is in preparation. Furthermore, the shore power supply for inland shipping is to be further expanded as a CO2 reduction measure. Hydrogen applications are in the pilot

phase. Finally, liquefied biogas or synthetic methane could also be used, provided methane escapes into the atmosphere ("methane slip"). Technology decisions are to be made on the basis of international research and development projects. In order to reduce CO2 emissions in the short term, an admixture is expedient until then. The respective roll-out is supported with a package of measures consisting of legal requirements, infrastructure development and incentives. At the European level, Austria will campaign for fair vessel diesel taxation with a steering effect.

Master planning by viadonau for shore power supply in Austria (2019-2021)

- Elaboration of planning principles for the development of shore power systems along the Austrian Danube (land and ports), both for freight and passenger vessels
- Elaboration of technical basics and organizational topics on rough feasibility level by expert planners at the Danube River
- Very rough economic efficiency estimates
- Transfer of further processing to federal state working groups and individual projects (ports)

Danube Action Program of bmvit/bmk (old version, currently under revision; new version still in 2022?)

- The Danube waterway is a location factor, as stipulated in the Danube Action Program of the bmvit/bmk until 2022: A modern infrastructure is an indispensable prerequisite for the success of Austria as a business location. This also includes the Overall Transport Plan for Austria 2012 (G-VP), to whose target criteria - social, safe, environmentally friendly and efficient - Danube navigation can make a particularly strong contribution. For this reason, the Danube waterway is recognized and promoted in the Overall Transport Plan for Austria 2012 as an important element of a multimodal, cross-border transport network.
- Action Program for Danube Navigation until 2022 in line with the EU program for inland navigation (NAIADES-II) and the EU Strategy for the Danube Region provides for the development of ports as trimodal transhipment centers: The Action Program aims to support the development and implementation of focused strategies and mutual learning. In addition, the integrative approach of the action program concerns the integration of the waterway into the overall transport system. The action program shall actively support the sustainable integration of Danube navigation into multimodal logistics chains.
- Objectives of the action program for the shipping sector: An efficient transport system is an important basis for economic progress and social prosperity. On the one hand, a sustainable transport system causes low emissions and the lowest possible number of accidents; on the other hand, it minimizes the consumption of resources while efficiently handling the increasing volume of traffic. Danube navigation can make a significant contribution to such a transport system, as it has the lowest external costs of all transport modes and a large available transport capacity. This makes it an important element of sustainable and resource-efficient multimodal transport networks in Europe.

Economic and Research Strategy of the State of Upper Austria #upperVISION2030 (2020 – relevant excerpt)

- Sustainable Solutions: Our state will be perceived as a livable and sustainably operating industrial region in 2030. The responsible use and reuse of resources are essential elements in this. Business and industry are an essential part of the solution to future challenges and are positioned at the top of the global field.
- New Mobility: In 2030, we have successfully mastered the structural change in the field of mobility. Due to their competencies, the companies continue to be internationally sought-after partners and successful suppliers of mobility solutions and components. The "Roadmap to Efficient Mobility" ensures that the know-how of all stakeholders is bundled in order to retain technological leadership in mobility in the future.
- Fields of action "Efficient and sustainable industry and production" and "Connected and efficient mobility

Upper Austrian spatial planning strategy "#upper REGION2030" (May 2020 – relevant excerpt)

- Guiding strategy 4 "Rethinking mobility": Sustainable mobility must also be promoted in freight transport. Targeted site development in areas best suited for freight transport and logistics is intended to reduce environmental pollution and congestion of existing infrastructures.
- Make interregional transport links more attractive for rail-bound passenger and freight traffic
- Measure M16.01: Expansion of multimodal nodes in freight transport to shift freight transport to environmentally friendly transport options and to exploit the system-related advantages of the individual transport modes

Upper Austrian energy strategy „Energieleitregion OÖ2050" (2020 – relevant excerpt)

- Photovoltaic strategy for Upper Austria with expansion plan for roofs and brownfields/traffic areas (in coordination with final version of the new national "Renewable Energy Expansion Act" and the associated ordinances)
- Energy communities (according to new national law) and PV expansion potentials in Ennshafen.
- The evolved energy strategy includes five equally important goals in the following areas:
    - Energy efficiency/renewable energies
    - Security of supply
    - Competitiveness/efficiency
    - Innovation/location/research and development
    - Acceptance/advocacy

5.2 Latest national project results (selected projects)

The Ennshafen has been involved in many national and international projects in the past 10 years, focusing on the strengthening of port functions and the further development of inland waterway transport and the improvement of the Danube waterway, as well as the future challenges in the energy sector for such operating and logistics locations. In the following, results of 2 international projects of the recent past are summarized, which have already developed important basics for the topics of the present port development plan.

DTP-Project “DAPhNE”

Many details of this project can be found in the project documents (elaborations, deliverables, outputs). The following list of strategically important objectives for Austrian ports in the international context of the Danube region can be seen as a summary.

1) Connecting of Danube (+ports) with BRI
2) Development of empty container management on the Danube
3) International lobbying for navigability of the Danube with best practice example of Austria
4) Environmental management systems in the ports as part of new standards
5) Increase transhipment figures by new products regarding decarbonisation strategy
6) Improvement of railway connections for future connections of the ports (with BRI, …)
7) Development of future synergies through improvements in rail cargo business
8) New cooperation with the surroundings to make better utilization of the port infrastructure without new areas

H2020-Project “S-PARCS”

Many details of this project can be found in the project documents (elaborations, deliverables, outputs). The following list of strategically important objectives for Austrian ports in the international context of the Danube region can be seen as a summary.

- Energy focused networking" between companies in the ENNSHAFEN.
  grown structure > in the future regularly exchange, inform, …
- joint developments of energy topics
  Photovoltaic cooperations - roofs, erfa, energy communities, … - Securing cooling water/precipitation water channel with authority.
- Mobility-related measures for the entire site
  "b2b infopoint or user center" for the transport industry -heavy transport on alternative propulsion technology and alternative fuels - LNG/CNG to hydrogen, shore power supply for ships, coordinated installation of car charging stations, LNG/CNG infrastructure development, e-mobility effects in short-range logistics.
- potential b2b cooperation in the heat sector
  Salesianer - Biomontan, Rumplmayr - Fixkraft, Bernegger/Kelag – surroundings, GEM – VFI, …

5.3 the port and its regional surroundings – highlights of current developments

Local development concept of the city of Enns for the Ennshafen area

With regard to issues relevant to spatial planning in the area of the Ennshafen, there are currently no planned fundamental changes. Currently, there is only one specific development in the Ennshafen area in the area of the diesel storage tanks of Energy Direct: a change of dedication is sought based on a planned expansion of the storage volume and a necessary Seveso dedication. In this regard, there is a consultation mechanism, which was started by the city of Enns in 2022; the time horizon for the conclusion is not yet assessable.

Important development in the road area near the port

The construction of a new bridge over the Danube at Mauthausen and the subsequent rehabilitation of the old bridge is the most important traffic-related measure in the vicinity of the port. The planning has been going on for many years and is now to lead to the decisive preparatory processes (EIA procedure has been started, realization is still planned for the current decade until 2030). This is of particular importance for port development, since on the one hand daily traffic jams at peak times in the immediate vicinity (also restricting freight transport) are to be reduced in the future, and on the other hand various accompanying measures to restrict traffic on various stretches of road in the vicinity of the port are being discussed. Further developments in this regard will be followed with interest and may also have (positive) effects on port development.

Current issues concerning the development of railroads for freight transport in Austria

- VCÖ publication 22.6.2021 and ORF homepage (23.6.2021): Companies transport their goods less and less by rail. In the past 5 years, the number of active operational sidings has decreased noticeably, according to Verkehrsclub Österreich (VCÖ), which is concerned that climate targets cannot be met because of this - which would result in high costs. Since 2016, the number of active operational sidings has fallen by around 10% from 643 to 579, it said. This means that almost 400 of the 950 operational sidings are not active. In addition, the volume of freight transported on the rail network had declined by nearly 5 million tons in 2020. The decline has been taking place for some time. However, rail freight transport must be used more intensively again in order to achieve the international and national goals that have been set.
- Thanks to a dense rail network and targeted subsidies, the rail share of ton kilometers of land freight transport in Austria is 28%, significantly higher than the EU average of 18%. Since 2010, rail has been losing market share to truck transport. The diesel price, which will be around 25 5 lower in 2020 than in 2012, will exacerbate the problem. To achieve the climate targets, significantly more truck shipments must be shifted to rail (EU compensation payments of up to €9.2 billion are threatened as early as 2030 if this is not achieved). Only if shipments the size of individual truckloads are also shifted to rail will rail achieve high shares of freight transport; this requires an efficient single-wagon system. The direct and indirect CO2 emissions of truck transport in Austria are 25 times higher than those of rail (EU total: 208 billion external costs for all freight transport - 94% of which are caused by truck transport (CO2 and air pollutants account for about 1/3 of this, the rest is distributed among noise, accident costs, landscape loss, soil and water pollution, and congestion).
- A comparison with other European countries shows that a high transport volume by single-wagon transport is a decisive criterion for a generally high rail share; in order to achieve this, end-to-end logistics and, in turn, equality of opportunity in terms of costs for the first and last mile between the rail connection and the company premises play an important role; the costs of connecting railroads in Austria currently have to be borne mainly by the loading companies themselves despite subsidies - the connection of the companies to the road network, on the other hand, is usually financed completely by the public sector (construction - operation - maintenance!). The central cost driver and biggest quality deficiency of the single wagon system is currently the high time expenditure for the assembly of the wagons, which could be drastically reduced by

digitalization and automation - e.g., Europe-wide introduction of the Digital Automatic Coupling (DAK), automated brake tests, …

- In Austria, single wagonload transport, unaccompanied combined transport and rolling road (RoLa) have been supported by state subsidies since 2013; the federal state of Salzburg has taken on a pioneering role: since Aug 2020, incoming and outgoing transports in single wagons have been supported with € 200 per wagon.

5.4 Main findings of the reflections regarding NATIONAL context

- OPS has to be installed (Austrian Governmental Program and viadonau masterplan)
- plannings for CO2-netrality
- measures for decarbonisation for all transport modes
- zero emission for vessels until 2040 and development of corresponding infrastructure (e.g., efuel)
- improvement for truck traffic in the port area (in/out and waiting zones)
- alternatives for individual mobility
- development for Seveso-zones within the port area / spatial planning concept
- preparation for new regulations regarding waste water (CDNI for Austria)
- installation of photovoltaics
- preparation for new building heating system (until 2035 latest)
- measures for intensification of existing rail infrastructure for single wagon business

6 Market Analysis

6.1 Current situation – important KPIs (history till now)

The following two KPIs are the leading KPIs for monitoring the transhipment performance in Ennshafen port, both regarding the waterside cargo business and the container terminal business of Ennshafen.

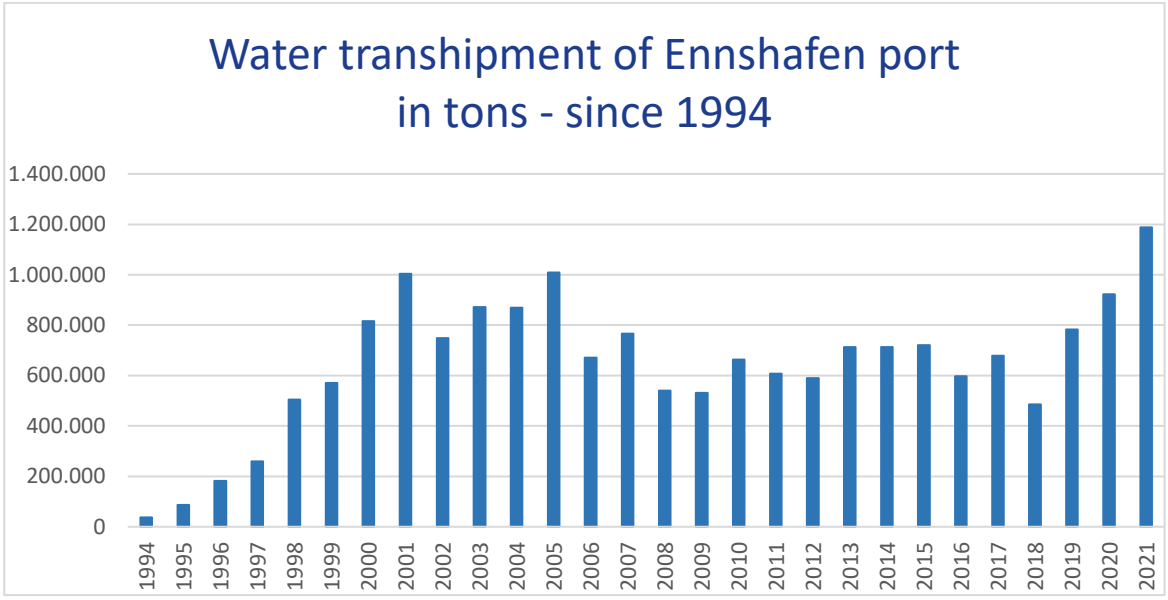


Figure 7: Water transhipment of Ennshafen port

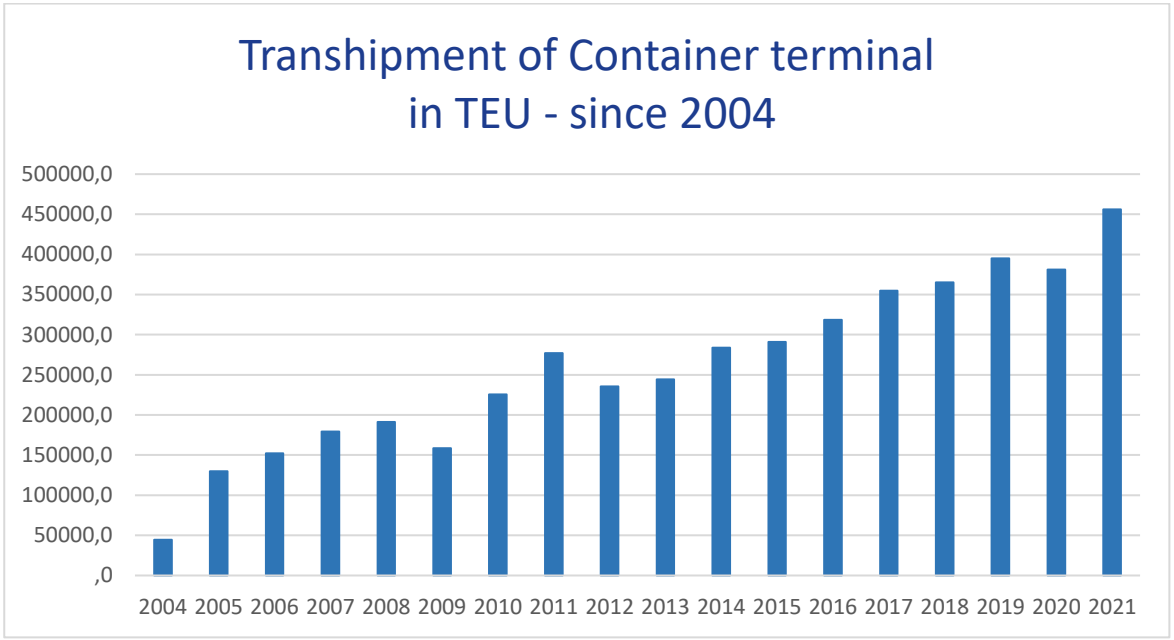


Figure 8: Transhipment of Container terminal

Furthermore, the following figures give an overview about the waterborne cargo business in the surrounding relevant market – meaning the cargo business figures on the Austrian Danube and the yearly transhipment figures of the 4 public ports situated on the Austrian Danube.

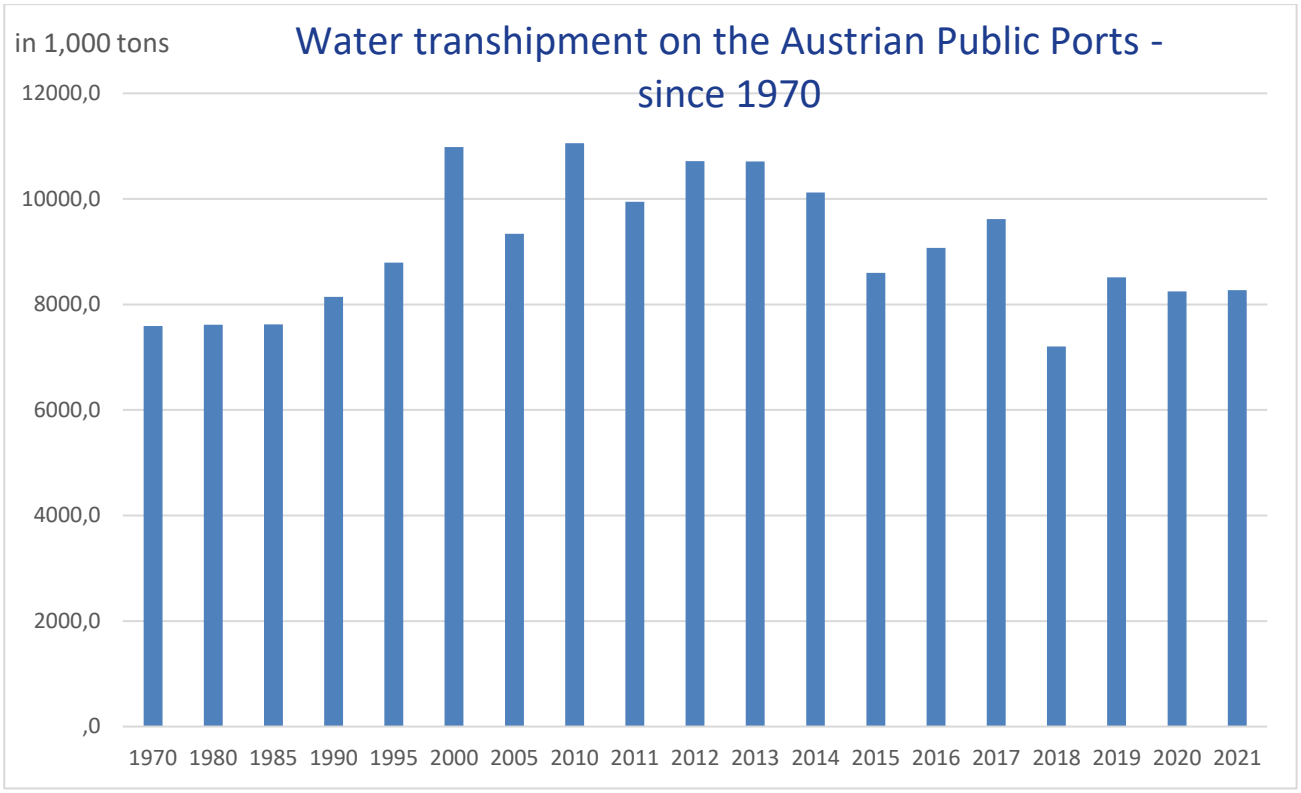


Figure 9: Water transhipment of the Austrian Public Ports since 1970

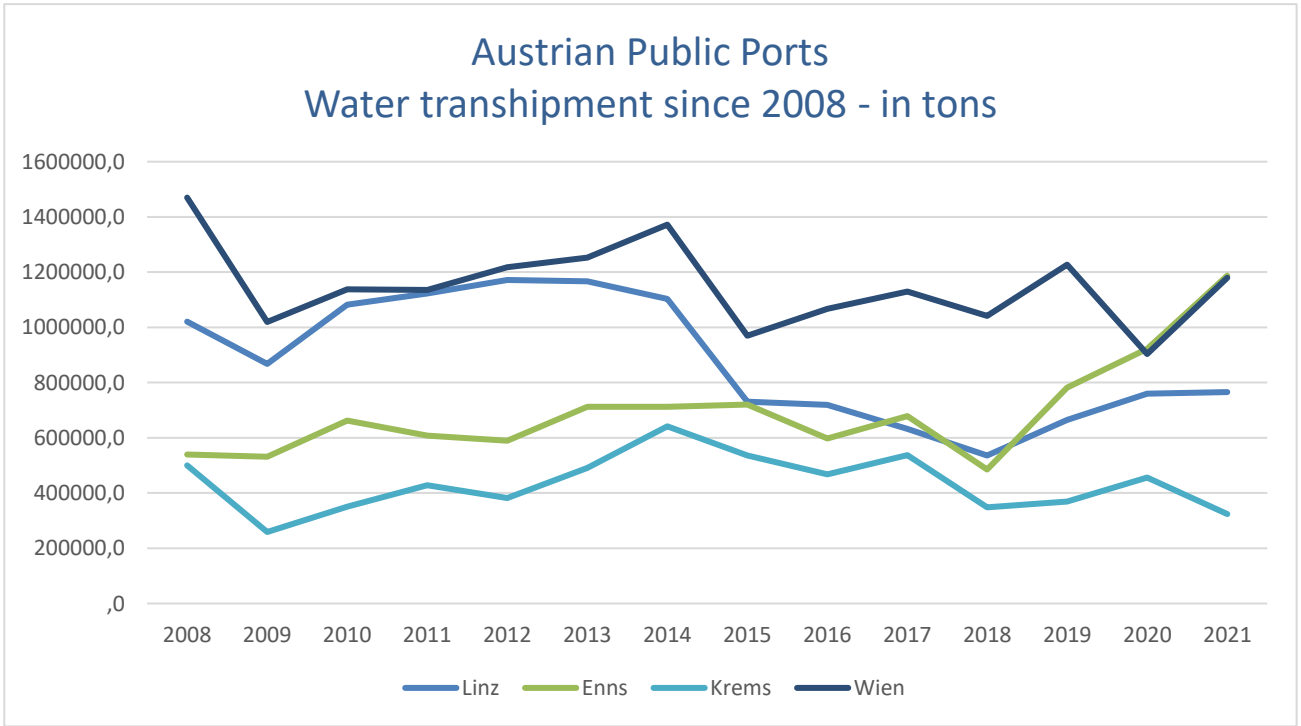


Figure 10: Water transhipment of the Austrian Public Ports since 2008

6.2 General economic outlook for Austria

The Austrian economy was massively affected by the COVID-19 pandemic. Economic output decreased by 6.7% in real terms in 2020. This interrupted the economic dynamism of recent years 2018: +2.5%; 2019: +1.5%). From an international perspective Austria's economic performance was below-average. Somewhat smaller drops were recorded in the EU as a whole (-5.9%) and in the euro area (-6.4%).

The Austrian GDP decreased in 2020 by 4.6% at current prices to around €379.3 billion. Hence, GDP per capita amounted in 2020 to €42 540 (-5.0%). In real terms (adjusted by purchasing power and indicated in Purchasing Power Standards = PPS) for the European comparison the GDP per capita adds up to €37180 (-5.6% vs. 2019; revised).

Austria has been able to maintain its position in the league of the economically most successful member states in the EU for several successive years.

Austria's economy grew by 1.5% q-o-q in the first quarter of 2022, i.e., one percentage point slower than expected in the Spring Forecast. Since March, the economic sentiment indicator and expectations deteriorated considerably, mainly due to the headwinds from Russia's war of aggression against Ukraine and disrupted supply chains. Consequently, growth is expected also to moderate over the rest of the forecast horizon.

Indicators	2020	2021	2022	2023
GDP growth (%, yoy)	-6,7	4,8	3,7	1,5
Inflation (%, yoy)	1,4	2,8	7,4	4,4

Table 1: Indicators of Austria's economy

On an annual basis, real GDP growth is forecast to reach 3.7% in 2022 and 1.5% in 2023. Growth is supported by the ongoing normalisation of services and tourism. On the labour market, labour shortages are becoming increasingly important and have started to restrain the growth momentum. Compared to the Spring Forecast, this is a slightly clouded outlook for both years, taking into account that growth in the first quarter of 2022 stood lower than the initial flash estimate (+1.5% instead of +2.5% q-o-q) and the expected further materialisation of downside risks.

Energy prices increased significantly following the Russian war of aggression against Ukraine, from an already elevated level. In 2022, energy inflation is expected to remain very high throughout the year. In addition, food prices increased considerably and are set to remain high over the course of the year. A delayed pass-through of higher producer prices is projected to keep inflation elevated over the forecast horizon. Overall, HICP inflation is expected to reach 7.4% in 2022 before gradually decreasing to 4.4% in 2023.

6.3 Demand analysis for waterway business in Danube region and outlook

The cargo transportation market at the beginning of 2020 was stable, following on positive results of 2019 (that were significantly higher compared to 2018). Relatively stable conditions and positive forecasts were expected for the main industries (metallurgy, chemistry) and agricultural sector as the main producers making use of the waterway transportation.

However due to the impact of COVID-19 pandemic and general worldwide economic decline it had caused, the cargo volumes have been affected. Transport performance in inland waterways decreased by around 8 % within Europe. Despite the global situation, the transport performance on Danube decreased only by 1.4 %. This was largely due to increased transport of agricultural products.

The volumes of cargo transported in 2020 in cross-border transport and total volume of cargo handled at Danube ports in riparian countries is summarized in the tables below.

Region	2018	2019	2020	2020/2019
Germany/Austria	2,424	3,321	2,332	70.2 %
Slovakia/Hungary	4,487	5,833	5,011	85.9 %
Hungary/Croatia/Serbia	5,425	6,694	6,113	109.5 %
Black Sea Canal	14,115	16,741	16,507	98.6 %

Table 2: Volume of cargo in cross-border traffic (in thousand tons)

Country	2016	2017	2018	2019	2020
Austria	7,493	7,981	6,123	6,452	6,645
Slovakia	1,968	2,127	1,542	1,664	1, 553
Hungary	5,438	5,799	5,200	6,064	6,742
Croatia	677	632	592	814	948
Serbia	8,412	6,390	7,429	9,735	8,164
Bulgaria	7,013	5,570	4,923	5,385	5,431
Moldova	886	1,591	1,889	1,299	1,185
Ukraine	6,680	6,277	6,067	5,629	4,055
Romania	25,096	23,785	24,680	28,474	27,307

Table 3: Volume of cargo in ports (in thousand tons)

Statistics collected show that mass bulk cargo (mostly agricultural produce, coal, fertilizers, oil and metal products) is predominant type of cargo on the Danube. Upstream transport consists mostly of iron ore, coal, fertilizers and metals. For downstream transport, grain, foodstuff, petroleum products and fertilizers are the major segments.

Breakdown of the most dominant cargo for each country handled at their ports is shown in the table below.

Country	Cargo segments
Austria	Metal products Iron ore raw materials Petroleum products Chemical products Agricultural products
Slovakia	Iron ore raw materials Petroleum products
Hungary	Agricultural products Petroleum products Iron ore raw materials Coal Metal ores
Croatia	Agricultural products Iron raw materials Coal Metal products
Serbia	Construction materials Iron ore raw materials Agricultural products Oil and petroleum products Coal and lignite
Bulgaria	Iron ore raw materials
Moldova	Agricultural products Petroleum products Construction materials Coal Containers
Ukraine	Iron ore raw materials
Romania	Metal ores Agricultural products Chemical substances Coke and refined petroleum products Metal products Coal and lignite

Table 4: Cargo segments handled in Danube ports

Iron ore, steel, metals and metal products and coal account for around half of all the goods transported on the Danube and between 2014 and 2019 followed an increasing trend. However, a decrease in demand for raw materials as well as reduction of EU import quotas, caused a suspension in activities of the metallurgy sector.

On the other hand, agricultural segment helped to stabilise Danube transport in 2020 thanks to large volumes of agricultural grains and other products transported mostly on the middle and lower regions.

Transport of petroleum products and products of chemical industry were relatively stable in 2020.

Outlook on Danube freight transport

It is expected that in next few years traditional segments will continue to be the dominant cargo transported on inland waterways, mostly:

- agricultural produce, grains, fertilizers, feedstuff,
- metal ores, iron, steel, coal,
- construction materials,
- chemical and petrochemical products and oils,
- automotive industry products and machinery.

It is also expected that the cargo transport will continually recover within the next three years as all traditional industries assume increase in production, demand and activity. For agricultural products, the forecast will be dependent on harvest results.

Long-term outlook predicts increase in transport of heavy and oversize cargo and Ro-Ro cargo on waterways, as well as gradual shift toward new industry segments, such as:

- waste and recycling products, renewable materials,
- LNG and alternative fuels, biomass.

Transport of empty containers along the Danube and establishment of regular container routes is also envisioned and has been a subject of the Container Market Report.

Summary of long-term outlook on cargo segments is listed in the table below.

Segment	Potential	Outlook
Chemicals	high	Inland waterways remain the preferred mode for chemicals.
Building materials	moderate / high	Moderate growth on established routes, potential for increase in urban areas.
Metals and metallurgy	neutral	Will depend on the pandemic, potential growth in emerging markets.
Coal	neutral / declining	Gradual decline due to environmental concerns and phasing out of coal in the energy sector.
Mineral oil products	neutral / declining	Gradual decline due to environmental concerns and switch to "green" fuels.
Agricultural produce	high	Strong dependency on harvest results but it is expected that inland waterways remain the preferred mode for this segment.
Containers	high	Will depend on external factors (especially navigational conditions on Danube). Potential for long-distance routes as well as transport of empty containers.
Heavy and oversize cargo	high	Inland waterways are ideal for transport of heavy cargo – large capacities compared to other modes of transport.
Secondary materials, recycling	high	Change towards more efficient circular economy, increase in reuse and recycling of materials.
LNG, biofuels and alternative fuels	high	Gradual transition from coal and mineral oils. High potential for inland waterway transportation.

Table 5: Long term outlook on cargo segments

Estimation of potential volume of cargo and expected demand for individual ports is dependent of several factors, such as the port's cargo handling capacity, equipment and storage capacity, production volumes in relevant industry segments and their proximity to the port, modal split and the share of water transport market and other.

6.4 Analysis of Business Opportunities

Ports are nowadays becoming dynamic industrial centres creating extensive logistic networks that enable trade and information flows between various stakeholders via intermodal transport links and digital and IT solutions.

One of the suggested solutions for Danube ports is establishment of hybrid logistics zones that is in greater detail described in DAPhNE report *"Guidelines for industrial development initiatives in ports"*. This is of course not a suitable solution for all ports as many of them have limited availability of land or are located in close vicinity to city centres as well as problematic water levels on Danube, but it offers interesting ideas and points of view on the future of ports and their business policies.

The main areas for future and general trends seen in the port business development are focused on multimodality, automatization, digitalization and sustainability, as well as on offering wide array of customer oriented and value-added services. List of the focus areas and why they can offer business opportunities for ports is summarized in the table below.

Focus area	Reasons for business opportunity
Multimodality	It is expected that the modal split will move from road to rail or water transport by 20 to 50 % by 2050 as a result of changes in EU and international policies regarding transport and environment. EU supports the development of water transport and there are EU funds available for the development of transport infrastructure.
Automatization and digitalization	Implementation of "smart shipping solutions" into port activities by taking advantage of existing ICT tools helps to optimize the whole supply chain and speed up processing of customers and therefore not only giving added value to the customers but also increasing the volume of cargo that can be processed at the port. Many of the tools, such as GPS tracking of vessels and cargo, digitalization and automation of port processes and minimalization of physical administration tasks are already implemented in many ports. What could be even more beneficial is harmonization of these tools along all ports in Danube and creating so a strong competitive advantage for inland waterway transport as a whole. Setting up of digital IT operations centres in ports to monitor all activities in port related to vessels, cargo but also infrastructure and port security systems is also beneficial to streamlining of operations, identifying and reacting to possible issues. Another area that could increase the quantity of processes cargo and overall quality of provided services, is the modernization of port equipment. Modernization and digitalization have also a side effect in attracting better qualified labour and in return higher quality of services provided. Streamlining of operations in conjunction with the move towards rail and water transport can also benefit a wider port area, removing bottlenecks and congestions in cities.
Sustainability	In line with changes to environmental policies, move from carbon-based fuels to increased support of renewable and alternative sources of energy, as well as lowering of acceptable emission limits

Focus area	Reasons for business opportunity
	and raising fines for their violations, ports have several options how to adapt their business operations. Introduction of principles of circular economy could be a suitable solution in ports with several stakeholders, where all participants will aim to reduce waste and pollution through sharing, reusing and recycling of materials and products, e.g. complex waste management (recycling and reuse of secondary raw materials), a waste product of one producer might be a useful source for another one (transformation of residual heat to heating, wood chips into biomass etc.). Implementing environmentally sustainable solutions to port functions could also attract new industries and investors: • building of LNG terminals including fuelling stations and storage (in return, this also supports the cargo fleet modernization and modernization of the supporting vessels), • alternative renewable energy production for the port (photovoltaic, hydroelectric power), reducing the dependency on the national grid and potential income in case of surplus production, • providing the conditions of import, storage, and transhipment of biomass for energy purposes, • waste collection from vessels and its subsequent processing (recycling, reusing etc.). Introduction of "polluter pay principle" or "emission fee" in order to promote sustainability, reduce pollution and combat climate change.
Value-added services	Value-added service can be defined as a premium service offered to customers at no additional price. The added value is usually achieved by implementation of various solutions in the "background", such as modernization of equipment, digitalization of processes, simplifying the administrative tasks, training of port labour force and port professionals. Offering wide variety of complementing services to customers in one place and simplification of the procedures needed to be performed by the customer also contributes to added value for customers. This can be achieved by creation of industry clusters or hybrid zones within the port. Collection and analysis of customer data (existing and potential customers within port's relevant catchment area) and their needs should become a base for planning of business development. Ports should also initiate marketing activities to promote port services and water transport as a viable alternative to other modes.

Focus area	Reasons for business opportunity
New markets	Cooperation with other Danube ports, membership in associations or organization supporting inland waterways development offer new opportunities and access to new markets or initiatives, such as: • establishment of scheduled container transport service along Danube (suitable for collection and transport of empty containers), • increasing the volume of Ro-Ro vessels and cargo along Daube (as these are suitable for the fluctuating water levels and conditions), • exploitation of the competitive advantage in transport of heavy cargo compared to road and rail transport, • possible new opportunities connected to new transport routes along "One belt one road" and port of Constanta, • new industry segments (alternative energy, biomass, LNG) create opportunities not only for transport but also for port development, • establishment of logistic, industrial or hybrid economic zones within ports, or increase of storage capacity.
Passenger ports	In cases where passenger harbour is part of the port, providing high quality services and modern amenities to passengers are the minimum to attract more business and cruise traffic. Passenger ports should work in close cooperation with the municipalities to increase interest in tourism in general by intensive marketing and advertising, offer interesting tourist opportunities – activities, attractions, bundles or packages (e.g. boat and bike tour, museum entries, theatre tickets, special offer for holidays). Other possibility is to incorporate inland waterways and their ports for public transport by establishing a river bus service.

Table 6: Focus areas for business opportunities

7 Assessment of identified action fields of the port & results of “ongoing investigations”

7.1 Infrastructure measures, equipment, facilities, digitalization, automatization

- “large port infrastructure" (harbor basin, quays, …): is broadly finished and up to standard; there are remaining zones for further optimization or investment (e.g., Gravel surface behind quay 21)
- "Smaller infrastructure topics" are currently being prepared in planning terms as part of the ongoing CEF project (CEF-2020-AT-TM-0006-S: Ennshafen prepares smart and sustainable mobility investments, 04/2021 - 12/2024) (see there) and are expected to result in CEF investment submissions in the current period
- Further location-related topics are in particular improvements in truck traffic (congestion zones) within the port - to be worked on jointly with the city of Enns and other port companies
- Maintenance: for this, a strategic approach was started in 2020, which should lead to the multi-year/long-term expansion of maintenance reserves for the main maintenance cost blocks of the future
- A new MIP (mid-term planning) has been prepared, which also includes a rough 10-year investment forecast and is updated annually (shareholder release).
- With regard to projects of international importance within the TEN-T-RD corridor, the following list of future topics or still ongoing investment projects was introduced into the rollingly updated corridor planning (via bmk or iC-Consulenten/ corridor management assignment); the details on the listed points - such as time frame, rough investment cost estimate, … - can be found in the TEN-T documents of the EHOÖ):
    - 9164: Cargo City Enns (Kaindl): Construction of the new logistics center by Kaindl and connection to the trimodal node of combined transport traffic
    - 9165: Rail connections improvement (Ennshafen GmbH): The trimodal port Ennshafen has got very good infrastructure and enough space for growing; the port is dedicated as industrial place; in order to manage the needs in the future decades it is necessary to start strategic plannings for the next level in railway connection to the port, which could be needed if modular shift will go the actual way and temporary problems of the IWW will occure due to weather conditions; in this case an backup-line for water transport is necessary and will foster additional in/outbound capacity of the lines
    - 9167: Further development of hinterland connection to business areas/port sections (Ennshafen GmbH): Study for planning of additional connectings and handling facilities within the port which need the business park and the local business surroundings to increase freight handling at the trimodal port, followed by the investment and construction phase.
    - 9721: Alternative fuel project IWW (Ennshafen GmbH): Masterplan and stepwise investments for LNG-infrastructure (and combined with other future energy items) in the port and in Austria and especially the regional catchment area of the port
    - 9722: Feasibility study for free space zones in the port (Ennshafen GmbH): "Truck-Train-Ship handling-stations", especially regarding the actual

decarbonizing strategy for Europe and for connection of Adria to Danube region (one of the nearest distances is Port of Enns) and special transhipment station in case of problems with navagability of the Danube - especially upstream of Enns) - very urgent, because Straubing-Vilshofen has "no 100 % solution" until 2030 > so the rest of Danube (downstream of Enns) can run well. Studies followed by the implementation phase.

- 9755: quay infrastructure optimization (Ennshafen GmbH): feasibility studies in accordance with the ongoing development of the business park areas of the port regarding debottlenecking/enlargement or other optimization projects within the quay sections, followed by corresponding investments
- 9770: Quay infrastructure optimization – works (Ennshafen GmbH): Works in accordance with the ongoing development of the business park areas of the port regarding debottlenecking/enlargements or other optimization projects within the quay sections, followed by corresponding investments
- 9535: Modernisation of transhipment facilities (Danubia Speicherei GmbH): Our company and its´owners strongly believe in the necessity of an existing and well working inland waterway system along the river Danube in extension of the Rhine-Main-Danube canal. To make inland waterways a working system, inland ports are needed. Within those inland ports we strongly need independent handling and transhipment facilities. Since 1995 we are absolutely believing in this idea and have so far created a spot along the river Danube where anybody can load/unload their goods on vessels, trucks and/or train wagons, absolutely independent and neutral. On average we do handle about 850.000 tons a year between the three main ways of transport with a main focus on Danube vessels. To extend our range and to become an even more flexible and faster handling spot along the river Danube we need to take further investments, mainly in the areas of a faster, more efficient crane and two new transhipment facilities. All of those investments will make it easier for existing and future clients to use different ways of transport in a mix, suitable for their goods and products. We strongly believe that this is what it takes for a cleaner and environmentally more friendly future. Handling centers in inland ports will have a big eligibility in future logistics and can be part of a solution to relivieve traffic on roads through Europe. Transport on the river Danube has been fighting and still fights with the bottleneck in Straubing/Vilshofen. As a consequence, the port of Enns and especially our company can and will be a major player when it comes to lighterage of vessels. Therefore investments into the infrastructure are needed.
- Ongoing CEF-Studyproject (CEF-2020-AT-TM-0006-S: Ennshafen prepares smart and sustainable mobility investments, 04/2021 – 12/2024)

7.2 Hinterland connections, port accessibility by rail and road

- Road connections-external: very good connection so far; however, there are 2 issues that are in the "2nd shell" of external development that need to be improved:
    - Reconstruction of Kristeiner junction on the B1: is being worked on by the state of Upper Austria, no direct activities for EH with the exception of general lobbying activities with state agencies.
    - New construction of the Danube bridge Mauthausen: major project of the provinces of Lower Austria and Upper Austria; EIA (Environmental Impact Assessment) procedure started in July2022 , to be realized by about 2027/8
    - Ennsdorf bypass: construction of an 8 m high noise protection wall (providing shielding from both road noise and noise from the adjacent port area); construction took place in 2021, no further measures for the time being
- Roads within the port: the following measures have recently been implemented or are currently in detailed planning or preparation:
    - 2021/2022: remaining debottlenecking works at the Industriehafenstrasse (City of Enns)
    - 2021/2022: significant improvement of waste solutions at truck storage areas or along stopping zones.
    - 2022-2024: Planning and successive anticipated rehabilitation of the Stub Road from Industriehafenstrasse to the quay area and start of rehabilitation work on the road between quay13 and quay14 (in several stages).
    - 2022: Start of feasibility considerations for a "managed" truck parking area in the port entrance area (possible synergies with LNG/CNG/H2 filling station expansion?) together with the city of Enns and port companies (truck Sub-station in the west entrance area, combined point with rest area/WC/..., enlargement of truck lane to port area ("Borealis-Spitz"), digital info system for trucks to pull forward).
    - Truck management in front of LZE (customs lane, customs square, ... barriers, cameras, ...)
- Rail-External: Debottlenecking/capacity enhancement considerations see ongoing CEF project [2020-AT-TM-006-S].
- Rail-Internal: see ongoing CEF project for planning of internal improvement points [2020-AT-TM-006-S].

7.3 Utilities

- Water supply pipeline in the Kaistrasse area: old pipeline at a depth of around 4 m needs to be renewed over a distance of around 400 m - start of planning in 2022 (synergies with road rehabilitation)
- New design of the power supply to quay 14 (build own Supply line)
- Port administration building LZE: Building is 10-20 years old and various general refurbishment measures are being prepared (especially in compliance with the current EU Energy Efficiency Directive), also for lighting, air conditioning, ...

- Port administration building LZE: Heating system must be retrofitted by the decade 2030-2040 due to current Austrian requirements (no more fossil fuels).
- Securing the old cooling water channel at the site: Master plan for the continued existence of the cooling water channel has been prepared, official concept is available and a takeover from the current owner Borealis by Ennshafen is being considered; further processing (in particular profitability calculation) is currently on HOLD due to ongoing sales process of Borealis.

7.4 Development plan for clean fuels

7.4.1 Onshore power supply

The Ennshafen already has a power supply system at the quays (35 boxes in total); the majority of these are based on 32A technology, a few boxes also on 63A technology. Detailed technical and commercial planning to achieve the standard required in the future (125 A for selected locations and 63 A in general for all quays, PowerLook system) is being carried out in the CEF project [2020-AT-TM-006-S].

7.4.2 LNG/CNG

In 2017, the first LNG refueling station for trucks in Austria was built in Ennshafen. Within the framework of the CEF project [2020-AT-TM-006-S], technical-economic planning is being carried out to create LNG bunkering facilities for ships (1st stage truck-to-ship, 2nd stage shore-to-ship) on the one hand and to further develop the existing refueling facilities for heavy goods traffic in the port according to market demand (LNG, bio-LNG, CNG, H2 blending) on the other.

7.4.3 Gas-hub

At Ennshafen, there has been a large storage, handling and distribution area for liquefied petroleum gas (LPG) for decades. Together with the LNG/CNG initiatives, it is being examined whether these two activities could not be more spatially interlinked in the future by the two companies involved ("sustainable gas hub" in the direction of "Next-LPG", "Next-LNG", synthetic Power2Gas products). The site requirements for this are perfectly met, all permits including a Seveso designation have already been obtained. Together with Ennshafen, the two companies will validate the possibilities for expanding the existing site in this direction.

7.4.4 Infrastructure for efuels

In Ennshafen, there is a well-established bunker station for fuel supply of ships in port. Against the background of the required changes in shipping traffic with regard to achieving the climate targets (Green Deal, 55% target, Austrian Mobility Master Plan 2030), the use of eFuels (from CO2-neutral sources) as ship fuel is being strongly considered for the next decades. For this purpose, plans have been started in the Ennshafen with the participation of the bunker station operator as well as a fuel company located in the Ennshafen, which already has access to eFuels, with the aim of examining the feasibility of expanding the infrastructure to include eFuel refueling possibilities and to enable a gradual transition or blending. A close link with the eFuel Austria initiative is also being established in order to work specifically on applications in the marine sector.

7.4.5 Photovoltaics

As part of the H2020 project S-PARCS, a basic assessment of PV expansion possibilities in Ennshafen was investigated for rough feasibility status and cross-company coordinated planning of energy activities at the site was started (as a working group under the existing site partnership). This PV coarse assessment revealed considerable potential. The first larger systems (up to less than 1 MW peak) have already been successively installed in recent years and expansion plans have been drawn up. Further work on this will follow in the next few years; this is in line with national and international targets for the expansion of electricity generation from renewable sources. In particular, the focus here is on evaluating the possibilities for expansion on brownfield sites.

7.4.6 Considerations regarding port tariff system

Adaptation and further development of a PORT DUES SYSTEM that takes into account and promotes "green vessels/green transport":

- "Green shipping" will be a major challenge in the next decade, but a development that is sure to come - based on today's international/national requirements
- connected with this, there will probably also be a demand from ship operators that they get financial advantages in ports if they are pioneers / e.g., buy environmentally friendly ships (electricity, LNG, H2, ...) or it will be a possible market incentive system for the port to address additional transport potential (possibly also to force additional goods from the hinterland (in/out) if companies want to do green transport)
- for this purpose, prepare/develop a model in time, how this can be supported on the part of the port; in this regard, reference is also made to the results from DIONYSUS / WPT2.3 (Port Tariffs)
- for this purpose, prepare/develop a model in time, how this can be supported on the part of the port; in this regard, reference is also made to the results from DIONYSUS / WPT2.3 (Port Tariffs)
- one approach could be that "clean ships" get discounts on fees; for this, models have to be designed who pays the difference for the port (e.g., refunded from subsidies, levies from CO2 taxes, ...)

7.5 Options in the fields of recycling and production of green energy within the port

- There are already 2 large companies at the site, which are strongly involved in recycling activities and want to expand them further; 1 x waste paper sector and 1 x metal recycling (60 million investment / capacity 100000 tpa - start 2022), especially from car shredder residues as well as recycling plant for plastic light fractions (60 million investment / capacity of 100000 tpa - start 2022).
- Talks are ongoing with both companies to intensify the corresponding in/out mass flows via the environmentally friendly transport modes of rail and ship, and also with regard to waste heat utilization at the site.
- With regard to the production of green energy sources, another company at the site has started the first expansion stage for the production of wood pellets from sawmill residues

(80,000 tpa plant / 16 million investment) in 2022. Reconciliations are also in progress here for possible future use of rail or ship.

- The work on efficient cross-company utilization of existing energy flows and waste heat as well as the future potential for joint energy generation from renewable sources was started in 2018-2021 as part of the H2020 project S-PARCS and worked on in a cross-company working group in the Ennshafen. After project completion and interruption of work due to Corona restrictions, this joint work will be continued in the coming years and continuously adapted to changing framework conditions new legal frameworks.

7.6 Plannings for CO2-neutrality

The aim of this is to create a CO2 neutrality plan for the Ennshafen ("3-shell model") to develop approaches to meet the targets by 2030 / 2040 / 2050. A structure in 3 shells is planned as follows:

- 1.shell: Direct processes under the direct responsibility of the Ennshafen.
- 2.shell: relevant logistics processes (of handling companies) in the port ("IN/OUT")
- 3.shell: overall picture for the port area incl. integrated business park

The preparation is done within the ongoing CEF-Study project (2020-AT-TM-0006-S / Ennshafen prepares smart & sustainable mobility investments), the consideration should be available until 31.12.2024.

7.7 Conceptual work for improvement of water-related items

EU Water Framework Directive

Due to the strong hydromorphological changes and the resulting utilization pressure, the Danube and the individual water bodies in Upper Austria were designated as heavily modified water bodies (HMWB) within the framework of the classification for the EU Water Framework Directive (WFD). The target status, which according to the WFD is to be achieved at least by 2027, was defined as the reduced environmental target, the "good ecological potential". The further implementation steps are carried out within the framework of the water law processes.

CDNI list and water rights situation-general

In Austria, preparations are underway at ministerial level to establish the CDNI system already in use on the Rhine concerning a Step-by-step plan for the discharge or non-discharge of wash water from ship operations into the Danube. A ministerial assessment and consultation process is currently underway, in which the ports were also involved to provide feedback. The process is expected to be completed in 2022. Only after the final version is available can the exact need for action be determined for the Ennshafen.

A preliminary assessment on the basis of the drafts submitted showed the following picture: channel transfer points for receiving ship sewage from the landing area are available, but have so far been little or not at all used. It is already apparent that a re-sharpening may be necessary here, since the location of the canal transfer points is not considered optimal for today's operations. Possibly the establishment of a new delivery point (with intermediate tank and Drainage by means of pumping vehicle) is to be considered. In particular, a new process flow is to be defined with the channel operator even after the final version is available.

All port facilities currently meet the requirements of water law; currently, an unpaved area (quay21) is being prepared for improvement within the framework of the valid water law notice (surface pavement / planning ongoing), the realization is to take place in the next few years -

possibly in the course of a settlement project currently under negotiation. Detailed planning for this is linked to planning work within the framework of the CEF study project (2020-AT-TM-0006-S / Ennshafen prepares smart & sustainable mobility investments) - improvement of the railroad infrastructure.

Another topic related to water rights is the securing of the old cooling water discharge channel of Borealis for the future. In this regard, talks are ongoing with Borealis and the water rights authority for an adequate future-oriented solution for the entire port area (incl. business parks).

7.8 Conceptual work for noise reduction measures

The priorities regarding the improvement of the noise situation in Ennshafen are currently as follows:

1) Railway areas: Train noise in the immediate vicinity of the connecting railroad line; in the year.... a road was closed in the entrance area (Enghagnerstrasse passage) in order to be able to erect a noise barrier to the adjacent residential area (2 m high, ... m long / one-sided? / two-sided?). This measure brought a certain improvement for the immediate neighborhood. In the meantime, additional rail traffic, increased demands and increasing awareness of the residents as well as the expected increase in rail traffic due to the targets "2030-2050" (drastic change of the modal split from road to rail and ship) lead to the expectation that the issue will gain in importance / explosiveness in the coming years. In addition, there are also ongoing complaints from an exposed neighbor on the railroad line; joint processing by the facility leaseholder (Container Terminal Ennshafen) and EHOÖ (as owner and landlord). The detailed planning processing is carried out within the framework of the CEF project 2020-AT-TM-0006-S / Activity 2.3).

2) Currently, there are also case-by-case complaints from residents regarding noise emissions from winter ships and in the area of the access sections of the railroad line to Ennshafen. In this regard, reference is made to the preparation for the conversion to shore power (technical-economic preparation is carried out within the framework of the CEF project 2020-AT-TM-0006-S).

7.9 Work for neighbourhood management system

In 2015, an initiative was launched to create an exchange platform of companies located in the port and neighboring municipalities. This resulted in the "Advisory Board Ennshafen Business Park - Upper Austria".

Figure 11: Neighbourhood

This instrument of open neighborhood exchange has proven itself well so far and is an important instrument of CSR. As a rule, there is a large exchange round once a year, which is primarily of an information and exchange nature. In addition, there are (temporary) working groups on an ad hoc basis, in which special topics are often dealt with by only a few of the companies concerned, also with the involvement of other experts (e.g., representatives of the authorities). In the past, these were mainly topics relating to noise, truck congestion zones and the working group set up as part of the S-PARCS project to deal with cross-company energy issues.

7.10 Business settlement within port or nearby areas (industrial development)

- Currently, only very few areas in the Ennshafen are available for new business locations or can be purchased on the market. Also, the leasing possibilities in the quay hinterland are only possible to a very limited extent and one last large open space of a large land owner is only being developed in a very targeted manner (adjacent to the container terminal).

- Possibility of expansion through Borealis withdrawal: here there is a potential of about 7 ha of open space (3 individual properties): Talks on this are ongoing, realization not yet foreseeable - dependent on strategic Borealis strategy.
- West area: newly launched in spring 2022 was the marketing of an area of about 6 ha located at the entrance to the port; development is ongoing - insert facsimile / cover sheet of "public prospectus" here; in this regard, there is close coordination between the appointed real estate agent and the port to support the best possible synergies from this sale/lease process (private owners) and the general port development.
- In the southern part of the harbor there is a potential area of about 15 ha, which has not yet been developed for the most part.
- As an overarching development, work is currently underway in Upper Austria as part of the strategic program #UpperLogistics2030 - Masterplan Logistikstandort OÖ to develop important logistics locations for Upper Austria. A coordination with the Ennshafen as a central trimodal logistics hub of international importance is given in order to take into account any existing infrastructures (rail, ship).

7.11 Conceptual work for ISO-certification

- The port currently does not have any special certificates regarding quality, environment or energy. In the medium-term corporate strategy, it is foreseen that within the next half-decade a certification regarding environmental issues or energy or possibly a new certification format regarding CO2 neutrality will be obtained.
- Currently, an integrated management manual is being successively developed, which takes into account many formal requirements as well as the introduction of the planned annual programs (e.g., environmental program) and integration into the management processes (from strategy to budgeting and measures control / PDCA cycle).

7.12 Work for port digitalisation

- In the first stage, the focus is on the development of a PMS / port management system, which can be successively expanded in further stages to a PCS / port community system if required. A link with existing initiatives (especially with EURIS and CEERIS) will also be worked on here.
- The PMS was prepared for planning purposes within the framework of an ongoing CEF project [2020-AT-TM-0006-S] (as a so-called "click dummy") and its implementation was started as early as 2022. The planning work in CEF has not been completed; the open points mainly concern software-technical links with other developments outside the port.
- In this respect, Ennshafen is a pioneer for inland ports on the Danube and plans further steps or relevant project participations successively and in accordance with the successes of the initiated development.

7.13 Overall financial plan for all predicted/identified investments

The investments to be made in the next few years are currently being prepared in detail in various projects in order to arrive at reliable investment estimates or real costs based on the results of tenders. For this purpose, a number of further preliminary clarifications (e.g., negotiations with authorities, existing notifications, declarations of intent for the

market, ...) are necessary in order to be able to carry out really reliable profitability calculations and finally to be able to present secured decision documents for approval by the shareholders. Also, the secured promise of subsidies (e.g., within the scope of CEF projects or national subsidy programs) is an absolute prerequisite for a resilient investment decision on a sound basis.
All in all, this is a longer preparation process for each individual measure. This is therefore first conceived in the strategic planning and then incorporated into the medium-term planning.
This medium-term planning is a rolling planning, which is updated 2-3 times p.a. and is released by the shareholders in the middle of each year, as it always represents the current basis for medium/long-term business planning and short-term budgeting. The problem of the lack of availability of exact figures is solved insofar as rough estimated costs (based on preliminary studies, analogy considerations, market information, ...) are used both for investments and rough subsidies, which are assumed to be attainable on the basis of current programs or which are defined as target figures, which will be necessary in order to be able to prepare a sustainable business plan.
These data - including the estimated market returns - are incorporated into the medium-term planning and thus provide a strategic picture of the company's economic development. Due to the great uncertainties, attention is only paid to whether the basic justifiable economic development will be presentable or whether completely different approaches must be pursued.
Subsequently, as the level of detail of real planning increases, these figures are refined and updated and then ultimately prepared as real business plan documents (CBA documents) for actual investment approvals by the shareholders and reflected in the budgets.

The current medium-term planning document (including investments / subsidies / liquidity) is available in detail. Major investments are listed individually, smaller investments are listed as lump sums, as are planned major maintenance projects (maintenance lump sum). <u>This data is confidential and will not be published</u>.

7.14 Transfer of findings into the new Port Development Plan

The points of the internal evaluation of important fields of action in the port, summarized in the above points 7.1 - 7.13, will be integrated into the new updated port development plan together with the following external evaluation ("Target Group Reflection") as well as with the derivations from the international and national framework conditions and the market considerations and possible results of deliverables and outcomes of the other activities and work packages of the DIONYSUS project. In this regard, reference is made to the compact presentation of Chapter 10ff. This ensures that the further treatment of the evaluated points is checked annually in the course of the management review for topicality or updated if necessary and that the implementation in the PDCA system of the Ennshafen is followed.

8 Integration of some outcomes of other DIONYSUS activities

During elaboration of this Port Development Plan even the outcomes of relevant deliverables of DIONYSUS project have been monitored and evaluated for feasible input. The relevant sections of these deliverables will not be copied once more into the current document, these passages are only copied into the large internal version of Ennshafen.

The most relevant deliverables which have been monitored are as follows:

- D.T2.1.1 - Report on multi-modal infra- and superstructure facilities and services
- D.T2.1.2 – Report on multimodal / intermodal market perspectives
- D.T4.1.1 – Operational & Business Development Model for DR Ports
- D.T3.1.1 - Summary Report: Analysis of Regional Economic Development Strategies, Policies & Programs with regard to Danube Ports with Annexes: Country Reports (AT, SK, HU, HR, RS, BG, RO, MD, UA)
- D.T1.1.1 Report on the selected Core & Comprehensive Network Sections and Nodes of the transport corridors on the Danube Region
- D.T2.1.3 Gap analysis (Country based report including summary)
- D.T2.2.1 Status quo & mid-term perspective Danube Ports infrastructure report

9 Target group reflection

Due to the project application document 5 main target groups have been defined in order to get good reflections from outside and insert them into the document.

a) Infrastructure and (public) service providers
b) Local public authority
c) National public authority
d) Other / owners of the port
e) SME (as existing and potential new clients of the ports)

During establishing of the current Port Development Plan a number of 20 reflection meetings with target group members have been processed. The given input from these partners is summarized in the following table.

Topic	**How do we deal with it?**	**Assignment to the development field**
Road rehabilitation (Quayside)	process within the framework of the "Road Transport Infrastructure Plan" (incl. maintenance)	4.1.2 & 4.1.7
Make free areas in the Ennshafen usable for existing companies	Development plan for additional areas (active involvement in Borealis withdrawal and sale process for western areas)	4.1.5
Energy issues/CO2 neutrality	Make port overall view with several shells	1.1.4
Create additional rail loading facilities	Processing within the framework of CEF / Activity 2 (debottlenecking) and Kai21 development	1.1.2 & 2.2.5
Establish Ennshafen as intra-European soy distribution point	Examination within the framework of a follow-up project to DIONYSUS (DTP or similar).	2.1.3
Improvement of internal access roads / truck pre-congestion concept (stage 2)	Continue infrastructure plan - road transport with the city of Enns (start stage 2 - "before the railroad line").	4.1.2
Improvement of external connection ("Kristeiner Knoten")	Road infrastructure plan-external; discussions with city, township, and state governments to contribution of interest.	4.1.3
(Cautious) land expansion towards the west (within B1 spandrel and flood embankment).	Development plan for additional areas	4.1.5

Set up a CO2 trading system for the entire Ennshafen port	Processing within the framework of the CEF project / Activity 2.3 ("CO2 neutrality plan")	1.1.4
Possibilities for trailer handling for individual transports - combined with the container trains	Processing within the framework of Kai21-high-concept or Kai21-slot-concept	2.1.2
Check and build bifunctional transport hub water-railway; up to Enns on waterway, then on container trains (because of Straubing-Vilshofen)	Intensification of targeted customer contacts or processing within the framework of the Kai21-high-concept	2.1.6
Establish electromobility infra-structure in the port area	on HOLD for the time being - observation of the first expansion stage in 2021 > further market demand given ?	4.1.8
Design photovoltaic expansion concept (entire area)	Carry out feasibility or also within the framework of CEF project (CO2 neutrality plan)	1.2.4 & 1.1.4
CO2 neutrality consideration over entire area (several stages / all companies)	Within the framework of CEF project (CO2 neutrality plan)	1.1.4
Skilled labor availability for freight forwarding (all levels) for microregion Enns	on HOLD for the time being - processing not until 2023	4.2.2
Create additional truck pre-congestion / post-congestion zones	Road transport infrastructure plan	4.1.2
CO2 neutrality consideration	within the framework of CEF project (CO2 neutrality plan)	1.1.4
Use of sustainable intermediate handling technology (forklifts, conveyor technology, internal + external vehicle fleet, ...	within the framework of CEF project (CO2 neutrality plan) or remain for the time being and observe the market (is focus work of cargo handling partners)	1.1.4 &. 2.2.7
Making free space available for resident companies	Development plan for additional areas	4.1.5
Access from the water side to the company premises	Carry out further in-depth research on the topic, referral to the companies within the framework of the advisory board	4.2.3

Break down decarbonization concept in detail according to Mobility Master Plan 2030	Within the framework of CEF project (CO2 neutrality plan)	1.1.4
Tackling green port alignment consistently and CO2 neutrality balance sheet	Within the framework of CEF project (CO2 neutrality plan) and other priority topics.	1.1.1-1.2.7
Energy demand/balancing/interconnections (multi-decade thinking).	Continuation of SPARCS working group	1.1.5
Start railroad debottlenecking in time	Within the framework of CEF project	1.1.2
Make CO2 neutrality planning	Within the framework of CEF project	1.1.4
Digitization planning in all processes	Within the framework of CEF project and following investment implementation	3.1.1-3.2.2
Electricity (all facets) - supply, extraction, PV, feeders, grids, ...	Continuation of SPARCS working group	1.1.5, 1.2.4, 1.2.7
Use vacant land to attract industrial businesses (modern/low-CO2 > Energy&Production&Port).	Development plan for additional areas	4.1.5
Consider further development of Kai17 on a larger scale (plan for the next 10-20 years)	Within the framework of CEF project	1.1.3 und 1.2.6
Strengthen the protection of the existing Seveso Zone and develop it strategically	Ongoing coordination with the city of Enns on further spatial planning developments (incl. settlers)	2.2.8
Further development of the truck jam concept on a larger scale	Pursue next stage of development with the city of Enns	4.1.2
Improve external roads (esp. Kristeiner junction, also Danube bridge)	Lobbying with municipalities and states	4.1.3
CO2 neutrality for the transport industry as a whole	Within the framework of CEF project	1.1.4
Offer synthetic fuels for ship refueling at the site (GTL; ...)	Examination for an offer in the Ennshafen port by the bunker station operator and partner; concept with eFuel-Austria.	1.2.1

Enable Seveso zones in the port area (various projects).	Ongoing coordination with city of Enns	2.2.8
Further development of "train-road" interchange systems in the port area	Processing within the framework of the Kai21 concept (slot management)	2.1.2
(future) driver shortage pay special attention to plans	Work on topic with partners (e.g. training with Spendel)	4.2.2
Ennshafen to consider stationing a small pusher for barge bowsing	Remain defensive for now; get more information from the market and monitor water development	2.2.4
Realize outer ring road in the harbor (flood embankment).	Continue talks with city of Enns	4.1.2
Establish strategic pipe bridge concept in the port area and keep routes free (energy networks)	Pursue topic defensively for the time being; in the context of the energy working group, possibly. Concretise need	1.1.5
Pursue hydrogen topics for application in large machines (e.g. construction industry)	Monitoring of further developments within the framework of the "Global Ports Hydrogen Initiative" and national projects	1.2.2
Agreement on ONE variant for future ship fuel/propulsion on the Danube (RASCH), due to CO2 balances.	Lobbying at the federal government (with PDA/PDI), contacts to eFuels-Austria, bunker operator planning	1.2.1
Create zones in the port for changing small units (boxes ?) between the modes of transport.	Kai21-new concept	2.1.2
Ennshafen site must remain suitable for a gas-fired power plant (possibly diversified, also including hydrogen, renewable derivatives, ...)	Pursue relevant points from Low Carbon Port and have discussions with city (land use development).	1.2.2, 1.2.3, 1.2.7, 2.2.8
Keeping an eye on energy and material networks in the port area, taking strategic precautions	Continuation energy work group	1.1.5
Noise/noise protection: pay very good attention to this in all projects	observe in all relevant projects	1.1.1, 1.1.3, 2.1.2, 4.1.5, 4.1.10
Push shore power (because of noise)	Within the framework of CEF project	1.1.1
Create additional space for temporary multifunction (storage,	When creating the concept for Kai21-new take into account	2.1.2

transhipment, ...) - loosen old system of transhipment & leasing.		
Waste management/recycling needs transfer points to rail (AWG / 2023-2025	Work out priorities and opportunities with relevant partners (from 2023 ?)	2.1.5
Public transport offers to reduce individual transport (company employees)	Processing within the scope of the city initiative / accompanying measures; New construction of the Danube bridge	4.2.4
Review of potential for additional transhipments from ongoing projects in the port (for ship / rail). Waste paper, metal recycling, plastic light fraction sorting, wood pellets, ...	Do detailed market research and follow up on customer projects	2.1.3, 2.1.5, 2.2.2

Table 7: Input from target group members to Port Development Plan Ennshafen

10 New Port development Plan - final

For the following Port Development Plan all inputs from previous chapters have been evaluated and condensed into the following structure:

- Framework international
- Framework national
- Own assessment for fields of action
- Market situation
- Input from other DIONYSUS outcomes
- Reflection meetings with target group members.

This new PDP will now be implemented in the yearly strategy update process of the Ennshafen company, which follows a PDCA-cycle depictured in chapter 11.

Port Development Plan ENNSHAFEN

This Port Development Plan is aligned to the existing strategic focus of the company „Ennshafen4.clean“ and will support the deployment of the „Vision EHOÖ2030“, which is embedded into the long-term development as follows.

Ennshafen 1.0 [1970-er - 1990-er]	decision for port establishment, basic permissions, , starting with works for preparing the ground fields, ...
Ennshafen 2.0 [1990-er - 2000-er]	erection of the office building, starting with erection of quais and port basins, settlement and further development of first companies
Ennshafen 3.0 [2000-er – ca. 2020]	finalisation of quais, erection of container terminal, transfer to operator via long-term contract and enlargement; Borealis retreat of the port site
„Ennshafen 4.0“ (at about. 2020 - 2030ff]	further development according to new framework – decarbonising and digitalisation in logistic business in general

- **Ennshafen 4.clean** = synonyme for clean logistics, digitalisation and decarbonisation as well a slow carbon fuels / techniques (LNG, electricity, H_2/bio, power2x, ...)

The measures of the new Port Development Plan are grouped into 4 sections:

1) Low carbon Port
2) Cargo & Core Infrastructure
3) Digitalisation
4) General & Basic Infrastructure

1: LOW CARBON PORT	
Fields of work	**Implementation or further checking**
<u>Already concrete ongoing:</u> 1.1.1. Shore power in port 1.1.2. Railway debottlenecking 1.1.3. LNG/CNG-Expansion plans in the port 1.1.4. Build up CO2 neutrality balance sheet 1.1.5. Pursue energy networks in the port **<u>Starting new:</u>** 1.2.1. eFuels for vessels 1.2.2. Check for possible future hydrogen developments in the port 1.2.3. other Power2X-applications in the port 1.2.4. Large-scale PV deployment in the port area 1.2.5. Building Heating / Conversion Plan (LZE) 1.2.6. „sustainable gas hub" in Ennshafen (developments in the area of quay 17/16,..) 1.2.7. Examine alternative power generation and other uses of „Power-new".	1.1.1. CEF-2020-AT-TM-0006-S >Investments 1.1.2. CEF-2020-AT-TM-0006-S >Investments 1.1.3. CEF-2020-AT-TM-0006-S >Investments 1.1.4. CEF-2020-AT-TM-0006-S 1.1.5. Continuation of the Energy Working Group 1.2.1 Offer planning with bunker operator 1.2.2 Monitoring "Global Ports Hydrogen Initiative" & national projects 1.2.3 Monitoring of market developments 1.2.4 carry out rough planning 2023 1.2.5 Planning – realized by 2035 at the latest 1.2.6 conduct joint planning with Primagaz, RAG et.al. 1.2.7 current focus on shore power project (possible combination truck e-fueling station).

Table 8: Low carbon port

2: CARGO & CORE INFRASTRUCTURE*	
Fields of work	**Implementation or further checking**
<u>Already concrete ongoing:</u>	
2.1.1. Railway debottlenecking	2.1.1 CEF-2020-AT-TM-0006-S >Investments
2.1.2. Quay21-New (surface, tracks, building construction considerations, mixed use, ...)	2.1.2 Based on result CEF-2020-AT-TM-006-S carry out further planning
2.1.3. Expansion of the focus on agricultural transhipment (soy, ...)	2.1.3 Launch focus 2023 (internal?)
2.1.4. Other inventory optimizations (e.g. Kai13)	2.1.4 CEF-2020-AT-TM-0006-S and others
2.1.5. Waste Management & Recycling	2.1.5 Launch focus work 2023
2.1.6. Bifunctional system ship-railway	2.1.6 Expand customer contacts (pellets,...)
<u>Starting new:</u>	
2.2.1. Options analysis for transhipment change („containerization/box")	2.2.1 Consolidation of the basic analysis from Project Dionysus, market analysis
2.2.2. Transhipment of new energy sources	2.2.2 Pursuit Pellets / e-Fuels / Hydrogen
2.2.3. Waste management / criteria tightening	2.2.3 Examination at Kai21 reorganization
2.2.4. Station pushers in the port to get moving aggregates free	2.2.4 Defensive for the time being, first conduct customer survey (interest given?)
2.2.5. Access to the railroad for small quantities	2.2.5 Reinforce slot concept at Kai21
2.2.6. Trailer-Handling	2.2.6 Integration in slot concept Kai21-new
2.2.7. New aggregates for handling equipment (clean)	2.2.7 defensive for the time being, market development?
2.2.8. Securing and further developing the Seveso Zone	2.2.8 Intensification of talks with community

Table 9: Cargo & Core Infrastructure

*... enhancement of transshipped cargo, new cargo, core infrastructure of the port (truck-train-ship and transfer between these modes), further containerization / "boxing" of cargo, ...

3: DIGITALISATION*	
Fields of work	**Implementation or further checking**
Already concrete ongoing:	
3.1.1. PMS (Port Management System) 3.1.2. PCS (Port Community System) 3.1.3. Extensions to include camera system and other port processes	3.1.1 Realisation of PMS-concept 3.1.2 successive extension testing (PCS) 3.1.3 complete planning in 2022 > start successive implementation
Starting new:	
3.2.1. Hybrid meeting infrastructure in the LZE 3.2.2. „Port-Card/App" (Access, DLs, ….)	3.2.1 Market offer for system upgrade 3.2.2 Checking whether there is a need in the future

Table 10: Digitalisation

*… digitalisation of the core processes of the port business (PMS > PCS)

4: GENERAL & BASIC INFRASTRUCTURE *	
Fields of work	**Implementation or further checking**
Already concrete ongoing:	
4.1.1. Waterway availability	4.1.1 permanent Lobbying (international)
4.1.2. Road & truck traffic within the port	4.1.2 pushing ahead with parking space concept with city
4.1.3. Improve road systems externally (remove known bottlenecks).	4.1.3 Expansion of Kristeinerknoten (on the B1) and Danube bridge-new – lobbying countries
4.1.4. Railroad connection (external)	4.1.4 CEF-2020-AT-TM-0006-S finalisation
4.1.5. Extension possibilities, free areas	4.1.5 Borealis withdrawal and „New areas west"
4.1.6. Certification	4.1.6 Environmental/energy certificate until approx. 2025
4.1.7. Strategic Maintenance and Reserve Building for Port Infrastructure	4.1.7 Continue concept for multi-year provisions that has been started
4.1.8. E-mobility infrastructure in the port	4.1.8 Observation 1st expansion stage >2nd stage?
4.1.9. Utilities	4.1.9 new water pipeline and power line
4.1.10. Neighborhood	4.1.10 Continue advisory board meetings
4.1.11. Human resources development	4.1.11strategic succession planning
4.1.12. KnowHow-Tools	4.1.12 Intensify Knowhow for CEF-projects
Starting new:	
4.2.1. Port wastewater	4.2.1 only after concrete CDNI-Ö decision
4.2.2. Shortage of drivers in the truck sector and skilled labor issue in general	4.2.2 Push Kai21-new and training concepts (truck drivers) with partners
4.2.3. Access protection (fences, water side,...)	4.2.3 further treatment in the advisory board
4.2.4. Public traffic	4.2.4 city concept in the course of Danube bridge-new
4.2.5. LZE / 5. & 6. floor: modernization and new utilizations (marked demand)	4.2.5 Feasibility about new offer possibilities for the port-affine enterprises

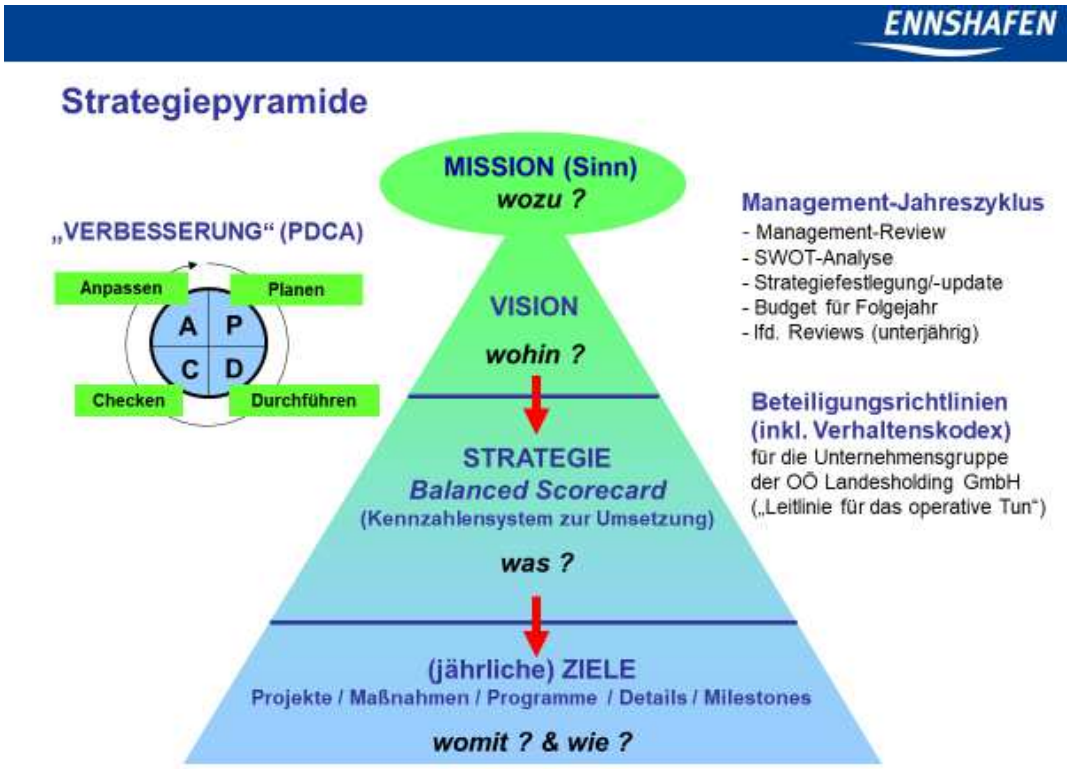
Table 11: General & Basic Infrastructure

*... cross-sectoral topics and general infrastructure elements of the whole Ennshafen-site

11 Setup of a PDCA-cycle for future update of Port Development Plan

The elaborated Port Development Plan will now be integrated into the management cycle of Ennshafen and should be a basic document in the yearly processes management review as part of the strategy review process. The whole process is oriented in a state-of-the-art PDCA-cycle (Plan-Do-Check-Act). The Port Development Plan with a fundamental assessment of the port situation and even the needs of partners, development on markets and upcoming compulsory measures is a very good basis within the yearly updated SWOT-assessment, which will deliver/update the management board strategy paper, the yearly action program as well as budgeting and mid-term financial planning.

[Summer-time: preparation of documents for management review; autumn: management review; last quarter of a year: passing of new budget and strategy update by owners; spring: preparation of new mid-term planning; all over the year: action based on yearly action plan]



The whole strategy paper is well formulated and tough document for compony government, but it is confidential due to competition reasons and therefore only part of the extended (internal) version of the Port Development Plan. A view into these documents is only possible for dedicated certification processes with fundamental secrecy agreements.

12 References

- TEN-T-Regulation / Regulation (EU) No 1315/2013 of 11.12.2013 on Union guidelines for the development of the trans-European network:
- CEF / Connection Europe Facility - Regulation (EU) No 1316/2013 of 11.12.2013 establishing the Connecting Europe Facility (CEF)
- Rhine-Danube Corridor / 4th Work Plan of the European Coordinator (May 2020)
- EU Green Deal Initiative - Overview (source: EFIP / Dec 2019)
- AFID / Directive 2014/94/EU of 22.10.2014 on the DEPLOYMENT OF ALTERNATIVE FUELS INFRASTRUCTURE
- SSMS - Sustainable and Smart Mobility Strategy (9.12.2020 / European Commission COM(2020) 789 final)
- Fit for 55 Program (14.7.2021) / "reducing net greenhouse gas emissions by at least 55 % by 2030"
- NAIADES III (24.6.2021) / "Boosting future-proof European inland waterway transport" [COM(2021) 324]
- PLATINA3 (www.platina3.eu)
- WATER FRAMEWORK DIRECTIVE (June 2020)
- EUSDR / Danube Region Strategy
- DTP-project "DAPhNE"
- Current government program Austria 2020 – 2024 (relevant excerpts)
- Austrian Recovery and Resilience Plan 2020 -2026, Vienna, 30.4.2021 (relevant excerpts)
- Mobility Masterplan 2030 for Austria (15.7.2021) – relevant excerpts
- Master planning by viadonau for shore power supply in Austria (2019-2021)
- Danube Action Program of bmvit/bmk (old version, currently under revision; new version still in 2022?)
- Economic and Research Strategy of the State of Upper Austria #upperVISION2030 (2020 – relevant excerpt)
- Upper Austrian spatial planning strategy "#upper REGION2030" (May 2020 – relevant excerpt)
- Upper Austrian energy strategy „Energieleitregion OÖ2050" (2020 – relevant excerpt)
- H2020-Project "S-PARCS"
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- https://economy-finance.ec.europa.eu/economic-surveillance-eu-economies/austria/economic-forecast-austria_en