

## STRATEGIC ACTION PLAN OF THE FUA RIJEKA

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**Client:** CITY OF RIJEKA  
Korzo 16  
51000 Rijeka  
Croatia

**Provider:** MYDONIA CONSULTING d.o.o.  
Milana Smokvine Tvrdog 1  
51000 Rijeka  
Croatia



**Authors:** Mirta Klaričić, mag.oec.  
Dunja Zagorac Šimac, mag.oec.



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## Introduction

### Scope and structure of the document

This document represents the deliverable of the GreenerSites project, and describes the concrete actions that, according to the project experience and approaches, can contribute to increase the effectiveness of management of identified brownfield site in the territory of Mlaka.

Redevelopment processes usually take long time, requiring clear strategic development directions, continuous motivation (and dedication) of those involved and stable legislative frameworks, allowing planning and especially implementation of envisaged activities/measures/project.

This Strategic Action plan summarises a few common recommendations that might be considered by local, national and EU actors in order to increase the efficiency of brownfield revitalisation planning process, ease implementation of revitalisation actions and facilitate attainment of its final results.

The document is composed by four main chapters.

The first part (Introduction) describes general presentation of the considered area and of the activities carried out during GreenerSites projects. Also, elaborates the involvement and consultation of local, regional and national key stakeholders, and the methodological approach adopted for selecting the relevant actions.

„Part A“ represents brief summary of concrete actions that have been identified in FUA area.

„Part B“ elaborates these actions and measures starting from the analysis of the specific problems addressed, describing the objective of the intervention, main stakeholders, dynamic of planned activities, financing sources and implementation steps.

The final chapter contains references to external documents and materials, that can be useful in expanding the topics dealt within this material.



## The contex: the Functional Urban Area and related Pilot Site

Rijeka is the center of the County of Primorje-Gorski kotar County and the center of Urban agglomeration of Rijeka. Its historic development is marked by the develop of ports and industries. In the last thirty years a large industrial facility went through a period of transition during which many of them was closed. The transition of the industry that once was the driver of the economic life of the city was difficult, and today there are a number of unused manufacturing planst, which are valuable spatial resources especially having in mind limited administrative-territorial boundaries of the city.

The industrial area of Mlaka is part of the historical port - shipbuilding - industrial zone of Rijeka, which lies on the historical center of the town and extends in a narrow coastal zone to the west.

It covers an area of approximately 24ha and consists of four spatial units:

- A. oil refinery facility (approximately 12.5 ha) and space used by Energo (approx. 2.5 ha)
- B. space of the oil refinery tank above the railway (approx. 2.3 ha)
- C. the Petroleum port Mlaka (approx. 3 ha)
- D. mixed use area at the beginning of Milutin Barač Street (2.5 ha).

The premises of the oil refinery and the Energo Company are located between Milutin Barača Street in the south and the railway line in the north. The tank area is located between the railway and Zvonimir Street.





Within the zone there are also smaller production facilities, working and storage buildings and a smaller number of residential buildings. There are no open public spaces or systematically planned green spaces (except for an avenue in the Milutin Barac Street section). To the north of the Torpedo plant is a Mechanical School for industrial and craft occupations.

The zone is intersected by a wide band of railway infrastructure primarily related to the needs of the port. The railway tracks terminate in the abandoned building of a former depot in the area between Petroleum Port and the former Torpedo factory. The industrial zone thus located has historically prevented the contact of the city center with the sea. Since the port of Rijeka and the shipyard are still active on this location, the possibility of access to the sea is located in the area of abandoned refinery and Torpedo plants.

As previously stated, the industrial area of Mlaka continues directly to the port area. The largest part of the selected area is the former Petroleum Refinery with the Petroleum port, which stopped with operations ten years ago. Remediation of highly polluted soil is the greatest burden of this area and a prerequisite for its urban transformation. Considering the central position within the city territory, the possibility of access to the sea in the immediate vicinity, the valuable industrial heritage and the envisaged new uses, this space has the potential to improve the quality of not only the area of Mlaka but also of the city territory as a whole.

The industrial complex of the abandoned Rijeka oil refinery is an example of a rarely preserved, complete industrial assembly of its kind, not only in Croatia but worldwide. In 2015, the space was preventively protected as a historical unit of the industrial heritage of the former Oil Refinery and included in the register of cultural property of the Ministry of Culture of the Republic of Croatia under the number P-5078. The protected area includes the area between Milutina Barača Street and the railway line, the space with tanks above the railway line and the Petroleum port, which is an integral part of this assembly.

The spatial structure of the former Mlaka refinery is important not only as a testimony to high technical, technological and architectural achievements, but also is an integral part of the industrial landscape of Rijeka, recognizable in European contexts. The refinery's industrial heritage has technological and scientific value for production history, cultural-historical and aesthetic-morphological value for the quality of architecture, design and planning, and social value as part of the testimony of people's lives.

Below the oil refinery is another large industrial complex, the site of the former Torpedo plant. Further west, in the Kantrida area, is the shipyard 3. May.



The Petroleum port Mlaka is located 0.5 M west of the entrance to the port of Rijeka. Two approaching waterways can be used for the approach. The main entrance and exit route to the Petroleum port Mlaka area is a sea passage through Kvarner between the eastern coast of Istria and the islands of Lošinj and Cres and through the passage of Vela Vrata. Another waterway is through Kvarnerić and the passage of Srednja Vrata, between the islands of Krk and Cres.

The entry to the Petroleum port does not provide a direct access to the sheltered area due to the position and layout of the breakwater, and shape of the coastline near the old torpedo launch ramp and railroad yard. The entrance to the port is 75 m wide (between breakwater and the shore). The width between the 5 m isobaths is 65 m, and between 10 m is 25 m. Based on the historical development, it is assumed that the area along the breakwater contains stone remnants of the breakwater that has fallen into the sea after the breakwater has been destroyed.



For each of the spatial units within the selected area the Spatial Plan of the City of Rijeka and the General Urban Plan of the City of Rijeka have defined the different purposes.

For the central area of the oil refinery the production - technological - business purpose is determined, and for the space of the refinery tanks mixed purpose zone, primarily business purpose. The eastern edge of the enclosure retains mixed purpose zone, primarily residential purposes. The Petroleum port area is part of the infrastructural surface of the Rijeka port, and the area next to the Petroleum port is an area intended for production and technology / business.

Based on the above, the spatial planning documentation allows whole range of activities and allows significant freedom in the choice of activities.



## **Natural characteristics and state of the environment**

A detailed analysis of the environmental situation of the area is part of a document produced under the GreenerSites project - Proposal of Measures for Economic and Environmental Recovery and Remediation of the Mlake Industrial Area, and basic information is provided here.

### **Soil and underground**

Due to more than a century of continuous oil production at this site, a high level of soil and underground pollution can be determined with certainty throughout the refinery area, and soil remediation is a key prerequisite for further development and use of this area.

Within the area of the former oil refinery are located all production facilities, warehouses, tanks for various purposes, most of underground lines and pipelines, above-ground pipelines, traffic handling areas. Three areas can be defined - an area predominantly contaminated with bitumen, an area predominantly contaminated with paraffin and an area predominantly contaminated with fats and oils.

As a landowner, INA has undertaken pollution research and elaboration of a study on pollution and soil remediation in the refinery, which is in the final stages but is not yet available to the public.

### **Sea**

Sea quality measurements have shown that all levels of pollution are below the permitted levels.

### **Noise**

Noise levels at the measuring station closest to the Petroleum Harbor area are approximately 60 dB, which is less than the allowed 80 dB. Regarding the envisaged significant development of the Zagreb coast, as well as the new use of the Petroleum port and the construction of a road that will connect the port area with the bypass passing through the selected area, when planning the urban transformation of the entire area, the noise protection aspect will certainly be one of the significant factors in the project planning and implementation.

### **Air**

Since the refinery has been shut down, there is no longer any air pollution which has been a significant problem for its surrounding area.

In the area of the Petroleum Port of Mlaka, because the abandoned oil refinery, the bulk soil is continuously washed away by hydrocarbons deposited by the work of the INA Oil Refinery of Mlaka. The hydrocarbon layer is visible on the sea surface, and the hydrocarbon deposits on the rocky shoreline of the breakwater and the paved shoreline of the harbor.



## Main challenges

All of the documents produced under the GreenerSites project (Study on the Spatial Planning, Urban and Social Aspects of the Future Use of the Mlake Industrial Area in Rijeka, Proposal of Measures for Economic and Ecological Recovery and Remediation of the Mlake Industrial Area) highlight several major challenges:

- The area of the former refinery, both in the East and in particular in the West, continues into space that will undergo intensive transformation processes in parallel with it and needs to be uniquely viewed. This area is specific for its leveling accommodation in relation to the city, surrounded by port facilities on the one hand and the shipyard on the other, which presents a challenge for its integration into the surrounding urban tissue.
- This is also an area intersected by railway infrastructure, rich in industrial heritage buildings that additionally bear the burden of soil pollution. The industrial activities that took place in the project area are associated with long-term oil treatment and environmental quality can be compromised and pose a risk to future users when reusing land and facilities. Given the constitution of the soil, there is a possibility of groundwater pollution. Due to the close proximity of the sea there is a risk that stormwater, dangerous and predominantly carcinogenic compounds from the refinery, can be carried into the sea, the ecological system and consequently into the food chain.
- Remediation and redevelopment of the area requires extremely high investment and effort from all stakeholders in the process. With the development of the City of Rijeka, the industrial area of Mlaka reached the center of the city itself, which makes the process of space revitalization even more complex.
- The access to the Rijeka port basin and consequently, to the Petroleum port using the railway infrastructure is limited by the outdated transport elements. The existing railway system cannot ensure safe transport of larger amounts of cargo.
- In view of the fact that the Petroleum port area is limited to a relatively narrow strip along the coast, when selecting the future purpose, it is necessary to take into account the limited possibilities to expand the area of activities.
- The presence of the bitumen in the Petroleum Port embankment and that it is significantly saturated with hydrocarbons. What has also been found is an increased concentration (up to 55,867 mg/kg in dry matter) of mineral oil in the samples, which indicates the need for rehabilitation of the area concerned. Analysis of groundwater samples for mineral oil (samples collected at the Petroleum Port embankment) has revealed concentrations significantly higher than the rehabilitation threshold (measured 3,864 µg/l - the threshold is 600 µg/l).



Urban transformation of the selected area brings with it a number of challenges and barriers, of which the key is a high degree of soil pollution, private land ownership, complexity and financial burden of soil remediation, space intersection with existing and future port related transport infrastructure, the need to find an adequate model of management and investment in space which will satisfy all key stakeholders as well as coordinate the many processes and interests that take place within the selected area and in its immediate vicinity.

## The implemented Pilot Activities

GreenerSites project aims at development of environmental management of un- or underused industrial areas. The project also aims to achieve this through the definition of strategies and tools that are based on a sustainable, integrated approach to make functional urban areas (FUAs) cleaner, healthier and more liveable places. And so, the Port Authority Rijeka withing GrennerSites project elaborated different types of studies aimed at enviromental rehabilitation and identifying measures needed for sustainable growth in the area.

The first study The proposal of measures for economic and ecological recovery and remediation of the industrial area of Mlake included an analysis of the current state of the environment and an overview of the measures that need to be taken to remediate the environment, considering the amount of pollution, and the proposal of phases of analyzes and implementation of remediation of the contaminated area in accordance with the legislative context.

The second study - Spatial Planning, Urban and Social Aspects of the Future Use of the Mlake Industrial Area, provided an analysis of the existing situation through the territorial, demographic and economic aspects, institutional and political environment, administrative and procedural obligations. It also elaborated the spatial features, communal, transport and energy infrastructure, analysis of spatial planning documentation, interventions and development programs of the subject area, presentation of capacities for managing the development of the area and SWOT analysis and proposal of a plan for implementation of urban transformation of the selected area.



## Consultation and participatory process

The need for consultation and participatory process is used as a means to improve communications, obtain wider community support or buy-in for projects, gather useful data and ideas, enhance public sector or corporate reputation, and provide for more sustainable decision-making.

Therefore, some of possible reasons for undertaking stakeholder engagement include:

- To harness other people's energies and resources
- To explore issues and come up with fresh ideas
- To network, share ideas and best practice
- To assist decision-making
- To inform
- To understand local needs and wants
- To encourage local buy-in and ownership in projects
- To achieve more sustainable results
- To better understand and monitor community perceptions
- To establish more open communication channels, gain trust or work on breaking down historic barriers<sup>1</sup>.

Stakeholder engagement increases the understanding of development and explores opportunities for joint action and interest convergence.

Stakeholders are divided into two main groups:

1. primary stakeholders - under direct influence of redevelopment or directly influencing it, whether positively or negatively (directly influenced by potential impact of action); and
2. secondary - refers to others connected to redevelopment, not directly influencing the decisions made through the process or indirectly influenced by potential impact of action (in case that a stakeholder is „an intermediary” in the process participating in financing, implementation, monitoring or advocating).

Both cases are similar with respect to administrative-territorial belonging, type of location, with development potential and close to city center, however requires support of public sector for successful redevelopment.

In the case EU project Greenersite, it must be said that just recently this area was given a much more importance in the economic, environmental and social meaning. Due to the interest in this area many stakeholders were able to managed to gat togethther to exchange information,

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<sup>1</sup> Stakeholder engagement toolkit; REVIT, p. 1



opinion, facts, materials ecc. That was the beginning of consultation and participatory process which continued today.

The representatives of the organisations and institutions presented their ideas and significant informations to be taken in the overall strategic planning of the area. This collaboration and participation is crucial in effective planning of the FUA area.

**Methodological approach to selected actions**

The participatory process of developing a strategic action plan is in itself as important as the result. In addition, an integrated approach is provided in the drafting of the document - the action plan should address the different dimensions of the problem, ie the social, economic, physical and environmental dimensions, and consider the different territorial levels relevant to the solutions being implemented. An advantage is certainly the use of the GreenerSites partnership and transnational networking, for transnational exchange on how to deal with identified challenges and how to foster an integrated and participatory approach

The strategic action plan is, therefore, the result of a participatory process; it was made with the stakeholders involved in the project and the project partners, and the following are the basic guidelines of drafting the Strategic Action Plan, which derive from the very name of the document:

<b>STRATEGIC</b>	<b>ACTION</b>	<b>PLAN</b>
Positive externalities	Action-oriented	A structured document
Addressing social, economic, physical and environmental dimensions	Useful and concrete	Including timing and budget
	In partnership with local stakeholders	Task allocation



## Part A. Short Summary of actions

### Action 1- The construction of the supply point for Krk LNG terminal

The action will be conducted in synergy with the project of the construction of the LNG terminal on the island of Krk as its subproject in order to enable further distribution of LNG. With the objective of introducing the LNG an environmentally friendly propulsion fuel in maritime, river, rail and road freight transport, the project is of strategic interest of the Republic of Croatia.

### Action 2- Extended environmental monitoring and testing

The primary objective of this action is to identify environmental changes and trends in area of Petroleum port Mlaka as a solid basis for the future investor(s). Also to identify decontamination measures which must be coordinated with the authorities in charge. This action or planning stage aims at detailed planning and the dynamics of activities of environmental research (testing and monitoring). To solve the problem it is necessary to scan, monitor, forecast and assess the area in order to identify environmental changes and trends, to develop projections based on those monitored changes and determine the importance of those changes for implementing the right strategy and action.

### Action 3- Development of Environmental management programme

The main objectives of this action are to consider issues related to the environment, which are specific to investment in infrastructure, which will improve the system of protection and rescue as well to prepare measures to mitigate adverse impacts.

The scope of this action will be the development of the effective environmental management programme (EMP) which will include the information on the generation and treatment of solid waste, liquid and gaseous effluents, details of safety measures around the project, and details of the safety organization including key personnel. An EMP will be formulated to mitigate the adverse impacts arising out of any developmental programme, also will ensure that resources are used with maximum efficiency, waste generation is minimized, residuals are treated adequately and products are recovered and recycled to the maximum extent possible. Stress should be laid on low waste or cleaner technologies



#### **Action 4- Branding and image-visibility**

In revitalisation process many assumes a close link between brownfield and contamination, and hence results in conveying negative implication for the management of brownfield sites. Image building, branding, visibility promotion and detailed marketing strategy are necessary for any successful brownfield revitalisation. It should ensure proper awareness among target groups and general public on positive effects and benefits expected as a result of planned revitalisation actions. For the successful implementation of marketing strategy it is important that the investors incentive programs and the brownfield redevelopment opportunities are effectively communicated to other stakeholders (property owners, developers, potential end users) , and support professionals both within and outside the area.

Therefore, the purpose of Marketing Strategy is to proactively and regularly advertise and market this FUA area. This Marketing Strategy should also help overcome any negative image that public or private sector may have of the FUA area.

Also, to educate the public, property owners, developers and other stakeholders regarding environmental site assessment and remediation processes and the whole area and with respect to these processes; to provide direction on how to obtain information and assistance.



## Part B. Detailed description of concrete actions

Description of characteristic features of the development area should include:

- Clear identification of the brownfield site
- Presentation of economic role of the site (if any economic activity is present there) and its role in the economic, social and political context of a broader area, including development plans of the broader area (if appropriate and if such plans are in place)
- State of ownership with a view to identify possible intentions of owners related to future developments
- Review of legal environment – national and local – with regard to any potential interventions in the site (e.g. land register, urban plans)
- Environmental status: possible contaminants and active contamination sources, which might have significant impact on the determination of remediation processes, time and financial resources, and future functions of the area, including exploring the site's historical past – in order to identify the types of contamination and seek for future functions most adaptable to the given qualities
- Urban aspects: assessing the site from urban and social aspects, mapping physical and technical condition of the built environment, including infrastructural facilities and buildings, in order to identify their adaptability for future use, and to categorise status of individual objects, including mapping of structures (buildings and other constructed items) of historical value (protected and, if relevant, unprotected) and identification of missing buildings and infrastructural elements, which would provide minimal conditions for revitalisation (such as roads, public utility elements, interspace etc.)
- Image and visibility: the present opinion about the area among interested parties, including residents, where appropriate (potential stakeholders).

Some of the above features and tasks were discussed in previous studies (see **The implemented Pilot Activities**) as preparatory and initial stage and this stage (strategic planning) is focused on elaborated overall action plan for revitalisation of the brownfield site, including phased approach (if necessary) and individual projects, main actors, timing, management, and identified financial resources, marketing including branding and imaging.



## Revitalisation planing



Comprehensive plan for brownfield revitalisation should involve:

### Main (groups) of aspects:

- A broader socio-economic and development context
- Legal and ownership issues
- Land use and spatial issues
- Environmental & sustainability issues
- Financial issues (budget and funding)
- Branding and imaging
- Organisational and management aspects
- Involvement of stakeholders



## Action 1- The construction of the supply point for Krk LNG terminal

### Content of specific action

As previously stated, the Law on the Terminal for Liquefied Natural Gas was adopted (NN 57/2018) and according to the article 1 of the Law, the interest of the Republic of Croatia is determined as well as the subsidiary application of the regulations, the terminal infrastructure for liquified natural gas as strategic interest of Republic of Croatia, the insurance of concession on the maritime domain for the realisation of the terminal and supporting infrastructure, including the location for LNG, the rules and measures for the realisation of LNG terminal in order to preserve the safety of natural gas supply and data security is regulated. The investor is also determined – LNG Hrvatska d.o.o.

In article 2. The following is expressively stated – the subproject of the construction of the LNG supply point in the Port of Rijeka – Rijeka basin – area Mlaka for the futher distribution of LNG, including all systems and the installation required for the operation of the LNG supply point.

With direct reference to Mlaka area in the Rijeka basin of the Port of Rijeka (Petroleum port), the purpose of the subject area is explicitly determined – the Article 4 states that the construction of the LNG terminal on the island of Krk and the point of supply of the LNG in the port of Rijeka is of interest to the Republic of Croatia, because of the introduction of LNG as environmental friendly fuel in maritime, river, rail and road cargo transport.

The Law also authorize The Port of Rijeka Authority to grant LNG Hrvatska d.o.o. (investor) a concession and to conclude a concession contract for the purpose of constructing a LNG supply point in the Petroleum port, in order to enable further distribution of LNG.

It is important to notice that the stipulation contained in the above mentioned Law are in significant accordance with the fundamental recommendation in the study realised in the framework of the GreenerSites project – **“The study on the future use of the Petroleum port Mlaka”**, created by the Faculty of maritime Studies, University of Rijeka in 2018. The recommendation were based on the evaluation of the possible development scenario with the existing strategic framework, but the Law came into force after the study was realised.

In case of cancellation of the LNG terminal on the island of Krk resulting with the cancellation of the LNG supply station, and the main risk is opposition of the local public, then it will be taken into the consideration other recommendations from the above-mentioned study, including the acceptance of LPG cargoes and construction of LPG supply station and the connection of the area with the Zagrebačka obala area (Zagreb Deep See container terminal) as an area of possible extension.



Geotechnical research for the design of the main LNG distribution and supply point in the Petroleum Port Mlaka was already began in 2018. to determine the conditions for the foundation of future tanks, forklifts and other future plants. The main objective of research is to gather information on the state of soil at the location of the future LNG supply point station.

The LNG supply point in Rijeka is a pilot project for which is the most important condition for the realization the realisation of the LNG terminal in Omišalj - the station in Rijeka will be the first in the series, as similar stations are scheduled in Pula, Zadar, Šibenik, Split, Ploče and Dubrovnik.

### **Short problem description**

The use of LNG as an alternative to traditional propulsion fuels in maritime and land traffic will in the coming years experience a great expansion, especially in the Mediterranean, where it is expected to introduce restrictions in sulfur compounds and nitrogen oxides in ship emissions from 2020. This is particularly in regard to cruisers, who go into the historic centers of Mediterranean cities, but also on ships in inland waterways, such as ferries. In 2016, Croatia already adopted the Law on Establishment of an Alternative Fuel Infrastructure, setting out the minimum requirements for the construction of alternative fuel infrastructure, which transposed the provisions of the Directive of the European Parliament and Council of the obligation to establish alternative fuel infrastructure for each EU member state. This law is defining the LNG as an alternative fuel for propulsion of marine engines, heavy truck traffic and in the future also the fuel for the propulsion of locomotives.

The law also defines the obligation of ports to provide access to the sites for the distribution and supply of liquefied natural gas.

As previously stated the main risk of realisation of the proposed action is opposition of the local public and this

### **Objective of specific action**

With the objective of introducing the LNG an environmentally friendly propulsion fuel in maritime, river, rail and road freight transport, the interest of the Republic of Croatia is to ensure the realization of the site for the supply of LNG in the Petroleum port Mlaka as a subproject of the LNG terminal on the Island of Krk.

As already mentioned, the construction of the terminal for the LGN on the island of Krk and the supply station in the Petroleum port is in the interest of the Republic of Croatia with the following objectives:

- The realization of the project will provide a new rout of supply for natural gas and will diversify the natural gas supply routes and sources on the Croatian and European



Union markets, which will significantly affect the security of natural gas supply - Pursuant to Regulation (EU) 2017/1938 of the European Parliament and of the Council on measures to safeguard security of gas supply and by the non-application of Regulation (EU) No. 994/2010, preventive measures for security of supply include measures for the diversification of natural gas routes and sources. The realization of the project was identified as the main measure for diversification of natural gas routes and sources.

- Besides providing diversity of supply of natural gas and security of supply of natural gas, the objectives are as well introducing the ecologically sound energy source in the region, reducing CO<sub>2</sub> emissions in the region and facilitating economic development.

### **Partners involved and description of participatory process**

According to the above-mentioned Law, company LNG Hrvatska d.o.o. is determined as the investor for the construction of the LNG terminal in two phases - construction of a floating terminal for LNG in the first phase and construction of a land terminal for LNG in the second phase and also for the construction of the LNG Supply Station in Rijeka, in Petroleum port. LNG Hrvatska d.o.o. is a company (founded by Hrvatska elektroprivreda d.d. (HEP Group), national energy company, and Plinacro d.o.o., the gas transmission system operator) established for the purpose of building and operating the infrastructure necessary for receiving, storing and degasifying liquid natural gas.

The stakeholders and partners involved: Croatian Ministry of Environment and Energy, Croatian Energy Regulatory Agency, HEP group, INA d.d. oil company, external experts/consultants engaged on realisation of project – on researches, studies etc, private investors, University of Rijeka, Port Authority Rijeka, Port of Rijeka, local environmental protection associations (NGOs), Institute of Public Health of the Primorje-Gorski Kotar County, City of Rijeka, Primorsko Goranska County.

Regarding participatory process, it is of extraordinary importance that all the stakeholders and also wider public is included in decision making regarding the project - Since 2013, LNG terminal project on Krk has status of European project of common interest, or PCI. This status brings significant political, regulatory and financial benefits to the project and its beneficiaries, as well as a series of obligations. One of these obligations refers to the democratic process that it requires - increasing transparency and great public participation, stakeholders and citizens are invited to submit their views on the projects, stakeholders and the general public also needs to be consulted during the process through an open consultation.



### **Planning of activities (timeline)**

The terminal is scheduled to start operating in early 2021. In accordance with planned deadline for the construction, documents and studies were provided - studies on power supply, the preparation of a series of comprehensive multi-disciplinary studies, Environmental Impact Assessment, a set of studies covering both onshore and offshore areas of the terminal, focused on the geological, geotechnical, geophysical, seismological and archaeological aspects, geodetic and hydrographic surveying. The necessary documents and studies will assess all aspects of the project in order to start the construction of the floating LNG terminal as well as the supply stations.

### **Financing**

In 2017, the European Commission approved a EUR 102 million grant for the construction of LNG terminal and supply stations through programme Connecting Europe Facility. LNG terminal project on Krk has status of European project of common interest, or PCI. The government of Croatia is financing the project with 50 million EUR in 2019 and 50 million EUR in 2020 for the project. The remaining amount of 32.6 million will be provided by the founders of the LNG Croatia company, the HEP national electricity provider and the Plinacro gas network operator.



## Action 2- Extended environmental monitoring and testing

### Content of specific action

Assessments through environmental monitoring and testing are subject to statistical analysis. Environmental monitoring utilizes specialized equipment and specific monitoring methods to get the most accurate recording of pollutant levels.

Environmental monitoring takes the form of air, soil, and water monitoring. Air monitors are used to identify the air quality and the levels of pollution. Soil monitoring requires the collection of soil samples to be analyzed and tested in a laboratory setting. This may be by way of grab sampling or composite sampling. Water monitoring may take the form of chemical, biological, radiological, or microbiological testing.

Environmental monitoring assessments can involve establishing baseline quality, uncovering environmental trends, identifying any variations, determining the success of projects. That is why the environmental monitoring and testing and evaluating are crucial steps for beginning any project.

This kind of testing should not only be applied on water, air and soil analysis but should also include deeper geotechnical research (also profiling with seismic waves in order to gain a better insight into the composition of the ground, georadar recording, measurements of microsystemic disturbances and seismic tomography as a basis for the seismic study of the area ecc.) not depending on what type of future use would this area be.

It should be said that the rehabilitation process will be very complex and challenging, and that, before any concrete measures are taken on that account, they need to be coordinated with possible measures taken or to be taken by INA oil refinery that surrounds the Petroleum Port Mlaka and whose burdens directly impact the present and future environment of the Port.

### Short problem description

Numerous cities around the world are facing the problem of unused and abandoned land/areas, which occupy attractive and significant areas. In addition, these areas are often contaminated, thus polluting the environment. This is the case with our FUA area, a former industrial area which occupies an attractive place in the urban area. Due to the fact that Petroleum port Mlaka was a part of oil refinery it is possible to conclude that the area is polluted (even in small amount). Some previous studies that have been elaborated in this project also confirm that fact.

The term“pollution“ consists not only of possible environmental pollution but also old and inadequate infrastructure that has not been removed or maintained properly (bulks, pipes ecc.).



To solve the problem it is necessary to scan, monitor, forecast and assess the area in order to identify environmental changes and trends, to develop projections based on those monitored changes and determine the importance of those changes for implementing the right strategy and action.



Hydrocarbon deposits on rocky shore breakwater

### Objective of specific action

Contamination of FUA areas, depending on its volume, intensity and the contaminants involved, significantly influences introduction of new functions, costs and time necessary for revitalisation.

In order to rehabilitate the area it is necessary to prepare FUA land for re-use in order to ensure adequate supply of land for new function

Regeneration of brownfield sites means investing in a better environment. The main motto of urban planning has to be sustainable urban revitalization, including environmental sustainability. This method of planning is a balance between protection and development of the environment, social cohesion and the creation of new values in the existing forms (Stojkov, 2007).

In this case, the primary objective of this action is to identify environmental changes and trends in this area as a solid basis for the future investor(s). Also to identify decontamination measures which must be coordinated with the authorities in charge.

### Partners involved and description of participation process

In this stage of planning process, stakeholders and partners involved are identified. The goal is to establish in which way they might be effective in the process or affected by the process.

Because of this specific action, most (but not all) stakeholders and partners are public services in the environmental sector such as:

- Regional level stakeholders:
  - Institute of Public Health of the Primorje-Gorski Kotar County, Department of Health and Ecology and Department of Health and Environment



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- Natural History Museum in Rijeka (biological status of demersal communities inhabiting the waters of Petroleum Port Mlaka)
- Local level stakeholders:
  - City of Rijeka
  - IND-EKO d.o.o. Industrial ecology and environmental protection
  - Private sector, investors, consultants
- National level stakeholders:
  - Ministry of Environmental protection and energy
  - LNG Croatia

## Planning of activities

### Short term perspective

At this level, expected outputs of specific action have to be defined. Short-term goals have to cover also remediation and preparatory actions, which represent a pre-requisite for development. Certain preliminary survey have to be carried out and reported.

Also, it is necessary to point out that Petroleum Port Mlaka is an integral part of its surroundings, more specifically the former oil refinery. The refinery closed down in 2008, but the area has still not been rehabilitated. In this period needs to be established which directions hydrocarbons from the refinery take when migrating into the Petroleum Port area, and the wells also need to be tested.

Moreover, it is important to get a confirmation from INA on whether they intend to rehabilitate the upper area or put in place a dug well to act as a collector of hydrocarbons migrating from upper area to the lower area. This would greatly facilitate the rehabilitation process at the Petroleum Port.

It is necessary to determine the movement of groundwater at the refinery site and its impact on the migration of pollutants under ground, which surely exists because of the permeability of the karst at the site.

### Mid -term perspective

This level should include a wider more specific approach to the environmental monitoring, testing and data collecting. Such as profiling with seismic waves in order to gain a better insight into the composition of the ground, georadar recording, measurements of microseismic disturbances and seismic tomography as a basis for the seismic study of the area ecc.

### Long-term perspective

In a long-term perspective rehabilitation measures should be proposed for the Petroleum Port and based on the previous data. In accordance with that, some steps that should be included are:



- construction of an impermeable barrier between the dry land perimeter of the Petroleum Port and the perimeter of upper INA's facilities, in order to prevent spreading and leakage of pollutants from the said facilities;
- construction of an impermeable dam between the Petroleum Port embankment and the sea, to prevent the spread of pollution during soil rehabilitation;
- rehabilitation of the Petroleum Port soil by excavating it, transporting the excavated polluted gravel to the hazardous waste incinerator, and replacement of the excavated material with a non-hazardous material, and flattening out the surface.
- marine sediment rehabilitation by excavating the polluted parts and disposing of them in the hazardous waste incinerator;
- breakwater rehabilitation and reconstruction, so that it may provide adequate protection for inbound ships.

## **Financing**

For the purpose of environmental monitoring and testing, the plan should be broken down by stages and individual years, allowing flexibility as much as practically allowed.

The financial plan has to identify potential financial sources available and accessible to cover the planned costs. In most cases revitalisation projects will be implemented by a „mixed“ funding scheme, where initial revitalisation activities / projects (such as remediation and infrastructure projects) will be most likely financed predominantly by public sources, including local, national and EU sources, which will act also as a „leverage“ to attract private capital, while investment in premises and „functions“ might be – depending on the concrete situation – fully financed from private sources.

## **Progress of implementation**

This planning stage aims at detailed planning and the dynamics of activities of environmental research (testing and monitoring). Some of the research are already being conducted but further more additional research should take place. The next step is to establish a management structure that would entirely be in charge of all actions considering this FUA area. To identify what kind of research and testing would be suitable to conduct. Also, to plan financial cost, involve institutions on local, regional and nation level taking into account all the elements and aspects included (economic and social context, legal and ownership elements, urban and spatial elements, environmental issues, cost and sources of funding).



This action presents a very good basis for any investor or developer but also residents and consumer, to receive a precise information about the area and its environmental condition and possible surrounding.

### **Action 3- Development of Environmental management programme**

#### **Content of specific action**

Environmental management plans describe how an action might impact on the natural environment in which it occurs and set out clear commitments from the person taking the action on how those impacts will be avoided, minimised and managed so that they are environmentally acceptable.

The scope of this action will be the development of the effective environmental management programme (EMP) which will include the information on the generation and treatment of solid waste, liquid and gaseous effluents, details of safety measures around the project, and details of the safety organization including key personnel. An EMP will be formulated to mitigate the adverse impacts arising out of any developmental programme, also will ensure that resources are used with maximum efficiency, waste generation is minimized, residuals are treated adequately and products are recovered and recycled to the maximum extent possible. Stress should be laid on low waste or cleaner technologies. It is useful both during the construction and operational phases of the project to ensure the effectiveness of the mitigation measures and to give guidance as to the most appropriate way of dealing with any unforeseen effects. EMP needs to be specified in order to check that environmental measures and environmental problems that might occur during either the construction or operational phase of the project. A number of important issues needs to be included in the EMP: – mitigation plan – during the project construction, during the project operation, and when stopping the usage of the project, monitoring plan, in accordance with previous action, institutional arrangements, and participatory process with local NGOs and all project – affected groups.

#### **Short problem description**

Environmental management is increasingly practised as an essential component of the business plan of any operation that claims to be sustainable, efficient and compliant with legislation. This is particularly evident in any kinds of port activities and operations, especially regarding the future plans of Petroleum port area – supply point for LNG terminal on the island of KrK. This activities can cause deterioration of air and marine water quality in the surrounding areas due to multifarious activities. Hence, for the determination of levels of pollution, identification of pollution sources, control and disposal of waste from various point and non-point sources and for prediction of pollution levels for future, regular monitoring and assessment are required during the entire construction and operation phase of supply point for LNG terminal in the Petroleum port. It is extremely essential that this project should have



an environmental management plan (EMP), to prevent different pollution, protection and control measures.

Understanding the main emission sources in the area of the port is a key component of the environmental projects and important for further improvements, thus the previous Action is considering monitoring and testing to get the most accurate recording of pollutant levels.

### **Objective of specific action**

The main objectives of this action are to consider issues related to the environment, which are specific to investment in infrastructure, which will improve the system of protection and rescue as well to prepare measures to mitigate adverse impacts.

Also, the purpose of the action is as follows:

- Define the scope of environmental management role and responsibility
- Outline how it will be managed the risks and opportunities associated with operations and activities to minimise impacts to the surrounding environment
- Provide an overview of the significant environmental risks and outline the key treatment plans that will address these risks;
- Outline the environmental objectives for the subsequent years, and to report progress
- Provide a framework for ensuring environmental performance is continuously and systematically improved;
- Provide a high-level overview of how environmental management meets the requirements of set standards
- Highlights key reference documents, systems and processes central to environmental management
- Encourage good management practices through planning and commitment to environmental issues concerning any project;
- It tells how the management of the environment is reported and performance evaluated periodically;
- To provide rational and practical environmental guidelines that will assist in minimizing the potential environmental impact of activities;
- Helps in minimizing disturbance to the environment (physical, biological and ecological, socioeconomic, cultural, and archaeological) ;
- Combat all forms of pollution through monitoring air, noise, land, water, waste, and energy and natural resources;
- Protection of sensitive and endangered flora and fauna;
- Prevent land degradation;
- Comply and adhere to all applicable laws, regulations, standards and guidelines for the protection of the environment;
- Adopt best practicable waste management for all types of waste (liquid and solid) with objective on prevention, minimization, recycling, treatment or disposal of wastes;
- Describe all monitoring procedures required to identify impacts on the environment;



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- Train and bring awareness to employees and contractors with regard to environmental obligations and compliance.
- Reduce environmental risk and provide better Health, Safety and Environment (HS&E)
- Increase efficiency through minimum consumption and conservation of energy deplete-able resources
- Establishing the reporting system to be undertaken during the construction.
- The EMP also serves to highlight specific requirements that will be monitored during the development and should the environmental impacts not have been satisfactorily prevented or mitigated; corrective action will have to be taken.
- An overview of the conditions and requirements of compliance with the World Bank's and other relevant institutions environmental policies.

### Partners involved and description of participatory process

The partners involved: external experts/consultants engaged on realisation of EMP, private investors, University of Rijeka, Faculty of Maritime Studies Rijeka, Faculty of Civil Engineering Rijeka, Port Authority Rijeka, Port of Rijeka, Ministry of Environmental protection and Energy, local environmental protection associations (NGOs), Institute of Public Health of the Primorje-Gorski Kotar County, Department of Health and Ecology and Department of Health and Environment, City of Rijeka, Primorsko Goranska County, Natural History Museum in Rijeka.

Regarding participatory process in creating EMP, it will be organised preliminary public presentation about the project and all the steps in project realisation, as well as the conceptual design, draft EMP, Environmental impact Assessment Study and results of the environmental monitoring programme during project construction and project usage.

The partners involved in this action will organise also public consultations and a public hearing – the public will be informed about the project and environmental impact of the project and proposed measures and extended program of monitoring.

### Planning of activities (timeline)

The EMP is most effectively developed when impacts are evaluated followed by EIA (Environmental impact assessment) completed with supporting baseline studies for the project and site. Impact evaluation signifies the importance for the mitigation measures suggested during the impact analysis or assessment. The residual impact estimated with execution of proposed mitigation measures is vital towards developing EMP. This EMP details the mitigation measures to prevent, reduce and where possible offset any significant adverse effects on the environment throughout the different phases of the project. EMPs are therefore important tools for ensuring that the management actions arising from Environmental Impact Assessment (EIA) processes are clearly defined and implemented through all phases of the project life-cycle.



Environmental management plans are often realised during the environmental impact assessment process and may be part of the documentation considered by the relevant ministry, when deciding whether to approve a proposed project. If the proposed action is approved, environmental management plans are often referenced in the conditions of approval. In addition, approval conditions sometimes require revised or additional environmental management plans to be approved before the approved action can begin.

In addition to meeting obligations under national environment law, an environmental management plan may also be required to satisfy the requirements of other regulatory bodies or regulations.

The main components of EMP are: 1. Mitigation Program 2. Monitoring Program 3. Recommendations 4. EMP Implementation Program. The EMP considers the institutional arrangements for implementation. Responsibilities for mitigation and monitoring will be defined along with arrangements for information flow, and for coordination between institutions responsible for mitigation. The developed EMP will specify the organizations and individuals that will be responsible for undertaking the mitigation and monitoring measures, e.g., for enforcement of remedial actions, monitoring, training, and financing.

## **Financing**

The financing of the proposed action most likely will be through:

- Port of Rijeka Authority resources
- Ministry of Environmental protection and Energy of the Republic of Croatia
- EU funds

It is important to note that The Law on the Terminal for Liquefied Natural Gas (NN 57/2018) define that the Port of Rijeka Authority will grant LNG Hrvatska d.o.o. as investor, a concession – it authorize the Port of Rijeka Authority to conclude a concession contract for the purpose of constructing a LNG supply point in the Petroleum port in order to enable further distribution of LNG.

## **Progress of implementation**

Preparation of environmental management plan is required for the formulation, implementation, and monitoring of environmental protection measures during and after commissioning of projects. The plans indicate the details as to how various measures have been taken or proposed to be taken including cost components. Cost of measures for environmental safeguards is treated as an integral component of the project cost and environmental aspects have been taken into account at various stages of the projects.

The concise steps in implementation are as follows:

- Preliminary environmental assessment background information required to prepare the EMP - documents from the EIA process (if applicable), identifying regulations and legislation that projects need to comply with and that provide the context for the EMP,



predicted positive and negative impacts, management actions to mitigate negative impacts and enhance positive impacts, as well as a statement of commitment from the Project Proponent regarding their commitment to implementing the management actions, high-level documents that set the framework for environmental management for the proposed activity, local monitoring programmes that the EMP would need to take into consideration - existing monitoring programmes carried out, environmental policies or guidelines, updated project information that may provide more detail than presented for the EIA. The EIA process may lead to more detailed investigations into implementation of certain mitigation actions. The findings of these investigations can be included in the EMP

- Preparation of Environmental Management plan
- Stakeholder engagement - if the EMP follows an EIA, then it is expected that the stakeholders would have had opportunity to comment on the impacts and management actions described in the Environmental Impact Assessment Study and EMP will follow with further specific consultation with stakeholders regarding the EMP - best practice requires an appropriate level of stakeholder engagement in the development of the EMP. The stakeholders should be provided with opportunity during the construction and operational phases of the project to provide input into the revisions of the EMP as well as the design of corrective actions where appropriate. The main benefit of involving stakeholders in the EMP is to include knowledge (eg. in the design of monitoring activities) and to ensure that the EMP addresses aspects of the project that could be a source of social risk. Stakeholders need to understand that their safety, health and environment are not being compromised. They should be kept informed (for example, via newsletters and notices) so that no uncertainty exists in this regard.



## Action 4- Branding and image-visibility

### Content of specific action

The detailed picture of the FUA area site should be completed by a perceived image of the site among (potential) stakeholders, e.g.: owners and tenants, potential developers and investors, business community and its associations, institutions (authorities, universities, other public organisations interested / influenced by the site), employees and unions, residents (in site and/or neighbouring areas), etc.

Identification of the perceived image might include the elements such as:

- General present image of the site (negative / positive) and envisaged future – target image (it has potential to improve / it will worsen)
- Transport accessibility (different means of transport, different purposes, such as work, leisure, residential function)
- Land value and prices (whether actual or perceived)
- State of infrastructure in the site; any heritage elements
- Awareness of current activities in the site (if any), can include e.g. renowned companies, important (e.g. for job opportunities) / or irrelevant / non recognisable
- Information on environmental issues, e.g. contaminated and dangerous for health, presumably dangerous due to hidden contaminants from past activities, live contaminants with adverse effects on neighbouring areas
- Potential for the future (e.g. it is suitable for introduction of new functions, job creation, residential area, green and recreation areas, others)
- Attractive for investments or not; worth to invest in revitalisation or not, etc.

### Short problem description

Older industrial properties such as our FUA area- even those with just small amounts of environmental contamination that could easily be remediated, are placed at a considerable disadvantage in the general urban site and potential regarding for example real estate market or any other sector. In revitalisation process many assumes a close link between brownfield



and contamination, and hence results in conveying negative implication for the management of brownfield sites

Giving the fact that Petroleum Port Mlaka was a part of oil refinery, general public and other stakeholders might be having image of an area that is polluted and contaminated. Not only the area of Petroleum Port Mlaka but also its surrounding. And they are probably right considering recent environmental analysis. It is necessary to rehabilitate that area because of the heavy burden and contamination which has been accumulating for years due to the proximity of the refinery and its production processes, as well as prior industrial activities at this site.

### **Objective of specific action**

Image building, branding, visibility promotion and detailed marketing strategy are necessary for any successful brownfield revitalisation. It should ensure proper awareness among target groups and general public on positive effects and benefits expected as a result of planned revitalisation actions. The concept of stakeholders' engagement is, among others, intended to promote the project among target audience – the stakeholders.

Petroleum Port Mlaka should be branded as a potential brownfield area with many advantages (position, transport capabilities, service capacities ecc.).

Entities entrusted with promoting these locations need to be aware of the best methods of informing the public of the benefits of considering Brownfield locations for their development efforts.

### **Partners involved and description of participation process**

Profile of the stakeholders will largely determine the type of investment, the tolerance for risk and the manner in which market forces drive their redevelopment objectives.

In recent years there has been some activities in which many stakeholders spoke and elaborated about the FUA area, mostly of its environmental status and future use. Nevertheless it has become a subject of matter and that was the beginning of participation process in the visibility part. Also, it must be said that many EU projects in which Port Authority Rijeka is partner, also gave visibility to the FUA area. Not only that, many concrete actions were implemented (strategic plans, studies, reports ecc.).

Stakeholders that were involved in the participation process were: Port Authority Rijeka, City of Rijeka, Society of architects, Primorje-gorski kotar County, Cezar association, Ind-Eko, Rijeka traffic, Energo, University of Rijeka ecc. Group work during the stakeholders sessions brought-in fresh ideas and an innovative look on processes, but it cannot replace the expert work that should be carried out between individual sessions in order to provide the basis for the next steps of the stakeholders engagement (e.g. analysis of ideas and proposals brought-



in, checking for feasibility in terms of e.g. legal environment, visibility procedures, cost, time, etc.).

### **Planning of activities**

Giving the above image elements and considering a wider approach to the matter it is necessary (in a short term) to identify an image of the brownfield site using some possible tools such as: collecting and processing information given by (potential) stakeholders using opinion polling (questionnaires, interviews, webpage voting, etc.) or some co-creative tools (such as workshops, panels, interactive web pages, etc.).

In the long/medium term its activity should be more focused on the investors and developers objectives. Due to other planned action in the FUA area, branding and imaging should be adjusted accordingly. In that case it is necessary to create a marketing strategy as a follow up activity to the main action that is going to be implemented in the area.

### **Financing**

Financing of this action should be broken down by stages, for example: in the short term (when investors and developers are not known) visibility as a brownfield site is already in the process (as mentioned through EU projects, meetings, conferences ecc.). These are national and EU funds.

Next step should be developing marketing strategy by investor/developers and should be financed by them. Also, it is important to involve all other stakeholders in process.

### **Progress of implementation**

For the successful implementation of marketing strategy it is important that the investors incentive programs and the brownfield redevelopment opportunities are effectively communicated to other stakeholders (property owners, developers, potential end users), and support professionals both within and outside the area.

Therefore, the purpose of Marketing Strategy is to proactively and regularly advertise and market this FUA area. This Marketing Strategy should also help overcome any negative image that public or private sector may have of the FUA area.

Also, to educate the public, property owners, developers and other stakeholders regarding environmental site assessment and remediation processes and the whole area and with respect to these processes; to provide direction on how to obtain information and assistance.



## References and annexes

- „Fundamental research on the environmental status of the harbour area“  
(Public health department of Primorsko - goranska county (NZZJZ PGŽ), Dezinsekcija ltd.)
- „Proposal for the measures of rehabilitation of the Petroleum port Mlaka“  
(IND-EKO d.o.o. Industrial ecology and environmental protection)
- „The study on the future use of the Petroleum port Mlaka“  
(Faculty of maritime studies Rijeka)
- Project REVIT- Towards more effective and sustainable brownfield revitalisation policies (REVIT - Stakeholder Engagement - a toolkit. REVIT Consortium)
- The Law on the Terminal for Liquefied Natural Gas (NN 57/2018)
- „Oil Refinery Rijeka- a European pioneer in the processing of black gold“ (V.Đekić, INA Rafinerija Rijeka, UDK: 665.6/.7(497.5 Rijeka)«18/19)