RIJEKA PORT AUTHORITY
Rijeka, Riva 1

RIJEKA GATEWAY PROJECT II

OVERALL PROJECT ENVIRONMENTAL ASSESSMENT
OVERARCHING EXECUTIVE SUMMARY

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1. INTRODUCTION

Background

The port of Rijeka is the largest international seaport in Croatia with 5 million tons of dry cargo handled in 2006. It offers the only port container terminal in Croatia and the basis for the many small and medium enterprises (SMEs) active in transportation service in Rijeka. The Port offers the shortest land transport distance to access either Belgrade (Serbia) or Budapest (Hungary). The city of Rijeka is the third largest Croatia city (about 135,000 inhabitants in 2001) and is located less than 25 kilometers away from the EU border with Slovenia.

As most other port-cities, Rijeka faces the complex challenge of balancing the demand for additional space for both port and city activities. The layout of the port city bordered by a mountain range and the sea limits its ability to respond to a modern port-handling requirement since excess-handling berths is coupled with insufficient port storage space and there is a high storage time for specific commodities like wood. Currently, the port container handling capacity is about a third of its competitors’ handling capacity in Trieste and Koper. Therefore, the Government of Croatia through the Port of Rijeka Authority (PRA) is eager to adopt a port development strategy that would develop Rijeka into a major container port that is responding proactively to market needs.

Rijeka is the largest port of Croatia in terms of throughput volume. The port handles a wide variety of cargo including, containers, ore, timber, grain, phosphate, and crude and refined petroleum products. Its 39 berths handle all types of vessels including tankers, bulk carriers, container vessels, general cargo ships, and passengers and Ro-Ro vessels. In 2006, the port handled 94,390 TEU and 10.9 million tons of cargo. In 2007 the number of containers increased to 145,000 TEU. Owing to its favorable position, Rijeka has all the necessary conditions to become a major port in the Southern Europe as gateway to EU markets.

The port faces new opportunities and challenges that have been reviewed in a comprehensive update of its 20-year port development master plan finalized by Rotterdam Maritime Group in April 2008. Container throughput potential through Rijeka is expected to reach about 335,000 TEU in 2015 and about 640,000 TEU by 2020. The updated master plan confirms the need for urgent additional investment to take place in the port of Rijeka, based on present traffic and traffic forecast, as well as the financial justification for many of these proposed investments. Major priorities include the expansion of the Brajdica container terminal (increase in length of berth by about 300 m), the construction of the Zagreb container terminal up to about 700 m, as well as a number of smaller investments in various terminals and in port management and information system.

The Government of Croatia together with the World Bank initiated the process of preparation of a new project (Rijeka Gateway II) for further modernization of the Rijeka port building on the solid cooperation established to date in the port and corridor development sector under the Rijeka Gateway I (RGI), the RGI Additional Financing, the Trade and Transport Integration project, and

1 The financing of the construction of the first 300 m of the Zagreb terminal (called Zagreb I) is presently covered under the Rijeka Gateway Project I (RGI) and the RGI Additional Financing project financed by the World Bank
the Trade and Transport Facilitation project. The overall RGII project objective is to help increase Rijeka’s competitiveness as a city-port, by responding sustainably to renewed demand for container flows through the port of Rijeka, while allowing an urban renewal of selected parts of the port, through public-private partnerships.

Specific infrastructure investments ready to be integrated at this stage and implemented under the RGII project include: (i) extension of the Zagreb container terminal from the proposed 300 m (covered under RGI and RGI AF projects) to up to 700 m representing an extension of 100 m under RG II, and a potential additional extension of up to 300 m, to be covered through an additional loan, if requested by the future concessionaire, accommodating fifth generation container vessels, with a capacity of about 225kTEU; and (ii) extension of the existing Brajdica container terminal from its current length of 300 m by about 330 m, increasing its capacity by 200kTEU. The Brajdica terminal would be extended using the same construction technology as the one used for the first part of the Brajdica terminal - a key wall constructed directly on the sea bed with concrete blocks, which are interlocked (‘monolithised’) by cement grout after final placement - and is envisaged to be completed by the end of 2011. The construction of the Zagreb terminal would be constructed using a “design-and-build” approach and is envisaged to be completed by mid 2012. The project would also finance the enhancement of selected port services including among others the development of a comprehensive port environment protection plan and the purchase of a waste collection vessel to address traffic increase in line with Croatian/Marpol requirements. Also, the project would follow up on corridor development aspects, although those would be funded through other government projects.

Other port infrastructure investments such as port city interface improvement and expansion of other terminals that will facilitate development of the Rijeka Port into a major, financially self-sustained, regional container port are envisaged in the future, when technically ready, but would not be included in this project.

The RGII project cost is tentatively estimated at about US$130 million including container terminal infrastructure investments proposed in accordance with the Master Plan, purchase of equipment and related consulting services. The project will build on the partnerships and achievements of the first Rijeka Gateway Project, engaging a broad spectrum of stakeholders.

**Overall Project Environmental Assessment Category and Required Environmental Due Diligence Documents**

In accordance with the World Bank's safeguard policies and procedures (OP/BP 4.01 on Environmental Assessment and OP/BP 4.11 on Physical Cultural Resources) the RGII Project has been classified as an environmental Category “A” project due to the two port terminals’ expansion investments that each requires preparation of detailed Environmental Assessment (EA) including an Environmental Management Plan.

The environmental assessment documents covering the proposed RGII investments were prepared by PRA in accordance with the Croatian Environmental Impact Assessment (EIA) law as follows:

(i) **Zagreb Container Terminal** - In accordance with the local environmental laws, in 2002 PRA prepared an Environmental Impact Study (EIS) covering the construction of the Zagreb container terminal. This EIS prepared by PRA in 2002 includes the environmental assessment of the construction works proposed for the entire Zagreb terminal with a total
planned length of 1,200 m as envisaged in its 2003 Master Plan. This EIS served as the EA for the RGI project and was disclosed as such. The Executive Summary prepared and disclosed at that time referred only to the section of the terminal which was being financed by RGI, respectively the first 250 m. However, the original EIS also covered the section which is proposed to be financed under RG II. It is therefore referred to herein as the “Zagreb Component EA”). Therefore, a new EA/EMP is not required for the Zagreb Terminal. In case the proposed “design and built” approach for the Zagreb terminal under RGII is susceptible to trigger additional environmental impacts than those already covered by the 2002 Zagreb Component EA and EMP, the preparation of an updated environmental assessment study will be required. The present overarching Executive Summary addresses the sections covered by both RGI and RG II, (a combined coastal length of about 400 m with an optional extension to 700 m), which falls entirely within the 1,200 m analyzed in the original EA.

(ii) **Brajdica Container Terminal** - the proposed extension of the Brajdica terminal under the RG II project was covered under an Environmental Impact Study (EIS) report (referred to herein as the “Brajdica Component EA”) prepared and publicly disclosed by PRA in 2005. This EIS funded by PRA and based on an approved preliminary design was endorsed by the Ministry of Environmental Protection, Physical Planning and Construction who issued a positive EIA conclusion in August 2005 (followed by a location permit issued in April 2006). This EIS has been reviewed and found to meet the WB requirements for category “A” projects, except that it was missing a separate EMP and proper executive summary and there was only one disclosure consultation instead of two as called for by World Bank OP 4.01 requirements. Therefore, a new EA for Brajdica terminal extension is not required but an improved Executive Summary and the EMP were developed by PRA to meet the Bank’s requirements.

In addition, PRA recently updated its port Master Plan report (April 2008) which supports, among other port investments, the overall development of the Zagreb Terminal into three phases: (i) a first phase of 400 m (financed by RGI, RGI AF and RGII under one contract); (ii) an optional second phase of about 300 m (up to about 700 m in total)\(^4\); and (iii) a third phase, for a total of 1200 m. In parallel, the General Urbanistic Plan for Rijeka was approved in February 2007. The Urbanistic Plan indicates that the area of the Brajdica terminal would be used for port activities only temporarily, but it does not define how long the temporary nature would be. Clarifications are being sought with the City Council.

Given the preparation that took place in accordance with the Croatian EIA legislation for project components under the proposed RGII project, and following their thorough review by the Bank project team in relation to the applicability of OP/BP 4.01, the Bank and PRA agreed that PRA would take the following steps prior to the RGII project appraisal to meet the World Bank safeguard requirements:

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3 One public consultation took place for this EIS in 2005 in accordance with Croatian Law

4 The introduction of a “concessionaire trigger” by PRA would let the market determine if this further extension is warranted
(1) preparation and disclosure of the RGII project Over-arching EA Executive Summary (current document) including a brief assessment of the proposed expansion works for the two container terminals as prepared in the respective component EAs; and

(2) preparation and disclosure of an EMP for the Brajdica terminal extension works together with the disclosure of an updated English Executive Summary of the Brajdica Component EA document.

These documents will be disclosed and discussed in a public consultation organized by PRA by mid-May 2008.

2. RGII PROJECT DESCRIPTION

The planned intervention under the RGII project would increase the container handling capacity of the Port of Rijeka, through the extension of an existing terminal (Brajdica), and the extension of the first phase construction of Zagreb container terminal. All of these activities are within the maritime domain under the jurisdiction of PRA. The Port of Rijeka is a port of special international economic interest to the Republic of Croatia, based on its size and importance, and it is open to transit.

The container traffic growth in the port of Rijeka exceeded expectations in 2007 (with traffic increasing from 95,000 to 145,000 TEU), and calls for rapid increase in capacity since the full port theoretical capacity is now used. PRA sees this increase in capacity coming from investments in the Brajdica container terminal extension, and in the construction of a Zagreb terminal of about 400 m with an optional extension to 700 m. It is expected that both terminals would be concessioned under public private partnership arrangements that will include investments by the concessionaire in equipment and superstructure and concession fees (market based or based on cost recovery) for the use of infrastructure.

2.1 ZAGREB TERMINAL- DESCRIPTION OF INVESTMENTS

The PRA intends to expand and modernize the mainland part of the port in the west side of the Rijeka port basin. Because of the current spatial restrictions (railway shunting yard, oil refinery and industrial area to the West, protected warehouses on port land), the use of the sea surface is one of the main possibilities for expansion of the port cargo terminal in the west basin of Rijeka.

In the long term (beyond the proposed projects), the future Zagreb terminal is intended for transport and storage of goods and is expected to have a length of 1,200 m and occupy a total area of about 45 ha (e.g., 28 ha of the onshore area and 16 ha in the maritime zone). The capacity of the 1,200 m terminal would be about 1.2 million TEU, based on the latest Masterplan. The capacity of the terminal would depend on the technology used and layout for the port.

Brief description of Zagreb terminal investments (under RGI and RGII)

The proposed new project (RGII) would extend the construction of the Zagreb Container terminal by 100 m for a total of 400 meters, compared to the 300 meters presently foreseen under the RGI and RGI AF loans. This first phase of Zagreb terminal construction, which offers a good financial
return potential based on the Masterplan Update and its cost estimates, would be built to accommodate 5\textsuperscript{th} generation container vessels (350 m length) with 22 rows. It would include an area of 15 ha, of which 10 ha of paved stacking area, installation of minimum three ship-to-shore gantry cranes, and a container handling capacity of 290,000 TEU. In case the optional extension is launched, based on suitable concessionaire fees, it would be launched simultaneously with the first phase, and include a total area of 22 ha, with about 700 meters of pier.

The first 300 m will be financed using funds from RG I and RG I Additional Financing projects, while the next 100 meters would be funded under the RG II project. It is foreseen that this terminal construction of 400 m in total will be tendered as one package. The three loans would cover only the terminal infrastructure (fill/land reclamation, quay wall including crane girders, and fendering). The next 300 m would be launched at the same time, under another financing mechanism, if the concessionaire to be selected in the near future agrees to cover the associated commercial risk. The concessionaire would be responsible to provide all equipment and build the superstructure (pavement, lighting, utilities, and buildings) to meet modern operational requirements.

The construction of the Zagreb terminal initially proposed under RGI and RGI AF (total length of 300 m) was suspended to reassess the range of technical options to build the terminal from the ground up, taking into consideration the results of a recent soil investigation and geophysics survey based on which the seabed soil conditions are weaker than originally anticipated. Consequently, to ensure the access to the best possible option, PRA opted to consider a range of possible design solutions through a Design and Build tender process for the Zagreb terminal that will enable the identification of the most suitable design option from a cost and duration of construction perspectives.

The original EA document prepared for the RGI covers the 100 m expansion of the Zagreb terminal proposed under RGII, as well as the optional extension by 300 m. More information on the possible environmental impacts related to this extension and the mitigation and monitoring plan implementation arrangements is presented later in this document.

### 2.2 BRAJDICA TERMINAL EXTENSION-DESCRIPTION OF INVESTMENTS

The Brajdica Container terminal will be expanded through the extension of the quay wall by about 330 m (from its current length of 300 meters) and the addition of about 14 ha (10.75 ha on land and 3.4 ha reclaimed on the sea). This extension will be technically and organizationally integrated with the existing terminal to reach an estimated throughput of 350,000 TEUs per year. The terminal will have a depth of up to 14.5 meters along the pier edge.

The proposed Brajdica terminal extension will enable this part of the port area to accommodate large vessels (up to 60,000 DWT) improving the competitive capacity of the overall Rijeka port. This extension will be constructed using the same methodology that was used for the original Brajdica terminal. The structure is envisaged as a concrete quay-wall constructed on a stone/gravel mound that will be built directly on the sea bed. The quay wall will be made of concrete blocks (up to 10 blocks positioned on top of each other with a length of up to 30 m), which are strengthened by cement grout after final placement. A reinforced concrete beam will be constructed on top of the final layer of concrete blocks, for the purpose of strengthening and interconnecting the different blocks. The area between the quay wall and the existing shore line
will be filled with rock material collected from existing regulated quarries and road construction sites in accordance with the local construction standards.

Several baseline studies have been made as part of the preparation of the Brajdica terminal expansion detail design (which positively concluded to use the same methodology used for the existing terminal) including a geotechnical investigation report produced based on the results from previous investigation campaigns and supplemented by new seismic profiles both on and offshore. A Croatian Panel of Expert endorsed the geotechnical report in a written expertise which is part of the documentation submitted for application of the construction permit. The seabed stabilization approach will be also more or less identical with the technology used for the first pier section: a concrete block key wall will be set on a rubble bed on the sea floor and supercharged with additional layers of blocks to accelerate settlement. The seabed subsoil conditions at Brajdica pier were generally found more favorable than at Zagreb pier, containing layers of coarser materials, thus facilitating soil drainage and pore water pressure reduction and a quicker subsiding of initial large settlements. No activities involving material removal, such as dredging or piling works, are planned. Furthermore, a comprehensive study was prepared on meteorological conditions and dynamics of the sea at the future location of Brajdica terminal as part of the EIA report. By law, the preparation of the detailed design is required to cover items identified in the EIA.

The Environmental Impact Assessment for the extension of Brajdica terminal was conducted by Rijekaprojekt Ltd during 2004-2005. Description of the short- and long term environmental impacts related to the works for the Brajdica extension terminal as well as the proposed environmental mitigation measures and the related monitoring actions are presented in detail in Chapters 4 and 6 of this document.

3. PROJECT BASELINE INFORMATION

3.1. SUMMARY OF MASTER PLAN UPDATE\textsuperscript{5} RELATED TO RGII PROJECT INVESTMENTS

The port of Rijeka (Lat 45°19’ N; Long 14°26’ E) is situated in the northern part of the Bay of Kvarner, where the Adriatic Sea retracts most deeply into the European continent (Figure 1). This location is potentially the most convenient exit to the open sea for Croatia, Hungary, Austria, Czech Republic, Slovakia, the western part of Ukraine, the southern part of Poland and the southern part of Germany. It offers all prerequisites for the acceptance of large vessels, because the Bay of Kvarner has a depth of about 60m (Figure 2).

The activities in the port of Rijeka characterize it as a multi-purpose port with a total surface area of about 200 ha, a total pier length of about 7,100 m, and an average depth of about 17 m. Overall port main commodities include dry bulk (e.g., coal and iron ore, and cereals), liquid bulk, general cargo, and timber. The port has access to five main international roadways (E59, E61, E65, E70 and E71) running through Croatia towards the surrounding countries as well as important national roads. Other routes linking Rijeka to Slovenia, Serbia, Hungary, Bosnia and Herzegovina constitute of railways for which main rehabilitation infrastructure is urgently needed.

Transport of containers to and from the hinterland is done by truck or wagon. In 2001, 69% of total container transport to and from Rijeka Port was transported by truck, while 31% was

\textsuperscript{5} Based on Masterplan Update from November 2007
transported by train. Growing throughput during the years changed these proportions resulting in 78% of the containers being transferred by truck and only 21% by train in 2006. The medium container throughput forecast for traffic through Rijeka by 2020 is 640,000 TEU.

Figure 1 The geographical position of Rijeka
3.2. PROJECT ENVIRONMENTAL BASELINE CONDITIONS

Air quality

The main sources of air pollution in the project area are the oil refinery, industrial activities, the grain elevator and phosphate terminal in the port of Rijeka, and the regular traffic in and out of the port, as well as regular city traffic. In the Rijeka port area, significant amounts of particles and dust are emitted in the air during loading/unloading cargo activities for cereals, salt, and artificial fertilizers due to outdated loading equipment. Containerized cargo handling does not lead to such emissions.

The local air monitoring network includes six stations for monitoring the ambient air quality in and around the city of Rijeka. None of these stations are in the Brajdica or Zagreb terminal areas. Collected data include concentration results for $SO_2$, $PM_{10}$, $Pb$ and $Cd$, in air particles and total sediment matter, $NH_3$, $NO_2$, $H_2S$, $O_3$, and PAH. The frequency of monitoring and the process of air quality assessment are established in the Regulation on Recommended and Limited Values of Air Quality (Gazette 133/05). Results collected in 2005, showed concentrations of $SO_2$, $NO_2$, PAHs and $H_2S$ as well as smoke and particulate matter higher than the permissible limits in the center of the city and around the oil refinery. According to these results and to the Law on Air Quality Protection requirements (NN 101/96), the air in areas surrounding the planned construction sites would fall into category II, i.e. it is mildly polluted.

Sea and sediment quality

The bay of Kvarner is a sheltered bay of 450 km$^2$ in area and average depth of 60 m with intensive sea traffic and adequate harbour activities. The waters present characteristics of minimal salts concentration and small production of organic matter (plankton), with an annual average temperature of 15 $^\circ$C. Due to the large oil refinery and incidental pollution caused by sea traffic and harbour activities, oil and its derivates (hydrocarbons) are probably the prevalent polluters of this area. The measurements of hydrocarbon concentration in the sediments of Rijeka bay show
much higher concentration of hydrocarbons in sediments coming from areas near sources of pollution, i.e. the coastal area to the North (near the refinery), than in other parts of the bay. Total hydrocarbons are found in the bay sediment in concentrations ranging from 18 to 211 mg/kg. PAHs measured at four locations in Kvarner Bay, none of which are in Brajdica or Zagreb terminal areas showed results ranging from 3 to 41 μg PAH/kg. As of today, Croatian legislative system does not define any thresholds for sediment pollution.

Recent heavy metals analysis performed by PRA for sediment samples collected in three locations around the Rijeka port (Brajdica terminal, Port of Baross, and Zagreb terminal) showed mercury, lead, copper and zinc concentrations higher than the standard levels for the marine sediments quality. Results above the maximum admissible levels for these heavy metals were specifically observed in the sampling point around the future Zagreb terminal extension at 9 cm sediment depth. The location where this sample was taken is in the proximity of the oil refinery zone thus this refinery could be a cause of historical environmental pollution in the area. However, due to the lack of a regular sediment monitoring program in the Rijeka bay it is difficult to correctly evaluate the source of these sediments pollution. PRA undertook to implement a proper monitoring program on the quality of marine sediments during the construction phase of the terminals financed under RGI and II. This is reflected in the respective EMPs.

In the planned project area, the greatest sources of sea pollution are the oil refinery and harbor activities related to the transfer of general cargo. Main sources of pollution from the oil refinery are liquid waste and the outflow of hydrocarbons into the sea from the polluted underground in the refinery area. Harbor activities including mooring, trans-shipment of goods from the ships to indoor and outdoor warehouses and trans-shipment to the means of transport ship-rail-trucks contribute more modestly to the marine pollution in the project area.

There has not been any testing of sea quality in the area planned for the reconstruction of the Zagreb pier, except for the exploration of the life on the sea bottom. As this part belongs to the port maritime zone and is under the immediate influence of the oil refinery, this area is rather degraded, as shown by high presence of hydrocarbons in the surface sediment layers. The clearness of the sea is reduced in this area, and the sea surface, especially on the western side of the planned works, is covered by a film of oil.

Sea water quality samples collected around the Brajdica terminal in 2005 at different depths in four different locations showed results for bacteriological characteristics in compliance with the standards listed in the national Regulation on Standards of Bathing Water on Beaches (Official Gazette 33/96), for three of the four samples, except for the one furthest from the existing terminal due to fecal waste water and other waste materials coming from urban areas. Out of the four samples the sample in front of the existing terminal showed the least pollution. Field survey and assessment of biological communities of the project area reveal that it is very poor indeed in biogenic life and natural habitats. There is no natural vegetation or terrestrial plants of environmental importance observed in the area. Videos of the sea bed carried out by divers as part of the baseline survey required by the Brajdica EIA around the Brajdica terminal showed an area ecologically altered due to constant filling with port materials without habitat or species of particular significance.

Storm waters are other sources of pollution in the area of Brajdica terminal since currently they are not treated sufficiently according to engineering standards and are allowed to wash out all the oils from the operating surfaces directly into the sea. Furthermore, the business zone of Susak located behind Brajdica terminal generates wastewater that is directly discharged into sea since the collector system in the area is partially deteriorated.
According to information presented in the Physical Plan of Primorsko Goranska County (Official Gazette, 14/2000), the sea sanitary quality around the Brajdica and Zagreb terminals is classified as a second category seawater, as defined by the Ordinance on water classification. It implies that part of the coastal area is under strong influence of anthropogenic and land based pollution.

**Noise**

Containers-reloading activities generate a certain level of noise for the residential area situated north of project area. However, the noise originating from city traffic and nearby railway (located between the port and residential area) is stronger than the noise produced around the two terminal areas. Noise limits are stipulated in the national *Regulation on Maximum Allowed Noise Levels in Area Where People Work and Live* (Official Gazette 145/2004).

**Waste**

According to their origin and characteristics, waste substances occurring in the port can vary considerably, but, generally, they can be classified into two categories: hazardous waste and non-hazardous. Hazardous wastes are waste motor oils, hydraulic and oils originating from transformation substations, oil packaging, and batteries as well as sludge from the oil/water separators. Non hazardous waste is generated through different activities like cleaning of the terminal area (wood, plastic packaging, cardboard, cloth, etc.), through maintaining the sewerage system (solid waste on screens), and generation of port activity waste produced with similar characteristics to municipal waste by workers. Since Rijeka is a port open to international traffic, PRA is required to provide waste reception facilities in accordance with Croatian regulations (*Official Gazette No. 110/2004; Official Gazette No. 90/2005*). Consequently, PRA is implementing a Port Waste Management Plan (PWMP)* that regulates reception and handling of ship-generated waste and cargo residues on the entire area under PRA jurisdiction. Specifically, the PWMP regulates procedures for management of ship-generated waste and cargo residues in the port area, the marine environment protection and against discharging, and the protection of the onshore area against pollution. Currently, PRA is employing four local companies for collecting the ship-generated oil waste and one company for collecting the port related solid waste. PRA intends to purchase (with funds provided by RGII) its own ship for collecting oil and solid waste generated by the port activities and by the vessels arriving in the Rijeka bay area. This purchase will allow PRA to reduce the waste collecting price and to retain a fair fee system that encourages the delivery of ship-generated waste to ports instead of discharge into the sea. The company “Luka Rijeka” also has its own Waste Management Plan (May, 2006) for separately collecting waste from port activity for all terminals, with designated responsible persons.

3.3. **LEGAL AND REGULATORY FRAMEWORK**

Croatian legal and regulatory framework related to the Project is mainly already harmonized with EU regulations and its *Environmental Acquis*.

The Croatian regulations require a series of steps before needed location and building permits are issued. Basic documents for obtaining a location permit are the physical plan (showing that the

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*The plan is developed based on the Croatian Regulation in accordance with the EC Directive 2000/59 related to port reception facilities for ship-generated waste and cargo residues*
proposed activity is foreseen within the regulations of the master plan), a feasibility study, and an EA report (in accordance with the Croatian environmental law). In order to obtain the final building permit allowing start of construction work, the design documentation must show that all environmental mitigation measures as stipulated in the location permit have been addressed and included.

The county physical plan, by recognizing the natural, cultural, and historical and landscape values, elaborates the principles of physical planning and determines the goals of physical development, as well as the organization, protection, use and purpose of space. The physical plan includes the county's physical and economic structure, the system of central populated areas of regional importance, the system of developmental regional infrastructure, bases for physical planning and protection, measures and guidelines for economic development, preservation and advancement of natural, cultural and historical and landscape values, measures for the advancement and protection of environment as well as other elements important for the county. The physical plan is issued by the county, i.e. city assembly, after obtaining consent from the Ministry of Environmental Protection and Physical Planning on its compliance with the State Strategy and Program of physical planning and provisions of this Law.

The participation of the public in the process of physical planning is ensured by the legal obligation whereby during the adoption process all the documents of physical planning must be put up for public debate on the physical planning proposal, which includes the participation of the government administration bodies, local self-government and government units, legal persons with public authority and citizens.

Annex 1 contains a list of international agreements in the field of environmental protection and nature that relate to the Project. Applicable legislation of the Republic of Croatia addressing the issues of nature protection is reconciled with the international agreements listed in this table, and the regulations of MARPOL Convention are included in the Croatian legislative documents and by-laws regulating the equipment used in ports and their operation.

4. PROJECT ALTERNATIVES

The decision by the Port Authority to proceed with the proposed construction of the Zagreb terminal and expansion of the Brajdica terminal in the Port of Rijeka is based on international, regional, national and local considerations. The very fast evolution of container traffic led the Port of Rijeka Authority to commission an update in 2007 of its Masterplan (2003), to review the target markets of Rijeka, its position relative to Northern European and Northern Adriatic ports, and update accordingly the investment plan and its priorities. The port of Rijeka is presently used intensively as a gateway for international transit towards Serbia, Bosnia and Herzegovina and Central Europe. It generates significant revenue for SMEs based in Rijeka, as well as for transport and logistics service providers along the corridor connected to this gateway.


The Port of Rijeka has reached its full theoretical physical capacity in 2007 for container cargo, primarily due to space limitations. While it can increase by a small increment its capacity by converting some of the existing wood shed into container storage area in the interim, these are ad hoc temporary solutions that would fail to meet the strong potential for throughput growth. In case Rijeka does not expand its container capacity, container traffic for Central Europe will continue to use the Northern European ports creating congestion and leading to far longer distance traveled by road and carbon footprint impact, given the distance to major markets
compared to transiting through the Rijeka gateway. In addition the quality of the road and rail connection from Rijeka to Central European markets is in the process of being upgraded as part of the continuous development of Pan-European Corridor Vb and X.

4.2. Alternative Technical Solutions in Rijeka (other than those proposed under the RGII project). As part of the Master plan update, the Port Authority reviewed a number of alternatives to develop further container traffic in the Kvarner Bay. There were two main alternatives to the proposed expansion of the Zagreb Pier and the Brajdica Pier included under the RGII: (i) development of Prasko Pier; and (ii) development of a complete new terminal on the Island of Krk.

(i) Prasko Pier, adjacent to the proposed Zagreb terminal is presently in operation as a general cargo terminal. A process of reclamation could have converted it into a new container terminal. However this terminal, while suitable from a depth perspective, would be insufficiently wide for modern container terminal operations, given the proximity of protected warehouses. Restriction in the General Urbanistic plan also would create a discontinuity of alignment between the Zagreb terminal and this terminal, making vessel operation problematic.

(ii) The Port Authority was also advised to consider the development of a completely new site on the island of Krk. While appealing in principle, this would be a long term solution (time frame for development 15 years) since, as this stage: (i) road and rail connections are insufficient to support such a terminal at this location and upgrades are not planned at this stage; (ii) no local consultation process took place (while those have been completed for the two proposed investments); (iii) no technical study exists; and (iv) the proposal is not included in the physical planning of the corresponding area.

4.3. Alternative Technical Design for Zagreb terminal and Brajdica terminal

The design for the Zagreb terminal was originally foreseen as a concrete pile based structure. Various options were reviewed as part of a process of optimization and led to the selection of a caisson based structure, which has proven complex, costly and time consuming to carry out. As the Port Authority moves forward with a design-build (DB) approach, a range of solutions will be evaluated as part of the tender process, considering the potential environmental impacts, within parameters defined in the applicable legal framework. As part of preparation of the DB package, PRA is financing (i) a comprehensive geotechnical/geophysical soil investigation on remaining sections of the expanded Zagreb terminal, including a chemical analysis of the seabed soil in the adjacent seawater area, (ii) an environmental report based on in-situ measurements, as well as (iii) a sea condition monitoring report based on measurement of waves, wind, and tide in the Zagreb terminal area. These investigations are intended to complement the results of the environmental assessment study prepared for Zagreb terminal construction in 2002.

The construction of the Brajdica terminal could have used a pile based structure, concrete or steel pile or other technologies. A major consideration was to build on existing experience of the current Brajdica terminal. By avoiding discontinuities of technology between the existing terminal and the proposed extension, the Port Authority will keep technological risk to a minimum, having learned from the first phase of construction, particularly since the soil characteristics are similar. For example the management of seabed stabilization, expected to allow settlements of about 1 to 2

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7 A geotechnical investigation report endorsed by a Croatian Panel of Experts was produced, based on the results from previous investigation campaigns and an adequate amount of new borings and cone penetration tests, supplemented by seismic profiles both on and offshore
meters during the three years of construction period until the designed water depth is achieved, will be easier given the experience of the existing terminal construction that provides a de facto full scale model.

5. PROJECT POSSIBLE ENVIRONMENTAL IMPACTS AND REMEDIATION

Predicted environmental impacts of the chosen activities are related mostly to civil works performed during the construction and extension of the two terminals. The EIA studies for the Zagreb and Brajdica terminals identified temporary impacts during the construction phase as well as long-term impacts once the terminals start their operation.

It is important to note that the environmental assessment of the infrastructure works related to the Zagreb terminal extension financed under the RGII project was covered during the environmental assessment process of the RGI project. However, if the “design and build” approach selected for the construction of Zagreb terminal under RGII is susceptible to generate additional possible environmental impacts, an update of the existing Zagreb terminal environmental assessment study will be undertaken by PRA.

Environmental issues in port rehabilitation/construction and operation primarily include the following: air emissions, dredged material management, general waste reception, waste water and solid waste management, hazardous materials management, noise and dust, water quality, biodiversity. Possible environmental impacts related to the proposed RGII investments are summarized below:

5.1. Construction Phase (short-term impacts)

Activities involving material removal, such as dredging and piling works, planned mostly during the Zagreb terminal construction may pose impacts on the environment if environmentally responsible technology is not adopted during the dredging operations and disposal of dredged material. The use of best technology available and the use of best management practices and internationally recognized guidelines will significantly limit re-suspension of sediment and minimize disposal of contaminants and degradation. Given the potential for heavy metals and other hazardous materials in the seabed, in order to carry out dredging activities with minimal environmental impacts, PRA is financing a thorough soil investigation study (especially in the area of Zagreb terminal) including geotechnical, hydrographical and environmental sampling that will capture the horizontal and vertical extent of any potential contamination in the pier area. Also, PRA will regularly monitor the operations carried out by contractors during the construction phase.

The management of the fill material used for land reclamation of the extended terminals will create several environmental impacts on the project area including effects on air pollution, soil and seawater pollution, noise, and temporary degradation of landscape. However, this fill material will be chosen to help minimize the air, sea and soil pollution. The filling will be carried out with uncontaminated, inorganic geological material, including pure stone material with maximum 5% silt and other inert materials contents. Permits for excavation and or filling are required as per construction standards. Any disposal of sludge or other waste together with fill material is strictly prohibited.
The land reclamation affiliated with the extended terminal constructions will have inevitable impact on the sea quality. During filling, the turbidity of the sea may increase. Increased amounts of suspended substances in water may limit photosynthesis of communities such as algal mats and seagrass. A common practice to mitigate this effect, is the use of a variety of protective screens that serve as a filter for the suspended solids, and reduce or eliminate an increased turbidity in the sea. The need and final selection of such screen (for example, geo-membrane) will be determined by the contractor based on the quality of filling materials used during the construction works and the level of silt and inert material content in these material.

Temporal degradation of air quality in the working area could occur due to the release and dispersal of excessive amounts of dust and sediments, particularly during the dredging phase. Emissions from construction equipment, work vessels, trucks and other vehicles used in construction work could be also a source of air pollution. Due to the high number of trucks which will transport the construction material to the port, it is suggested to reach an agreement with the city of Rijeka on routes and time of transport as well as measures for minimizing the air pollution, such as speed limit or watering and covering of the cargo during transportation.

Some increased pollution loads into sea may be caused by direct or indirect contamination of surface waters due to accidental spills or mishandling of hazardous materials. Stockpiling of construction material should be avoided by following proper storage conditions at the construction site while using covers for protection where possible against weathering. Hazardous materials (lubricants, oils) should be kept on impermeable surface, and adsorbents like sand or sawdust should be available for quick handling of small accidental spillages. All materials should be handled in line with instructions included in the Material Safety Data Sheets present at the construction site. Hazardous waste will be handled according to Regulation on Hazardous Waste Management (Official Gazette 32/98). Any asbestos containing material will be separated and disposed at a special landfill in accordance with the Croatian legislation. Arrangements for their proper transport and disposal (in or outside the country) will be financed through the project.

Water effluents associated with port activities would include storm water and sewage from port operations, as well as, sewage, ballast water, bilge water, and vessel-cleaning wastewater. Sewage will be channeled to an existing treatment plant; waste oils will be collected and returned to suppliers or handled by PRA; used parts and filters will be disposed of by PRA or sold as scrap if no potential PCBs or other hazardous waste are contained; storm water runoff will be channeled to drainage and passed through oil and grit separators. On site fuel stations and vehicles/equipment washing and service bays will be equipped with drainage system and oil separators.

There was no sensitive aquatic natural habitat observed in the study area. Hence, probable adverse impacts of the proposed development on the marine life are considered to be minor.

In case of an accidental release of ballast water or possible hazardous spills, PRA is responsible for providing emergency response. PRA is implementing an Operating Emergency Plan, and has an agreement to this end with a specialized firm equipped with emergency response equipment (vessels, skimmers, oil booms, dispersants..). In addition three other companies, working in Rijeka as concessionaires, have anti-pollution equipment at their disposal. PRA also implements a Port Waste Management Plan for Ship-generated Waste and Cargo Residues, which outlines the main measures and actions related to waste management in accordance with international standards. Under the project, PRA will extend its related capacity by purchasing a waste collecting ship.
The noise could be limited by following good management practices and limiting works during regular daily shifts. The equipment and machinery used should be calibrated according to the *Ordinance on Highest Permitted Levels of Noise in Working and Living Environment* (Official Gazette 145/04) and the *Law on Noise Protection* (Official Gazette 20/03). Road fences could be constructed as noise barriers during construction works.

Different waste types should be separated and submitted for disposal and treatment to authorized companies. The contractor is responsible for waste management as required by the *Law on Waste* (Official Gazette no. 178/04).

In the case of archaeological chance finds during preparation of the site for the construction, the contractor is responsible to stop the works and notify the municipal authorities, the Regional Institute for Protection of Cultural and Historical Heritage and PRA.

A special attention should be given to the sea and land traffic management to avoid accidents and heavy disturbances. The landscape of the port zone has been affected especially because many areas were not properly constructed based on good planning. The completion of Zagreb and Brajdica container terminals will actually improve the port area aesthetics, by selecting material, shapes and colours that would revitalize the landscape.

**5.2. Operation Phase (long-term impacts)**

The major impacts on the environment from the activities on the extended Brajdica and Zagreb container terminals during operation will be noise and waste generation.

Normal noise sources in ports include cargo handling, vehicular traffic, and loading/offloading containers and ships. The equipment and machinery used during the terminals’ operation should be calibrated according to the *Ordinance on Safety of Equipment* (Official Gazette 135/05) and *the Regulation on Testing the Working Environment and Dangerous Equipment and Machinery* (Official Gazette 114/02). Also, the noise will be decreased by using precautionary measures during container handling through proper planning of the cargo and equipment reloading, in order not to exceeded limits set by the *Regulation on Maximum Allowed Noise Levels in Area Where People Work and Live* (Official Gazette 145/2004).

As requested by the EIA for Brajdica, PRA prepared a Maritime Study for Calling and Leaving the Container Terminal, which allows proper management of ships traffic in and out of the terminal.

The port activities will generate both hazardous and non-hazardous waste. The operator is responsible to develop Waste Management Plan according to the Waste Act. According to this plan possible waste types will be identified and their management properly described. Also, transport of hazardous material is regulated in detail by Law, and By-Laws providing regulations concerning type of vehicles allowed for this transport, special requirements related to equipment, type of packaging, education of drivers, manuals in case of accident, and speed restrictions.

The extension of the terminals may increase potential pollution of sea from ships. For example, management of ballast waters, oil sludge (tar residue from oil burning) and dangerous cargo (e.g. herbicides, ethylene, mercury, or acetylene gas) present certain environmental risks if accidents occur during docking, unloading, or storage in the warehouses. PRA is currently implementing an Operating Emergency Plan that identifies responsible personnel for maintaining the emergency
response system and training of the workers. Oil and chemical spill handling equipment is placed at appropriate points in the port. PRA will extend its current spill prevention, control and countermeasures plan to include areas within the port that are sensitive to spills and releases from hazardous material, locations of any water intakes (e.g. cooling water), and training of response personnel in deployment of equipments during emergencies.

An EMP, including mitigation of possible environmental impacts and a monitoring program during the construction phase as well as after completion of proposed civil works will ensure that possible negative impacts could be managed appropriately. A summary of the EMP is presented below.

6. SUMMARY OF THE ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The EMP entails a thorough presentation on mitigation measures applicable to the construction works as well as the operation stage of the terminals including: (i) site management and institutional controls; (ii) health and safety protection for workers; (iii) emergency responses (including spills); (iv) mitigation measures for collecting and discarding waste, reducing air and noise, soil and seawater pollution.

The main mitigation actions proposed to overcome possible environmental effects related to noise generation, sea quality and soil pollution during the construction of the terminals were briefly discussed in Chapter 5 and are integral part of the design and construction while the operation related mitigation will be incorporated into the operation practices of the existing port. This include the following actions: (i) execution of works during working hours between 6AM – 6PM; (ii) use of separable sewage systems and of separators for cleansing the storm waters; (iii) proper collection and disposal of hazardous waste (including asbestos) by accredited waste companies; (iv) disposal of non-recyclable waste to proper landfill; (v) proper packing and labelling of municipal waste materials; (vi) proper recycling of construction materials such as steel structure and tin plates; (vii) health and safety measures for workers; and (viii) cleaning of construction site at the end of the works and disposal of all debris in according with the clauses stipulated in the bill of quantities. Once the terminals start their operation, the following mitigation measure should be applied to prevent possible long-term environmental effects: (i) use of low noise technology in the terminal activities and of low noise transport vehicles; (ii) proper collection and storage of hazardous waste (e.g., waste motor and hydraulic oils, waste oil packaging, waste oils from transformation substations, batteries and sludge from oil/water separator) in special containers labeled and disposed by authorized waste companies; (ii) collection in proper containers and regular disposal of municipal waste, and (iii) implementation of port safety measures to prevent fire accidents and other ship related ecological accidents in accordance with the Regulation on Handling of Dangerous Substances, Conditions and Ways of Shipping, Loading and Unloading of Dangerous Substances, Bulk and Other Cargo in Ports and Ways of Prevention of Oil stains Spreading in Ports (Official Gazette 51/04)

Also, the EMP provides a rigorous environmental monitoring program consisting of sampling and analyzing of various media (seawater, air and noise, soil and sea sediments) on and around the project sites. During the construction as well as the operation phase of the terminal extensions, the following actions will be performed according to the monitoring plan: (i) noise levels will be monitored yearly at control points located at the project site and at the border of residential areas; (ii) wastewater quality tests performed quarterly at the outlet of the oiled water or storm water separators; (iii) sea water quality monitoring performed for specific indicators for seawater transparency, temperature, salinity, dissolved oxygen, pH concentration of mineral oils, ammonia and bacteriological testing; (iv) sea sediment conditions tested every two years through
measurements heavy metals concentrations, (v) monitoring of proper waste collection; (vi) regular check up on vehicles conditions used in the terminal operation and (vii) measurement of the state of the wind-wave climate compiled in an annual report. The annual average costs\(^8\) of such monitoring activities will rise at about US$10,000 for Brajdica terminal and about US$12,000 for Zagreb terminal. The EMP implementation costs are included in the project financing or covered by parallel financing from Government of Croatia.

The soil material analyzed and found to contain heavy metal concentrations higher than those allowed for use in agricultural land, as well as the presence of mineral oils cannot be used for reclamation and it shall be transported to special disposal sites. The design documentation for obtaining the building permit shall define the quantities and the method of disposing materials inappropriate for reclamation produced by demolition of buildings, dredge materials and excavation of land.

Environmental monitoring and supervision will be integrated into the project management and reporting system. Relevant Government authorities will be involved in auditing project performance and will receive copies of monitoring reports. Furthermore, PRA management is responsible for implementing the Emergency Action Plans used in response of various possible types of emergency situations including evacuations, fire reporting, hazardous materials spill and response, and first aid.

**EMP Implementation Arrangements**

PRA is fully committed to ensuring that all employees and customers are instructed in the healthy and safe work practices, and to maintain an environmentally friendly sound port. The PRA Control Division and the Supervising Engineers will monitor the implementation of the EMP. Port Authority already has an established environmental unit and is familiar with the monitoring of the EMP enforcement since Rijeka Gateway I. Specifically, PRA successfully dealt with proper transport and disposal of asbestos waste generated during construction works performed at the port’s passenger terminal. The asbestos waste, which was properly collected, labeled and temporarily stored in few old warehouses in the port premises, was eventually transported to an authorized landfill in Austria at PRA’s expenses. Monitoring activities as stipulated in the RGI project EMP have been partially implemented by local firms hired by PRA on short terms. These firms performed mostly analysis of dissolved eco-toxic metals in sea water and sediments as well as air quality monitoring. The port also engaged in the preparation of the noise chart for the port area expected to be finalized in June 2008. Furthermore, as a follow-up on recently joining the Ecoports Foundation – a network of ports and port related stakeholders sharing environmental experience – PRA is working on establishing its own Environmental Management System according to European best practices based on which a Port Environmental Review System will be adopted. This will facilitate general environmental performance of the Port, which includes mitigation measures and monitoring stipulated in the EMP.

PRA will also implement the RGII project and will maintain files including copies of all contracts and environmental permits. PRA will ensure that the contract documents include the relevant environmental protection clauses. The Contractor that will perform the civil works will follow the requirements of the current Croatian construction and environmental regulations. The Supervisor Engineers on the project sites will supervise the construction works. Compliance with the Croatian regulations and the terms of the present EMP will be monitored and verified during

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\(^8\) Costs were estimated taking in consideration current (2008) local prices for analysis of sea water, wastewater, sediments and air and noise samples.
regular site visits. The findings of these visits will be reported quarterly in supervision reports submitted to PRA by the Supervision Engineer, based on consultations with the Contractor.

The EMP recommends the following steps to ensure that the EMP is implemented accordingly:

- To ensure that contractors pay attention to environmental impact mitigation, the EMP will be included in the Technical Specifications of the contract;

- To ensure the contractors understand the actions to be taken and the cost implications of environmental management and to ensure that required actions and measures are priced in bid proposals and included in the bid price evaluation. Two approach will be used to that end: identification of discrete environmental measures to be covered under a lump sum payment and description in the technical specifications of environmental aspects that unit costs should cover;

- Once the contract is signed, the Contractor will be briefed on environmental management by the Employer explaining impact prevention/mitigation, the EMP included in their contracts, and the environmental monitoring to be implemented.

- The Supervisory Engineer should report regularly on Contractor performance and progress with regard to EMP compliance

- Port Authority should report on implementation of the EMP in regular project progress reports

Table 1 below summarizes the institutional arrangements proposed for the EMP implementation.

<table>
<thead>
<tr>
<th>Responsibilities for mitigation monitoring</th>
<th>Environmental information (reporting)</th>
<th>Decision making chain of command for environmental management (to take action, to authorize expenditures, to shut down, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>During Construction:</strong></td>
<td></td>
<td>Activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Responsibility Institution or person</td>
</tr>
</tbody>
</table>

Table 1 Institutional responsibility for EMP implementation
<table>
<thead>
<tr>
<th>Port Authority Contractor</th>
<th>Supervising Engineer to Port Authority Environmental Unit to County Environmental Department to Ministry of Environmental Protection, Physical Planning and Construction</th>
<th>Monitoring of the Implementation of the EMP and provisions of the EIA</th>
<th>Supervising Engineer, appointed person (liaison officer) from PRA Regional Inspectorate of Environment and Water</th>
</tr>
</thead>
</table>

**During Operation:**

<table>
<thead>
<tr>
<th>Port Authority</th>
<th>Supervising Engineer to Port Authority Environmental Unit to County Environmental Department to Ministry of Environmental Protection, Physical Planning and Construction</th>
<th>Monitoring of the Implementation of the EMP and provisions of the EIA</th>
<th>Appointed person from PRA and environmental team Regional Inspectorate of Environment and Water</th>
</tr>
</thead>
</table>

Institutional strengthening actions for enhancing PRA capacity in implementing practical activities related to environmental impact mitigation and monitoring should include environmental training for those selected in PRA environmental unit and purchase of special equipment to facilitate proper monitoring of the environmental indicators agreed in the EMP.

7. **PUBLIC DISCLOSURE**

The EIA for the overall extension and rehabilitation of Brajdica container terminal was publicly disclosed in Croatian at the exhibition place of the Rijeka Municipality during September 14-27, 2005. The availability of the report at this location was advertised in the local newspaper on September 6, 2005. According to the Croatian EIA legislation, the report was publicly discussed on September 20, 2005 at the Rijeka municipality premises. A summary of the EIA document was also disclosed on the website of the Ministry of Environmental Protection, Physical Planning and Construction in Croatian language. The public debate was attended by 16 persons including representatives of local county, Faculty of Science, Society of Historians, NGOs, Civil Society for Maritime Activities Improvement, local governmental authorities, etc. Comments were raised on the future economic growth of the port, technical aspects related to terminal construction design, concerns of air and noise pollution during future works. Minutes of the meeting were recorded and incorporated in the project documentation.

The EIA for the overall extension of the Zagreb pier has also been disclosed and discussed in 2002 in accordance with the Croatian legislation. An overall public consultation for the whole project RGI took place on January 15, 2003, and the project EA, EA-Summary, and the EMP were made available to the public for comments. The documents were than made available for further comments during an additional seven days, thus no were received during this time.

The Overarching Executive Summary of the RGII project (the current document), the updated Executive Summary for Brajdica Terminal and a related EMP will be disclosed in Croatian and discussed in public during a meeting proposed around mid-May 2008. These documents will also
be disclosed in English at the Bank’s Infoshop in Washington DC upon disclosure and public
debate in country.
Annex 1

List of international agreements relevant for the field of environmental protection and nature conservation relating to specific characteristics of port activities

- Convention on Protection of World Cultural and Natural Heritage (Paris 1972)
  Published in Gazette – MU 12/93; the Republic of Croatia is a party to the Convention on the basis of notification of succession dated 8 October 1991; came into operation for the Republic of Croatia on 8 October 1991.

  - Annex 3. Prevention of pollution by hazardous substances transported by sea in unpacked condition – came into force on 1 July 1992

- Convention on protection of the Mediterranean Sea from Pollution (Barcelona 1976). Based on the notification of succession the Republic of Croatia is a party to the Convention since 8 October 1991 (Gazette MU No. 12/93). Amendment of Barcelona Convention from 1995 published in Gazette MU No. 17/98 came into force for the Republic of Croatia on 9 July 2004 (this date published in Gazette MU No. 11/04).

- Convention on access to information of participation of the public in decision-making and access to the administration justice involving environmental matters (Aarhus 1998), the Republic of Croatia signed the Convention in 1998.