LM & CO

EAGLE OF THE ADRIATIC

A CONCEPTUAL PROJECT

Tirana, 2012

LM & Co
Twin Towers, Tower 2/11
Bulevardi Dëshemoret e kombit
TIRANA, ALBANIA

SUMMARY

The main purpose of the conceptual project is to establish the relevant general conditions for the development and activation of the Eagle of the Adriatic, which will primarily connect the southern Adriatic and eastern Mediterranean with the Central and Eastern European countries. The Eagle of the Adriatic will also be important on a European scale from the point of view of connecting the Adriatic with the Black Sea, avoiding the highly congested Bosphorus and Dardanelle Strait.

Due to its geo-strategic position in the Mediterranean area, Albania plays a key role in terms of mobility. Well-developed and modern transport (port) infrastructure is the most important factor for the sustainable economic growth of Albania and the Balkans.

In the light of Pan-European transport corridor no. VIII, terminating at the Eagle of the Adriatic, the adoption of national development policies, with a main focus on transport and spatial planning, is of crucial important in all Western Balkan countries.

The creation of the Shengjin zone provides great possibilities for the development of the northern area of Albania, not only in relation to issues of transport and Euro-Balkan transit, but also because it increases the possibility of both permanent and temporary employment of a large number of workers, specialists in various fields, and increases the possibility of the development of tourism, trade, the housing construction sector, various industries characteristic of the area and agriculture etc. The port will be the largest employer, both in the region and in the country.

INTRODUCTION

The conceptual port survey consists of a number of technical and economic plans. In order to make clear the benefits to the economy and public transport, the road infrastructure in the Euro-Balkan territory that is of interest in terms of communications and goods processing in the new port of Shengjin, has been drawn on various topographic scales. On the basis of the plans, three Balkan corridors have been distinguished, which have the Eagle of the Adriatic as reference centre, of which two are most important:

The first is the ***Mirdite*** corridor***: Shengjin - Morine - Prizren - Pristine - Nis - Krajove - Romania***. The Mirdite or Fani Vogel corridor passes as a medial across the territory of Pristine and ends in Nis in Serbia, where there is a connection with European Corridor X. The Mirdite corridor has two main branches ***Kridorin - Morine - Pristine - Nis – Krajove***, where it divides towards Belgrade and Skopje. The ***Morine - Pristine - Nis*** corridor is very advantageous from a geophysical aspect compared with all other road directions involving descent from the Balkan plains to the coastal lowlands of the Adriatic Sea.

The ***Shengjin - Shkoder - Podgorica*** corridor provides a transit link between Montenegro and southwestern Europe, while the Shkumbin corridor enables part of the transit of goods and people. Final goods distribution is clear from the line of the aforementioned axes.

Based on the urban area plan of the Albanian Euro–Balkans transit corridors, it is calculated that over 230,000 km^2 of the Balkans require the transiting of goods via the port, signifying a minimum volume of 40 million tons of goods per year. The survey of the Eagle of the Adriatic concept includes a number of graphic charts of the areas of influence of maritime transport that benefit from Shengjin's geographic position. These geophysical charts serve as »de facto« arguments in favour of the great economic value of the geographic location of the Albanian coast.

INDEX

INDEX OF TABLES

INDEX OF FIGURES

1 WHAT DOES THE EAGLE OF THE ADRIATIC EUROPORT SHENGJIN REPRESENT?

The feasibility project Eagle of the Adriatic Europort Shengjin is a product of many years of studies on marine circulation geometry and the port needs of the eastern Adriatic coast. This major port facility also conforms to Anglo–American interests and the European economic development of Southeastern Central Europe, the Central Balkans and the prospect of connecting the Adriatic with the Black Sea etc.

The study consists of:

1. Technical Report.
2. Technical Album with dimensions S = (50 x 60) cm, consisting of 65 sheets.
3. Geological Survey.
4. Environmental Survey.
5. Emergency Survey.

2 PHYSICAL CONCEPT

- The port is situated on the Albanian coast.
- The port is part of the territorial waters of Shengjin, in the county of Lezha.
- Dimensions: max. length L = 4300 m., max. width W = 1245 m.
- The port is built on a rocky coast, which is completely barren and uncultivatable.
- It is located between Velipoja and Shengjin.
- Construction normally takes place on urban or agricultural land.
- It is planned to build the port 89% at sea and 11% on rocky coast. This means that it does not use urban or agricultural land.
- The port area is: S = 730 ha = 7300,000 m², (4300 x 2000)-2 x (778 x778)
- Open water of the port S = 430 ha = 4,300,000 m² = 59%.
- Area of uilt yards + terminal S = 300 ha = 3,000,000 m² = 41%
- Surface area of port, S = 1,581,051 m², or 53% of the built area.
- Surface area of terminals, S = 1,121,500 m², or 37% of the built area.
- Breakwater = 86,000 m², or 3% of the built area.
- Construction and maintenance areas = 61,449 m², or 2% of the built area.
- Of these on land (701,050 ha = 70,1 ~ 70 ha) S =70 ha or 11%.
- Of these on the sea (70,730 ha) 660 ha. S = 660 ha or 89%.

3 EURO-BALKAN GEOGRAPHIC CONCEPT

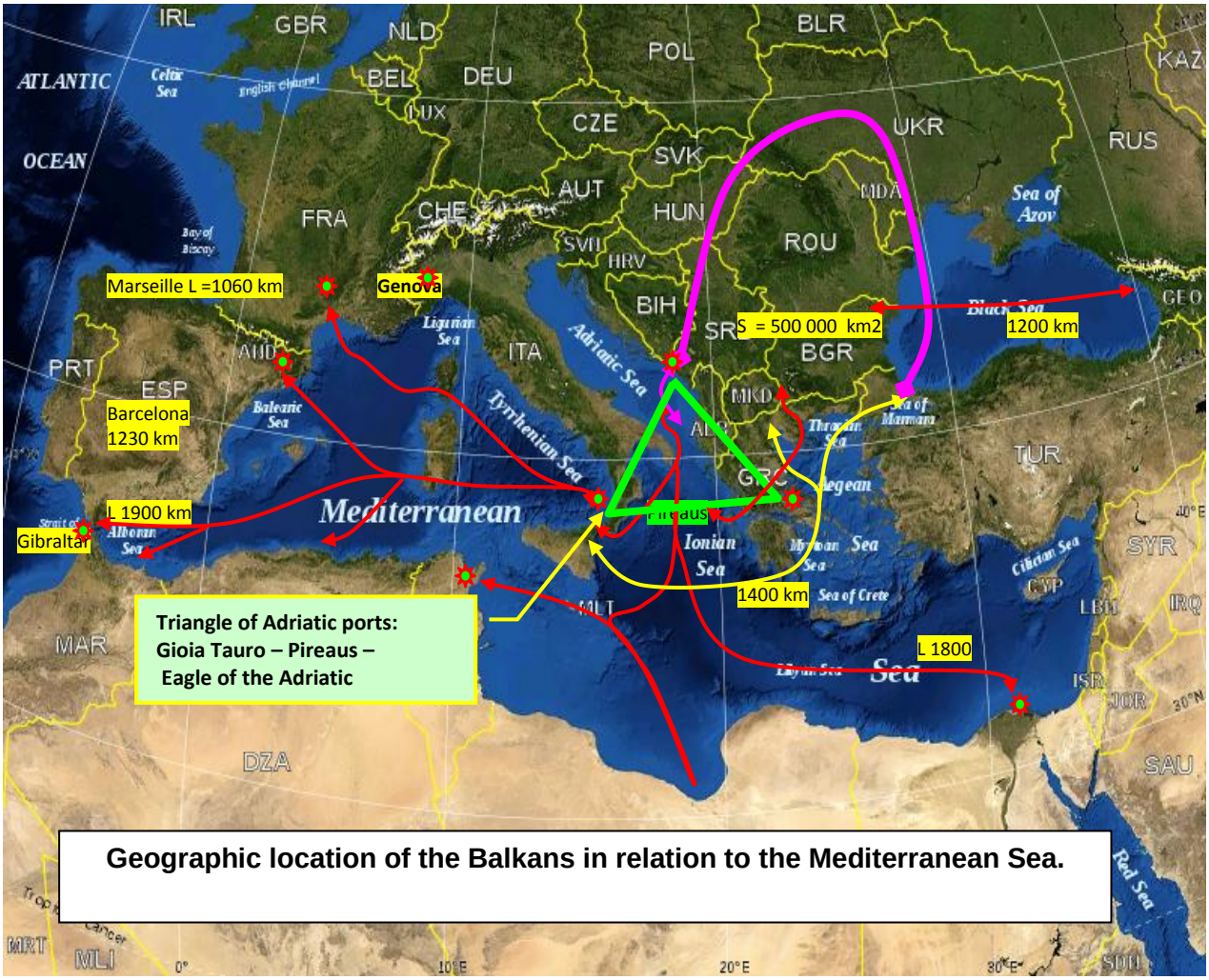
1. Latitude 41 ° 49 E-26249 `` `
2. Longitude 19 ° N-33 `26607 ``
3. Located on the eastern coast of the Adriatic and Ionian Seas, between the Port of Trieste (Italy) and the Port of Piraeus (Greece), about 800 km equidistant from them.
4. The entire eastern Adriatic coast is rocky. The only lowland, arable part of the coast is the Vlore-Shengjin area. In physical terms, the entire Albanian coast is a natural area for tourism and the entire coastline has the natural potential for a transit port.
5. The Albanian coast has no tourist port nor any major transit port.
6. The annual processing of goods through Albanian ports does not exceed 5 million tons. The largest port in the country is at Durres, which has limited processing capacity and is shallow, capable of processing ships of DWT = 2000-4000, max. 6000 tons
7. Studies of economic geography show that ***50 million inhabitants of the Balkans would benefit from transiting goods through Albania to the Strait of Gibraltar (America, England, southern Italy, southern France and Spain, northwest Africa)***, because this would reduce the distance by cca. **700 km** compared with other sea routes. Goods do not pass through Albania because there is no port capacity.
8. Road and railway infrastructure that connects directly with the port and goes to the heart of the Balkans; by the axis ***Shengjin-Kukes-Pristina-Nis-western Bulgaria and south-western Romania up to the Ukraine.***
9. The port as the main link for NATO geostrategic traffic in the Balkans, Black Sea and for the transit of fuel from the Black Sea towards Europe and Gibraltar.
10. Maritime traffic of goods coming from the Strait of Gibraltar (America, England, Australia etc.). Because there is no Albanian port capable of processing ships over 10,000 tons, goods coming from the Suez canal and goods coming from southern Europe are unloaded at the ports of Gioia Tauro (Messines Strait Italy) and Piraeus in Greece.
11. Geographical position as the **Eagle of the Adriatic,** together with the ports of Piraeus (Greece) and Gioia Tauro (Italy, Messines Strait) to create an equilateral triangle (around 600 km from each other).
12. Construction of large storage capacities can provide major natural and refrigeration storage for many goods destined for the Euro-Balkans, without causing environmental pollution.

4 FUNCTIONAL CONCEPT IN TECHNICAL CONCEPT

1. The Eagle of the Adriatic project is planned to modern design standards. All port facilities meet all the requirements of an international port in terms of construction and function. The structures of the port are designed to conform organically with the coastal relief.
2. The study consists of a Technical Report, Geological Survey, Environmental Study, Emergency Research and Technical Overview, with a format of 50 x 60 cm, 65 sheets. The study deals with all the technical, organizational, economic, engineering, operational, technological and municipal problems involved in the construction of an international port.
3. The proposed port is located in a geographical position that reduces the distance of sea and land routes between Europe and the Balkans, and vice versa.
4. The terminals and harbor spaces are dimensioned to allow speedy connection between the ship and the port area.
5. It is planned as the deepest port of the Mediterranean, capable of processing all sizes of ships and types of goods for Euro-Balkan export-import
6. Capable of processing a minimum of 2.6 million containers per year, or about 52% of annual capacity of goods. It has the processing capacity to double the number of containers. It will be able to process liquid commodities and bulk ships etc.
7. In addition to the port yards, the port has available a coastal area of (5000 x 300) m = 1,500,000 m² and behind the tunnels there is large free area for the storage of goods (on Kakariqi plain).
8. The plan is in the form "COMB", while the terminal inclination favors the movement of ships.
9. Dimensions refer to goods processing rates (tons of goods/m² wharf/year, tons of goods/m², yard/year, tons of goods/commodities m³/m² wharf, tons of goods/yard, yard/warehouse etc…), while the dimensions of the terminals have been calculated from the experience of design standards of Mediterranean ports (Marseille, Genoa, etc.)
10. Differential dimensions of the entrance and exit of ships are calculated according to sea currents and winds.
11. Raw material for the construction of port is available on site and a physical-mechanical analysis of the limestone rocks of the coast has already been made. The abundant availability of raw materials at the site of port construction is of course an advantage in terms of construction time, construction organization and reducing construction costs.

12. Three tourism ports are located on both sides of the Eagle of the Adriatic. The plans for tourism ports have been calculated by projecting average rates. S = 100-130 m/per 1 boat/ship.

Figure 1: Triangle



5 FUNCTIONAL CONCEPT

- The port has a total of 9 terminals but the dimensions of the terminals and yards allow the processing of 12 different commodities. Containers, building materials, grains, fruits, foods, tools, passengers, minerals, petroleum, hazardous goods, chemicals, machineries, equipments, passengers, tourists, live animals etc. will be processed in the port.
- The areas of terminals, the volume of goods to be processed, the volume of goods per unit of area, the length of quays and many other technical-functional indicators are given for all port activities.
- In calculating commodity processing capacities, a surface utilization coefficient of P = 50% is taken, and 24 working days per month and 10 months of work per year are assumed. Calculations have been performed for each commodity processed according to the above coefficients, given the freight specific weight volume.

6 COEFFICIENT OF USE AND CALCULATION OF TERMS OF GOODS AND PASSENGER PROCESSING CAPACITY

All rates of conception and design of structures for processing goods are received by publishing C. Maritime., G. Mateoti etc. and updated in 2004.

The following design data have been used for the annual processing of goods.

- Platform and terminal surface utilization coefficient P = 50%.
- Monthly cycle duration T = 24 days or annually 288 days or 9.6 months = 80% of the year.
- Annual usage ratio/coefficient T = 288 days or 80% of annual time.
- Processing and evacuation cycles depending on the nature of the goods T = 6-12-24 days.
- TEU (twenty-equivalent unit) container = 20 feet (6.1 x 2.43 x 2.43) = 36 m^3.
- TEU of 20 feet (6.1 x 2.43 x 2.43 = 14.82 – 15m^2 = 36 m^3: 2.8 = 12.86 tons
- FEU containers (forty-equivalent unit) = 40 feet (12.2 x 2.43 x 2.43) = 72 m^3.
- One FEU of 40 feet (12.2 x 2.43 x 2.43 = 29.64, 82 ~ 30 m^2 = 72 m^3: 2.8 = 25.72 tons.
- Weight 1 m^3 = 1 ton = 1 m^2.
- Weight and volume of bulk materials, P = 1m^3 = 2.4-4.8 tons.
- Weight and volume of grain-rice-sugar P 1m^3 = 600-680-780 kg.
- Cement materials P 1 m^3 = 900-1400 kg.
- Fruit, vegetables P = 300-350 kg 1 m^3.

- Stone-limestone-travertine-marble P 1 m^3 = 2200-2800 kg.
- Various construction materials of glass etc. P 1 m^3 = 1800-2400 kg.
- Carbon (coal) P # 1 m^3 = 850-950 kg.
- Bitumen, construction materials P 1 m^3 = 1300 kg.

1. Processing commodity capacities are calculated for each terminal, for each port yard, each port open space or warehouse in terms of the nature of the goods. Shelving and emplacement of goods is also treated according to the norms and experience of other European ports.
2. For each are given terminal depth, ship's ability to process, area utilization coefficient, daily, weekly, monthly and annual duration of treatment.
3. Ships are scheduled to be processed up to DWT = **500,000** tons.
4. Anchorage and simultaneous processing of 55 ships of all categories is scheduled. The study provides an outline berth scheme of ships in the port facilities.

Table 1: Table of terminals

TERMINALS	Processing total area m^2	Pcs. Containers and ton/volume	Teu=pcs/m^2 & ton/m^2	Anchorage	TEU=pcs/m^2 & ton/m^2
Terminal-1	733,750			2648	
Terminal-2 /1	242,500			826	
Terminal-2/2					
Terminal-2 /3					
Total surf. area of container	976,250	2,600,000 pcs or 31,200,000 ton	2.66 pcs/m^2 Or 32 ton/m^2	3474	748 pcs/m^2 8981 ton/m^2
Terminal – Constr. mater.	175,563	4,600,000	26.2 ton/m^2	713	6451 ton/m^2
Terminal-4 - Cereals	207,563	2,000,000	9.64 ton /m^2	1127	1774 ton/m^2
Terminal–5 - Fruits-Foods	118,500	3,000,0000	25.32 ton /m^2	507	5917 ton/m^2
Terminal-6 - Vehicles	106,000	1,440,000 pcs or 36,000,000 ton	13.5 pcs /m^2 33.96 ton/m^2	457	3150 pcs/m^2 7877 ton/m^2
Terminal-7- Passengers	83,250	2,000,000	24 pass./m^2	875	2285 pas/m^2
Terminal-8 - Minerals	212,750	6,000,000	28.2 ton/m^2	826	7263 ton/m^2
Terminal-9 - Fuels	176,750	2,000,000	11.32 ton/m^2	713	2805 ton/m^2
Terminal–10 - Hazardous commodities	216,750	2,000,000	9.23 ton/m^2	1127	1774 ton/m^2
Terminal-11 - Machinery-Equipment	118,500	5,000,000	42.19 ton/m^2	507	9861 ton/m^2
Terminal-12 - Vehicles + repairs.	106,000	1,440.000 pcs or 3,600,000 tons	13.5 pcs/m^2 33.96 ton/m^2	457	3150 pcs/m^2 7877 ton/m^2
Terminal-13 - Passengers	83,250	2,000,000	24 pass/m^2	875	2285 pass/m^2
V = 63 million ton x 0.95 = 60 M	3,000,000	Max. 60,000,000	20 ton/m^2	11,658	5146 ton/m^2

5. In the table below is given the order of the terminals, type of processed goods in the terminals, the total usable area of the terminals, the total processing capacity of the terminals based on the nature and structure of goods, terminal processing capacity per unit volume and unit area (pcs, tons/year), as well as the length of berth for ships for the respective terminal.
6. The annual capacity of the port is calculated according to technical standards by coordinating physical dimensions, mechanical ability, the ability of movement, storage capacity and storage duration and delivery destination of cargo.
7. Within the activity of processing goods, particular importance is given to container processing capacity. The statistics of traffic and processing of goods in ports demonstrate that containers are of major importance in port activity. The area devoted to container processing is 976,250 m^2, or about 32% of the total built area of the port. On average, 2,600,000 containers or around 31,200,000 tons of merchandise will be processed or about 50% of the annual processing capacity of the port.
8. In the table of port structures are given the relations among port facilities, on which was based the entire functional scheme of goods processing. The study also envisages an additional area for the maintenance of port facilities.

Table 2: Table of port structures

TOTAL AREA OF PORT STRUCTURES/facilities S = 3,000,000 m^2 = 100%
The surface of the terminals and yards m^2 S = 2,702,551 = 90%
Total area of terminals m^2 S = 1 m^2 = 53% 581,051
Total area of yards m^2 S = 1,121,500 = 37%
Tourism port area m^2 S = 150,000 = 5%
Breakwater surface area m^2 S = 86,000 = 3%
Maintenance facilities area m^2 S = 61,449 = 2% = 1.02 m^2/1000 tons

9. Goods processing capacities are compared with processing in some ports of the Mediterranean Sea.

10. In the following table are given some comparative processing capacities of European and Mediterranean ports, including comparisons of the processing capacities for goods, annual processing of goods tons/merchandise and ton/m², processing surface and the limits of anchoring. Comparisons of techno-economic indicators of the Mediterranean ports include not only processing capacities but also the physical dimensions of port facilities.

Table 3: Indicators of productivity for Mediterranean ports

INDICATORS OF PRODUCTIVITY FOR SOME MEDITERRANEAN PORTS							
NAME of the port	**Annual processing tons**	**Container TEU/year**	**Area /P m^2/000**	**Total Surf. processing per. m^2**	**Anchorage**	**Annual effic. coeff. ton/m^2**	**Annual effic. coeff. kg/m^2**
Port of Bari	**5554**	**24,000**		**2,850,000**	**2500**	**2221**	**1950 kg/m^2**
Port of Trieste	**48,160,000**	**215,000**		**2,304,000**	**12,128**	**3970**	**20,900 kg/m^2**
Port of Brindisi	**10,500,000**	**600,000**		**4,927,000**			**2130 kg/m^2**
Port of Taranto	**49,400,000**	**892,000**					
Port of Geneva	**56,370,000**	**1,625,000**	**7,000,000**	**3,200,000**	**19,055**	**2958**	
Port of Gioia Tauro	**23,844,000 Commodity/ cont,**	**3,161,000 Bank, cont,3011 ml**			**6322 Commodity/ cont**	**1049/kont**	**17,620 kg/m^2**
Port of Koper	**17,000,000**	**218,000**		**4,700,000**	**2500**	**6800**	**3620 kg/m2**
Eagle of the Adriatic	**Max, 60,000,000**	**2,600,000**	**7,300,000**	**3,000,000**	**11,658**	**5146**	**20,000 kg/m^2**

7 INFRASTRUCTURE CONCEPT

- Infrastructure is divided into two groups:
    - A - internal infrastructure, which means roads within port terminals and yards;
    - B - external infrastructure or connection of the port roads with Albanian and Balkan national roads.
- Interior port infrastructure consists of demarcation roads between yards and terminals, which are provided with four lanes, roads within platforms are provided with 3 lanes and roads within buildings, warehouses for yards and terminals are designed with two lanes. The construction costs of internal roads are estimated together with the construction costs of port terminals and yards.
- External infrastructure costs for the connection of the port to national and Balkan infrastructure are estimated at 104,484,000 EUR. The key elements of external infrastructure are:
    - ***Tunnels, 2 x 2.8 km = 5.6 km***
    - ***Four lane roads = 5.5 km***
    - ***Road towards Shengjin L = 4 km***
    - ***Road towards Velipoja L = 6 km***
    - ***Reconstruction of roads and high waters disposal L = 3.5 km***
    - ***Railway of L = 9 km***

The study also details the connection of the port to external infrastructure or with Albanian and Balkan national roads. The link with the national roads ***Tirana-Lezhe-Shkoder-Montenegro and Lezha-Kukes-Pristina-Nis*** etc is via tunnels under the mountain of Rencit, exiting on Torovica plain. In addition to the tunnels, the construction of roads connecting with the urban centers of Velipoja and Shengjin is also planned.

1. The projected also envisages the building of a railway network that extends to the perimeter of the terminals and the spaces separating the goods processing yards. ***The port railway infrastructure connects with the national railway network Lezha-Shkoder after emerging from tunnels in the area of Torovica.***
2. For the construction of the external infrastructure network, ***104,484,000 EUR*** are estimated, calculated for each route separately.
3. Within the concept of infrastructure, the study also includes technical schemes of the movements of surface waters, municipal water, etc. Since the height of the port yards

will be 3 m above natural sea level, the possibility exists of designing and constructing municipal sanitation of sewage and wastewaters, electric cable channels and potable water supply and gas and fuel pipelines for emergency structures, without obstructing the port facilities.

4. Given the position of the coast and the escarpment of Renci mountain, with much sun on the southwestern exposure, the possibility is treated in the final draft for the production of renewable energy from the sun, wind and deep processing of municipal and urban waste etc.
5. The concept of infrastructure in the project means not only road traffic and railway lines but all the technological infrastructure described in item 4.
6. The cost of technological infrastructure is covered in the construction of the port yards and terminals.
7. External roads or infrastructure are also available for connecting the tourism ports with the Albanian and Balkan hinterland.

8 BATHYMETRY AND DEPTH OF PORT FACILITIES

The Eagle of the Adriatic is envisaged as the deepest Mediterranean port.

The perimeter of the eastern Adriatic coast from Trieste to Vlora (Ionian Sea) is calculated with the following dimensions:

- Slovenian coastline, L = 44.5 km.
- Croatian coastline, L = 5835 km
- Coastline of Bosnia and Herzegovina, L = 21 km.
- Coastline of Montenegro, L = 260 km.
- Area of the Adriatic Sea, S = 139 595 km^2.
- Maximum length of the Adriatic, L = 850 km.
- Average width of the Adriatic, B = 72-90-200 km.
- Italian Adriatic coastline, L = 1272 km

Albania's coastline L = 427 km.
Length of the Adriatic coastline L = 273 km.
Length of the Ionian coastline L = 154 km.

1. The entire eastern Adriatic coastline from Trieste to Albania's border at the River Buna (Bojana) is hilly, mountainous and very deep. The nature of the coast does not allow the building of large ports, which is why over 1300 small tourism or trading ports of all categories have been built along the Dalmatian coast.
2. Only the Albanian Adriatic coastline of 273 km has a flat, woody coast with abundant sand. The Albanian coast is a natural tourist plain.
3. Only in three areas (3x12 km) is the coastline hilly: Renci Mountain coast, the hills of the Cape of Rodoni and the hills of Carpen.
4. ***Albania's Adriatic coastline is DEEP only in the vicinity of Renci Mountain (between Shengjin and Velipoja) and in the area of Vlora, where the Ionian Sea begins.***
5. Construction of the port is planned along the coast of Renci Mountain. The depth where the port will be constructed is a result of the geometry of the wind and the movement of the sea currents, which are explained in the study and illustrated by a graph. The geological formation, not only the natural shore but also at a sea depth of 50m, is rocky and there is not more than 30 cm filling with clay or alluvial precipitate.
6. In order to illustrate the depth, over 18 main transversal profiles (cross-sections) are drawn, together with the same number of profiles in the port facility terminals and yard borders. Each main profile has next to it the cross-section of the borders of yards and terminals, as well as an outline scheme of the construction.
7. The cross-sections show individual quays and relevant functional depths of terminals.
8. The bathymetry of the port area is performed according to the Gauss-Kruger measuring system. Actual measurements were performed to validate the theoretical depth, according to a (250 x 100, 250) m scheme. Actual sea depth is shown.
9. We carried out a detailed study of the geographical position, hydrology and geometry of sea currents in Shengjin Bay (or Drini Bay). Even the depth of the coast where the construction of the port is planned and the morphology of the coastline throughout Shengjin Bay are the product of sea currents and winds.
10. The survey of the position of the port and depth plans is accompanied by schemes of the directions and strengths of sea currents and winds, diagrams of their influences etc., which show not only the depth but also marine erosion on the exposed parts of the coast where the construction of the Eagle of the Adriatic is planned.

9 SEA CURRENTS

1. The eastern coastline of the Adriatic and Ionian Sea from Trieste to Patras, Greece, has a northwest-southeastern direction and is entire mountainous. Only the Albanian coastline from Vlora to Shengjin has a north-south direction and is a completely flat, sandy coast, with pine forest in many areas. The nature and structure of the Albanian coast is explained of its abundant hydrology and alluvial deposits from rivers. The marine bathymetry of Drini or Shengjin Bay is exceptional in the configuration of the Albanian coast. The proposed location of the port is the deepest part of the entire eastern Adriatic coast. The construction site was chosen on the basis of our studies and existing publications on the coastal infrastructure.

2. The site is located in the northern part of Shengjin Bay, which is the largest bay of the eastern Adriatic. The Albanian Adriatic coastline Vore-Shengjin-Buna River, with a length of 273 km, is characterized by the hydrological feature of a catchment basin flowing into the Adriatic coast of Albania that is almost equal to the entire catchment basin of the Slovene Croatian, Montenegrin coastline, which has a length of 6160 km. (Albanian catchment basin S = 43,305 km², while the Dalmatian catchment basin SD = 46,544 km²). Although the volume of water carried into Shengjin Bay by the River Drin amounts to about 25% of the inflow into the entire eastern Adriatic, it still remains the most concave bay of the Adriatic.

3. Below is given a marine plan showing the main directions of currents in the Adriatic Sea. On the east coast of the Adriatic, the strong Bores wind blows from the north and northwest to 11 coastal positions, one of which is close to the planned location of the Eagle of the Adriatic. Even the depth of coastal waters is a product of the geometry of sea currents and winds.

4. The position of the breakwater and direction of entry of ships to the port area are governed by the directions of sea currents. The entrance and exit from the west are half the size of the entrance and exit from the east, the dimensions being planned on the basis of the marine currents. The directions of the marine currents also explain the small amount of alluvium filling of the sea bed.

5. Other maritime and terrestrial wind currents affect the Adriatic Sea. All maritime currents are present within Shengjin Bay. The Adriatic coast also experiences tidal ebb and flow, although the height difference does not exceed 20-30 cm. Tide levels are greater in the Bay of Venice. South-western, western and littoral currents are significant on the Shengjin coast.

   Construction standards in Mediterranean ports recommend the construction of port terminals and yards at a height of 2.5 – 3 m above normal sea level. This has been respected in the planning of the Eagle of the Adriatic.

10 TECHNICAL-FUNCTIONAL INDICATORS

ANNUAL PROCESSING CAPACITY V = 60 million tons

COST OF CONSTRUCTION V = 2.2 billion EUR

SHIPS WILL BE PROCESSED WITH A DTW UP TO 500,000 TONS

UP TO 2.6 MILLION CONTAINERS WILL BE PROCESSED ANNUALLY

UP TO 4 MILLION PASSENGERS WILL BE PROCESSED ANNUALLY

THE PORT WILL BE BUILT ON AN ERODED BARREN COAST

1. Total port area = 7,300,000 m^2 = 730 ha
2. Construction area of yards + terminals = 3,000,000 m^2 = 300 ha, or 41%
3. Port constructions on land = 70 ha, or 11%
4. Port constructions on the sea = 660 ha, or 89%
5. Built surface compared to port area, (3,000,000:7,300,000) = P = 41%

1. Annual processing capacity, N = 60 million tons
2. Categories of ships processed, DTW = 500,000 tons
3. Cost of construction, V = 2.2 billion EUR
4. Construction cost for 1 ton commodity, v = 36.67 EUR/ton goods
5. Construction cost for 1 m^2 built surface, v = 733.3 EUR/ton
6. Self-liquidating term, T = 15 years

1. Port length = 4000 m
2. Port length together with tourist ports = 4300 m
3. Depth of immersion in the sea up to the breakwater = 1750 m
4. Average width of yards (15:1) = 395 m
5. Average port width together with yards = 2145 m
6. Minimum port width together with yards = 2000 m

1. Surface area of built port = 3,000,000 m^2 = 100%
2. Total terminal area = 1,121,500 m^2 = 37%
3. Total processing yards area = 1,581,051 m^2 = 53%
4. Tourism port area = 150,000 m^2
5. Different lateral surface of port + breakwater = 147,449 m^2
6. Average length of berths = 11,658 m
7. Max. length of berths =13,312 m
8. Breakwater length =3340 ml

1. Number of mooring points for ships (Ormegi) = 55
2. Depth of berthing spaces = 7.8-15,5-32 m
3. Categories of ships that can be processed: up to DTW = 500,000 tons
4. Processing commodities/m^2, port surface area, V = 60,000,000:3,000,000 = 20 ton/m^2
5. Processing commodity/m^2, wharfs V = 60,000,000:11,658 = 5146 ton/m^2

11 ESTIMATE DETAILS

FACILITIES AND KEY ELEMENTS OF CONSTRUCTION

- Terminals.
- Processing yards.
- Breakwater + portals + wharf.
- Port infrastructure of internal and ex-network connections.
- Processing machinery & equipment.

TERMINALS

- Filling volume and terminal layers.
- Construction schemes of terminals in relation to perimeter.
- Processing machinery/equipment in terminal yards.
- Water & energy supply facilities for terminals.
- Emergency facilities for terminals.

PROCESSING YARDS

- Filling volume and layers in the port yards.
- Construction schemes for yard wharfs.
- Processing machinery/equipment, port yards.
- Infrastructure in port yards.
- Perimeter wall in the extremity of the isohypse h = 25 m.
- Water & energy supply facilities in port yards.
- Emergency structures for port yards.

BREAKWATER + PORTALS + WHARF

- Filling volume and layers in the breakwater section.
- Construction scheme of breakwater embedding.
- Layers and the partial function of breakwater.
- Structure, volume and connection of wharf to port yard tanks.

INTERNAL PORT INFRASTRUCTURE AND EX-NETWORK CONNECTION

- Terminals and processing yards infrastructure.
- Europort tunnels infrastructure.
- Road and railway infrastructure in the area of Balldreni, up to ex-network.
- Port infrastructure functional structures and signals.

PORT ACTIVITY MACHINERY/EQUIPMENT

- Panamax cranes at processing terminals.
- Auto-Cranes pieces at terminal and processing yards.
- Breakdown-truck 30 ton Auto-Cranes for goods processing.
- Goat cranes in terminal and processing yards.
- Various machinery and equipment for port activities.

12 PHYSICAL CAPACITIES OF PROCESSING TERMINALS

On the basis of technical conditions, yards and port terminals will be at a height of 3 m above sea level. This height is calculated as filling to a height of 25.74 m.

Designation	Area M^2	Average depth in metres	Filling on foundations H = 1.2 m	Ballast volume Total M^3	Ballast volume Total + coefficient of 1.3 M^3
1. TERMINAL - 1	425,000	21.25	22.45	9,541,250	12,403,625
2. TERMINAL - 2	135,000	17.85	19.05	2,571,750	3,443,275
3. TERMINAL - 3	70,000	18.05	19.25	1,347,500	1,751,750
4. TERMINAL - 4	87,000	16. 85	18. 55	1,613,850	2,098,800
5. TERMINAL - 5	56,250	18.6	19.8	1,113,750	1,447,875
6. TERMINAL - 6	135,000	20.8	22	2,808,000	3,650,400
7. TERMINAL - 7	70,000	18.05	19.25	1,347,500	1,751,750
8. TERMINAL - 8	87,000	19	20.2	1,757,400	2,284,620
9. TERMINAL - 9	56,250	19	20.2	1,136,250	1,477,125
					V=30,309,220
TERMINALS (surface area)	1,121,500 m2				
10. TOURIST PORT -1	75,000/2	7.8	9	337,500	438,750
11. TOURIST PORT -2	75,000/2	6.4	7.6	285,000	370,500
12. SURFACE AREA of BREAKWATER	86,000	33.1	34.3	2,949,800	3,834,740
TOTAL AREA of TERMINALS	1,357,500	Aver. 25. 74 m			34,943,210
Terminal A nchorage	L = 11,658				

13 TERMINAL CONSTRUCTION COSTS

A-S = 1,357,500 m^2 B-V = 1,104,846,605 EUR

C-V = 1.104.846.605 : 1,357,500 = 813 EUR/m^2 Terminal

the surface area of the tourism ports and breakwater surface are added to the terminal surface area.

Surface area of terminals = 1,121,500 m^2

Surface area of breakwater = 150,000 m^2

Surface area of tourism ports = 86,000 m^2

TOTAL area = 1,357,500 m^2

The main layers of the terminals are:

- Filling, compression of padding material: brown stones, ballast.
- Filling, compression of Fractional Granolith, h = 40 cm
- Filling with concrete, Mb. 200 m T = 0.6 V = 1,357,814,500 x 0.6 = 50,000 m^3
- Asphalt-concrete layer, S = 40% of the total area of terminals S = 1,357,500 x 04 = 543,000 m^2
- The filling volume in the terminal will reduce the height by 1 m, which will be filled with 60 cm concrete 60 cm and 40 cm fractions of Fractional Granolith.
- The remaining volume will be 34,943,210 - 1,357,500 = 33,585,710 m^3
- The estimate for the quayside edging, which is a key element in the cost of the port will be made for three quayside heights.
- Average height of quayside = 25.74 m and length = 11,658 m
- For depth H = 12 m to +5 m = 17 m, L = 3658 m
- For depth H = 20 m to +5 m = 25 m, L = 5000 m
- For depth H = 30 m +5 m = 35 m, L = 3000 m
- Given the rocky sea bed, the foundation depth and height of the quayside will be assumed to have an extra height of 5 m

Table 4: Calculation of construction costs

	DESIGNATION	Unit	Volume m^3	Price EUR	Amount EUR
1	Area and volume of terminals (land + sea, average h = 25. 7 m) S = 1,357,500 m^2. Supply and installation of padding material, brown stones of various dimensions + transport 2 km	m^3	33,585,710	9.45	317,384,959
2	Supply and installation of granulated stone, filling, compression, leveling, H = 40 h = 23 cm and 17 cm V = 1,357,500 x 0.4 = 543,000 m^3	m^3	543,000	11.8	6,407,400
3	Supply and installation of concrete, entire terminal yards, 30+30 cm m. V = 1,357,200,500 814 x 0.6 = 50,000 m^3	m^3	814,500	180	146,610,000
4	Supply and installation of hydro-isolation, on 50% of the area, S = 1,357,500 x 0.5 = 678,750 m^2	m^2	678,750	6.8	4,615,500
5	Supply and installation of asphalt concrete, on 40% of the terminal surfaces. S = 1,357,500 x 04 = 543,100 m^2 x 16 = 86,896 m^3	m^2	86,896	70	6,082,720
6	Supply and installation of c/r of terminal juxtapose edgings, l = 9658 m with pilots, concrete walls or panel on water, cemented with c/r walls of anti-corrosion mixed concrete, t = 100 cm, average H = 12+5 m (3658 x 17 m = 61,186 m^2 x 08 m or V = 48,948 m^3 780 EUR: 17 m = 45. 88 for 1 m pilot.	m^3	48,948	780	38,180,064
7	Supply and installation of c/r of terminals juxtapose edgings, l = 5000 ml with pilots, concrete walls or panel in water, cemented with c/r walls of mixed concrete with anti-corrosion, t = 100 cm, average H = 20+5 m (5000 x 25 m = 125.000 m^2 x 08 m or V = 100,000 m^3 980 EUR: 25/39.2 m to 1 m pilot	m^3	100,000	980	98,000,000
8	Supply and installation of c/r of terminals juxtapose edgings, l = 3000 ml with pilots, concrete walls or panel on water, cemented with c/r walls of anti-corrosion mixed concrete, t = 100 cm, average H = 30+5 m (3000 x 35 m = 105,000 m2 x 1 m or V=105.000 m^3 EUR 980 x 25/m to 1 m 39.2 pilot	M3	105,000	1028	107,940,000

9	Supply and installation of c/r vertical walls with panel or pilots of breakwater, L = 2 x 3442 = 6884 + 40 = 6924 m, walls of c/r, with anti-corrosion mixed concrete, or blocks of box type on a pedestal of granulated stone, up to H = 10 m, the box will be set on the foundation, H = 30 m. Total wall thickness of 100 cm, average = 30 m, 1 m, or V = 6924 x=207.720 m^3 30/ml	m^3	207,720	618	128,370,960
10	Supply and installation of metal construction, 20 kg/ m^2, connections, berths, railway lines, equipment, mechanization etc.	Ton	27,150	1200	32,580,000
11	Supply and installation of electrical network, cabin, lighting transformer (price per unit of 100/ m^2)	m^2	135,750	80	10,860,000
12	Supply and installation of water and energy supply, municipal water, pressure assembly, distribution pits. Unit price per 1000 m^2 of surface area.	m^2	13,575	500	6,875,000
13	Supply and installation of administrative mobile structure + equipment at terminals + 1% = 1 x 0.01 = 357,500 13,750 m^2	m^2	13,750	280 /m^2	3,850,000
14	Finishing works in terminal, 5/EUR/ m^2	m^2	1,357,750	5 /m^2	6,788,750
15	Special works in the terminals for dangerous goods	m^2	70,000	88	6,160,000
CONSTRUCTION AMOUNT					920.705.535
SITE ERECTION, 2.5% COST STRUCTURE, 2 = 20% 12.5% Profit allowed, 5%					184.141.070
TOTAL AMOUNT					1.104.846.605

14 CONSTRUCTION COSTS OF PROCESSING PORT PER SQUARE METRE

S = 1,642,500 m^2, cost of building = 331,753,206 EUR

V = 331,753,206: 1,642,500 = 201.98 EUR/ m^2

Port yards surface area, S = 1,581,051 m^2

Maintenance yards surface area, S = 61,449 m^2

Total yards surface area, S = 1500 m^2 642 m^2 (1,581,051 + 61,449)

15 KEY LAYERS of PORT YARDS

The key layers of port yards are:

- Port yard height above sea level H = 3 m
- Processing yards divided into two areas. Processing yard access from sea, l = 250 m
- The first area is in the form of a trapezium, at the edge of the sea h = +0 m, while in the extension l = 250 m, average depth = 9.5 m average H = 9.5/2 = 4.75 + 3m height above water = 7.75 m
- Surface area = 4000 m x 250 m = 1,000,000 m^2 x 7.75 m = 7,750,000 m^3
- Surface area on land S = 1,642,500-1,000,000 = 642,500 x 3m/2 = 963,750 m^3
- The total amount of filling yards on sea and land
- V = 7,750,000 + 963,750 = 8,713.750 m^3: 1,642,500 = 5.31 h = 5.31 m
- Filling, compression padding material. Stones, ballast V = 8,713,750 m^3
- Supply and installation of Fractionated Granolith h = 23 cm, concrete Mb. 200 T = 0.5 cm V = 1,642,500 x 0,5 = 821,250 m^3
- Asphalt concrete layer S = 40% Total area S = 1,642,500 x 0.4 = 657,000 x 0.16 = 105,120

Table 5: Key elements of port yards

KEY ELEMENTS OF PORT YARDS	Unit	Volume	Price Euro	Amount Euro
CENTRAL YARD (Land + sea between h = 5.31 m) 8,713,750 m^3: 1,642,500 = 5.31 h = 5.31 m. Supply and installation of padding brown + transport 2 km	m^3	8,713,750	9.45	82,344,937
Supply and installation of fractional granulated stone material, 1,642,500 x 0:23 = 377,745 m^3, filling, compression, leveling h = 23 cm	m^3	377,745	11.8	4,457,745
Supply and installation of c/r 20 +30 cm Mb. 200 V = 1,642,500 x 0.5 = 821,250 m^3	m^3	821,250	80	65,700,000
Supply and installation of asphalt/be in the processing yard, 50% S = 821,250 m^3	m^2	821,250	6.2	5,091,750
Supply and installation of wall-perimeter + portals m + 5000 + x 10 m^3/m foundation	m^3	50,000	80	4,000,000
Supply and installation of plastering and perpendicular perimeter, divisions, entrance and exit	m^2	60,000	96	576,000
Supply and installation of asphalt-concrete yards + internal roads + pedestal, under-way 10% 1,642,500 x 10%	m^2	164,250	7.2	1,182,600
Supply and installation of industrial buildings, (first phase), administration, various warehouses S 19% x 1642 = 500 = 19% = 0.19. Building structures S = 19% of yard area	m^2	320,000	280	89,600,000
Electrical supply network installation, cabin, lighting transformer (price per unit of area)	100/ m^2	16,425	160	2,628,000
Supply and installation of water and emergency facilities. Price per 1000 m^2	m^2	1642	1000	1,642,000
Supply and installation of administrative building + equipment	m^2	5000	500	2,500,500

Construction, treatment of wastewater and drinking water. Price per 1,000 m^2. Sewage will not flow into the sea.	**m^2**	**16,420**	**600**	**9,852,000**
Supply and installation of metal construction, berths, enclosures, stairs, bridge transit, railway lines, equipment etc.	**ton**	**32,850**	**1000**	**3,285,500**
Building customs agency, control, customs, laboratories		**9000**	**400**	**3,600,000**
CONSTRUCTION AMOUNT				**276,461,032**
SITE ERECTION, 2.5% **COST STRUCTURE, 12.5% = 5%** **ALLOWED PROFIT, 5%**				**55,292,174**
TOTAL AMOUNT:			**331.753.206 EUR**	

16 INFRASTRUCTURE CONSTRUCTION COSTS

1. *Two tunnels, L= 2 x 2.8 km, will link Europort yards with Balldreni plain.*
   L total = 2 x 2.8 km = 5.6 km (under section)
2. *Four lane road, L=5.5 km.*
3. *The road will connect the tunnel exit on the plain of Balldreni with the national roads Shkoder-Lezha-Tirana and Lezha-Kukes-Pristina.)*
4. *Railway of L = 9 km, will connect the port with the national railway Lezha-Shkoder.*

	DESIGNATION	Unit	Quantity	Price EUR/km	Amount
1	Supply and construction of a four-lane road under the section, including works of art, crossroads etc….V = 3 million EUR/km	km	5.5	3 million	16,500,000
2	Supply and installation of disposal equipment of high waters in the area of road construction, disposal, afforestation etc. in front of the tunnel.	M^2	6000	50	300,000
3	Supply and installation of tunnel construction, based on the present cross-section. Two sections, with circular system	km	5.6	12.2 million	68,320,000
4	Supply and installation of equipment for disposal of high waters in the area of road construction, disposal, afforestation, etc. behind the tunnel	M^2	3500	100	350,000
5	Supplyand installation of equipment for disposal of high waters in the area of road construction, disposal, afforestation, etc.	M	6000	100	600,000
6	Supply and construction of road links with existing routes of Shengjin	Nodes	4000	250,000	1,000,000
7	AMOUNT for CONSTRUCTION				87,070,000
8	SITE ERECTION, 2.5% COST STRUCTURE, 12.5% = 20% ALLOWED PROFIT, 5%				17,414,000
9	TOTAL AMOUNT:				104,484,000

17 CONSTRUCTION COSTS OF PIER AND TOURISM PORT

	DESIGNATION	Unit	Quantity	Price Euro	Amount
1	Fixed PIERS: Supply and installation of cassette units c/r, with unilateral function, based on breakwater L = 2 x 200 x 35 = 14,000 m^2 x 1 m concrete/reinforced = 14,000 m3 Supply and installation of fuel piers and platforms, combustibles, various liquids, maritime platform links with breakwater and shore connection pipelines, for ships of 150,000 tons.	Pcs	14,000	2056	28,784,000
2	SHENGJIN TOURISM PORT (200 x 150) m, a port for 230 boats. Next to Shengjin and Velipoja, S = 75,000 + 75,000 = 150,000 m^2	m^2	150,000	224	33,600,000
3	Special works on foundations of terminals, breakwater, piers. Excavation, cleanup, disposal of edging perimeter foundation, terminals, breakwater, pier, S = 40, width to 1 m circum., S 0 11 658 + 8924 = 20,582 + 418 = 21,000 x 40 = 840,000 m^2 x 6 = 5,040,000 m^3 Depth of filling 6 m	m^3	5,040,000	9.88	49,795,200
4	Concrete works on the platform before installation of pre-prepared box 50% of length of terminals, breakwater, piers, V = 21,000/2 = 10,500 m x 40 m wide x 420,000 m^2 04 m^3/ m^2 = 168,000 m^3 in dry mix.	m^3	168,000	92	15,456,000
	CONSTRUCTION AMOUNT				127,635,200
	BUILDING SITE 2.5% COST STRUCTURE 12.5% = 20% ALLOWED PROFIT 5%				25,527,040
	TOTAL AMOUNT:				153,162,240

18 SUMMARY of CONSTRUCTION COSTS

1. CONSTRUCTION of TERMINALS	V = 1,104,841,605
2. CONSTRUCTION of PORT YARDS	V = 331,753,206
3. CONSTRUCTION of INFRASTRUCTURE	V = 104,484,000
4. CONSTRUCTION of PIERS- TOURISM PORT	V = 153,162,240
5. SUPPLY/INSTALLATION OF MACHINERY EQUIPMENT	V = 38,420,000
CONSTRUCTION-ASSEMBLY TOTAL AMOUNT	V = 1,732,661,051
Expropriation+ administrative oblig., environnent, 5%	V = 86,633,052
Sum	V= 1,819,294,103
Cost structure 15%	V = 272,894,115
Sum	V = 2,092,188,218
Consulting-Project Organization-Bathymetry, 5%	V = 107,811,782
COMPLETE CONSTRUCTION OF PORT	
Total cost of construction	V = 2,200,000,000

Port area = 730 ha S = 7,300,000 m^2

Price per unit S = V = 2,200,000,000 : 7,300,000 = € 301,37 Euro/m^2

Price for 1 m^2 of area built

Total surface processing per m^2 = 3,000,000

S = V = 2,200,000,000 : 3,000,000 = 733,33 EUR/m^2

In the calculation of the cost, construction capacity coefficients recognized in design practice were used. Given that studies of such objects are rare, special and of large dimensions, the investment for the first conceptual stages is fixed to the minimum investment, for reasons of security in decision-making. This means that the project can be continued or terminated. The latter would entail prior losses.