

Logistics as A Factor for Integration of the Durres Port in Multimodal Transport Network

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Abstract

Albania is located in the South Eastern Europe, bordering the Adriatic Sea, Greece, Monte Negro, Kosovo and Macedonia. Her largest and busiest port is the Port of Durres which is located in the southeastern part of Adriatic Sea. It serves as a principal gateway to the Pan European Transport Corridor, 8-th corridor through the Balkans. The region represents a hinterland of approximately 40 million inhabitants, and encompasses Albania, Kosovo, Macedonia, parts of Serbia, Bulgaria and Romania. Creation and development of a "multimodal transport platform" provides integration of regions and structures related to transportation, and environmental protection.

The aim of this paper is to identify the degree of integration of the Port of Durres in European multimodal network and ways of its development as an important logistics center through the promotion and development of intelligent transport systems.

Based on advantages of the connection between the port and the other actors, this paper aims at creating a deep knowledge about the previous mentioned factors that have made it as a hub connection at the multimodal transport chains. Also reveal the impact that transform its logistics center actors on the port and increase its attractiveness in the Mediterranean region.

The paper explores the factors based on the literature study and the data collected directly in the field, and argues the importance of the modification of the Port of Durres as logistics hub in multimodal transport corridor East-West.

Creation and development of a "multimodal transport platform" bring a multimodal network in South-Eastern Europe, with the same standards of quality and performance; It transforms into a multimodal transport alternative to road transport contributing to environmental protection; It makes the rail a safe solution for economic operators, through the development of an integrated corridor linking the Black Sea and landlocked countries, with links to the main ports of the Adriatic.

KEYWORDS: Multimodal transport, port and terminal, logistics, performance, supply chain integration

I. GENERAL

Globalization contemporary is driven by a combination of new transport and communications technologies, knowledge intensive of production technology, new market access and innovations logistical that ease the flow of goods, services, capital, and knowledge. International consortia and main agents of globalization at the same time for

exploit economies of scale in the expansion of markets and of scope in information and financial marketing networks maintaining production units in urban areas around the world to benefit from low cost.

To promote understanding the dynamics of port and transport logistics along Adriatic-Ionian Sea in trade and international transport services, the role of competition multilateral trading system, intelligent transport systems, we are considering an analytical framework.

Definition of the key performance indicators as being the quantifiable indicators of success Multimodal Transport Platform in terms of the mission aims. Introducing new integrated intermodal maritime based on logistics chains with high quality maritime needs to connect the limited number of selected ports that are located at strategic points on European coastlines. The logistic behind the promotion inter-modality is still socio-economic rather than financial logistics.

Multimodal Transport Platform creates clear benefits in terms of transport efficiency, sustainability, safety and security. Many companies benefiting directly as public or private logistic companies, MTOs (Multimodal Transport Operators), shipping companies, and railway companies registered in an EU Member State which organize transport services. In addition, local population will be positively affected by the support of modal shift towards less polluting transport modes.

Albania is supporting intermodal transport solutions in Adriatic area. The approach of inter modality will focus in particular on: ports network; rail network; special attention in containers and Ro-Ro.

II. THE PORT OF DURRES

Durres Port performs a key role within the development of Albania and region because it is located 40 km from Tirana and it's the starting point for Corridor VIII. The port of Durres is the biggest port, which handles 78% of import-export volume on national scale and about 90 percent of the Albanian's maritime transportation. Substantial investments are being made to change the Port of Durres into a really competitive port. Recently there are investing more than 30 million euro in infrastructure works such as: New Ferry Terminal Building; yards and secondary roads, valuable 19 million euro. More than 10 million euro are invested in superstructure works, such as: procurement of a 65 ton capacity mobile crane, reconstruction of two general cargo cranes, procurement of brand new tug masters, container handling equipment, work safety equipment, etc.

At present, the Port of Durres is the only port in Albania being connected to the rail network. For the new ferry terminal, a connection to the rail station has been included. For the connections of the container terminal and eventual terminals for general cargo and bulk commodities, the connections will have to be planned and upgraded for the future needs of the port. Present and future needs for the rail tracks have to be evaluated to determine which tracks should be modernized. The areas needed to be reserved of the alignment adapted to the modern cargo handling methods and to what extent the unused rail yards could be used for other port functions.

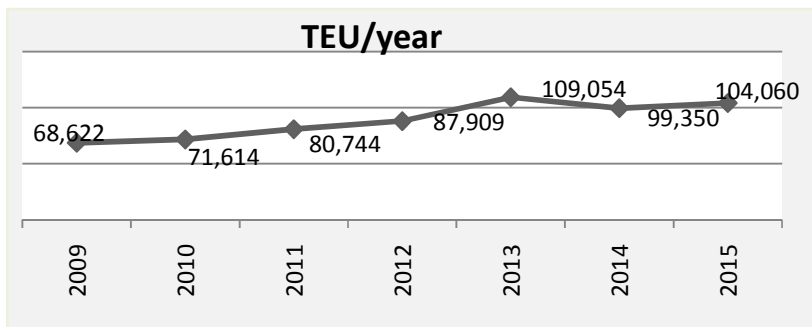
In the landlord port model, infrastructure is leased to private operating companies or to industries such as refineries, tank terminals, and chemical plants. The private port operators provide and maintain their own superstructure including buildings (offices,

sheds, warehouses, container freight stations, workshops). They also purchase and install their own equipment on the terminal grounds as required by their business. In landlord ports, dock labor is employed by private terminal operators, although in some labor parts of the port may be provided a labor pool system. A successful container operation in the port depends on a careful evaluation of the potential for the Port of Durres given the connections to the hinterland, the development of the domestic market and the competitive position in relation to the other regional ports.

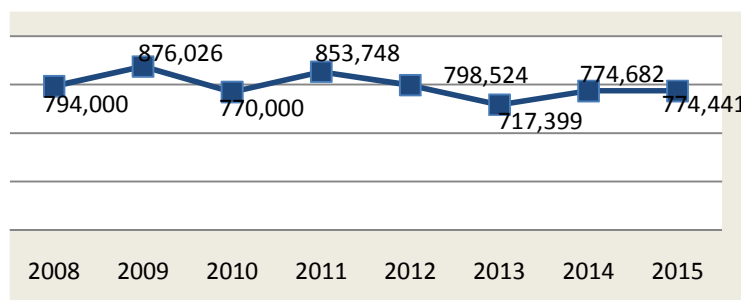
The Analysis for port/platform of Durres is articulated in according to the following indexes:

- a. Demand analysis
- b. Supply analysis
- c. Transport services
- d. Development scenarios

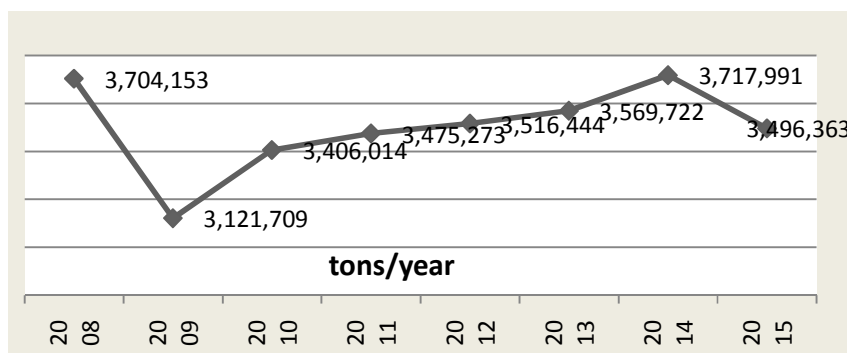
a. Freight data analysis:



Graphic 1 Volumes of works



Graphic 2 Passenger traffic



Graphic 3 Container traffic

b. The Supply analysis

This analysis comprises:

Port infrastructure context, synthesis and presentation of the main elements on port area, docks, equipment, road and railway internal links, main critical aspects

Operation and governance, presentation of the relevant subjects operating in the port, description of access process to infrastructures, analysis of load/unload capacity, main critical aspects

Distribution hubs, description of main infrastructure features of hubs linked to the port including movement modalities and capacity

Road infrastructures, detailed analysis on road links from and to the port

Rail infrastructures, detailed analysis on railway links from and to the port, highlighting the availability of “slots” for the activation of intermodal transport services

Supply revision, match of the key supply elements including an in-depth synthesis of infrastructure maximum level of capacity, rates of congestion and bottlenecks

❖ *Durres Port infrastructure*

Surface 65 ha, water surface 67 ha, berth length 2275 ml, depth 7.3 – 11.5 m; free land (bulk cargo) 52.232 m², area in use (bulk cargo) 31.270 m², area in use (general cargo) 60.000 m², transit area (bulk cargo) 22.280 m², transit area (general cargo) 12.300 m²; warehouse 5.115 m², Ferry Terminal 8.7094 m²

Main critical aspects: The lack of infrastructure for passengers from the city and the missing link between the port and the train station.

❖ *Operation and governance*

Directory of Maritime Transport near Ministry of Transport and Infrastructure, Durres Port Authority. *Main management structures of port* are: Steering council; Executive director; Consultative council. *Actors involved in port for Ships arrival/departure*: Port Authority, Harbor Master, Customs Authority, State Police, Security Force, Shipping agents, Custom agents, Ship servicing (pilot, ship towing, immersing, ship supply and waste disposal), Stevedoring agency. The environmental protection and the safety and security service, are part of the DPA and operate under Executive Directory, according to the framework and regulation.

❖ *Distribution hubs*

Container terminal: ISPS standard, 6th and 7th quay. Managing institution: concessionary company.

Eastern terminal: 8th, 10th and 11th quay. Managing institution: concessionary company
Western terminal: 1st, 2nd, 3rd, 4th and 5th quay, Western terminal managing from APD
Freight load/unload capacity: 281 .225ton yearly loaded, average daily loaded 770 ton, 418.201 ton yearly unloaded, average daily unloaded 1.146 ton
Critical: 98% of freight arriving and leaving Port of Durres by road; only 1-2% of freight arriving and leaving Port of Durres by rail

❖ *Road infrastructures*

Internal roads of Durres Port: Length: 6 lanes road = 830 ml; 2 lanes road = 3.115 ml; width: = 4m; number of lanes: 2 and 6 (as above); weight per axes = 10 ton/axes

Local roads: Managing Authority: Durres Municipality; number of lanes for each direction – 2; average speed of vehicles – 40 km/hour

Regional/national/international roads: Number of vehicles per hour: Durres–Vlore 2520; Durres –Rrogozhine 2045; average speed of vehicles –90km/hour, Managing institutions - Albanian Road Authority

❖ *Rail infrastructure*

Distance of Durres railway station from port – 500m: railway line within Port: - 1.500ml; only the eastern terminal has access to railway: In quay no 11 -150 ml, in docks - 1100 ml, together - 1550 ml. The rail stations connected to port: the train station: Shkozet; number of lines: 11; maximum weight: - 20 ton, number of sidetracks – 1, max axle load (t) – 20 ton

❖ *Supply revision*

The key supply elements including: An in-depth synthesis of infrastructure; Maximum level of capacity; Rates of congestion and bottlenecks; Low use of rail transport mode, insufficient surface, old aged equipment; Logistics management cycle of freight; Access procedures to the rail infrastructure; The lack of public transport station

Main critical aspects: The lack of integrated information between stakeholders who operate in Durres Port

c. Transport services

The transport services composed by the road transports, railway transports, and maritime transports.

Development maritime transport The Development scenarios are composed by: As-is situation; short description of scheduled actions/policies; Scenario development perspectives, in coherence of actions/policies with international networks, level of integration with the TEN-T and the SEETO core networks.

Fig. 1. Rail and Road Network within port area.

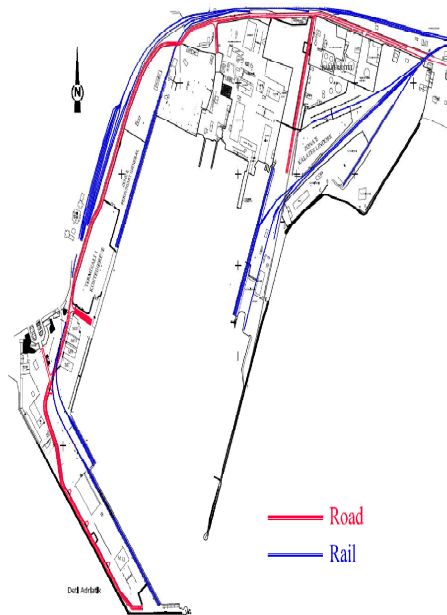
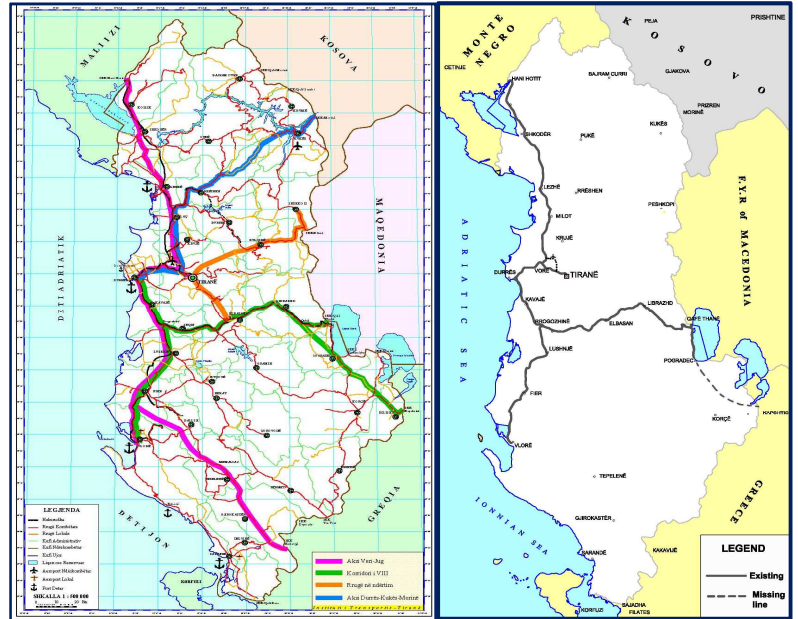


Fig. 2. Albanian main road and rail network



As-is situation: The goal is to better use of rail and sea port infrastructure through the improvement of the interconnection and cooperation between Durres Port and rail transport infrastructures for enhancement efficiency by door-to-door delivery and reducing the freight road transport.

The policy intervention areas:

Links: capacity and quality of road, rail and maritime infrastructure terminals: capacity and quality of intermodal terminals, dry ports and ports, quality and capacity of transshipment facilities, quality of connections with foreland and hinterland.

Services: availability and reliability of freight operations, safety and security standards, and traffic control solutions, performance quality and skills.

System tools: planning and policymaking frameworks

The predicted actions planned on improving port operation are: Durres Port Master Plan and Port strategy to convert it into a Green Port.

Some incentive policies are under investments plan such as the Concession for Western Terminal, but not yet any project for rail infrastructures development.

Development of a Commercial Modern Port at Porto Romano Bay, which will handle all sea traffic in Albania with respect to import/export and transit to Kosovo and Corridor VIII. The development of adequate infrastructure, which connects the New Port of Porto Romano Durres with the Enterprise development across Albanian North-South Corridor, including an efficient railway system for cargo transport

Rail segments design projected: Qafë Thanë–Kicevo(FYRO Macedonia); Pogradec–Florina (Greece); Lezhë–Shëngjin (Port); Rrëshen–Morinë–Prizren (Kosova); Branch of Rinas Airport line and completion of east curve in Vora segment.

d. Development perspectives

The scenario for port development should be in respect with the national strategy for port and coastal area, in a national and international context putting forward the integration of Albanian transport infrastructures into that of Balkan and European Networks.

The potential results achieved: Durres Port infrastructure connection with other transport infrastructures to facilitate the freight and passengers transportation.



Figure 4 European highways network

Coherence of actions/policies with international network

National and regional practices in terms of incentive policies and infrastructural development actions.

- ❖ The improvement and achievement of integration of Albanian Railway Network to the Balkan Rail network:
 - Rail connection to connect the Albanian Railways to FYR of Macedonia.
 - The modernization of rail segments in VIII Corridor and South - North Corridor in Albania.
 - The rehabilitation of railway in Tirana - Durres segment.
- ❖ ArbërRoad26.8 km which provides the shortest link between the port of Durres and Republic of Macedonia.

Development of intermodal transport infrastructures in Port of Durres area

Port of Durres 1.4 km and land surface about 650.000 m² national and international connections with: highways, railway, and international airport.

The idea of intermodal transport terminal:

- To create, in the areas close to the North-South and East-West motorways, activities and services suitable for the *development of international exchange*.
- The only logistic infrastructure supporting the production that links 3 main operator categories: production activities (the loaders), forwarding agents and logistic operators.
- It interconnects different shipping models (rail, road, air), concentrates traffic flows, and gives access to European transport corridors.

The general objective is to increase the competitiveness of the short sea shipping and to strengthen the attractiveness of intermodal transport solutions serving the ports and logistics centers in the medium and lower Adriatic area, with particular reference to the integration in the logistics chain of the sea-routes that serve the two shores of Adriatic and Ionian seas.

III. PORTPLAN

An application resolves the multimodal transport

Multimodal transportation is a very challenging task for planning in the field of Artificial Intelligence. This is a problem of logistics in which an array of goods will be transported to different locations, with the combination of at least two modes of transport in a single transport chain, without changing freight containers. The main purpose of this part of the paper is to present the PORTPLAN, an application which we created to solve the problems of multimodal transport. The main challenge of this project is the size of the problems of planning: counties of stakeholders of, trucks, area and services need to be treated every day. In the inside as in his Port Plan combines techniques Research Operational planning intelligences artificial, in order to obtain good quality plans, exploiting the advantages of both types of techniques. These plans may also graphically visualize.

Panel description problem

In our problem, we have a group of initial transport requirements, and for any application (or service) should generate a route. Each request specifies the locations where the goods are to be taken and the places where they will be sent. A service is assigned every time



Figure 5: Example of a multimodal transport route

when making or delivery location, time which represents the time at which the relevant location is available for pick up or deliver services. In addition, we have trucks and containers. To complete a road transport, only a container is needed, but the latter can be moved using a combination of trucks, ships and / or train. If used a truck, he must travel to pick up the container, and visit all locations required to transport (countries receiving and delivery), or need to transport container that has

over the means of future transport where It is transported (in port or train station). As a result we must have: Achieving the time of service assigned each location. Multimodal transportation usually needs several trucks. For example, Figure 5 shows how, in order to meet road transport has available three trucks, a container, a train or two ships. The first truck takes delivery of containers and ships P1 to P2 to (to continue with the mode of transport: road) or S1 (to continue the path of transport by train).

Well, there are several ways, each of them with different types of expenditure (e.g., empty truck movement is different from when his movement is loaded), road (transport only a single instance type boat, or combining truck, train, ship, etc.), as well as time and resource constraints (e.g. drivers have restrictions on the number of hours that can ride a tool).

Architecture Port Plan

PORTPLAN is composed of a set of modules as shown in Figure 2. The input is the list of services to carry out and a list of resources available (initial locations of each source, costs, restrictions, etc.), both data in XML format. The output is a production of a plan

for each service. This plan can be inspected graphically on a map that includes the points where actions are performed and the ways of the vehicles.

Web access component performs various questions through web portals such as Google Maps in order to get information about traffic. PORTPLAN then creates a description of the problem. Monitoring component allows PORT Plan's reveal deviations from the original plan or planned new services arising every day.

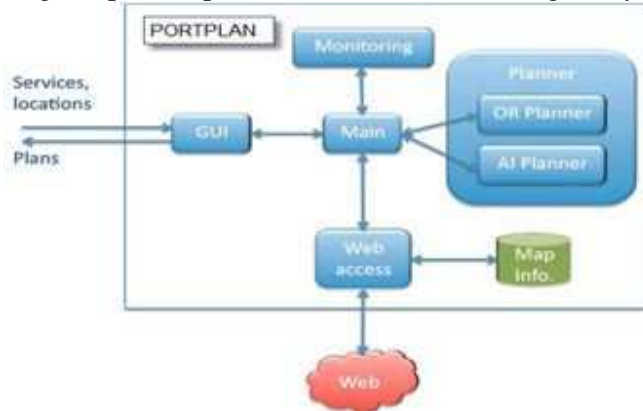


Figure 6: Architecture of PORTPLAN

Solving the problem with an the linear programming and planning

Given the complexity, to address the problem of multimodal transport, this kind of problem divided into two cases. First assignment is a problem in which every road transport by truck or / and container chosen the path which is estimated at minimum cost. Case second is a planning problem of logistics, in which selected the best means of transport in order to achieve the realization of each individual selected trying to minimize its cost through the use of a truck or container selected at the previous stage.

This level algorithm is described in Table 1

PORTPLAN (G, F, C, R, B, TR)

```

;; Inputs: the network graph (G), and the set of trucks (F), containers (C), trains (R), ships (B)
;; and transportation routes (TR)
For each tr ∈ TR
;; Select the truck/s and container to complete the transportation route
Selected Trucks, selected Container = solve Assignment Problem (G, F, C, R, B, TR, tr)
;; Plan the transportation route with the truck/s and container selected. Select the
Best transportation modes
Plan = solve Planning Problem (selected Trucks, selected Container, R, B, tr)
End
Return plan
    
```

Table 1: Algorithm PORTPLAN

```

The initial condition algorithm
(goal
  ;; Trucks
  (in-town truck1 I1)
  (= (cost-per-kilometer-empty truck1) 0.5)
  (= (cost-per-kilometer-loaded truck1) 0.3)
  (= (mean-speed truck1) 50.0)
  (= (cost-stopped truck1) 0.6)
  ...
  ;; Roads
  (road I5 I2)
  (= (distance I5 I2) 347.0)
  (road I4 I1)
  (= (distance I4 I1) 200.0)
  ...
  ;; Containers
  (in-town container1 I1)
  (empty container1)
  (disengaged container1)
  ...
  ;; Freights
  (in-town freight1 I5)
  (= (pickup-time freight1 I5) 100)
  (= (penalization-pickup-delayed freight1 I5) 0.1)
  ...
  ;; Ships
  (in-town ship1 I0)
  (ship-top I0 I3)
  (= (departure-time-ship ship1 I0 I3) 200)
  (= (departure-time-ship ship1 I0 I3) 400)
  (= (trip-duration-ship ship1 I0 I3) 60.0)
Optimal condition to be achieved by means of this algorithm
(goal (and
  (picked freight1 I5)
  (picked freight1 I1)
  (delivered freight1 I5)))
Concrete action at the algorithm that performs the loading of goods in intermodal train node
(action load-train
  parameters (?t - train ?c - container
    ?station1 ?station2 - localization)
  precondition (and (in-town ?c ?station1)
    (in-town ?t ?station1)
    (<= (+ (time-container ?c)
      (time-load-train ?t ?station1))
      (departure-time-train ?t ?station1 ?station2)))
  effect (and (not (in-town ?c ?station1))
    (in-train ?c ?t)
    (assign (time-container ?c)
      (departure-time-train ?t ?station1 ?station2))))

```

Transport routes selected sequentially. In each cycle, the algorithm takes into account the final locations and times of trucks and containers calculated in previous cycles. Scheduling problem we can to share it at 3 under other problems: first assignment of a container lorry, second assignment of a container truck with a further road transport and the appointment of a truck a multimodal node.

At first we solve the problem of what would arrange container truck. Then solve what container truck will arrange transportation using a road that we learned definitely setting the first point.

These actions include the provision of an empty truck and container transport path. Truck and container transport used and the sub-sequent until you reach the end point of delivery on the carriageway, or until they reach a multimodal hub in the carriageway. (For example, until they reach a ship which will continue beyond this logic)

Multimodal transport, additional trucks are required to complete a road transport. These trucks take the containers from the destination station / port and transporting them until the end of the road transport or until you reach the next node multimodal. Well, the problem with allocation under the third method selects the best truck to get the container

from the destination station / port and road transport continue, taking into account once again the previous tasks.

CONCLUSIONS AND RECOMANDATIONS

- To increase the integration in the logistics chain of the maritime routes linking the two shores of the Adriatic sea as alternative to road transport;
- To highlight business opportunities coming from the investments in infrastructures for the land accessibility of sea-ports (especially on rail investments);
- To promote policy actions and financial instruments to support intermodal transport solutions;
- To increase the awareness and monitoring capacity of the freight flows;
- To increase the attractiveness of port professional profiles.

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