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THE LOGISTICS CENTRES ADAPTED TO THE DEMANDS
OF THE DEVELOPING COUNTRIES
(WEST AND MIDDLE EUROPEAN CASE)*

Abstract

The logistics centres are representing the multimodal terminals, operating significant cargo streams giving access for a wide variety of transport unit servicing regional, domestic and international markets, moving the burden of transport traffic out of towns. The basic functions of these centres are transport, handling, storage, sorting, labelling, repackaging, renting of area, consulting etc.

The centres should possess an easy access to the main roads (highways) railways, inland waterways realising international transport, as well as sea-land transportation corridors. The existing logistics centres in Europe are economically effective bringing high profit and promoting development of the region.

The localisation of the logistic centre generally depends on the volume category and intensification of cargo streams tending to the area where the centre has to be established. Also other factors have to be taken into consideration as local basic provisions, localisation of local suppliers and consumers in the trade chain, the environment, access to the arterial roads, costs of the building site, operation costs, etc.

It is well known that ports as transport centres develop capacities as logistics centres as well. The examples might have been given basing on experiences of the most active ports in Western Europe and Middle Europe including Rotterdam, Hamburg, Bremen and Rostock. The centre in Bremen is located close to the well-developed international seaport occupying area of 200 ha. The centre located close to the port of Rostock has started construction works in 1994 occupying total area of 150 ha with market area of 24 ha.

The localisation of logistics centres in Poland has been based on the factors mentioned above including such criteria as: labour and housing market, taxes and levies, special financing possibilities, cadastral description, supply potential of the companies, etc

Having in mind logistics transportation network of the country six centres have been selected including two centres located close to the sea ports of Gdańsk-Gdynia area and Szczecin-Świnoujście.

Taking under consideration the economic and commercial situation of Alexandria port area with direct links to the five modes of transport such as: sea, river, road, railway and air, the localisation of logistics centre in this area seems to be economically justified.

According to the initiative of the Egyptian Government in June 1998 the Port Said East Port Project has been worked out and implemented. The project comprises the construction of a Hub Port and free industrial zone, container terminal and logistics centre to the development and growth of the Egyptian economy.

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1. General criteria of localisation of the logistics centres

The main objective of my paper is to present the theoretical and practical criteria concerning the localisation and operation of logistics centres basing on studies elaborated under my leadership in the Maritime Institute in Gdańsk (Poland).

The localisation of the logistics and distribution centres generally depends on many factors where predominant position possesses the volume and category of transport goods.

Therefore the first step inaugurating the study on localisation concerns the determination of the sources of supply of goods (cargo, products) deriving from the most important commercial and business centres of the country including the foreign countries interested in business with discussed region.

The next task has to be concentrated on the methods used in forecasting the future trends of cargo streams, which has to be taken under consideration when the basic information concerning the localisation of the centre are needed.

The next step is the estimation and evaluation of the models concerning the supply and demand of goods (consignment of cargo, containers and vehicles) operated by different transportation systems: rail, road, air, river and sea transport directed to specialised terminals, warehouses, store sheds, parking spaces etc.

It might also be very useful to study the localisation and economic efficiency of foreign logistics and distribution centres which in the future could be treated as competitor or as acting in co-operation.

The logistics and distribution centres are quite numerous in the Western Europe usually occupying vast territories, rendering services to preserve transport, reloading, sorting, storage, repackaging, renting, stores and consulting. They also often provide ancillary services for different cargoes as quality control, labelling, making consolidation and breaking of cargoes into individual consignments.

Logistics and distribution have become central to the overall quality standards that business seeks to achieve. In the modern market, making very good product is pointless if a company lacks the organisation to distribute and deliver it on time to the customer. There is an increasing tendency within the manufacturing industry to concentrate on its core business and to find agencies to provide other services mentioned above. In practice, the logistics and distribution centres take a very sophisticated approach to these concerns and offer tailor-made packages and contracts to suit each individual customer.

The number of services offered by the centre depends on many factors of external and internal characters.

Manufacturing companies often find that in effect an outside distributor can become their own logistic department, thus saving them time and money while often offering more comprehensive distribution network and far better market penetration than in-house operator could achieve.

An example might be given from experiences of Hamburg having own distribution and logistics services. There are plenty of activities to set up own account distribution operation, as some leading manufacturers as "Sharp" and "Panasonic" have already done. The cited example is rather supporting the idea of development logistics centres in co-operation with the well operated port where many modes of transport are in active co-operation giving more possibilities to enlarge its activity.

The study on the cargo streams of internal and transit origin passing through the territory of Poland resulted in reality a statement that commodities normally transported by trucks are esti-

mated to grow faster than commodities transported by train. As a consequence the relative dominance of the first, track commodities is expected to increase. This process might be also observed at present in the Eastern part of Germany.

The commodity streams are concentrated in highly industrialised region with growing population located along the transport corridors with dominant position of railway and road (highway) transportation systems.

Predominant position in the logistics transportation network of Poland have four transport corridors:

- The North South multimodal transportation system passing through the Polish territory, parallel to Vistula River. Together with railway line and the Trans-European Motorway (A1) including the project of TEM-Scandinavia are formulating sea-land transportation corridor linking Oslo, Karlskrona, Gdynia/Gdańsk, Balcan States, Greece and Turkey.
- Second very important international road linking Moscow with Berlin crossing the Polish territory in the East-West direction is composed of rail - road transportation system including the highway in construction (A2). This transport corridor is connecting the developed trans-shipment centre located close to the Polish-Bielorusian frontier with the huge industrialised centres of Warsaw and Poznań regions.
- The next sea-land transportation corridor linking the port area of Szczecin and Świnoujście with the vast hinterland of the country by rail, river, road and a highway in construction (A3) is an important link connecting Poland with Czech Republic and the states of the Southern Europe.
- The fourth one of the rail road corridors and a highway in construction (A4) is running parallel to the Polish Southern frontier crossing important industrial and business centres of Wrocław, Katowice and Kraków linking territory of the southern Germany with the Ukraine.

The following transportation activities along the mentioned four important Polish transport corridors are giving to the cited industrial regions the possibilities for localisation of well operating logistics centres.

While selecting a location of the cited centre any regional and local location requirements have to be distinguished.

Depending on the local situation the following questions have to be taken into consideration: labour and housing market, taxes and levies, special financing possibilities, local basic provisions, social and health institutions, the retail trade and service companies, supply and sales potential of the companies, the location of local suppliers and customers in the trade chains, cadastral description, the natural characteristic, the environment, access to arterial roads, railways, waterways power supply, district heating, fire fighting, energy services, the costs of the building site and the operating costs.

Each of the mentioned problems must be thoroughly examined and investigated. As a rule the following arguments, which correspond to the logistics centre forming, have been also considered:

- possibility of transferring the rail traffic to road, sea or inland water system
- connection of local traffic with long distance traffic through co-operation aided by informatics system
- improved utilisation of modes of transport, higher throughput through warehouses and storage places
- moving the burden of transit traffic out of towns

- improving of economical attractiveness of a given region and possibilities of creating new jobs.

The examples of this process might be observed while analysing the development of logistics centres, where the scheduled centres are an element of the development programme of the railway and highway systems.

The optimum size of the centre and its economic position in the logistics transportation network of the country is also connected with the number of population of the region and its economic activity.

As an example of a large modern integrated logistics centre could be mentioned the centre connected with the Municipal port of Rotterdam representing combined purchasing power of more than 200 million consumers. The port of Rotterdam holds a long and important position in the economy of the country handling roughly 300 million tons of cargo every year.

During past 10 years Rotterdam has developed its Distripark concept offering every facility and service to the companies in the field of distribution. The Distripark Eemhaven is 35 hectares in size. Distripark Botlek covers 86 hectares and Distripark Maasvlakte 125 hectares in size. The companies at the Distriparks are offering a wide variety of services as storage, repackaging, labelling, assembling, stripping and stuffing of containers.

In Germany the first centre in Bremen was located close to the well developed international sea-port, occupying area of 200 hectares.

Likely the same area have two centres located around Berlin in Wustermarks area of 265 hectares and Grossbeeren of 260 hectares. The third one in Freiebrik is occupying smaller area of 130 ha.

The centre in Rostock-Warnemunde has likely similar territory as the above with the vast reserved area for development.

Very important centre in Koln-Eifeltor is keeping only the area of 87 ha but the multimodal transit is occupying 30 ha, being in close co-operation with the Italian, French and Swiss centres.

In Poland the concentration of cargo streams, measured in tons and transport units (rail, road) is notified in following regions: Katowice, Warsaw, Poznań, Zielona Góra and Gdańsk.

The most active regions participating in export and import of dry cargo are: Katowice, Warsaw, Gdańsk, Szczecin and Lublin.

Having in mind that the quantity of general, not bulk cargo in containers is essential in operation by logistics centres in the six regions: Warsaw, Poznań, Katowice, Szczecin and the frontier area with Bielorusia, they are most favourable for location of logistics centres.

The location of the Three-Towns at the Gulf of Gdańsk coastline, with developed maritime industry, commercial and business organisations access to the five modes of transport (rail, road, sea, river, air) have great opportunity to develop logistics and distribution centres in the port area following the experiences of port-cities: Rotterdam, Bremen and Rostock-Warnemunde.

2. Framework for planning logistics centre

Many different methods and models have been applied in order to support planning of the logistics centres. The computer simulation has become most versatile and promising aid to investment decision making process pointing out the performance of alternative logistics centres configuration guided by sets of decision rules under various conditions.

Great variety of subsystems and processes exist in logistic centre (further abbreviated as LC). Transferring all possible phenomena of the real world LC to the simulation model makes the modelling process unnecessarily complex that prohibits clear and reliable results of simulation. Some LC processes are principal, core ones, others are secondary or derivative. Therefore a question arises: which process should be taken into consideration in modelling and which may be omitted, or which real objects of logistics centre are to be included in its simulation model?

Most of resources of LC are used for cargo-handling as main object of service. The cargo passes through the following phases:

- Delivery of cargo from the point of origin to LC; servicing cargo on entry to LC;
- Servicing cargo inside of LC;
- Servicing cargo on leaving LC;
- Delivery of cargo from LC to the point of destination.

Therefore both the whole LC infrastructure as well as its resources and means of transportation realise their main purpose i.e. *logistics* organisation and servicing cargoes.

It follows then that *fundamental processes* are to be included in LC simulation model, the processes which cover full range of logistic services:

- Movement of vehicles in LC environment (from the environment to LC and vice versa);
- Discharging incoming vehicles;
- Loading outgoing vehicles;
- Moving cargoes within LC area between their temporary storage places; servicing cargoes stored in LC (stuffing and stripping containers, control etc.); movement of vehicles in the LC area between different points of loading/discharging.

We further assume that all the above principle categories of process may optionally be carried on according to various alternative technologies, each supported by different set of resources.

Various priorities may be assigned to parallel and sequential technological paths included in the LC simulation model.

Main classes of objects which are subject of modelling can be determined as follows:

- A. Objects of LC (resources of LC)
 1. Cargo handling facilities
 2. Storage facilities and locations
- B. Objects of the environment of LC
 3. Cargoes
 4. Vehicles

Maintaining high semantic capacity of the above classes of model elements ensures powerful interpretative capability of the relevant simulation algorithms. Elements of the LC simulation model represent not only real LC objects and their attributes, but also *relations* between them in the function of time. These relations correspond with the following principal *categories of processes*:

- Moving cargoes in different directions (vehicle - storage, storage - vehicle, storage - storage or vehicle - vehicle);
- Trips of vehicles;
- Servicing cargoes (completing, packing, improving quality, control etc.); servicing vehicle as a whole (non-cargo handling operation).

General framework of the System of Modelling and Simulation of Logistic Centres is presented in Fig. 1. The system consists of three main *modules* (or subsystems):

- (1) modelling LC (building new models and modifications/updates of existing ones;
- (2) simulation execution;
- (3) analysis and edition of simulation results.

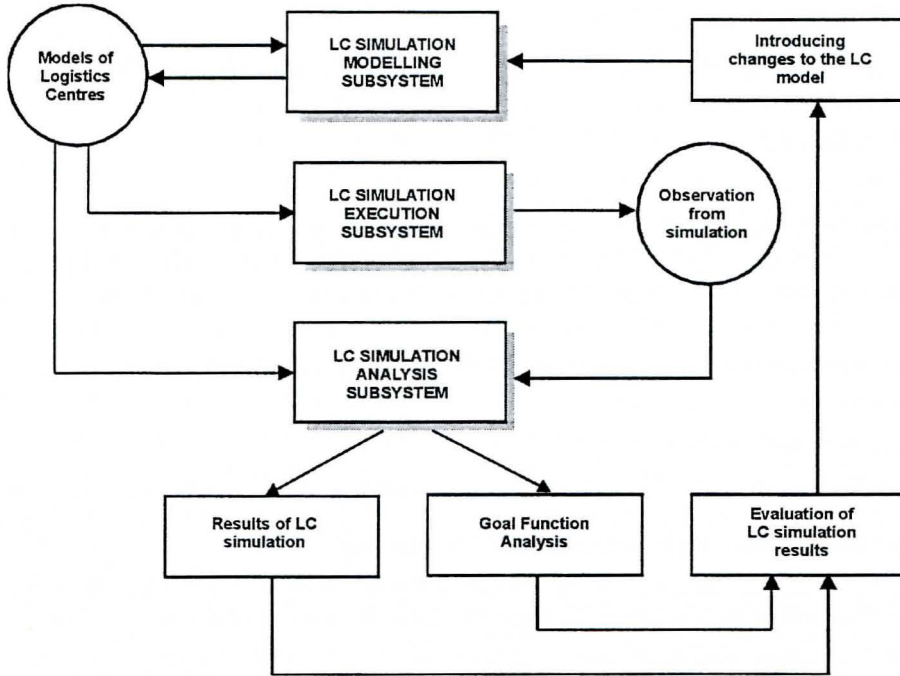


Fig.1. The System for Modelling & Simulation of Logistics Centres [2]

As an outcome of the modelling process, a simulation model of LC is created and stored on hard or floppy disk. The process of simulation can be executed basing on the model previously created and stored in the model file. Observations on the simulated logistics centre behaviour captured during the process of simulation are later on retrieved and used as an input data (in the form of time-series) for the subsystem of analysis and edition of simulation results.

The simulation process proceeds *in cycles* which are determined by sequential time increments between consecutive events. The simulation model is “moved” along the time axis from one event to another.

Simulation process is performed in two *phases*. The *first phase* consists of three activities:

- (1) of arrivals of vehicles to the LC. Generation of arrivals of new vehicles to LC, queuing up for service, definition of types of required operations (types of transshipment and other tasks), start of counting of vehicle stay in LC and waiting time for service.
- (2) Control of events of end of service processes. Recording service times. Releasing resources. Updating lists of operations to be carried out.
- (3) Initiating new service processes i.e. generating events of starting service processes. Engaging resources. Calculating service times (duration of the initiated processes). Modification: of stocks of goods in storage areas and on vehicles.

After completion of all changes possible in the state of simulated LC at a given point of time, the second phase starts in which time flow mechanism simulates real system dynamics. After "shifting" the model on the time axis by a minimum time increment, the control is passed over to the beginning of the next simulation cycle.

The simulation process is continued until the assumed simulation period is completed. The output module works out results of the simulation run which characterise the simulated LC functioning.

3. Information technology management of the logistics centres

The problem of information technology management in such units as logistics centres (CL) is a very complex process, especially because of necessity of connecting and managing various forms of information. As the co-operation of logistics centres refers not only to economic subjects located on this area, but also includes international relations, an important aspect of logistics centres becomes interchange and management of data on the international level. The range of economic-information impact of regional logistic centres present the given below Fig. 2 and 3.

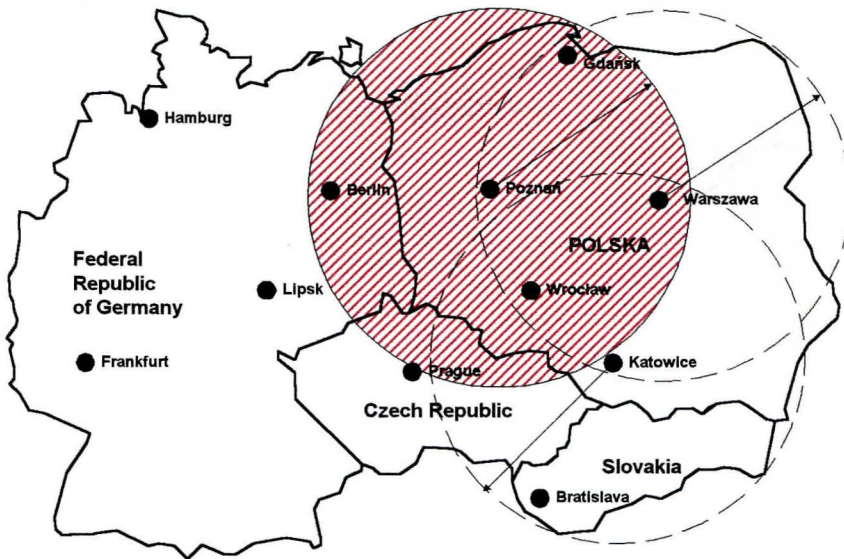


Fig.2. Range of economic and information impact of regional logistic centres [4]

At present many producers offer software to aid many aspects of functioning this type of logistics centres, under Polish conditions, however the solutions offered often prove insufficient because of complex and non-uniform infrastructure of subjects covered by action of CL.

Functioning of computer system as such does not cause increase of labour efficiency and acceleration of daily operations. The effects of applying computer systems, not seldom very expensive ones, will become visible only after having organised flow of all documents in the company through a computer system. The complete effect is reached only in the moment of functional coverage by the system of all aspects of daily work. Starting from operational activities and ending on administrative ones.

LOCiTT system, because of its computer technique function, must be an integrated system basic. The basic functions implemented by its particular modules are presented in the below given Fig. 4 and 5.

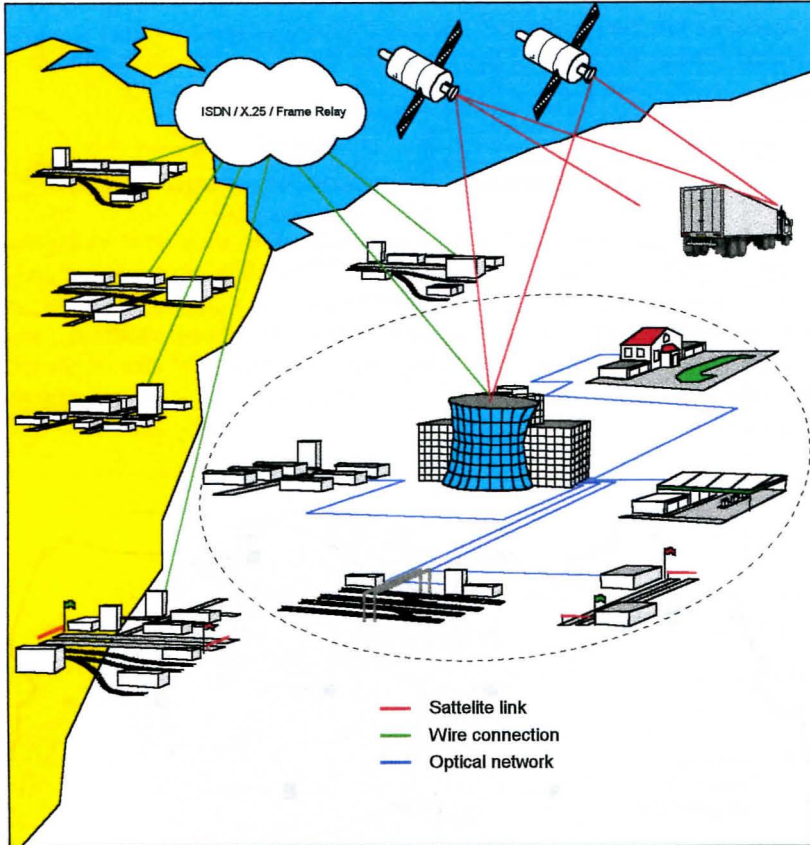


Fig.3. Co-operation of CL with a region and in the international system [4]

Moreover the LOCiTM system allows to co-operate with:

- the other transportation units depending on their outfit,
- individual forwarders,
- offices, institutions etc.

From the above mentioned problems on information technology the most important one becomes the co-operation between logistics centre in the international scale. The flow of information will take place on various organisational levels where the knowledge of languages of neighbouring countries is not necessary and the use of English is not always implemented because of the existence of a specific professional slang.

The problems of such type can be solved by using proper language patterns with regard of appropriate grammar. If we in addition impose specific professional activities on this type of information carriers then we pass in fact to creating expert computer system which consists of:

- problem oriented language on logistics in transport,
- knowledge base which allows automatic translation of the information sent,



Fig.4. Module of administrative-accountancy services of LOCiTM System [4]

- data bank which allows full coverage of parameters of vehicles, transported goods, machines and handling facilities etc.

The implementation of the system which takes into consideration all the above mentioned assumptions requires application of proper hardware and software tools. Most of traditional data base systems does not provide required elasticity (in particular when diversity and information supplied and required by CL partners is considered and the necessity of matching with the existing hardware and software solutions at the potential clients and suppliers).

In effect an efficient and stable system is obtained with a uniformed user's interface which meets requirements of all participants of information interchange (flow) and considerably increases functionality of the whole Logistic Centre. With such an approach the computer system already appears not only as computers and software but as sophisticated tool of information technology. Only application of high technologic achievements of science allows us to cope with the set tasks. The chances for those who do not have integrated systems will decrease because of the rising administration costs, slow work speed, no possibility of providing and precise information.



Fig.5. Main modules of the integrated system LOCiTM [4]

4. The Baltic Logistic Centre – Polish case

There are a few reasons for logistics centre are, inevitably, to be set up in Poland.

Firstly, in a few years Poland has to be prepared for opening widely its borders to the West European manufacturers and retailers entering one of the biggest markets of the Central Europe, by establishing logistics and distribution centres co-operating with their foreign partners.

Secondly, the strands of supply channels operated by multiplicity of small and medium-size private operators who are lacking in infrastructure and organisation to fulfil demands for co-operation inside developing impressively sector of private owned enterprises need a third-party to integrate them into an effective logistics organisation.

Thirdly, Poland is one of the main cross-roads joining the two traditionally transcontinental North-South and West-East transport corridors important for stimulating the EU economy which can be restored profitably under the condition of compatibility with procedures and standards of UE co-operators.

In Poland we do understand the development of an efficient supply chain logistics is probably the biggest challenge the Polish economy has to face in the nearest future. Identifying business opportunities, western manufacturers, retailers and third-party companies share the opinion that logistics network in Poland will play an important role in consolidation of pan-European economies and in stimulation of trade between the West and Central & Eastern Europe.

The future enlargement of the European Union leading to increased trade and investment between Western and Central Europe demands a new quality state of transport, warehousing and goods flow management adequate for the EU standards and long-term aims of the transport and trade development.

There are a few locations foreseen for logistics centres in Poland. The northern region of the cities of Gdańsk and Gdynia with its seaports, connections to inland waters, two airports, telecommunication, road- and railway transport and storage infrastructure, the special economic zones is aware of its advantageous position. The region should challenge the increased interest in logistics and take advantage of the opportunity.

A solution is the Baltic Logistics Centre. Gaining advantages from a regional insight into potential logistics service providers and customers and combining potential of the local companies, the initial organisation of the Baltic Logistics Bureau will permanently develop into the full-grown Baltic Logistic Centre. Based on the biggest enterprises of the region, as seaports, forwarders, airports, retailers and wholesalers, bank and insurance companies, special economic zones, supported by local community and the local government, involving local business organisations such as the Gdańsk Employee's Organisation and the Regional Industrial & Commercial Chamber, the Baltic Logistic Bureau presents remarkable ability to offer logistics services to home and foreign parties.

The BLB, forming the basis of introduction to the Baltic Logistic Centre, is predicted to take over the organisational task of setting up a logistic network by joining supply chains with technological processes and connecting them via logistics centre through distribution chains to wholesalers and retailers, combining highly fragmented domestic retail market, playing an integrating role towards western retailers and manufacturers being present on the market today and implementing formal procedures in accordance with the EU standards in the network within three to five years.

One of the Europe's fastest growing economies today, Poland within its technical infrastructure and skilled working power is recognised as a potentially high rewarding and profitable partner. Foreign manufacturers, forwarders, retailers, transport operators are aware of the unprecedented opportunities the market of 40 million consumers presents itself.

A logistics centre establishing the connection between the inner chains in Poland and the foreign ones needs an adequate infrastructure and organisational framework to match its foreign partner standards.

To satisfy the sophisticated needs of western manufacturers and suppliers, a vital supportable investment is needed. An impressive range of leading international manufacturers and retailers operating in the market indicates clearly that logistics in Poland pays off.

5. The outlook on the Egyptian Port Said East Port project regarding the International Logistics Centre

Many of the activities carried out at the distribution centres have been part of a normal port work and a port may, to a less or larger extent be involved in distribution and logistics business centre.

These principles are supporting the idea of localisation the logistics centres within or close to the well operated large port area where many modes of transport are co-operating in transportation of goods, linking the sea transport with the vast territory of the hinterland.

The examples of many ports in the world which possess logistics centres are generally known and some of them have been already presented in my paper.

The Egyptian project connected with development of a new port east of the Suez Canal, as on east branch of the Port Said includes the construction of a Hub Port, free industrial zone of over 22,5 square km and about 12 km of quay walls with the associated container and general cargo terminals. The industrial zone area is about 87.6 square km and will develop industries mainly concentrated on export relations (Fig. 6).

The port will serve for the import and export activities attracting in considerable portion of the international container traffic in handling and transshipments including call at the port the Jumbo container ships of 6000 teu. Close to this terminal is expected the location of the Logistics Centre.

The project expects also the future development of its industrial zone requiring dry bulk/liquid terminals, contributing also to the "Sinai Development Programme" by building the tunnel under Suez Canal and Al. Kantra highway bridge already under construction.

The East Port Said will be linked with the roads and railway network in Sinai according to "The National Project for the Development of Sinai –1994-2017" as a potential contributor to the construction of PSEB.

The development of Sinai is realised according to the comprehensive plan taking into consideration the national development and regional demands within the framework of an integrated national project based on efforts and the participation of private and public sectors.

Constructing a Hub Port at the north west of Sinai is integrating this territory of Egypt in the socio-economic structure with other regions of the country, establishing major developments and opening for the Port of Port-Said new possibilities in co-operation in cargo and passenger traffic.

The projected Hub Port and Container Terminal as well as Logistics Centre are reasonable located at the northern entrance of The Suez Canal having in mind the importance of the waterway (sea and inland water junction) giving unique economic advantage. Any ship operating on the Far East shipping routes have no other way as Suez Canal to reach Mediterranean Sea and for loading and unloading transit containers.

Also the expected increase in trade between European and Far East countries from 65 million tonnes in 1991 to 120 million tonnes in 2010 is supporting the right decision of Hub Port development.

In order to make the new port an international loading and discharging centre in addition to the traditional activities of port operation, the shipping companies and consortia will be invited, having in mind their own profit, to participate in port and container terminal operation.

Providing efficient operation system based on advanced technologies and modern organisation system supported by logistic management the port might attract not only ocean going ships operators but also companies operating feeder service and short sea shipping lines to call the Port Said East and organise its own berthing-landing place.

The favourable links with the developed land transportation network connecting port with its vast hinterland will attract ships-operators ready for booking various kind of cargo.

The location of the Logistics Centre in the Port Said East close to the Suez Canal and the sea, connected with the well operated road and rail transport of intermodal system could be compared with some of the European ports, for instance with Municipal Port of Rotterdam.

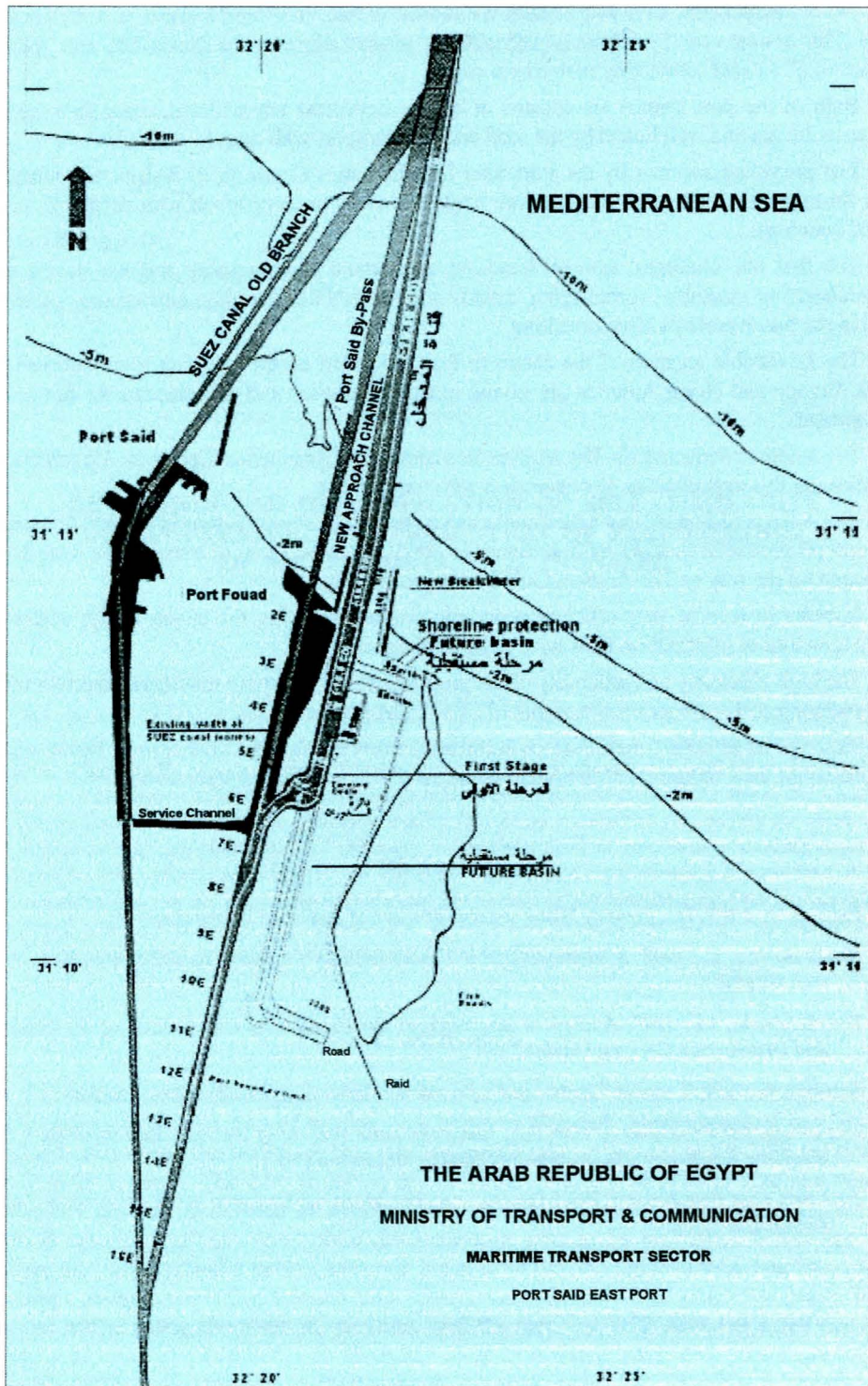


Fig.6. Master plan – Port Said East Port

Port of Rotterdam, as it was already mentioned before, has three logistics-distribution centres. The newest one, Distripark-Maasvlakte, is located close to the North Sea and "Nieuwe Waterweg" a canal connecting with Rhein river.

Both of the port centres are located at a very important international water thoroughfare close to the sea and well linked by the road and rail transport with deep hinterland.

The providing services by the Port Said East Logistics Centre in its distribution functions and through its added value activities are likely the same in comparison with centres in developed countries.

The first one concerns: storage, handling, adjustment and transport, and the second one: manufacturing assembly, repackaging, quality control, labelling, testing, customising, repairing and in the future perhaps also consulting.

The favourable location of the centre in Port Said East on the shipping route between Far East, Europe and North America are giving positive promises and expectations for further development.

The studies conducted by The Marine Research and Consultation Centre in Alexandria are confirming this expectations, in connection with transit trade.

The volume of Suez Canal transit will amount from 281.2 million tonnes in 2000 (excluding oil and oil products) to 3249 million tonnes in 2005 and the volume of transit trade from North to South on the way to The Arabian Gulf Port is growing up.

In order to receive very efficient economic system satisfying the clients of the centre the right structure of information flow have to be implemented.

The high efficiency and reliability of the proposed solution require multilevel structure of the created computer systems similar to that of LOC i TM system.

This type of solution (multilevel, multimodule) allow to adapt the system in an elastic way to the emerging new requirement or system platform which it should co-operate with.

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