# NATIONAL TECHNICAL UNIVERSITY OF ATHENS

# PRELIMINARY ESTIMATION OF THE SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACT OF THE CONSTRUCTION OF A PORT OF INTERNATIONAL SCALE IN THE AREA OF TIMBAKI

Athens, February 2007

Translation: Citizens initiative against a container transshipment port in Timbaki

## 1 . Introduction

The Heraklion Port Authority assigned one pluridisciplinary scientific team of the National Technical University of Athens (NTUA) to make a preliminary estimation of the social, economical and environmental consequences of the construction of a port of international scope in the area of Timbaki, on the south coastline of the prefecture of Heraklion. The precise location of the construction, the type of the port and the preliminary plan of the project have been defined, and given to the team of the NTUA by governmental services.

The estimation of the consequences had been asked to be made through answers of the workteam to precise questions, which had previously been formulated and gathered by the Prefecture of Heraklion (see Appendix 1).

For the realisation of this study, the team of the NTUA visited the location of the project under study, communicated with the former and current prefects of Heraklion, with all the deputees of the prefecture, the former and current mayor of Timbaki, the mayor of Lambi, and took part in an opened deliberation with local institutions and inhabitants of the area, in Timbaki, on January 22th, 2007. The team also received and used precious material from the secretary of the MUSEUM OF CRETAN ETHNOLOGY fundation, and it thanks its director, Dr Chr. Vallianos. The team also thanks Dr M. Spyridakis, ports engineer, for the informations he provided.

**2 . Workteam**

The workteam of the NTUA included scientists specialised in urbanism, land planning, ecology, coastal engineering, port projects and environmental subjects. Concretely, it was composed of (alphabetically):

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|---|---|
| Maria Giaoutzi | Professor at the NTUA<br>School of Rural and Surveying Engineering<br>Department of Geography and Regional Planning<br>*Land Planner - Economist* |
| Konstantinos I. Moutzouris | Professor at the NTUA<br>School of Civil Engineering<br>Department of water Resources, Hydraulic and Maritim Engineering<br>Rector of the NTUA<br>*Port and coast engineer* |
| Nikolaos Markatos | Professor at the NTUA<br>School of Chemical Engineering<br>Process and Systems Analysis, Design and Development<br>Former rector of the NTUA<br>President of the school of Chemical Engineering of the NTUA<br>*Computer sciences applied to environment and energy* |
| Athanassios Ballis | Lecturer at the NTUA<br>School of Civil Engineering<br>Department of Transportation Planning & Engineering<br>*Transportation engineer* |
| Ioannis Polizos | Professor at the NTUA<br>School of Architecture<br>Urban and Regional Planning<br>Vice-rector of the NTUA<br>Urbanist |
| Kimonas Chatzibiros | Assistant professor at the NTUA<br>School of Civil Engineering<br>Department of water Resources, Hydraulic and Maritim Engineering<br>Environmentalist |

Also collaborated to the study:

| | |
|---|---|
| Eleni N. Anastasaki | Civil Engineer NTUA<br>(Environmental Coastal Hydraulics)<br>Collaborator of the Laboratory of Port Projects of the NTUA |
| Io Karidi | Architect NTUA<br>MA Architectural Association |

Mr I. Moutzouris was coordinator and head of the workteam.

## 3 . Location of the project under evaluation

*Not translated.*
*This chapter mainly contains maps (showing the location of Timbaki in Crete, the Natura 2000, CORINE and other classified/protected natural and historical sites), pictures (Komos beach, Paximadia Islands, Kokkinos Pirgos port, etc.) and charts (data regarding local climate), that can be seen on the original Greek document.*

*It must be noticed that, on the release of the document available on the website of the Heraklion Port Authority (OLH), a significant number of pages are empty (some of them contain legends of invisible charts, maps or pictures). In this chapter, these pages are:*
*- pages 10 to 14*
*- Page 16, 22, 24, 29*

## 4 . project under evaluation

*Not translated.*
*This chapter gives information on the size and location of the project, and confirms its type: a transhipment hub (p. 30).*

*Empty pages: 31, 32, 33*

## 5. Basic notions - Terminology

*Not translated.*

*This chapter gives information on international maritime transports, function and utility of transshipment hubs, current routes of container ships, and existing ports of this type in the Mediterranean Sea.*

**6 . Answers to the questionnaire**

Within the scope of the promotion of sustainable development in the European Union, transports have a priority role. The development of a strategy aiming at ensuring what is defined as "sustainable transports" is targeted. Such transports constitute one of the priority domains of the strategy of the EU regarding the development of the state-members.

The meaning of "sustainable mobility", which was established within the scope of the common strategic goal of sustainable development, is one of the main bases on which the Common Transport Policy relies.

For the sustainable mobility, the Commission has presented a concrete program of actions, which includes goals until end of 2010. It focuses on precise, mandatory measures, like the improvement of access to the market, especially in the domain of railways and transports via ports.

The enlargement of the EU towards the East, and the rapid extension of markets, especially the Asian ones, reinforces the strategic location of Greece. This will have to be properly exploited by our country, in order to significantly participate to the progresses, taking advantage of the proposed development solutions.

Due to the geographical location of Greece, the maritime transports constitute an important component of the country's transportation system. Its modernisation, with the revalorisation of the ports infrastructure, constitute a priority of the strategic plan of Greece.

Our country will have to enforce the main role that it already plays in the frame of the European and international maritime community, by constituting a hub for transportation networks connecting the EU with the Middle East and Africa, while it will have to keep and reinforce its particularly important contribution in the control and protection of maritime borders in the sensitive area of the Eastern Mediterranean Sea.

The strategic location of Crete, as well as its interconnection with the big ports of the Mediterranean and the inter-European transportation networks (see following maps), will contribute to this, as the island is the most southern point of the country.

Considering this, the perspective of a new, modern port targeting international markets, serves both development and strategic aspects, in multiple ways.

The development of a port of international scale in the area of Timbaki and its connexion with other big ports of the Mediterranean, and mainly with the ports of the Far East (Singapore, China, Korea, Japan and Taiwan) and India will ensure the development and profitability of maritime transports, within the scope of the their integration in the inter-European transportation networks and combined transports, as well as the reinforcement of the economic activity at regional and national levels.

Crete, as a centre of merchant transports, will obtain a role that other islands of the Mediterranean are claiming, like Cyprus, Malta and Sicily. The benefits for the island strongly depends on how the project will integrate in the specificities of the Cretan economic and land structures, as well as to what extent it will be accepted by the local community.

The evaluation of the preceding leads to the result that the strategic location of the island will be importantly strengthened by the creation of a new port for container transport. Of course, the contribution of this particular activity to the balanced, long-term development of the region of Crete, regarding its natural, economical and social activity, has to be argued.

The fact that the creation of a merchant – passenger port is foreseen in the area in the "regional land planning and long-term development of the region of Crete" clearly constitutes a first step. It must be noticed that the regional land planning and long-term development of the region of Crete does not determine the precise…

A basic aim of the European Union is to set a common policy for sure, profitable and competitive transports that would take into account the social benefits and the environment. The basic principle, consisting in integrating the environmental dimension in the policies of the EU, is one of the bases of the actions of the Community.

The precise consequences of the project on the environment cannot be evaluated if an argued Study of Environmental Consequences (MPE) is not done. The project is of big scale and belongs to the first category, according the corresponding European and Greek legislation, i.e. to projects which are considered as having important consequences on the environment and require, for this reason, a MPE of 1st category.
We insist on the fact that the present study is based on estimations done during the visit of our team in the area. *This study thus does not constitute an argued Study of Environmental Consequences*. We mention here the following environmental components, where the consequences of the project are localised and evaluated:

Morphology
The extent occupied by the project is important, and depends on the estimated number of containers that will circulate in it.
Apart from the infrastructures used for the port itself, the storage and transshipment of the containers, as well as the infrastructures providing access to them and the internal means of communication of the port, will need sufficient extent.
If we consider, for example, that in a first phase about 1 000 000 containers will transit annually in the port, about 80 ha will be needed to satisfy the needs exposed before, and provide possibility for future enlargement. With a goal of a traffic of 3 000 000 containers, the corresponding needed surface will reach about 250 ha.
The embankment in the sea, within a distance of about 1 km from the coast is expected to have consequences on the bottom of the sea at the location of the port.
Apart from the embankment in the sea, an extent is needed for the infrastructures for access and internal communication in the port, which will touch some of the surrounding greenhouses.

Natural ecosystems – Protected areas
The surrounding region gathers remarkable areas, presenting ecological value, and which have been included in the biotope networks CORINE NATURA 2000. CORINE areas neighbouring the area of the project are: A00050011 (River and Mouth of Geropotamos, Messara), A00050012 (Lithino Cape), A00030058 (Paximadia Islands), A00010070 (Asteroussia Mountains), A00030048 (Rouvas Forest – Zaros Gorge), A00030049 (Mana Nerou, Kamares), A00010069 (Ida-Psiloritis Mountain), A00040094 (Kedros Mountain). The NATURA 2000 areas are: GR4310004 (Eastern Asteroussia, from Agiofarango to Kokkinos Pirgos), GR4310005 (Asteroussia – Kofinas), GR433005 (Ida – Psiloritis Mountain) and GR433002 (Kedros Mountain). The NATURA 2000 network is more recent and is taken into account in a determinant way regarding the localisation of projects. The area of the project is located just outside the northern limit of the GR4310004 area.
The preceding CORINE and NATURA 2000 areas include protected ecological elements, like various ecological habitats and significant number of threatened animal and vegetal species. Some of them are noticeable and special measures will have to be taken while designing the project, so that possible negative effects of the construction and operation of the port are limited. We mention the sea turtle Caretta caretta, which nest on the sand beaches (the surrounding area is considered as one of the three most important in Greece), birds of prey like Aquila chrysaetos, Circus cyaneus, Buteo buteo, Falco tinnunculus, Falco peregrinus, Gypaetus barbatus, Gyps fulvus, sea birds like Calonectris diomedea and Puffinus puffinus, and the endangered mammal specie of Mediterranean monk seal Monachus monachus.
According to the data bank of the NTUA, there are no Landscapes of Special Natural Beauty in the concerned area, even if the landscape of the surrounding area is considered as valuable.

*Conclusion*

The MPE will study the expected negative consequences on the fauna and flora, and on the mechanism of the ecosystems of the protected areas located near the surrounding area of the studied project. The proper measures will be proposed.
Especially, in order to face the ecological repercussions on the protected areas and threatened species, scientific works are mandatory. They will constitute the inputs of the MPE, which will define the measures required to prevent or reduce the consequences, regarding:

- Effect on the population of sea turtle. A primary scientific study is required.
- Effect on the population of Mediterranean monk seals. A primary scientific study is required.
- Effect on the population of all the birds of prey using the surrounding protected areas as a biotope.
- Effect on the sea birds and cetacean living in the surrounding marine area.
- Effect on the other numerous protected species of the surrounding area, and likely alteration of the situation of protected ecologic habitats.

Natural resources
The capabilities of the area regarding the use of natural resources (material, water, energy, etc.) for the support of the project during its construction stage are relatively limited.
The most important question regarding the natural resources might be the needs of the project for solid material, given the fact that it is foreseen to be constructed nearly entirely on the sea. Material will have to be taken from quarries, which will probably be located far away, given the fact that there are no quarries in the area of Timbaki. The transport of these material will load the existing road network, and the cost of the project.
As far as the water resources are concerned, it is estimated that there won't be any problem. Nevertheless, the complete final study will have to totalise the important amount of water that is needed for the agricultural production of the Messara.

Consequences on the coast
A oceanographic study of the Messara Gulf, or other equivalent study, has been asked to the Heraklion Port Authority (Mr Liokalos), but it appeared that there does not exist any such study.
According the available plan of the port, it is estimated that a small-scale erosion will appear on the nearby coast, east from the port of Kokkinos Pirgos, due to the location and orientation of the external mole of the port. In such situations, a classical method of protection of the coast consists in a system of detached breakwaters, which are set up parallel, and at a given distance from the coast. Their physical characteristics (axis, distance from the coast, distance between them, section, etc.) are determined by the morphology of the coast, the geological characteristics of the coast and sea bottom, the sea depth, the waves amplitude, the existing constructions, etc. Generally, their section is made with natural stones pieces, and their top raises from about 1 m to 2.5 m above the average sea level. For environmental reasons (mainly to avoid optical pollution), there is a possibility, in certain situations, of building reefs of breakwaters having their top under the average sea level, about –0.25 to –0.50 m.
The construction of these systems, except the fact that they will protect the coast from erosion, will also achieve to enrich it with sand.

Waste - sewage
Considering that sewage are currently (badly) disposed in the river Plati, it is estimated that, if the proper measures are taken and if conventional antipollution technology is developed for sewage and solid waste, there should not remain negative consequences on the quality of the sea water.

Aesthetics

Even if the area does not constitute a landscape of special natural beauty, the grey storage space of merchandises, cranes and big container ships will create a relative change. The port will be partly visible from the touristic area of Agia Galini.

Furthermore, the change of the nocturne landscape is expected, a phenomenon known as light pollution. But the consequence on the enlightment is considered subjective, and cannot ne argued at this stage as problematic or not.

Noise

Even if the noise of a big port can come from various causes, such as circulation of heavy vehicles, loading/unloading, circulation of the crowd and related activities, the main component of the total noise in a port can be considered as coming from the arrivals and departures of the ships and from the loading/unloading. The values showed by the following table are giving indications regarding the intensity of such noises (Scrimger, P. and Heitmeyer, R. M., Acoustic Source level measurements for a variety of merchant ships. J. Acoust. Soc. Am., 1991, 89, 691-699).

| Hz | dB | (Level of intensity of sound of commercial ships+) |
|---|---|---|
| 70 | 87 | The values are average values from 50 different ships of all kinds (oil tankers, tankers, passenger, car-ferries), and were measured in the port of Genova (Italy).<br>The measures have been taken on the quay and were then referenced to the values in the location of the source (ship) |
| 100 | 83 | |
| 200 | 78 | |
| 300 | 76 | |
| 400 | 76 | |
| 500 | 78 | |
| 600 | 74 | |
| 700 | 73 | |
| +in the location of the source (ship) | | |

As a comparison, on a busy road, the level of intensity of noise is about 70 dB.

The precise determination of the noise environment of the given port, a calculation relying on concrete conditions and data will be needed.

From preliminary calculations taking into account the topography and data related to the traffic, the consequences of the noise of the port is not expected to be important in the nearby inhabited areas, except locally, in and around the port, and, in any case, not further than a total distance of 2 km.

Another likely source of noise can come from the vehicles conveying the containers, especially the ones located outside and performing container transshipment. It is very likely, considering the foreseen amount of containers and the transshipment character of the port (which, from a technical point of view, mainly implies loading/unloading of ships and internal transports of containers to and from momentary storage spaces), that the equipment used on the ground will consist in electricity-powered bridge-cranes on rails. One of the advantages of this technology is the decreased emitted noise which, in relation with the automation features (e.g. automatic decrease of speed when handling the containers), provides possibilities of reaching, for a merchant port, a relatively low level of noise.

Energy

The energy demand of the port will be supplied by use of systems that will be studied by the operators of the port.

Water

If the proper measures are taken and antipollution technology is used for solid waste and sewage, serious negative consequences on the quality of the sea water should not be expected. Regarding possible environmental consequences of shipping or other accident, preliminary estimations based of the available sea depth information and dominant winds show that, if an oil slick occurred, it would not go away quickly, but it would sink, resulting in the destruction of the ecosystem of the sea bottom. Events of this kind can be avoided by the installation of sea traffic electronic control systems.

Atmosphere

The likely expected consequences of a port of such kind are:

- Probability of smells and smokes from local combustions
- Atmospheric pollution due to the combustion of petrol by the ships

However, they will be limited by the observation of strict rules regarding the operation of the port.

Traffic - Transport

Crete constitutes a proper location for the installation of a transshipment port in the Mediterranean region. In this case, it is expected to become a "South Gate" for Europe (mainly South-East Europe and countries of the Black Sea), thus creating a connexion with the world-wide economy of some Asian countries (China, Japan, Taiwan, South Korea, India, Singapore).

For the appropriateness of the foreseen location, the elements to be estimated are related to:

- the competitiveness with other ports, already installed in the surrounding Mediterranean area,
- the terms of negotiations of the conventions of public private sector
- the socio-economical and environmental repercussions

At local level, an increase of the traffic of lorries and vehicles is expected, which will relatively influence the pollution and noise, on the main roads accessing Timbaki and the airport.

The proposed location of the container port is at a sufficient distance (about 2 km) from the military airport of Timbaki, so that it won't influence its operation. Of course, the main access road to Timbaki (and naturally to the airport) is expected to have its traffic of lorries and cars increased, due to the creation of the container port. For this purpose, it will have to be upgraded, so that it can support the bigger traffic load.

For a better integration of the project in the region, the creation of a peripheral road outside the locality of Timbaki is needed. The peripheral road will start from the national road Heraklion-Timbaki, before the entrance of the town, and will end up at the port. Proper sound-reflecting systems will be foreseen in order to reduce noise, and trees will be planted for atmospheric pollution.

The extension, up to the entrance of the town of Timbaki, of the existing high-speed road, which is foreseen to end up 20-25 km before Timbaki, will probably be needed.

Considering providing the airport by sea, the project will facilitate the process of supplying the military airport with materials.

The parallel use of the military airport as a civil airport (passengers, merchandise, transports) is a subject of study. This use is expected to have positive consequences for the area, given the fact that it will also offer to the container port the possibility to develop connected sea-air transports for particular categories of freight.

For a better management of the ships traffic, but also in order to avoid accidents, VTMIS (Vessel Traffic Management Information Services) and VTS (Vessel Traffic Services) will have to be set up.

We mention that the operation of the port will require that the foreseen international agreements (SOLAS, PARIS MOU etc.) and rules (ER) number 725/2004 of the European Parliament and Council, 31st March 2004 for the improvement of security on ships and in port installations, signed by our country, have to be followed, as well as the harmonisation with models from International Organisms (e.g. IMO, IALA, IEC, ITU).
The guarantee of security of ships and port installations is also necessary, with the adoption of international tools (ISPS code) and bilateral or regional agreements and initiatives, as well as in the fields of protection of human life in sea (safety of ships and safety of navigation) and sea environment.

Urban repercussions – Use of the ground
Such a big project is expected to considerably influence the structure of the activities in its area, and the use of the ground within a relatively important distance. The precise size of the zone influenced by the studied port, and the changes of use of the ground, will constitute the subject of a special study.
According the legislation in effect, a Specialised Urban Study has to be foreseen immediately after the definition of the final form of the proposed intervention, as well as the creation of a Regional Development Strategic Plan.
Undeniably, an abundance of specialised activities and operations will develop around the port and along its access roads. Most probably, these activities, at the very local level of the project, will conflict with existing activities (e.g. agriculture). But they will also involve an important development in the region, and they will create new jobs. It is mentioned that, in the new port, a free zone will be created, resulting in the development of an optimistic business climate, which will improve the investment environment in the area, bringing secondary profits.

Social and economic repercussions
There will be important changes in the economic and social life in the surrounding region.
The current activities are focused on agricultural production and, partially, tourism. These activities cause important negative environmental repercussions, due to the use of pesticides, the disgraceful construction on the coast, etc., which are reversible.
A modernisation of the development followed until today could focus on a turn towards certified agricultural products, integrated agricultural production and development of quality tourism, respecting the landscape and exploiting the natural and cultural resources of the region in a better way. It seems that an important part of the local community is mainly interested in investments of such a kind, which promote a more rational direction for the current development of the private sector. This tendency does not converge with the tendencies of industrial development offered by the port.
We propose that measures are taken for the reinforcement of the agricultural production, with the installation in the area of agricultural products standardisation units, export of them through the port, etc.
The operation of the port exclusively for the traffic of containers is not expected to contribute to the touristic development of the region. But it will create a different development, from the professional people that will visit the area on a 12-months basis.
Today, the area is depicted in touristic guides as “idyllic and suitable for individual tourism”. This image, in the area of the project, is expected to be modified due to its direct negative repercussions, eg. in the domain of the landscape aesthetics, the quality of the natural environment.
It is clear that part of the current “touristic product” will be replaced with another type of activities/incomes, in relation with the new economic structure or the region (e.g. activities related with businessmen and people in relation with the port, as well as ship crews).

The development profile of the area will depend, to a large extent, on its possibility to offer support to the touristic sector, through a series of supporting measures (e.g. installations dedicated to touristic ships and cruise ships, and beaches).
The repercussions on the touristic sector, and more specifically on the small to medium-sized enterprises, which for the time being constitute the main body of the economic basis of the touristic sector in the region, are expected to be negative, if they are not adapted to the new requirements of the demand of services corresponding to professional visitors.
It is estimated that there exist possibilities to compensate the negative repercussions on the small touristic units and shops of the area, due to the change of the "touristic product", if they adapt themselves to the new conditions.
Even if, under the suitable conditions of course, the creation of new jobs is expected, it is not possible to foresee if it will be possible that they are occupied by "older" employees who, in many cases, are not subject to be easily professionally re-oriented and trained to the new jobs. Consequently, the question of created unemployment will need to be particularly stressed, so that the undermining of the local community's social cohesion is avoided.
The study of socio-economic repercussions will have to examine enough this subject and precisely determine the number and the kind of jobs that will be created, during construction phase as well as during operating period of the port.
However, the needs of the port construction will require specialised and non-specialised manpower. At operating stage, a limited number of qualified personal, usually commissioned executives, is needed for the operating needs of the port. In that case, usually, the criterion for choosing the employee is not his/her being a local, but its specialisation.
The most basic services that the mercantile centre will offer, concern the selection and constitution of freight sets, with possible in between added-value services (e.g. reception of a product in pieces, constitution of a complete order, packing of final product).
It is important to put the stress on the fact that, in such a case, the repercussions on the total creation of new jobs depends on the political negotiation between the potential investors and the deciding centres.
As far as the profits are concerned, the question will be studied in the economic-financial and socio-economic opportunity studies, and in the studies of environmental repercussions (in environmental terms).
The economic object of the project is enormous. To what extent the local community will benefit from the project (development vs. social and environmental repercussions) is a question of negotiation between the involved parties. The international experience shows that the negotiation – signature of the final agreement is the most serious part of such a project. The agreed terms will have to be profitable for both parties (social community and private individuals).
Furthermore, it is estimated that the construction of a port of such an important scale as the Timbaki port, will concentrate a lot of available resources, part of which should be used for the protection of the environment, like:

- Protection of the areas where important works are performed, with the application of environmental repercussions studies
- Cleansing and restructuration of areas of touristic concentration
- Processing of especially heavy waste coming from the most harmful activities in the area, but also from the agricultural activities (pesticides, weedkillers)
- Inter-municipal programs for the covering of the needs in local network and installations
- Parallel port installations for touristic ships, passengers and merchandise
- Touristic beaches
- Inter-municipal programs for the covering of the needs in local network and installations for solid and liquid waste process

- Creation of a Museum of Marine Archaeology which will host the archaeological finds and will stimulate the tourism in the area.
- Connexion of the container port with additional infrastructures needed for the traffic and export of the Cretan production, and more generally for the creation of a merchant centre.

A potential form of investment useful both for the transshipment port and the local community (regarding the additional offered jobs and the resulting economic activities) concerns the creation of a merchant centre in the hinterland, given the fact that the surface of the port and the surrounding land are not sufficient, under the condition that it would operate in direct connexion with the port.

Archaeological sites

An examination in situ, from the archaeological service, is required.
A special study will be needed, so that the construction of the container port, with its involved harmful effects (aerial pollutants, noise, etc.), do not cause negative environmental repercussions on the archaeological resources of the region. However, measures will have to be taken for the preservation and the valorisation of the precious, worldwide level archaeological resources of the studied area.

Conclusion

It is pointed out that, for the construction of the port, a full study of environmental repercussions will be required, as foreseen by both Greek and Community legislations (97/11/EC). This study will estimate and evaluate the consequences of the project on the natural environment on the land and in the sea and it will propose the suitable measures, so that these consequences are limited to a minimum. The strict observation of environmental terms and safety rules are not subject to discussion and will need to be considered obvious for a project of such importance.
Nowadays, technology offers solutions or improvements for nearly all the formerly mentioned repercussions.

**7. General evaluation - Opinions**
Not translated (yet…).

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