



WP 3.1 – LOCAL INFORMATION SYSTEMS

CASE STUDY IN DOLOS KITI - CYPRUS

EUROSION Project
FINAL REPORT

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Foreword

The preparation of this report has been undertaken as part of Work Package 3 “Local Information Systems” of EUROSION, a project contracted by the European Commission to a consortium led by the Dutch National Institute for Coastal and Marine Management (RIKZ) for the period 2002-2004.

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ABSTRACT

The coastlines of Cyprus are under increasing pressure of economic development, particularly tourism development. The economy of Cyprus depends considerably on the tourist industry, the farewell of which depends largely on the quality of the beaches. The 30% of the total coastline of the island suffer from erosion. Erosion of the coastline due to natural but mainly to manmade causes, coupled with shortage of fine sandy beaches became a serious problem of growing concern the last 20 years. At the same time the growing pressure for utilization and exploitation of the coastal zone was making the whole picture worse.

Since late 80s, Cyprus Government has realized that coastal zone is *a natural resource* for the island which was under the threat of extinction due to the over pressure resulting from intensive tourist development. Erosion was a serious threat. It was clear that something had to be done. It was also realized that an integrated approach was needed. The fragmentation of responsibilities among several governmental Departments concerning the coastal zone, formed a labyrinth of competent authorities, resulting in overlapping and even contradicting decisions. At the same time, the legal framework for coastal zone, coastal defense works and anything related to the coast, was so old that was practically not – existing.

The problem of erosion still exists in several coastlines of the island, although there have been efforts to implement Integrated Coastal Zone Management (chapter 2). A very serious problem is still the fragmentation of responsibilities among the competent authorities and also the lack of an organized system for stakeholders involvement and participation in the decision making process.

EUROSION is a project dealing with these parameters of erosion problem, introducing the socioeconomic parameter into the system for combating erosion. Cyprus was involved in Work Package 3 of EUROSION the target of which is to locate pilot sites around Europe which suffer from coastal erosion, document the practices, the policies and the methods which have been implemented and focus on the lessons learned.

Cyprus participated in WP3 with the pilot site Dolos-Kiti. Dolos – Kiti coastal area is located in Larnaka District, at the south coast of Cyprus (see attached map). The total length of the

coastline is 36 km. There are 10 villages in the coastal area, with a total population of 9173 and several conflicting uses like industry, tourism, agriculture and aquaculture (chapter 4). The coast is generally relatively low and flat, and it is mainly characterised by accumulations of gravel and pebble and few tiny poor sandy beaches. The area suffers from severe erosion which in some areas reaches about 0,5 m/year (chapter 3). The land uses of the coastal area (chapter 4) have been mainly agricultural until recently, when by a reform of the Town Planning regime most of the agricultural areas have been characterised as tourist or development areas. This led to a sudden increase of pressure for tourism and real estate development. Eventually the problem of beach quality became very important and efforts started to combat erosion, some using legal and some illegal methods (chapters 3 and 6).

A survey of 200 questionnaires which has been carried out on the beach and concern the beach users showed that people are quite happy with any structure that can solve the problem of erosion. The survey also showed that people are quite interested in having facilities on the beach (toilets, showers, water sports) however their main concern is to have clean and healthy beaches. Another 30 dedicated questionnaires have been carried out among the stakeholders (administrators, officials, experts, economic sector, social groups). This survey showed that all stakeholders feel that the communication network is insufficient, that there should be a better way for organising information and the non-governmental questionees stated that there should be a legal framework to establish and sustain public participation and involvement in the decision making process. The results of these surveys are included in chapter 6.

Finally, the need for the implementation of an efficient Information System which will support the decision making process and will provide with transparency the public is stated in chapter 7, after describing the existing Information and Communication condition.

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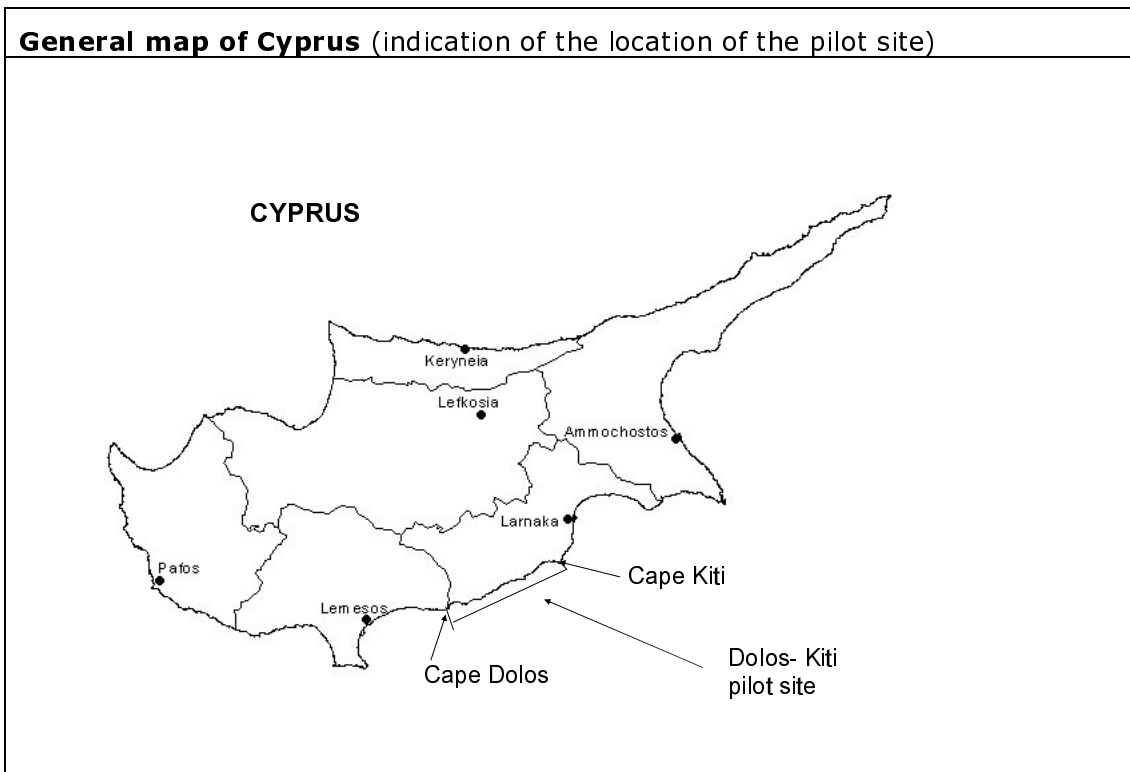
1. INTRODUCTION

1.1 Location of the area

Dolos – Kiti coastal area is located in Larnaka District, at the south coast of Cyprus (see map). The total length of the coastline is 36 km.

There are 10 villages in the coastal area, with a total population of 9173.

General map of Cyprus (indication of the location of the pilot site)



1.2 Background on ICZM practices in the country

Since late 80s, Cyprus Government has realized that coastal zone is a *natural resource* for the island which was under the threat of extinction due to the over pressure resulting from intensive tourist development.

The economy of Cyprus depends considerably on the tourist industry, the farewell of which

depends largely on the quality of the beaches. The shortage of sandy beaches together with the problem of erosion which affects the 30% of the total coastline of the island, were a serious problem of beach quality. At the same time the growing pressure for utilization and exploitation of the coastal zone was making the whole picture worse. It was clear at those days of late '80s that something had to be done. It was also realized that an integrated approach was needed. The fragmentation of responsibilities among several governmental Departments concerning the coastal zone, formed a labyrinth of competent authorities, resulting in overlapping and even contradicting decisions. At the same time, the legal framework for coastal zone, coastal defense works and anything related to the coast, was so old that was practically not – existing.

The first effort to implement Integrated Coastal Zone Management in Cyprus was thought the project "Coastal Zone Management for Cyprus". The project was co-funded by European Union, through MEDSPA Program and the Government of Cyprus. The Project was carried out by Delft Hydraulics, supported and working together with the staff of Coastal Unit of the Public Works Department (Ministry of Communication and Works). The Project started on January 1993 and finished on December 1995. This was the first systematic integrated effort. After the first two Phases, where a lot of ICZM aspects were implemented or tackled, the Project focused on coastal erosion management since this was identified as the most serious problem of the Cypriot Coastal Zone.

That Project led to the formulation of Guidelines for preparing Master Plans for coastal protection and improvement works in Cyprus and also prepared the Master Plans of coastal protection and improvement works for three Coastal Areas of the island.

A very important activity of the Project, was the formulation of an ad-hock committee, with the participation of representatives of all the governmental departments/ organizations involved with coastal zone: the Town Planning and Housing Department, the Fisheries Department, the Cyprus Tourism Organization, the Water Development Department, Geological Survey department, Environmental Service and the Planning Bureau. Coastal Unit was chairing the committee. This ad-hock committee worked very efficient during the Project. It was a fast way of providing data to the Consultants (the procedure otherwise would be very long) and mainly it functioned as a quick and efficient tool for decision making. Since all the involved departments participated in the committee and worked together, the decisions for proceeding with integration process were considered as the result

of this team-work and thus was accepted and adopted by all.

By the end of the Project, the capacity of the Coastal Unit was significantly enforced, the personnel trained and could act, until today, as the agency responsible for coastal protection and improvement works. The ad-hock committee gradually became non-active, the fragmentation of responsibilities among the various departments still exists and the legal framework is still out of time. Actually this was the first and until now, the last effort to implement Integrated Coastal Zone Management in Cyprus.

In 2000, the National Technical University of Athens (laboratory of Harbour and Coastal structures) undertook a Project, financed by the Republic of Cyprus, to carry out Master Plans for Coastal Protection and Improvement Works for three coastal areas, others than the ones which have been studied under the ICZM for Cyprus Project. This new Project doesn't have the function of integration. It is a clear Coastal Engineering Project and mainly tackles the problem of erosion directly, proposing "hard" engineering measures. The Project is expected to be completed by the beginning of 2003.

2. LEGAL STATUS ON COASTAL MANAGEMENT POLICY (POLICY LEVEL)

2.1 Definition of the coastal zone

The Foreshore Protection Act of Cyprus (acts 59, 22/61, 17/64, 8/72) identifies as land limit of the coastal zone the distance of 100 yards (approximately 90 metres) from the “winter wave”. In the Town Planning and Housing Law (of 1972 which was enforced in 1990) coastal zone is indicated graphically on the town planning zoning maps, as a strip of 100 meters width from the coastline. Actually, according to the existing legal framework, coastal zone coincides with the town planning coastal protection zone. There is not an official and actual estimation of the winter wave run up limit around the coastal areas of the island. So, the existing coastal zone (landwards) is not responding to the real dynamic coastal zone.

This creates several problems. The position of the coastline on the maps used for the definition of the Town Planning Zones, is not the recent. In some cases the position of the coastline results from the maps of 1924! So, when the 100 meters of coastal protection zone are defined, erosion of the last 40 years is not taken into consideration. This creates the problem that in several cases buildings are constructed practically on the coastline and certainly in the coastal protection zone, since the coast has been eroded and the coastal protection zone as defined on the zoning maps doesn't exist. However, according to the Shore Act of Cyprus, the coastal protection zone is 100 yards from the winter wave run-up and refers to the present situation. The conflict between these two legal tools is obvious.

Concerning the offshore limit of the coastal zone there is not a legal/ official definition. Coastal Unit is using the -20 meters water depth as the offshore limit for the natural dynamic coastal functions.

2.2 Legal instruments for coastal protection

2.2.1 Administrative system

The Headquarters of the Government of the Republic of Cyprus are located in Nicosia,

the capital of the island. Cyprus has the political system of Presidential Democracy, ie the executive power is vested in the President of the Republic, who is elected every five years directly from the people. The President is responsible to form the Government and appoint the Ministers. The House of Representatives is the Legislative Authority of the Republic. The Members of the Parliament are elected every four years in different elections.

Cyprus is divided into six Districts: Nicosia, Limassol, Pafos, Larnaka, Ammohostos and Kyrenia. Each District has the District Officer, supported by a team of employees, who is acting as the local representative of the Government in each area. The Districts Officers and their offices are under the authority of the Ministry of Interior.

Most of the Governmental Departments also have offices in each District, in order to decentralize the system of decision making. These offices work in close cooperation with the District Officer, forming a kind of "local government". However, all major decisions or the solution of all major problems are directed to the Headquarters of each Department in Nicosia and at the Ministries.

Each District has Local Authorities. Every community with population over 5000 inhabitants is a Municipality. The rest are villages with their Local Authority. Mayors, Municipality Councils, the Presidents of Local Authorities and the Councils of Local Authorities are elected by the people in the elections for Local Authorities, every five years. Although Local Authorities have power, it is rather limited to a series of local problems. The major decisions are taken by the Government, for example for infrastructure works, ie if a road is going to be constructed and when or for the allocation of budgets. Local Authorities (including Municipalities) act several times as pressure groups to the Government. The financial support of the Government to the Local Authorities is less than 1% of the GNP.

2.2.2 Administration responsibilities concerning coastal protection

According to the Foreshore Protection Act, the Ministry of Interior, through the District Officers, is the "owner" of the coastal zone, ie the authority responsible to manage coastal zone.

However, several other Governmental Departments, Semi-Governmental Organisations and the Local Authorities are competent authorities since they are responsible for the enforcement of Laws and Acts concerning Coastal Zone. So, the decisions are taken in several levels and through a quite complicated process. Usually, and depending on the subject, committees are formed, with representatives of all the competent authorities in order to come to a decision.

Central Government

The major stakeholders for coastal zone in the administration system are as follows:

- The District Officer, Ministry of Interior, is the “owner” of the coastal zone, according to the Foreshore Protection Act and is the authority responsible to issue permits for coastal structures¹ and also issue “the building permits”² for all land based structures.
- The Town Planning and Housing Department, Ministry of Interior, is responsible for the enforcement of the Town Planning and Housing Law, which defines the width of coastal protection zone and is the authority responsible to issue the “Town Planning permits” for all the land based structures
- The Coastal Unit, Public Works Department, Ministry of Communication and Works, is responsible for the planning, design, surveying of coastal protection works. Is the official Consultant of all the Governmental Departments on issues pertaining to the coastal zone morphology. Coastal Unit has only consulting and technical authority. It participates to the decision making process through the participation in Committees. It is not considered competent authority for the enforcement of any Law or Act concerning coastal zone.
- The Environmental Service, is the authority responsible for the enforcement of the Environmental Impact Assessment Law (no 57(I) 2001). Coastal structures are

¹ The permit for the construction of coastal structures, such as offshore breakwaters, is issued directly from the District Officer, provided that there is an Environmental Impact Study for the structures which has been accepted by the Technical Environmental Committee.

² The issuing of the permits for land based structures has two levels: first the Town Planning and Housing Department issues the “town planning” permit and then the District Officers issues the “building permit”.

included in the Annexes of the Law, ie the execution of an Environmental Impact Study is essential.

- The Technical Environmental Committee. The Committee is chaired by the Director of the Environmental Service. Several competent Governmental Departments are represented in the Committee, as well as representative of the Ecological and Environmental NGOs of Cyprus. The Committee examines the Environmental Impact Studies and accepts them or not, in order to proceed or not with the issuing of the building permit by the District Officer or/and the Town Planning and Housing Department.
- The Fisheries Department, is the agency responsible for the enforcement of the Fisheries Law, for aquaculture and for the marine ecosystems.
- The Water Development Department is the agency responsible for Water Resource Management. River damming and the management of the streams³ estuaries have direct inter-relation with the coastal zone.
- Geological Survey Department, carries the research for coastal sedimentology and geology
- Land and Survey Department. The agency responsible for mapping and cartography.
- Cyprus Tourism Organization (CTO). A Semi-Governmental organization, which is the Agency responsible for the Tourist Development in the island. Decisions concerning construction of Hotels and other tourist facilities in the coastal areas, define the future of the coastal zone morphology, the needs for protection coastal structures etc.

³ There are no rivers in Cyprus. The hydrological networks comprises of streams with run off only during raining periods (winter)

Local Authorities

Municipalities have their own Technical Department and they are responsible to issue "Town Planning permits" within the area under their jurisdiction (they replace the Town Planning Department in some activities. However, the permit of the District Officer is necessary for all Coastal Structures. The Local Authorities, which do not have a Technical Department, participate in the decision making procedure in a rather informal way, mainly through the process of Public Hearings which has been established with the Environmental Impact Law (57(I)/2001) and as pressure groups.

National Committee of Coasts

This Committee is chaired by the Union of Municipalities of Cyprus. It consists of a representative of the Union of Local Authorities, representatives of several Governmental Departments, representative of the Ecological and Environmental NGO's. The Committee is the agent responsible for any changes in the Foreshore Protection Act which have to do with the economic activities on the beach, ie define swimming areas, areas for water sports (jet skis etc), areas with sun-beds and sun-umbrellas, rates of renting etc. The decisions/suggestions of the Committee are submitted to the House of Parliament for approval in order to be incorporated as modifications to the Foreshore Act.

2.3 Strategies on coastal protection

Almost the 30% of the coasts of Cyprus suffer from coastal erosion. Since '80s the strategy to face the problem of erosion and protect the receding coastline was limited in constructing coastal structures, mainly offshore breakwaters and groynes. Since 1993, after the beginning and the completion of the Project "Coastal Zone Management for Cyprus", coastal protection became a more integrated process. The strategy of the Government was and is to prepare Master Plans for coastal protection and improvement works, for the entire length of the eroding beaches of the island. In this way, all the interventions in the coastal zone will be planned and be under the rather integrated approach of Master Plans.

2.3.1 Legislations and Regulations

The following Acts, Laws and Regulations form the main legal framework for coastal zone

- Environmental Protection
 - ✓ Environmental Impact Assessment Law (no 57(I) 2001), enforced the 12th April 2001
 - ✓ There is a large number of Laws concerning environmental aspects, eg. Water resources, Waste Management, Protection of Nature (including fauna and flora) Noise, Odour etc, which apply in coastal zone activities.
- Coastal Defence
 - ✓ Foreshore Protection Act, (Acts 59, 22/61, 17/64, 8/72)
 - ✓ Piers law
 - ✓ Roads and Buildings Law
 - ✓ Government Lands Law
- Spatial Planning
 - ✓ Town and Country Planning Law – 1972 (with several later amendments, enforced in 1990)

2.3.2 Existing Policies

Except for the legal framework, the policy of the Government for coastal protection is based on the out-comes of the Project “Coastal Zone Management of Cyprus”. The general coastal policy guidelines for the Master Plans for coastal protection works can be considered as the existing official policy for dealing with coastal protection. The guidelines, as defined in Unified Report (Delft Hydraulics, H1456, prepared for Ministry of Communication and Works, Nicosia 1996) are as follows:

Coastal policy guidelines for the Master Plans

A. Guidelines, expressed in general terms, for those coastal areas which still have a largely natural character:

Preserve and/or improve the conditions for the natural coastline.

In more concrete, practical terms this may, for example, mean (depending on the location and the specific local coastline conditions):

- *do not, by way of automatic reaction, plan to intervene with any type of engineering works where erosion occurs,*

- *do adopt, instead, a more environmentally sound policy of letting the natural coastal dynamics as much as possible be free, even if this would mean that certain coastal stretches some (temporary or sustained) shoreline erosion occurs,*
- *to prepare for such natural coastline behaviour policy in a framework of operational management, a coherent system of different set-back lines and a dedicated monitoring system must be formulated in the detailed design stage,*
- *in cases where, for urgent and important local reasons, a stretch of shoreline should not be allowed to erode beyond a certain line, the protection intervention should be as natural as possible,*
- *in locations which offer good local opportunities, strive to an improvement and a reinforcement of the natural environmental value (habitat) of the coast, to support biodiversity.*

B. Guidelines, expressed in general terms, for the coastal areas of major tourism concentration:

Protect the coastline and improve the beach and shoreline quality, by applying environmentally sound principles of coastal engineering.

In more concrete, practical terms this may, for example, mean (depending on the location and the specific local requirements):

- *protect existing beach area,*
- *improve the position of the waterline and the beach (e.g. prevent tombolos from getting connected to detached breakwaters),*
- *improve the quality of the beach, where necessary,*
- *improve, adapt, or altogether renovate (parts of) the existing coastal protection and improvement structures (e.g. at the " old " illegal groynes of Limassol),*
- *improve the appearance of the beach (visual aspect, e.g. sea grass),*
- *improve the beach water quality (e.g. to make space for public road width extension on specific locations).*

C. Guidelines, expressed in general terms, for coastal areas where ports, harbours, industry facilities, waste water outfalls, cooling water intakes, fishing shelters, marinas etc. are present or are planned:

Minimize, or eliminate whenever possible, the negative impacts of these structures on the coastline.

In more concrete, practical terms this means for example:

- *limit the number of these structures in the future as much as possible (e.g. combine or concentrate them where feasible on locations and in such lay-out that they cause the least harm to the natural coastal environment),*
- *design (or re-design) these structures in such a way, and provide additional facilities of such a functionality, that their remaining negative impact on the natural conditions is deliberately reduced (e.g. provide and maintain an operational sand by – pass system; incorporate the sea grass problem in the layout and design),*
- *define set-back lines taking into account the effects of future developments on coastal morphology.*

2.3.3 Tools for implementing coastal protection

The tools for implementing the best available techniques for coastal erosion which exist today in Cyprus can be categorized in the following five groups:

- **Environmental Impact Law (2001)**

An important step in the direction for introducing integration in coastal protection actions was the Environmental Impact Law of 2001, through which it is necessary to proceed with an Environmental Impact Study before the construction of any coastal protection work.

- **Funding**

In 2000, the Council of Ministers took a Ministerial Decision arranging the funding co-operation among competent authorities concerning coastal structures. The Decision defines the following percentage of each authority's financial participation in the total cost for the construction of coastal structures:

-
- ✓ If the structures are needed for coastal protection to counteract erosion, then the Government contributes the 50% and the Local Authority the rest 50%
 - ✓ If erosion is not a serious problem and the structures are needed mainly to enable recreational uses of the coast, then the contribution of the Government goes down to 30% and the rest 60% is covered by the Local Authority. The 30% of the Local Authority's contribution can be covered by private funding, from the Hotel owners who are going to benefit from the structures.
- Research and Development

Coastal Unit carries a program of applied research. The Unit runs a very systematic program of monitoring morphological parameters of the coastal zone, since 1993. The data from the field work are stored in the Data Bank of Coastal Unit in the form of EXCEL spreadsheets.

All types of coastal protection structures/methods which are going to be implemented for the first time in Cyprus (eg submerged and low-crested offshore breakwaters, beach nourishment) are first constructed as pilot structures. A monitoring program is applied and carried on by Coastal Unit for at least two years and then, based on real data it is decided whether this type of coastal protection functions well for the local conditions of the island.
 - Education

A number of workshops, seminars, Conferences have been organized in Cyprus in order to inform, educate and raise awareness on aspects dealing with Coastal Zone Management and coastal protection works, focusing on the governmental employees of the Departments involved in the decision making process. This was very helpful, since all these people are aware of the alternatives and of the need for an integrated approach.

The staff of Coastal Unit had dedicated special training in Holland, by the Delft Hydraulics on several aspects dealing with coastal protection and integration, since this is the agency responsible for planning and designing coastal protection works.
 - Awareness raising campaigns

NGO's focused on coastal zone (like CYMEPA and AKTI) organized several awareness raising campaigns for the public. Local Authorities hosted workshops and happenings.
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The effort was and is to give people and the Local Authorities the information on the alternative, environmental friendly coastal protection methods and promote the need for integration. The Environmental Service and Coastal Unit support this effort.

2.4 Decision making

Decision making process is quite complicated, since the authority for coastal zone aspects is very fragmented and lies to several bodies.

2.4.1 Mechanism of decision making

As already mentioned above, all the decisions are taken centrally, by the Government. The authority for issuing permits for coastal protection structures lies on the District Officers of the Ministry of Interior. The responsibility for preparing Master Plans for coastal protection and improvement works lies on the Coastal Unit of the Ministry of Communication and Works, which however has not the power to enforce them. The process is analyzed below.

2.4.2 Process of decision making (administrative process)

There are two different levels of decision making:

- **Decisions concerning changes in legal framework or political aspects on coastal zone:**

These decisions lie under the responsibility of the Council of Ministers. The Council decides upon a proposal by the Minister in charge of the specific matter. If the Decision has to do with a new Law or with the modification of an existing Law, then the Decision goes to the House of Parliament for approval and when approved it is incorporated in the existing legal framework. If the Decision has to do with policy matters then it is directly implemented by the competent authority.

- **Decisions concerning coastal protection works:**

The process for these type of decisions are different, relating to who is the proposing

agent: the government or the private sector.

✓ **Coastal Protection Works proposed by the Government:**

When Coastal Unit (or Consultants employed by Coastal Unit) prepares a study (design) for Coastal Works or Master Plan for the coastal protection of an area, according to the new Environmental Impact law, it is obliged to proceed with an Environmental Impact Study, which has to be carried out by an independent Consultant (or Consulting firm). The Environmental Impact Study is submitted by the Consultant to the Coastal Unit and the Coastal Unit submits it to the Environmental Service. The EIS is examined by the Technical Environmental Committee. The Environmental Consultant is invited to present his study to the Committee at a certain date. A representative of Coastal Unit attends also this presentation and has to be able to answer to questions of the Members of the Committee concerning the study (design). The Technical Environmental Committee approves or not the Environmental Impact Study, or asks for modifications. This decision actually means the approval or not of the actual design of Coastal Unit.

✓ **Coastal Protection Works proposed by private sector:**

The private company has to prepare the design of the proposed coastal structures, together with the Environmental Impact Study by an independent Consultant. The design and the EIS are submitted to the District Officer. The District Officer submits the EIS to the Environmental Service and it is examined by the Technical Environmental Committee, as in the previous case. When the EIS is approved, the District Officer issues the "building permit" according to the Pier Law.

If the proposed coastal protection works are located landwards (eg a revetment for direct protection of a receding coastline) then the design, together with the EIS have to be submitted to the Town Planning Department. The Town Planning Department submits the EIS to the Environmental Service to be examined by the Technical Environment Committee, as described above. If the EIS is approved, the Town Planning Department issues the "Town Planning permit". The study- design of the coastal protection structure, the

“Town Planning permit” and the approved EIS are submitted to the District Officer in order to issue the “Building permit”.

Even if the coastal protection structures are constructed with private funds are not considered private-owned. It is clearly stated in the permits that *they belong to the public and everybody has the right of using them.*

2.4.3 Technical participation

As already mentioned above, technical participation is safeguarded through the Technical Environmental Committee, which is part of the Environmental Impact Assessment Law of 2001. Scientists from different Departments take part in this Committee which examines the EIS.

However, technical participation is limited to this. There are no decision support systems. Coastal Unit has a Data Bank, which however is not organized in a way that could be easily used: it mainly consists of raw data. During the Project “Coastal Zone Management of Cyprus” an effort was launched to define indicators and introduce models and technologies in the decision making process for coastal protection. This effort was never completed, and thus there is not this kind of technical support to the decision making system of coastal protection.

2.4.4 Public participation

The new Environmental Impact Assessment Law of 2001, introduced public hearings as an obligatory step for the EIS. In this way, the public is informed on the planned works and can react. There is not any other official way to safeguard public participation. Mainly through pressure groups.

The participation of representative of the Ecological and Environmental NGO's as permanent member in the Technical Environmental Committee and the National Committee of Coasts is very recent and it is a significant step towards upgrading public participation in the decision

making process.

2.5 Mechanism for conflict resolution

There are a lot of conflicting uses located in the coastal zone: tourism, industry, agriculture, and aquaculture. Strong conflicts also result from policies that are focused on more tourist exploitation of the coastal areas (usually the governmental policies are in this direction) and the more sustainable opinion that the carrying capacity of the island has reach its limits and some coastal areas have to be protected (usually supported by Environmental NGOs). Conflicts also result from Government's decision to proceed with "hard" coastal structures for coastal protection from erosion and the opposition to this which usually comes from environmental NGOs and pressure groups of locals.

There is not an official mechanism for conflict resolution. If the conflict is very "loud" and the Mass Media are involved then the whole resolution process sometimes is led to the House of Parliament. Justice is the usual way for conflict resolution, however this process is taking too long (usually more than 3 years) so it loses its credibility and effectiveness.

Governmental Committees are formed sometimes for specific problems in order to discuss the conflict and try to find a solution of mutual agreement.

3. PHYSICAL DESCRIPTION OF THE COAST (PHYSICAL LEVEL)

3.1 Geology and Coast classification

Coastal area Dolos – Kiti has south/ south-eastward orientation. It stretches over some 36km between Cape Dolos in the west and Cape Kiti in the east. The coast is generally relatively low and flat, largely consisting of the elevated marine sedimentary terraces or “raised beaches” containing sand and gravel deposits.

3.2 Morphology of the coast

3.2.1 Topography and Bathymetry

Topography

Near the coast there is mainly gently sloping agricultural land, mostly extending right towards the edge of the land which in many cases exhibits a cliffy, eroding appearance of rather soft material, several meters high, lined with a narrow beach of mainly gravel and some sand.

Bathymetry

The bathymetry shows a gentle slope from the coastline to approximately the 20 m depth contour. The distance between the coastline and the 20 m depth contour is approximately 1600 m indicating a fairly gentle overall slope steepness of approximately 1:80. Just deeper than 20 m a steeper drop occurs to a depth over 500 m.

3.2.2 Sediment characteristics

The information of this chapter is based on data included in the Phase II Report of the Study “Coastal Zone Management for Cyprus”. The data resulted from the field work carried out by the Geological Survey Department of Cyprus, Dr E. Morriseau (1994).

The coastal area which is often rocky, is characterized by accumulations of pebble and

gravels with few tiny and poor sandy beaches. The material accumulated at these beaches originates either from nearby rocks or from the inland bedrock (igneous-extrusives and sedimentary). The elevated marine terraces are composed of conglomerate with well rounded pebbles, mostly of igneous origin.

Five main rivers which originate in the easternmost part of the Troodos Massif and which cut mainly through the extrusives/lavas (with the exception of the Vasilikos river which originates in the Limassol Forest), are reaching these shores. These rivers introduce sediments to the beaches with high percentages of pebbles of igneous origin.

Sediment samples

Four sediment samples were selected and analyzed from this coastal area (Morriseau, 1994), covering the whole stretch of the 36 km. The samples studied have a characteristic grey colour while the shape of the pebbles and grains range from well rounded to subangular.

About 50 % of the grains studied under the microscope were identified as igneous rocks and 10 % as sedimentary rocks. Bioclastics were also observed (less than 5 %). The weathering resistant minerals are mainly pyroxene, quartz, jasper, chalcedony, plagioclase and some magnetite, representing 35 % of the sample.

Description of gravel

As expected, the igneous rocks represent the main component of the beach gravels with their percentage ranging from 50 to 79 %. The main rock types represented on the beach are diabase, lava (basalt), plagiogranite and gabbro. The sedimentary rocks, mainly chalk, silicified chalk and chert represent up to 20 % of the beach material.

3.3 Transport agents

The waves are the major transport agent of the coastal sediment. There are no high tidal variations in the island and the nearshore currents are wave induced.

3.3.1 Wind regime

Annex 1 includes the tables of Wind data as they are recorded at Larnaka airport.

3.3.2 Wave climate

The Report "Nearshore wave climate of Cyprus" (Public Works Department, X.I. Loizidou, Nicosia 1994) provides with wave climate data all around Cyprus. The data come from ship observations in open sea around Cyprus from the Data Bank of the Dutch KNMI. The open sea data have been analysed in the Report "Nearshore wave climate of Cyprus" and transfer to the water depth of -20,0 m. for different points around Cyprus.

The Coastal Area Dolos - Kiti is exposed to waves between east and south-west. In all other directions the fetches are limited by the coast of Cyprus. The most frequent waves are observed from southwesterly directions. However, the figures show that during winter eastern waves occur more frequently. The highest waves come from the south-south-west. The total frequency of occurrence of all wave directions for the area of Zygi is slightly larger than for the area of Pervolia. Most probably this is caused by the more sheltered location of Pervolia for waves from the west.

The tables with the probability of wave occurrence during summer, winter and all year are included in Annex 2.

3.3.3 Tidal regime

There are not sufficient data/ measurement on tidal regime around Cyprus. Due to the deep sea waters around Cyprus it is expected that tidal fluctuations should be rather small. However there coastal areas with very mild slopes, especially the south part of the island where the pilot area Dolos – Kiti is located. In these coastal areas the knowledge of tidal fluctuations would provide with important information for the assessment of the exact position of the coastline.

According to the British Admiralty tide tables (1988) astronomical tides around Cyprus are of

small scale. Tidal fluctuation are not over 0,5 m, according to those tables.

From November 1984 to December 1985 the Delft Hydraulics carried out tidal measurement at Limassol Harbour. The average tidal fluctuations in the Harbour are in the order of $\pm 0,3$ m. The tidal regime of Limassol Harbort can be applied more or less for the pilot area Dolos – Kiti since it is located relatively close to the Harbour.

3.3.4 Nearshore currents

As already mentioned, nearshore currents are wave induced. Tidal variations are quite limited.

3.4 Sea level rise

There are no available data on this subject in Cyprus. No field work or even estimations based on historical data are available. The only available information comes from the reports of IPCC, which include the area of Eastern Mediterranean, and Cyprus, in the different scenarios of Sea Level Rise.

3.5 Sediment transport

3.5.1 Data of inputs and output of sediment

Sediment Inputs

- **River sediment**

The major sediment input in this are comes from the rivers. Five medium size rivers debouche into the sea, from west to east the Vasilikos, the Potamos tou Ayiou Mina or Maroni, the Pendashkinos (dammed), the Pouzis, and the Tremithos (dammed). In Cyprus there is no continuous flow of the rivers through-out the year. Rivers have water flow only during the rain period (from November to March) and the rest of the year they are dry. These rivers have an annual water flux as indicated in table 1. Their responding sediment flux was also estimated from different scientists based on different assumption. All the estimations are included in table 1.

- Rain runoff

This is a source of sediment not so important as river sediments, however important enough for the specific area. As it has been mentioned already, the coastal area is mainly agricultural area. In Cyprus the rain comes mainly in very strong showers which last for 15 minutes or half hour. During rainfall there is a significant sediment transport in the sea together with rain runoff.

Sediment outputs

Two are the main sediment outputs in this coastal area:

- River damming
- Sand and gravel mining

- River damming

The two major rivers, Pentashinos and Tremithos have been dammed. It is estimated that this two dams cut-off approximately 87000 m³ per year of riverborne sediment which otherwise would debouch to the coastal system. It is important to mention in addition to dam sediment cut-off, that the water flux of the rest rivers has been dramatically reduced the last 20 years due to over pumping for agricultural uses. Thus, sediment flux has also been reduced. There is not estimation about this reduction, however it should be considered even qualitatively in the sediment budget.

- Sand and gravel mining in the coastal area

Sand and gravel mining was permitted in coastal areas since early 70s, when it was prohibited by Law. The area was one of the coastal areas more mined, since the quality of the coastal material (gravel and sand) was considered suitable for construction purposes (after washing). There are not official data for the quantities that have been mined in the area from Dolos to Kiti. Estimations according to data from the Mines Service of Cyprus give the figure of 300,000 m³ within the period of 25 years, from 1955 to 1970. However, during those years there was also illegal mining in the area, the quantities of which could not be estimated. Illegal mining in the area continued long after the prohibition of 1970. The quantities should be rather much larger than that. It is maybe the most important reason which caused beach

erosion in this coastal area.

3.5.2 Direction and taxes of transport

At many locations, especially near small headlands and groynes, during inspection in the summer there were clear signs of an eastward littoral drift.

According to the computations which have been included in the report "Coastal Zone Management for Cyprus" by Delft Hydraulics *the net potential longshore transport along the coast at Zygi is in eastward direction at a rate 22.000 m³/yr. The gross transport rate in eastward direction is considerably higher, indicating also the relatively significant importance of waves from east to southeastern directions for the longshore transport process. During winter eastern waves occur more frequently and thus the transport direction is expected to be temporarily reversed.* The computations have been carried out using the software of Delft Hydraulics UNIBETS-LT.

3.6 Sedimentary Budget

3.6.1 Coastline variation

The coast is generally relatively low and flat, largely consisting of the elevated marine sedimentary terraces or "raised beaches" containing sand and gravel deposits. The coastline forms a continuous chain of four, each 5 to 10 km long, shallow bights separate by slightly protruding points which are either rocky headlands or gravel deltas. The bights are shown in map 2 and their description is as follows:

- I. *Governors Bay: 7 km coastline length. From cape Dolos (west) to cape Vasilikon (east)*
- II. *Cape Vassilikon (west) to point Pentashinos (east): coastline length 8 km*
- III. *Point Pentashinos (west) to point Petounda (east): coastline length 8 km*
- IV. *Pervolia Bay: coastline length 13 km. From point Petounda (west) to cape Kiti (east)*

I. Governors Bay

Governors Bay is characterized by high rocky cliffs and narrow sandy beaches at the base of the cliffs. The coastal cliffs are high (up to 8 meters), white colour, with almost vertical slope and there are often shallow caves. There is a narrow sandy beach of 2 to 3 meters width along the base of the cliffs. The width of the beach has seasonal variations.

At the west part of Governors Bay, the cliffs are not so high and the width of the sandy beach is larger (up to 10 meters). This is a popular area for swimming.

The coastline in Governors Bay is stable, with no indications of recent coastal erosion.

II. Cape Vassilikon to point Pentashinos

The coastal topography in this area varies from west to east.

In the west part, the coast is mainly low and flat, largely consisting of the elevated marine sedimentary terraces containing sand and gravel deposits, which are under severe and active erosion. The main characteristic of this part of the coast are the gravel deposits at the base of the coastal cliff, forming narrow gravel beaches. At the centre of this area, the beach has receded about 20 m the last 20 years.

In the east part, the coast becomes partly rocky, with high rocky cliffs (up to 4 meters high) and partly consists of eroding sedimentary cliffs which suffer from erosion. The delta of Pentashinos river forms a part of this coast. The alluvium coastal deposits of the delta are receding with high rates. It was estimated that there was a recession of 10 meters in this part of the beach from 1993 to 2000. The gravel deposits at the base of the eroding cliffs characterise this coastal area too (as previously). The gravel beach in this area has a width of up to 5 meters (with seasonal variations) and has a mild slope from the base of the cliffs up to the depth of -0,5 meters. From this depth and on, the sea bed becomes sandy.

III. Point Pentashinos to point Petounda

The morphology of this coastal area varies significantly:

Along the first 2 km (west), this coastal area is mild with sedimentary eroding cliffs with the same characteristics as the east part of the previous coastal area (gravel beaches at the base of the eroding cliffs)

By the end of the 2 km, the coast becomes rocky for 1,5 km eastwards, with high rocky cliffs (up to 7 meters height), characterised by steep, almost vertical slopes. At the base of the cliffs there is gravel deposit forming gravel beach of 5 to 10 meters width (with seasonal variations).

The coast becomes again low and flat for the next 3 km eastwards. The coastal sedimentary cliffs are eroding and the gravel deposits at the base of the cliffs form gravel beaches which reach with mild slopes the -1,0 meter water depth. The sea bed becomes sandy in deeper water.

Approaching Petounda point, the coast becomes rocky for the last 2 km eastwards. The high rocky cliffs (up to 5 meters height) have steep slopes and the gravel deposits appear again at their base, forming gravel beach all along the 2 rocky km.

IV. Pervolia Bay

This coastal area is low and flat all along its length. The main characteristics of the area are the low, eroding sedimentary cliffs and the gravel beaches. Erosion rates are severe along the coast. A particular characteristic of this area is a submerge sandy berm of appr. 0.3 meters height, which is located in a distance of approximately 10 meters from the coastline (seawards). This berm runs all along the bay of Pervolia and it is quite stable, no matter the wave conditions.

While approaching cape Kiti, the coast becomes rocky for the last 200 meters. The rocky cliffs are high and steep (up to 10 meters). At the base of these cliffs there is sand deposition, forming a sandy beach of varying width of up to 20 meters width, all around cape Kiti. The sea bed is covered completely by rocks.

3.6.2 Erosion rates and trends

According to the comparison of shoreline positions 1920-1970 as reported in the phase 1 Report Coastal Zone Management for Cyprus (Delft Hydraulics, 1993), the coastal area of Dolos - Kiti showed the most severe coastline recession of entire free Cyprus: a total coast length of 6,25 Km has receded 25 m or more, in other words receded with a mean rate of more than 0,5 m per year. It is emphasized that no information is available about the time history of this coastal recession. In other places some accretion partly balanced this retreat.

Coastal Unit made a comparison between the coastline position as indicated in the topographical maps of 1977 and the series of bathymetric monitoring results of the coastal profiles of 1993, which had been carried out by the Coastal Unit. This comparison involved the coastline position in 54 coastal profiles which are equally distributed over the entire Coastal Area of Dolos-Kiti. Of these 54 profiles, 13 showed accretion, 23 showed erosion, and 18 showed no difference at all. The largest accretion 17 m, occurred updrift of a groyne (illegally constructed) just east of Pendashkinos river outlet. The largest erosion, 23 m, occurred on a gravel beach near Perivolia, just west of Cape Kiti.

This work shows a possible slowing down of the rate of recession. Coastal Unit has systematically measured coastal profiles every year since 1993, so the field data for the last 9 years are available. However there was not any work on this direction since 1993, so it is not possible to be sure on the trends of erosion in the area, ie if coastal erosion has been retarded the last years, if the coast has reached or is in the process of reaching equilibrium or if erosion continues.

4. SOCIO-ECONOMICAL DESCRIPTION OF THE COAST (SOCIO-ECO LEVEL)

4.1 Demographic description

4.1.1 Resident population

The coastal area from Dolos to Kiti is under the administration of the District Officer of Larnaca. The coastal land is under the authority of 10 villages. All these villages, with the exception of Zygi, are located inland, some kilometres (2 to 5 km) away from the coast. However their administration authority reaches the coastline.

According to the demographic survey of 1992, the 10 coastal villages of Dolos- Kiti pilot site have a total population of 7823 (3902 Men and 3921 Women). According to the demographic survey of 2001, which is the most recent available in Cyprus, the population of the 10 village has risen to 9173 inhabitants, ie an average increase of 17% (from 1992 to 2001).

Table IV-1 presents the population data from the two demographic surveys with the distribution per village⁴. The last column of the table IV-1 presents the percentage of change from 1992 to 2001. The villages are in order, going from west to east.

⁴ There are not available data for Men/Women from the 2001 demographic survey.

Table IV-1: POPULATION DATA FOR THE VILLAGES OF DOLOS - KITI PILOT SITE

A/A	Name of village	population (1992)			population (2001)	% change from 1992 to 2001
		Total	Men	Women	Total*	
1	Mari	236	127	109	177	-25%
2	Zygi	435	226	209	504	16%
3	Maroni	424	206	218	520	23%
4	Psematismenos	146	69	77	176	21%
5	Ag. Theodoros	577	296	281	597	3%
6	Alaminos	261	132	129	280	7%
7	Mazotos	665	333	332	784	18%
8	Pervolia	1507	755	752	1798	19%
9	Kiti	2621	1281	1340	3141	20%
10	Meneou	951	477	474	1196	26%
TOTAL		7823	3902	3921	9173	17%
						weighted average change

* Data for Men/Women are not still available from the 2001 demographic survey

The following comments result from the table IV-1 concerning the historical evolution of population density in the 10 villages of the pilot site:

- The density of the population in this area, with a total length of 36 km and a width of appr. 5 km, is very low. The villages at the east part of the coastal site (ie villages with numbers 7 to 10) are the ones which concentrate the larger amount of population:
 - ✓ 5744 inhabitants in 1992, i.e. the 74% of the population
 - ✓ 6919 inhabitants in 2001, i.e. the 75% of the population

The main reason for this behaviour could be that these villages are located in a relatively short distance to the town of Larnaca, which is the administration centre of the area and thus people have an easy access to the town. This is becoming more and more important, since agriculture, which used to be the main activity of the area, is declining and people shift to tertiary sector of employment. These new employment opportunities are concentrated in Larnaca.

- Although there was an increase in the population of the 9 villages, in Mari, the western village, there was a decrease of 25%. Mari used to be a Turkish Cypriot village before the invasion of 1974. After 1974, during the population exchange, the Turkish Cypriots were transferred to the northern part of Cyprus and the village was inhabited by Greek Cypriot refugees. As the years pass and the economic status of the refugees improves, the children of the refugees and the refugees themselves, are leaving the village to go to other areas where they can buy land and build their own house. This is the main reason for this decrease of population.

4.1.2 Total employment/ unemployment

The data of the demographic survey of 1992 are used in this paragraph, which are the most recent available. This kind of data is not yet available/ published from the Statistical Service concerning the demographic survey of 2001. The only available results from this survey are the total number of population per town and village which have been included in table IV-1.

Generally in Cyprus, unemployment is very low. According to 1998 data (Statistical Service of Cyprus) the unemployment rate was 3,3% (2,8% males and 4,2% females) and it concentrates by 70% to people which graduated General Secondary School (43%) and University graduates (20%).

According to the demographic survey of 1992, the employment in the 10 villages of the pilot site reaches a total of 37% of the total population. The results concerning employment are presented in table IV-2. Gender distribution is included. The sectors of occupation are presented in table IV-3.

The 50% of the Male population is employed, while the relevant number for Female population is only 23%. The women in the villages are usually housewives, and also help their husbands in the agricultural activities. So, although they are not considered as unemployed they are not included in the employment tables.

Table IV-2: Employment data according to gender (1992 demographic survey)												
A/A	Name of village	Population (1992)			employment (1992)							
		Total	Men	Women	Total	% of total population	Men	% of total population	% of male population	Women	% of total population	% of female population
1	Mari	236	127	109	88	37%	71	30%	56%	17	7%	16%
2	Zygi	435	226	209	156	36%	118	27%	52%	38	9%	18%
3	Maroni	424	206	218	152	36%	102	24%	50%	50	12%	23%
4	Psematismenos	146	69	77	35	24%	29	20%	42%	6	4%	8%
5	Ag. Theodoros	577	296	281	187	32%	147	25%	50%	40	7%	14%
6	Alaminos	261	132	129	92	35%	65	25%	49%	27	10%	21%
7	Mazotos	665	333	332	231	35%	163	25%	49%	68	10%	20%
8	Pervolia	1507	755	752	517	34%	368	24%	49%	149	10%	20%
9	Kiti	2621	1281	1340	1055	40%	665	25%	52%	390	15%	29%
10	Meneou	951	477	474	364	38%	251	26%	53%	113	12%	24%
	TOTAL	7823	3902	3921	2877	37%	1979	25%	51%	898	11%	23%
						<i>weighted average</i>		<i>weighted average</i>	<i>weighted average</i>		<i>weighted average</i>	<i>weighted average</i>

4.1.3 Sectorial population description (primary, secondary, tertiary)

The distribution between the main economic activities is presented in table IV-3. Summarising, the percentage of employment in each one of the sectors of employment is as follows:

- Agriculture: 551 persons, 19%
- Fishing: 18 persons, 1%
- Quarrying/ mining: 6 persons, 0,5%
- Manufacturing: 663 persons, 23%
- Electricity/gas/water: 26 persons, 1,5%
- Construction: 409 persons, 15%
- Wholesale/ retail trade: 348 persons, 12%
- Hotel/ restaurants: 236 persons, 8%
- Public Administration: 112 persons, 4%
- Real Estates: 47 persons, 1,8%
- Education: 43 persons, 1,5%
- Other: 114 persons, 4%

The distribution according to sector is as follows:

- ✓ Primary sector: (Agriculture, fishing, quarrying/mining)
 - 551 persons - 20,5%
- ✓ Secondary sector: (Manufacturing, Electricity/gas/water, construction)
 - 1098 persons – 39,5%
- ✓ Tertiary sector: the rest
 - 1649 persons – 57,35% (10% in Hotel/restaurants and real estates)

4.2. Human Activities

4.2.1 Principal sectorial activities in the coastal zone

Table IV-3 presents the distribution of employment according to sector for each of the 10 villages.

Comments on the data of table IV-3

- The low percentage of people dealing with fishing is something which has to be commented, knowing that the villages of Zygi, Mari and some of the others are fishing centres. According to the official data of Table IV-3 only 1% of the active population in the pilot site is dealing with fishing. However, reality is slightly different. According to the Fisheries Department's categorisation, there are two status for fishermen: the "professionals" and the "amateurs". "Amateurs" are fishermen who have another source of income except from fishing. However, these people fish regularly and most of them, in reality, have fishing as their main source of income. So, the percentage of active population dealing with fishing should be larger.
- Military/ Defence is included in "public administration" sector
- The data of table IV-3 refer to 1992. A rapid tourist development took place in the area the last 10 years. Recently, as it is presented in paragraph 3, the use of the coastal areas was shifted from agricultural to tourist. Consequently, it must be expected that:
 - Employment in tourist related activities (tertiary sector) is expected to have grown significantly.
 - Real Estate is also a rapidly expanding economic activity in the area.
 - Aquaculture is a new activity which has been developed in the area since 1995 and is not included in the sectors of table IV-3

The above observations would have been confirmed if the data of the 2001 demographic survey were available. However, they are not yet available.

Table IV-3: Sectorial activities (1992 demographic survey)

A/A	Name of village	Total working population	Agriculture and Forestry	Fishing	mining & quarining	manufacturing	electricity/gas/water	construction	Wholesale	hotels/ restaurants	real estate	transport	financial intermediation	public administration	education	health/ social workers	others
1	Mari	88	24	1	1	24	0	16	4	7	0	9	0	0	2	0	0
2	Zygi	156	31	10	2	30	0	13	16	22	1	9	2	10	2	2	6
3	Maroni	152	116	1	0	9	0	2	9	3	2	2	4	1	1	0	2
4	Psematismenos	35	14	0	0	3	0	3	7	0	0	2	0	2	0	0	4
5	Ag. Theodoros	187	76	0	2	50	1	19	11	6	0	10	2	3	3	1	3
6	Alaminos	92	30	0	0	15	0	5	10	7	5	14	2	2	0	0	2
7	Mazotos	231	58	0	0	42	0	42	23	11	8	14	6	11	4	0	12
8	Pervolia	517	39	5	0	122	5	123	68	59	3	34	6	22	7	2	22
9	Kiti	1055	130	0	1	267	19	132	157	95	18	80	26	47	16	19	48
10	Meneou	364	33	1	0	101	1	54	43	26	14	41	7	14	8	6	15
	TOTAL	2877	551	18	6	663	26	409	348	236	51	215	55	112	43	30	114
	%		19%	1%	0%	23%	1%	14%	12%	8%	2%	7%	2%	4%	1%	1%	4%

4.2.2 Sectorial conflicts with coastal management and pressures on environment

The main conflicts and incompatibilities between economical sectors located in the coastal zone of the pilot site are as follows:

- **Land uses: Agriculture – Tourism**

The area used to be an agricultural area. Since 1996 the zoning of the coastal land has changed (see paragraph 3.2 below) and a significant part of the agricultural coastal land has been transformed into tourist zone, but not all. There are still large parts of coastal land characterised as agricultural. A major conflict is among the owners of the land which remained agricultural and the Town Planning Department (the Governmental Department responsible for zoning definition). These people protest, because their land has much lower selling value than the one of their neighbours, whom the selling value of their land jumped to heights since it was included in tourism zone. The pilot site is one of the very few coastal areas of Cyprus, without massive tourist development. And this mainly occurred until now due to the fact that the building coefficients were very low, since all coastal land was in the agriculture zone. So, the market is high for the lands which become tourist now. Real Estate agents and Developers are investing high budget to buy newly defined tourist land in the area.

- **Agriculture – Tourism**

Conflicts occur in the areas that these two uses exist together, in neighbouring lands. Tourists are annoyed from the agriculture activities, ie noise from early morning cultivation, air pollution from the pesticides the farmers are using etc. etc.

- **Tourism activities, amenity uses – industry** (cement factory and electric power plant)

The area of Vassilikon (west part of the pilot site) is a completely industrial area: Cement Factory, Agricultural pesticides factory, Power Plant (the biggest in the island) and other smaller industries. This area can not be used for amenity reasons. The first protests have started five years ago, when the residents of the nearby villages protested for air pollution which *harms their health and the health of the visitors of the area, and affects the tourism activities*. The Industries took some environmental friendly measures (e.g. filters, introduction of energy saving technologies etc). However, this conflict is

expected to become more serious while the surrounding areas become more and more tourist.

- **Fishery – aquaculture**

At 1995 the Fisheries Department gave permits at the west part of the pilot site (near Dolos cape) for the installation of Open Sea Aquaculture Farms (with size less than 500 tonnes of fish). Fishermen are claiming that all the fish is concentrated around the fish-cages⁵, a fact which affects their work, since they can not put their nets around the fish-cages.

- **aquaculture – amenity uses of the coast**

Aquaculture is accused to cause pollution to the coast. However, the specific open sea aquacultures are located about 0,5 km from the coast in deep waters. Fisheries Department has launched a systematic monitoring programme for sea water quality around fish-cages and the possible effects at the nearby coasts. Until now, nothing worrying was reported.

4.3. Land uses in coastal zone

4.3.1 Uses description

Development control in Cyprus is exercised by the Government (Central Government) through the *Town Planning Law*. The Law itself aims in concentrating development within areas/ zones with specific development rules, within the framework of specific development policy.

This policy is expressed through two tools: the *Town Plans*, one for each urban area of the island, and the *Policy Statement for rural areas*, which is defining development policies and rules for the non-urban (rural) areas of the island. These two tools consists of Zoning Maps together with reports for the concept of the zoning definition of each area. Both the Town Plans and the Policy Statement for rural areas, are re-defined every 5 years, through a

⁵ Sea around Cyprus is oligotrophic, so fish find easy access to food around the fish-cages.

process with Committees with the participation of local communities and NGO's in the decision taking.

Development in the pilot site is defined by the *Policy Statement for rural areas*. The 36 km of the coast are covered by 11 Zoning Maps, which are included in annex 1 of this chapter. The last change of the zones in the area took place in 1999, where a large part of agricultural land was characterised as tourist. Land uses, construction coefficients and height of construction are defined in the Zoning Maps as follows:

- After the new definition of Zones of 1999, almost all the coast along the 36 km is a tourist zone. Tourist zones are characterised by the letter "T" or "Ta" (T1, T2, T3, T4, T5) and the construction coefficient varies depending on the type of tourist zone and the kind of development:
 - ✓ For Hotels, construction coefficient varies from 30% to 50%
 - ✓ For Hotel Apartments, Tourist Villas and Tourist Villages, construction coefficient varies 20% to 45%
 - ✓ For Housing (private own, for housing reasons, not for development) the construction coefficient varies from 15% to 30%
- Touristic Zones cover the 75% (in length) of the 36 km coastal pilot site of Dolos - Kiti.

The coastal tourist zone is interrupted in the following areas:

- In Vasilikon area (at the west part, near cape Dolos), where the zone is Industrial.
- West of Zygi village, for a coast length of 500 m the zone is agricultural (type of zone "Γ3", construction coefficient 10%)
- In Maroni, for a coast length of 1100 m the zone is becoming "Protection Zone" (type of zone Z3, construction coefficient 1%)
- In Agios Teodoros area, for a coast length of 7 km the zone is becoming agricultural (type of zone "Γ3", construction coefficient 10%). This zone is very narrow with a width of only 60 m from the coastline. Most of these 60 metres have been eroded, so this zone is almost non-existing. Landwards of this narrow agricultural strip, the

development zone is becoming again tourist (type T) along the 6 km (out of the 7 km of this part), while only 1 km is remaining agricultural zone and landwards, part of it is characterised as Protection Zone (type Z).

- From Petounda Point and 2 km west, the coastal area is agricultural (type of zone "Γ3", construction coefficient 10%)
- In Pervolia Bay, tourist zone "T" is interrupted in four areas with Protection Zones (Z1, with construction coefficient 6% and Z3 with construction coefficient 1%). Protection Zones cover a total coast length of 1900 metres in Pervolia Bay.
- Cape Kiti (at a coast length of 300 meters west and east of the cape) the coast is in Protection Zone Z3 (construction coefficient 1%)

Infrastructure (coastal)

- Vassilikon Power Plant

A water intake has been constructed in front of the Vassilikon Power Plant, for the cooling system of the plant (photo IV-1, map IV-1)

- Harbour

The harbour of Vassilikon (photo IV-2, map IV-1) is the only harbour in the entire area. It is a commercial harbour constructed by the Cement Factory. Just west of the harbour, there is a fishing shelter in a very primitive stage (photo IV-2).

- Small marina

A small marina has been constructed recently (work still on going) by a developer who is going to construct a tourist village on the coastal area of Alaminos (photo IV-3, map IV-2). The fishermen of the area are going to be allowed to use a part of the marina as fishing shelter.

- Coastal defence works

- ✓ Groynes

From Zygi to Pervolia, ie all along the coast of the pilot site, there are illegally constructed groynes (photo IV-4). The groynes have been constructed by the owners of the coastal land in order to protect their

properties from coastal erosion

✓ Revetments

Revetments with natural rock can also be found all along the coast (photo IV-5). The revetments are also illegal and have been constructed by the owners of the coastal land to protect the eroding coastal cliff and thus their properties from the advancing coastal erosion

✓ Offshore breakwaters

There are 4 offshore breakwaters at Alaminos area constructed in 1999-2000 by the same developer who also constructed the small marina. The breakwaters have been legally constructed.

4.3.2 Land use maps

All the 11 Zoning Maps of the Town Planning Department are included in annex 1 of this chapter. Each map defines in detail each zone, its characteristics and its boundaries.

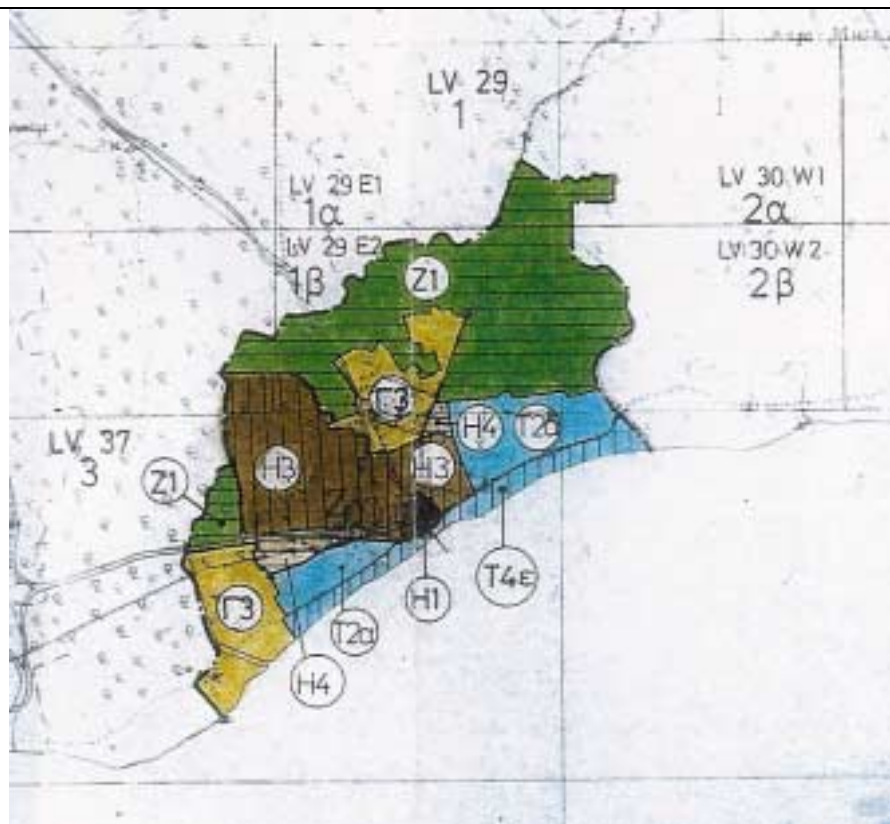
INDEX

- Zone "T" or "Ta" (T1, T2, T3, T4, T5), zone of tourist development, zones H, zone for domestic development, zones "Π" zones of "holiday development": the construction coefficient varies depending on the type of development in the above three development zones:
 - ✓ For Hotels, construction coefficient varies from 30% to 50%
 - ✓ For Hotel Apartments, Tourist Villas and Tourist Villages, construction coefficient varies 20% to 45%
 - ✓ For Housing and Holiday House (private own, for housing reasons, not for development) the construction coefficient varies from 15% to 30%
- Zone "Γ" (Γ1, Γ2, Γ3): agricultural zones, construction coefficient 10%
- Zone "Z" (Z1, Z2, Z3): "Protection Zone" (type of zone Z1: construction coefficient 6%, Z3: construction coefficient 1%)
- Zone Δ : forest areas, construction coefficient 1%



General map of the area. Land use maps location

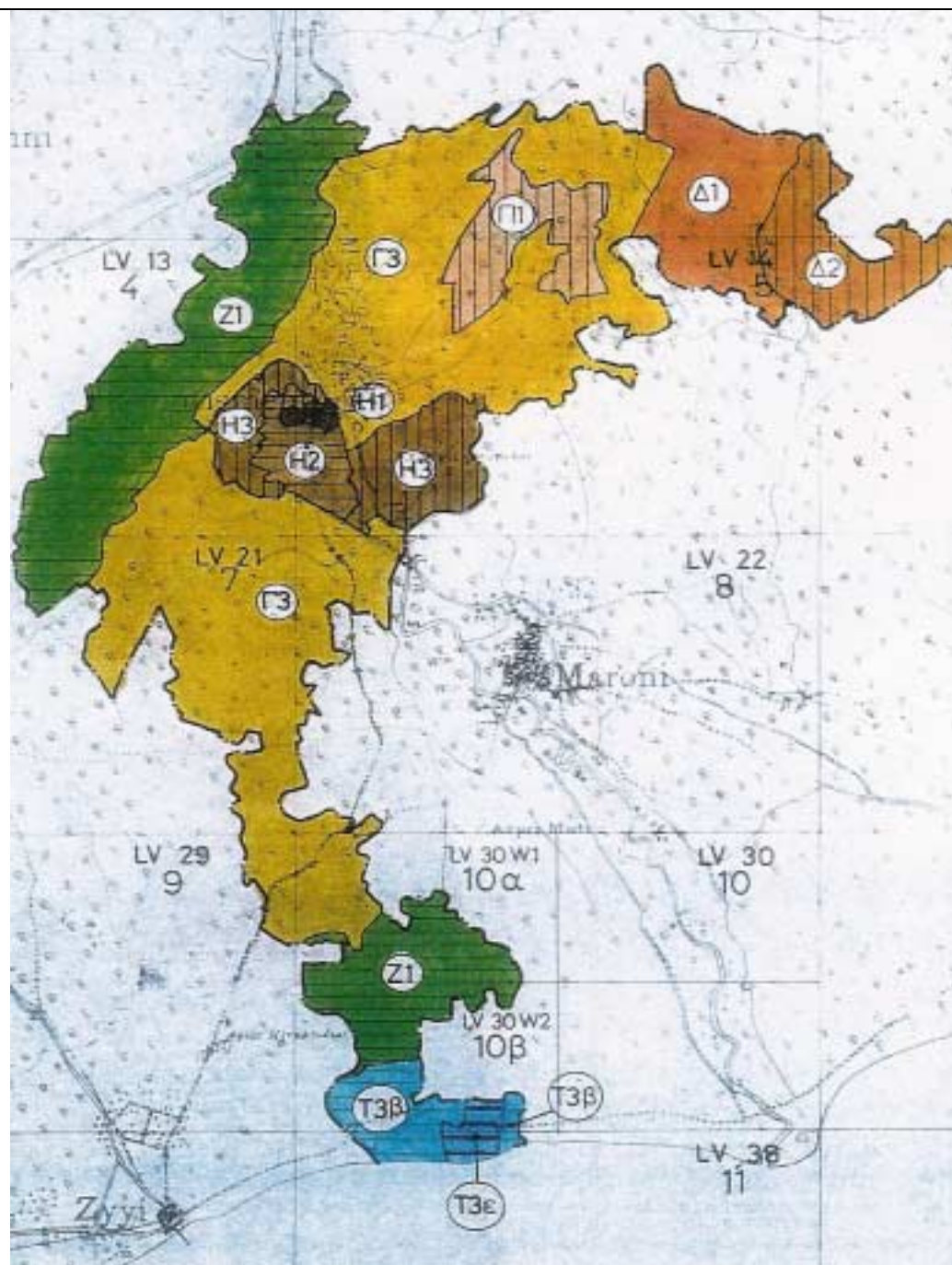
Zygi Land
use map



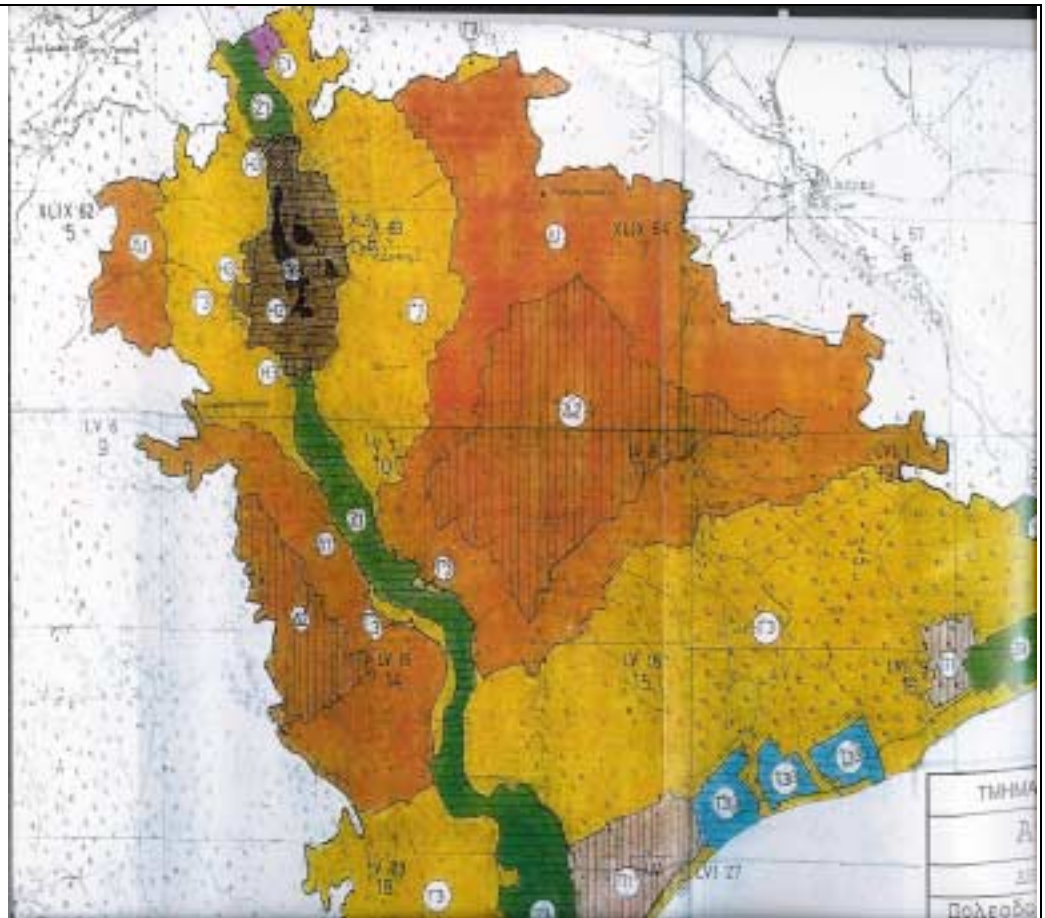
The map displays the Parnassos region with various land use zones and their corresponding codes. The zones are color-coded and labeled with codes in circles or boxes. The codes include:

- Δ1 (Orange)
- Δ2 (Orange)
- Γ1 (Brown)
- Γ2 (Brown)
- Γ3 (Yellow)
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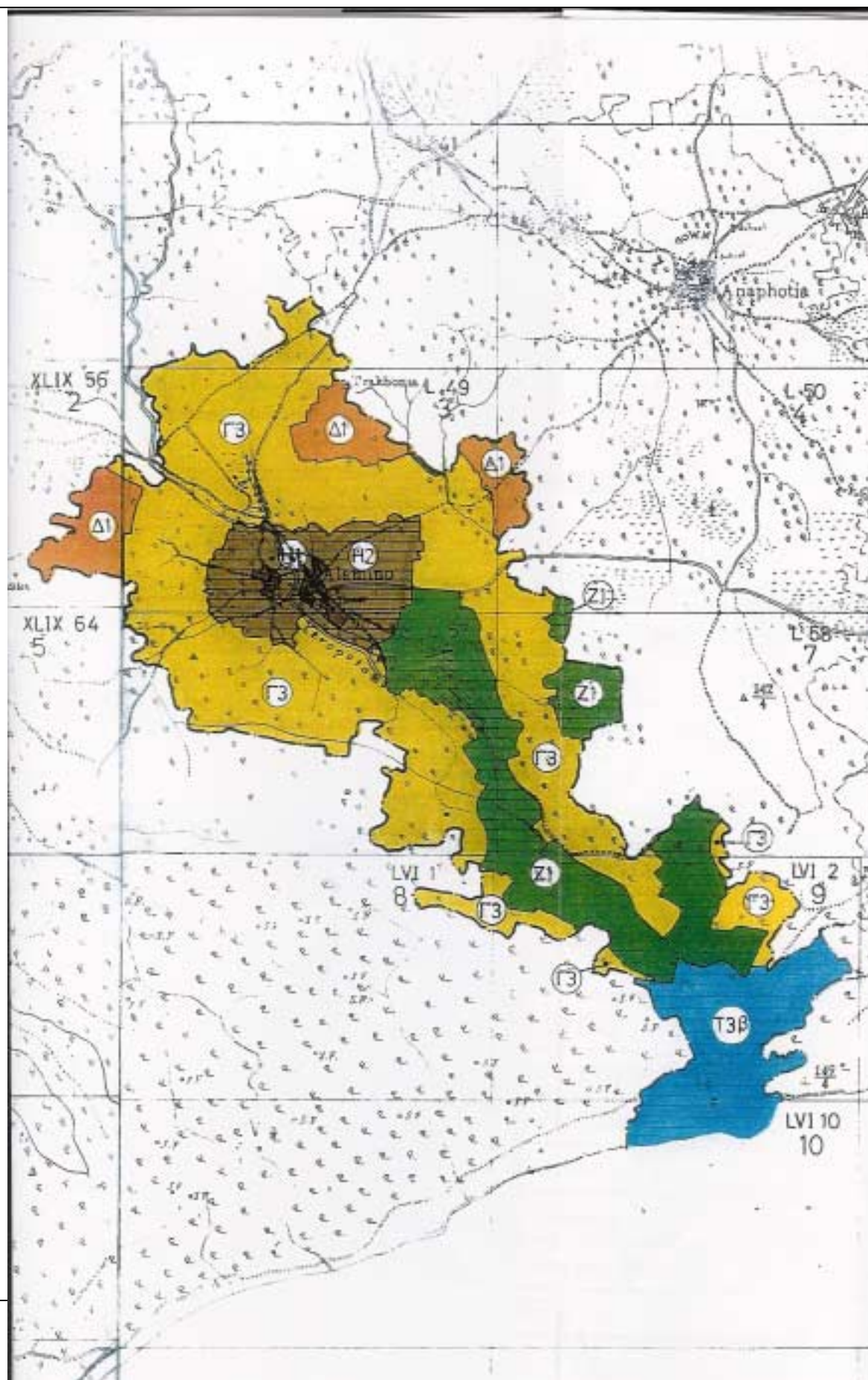
Psematismenos
Land use map



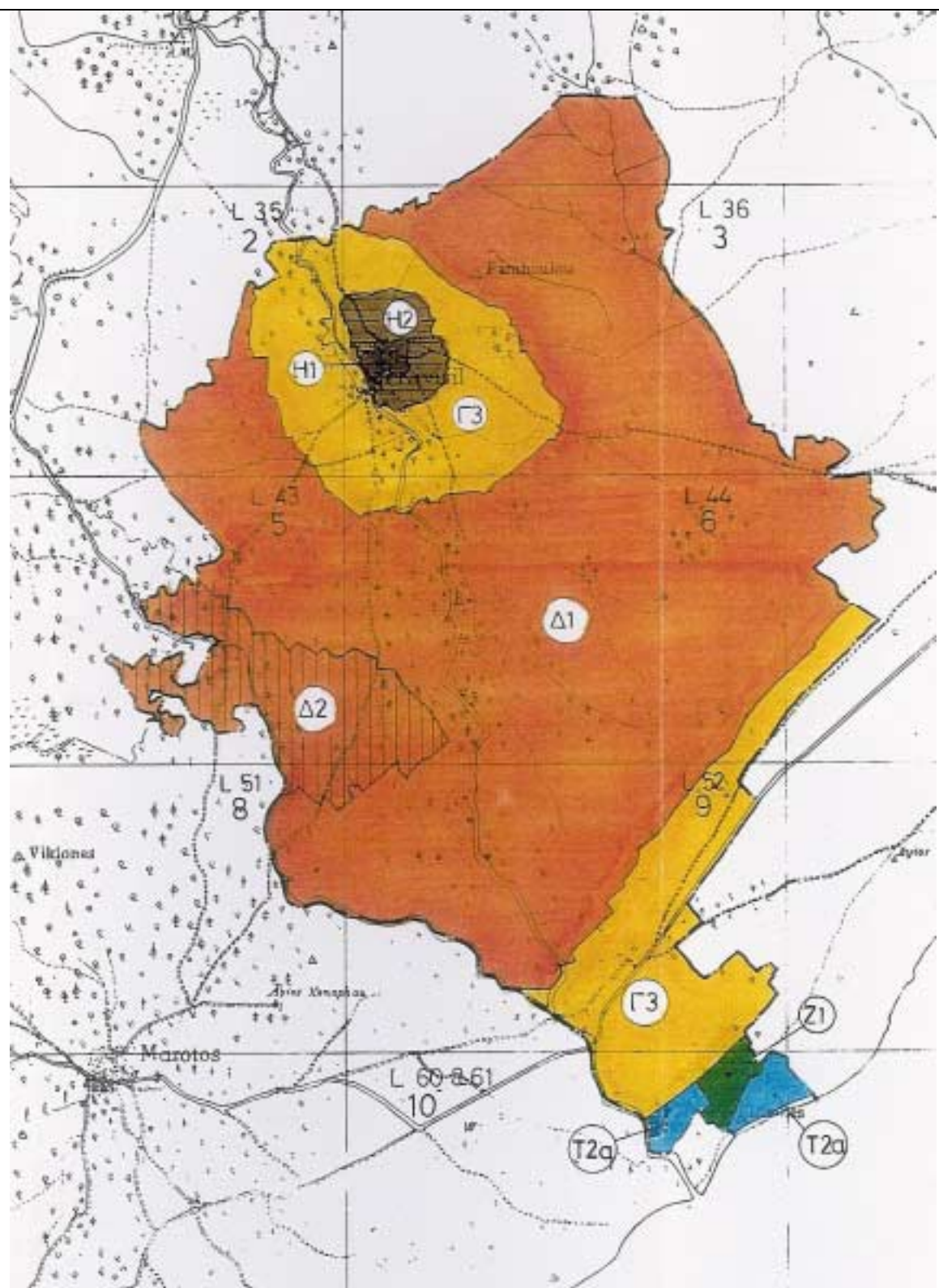
Agios Theodoros
land use map



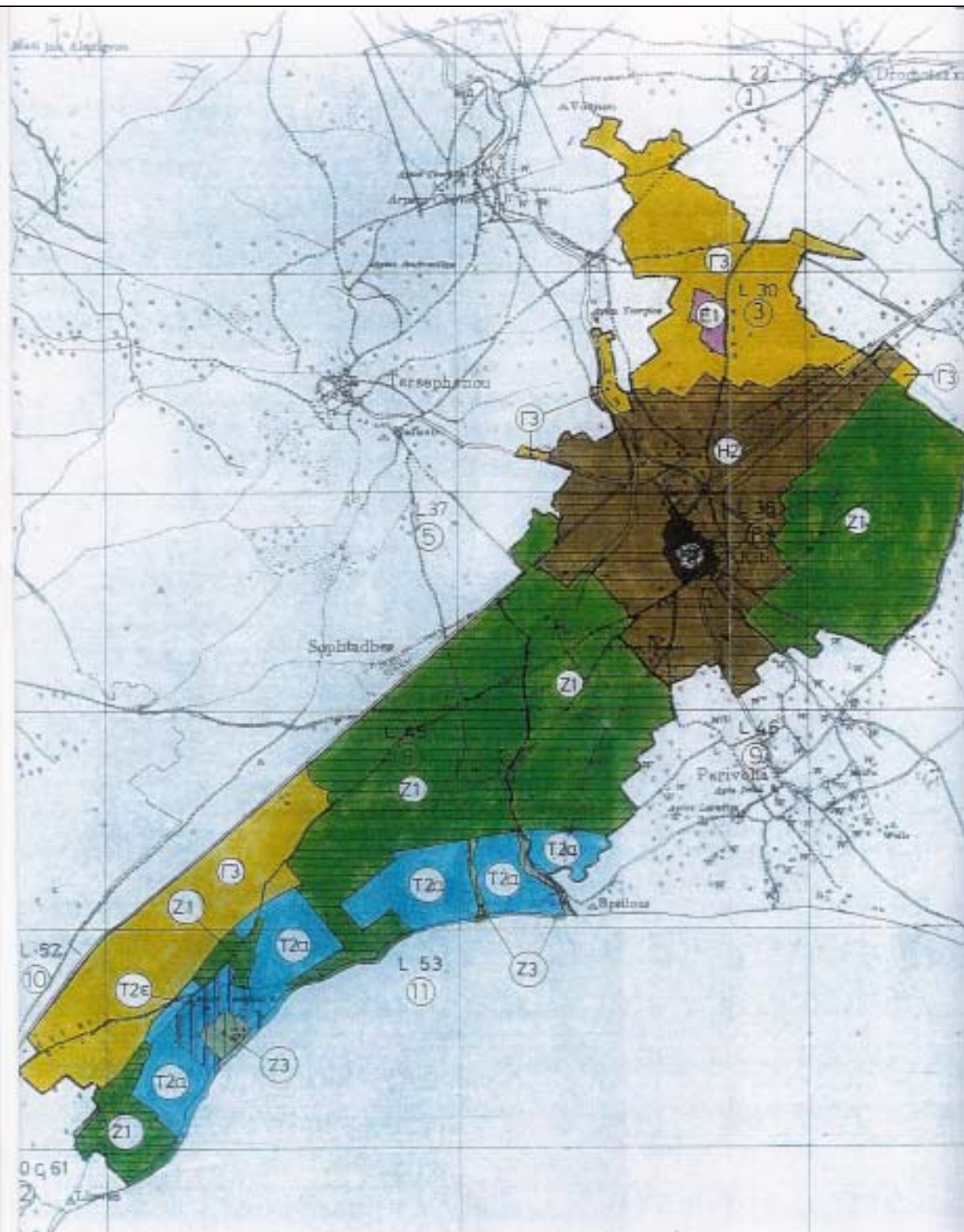
Alaminos
Land use
map



Kivisili
Land use
map
(Mazotos
area)



Kiti –
Softades
land use
map



5. COASTAL DEFENCE ACTIONS

5.1 Needs for coastal defense actions

As described in chapter III, the 36 km length of coastline between cape Dolos and cape Kiti is one of the coastal areas with the highest erosion rate in Cyprus: in some areas the erosion rate exceeds 1 m/year, for the last 20 years.

The major causes for these high erosion rates in the area are:

- extensive beach quarrying. Until late 80's this coastal area was one of the most favorite "quarries" for the construction industry of the island. During 70's a Law was enforced which prohibited beach quarrying. However it took some years for the authorities to manage to control this activity.
- river damming. (see information in chapter III)

The land uses of this coastal area have been traditionally agricultural. Since 1996, there was a reform to the land uses zones in this area. The Town Planning and Housing Department, which has the authority for the zoning of land uses in the island, published the new Policy Statement for land uses in this area. Most of the coastal agricultural areas transformed into tourist zones, by a radical increase to the building coefficients and a radical change to the kind of development allowed in the coastal zone.

This reform, coupled by the very important fact that this is the last coastal area in Cyprus which is still "undeveloped", ie not tourist developed, draw the attention of developers and real estate agents: from 1996 the entire coastal area is under construction, which obviously will last for some years. This eventually led to an increased pressure both by the locals and the developers to the Government, to find a solution to the erosion problem, in order to improve the quality of the beaches.

Since the value of the coastal land has risen significantly due to the land uses change, coastal defense actions became a necessity: erosion is causing a significant loss to the owners of coastal land and is a very negative phenomenon for beach quality.

Until now, nothing official has been done in this coastal area in terms of coastal defense structures. There are some groynes illegally constructed by owners of coastal land (see

photos of chapter IV) and a series of five offshore breakwaters in Alaminos area, legally constructed by a developer, after receiving official construction permits.

5.2 General strategy on coastline protection

5.2.1 A brief history on coastline protection strategy in Cyprus

In 1992, the Delft Hydraulics Institute included the coastal area Dolos – Kiti (actually the part from Zygi to Kiti) in the first part of the study “Coastal Zone Management for Cyprus” (1992 – 1995, co financed by EU and the Government of Cyprus).

The study “Coastal Zone Management for Cyprus” was the first systematic approach in Cyprus concerning coastline protection through a “shoreline management” concept. As it is already mentioned in chapter II, until then, very little was known on the coastal dynamics of Cyprus and of the man-made effects on the coastal system. Since Cyprus economy was, and still is, depending more and more on tourist development, there was a growing pressure for the exploitation of the coastal zone, for the creation of sandy beaches suitable for tourist development. This growing pressure has led to the construction of many small scale groynes and breakwaters, within the effort of the developers to improve the quality of the beaches so they could be use for amenity reasons and increase their dimensions so they could accommodate more visitors. Most of these structures have been illegally constructed. Photo V-1 shows the coast of Limassol, one of the more touristic areas of the island, with all kinds of coastal defense structures.

One of the aims of the study “Coastal Zone Management for Cyprus” was to concentrate as many of the existing data on coastal dynamics, coastal morphology and generally for the natural coastal system as well as data on land uses, economical activities, user conflicts etc. All these data were introduced in a Data Bank of Coastal Data. Doing this, it was found out that there were hardly any systematic data on coastline evolution. So the Study proposed a monitoring system for the survey of the evolution of the coastline. The monitoring system was designed and set-up in 1993, covering the entire length of “soft” coasts of the island, i.e. not rocky coasts. Most of the “soft” coasts of the island are under severe erosion.

5.2.2 Coastal monitoring program in Cyprus

The monitoring system as described above, was based on a network of semi-permanent benchmarks. The benchmarks were installed around the island: one bench-mark was installed every 500 meters of soft coastline. The benchmarks were connected to the National Coordinates System of Cyprus (ie coordinates-position and height from Mean Sea Level).

Each benchmark defines a cross section, a coastal profile, which is used as reference for a series of field measurements. Since 1993 the field work, as it is briefly described below, is carried out systematically by the staff of Coastal Unit:

Annual field work

1. bathymetric survey of coastal profiles: once a year at the same period (every summer) there is a bathymetric survey covering all the coastal profiles. The measurements cover the whole length of each coastal profile: a wadding part from approximately +0,5 m (height above MSL) up to a water depth of -20,0 m (below MSL).
2. sediment sampling: at the same time with the bathymetric survey, sediment samples are taken (with Van Veen grabs) from specified points on specified coastal profiles, covering the entire length of the profile. The samples are treated (granulometric analysis) at the Laboratories of the Geological Survey Department and the Public Works Department.
3. photographic survey: once a year, four photographs are taken at each benchmark, which show the condition of the coast. This is an extremely valuable source of information, since the evolution of the coastline can be documented visually.
4. vegetation inventory: every a couple of years, there is a sampling of the sea bed vegetation, at the same time with sediment sampling.

Field work in areas of morphological interest

In addition to the above, some areas can be occasionally characterized as areas of morphological interest, and more frequent monitoring is done there for as long as it is needed to have conclusions. Areas with special morphological interest are:

-
- river deltas
 - eroding areas after a storm
 - areas where coastal defense structures are going to be constructed. In these cases the area is monitored in detail before the construction, in order to have reference data, and for some years after the construction
 - areas where coastal structures have been constructed before 1993

The Data Bank of the Coastal Unit hosts all the results of the field work and documents which can indicate the historic evolution of the coastline.

The data stored in the Data Bank of Coastal Unit are an important basis for the studies on coastal dynamics, coastline evolution and coastal morphology. However, the access to these data for the public is rather difficult. Some of the Governmental Departments in Cyprus (see chapter 7) are still very reluctant to provide access to their Data Bases to private Consultants or non- Governmental Researchers. This attitude results in a huge overlapping of work and insufficient data for non-Governmental experts.

5.2.3 Principles/ instruments for coastal protection - techniques

Based on the data from the filed work of the first 2 years and on the collected documents on coastline evolution, the Study "Coastal Zone Management for Cyprus" resulted in:

- General Policy Guidelines for Coastal Protection
- Coastal Defense Structures (mild options and methods)
- Master Plans for Coastal protection and improvement works for three coastal areas in Cyprus which were characterized *as priority areas* (the coasts of Limassol, Pafos and Larnaca)

The coastal area "Dolos – Kiti" was at that time one of the coastal areas with no tourist development. So it was not considered by the Study as *priority area* in order to formulate specific proposals in the form of Master Plan for coastal protection and improvement works. The General Guidelines and Policy options as defined during the Study apply as general strategy for coastline protection of this area.

The strategy had a clear environmental friendly character. It included environmentally sound principles for shoreline management and erosion control. Special priority was given to "soft"

techniques and non-engineering measures, such as *retreat management* and the "*do nothing*" option. A summary of the strategy is as described below:

- give priority to "soft" protection, such as beach nourishment using sand or gavel, where this is possible
- use "hard" or "rigid" coastal defense structures only when absolutely necessary. Even in those cases, proceed with environmental friendly design of the geometric characteristics of the structures, i.e. low crest, keep a distance from the coast in order to minimize aesthetic impacts etc
- when applicable, prefer to apply *retreat management*
- introduce the "*do nothing option*" in the decision making process
- organise ad-hock committee, with the participation of representatives of all the stakeholders The Committee would actively participate in all the steps of the shoreline management study, so the final decision would have social consensus.⁶

These were very important tool for coastal defense. It was the first time in Cyprus that there was a proposal in the form of Strategy and Master Plans for erosion control.

The implementation of the Master Plans, which have been prepared for the three coastal areas started on 1996 and it is still going on.

For the rest of the coastal areas, the Government of Cyprus financed recently studies for the preparation of Master Plans for coastal protection and improvement works.

In 2000, the National Technical University of Athens (Harbours Laboratory) started a study in the area, funded by the Government of Cyprus, aiming in producing Master Plan of coastal defense structures. The study (and the Master Plan) is expected to be completed by the end of 2002.

⁶ This ad-hock Committee worked very effectively for three years 1992- 1995, during the execution of the Study "Coastal Zone Management for Cyprus". Due to the good work of this Committee the results of the Study had the consensus needed to avoid negative reactions and be accepted by all stakeholders. The Committee still exists, but it mainly acts now as Steering Committee for the studies referring to coastal zone. There is hardly any kind of participation in the studies themselves or in the general processes.

5.3 Alternatives for coastal defense

The public hearings (public presentations)⁷ of the draft proposals of the on-going study of the National Technical University of Athens, took place during February 2002. The Master Plan which is under preparation for the coastal area Dolos- Kiti focuses in proposing hard structures (breakwaters and groynes and in some areas cliff revetment using natural rock) for the protection of this coastline. The General Strategy of the Study "Coastal Zone Management for Cyprus" was not taken in account. As described in the previous paragraph, that Study introduced a more environmental friendly approach and a set up of Coastal Zone Management Scheme through which the Consultants would derive their proposals for coastal defense.

The National Technical University of Athens is also preparing Master Plans for coastal protection and improvement works in two other coastal areas of the island. The approach in the other areas is the same: hard engineering structures, no integration in the design process.

The Master Plans of the three coastal areas will be approved by the end of 2002, after the approval of the Environmental Impact Studies which have to be prepared for each of the Master Plans.

5.4 Effects of coastal management in human activities and the environment

5.4.1 Coastal management and human activities

There is not any official specific assessment on the effects of coastal management in human activities in Cyprus. The general assessments exist. However, it was preferred to draw some conclusions/ assessments/ comments out of the author's experience from working in coastal

⁷ Public Hearings are obligatory by the new Environmental Law, which has been enforced on April 2000.

management processes in Cyprus for the last 10 years. Some of these comments are presented below. More details on the social perception and effects of coastal erosion to people are going to be presented in chapter VI:

1. The protection of the coastline and the improvement of the beach quality in order to be suitable for amenity uses promotes tourist development. This is an important factor of development in tourist areas, such as the pilot site Dolos - Kiti.
2. A sandy beach attracts several swimmers. Especially in countries like Cyprus, where sandy beaches are rare, the creation of a sandy, protected beach in a place where an eroded beach exists, can be a very important asset for the further exploitation of the coastal area. A sandy beach promotes the initiatives for a series of activities related to amenity uses such as water sports, refreshments stalls, even tavernas. Examples of this behavior are the beaches of Mazotos and Alaminos in the pilot site Dolos – Kiti.
3. An effective coastal management is based on social consensus. Especially if the effort is to promote environmental friendly solutions for coastal defense. Locals are usually very keen on having “hard” structures in their area, especially if they have suffered for years from coastal erosion and they consider breakwaters and groynes as the solution to the degradation of their coast. “Hard” engineering structures are the most well known and they have direct effects: sediment is trapped in front of them and sandy beaches are quickly developed! It takes time and well set-up awareness raising campaigns, in order to inform people on the new “soft” approaches and persuade them for the effectiveness of this “modern” way of coastal defense.
4. Decision makers and politicians compose a very crucial *target group* for awareness raising campaigns and education on the new integrated approach for erosion control and coastal defense. If the decision makers realise that an effective coastal management can have positive impacts on human activities, then the whole process becomes easier.
5. The active participation of the stakeholders in Committees which have a role in the decision making process, is a very important parameter for social consensus and acceptance of non-conventional methods for coastal defense.

5.4.2 Coastal management and the environment

Environment is one of the crucial parameters in the integrate approach which is introduced in order to achieve an effective coastal management. According to the Environment Act of April 2001, an Environmental Impact Study is necessary for any construction within the coastal zone (land and sea).

The environmental system of coastal zone includes a large number of parameters which are involved in the coastal system:

- natural parameters – physical processes
 - ecology of the area (land and marine ecology) – ecosystems- protected areas etc
 - geology (land and sea bed) – geodynamics (earthquakes, liquefaction etc)
 - sedimentology
 - morphology (land, coastline and sea bed)
 - hydrology (precipitation, river network, dams in the area etc)
 - meteorology (aeolian field, air-sea interaction, temperatures etc)
- manmade parameters
 - population – occupation – statistics on the welfare of population in the area
 - archeology (land and marine) – archeological protected areas
 - history (eg Byzantine churches, Venetian fortresses, or more recent historical monuments which are under protection)
 - land uses – existing institutional framework for development
 - existing infrastructures
 - sewage/ landfills
 - harbor/marinas facilities
 - road network
 - etc
 - pollution – land and marine sources

All these parameters, and more if it is locally necessary, have to be identified and evaluated. Their present status and their evolution throughout the years has to be assessed. Data and

documents have to be collected, evaluated, assessed and presented in a report. The evaluation of the impacts of coastal management activities has to be based on a concrete set of information.

All these environmental parameters have to be introduced as an inherent part of the coastal system, and have to be assessed together with the hydrodynamics, the sediment transport and budgets, the morphodynamic processes. Through this procedure, the environmental parameters become well established, better defined and more concrete.

So, the coastal management schemes include the environmental parameters, and the management process refers to the entire integrated coastal system.

6. SOCIAL PERCEPTION

6.1 Methodology and field survey location

6.1.1 Methodology

The methodology followed for assessing social perception of beach users was the one proposed by the EUROSION group. It is based on the analysis of the information from the previous chapters together with field survey. The description of this methodological approach is coded below, as included in the relevant set of directions of EUROSION group:

*The **first** arises from the analysis carried out of preceding chapters. The chapter corresponding to the Policy Level provides knowledge on the legal framework, distribution of responsibilities, policy application, and so on. The next chapter covers the Physical Level that provides us with a description of the main physical parameters (morphology, sedimentary transport, etc). The fourth chapter describes the socio-economic context providing the main activities and uses involved. Finally, the fifth chapter corresponds to the Technical Level that gives us information on the coastal defence actions carried out. Knowledge of the contents of these chapters provide us with an adequate reference.*

*The **second** is based on a **questionnaire** based survey of the users of beaches and territorial agents: local politicians and technicians, financial players, business agents and institutions in areas affected by beaches. At the same time the beach space was inspected at the time of taking the survey in order to complete a list of features that define an objective reference for the condition of the beach. During this phase, chapter VI covering Social Perception Level is completed with complementary information other than the simple identification and description of the stakeholders. Survey contents also serves to complete those aspects related to Information and Communication Level.*

*The initial step was a **static analysis** that feeds from the **bibliographic sources** related to **theoretical and empirical knowledge** on the physical phenomenon, socio-economical characteristics, **action taken on the environment** and the **legal context** governing the area under study. In order to put all this knowledge into movement and to generate dynamic results in terms of social perception and knowledge of local information and communication the **mechanics for survey**, based on a **questionnaire about the social perception of the problem of erosion currently affecting the coast** is set up. This **dynamic analysis** covers two fields, one that is **wider in scope** using **quantitative techniques**, that evolves above the users' universe when they are on the beach or at the most frequented part of the coast. The other is a **quality in-depth interview** that provides a detailed, sectoral vision.*

*This part that incorporates the dynamic analysis is complemented by **photographic information** with images of the space as it was a few decades ago and how it looks now. This provides us with an accessory to describe the size and uses of the coastal spaces. The photographs show in greater detail the aspects that make up the perceptive evaluation.*

This chapter VI, is describing/ analyzing the results from the filed survey on beach evaluation. The survey included four subsequent phases:

1. Checklist – Details of direct observation (ANNEX VI-3).
 - List of photographs (paragraph 6.1.2)
2. Interviews with beach users: - Questionnaire used to evaluate beach characteristics and classification data of the users (ANNEX VI-2)
3. Interviews to local officials. In-depth interviews (ANNEX VI-4)
4. Interviews to institutional officials. In-depth interviews (ANNEX VI-4)

The questionnaires have been translated in Greek in order to have better understanding among the Greek (local) interviewees. For the tourists (foreigners) beach users the English version of the questionnaires was used, although this category of beach users was very small (see paragraph 6.3.1 *beach user profile*). In the case for in-depth questionnaires, although the questions have been given by EUROSION, each interview was adapted to the interviewee background and the interview was done in the form of discussion. In order to make this approach feasible, a tape recorder was used for recording these interviews.

6.1.2 Description and justification of the survey locations

Four main criteria were implemented for the selection of survey beaches along the 36 km coastline of the pilot area:

- Living beaches known to users, mainly used by locals, who have knowledge on the beach evolution through-out the years
- The coastline has been or still is, under erosion
- The beach is used for amenity reasons
- Hard coastal structures have been constructed in the specific area

Five coastal areas were selected according to the above criteria. Each of them had a peculiarity, a specific characteristic:

- **Agios Theodoros** is a recently protected beach. Very small (70 meters length), high groynes, artificial “pocket beach”. No facilities available. (photos VI-1 to 3)
- **Alaminos** is an open beach, 1 km long, recently protected by offshore

breakwaters, which are still under construction. A tourist village is going to be constructed on the coastal land. No facilities yet available.(photos VI- 4 to 6)

- **Mazotos** is a camping site. The beach is protected by two groynes which have been constructed 15 years ago. The quality of the beach is not good, due to trapped seaweed. Some facilities available. (photos VI-7,8)
- **Pervolia** beach is an eroded open beach, 10 km long, without organize and effective coastal protection. (photos VI-9 to 12)
- **Faros** beach is a sandy, wide beach (more than 20 meters width of sand). The beach was created after the construction of an offshore breakwater 20 years ago. There are some facilities. (photos VI-13,14)

Annex VI-2, at the end of the chapter, includes the checklists with the description of each survey site, as provided for this specific work by EUROSION group.

The description of each site follows together with characteristic photos of each area:

- **Agios Theodoros beach**

The area was suffering from severe cliff erosion, approximately 1m/year (photo VI-1). The owner of the coastal land decided in 1995 to build a house. In order to protect the construction he proceeded in constructing illegally two groynes, creating thus a highly protected pocket beach (photo VI-2). According to the Cypriot Shore Act, coastal zone (a width of 100 meters from the coastline) has public use, ie privatization is not allowed, although the land is private owned. So, a lot of people use now this beach (photo VI-3), which is the only protected beach with sand in an area of more than 10 km. There are no facilities on the beach.



Agios Theodoros beach

- **Alaminos coast**

The area was suffering from cliff erosion as Agios Theodoros (photos VI-4,5). In 1997 the owner of this coastal area took a permit for the construction of a 2000 bed tourist complex. However the investors-developer wanted to have a protected beach in front of the development, in order to defend the coast from the severe erosion and make the beach suitable for amenity uses. The permit for the proposed coastal structures was provided to the developer, after submitting an Environmental Impact Study, together with the design of the breakwaters. The process for getting the permit for the coastal structure took more than two years. Today, the coastal structures (offshore breakwaters and a small shelter) are still under construction, however local people use the area for swimming (photo VI-6) and feel happy about the “new” beach they have in their area.



Photo VI-4: Alaminos eroding cliff,
1996



Photo VI-5: Alaminos eroding cliff,
1996



Photo VI-6: coastal structures in Alaminos,
2000

• Mazotos beach

This beach was also eroding as the previous. However, there was a camping site by the sea, with a restaurant which was serving the camping site. The owner of the restaurant constructed in early 80's two illegal groynes to protect his restaurant from coastal erosion (photos VI-7,8). Now this small, protected beach is mainly used by the people of the camping and the clients of the restaurant. However the quality of the beach is not very

good. Sea weed are trapped in between the groynes resulting in bad aesthetics of the beach. This is the only beach out of the 5 selected which has facilities (shower, toilets) and a place to have coffee and eat.



Photo VI-7: 2002



Photo VI-8: 2000

Mazotos beach

• Pervolia beach

Pervolia beach is rather long, compared to the other survey-sites: it has approximately 10 km length. The beach mainly consists of gravel and it is still under erosion. A lot of different kinds of defense structures have been constructed in the area by private initiative, mainly wooden or rock revetments (photos VI-9 to 11) or even groynes (photo VI – 12). These coastal protection structures cover less than the 5% of Pervolia beach and all of them are illegal.

The 95% of Pervolia beach is still not protected. There are no facilities in the entire area. The people swimming here are mainly locals or people who own a holiday house or apartment nearby.



Photos VI-9,10:
Pervolia, rocky
revetment for coastal
defense
(up: before
protection, 1996,
down: after



Photo VI-11:
Pervolia,
wooden
revetment



Photo VI-12:
Pervolia, groyne
for coastal
defense



- **Faros beach**

This is the only sandy beach in the area. The offshore breakwater in front of Faros Tourist Village (photo VI-13) has been constructed in early '80. The area was completely rocky, with high rocky cliffs (up to 15 meters). The breakwater resulted in huge accretion, which was expanded not only in the shadow area of the structure itself but also created accretion upstream (south part, photo VI-14). The breakwater and the full tobolo in front of it, behave like a groyne.

There are some facilities in the beach: sunbeds and umbrellas, small cantines for cold drinks and some showers (not toilets).



Photo VI-13

Photo VI-14



6.1.3 Description and justification of interviewees selection

Beach users

The methodology for the selection of beach-users interviewees has been already described in the previous paragraphs of this chapter. The exact way for beach-users selection was provided by EUROSION and is coded below:

For each place of survey a checklist needs to be filled out, a task that the interviewer must carry out during the sowing of the questionnaire to the users. That is to say, during the same morning or afternoon that is carried out. The starting points of the racetrack must be chosen randomly at the edge of the sand and a zig-zag route traced toward the water, trying to cover the whole beach. The questionnaire should be given to the 5th person along the route, making sure that there is a minimum separation of 5 meters between each one in order to avoid collective responses. The interviewer must explain briefly the aim of the survey and the simple way it works. A pencil will be provided to the interviewee so that they may mark the answers themselves. 5 to 10 questionnaires can be given out over an area where the interviewer stays in case any problem arises. After 15 to 20 minutes the questionnaires are recuperated any last doubts expressed before filing them so that all answers are guaranteed and not waste any of the questionnaires. Finally the interviewer must check the classification data to be aware of the population profile for later data exploitation, and he/she has also to check if all the questionnaire is completely answered.

If appropriate, because of the diversity within each place of survey, one or more units may be established that can be mapped out on a conventional plan of the pilot zone. The operation must be developed until 250 answers have been obtained for each place (see figure 1). You can choose or the alternative 1, adopting a continuous place of survey, or the alternative 2, having discontinuous place of survey. The election depends on the characteristics of each pilot zone.

Local and Institutional officials and experts

Concerning the opinion of local and institutional officials and experts for this pilot site (from Dolos to Kiti), 20 in-depth interviews (see annex VI-4) have been carried out to three major groups of stakeholders.:

A. Politicians and officers

- representatives from the Local Authorities of the ten villages
- employees from the District officer of Larnaca who are responsible for the survey areas.
- One Larnaca ex-Member of the Parliament
- One employee of the Cyprus Tourist Organisation

B. Experts

- One ex-employee from the government, responsible for the preparation of the Master Plans for Coastal Zone Management of this coastal area (Dolos – Kiti)
- The ex-Director of the Fisheries Department, who was until last year responsible for the sea water quality of the entire island of Cyprus.
- The marine biologist, responsible for the monitoring of Fish Farms in the area

C. Economic - Social group

- Members of the Board of the Fishermen Association
- Employee of the Vassiliko Cement Factory
- Representative of the Federation of Ecological Organisations of Cyprus
- One major tourist developer of the area
- Restaurant owners
- Owners of beach beds and umbrellas

-
- Representative of the Federation of nautical sports (only in Faros area nautical sports facilities are available)
 - One employee in the fish farms of the area

With this total of twenty in-depth interviews, the social and local perception of erosion, the issue that is the subject of this study, was outlined in qualitative form.

The in-depth interviews were carried out following a prearranged set of questions, which however were transformed depending on the background and the interests of each interviewee. The interviews were carried during a high season for the beaches, from 30 July to end of August.

6.2 Stakeholders system description/ relations between stakeholders

6.2.1 Description of stakeholders

It has to be noted here, that the pilot area Dolos – Kiti covers 36 km of coastline and there are only 9200 inhabitants distributed in ten villages. It is not yet a tourist area, so there are not many visitors. So, until now, the stakeholders system is rather simple, following the usual pattern of stakeholder system in rural areas of Cyprus. The major stakeholders for the coastal area of Dolos – Kiti are briefly described here and are included in Annex VI-1, in the form of table of each stakeholder.

Government

Ministry of Interior

- The District Officer of Larnaca, Ministry of Interior, is the “owner” of the coastal zone, according to the Foreshore Protection Act and is the authority responsible to issue permits for coastal structures⁸ and also issues “the building permits” for all land based structures.
- The Town Planning and Housing Department, is responsible for the enforcement of the Town Planning and Housing Law, which defines the width of coastal

⁸ The permit for the construction of coastal structures, such as offshore breakwaters, is issued directly from the District Officer, provided that there is an Environmental Impact Study for the structures which has been accepted by the Technical Environmental Committee.

protection zone and is the authority responsible to issue the “Town Planning permits” for all the land based structures

- Land and Survey Department. The agency responsible for mapping and chartography.

Ministry of Communication and Works

- The Coastal Unit, Public Works Department, is responsible for the planning, design, surveying of coastal protection works. However, the Unit has no authority for decision making.

Ministry of Agriculture, Natural Resources and Environment

- The Environmental Service, is the authority responsible for the enforcement of the Environmental Impact Assessment Law (no 57(I) 2001). Coastal structures are included in the Annexes of the Law, ie the execution of an Environmental Impact Study is essential.
- The Fisheries Department, Ministry of Agriculture, Natural Resources and Environment is the agency responsible for the enforcement of the Fisheries Law, for aquaculture and for the marine ecosystems.
- The Water Development Department, is the agency responsible for Water Resource Management. River damming and the management of the streams⁹ estuaries have direct inter-relation with the coastal zone.
- Geological Survey Department, carries the research for coastal sedimentology and geology
- The Technical Environmental Committee. The Committee is chaired by the Director of the Environmental Service. Several competent Governmental Departments are represented in the Committee, as well as representative of the Ecological and Environmental NGOs of Cyprus. The Committee examines the Environmental Impact Studies and accepts them or not, in order to proceed or not

⁹ There are no rivers in Cyprus. The hydrological networks comprises of streams with run off only during raining periods (winter)

with the issuing of the building permit by the District Officer or/and the Town Planning and Housing Department.

- Cyprus Tourism Organization (CTO). A Semi-Governmental organization, which is the Agency responsible for the Tourist Development in the island. Decisions concerning construction of Hotels and other tourist facilities in the coastal areas, define the future of the coastal zone morphology, the needs for protection coastal structures etc.

Local Authorities

None of the ten villages along the pilot site is a Municipality. They are all small villages and simple Communities, ie they do not have their independent Technical Department or any kind of infrastructure. They mainly deal with some simple, everyday problems (publishing of certificates of birth/death etc). They depend strongly to the services of Larnaka District Officer. They participate in the decision making procedure in a rather informal way, mainly through the process of Public Hearings which has been establish with the Environmental Impact Law (57(I)/2001) and as pressure groups.

National Committee of Coasts

This Committee is chaired by the Union of Municipalities of Cyprus. It consists of a representative of the Union of Local Authorities, representatives of several Governmental Departments, representative of the Ecological and Environmental NGO's. The Committee is the agent responsible for any changes in the Foreshore Protection Act which have to do with the economic activities on the beach, ie define swimming areas, areas for water sports (jet skis etc), areas with sun-beds and sun-umbrellas, rates of renting etc. The decisions/suggestions of the Committee are submitted to the House of Parliament for approval in order to be incorporated as modifications to the Foreshore Act.

NGOs

The Federation of Environmental and Ecological NGOs is active all around Cyprus and hosts several small movements. The only local environmental group active in the area is the branch of Larnaka of the Federation.

Fishermen Federation

The Fishermen federation has a strong branch in the area, since fishery is one of the significant activities in some of the villages along the pilot area (Zygi, Mari).

The description of each stakeholder is included in Annex VI-3 of this chapter.

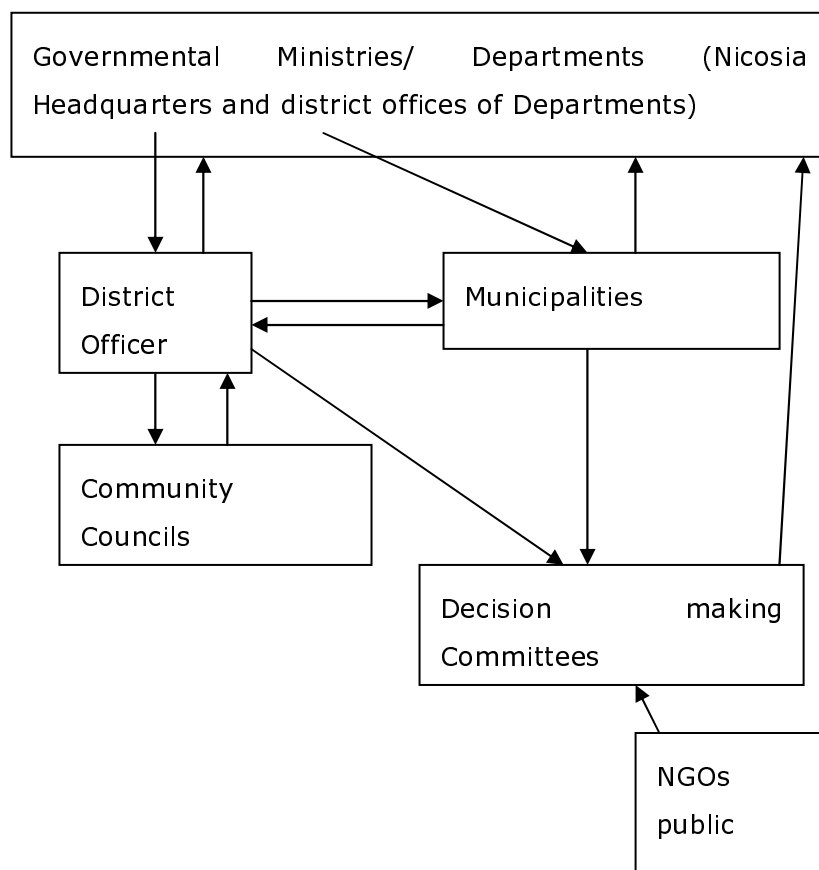
6.2.2 Description of relation between stakeholders

The decisions, concerning coastal zone are taken by the Governmental Departments and the District Officer. As already mentioned in previous chapters, each District has Local Authorities. Every community with population over 5000 inhabitants is a Municipality. The rest are villages with their Community Council. The Municipalities have power according to the law. They have their own services and departments (eg Technical) and they are entitled to take decisions on matters which concern their Municipality. In contrary Local Authorities-Communities have a more “political” power. It is rather limited to a series of local problems. The major decisions are taken by the Government, for example for infrastructure works, ie if a road is going to be constructed and when or for the allocation of budgets. Local Authorities (including Municipalities) act several times as pressure groups to the Government. The financial support of the Government to the Local Authorities is less than 1% of the GNP.

Most of the Governmental Departments also have offices in each District, in order to decentralize the system of decision making. These offices work in close cooperation with the District Officer, forming a kind of “local government”. However, all major decisions or the solution of all major problems are directed to the Headquarters of each Department in Nicosia and at the Ministries.

The environmental NGO’s are actively participating in all public hearings concerning Coastal Zone. According to some new legal changes (due to the process for harmonizing Cyprus legal framework with the European one) the NGOs participate in the decision making process by including as permanent member a representative of the Federation of Environmental NGOs in several decision making Committees, such as the National Committee of Coasts. The major problem of the Environmental NGOs is the financial. They do not have any economic resources so all the work is based on voluntary work from their member, which makes difficult to have expert views and proper studies.

A simplified diagram for the relation of the stakeholders in the decision making process is following:

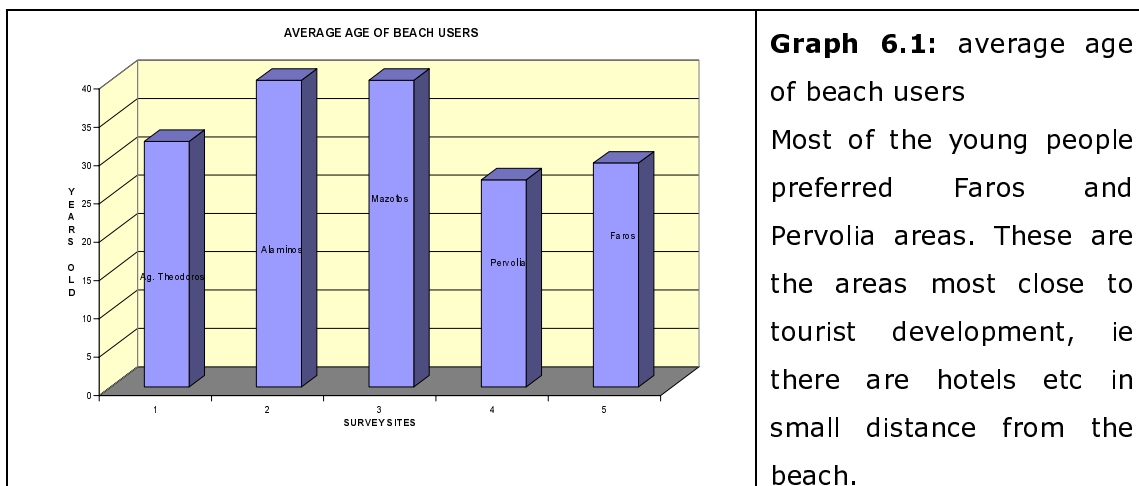


Decision making process (diagram)

6.3. Local perception analysis

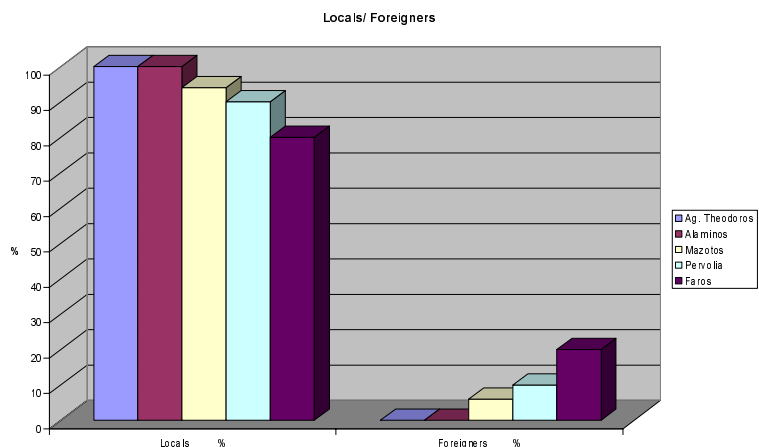
6.3.1 Social profile of beach users

The results of the questionnaires on the profile of beach users are presented below, in graphs and tables with the average values in each survey site. Each parameter characterizing the social profile of beach user is commented.



Graph 6.2: Locals – Foreigners

Almost 100% of the beach users were locals. Faros beach hosted 20% tourists, while Pervolia and Mazotos around 10%.



Survey sites	average distance (km)	hours on beach	
Agios Theodoros	14,7	3	<p>Agios Theodoros and Alaminos are areas clearly preferred by locals, who travel a short distance in order to have a swim. Pervolia beach is mainly used by people who have a holiday house or stay in one of the hotels of the area. Faros attracts people from Nicosia, which is located appr. 40 Km away.</p> <p>Mazotos attracts visitors from a distance because of the sea-side restaurant (see table this particular beach)</p>
Alaminos	2	3	
Mazotos	30	5	
Pervolia	1	3	
Faros	35,5	3	
Table 6.1: average distance of travel to reach the coast			

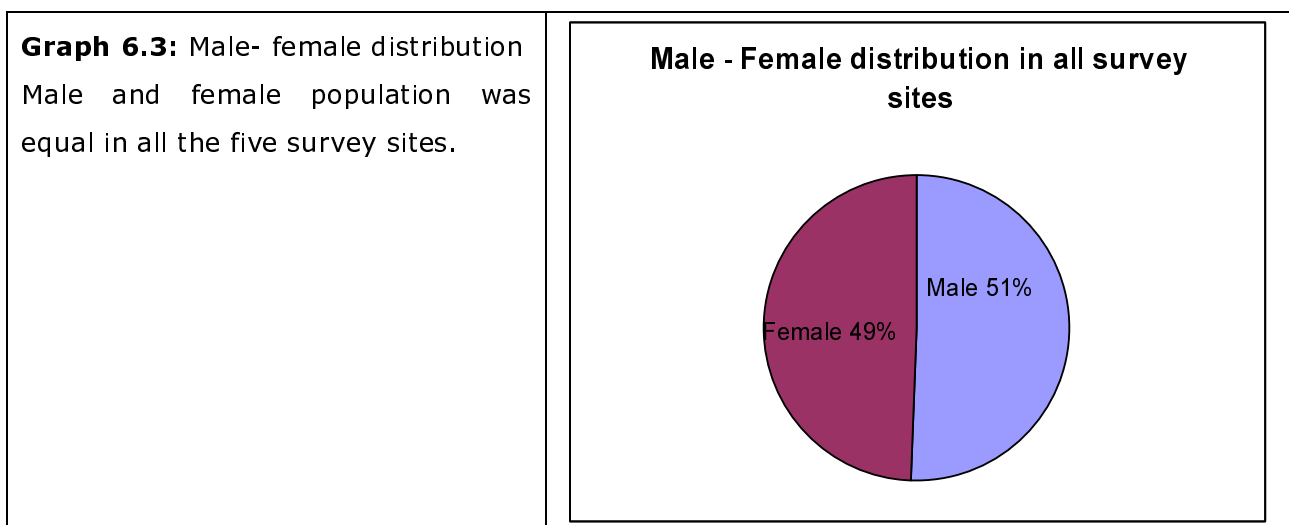


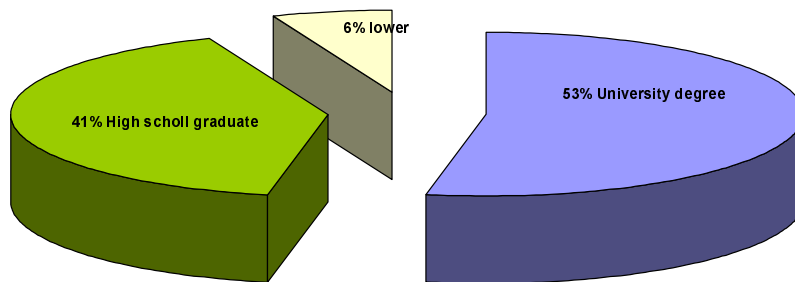
Table 6.2: Why to this particular beach

Survey sites	quiteness	best in area - vicinity to home	restaurant on the beach	clean beach	holidiay house owner	free accomodation (friends house)
Agios Theodoros	40%	60%	0%	0%	0%	0%
Alaminos	40%	60%	0%	0%	0%	0%
Mazotos	30%	0%	70%	0%	0%	0%
Pervolia	15%	0%	0%	30%	45%	10%
Faros	30%	20%	0%	30%	20%	0%

Table 6.3: Education

Survey sites	University degree	High School graduate	Lower
Agios Theodoros	70%	25%	5%
Alaminos	40%	50%	10%
Mazotos	30%	70%	0%
Pervolia	60%	30%	10%
Faros	65%	30%	5%

Beach users education status
average for all survey beaches



6.3.2 Beach users' results and perceptions - evaluation

Beach users were selected according to the directives of EUROSION group:

- Users randomly selected. A zig-zag racetrack was followed, starting from the coastline up to the end of the sand
- Minimum distance between interviewees: 5 meters
- Interviewees of both sex and all range of ages above 15 years.

The results are presented in the following pages, as summaries of the basic groups of questions, together with some comments- analysis- evaluation of the results.

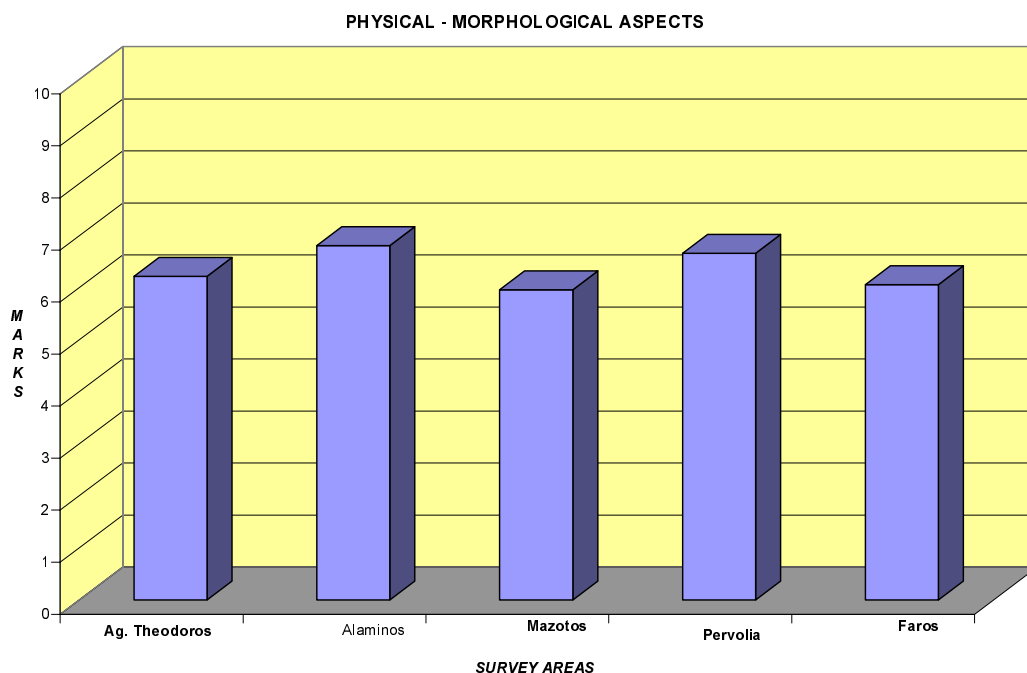
Physical and morphological aspects

Alaminos beach scores higher (6,5) concerning physical- morphological aspects (colour- texture of sand, slope of the beach etc). If Alaminos beach is compared with Faros beach which is a wide, sandy beach, well protected by Cape Kiti, nice mild slopes of the beach etc, then this higher score of Alaminos sounds strange. However, there is a pattern in all the results, which is more all less the same and it is important to be stressed: *in the areas where coastal defense structures have been recently constructed, beach users were giving high scores on physical and morphological aspects, since they were comparing the present situation with the previous, before coastal protection, when there was a great difficulty even to have access to the sea through the eroding cliffs.*

The profile of the beach users is important in order to have a correct analysis of the results: according to the first criterion for the selection of survey sites (par. VI- 1.1) the beach users of all the survey beaches, had been mainly people who knew the areas for years. These people had difficulties in using the beach during the days of beach erosion. Even the access to the beach through the 2 meters high eroding cliffs, was a very big problem.

Now, with the coastal protection works and the improvement of the beach, concerning amenity uses, the beach users feel very happy, being able to enjoy a calm, sandy beach instead of an eroding wavy one. Thus their evaluation of the physical and morphological aspects of the beach was **mainly in comparison with what it used to be when the beach was eroding.**

The second “best” beach in ranking according to the physical- morphological characteristics is the beach of Pervolia, where erosion is still in process and no coastal defense structures have been constructed. Pervolia is a long and not at all crowded beach. So, a possible explanation to this “score” could be that the few beach-users of this beach are people who like gravel beach and also like the absolute natural aesthetics of the beach. These people have chosen Pervolia for their swimming so they are happy with their selection.

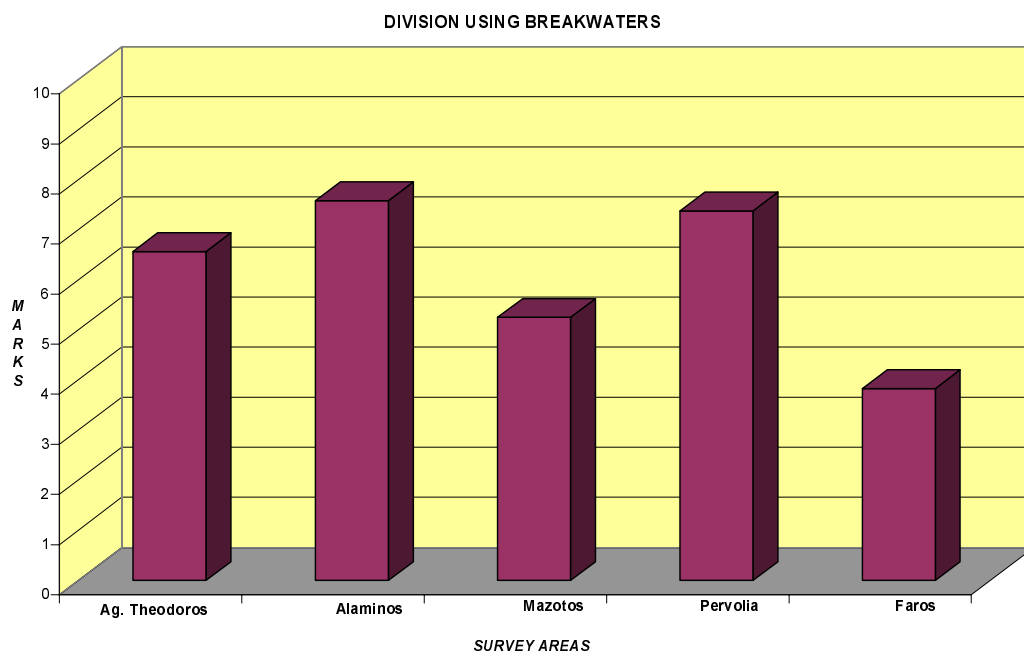


Graph 6.4: Physical – morphological aspects

Parameters composing “physical- morphological aspects” evaluation

The colour of the sand	Slope into the water
The texture of the sand	Waves
Water temperature	Sand temperature
Width of the beach	Wind
Length of the beach	The presence of rocks
Sloping of the beach	Division using breakwaters

An interesting result in this group of parameters is the opinion of the interviewees for the use of breakwaters for coastal protection from erosion. The relevant question in the questionnaire was “division using breakwaters”. The following graph presents the results.



Graph 6.5: Division using breakwaters

It is interesting to notice that **Alaminos** beach has the higher score of acceptance of the breakwaters. It is an expected result, according to the reasoning already mentioned before, i.e. the breakwaters have been recently constructed (are still under construction). Beach users can already feel the difference in terms of beach protection and improvement. The beach is becoming pleasant to be used for amenity reasons, so beach users who are 100% locals, like the breakwaters, giving them a score of 7,3.

In the case of **Pervolia**, the question was put hypothetically, i.e. “would you prefer to have

in this beach breakwaters?”, since there are no coastal defense structures in most part of the beach. Although the beach users are generally satisfied from the physical-morphological characteristics of this beach (see previous graph), they would like to have coastal structures for the improvement of beach quality.

It is also very interesting to notice that the users of **Faros** beach don't like breakwaters, giving an average “score” around 3 in this question, although this beach has been artificially created after the construction of the offshore breakwater in 80's. However, it seems that it is not so obvious to the beach users that the beach they are swimming is a result of the accretion caused by the breakwater which is situated 100 meters away. Beach users are very satisfied with the beach and they wouldn't like to have a breakwater in front of them. It is important again to see some critical characteristics of beach users' profile in Faros, which help in better understanding answers:

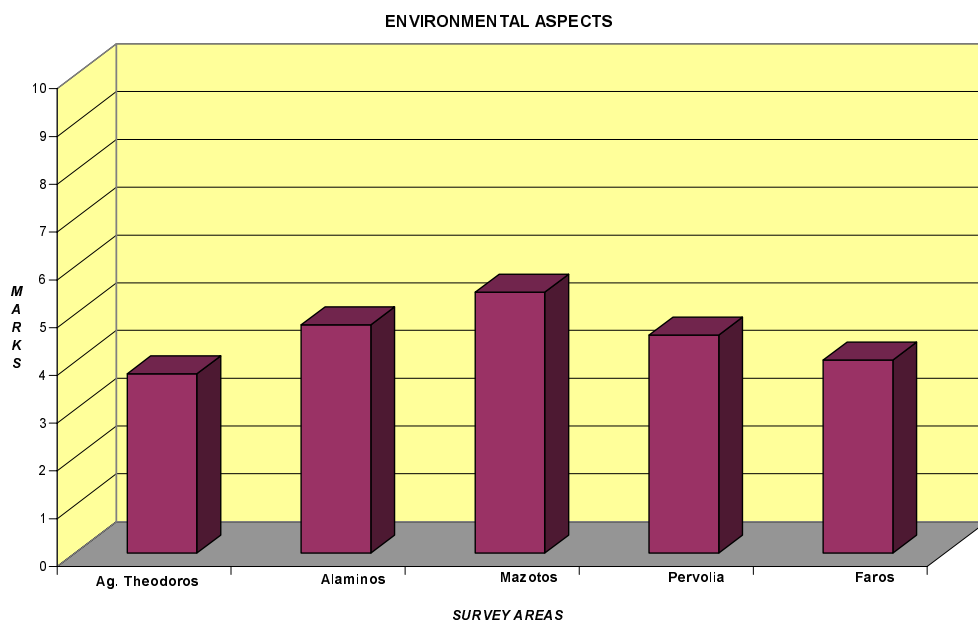
- about 20% of beach users are foreigners - tourists who visit the beach for the first time. In the four other survey beaches this percentage varies from 6% (Mazotos) to 0% (the other 3 areas), where almost all of the beach users are locals
- the average age of beach users in Faros is 29 years old, i.e. young people. The breakwater had been constructed in 80's, so even local people do not remember the area before the construction of the breakwater, because of their age. They consider the sandy beach of Faros as natural and they wouldn't like to see any breakwaters in this beach.

Environmental aspects

Questions regarding facilities (toilet, shower etc) have been included in this group of parameters of beach users evaluation, as seen in the table with the parameters below. It was decided to proceed with two statistical processes, which resulted in the two tables which follow:

- in cases where facilities did not exist (toilet, shower etc) the relevant answers were taken as “zero”, thus participating in the statistical process. The results are shown in the following table.

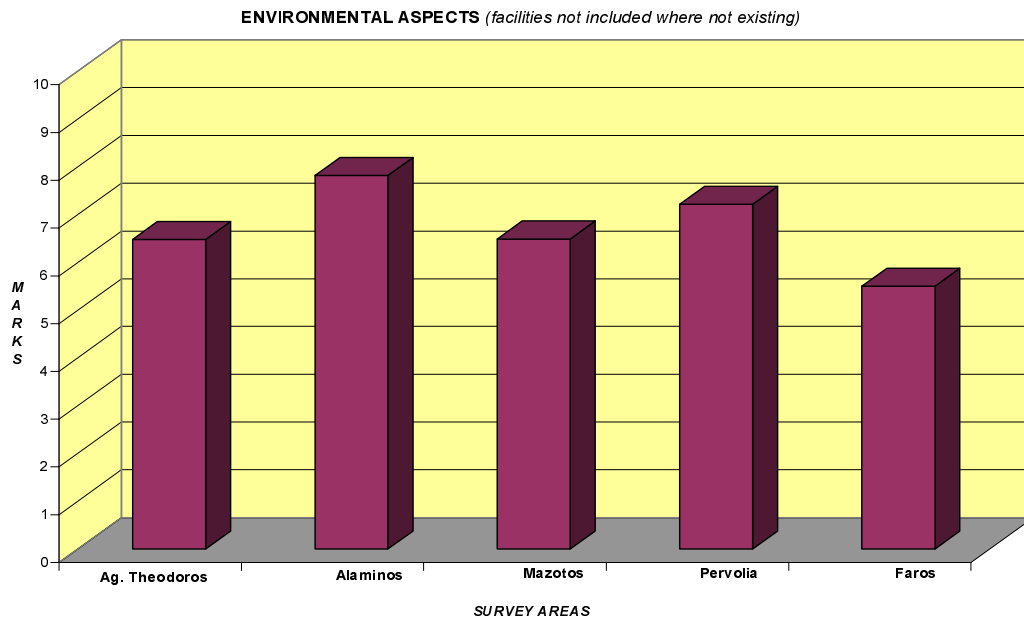
Graph 6.6: Environmental aspects (facilities included)



Mazotos has the higher score. This is the area with the most “acceptable” facilities concerning toilets and showers, because of the coastal restaurant. The rest survey beaches are evaluated with negative score (less than 5).

- in the beaches where facilities did not exist, the relevant questions were not included in the statistical process and the results are shown in the table below:

Graph 6.7: Environmental aspects (facilities not included where not existing)



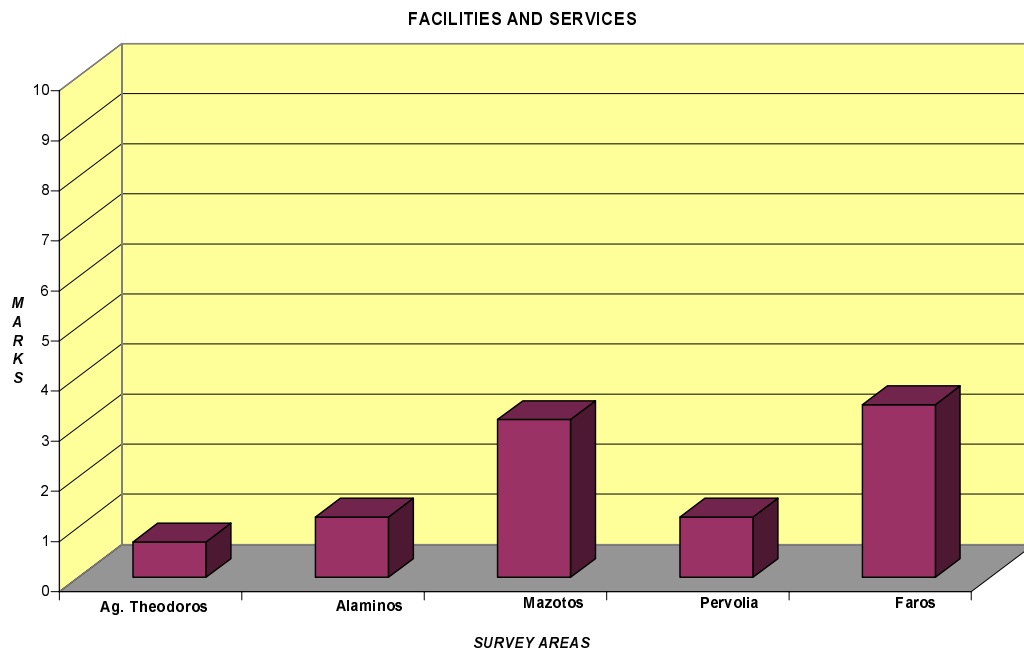
The results in this case, are rather independent from facilities and their maintenance. If facilities are subtracted from the evaluation of "Environmental aspects", then according to the cleanliness of the beach, the sand and the water, the presence of fish etc, all the five survey beaches have positive evaluation, and Alaminos is first in score.

Parameters composing "Environmental aspects" evaluation		
Waste matter on the sand	Cleanliness of the sand	Presence of running water
Waste matter in the water	Cleanliness of the water	Presence of stagnant water
Toilet facilities	Installation of waste-baskets	Presence of oil in the water
Shower facilities	Rain water run-offs	Presence of oil on the sand
Toilet maintenance	Presence of vegetation	Sound of engines
Shower maintenance	Presence of fish	Sound of people
		Presence of dogs

Facilities and services

As it is expected, all the survey beaches take a negative score concerning the facilities and services offered. Mazotos and Faros are considered to be the best out of the five site areas. These two beaches are the only ones where some facilities and services are available.

Graph 6.8: Facilities and services



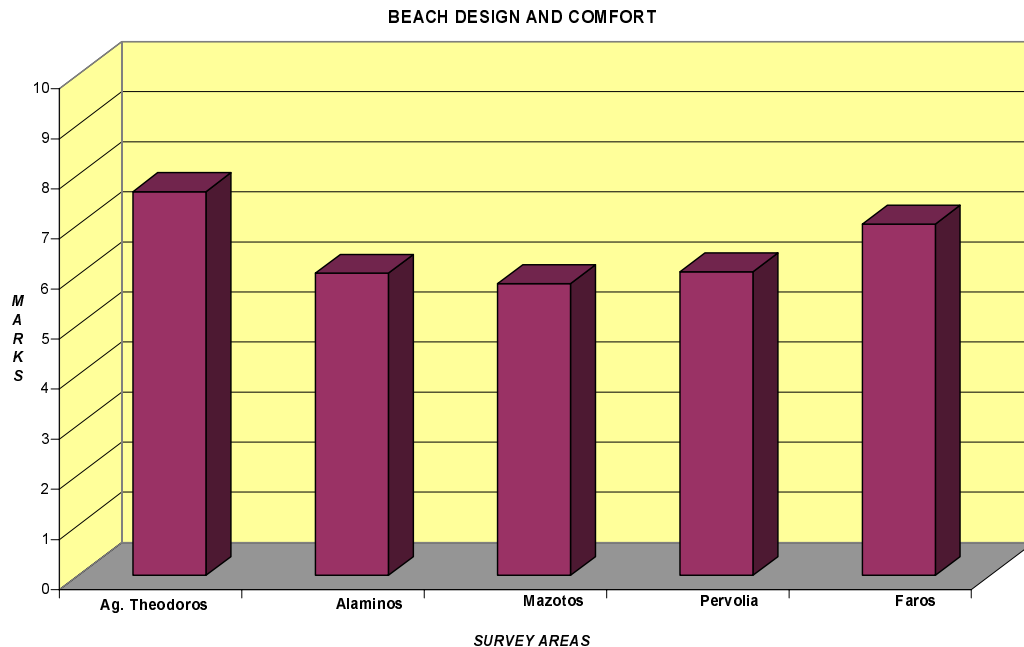
Parameters composing "Facilities and Services aspects" evaluation

Refreshment stalls	Rent of windsurf, motors...
Renting of deckchairs and sunshades	Parking areas
Vigilance and life-saving	Access to the beach
Play and sport areas on the beach	The waterfront
Areas for water activities	Restaurants & bars on the waterfront

Design aspects

All five survey- beaches have a positive score in this group of parameters. Agios Theodoros and Faros have the higher scores. Once more, this has to be analysed according to the *pattern* described in the first paragraph of this chapter (physical and morphological aspects): *in the areas where coastal defense structures have been recently constructed, beach users were giving high scores on physical and morphological aspects, since they were comparing the present situation with the previous, before coastal protection, when there was a great difficulty even to have access to the sea through the eroding cliffs.*

Graph 6.9: Beach design aspects



Parameters composing "Design and Comfort aspects" at evaluation

Composition of the landscape
The comfort of the beach
Quality/price ratio
The number of users

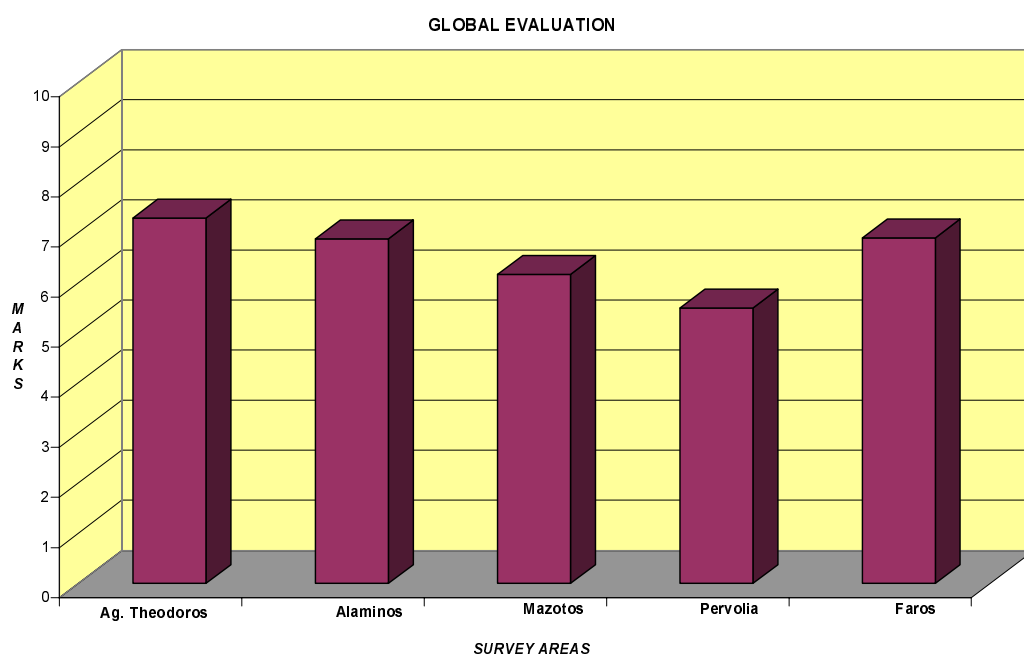
Global evaluation

Generally the beach users are satisfied with the five survey beaches, giving them a positive global score. Agios Teodoros and Alaminos come first on global evaluation. This result has to be analysed again, based on the characteristic pattern explained in Physical and Morphological Aspects paragraph above: beach users were giving high score to the beaches of more profound evolution (improvement) towards amenity uses based. This behavior of the beach users explains why they gave higher scores to beaches which are not objectively, the best. Summarizing some important notes:

- The profile of the beach users is important: the beach users in Ag. Theodoros and Alaminos are 100% locals, people who know the beach since ages and they compare the present situation of the beach with the one before the coastal protection structures.
- The coastal structures both in Ag. Theodoros and Alaminos have been recently constructed, so beach users have a recent picture of the change in beach quality.

The breakwater of Faros is more than 15 years old, so most of the local young beach users do not even remember the area before the construction of the breakwater.

Graph 6.10: Global evaluation



6.3.3 Stakeholders perception

(based on the answers of in-depth interviews)

The opinions expressed by the local administrators, the experts and generally the stakeholders-actors of the area have been very significant for understanding the perception of people against erosion, coastal protection structures, beach quality. For understanding each stakeholders priorities, the way they think and the bases for decision making.

It is important to keep in mind that the entire pilot coastal area, from Dolos to Kiti is suffering from severe erosion. Until 5 years ago, all the coastal area was characterised as agricultural, so tourist development was in practice prohibited. Since five years the agricultural zones are transformed into tourist zones, so there was and still is a “boom” in tourist development. Since beaches are the most important asset for tourism, the need to stop beach erosion and improve the beach quality became crucial. The Government has begun studies in order to prepare Master Plans for coastal protection. However, developers and owners of coastal land have already proceeded with the construction of erosion defence structures, most of the illegal.

The opinion of the interviewees as resulted from their answers to the questions posed during the interview are summarised below, according to the subject. A cassette recorder was used and all the interviews have been recorded.

Problem of erosion

All the interviewees from administration, experts, professionals and social and environmental groups agree that coastal erosion is a problem. However, most of them believe that for the pilot area Dolos – Kiti, there is need for better studies. Most of them strengthen the point for the quality of the studies concerning coastal erosion. People from administration and local officials believe that the undergoing studies are O.K. and will provide with accurate solutions to the problem.

All the interviewees pointed that we should protect only the areas where protection is needed, ie areas with buildings, tourist areas etc. We shouldn't try to construct coastal defence structures all along the 36 km. Although all supported this opinion, the people from local communities thought that each ones area is important to be protected.

All of them supported that there should be a control by the Government on the kind of coastal defence structures, and stop the illegal construction.

Morphological aspects - landscape

Most of the interviewees supported that they like the landscape which is created after the construction of coastal structures. Most interviewees noted that they prefer the offshore breakwaters of Alaminos and Faros than the groynes of Agios Theodoros. They thought that they have better aesthetics. Some were dubious whether the coastal structures should be so big, or the problem could be solved in more friendly way. Especially among the locals, there is the perception that the technical solutions carried out up to now have not been the right ones. The ones supporting this opinion insisted that they are not persuaded that coastal structures (like breakwaters) are safe for swimmers and that nobody cares for safety. They believe, based on what is happening to other areas of the island, that the offshore breakwaters create "currents" around their ends and thus they are not the right structures, "at least this is what is heard from newspapers".

Who is responsible for the coastline?

Officials and administrators know the authorities responsible for coastline. The rest had a great confusion on this matter. People from tourist sector were thinking that the Tourist Organisation is responsible for the coastline. The fishermen believe that the responsibility is on the Fisheries Department and so on. This is an important gap in information. And also shows the complexity of responsibilities that exist in the Government and Administrative system concerning coastal issues.

Actions taken- projects undergoing

All the interviewees were aware on the Master Plan which is these days under preparation by the Coastal Unit (Public Works Department) and the National Technical University of Athens. This is the only project undergoing for this area concerning coastal protection and improvement. However, the people, even administrators, were not aware of the proposals of the Master Plan. This is rather strange since the study is at its final stage and there have been public hearings in the area where a first draft of the Master Plans have been presented. This leads to the next paragraph.

Awareness – participation

Administrators and officials believe that participation of public is efficient and it is becoming more active due to the recent changes to the legal framework due to the EU harmonisation process. Professionals and social and environmental groups feel that the legal framework excludes them from active participation. They feel they don't have efficient information on what is planned for their area and even if they are informed they don't know how they can react. They don't feel they are entitled to participate in the decision making process and they believe that public hearing and "all these" are "dust in their eyes" ie the authorities use this obligation for public hearings just to satisfy the legal demands and nobody really cares on their opinion, unless they protest strongly. People from the tourist industry expressed the opinion that it is not good that the Federation of Environmental Organisations is now part of the decision making process, since they believe that they will block all the development.

A very interesting opinion was expressed by a hotel owner and a researcher. They supported that by including social and environmental groups in the decision making process we don't achieve "democracy through participation" unless these people are trained and educated on the subjects they become entitled to discuss and decide on. Otherwise the participation of ignorant people in this process is dangerous and can lead to very bad results.

With the exemption of officials and administrators, the rest of the interviewees get information on matters referring to coastline through the media. Most of them believe that the Government withhold information and try to keep people in dark in order to avoid protests.

Changes and Effects in local economy

Although the interviewees don't know the suggestions of the Master Plans for coastal protection of the area, they all agree that something should be done to solve erosion problem. Most of them are willing to accept any kind of structures, if this will solve the problem. The environmentalists support that there should be great concern on the environmental issues, but they also accept the need for defending the coast, or at least some parts of the coast. All of them believe that an improvement of the beach together with

the recent changes in land uses, will provide local economy with significant benefits (the Environmentalist oppose strongly to this general transform of agricultural areas to tourist, since all along Cyprus the coast will be build and thus the environment is degrading).

Networking – cooperation

The administrators and the officials feel satisfied with the existing network for communication and information exchange among the authorities.

7. INFORMATION AND COMMUNICATION LEVEL

7.1. Level of information

7.1.1. Existing Information

The major source concerning information on coastal issues is several Governmental Departments, since there are no Institutes, Universities or research centres dealing with these issues. Most of the data are available in raw form and are kept to each Department's archives. So, the information is very scattered and it is very complicate to have a complete catalogue of existing information.

There are mainly eleven Departments/ Organisations which have significant data/information on coastal zone:

1. Coastal Unit – Public Works Department – Ministry of Communication and Works

Coastal Unit has a detailed monitoring program covering all the length of Cyprus coastlines. The program includes:

Anual field work

5. bathymetric survey of coastal profiles: once a year at the same period (every summer) there is a bathymetric survey covering all the coastal profiles. The measurements cover the whole length of each coastal profile: a wadding part from approximately +0,5 m (height above MSL) up to a water depth of -20,0 m (below MSL).
6. sediment sampling: at the same time with the bathymetric survey, sediment samples are taken (with Van Veen grabs) from specified points on specified coastal profiles, covering the entire length of the profile. The samples are treated (granulometric analysis) at the Laboratories of the Geological Survey Department and the Public Works Department.

-
7. photographic survey: once a year, four photographs are taken at each benchmark, which show the condition of the coast. This is an extremely valuable source of information, since the evolution of the coastline can be documented visually.
 8. vegetation inventory: every a couple of years, there is a sampling of the sea bed vegetation, at the same time with sediment sampling.

Field work in areas of morphological interest

In addition to the above, some coastal areas can be occasionally characterized as areas of morphological interest, and more frequent monitoring is done there for as long as it is needed to have conclusions. Coastal areas with special morphological interest are:

- river deltas
- eroding areas after a storm
- areas where coastal defense structures are going to be constructed. In these cases the area is monitored in detail before the construction, in order to have reference data, and for some years after the construction
- areas where coastal structures have been constructed before 1993

The Unit has installed waveriders in specific areas around Cyprus, recording continuously wave characteristics. The wave data for Cyprus as they result from ship observations (from the Data bank of the Dutch KNMI) are also available in Coastal Unit.

The Data Bank of the Coastal Unit hosts all the results of the field work and documents which can indicate the historic evolution of the coastline.

The data of the Data Bank of Coastal Unit compose an important basis for the studies on coastal dynamics, coastline evolution and coastal morphology.

2. The Fisheries Department – Ministry of Agriculture, Natural Resources and Environment

Fisheries Department has a systematic monitoring program for coastal water quality around Cyprus. The Department also has analytical data on coastal fauna and flora and a very interesting data bank on oceanographic data.

3. Meteorological Service– Ministry of Agriculture, Natural Resources and Environment

Meteorological Service has a large Data Bank with all Meteorological data: wind, precipitation, temperatures. The meteorological stations are installed in a quite dense network all around the island. The Service publish the data in annual reports and also in thematic reports (eg report for wind climate etc).

4. Water Development Department– Ministry of Agriculture, Natural Resources and Environment

The Water Development Department has the data bank on river catchments, discharges and surface water.

5. Environmental Service – Ministry of Agriculture, Natural Resources and Environment

Environment Service has the Library for Laws and Directives referring to environment, the strategic plans on coastal management and the Environmental Impact Studies, which are considered public documents and they include several significant information.

6. Geological Survey Department – Ministry of Agriculture, Natural Resources and Environment

Geological Survey Department has the Data Bank for sediment quality and coastal geology.

7. Town Planning and Housing Department – Ministry of Interior

The Department has the maps of land uses.

8. Land and Survey Department – Ministry of Interior

Land and Survey Department has the chartographic data (maps of different scales and details), series of airphotographs since 1963 and photogrametric work on coastline position.

9. Statistical Service – Ministry of Interior

Statistical Service has all the data on population, economic activities, consumption of resources etc.

10. Cyprus Tourism Organisation

The CTO has data concerning tourism. Some of the data are published every year (amount of visitors, availability in beds etc).

11. The Cyprus Ports Authority

The CPA has data on tidal variations in the harbours and wave records near the harbours.

7.1.2 Data accessibility

There are Departments who generate, manage and publish the information and others who keep them as raw material. In the last case the access to these data for the public is rather difficult. The Governmental Departments who do not have the tradition to publish their data are still very reluctant to provide access to their Data Bases to private Consultants or non-Governmental Researchers. This attitude results in a huge overlapping of work, and insufficient data for non-Governmental experts.

Even in the case where data are available, they are usually in paper form. They are not available in electronic form and this makes working with these data difficult and expensive.

Some Departments have information offices, where public can go and just buy the reports or maps needed. Some other Departments have more time consuming procedures: the interested person has to write a letter, explaining why these data are needed and it takes a couple of weeks to have the positive or negative answer.

7.1.3 Cost of data acquisition

The financial cost of obtaining the information is not significant. The available information is rather cheap to buy. However, the actual cost has to be estimated according to the time that has to be spent in order to obtain the necessary data. The data are so scattered that it can take much time and effort to find the right source and then go through the legal procedures for acquiring them.

7.1.4 Data appropriateness

Usually the available data are accurate and of good quality. The problem is when the data are in raw data. The work on raw data can be tricky if the background, i.e. the details on the methodology of field work out of which these data resulted, is not well defined.

7.1.5 Existing information and gaps at each level (see annex III)

There are three major deficiencies in existing information:

- the complications which result due to the dispersion of the data in so many sources
- there is not any index where the interested stakeholder can check if the information needed are available and trace their location
- the delay of the Departments to have digital Data Bases. Most of the data are available on paper form, which makes things very difficult, especially when dealing with maps.

Generally the data which are available in the Governmental Departments are of good quality. There has been systematic data collection for more than 2 decades in most of the Departments and in some Departments (eg Water Development Department and Geological Survey, the data are systematically collected for more than 80 years.

There is an immediate need for a centralised Data Base, with possibility of access to the public. At least a network of Data Bases among the Departments who have data.

It is very difficult for the decision makers to use the data with the complicated way they are organised. It is also very difficult for the public to use the data.

The above three deficiencies are the major drawbacks in the existing information. There might be data gaps. Even gaps are difficult to be traced with the existing information scatter and lack of organising.

7.2. Communication

7.2.1. Gathering of information

The most usual way to gather information is to visit all the central offices Governmental Departments which are involved with the specific issue under study. If there is personal relationship, information can be obtain more easily. If the data are published or “publishable” then they can be bought. Otherwise formal processes are obligatory, the complication of which vary from writing letters and explaining why the data are needed to asking for written permissions from the Director of each Department.

7.2.2 Mechanisms of communication between stakeholders

The main communication channel between the different government offices is informal, through personal meetings, telephone calls and e-mails. However the official way of communication is through formal meetings and reports.

As regards the rest of the stakeholders, there are not formal mechanisms of communication and information. The civilian becomes informed mainly through media, the annual reports of the Departments or in some cases by attending workshops and seminars.

7.2.3 Information dissemination to society

Specific information concerning projects which are under study, become available to the public through public hearings, which are obligatory for all the projects which are subject to Environmental Impact Studies, according to the Law for Environmental Impact Studies of 2001.

In general the communication policy of the Governmental Departments and even Local

Authorities has been very limited until now. This was a common comment of all the stakeholders which have been interviewed.

8. LOCAL INFORMATION SYSTEM - SUGGESTIONS

8.1 Information accessibility

As it was presented in previous chapters, one of the major problems of coastal data is the lack of any central organisation of Information. Data exist and they are of good quality. However they are spread in several Governmental Departments and most of them in "hard" form. It is very difficult to locate the needed data and when located the data are difficult to access (see chapter 7) and difficult to work with them. The whole process has high cost.

It is also very difficult for the decision maker to use the data, for the public to have access to them and generally

8.2 Suggestions for general concept

A system that could concentrate the data in one Central Data Bank, could be a solution to the problem of accessibility. The use of spatial representation methods, such as GIS (Geographic Information System), can make the use of the Data Bank more friendly-to-users. Generally, it is important to apply/use the of state-of-the-art e-technologies to make the Information System more robust. For example the Data Bank could be inserted in the Internet and thus give more people the possibility to visit it/

We believe that the following three parameters are the most important to be taken under consideration when designing a Local Information System:

- A user- friendly Information System
- Easily accessible System
- A System divided in "levels" according to users. i.e. a level for general public, a level for decision makers and a level for scientists

It is important to take provisions for systematic update of the Data Bank

8.3 Suggestions for the contents set-up

Since this specific Local Information System refers to coastal information, it would be

optimum that the system is structured according to the principles of Integrated Coastal Zone Management (ICZM). The major sectors could roughly be the following:

- Natural parameters – physical processes

- Ecology
- Sediment transport
- Sediment budget
- Hydrodynamics (waves/ currents)
- Geology
- sedimentology
- morphology
- coastline evolution
- hydrology
- meteorology

- Manmade parameters

- Population
- Occupation
- existing infrastructure
- Archaeology
- land uses

The LIS should include, except from the data in form of numbers/ tables, the following:

- Thematic maps (geology, hydrogeology, bathymetry etc)
- Photo gallery
- air photos

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