



**Expert Meeting
“Towards Mediterranean Regional Strategy on Coastal
Erosion: Benefiting from the EUROSION Project“
(Nicosia, March 16 - 17, 2006)**

REPORT

Priority Actions Programme
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1. Within its programme of activities, PAP/RAC organised the expert meeting “Towards Mediterranean Regional Strategy on Coastal Erosion: Benefiting from the EUROSION Project“. It was focused on the EUROSION project (www.euroSION.org) implemented by the EU. It was a very successful project that resulted in recommendations for combating coastal erosion in the EU countries. In agreement with the EU, it was decided to consider the possibilities of using the EUROSION results in the Mediterranean countries with the objective of defining a strategy of coastal erosion combating in the Mediterranean in the near future. Thus, the main objective of this meeting was to identify the parts of the EUROSION project that could be applied in the Mediterranean and to prepare an appropriate programme of activities.
2. The meeting was organised at the "Holiday Inn" hotel in Nicosia, Cyprus, on March 16 - 17, 2006. It was attended by experts from 11 countries and the EU, as well as a number of observers from Cyprus. A complete list of participants is attached as Annex I, while the Agenda of the meeting is contained in the Annex II.
3. Mr. N. Iacovou, Head of the Coastal Section of the Public Works Department, welcomed the participants wishing them a pleasant and comfortable stay in Cyprus. He thanked H.E. Mr. Harris Thrassou, Minister of Communications and Works, Mr. Makis Constantinides, Permanent Secretary of the Ministry, and Mr. Efstathios Hamboullas, Director of the Public Works Department and Mr. Nikos Georgiades, Director for Environment, Ministry of Agriculture, Natural Resources and Environment for attending the meeting and their support in its preparation.
4. Mr. N. Georgiades, in his role of Cyprus National Focal Point for PAP, informed the meeting of the good co-operation of Cyprus and other Contracting Parties to the Barcelona Convention, a good part of it through the activities of PAP/RAC. He reminded that the issue of coastal erosion was very important and stressed the need of integrating them into coastal defence policies. He wished the participants a pleasant stay in Cyprus and fruitful work in the meeting.
5. Mr. E. Hamboullas, Director of the Public Works Department, welcomed the participants on behalf of his Department. He informed that the methods of coastal erosion management were of paramount importance for the Government of Cyprus. He mentioned several studies concerning the coastline of the free part of Cyprus carried out since 1993. The purpose of those studies was to find proper methods to protect the coastline and improve the quality of the beaches without serious consequences to the environment. Following those studies, Master Plans and detailed designs were prepared. The studies covered almost 50% of the free coastline. The project was entitled "Coastal Zone Management for Cyprus" and was financed 50% by the European Union. Mr. Hamboullas also informed on the current activities in the field. He assured the meeting of the great importance they attributed to the present meeting as it offered the chance to contribute to the dispersion of knowledge and establishment of required co-operation to reach the common goal, a sustainable management of coastal erosion. Convinced that the present meeting would represent a step forward in the right direction, he wished the participants a pleasant stay in Cyprus. He took the opportunity to thank PAP/RAC for the initiative to organise the meeting in Cyprus. Finally, he thanked the Minister and the Permanent Secretary, as well as colleagues from other ministries, departments and agencies for attending the meeting and commitment to this very important topic.
6. Mr. I. Trumbic, Director of PAP/RAC, greeted the participants on behalf of Mr. P. Mifsud, Co-ordinator of the Mediterranean Action Plan (MAP), who was unable to attend the meeting personally but followed closely all the activities related to coastal erosion. Mr. Trumbic informed the meeting that PAP/RAC had been active in the field for more than 20 years. Coastal erosion

is not a separate activity of PAP, but is included as a part of a wider activity, integrated coastal zone management. The EUROSION Project, that had been prepared for the EU countries, was deemed very successful, and it was concluded that it might be applicable in the Mediterranean region and beneficial for the countries of the region facing similar problems. Since coastal erosion is not present in all the countries of the region, not all countries were invited to the present meeting, but only those for which this is an important issue. The main objectives of the meeting were to present the results of the EUROSION Project and to get an insight into the experience of the countries regarding the erosion and mitigation measures. Mr. Trumbic mentioned ICAM Protocol as one of the major current initiatives undertaken by MAP. It is envisaged as an important instrument for better management of coastal zones of the Mediterranean, and coastal erosion is mentioned specifically in the draft text of the Protocol, which testifies of the importance that the matter has been given. He then mentioned the CAMP project currently being prepared for Cyprus. The project that will be implemented over the following two years is expected to lead towards a better management of coastal zones as a whole, including the coastal erosion. Mr. Trumbic thanked the Public Works Department for the efforts put in the organisation of the meeting, and wished the participants fruitful work.

7. H.E. Mr. H. Thrassou, Minister of Communications and Works, also welcomed the participants. He reminded of the importance that the issue of coastal erosion had for a number of countries including Cyprus. He briefly introduced the activities undertaken by the Government of Cyprus in that respect, and raised hopes that the meeting would be a step to the correct direction and help achieve the scope and tasks of the EUROSION Project. He wished the participants a very productive meeting and a pleasant stay in Cyprus. The full text of the Minister's speech is attached as Annex III.

8. Ms. B. Snoeren, European Commission, DG Environment, DGENVD3 Cohesion Policy & Environmental Impact Assessments, presented the EU activities on coastal erosion in the context of ICZM, and gave an introduction to the EUROSION project. Starting her presentation, she thanked PAP/RAC and the Cypriot hosts for this major opportunity to share knowledge and experience. She pointed out that coastal erosion was a specific topic and that very little knowledge existed on that matter. She then introduced the EU ICZM Recommendation (2002/413/EC) which recognises sound coastal erosion management as one of the strategic themes upon which the integrated planning and management of Europe's coastal zones is to be based. The Recommendation provides 8 principles that jointly define the key characteristics of ICZM. While established to define ICZM in general, the principles are very similar to best-practice risk management recommendations. The EU ICZM Recommendation is currently being evaluated, in view of a Commission report to the European Parliament and the Council by the end of 2006. Future policy and possible measures will be set in the broader EU policy context of the "Green paper towards a European Maritime Policy", due out end May 2006. Coastal risks will be part of this Green paper. The results of the EUROSION project will be taken on board in this exercise. The EUROSION project delivered the first pan-European assessment of both the extent of the coastal erosion problem in the EU and the management practices. The study highlighted that coastal erosion risk affects a significant portion of the EU shoreline and that due to climate change and continuing human encroachment on the coast (coastal squeeze) the problem is set to increase in the future. The management however is still very much ad-hoc and the knowledge about natural processes is not effectively being used in decision making processes. On the basis of the findings, the EUROSION project provided 4 strategic policy recommendations:

- Take a more strategic approach to coastal erosion based on increasing (or restoring) coastal resilience;
- Internalise coastal erosion costs and risks in planning and investment decisions, including achieving a better share of risk and costs between public authorities and causers of erosion problems or benefactors of protection schemes;
- Make responses to coastal erosion more pro-active and planned, based on transparent coastal sediment management plans;
- Strengthen the knowledge basis of coastal erosion management.

Through these policy recommendations the EUROSION project contributes significantly to establishing a broader policy framework which is needed to address coastal erosion. Coastal erosion is a matter of planning and management of the wider coastal zone (ICZM) and there is a need to stimulate a shift in approach away from merely finding ad-hoc engineering solutions to an erosion problem in a specific location.

9. In the brief discussion that followed Ms. Snoeren's presentation the issue was raised of risk maps preparation, i.e. whether the preparation of new risk maps had been recommended. That issue remained open in the Project but it is very unlikely that the preparation of risk maps would be suggested. Rather the suggest directives for mitigation of coastal flooding and soil erosion.

10. Mr. H. Niesing, Ministry of Public Works, Transport and Water Management of The Netherlands, presented the Mediterranean component of EUROSION. He first pointed out the differences between the Mediterranean region and the northern European countries with regard to the nature of erosion processes and their impacts, as well as regarding the level of pressure on the coast, historical background, etc. For those reasons, he emphasised the need to be careful when applying European solutions in the Mediterranean, and stressed the importance of a country's own experience. However, EROSION findings could, by all means, be very useful for the Mediterranean countries, as they were, for example, even for England in soft coast management. Given the economic development, step-by-step solutions would be required. Another important point is transfer of knowledge and experience from one country to another. Guidelines and legal justifications at the regional level might be provided by the Kiev Protocol, whereas MAP should put action at national level. As possible solution measures, he proposed the following: (i) specialists/universities should draft hazard maps based on actual knowledge; (ii) priorities should be placed on improvement; (iii) cost-benefit analysis should be made of a proper information system versus blind risk taking; (iv) awareness should be raised of local politicians and community when risk becomes unacceptable, a possible tool being information campaigning; (v) when new measures are to be drawn, local experts should be taken on board, and efforts made in the explicit internalisation of risks (for investors, permit giving authorities and exploiters). As one of the key points, he made the following citation from the EUROSION Project findings (2004): "Information lies at the heart of good decision making – at each level identifying the need and collecting and collating relevant information helps communication and the understanding of the issues and their possible solutions."

11. As a part of his presentation, Mr. Niesing showed a film about the problems of coastal flooding and coastal erosion facing the coasts of the United Kingdom and The Netherlands.

12. In the discussion that concluded the morning session, numerous questions were raised. The first one was whether the EUROSION recommendations were relevant for the Mediterranean, and if so, could they be used to set a form of action plan. It was replied that some had already been applied successfully in some Mediterranean. A very good job had been done in promoting the inclusion of coastal erosion issues into the ICZM processes. Housing along the coastline was mentioned as one of big problems facing most of the countries of the region. As a possible solution it was suggested that not only EIA studies should be prepared for each development project but they should also be obeyed. It was also suggested that coastline sediment plans should be provided wherever an impact assessment of a project/development is done. Opinion was expressed that EUROSION was very relevant for the Mediterranean, especially since the erosion problems are very difficult to tackle. Also, a high level of flexibility would be needed to see what is applicable and where. A participant enquired whether the link between the effects and who is responsible had been investigated, and the reply was negative. However, additional projects were in preparation to deal with the recommendations on the ground. The importance was stressed of environmental assessment, especially SEA, as a tool to estimate the impacts of coastal erosion, and especially the man-induced one. The EU has a Directive on SEA, but many Mediterranean countries are not members of the EU. The ICAM Protocol, currently in process of negotiation, involves a large number of stakeholders. Its art. 10

deals specifically with coastal erosion, so, if adopted, it could provide an appropriate legal instrument. Another interesting point raised in the discussion regarded the difficulty of sharing knowledge and experience if a mistake you had made produced short-term economic benefit. Therefore, a rationale behind a solution should be explained properly. In the case of coastal erosion, as in any other case, a very important role is played by the local conditions and the national priorities. A very good example was provided by the Moroccan representative who said that in her country providing sufficient quantities of drinking water was a top priority, while the resulting damage to the coastline was less important. However, it is important to realise the problem, and a solution can be found of getting the sediment to the coast anyway. There was a general agreement among the participants that experience and knowledge should be shared and widespread. Regional co-operation among the countries would be beneficial for each individual country.

13. Mr. S. Zervos, Coastal Section, Public Works Department, Ministry of Communications and Works, Cyprus, presented the activities relative to coastal erosion management in Cyprus. Specifically, he presented the plans of his Ministry to cope with the problems of erosion occurring at the free shore of the island. A short mention was made of the study for the "Coastal Zone Management for Cyprus" which had been carried out during the period 1993-1996 by the Public Works Department in cooperation with foreign experts of Delft Hydraulics. He also mentioned the study for the management and improvement of the 3 sea shore areas, carried out recently by the Public Works Department in co-operation with the National Technical University of Athens. The main task of that project was to find proper methods to protect the coastline and improve the quality of the beach, where necessary, without any serious consequences for the environment. At the end of the project, Master Plans for selected coastal sections, as well as conceptual and detailed designs were prepared for the proposed coastal and/or improvement works, with due care of the environmental aspects. In 1998, the Cyprus Government started the implementation of these Master Plans and detailed designs. The implementation of the Master Plans is expected to take several years but the results from the work done so far are very encouraging. In this presentation, the measures that were taken for the protection of the coastline in specific areas (construction of coastal defence structures, removal of illegal structures, etc.) and their results were presented. Having Master Plans enabled the Government to proceed with the appropriate decision for the protection, management and monitoring of the coast. The experience and benefits gained from the implementation of the Master Plan and its effects on the decisions to be taken in other areas were also presented.

14. Ms J. Constantinidou, on behalf of the Environment Service, Ministry of Agriculture, Natural Resources and Environment, presented the Coastal Area Management Programme for Cyprus. She started by analysing the current state of the coastal zone. The coastline covers 772 km, hosting 50% of the total population, as well as 90% of the tourist development and 40 – 60% of GDP. There are several developments along the coast, like airports, ports, desalination centre, refinery station, energy plants, industries, or archaeological sites, etc. Five coastal areas are under the "Natura 2000" network, 48 beaches were awarded the Blue Flag for the year 2005, and 100 coastal bathing areas are being monitored under the EU Bathing Water Directive. On the other hand, the main pressures on the coast are the intensified urbanisation, unbalanced urban / rural – coastal / hinterland development due to uncontrolled development of tourist activities, and the limited local-level environmental awareness.

15. Ms. Constantinidou continued by presenting the CAMP background and timetable, mentioning that in June 2005 the CAMP Cyprus Agreement was signed. The inception workshop was organised in January 2006, and at the moment they were at the stage of proceeding with the declaration of the Terms of References for the seven National Specialists. The CAMP objectives are to offer assistance to Cyprus in solving urgent environmental problems; introduce the ICAM as the basic tool to achieve sustainable development of the Cyprus coastal area; increase collaboration among the competent Departments and national experts in the policy-making and implementation process; raise public awareness of the scope and significance of coastal area management and involve stakeholders; share knowledge on

coastal issues by collaborating closely with MAP and PAP/RAC; and harmonise with the EU Integrated Coastal Zone Management (ICZM) Recommendation. The activities which will be carried out will elaborate and demonstrate the application of Methodology and tools of ICAM for the coast of Cyprus as a whole. Within the broad island-wide scope of CAMP Cyprus, a local spatial dimension will be incorporated, through the proposed Pilot Case Study Application Projects. The CAMP for Cyprus was prepared by the MAP as the Project Co-ordinating authority, and the PAP/RAC as the Project Implementing Centre. The overall project management will be carried out in close co-operation between the Cyprus Government and MAP-PAP/RAC. On the Cyprus side, responsibility for the project management will be exercised by the Director of the Environment Service acting as the National Project Director. On the MAP-PAP/RAC side, the PAP/RAC Director will be responsible for the Project. Finally, Ms. Constantinidou pointed out the principal output of the project, mainly, to understand the ICAM methodology and SD; to apply ICAM methodology for erosion control management in coastal areas; to address use conflicts and policy harmonisation needs; to incorporate into policy framework and development of a common broad framework; to raise local level awareness and participation; to lead towards an integrated approach to CZM, and to contribute to regional co-operation and experience and learn lessons for wider application.

16. Ms. X. I. Loizidou, Head of Coastal Zone and Natural Resources Management Department, ISOTECH LTD Environmental Consultants, delivered a presentation on environmental and social aspects as an inherent part of coastal erosion management. Coastal zone is a dynamic environment and each coastal area is a unique natural system. It is thus necessary for the coastal engineer to have a good knowledge of the wider coastal system, before proceeding with the suggestion of any engineering solutions for an eroding beach. The coastal engineer should work together with environmental experts, and decisions and designs should be based on the environmental and social characteristics of each coastal area. Water quality, availability of quarry material, ecological characteristics of the wider coastal area (e.g. are there any *Posidonia Oceanica* meadows), historical significance, protected areas, aesthetics of the landscape, the value of coastal land, the cultural characteristics of the local population, are only some of the parameters that a coastal engineer should take into consideration, together with clear addressing of erosion rates, sediment transport patterns, evolution of coastline, hydrodynamics, etc. The coastal engineer should believe in integrated approaches, and should be able to use all the available tools, such as EIA, SEA, ICZM, Fiscal Instruments, etc, for better decisions and designs. Data availability is of great importance, in order to be able to understand the uniqueness of each coastal system and proceed with the correct estimates. Awareness raising of decision-makers, local authorities and generally the civil society is a crucial parameter for the success of the implementation of sustainable solutions in eroding beaches.

17. Ms. E. Roca, Institute of Environmental Science and Technology, Autonomous University of Barcelona, Spain, made a presentation illustrating several aspects of the coastal erosion management in Spain through some of the case studies conducted within the EUROSION Project. The policy framework on coastal protection in Spain is characterised by a concentration of responsibilities in the hands of the national administration through the General Directorate for the Coast. Regional level holds fragmented responsibilities of multiple sectoral topics (territorial planning, protected areas, ports, etc.). Currently, there is a lack of strategic planning on coastal erosion. Coastal defence projects do not respond to any programmed plan, but emergency situations. Moreover, although the coastal law prescribes public participation procedures, in practice, it is highly limited. This situation highlights a significant need to generate long-term plans with specific objectives at different spatial scales, and to clarify responsibilities at each administration level with co-ordination mechanisms among them.

18. Ms. Roca introduced the three cases reviewed in the Mediterranean Sea: Ebro Delta, Can Picafort (Mallorca) and Sitges (Barcelona). The first one is the main coastal delta of the Iberian peninsula. Several factors have a direct impact on the erosion processes in the Ebro delta. On one hand, the reduction in the river flow due to the regulation by dams for e.g. irrigation and water supply has reduced sediment contributions. On the other, the human occupation of the delta, which has induced the transformation of the wetland into rice fields, has significantly

reduced its resilience to face extreme storm events. In particular, the delta shows a tendency towards a negative sedimentary budget in the deltaic front and the adjacent coast. This trend is positive only at the end of the spits. Various solutions have been implemented to eliminate and reduce this erosive trend in the delta, but they mainly failed. The latest proposals made by an interdisciplinary board of experts pointed out a managed realignment strategy consisting of the following actions: dredge and recirculate sediment budget from dams, provoke some avenues per year, reduce daily changes in river flow due to hydro-electrical plants, increase present deltaic resilience with wetland restoration and the recuperation of the old river mouth and channel. Ms. Roca then presented the case of Can Picafort in Mallorca. It is a sandy beach nourished mainly by sediments of bioclastic origin from the biological activity of the *Posidonia Oceanica*. The study area, with significant tourist and recreational functions, shows erosion problems due to several human-induced factors. First, the housing on the foredune has implied that the beach system cannot replace the sediment losses during the storms. In addition, nautical activities during the summer season affect the *Posidonia* meadows compromising this natural reservoir of sediments. So far, the main strategy implemented has been based on periodical nourishment before the high season with sand originating from other parts of the island. The results, which are just short-term, affect on one hand the *Posidonia* meadows, and on the other it was criticised by beach users and hotel owners because the new sand had different texture than the original one. Some of the recommendations to address the problems point out the need to internalise the ecosystem services (e.g. protective and nourishment effect of the *Posidonia*) within the planning procedures and provide a long-term perspective. The last case presented regards the village of Sitges, south of Barcelona. This stretch of coast is made up of a sandy area divided by breakwaters and other coastal defence works, which are the result of a strengthening policy that started back in the 1930s. Over the past 50 years, a number of man-induced causes have changed the layout of this coastal area and led to a lack of sediment. The latest proposal of the Ministry for the Environment to deal with coastal erosion in Sitges was categorically rejected by the public. The project proposed was a huge plan to redesign the seafront of the town, which is currently a symbol of local identity. The main arguments of these stakeholders were that the project entailed a radical change to the water front of Sitges, uncertain environmental impacts, a questionable distribution of uses along the beach, and modifying and reducing one of the town's most identifying features: the boulevard, an element highly valued by the public. Studying the case of Sitges ended up being a paradigmatic example because of the intensity of mobilisation of the town population. An important conclusion is related to the knowledge base for decision-making. The scientific knowledge is not enough to address problems of coastal erosion. An appropriate interface among experts, decision-makers and society should be worked out in order to provide a participatory framework towards a sustainable management of erosion problems.

19. Mr. A. G. Abul-Azm, Professor at the Cairo University, Egypt, presented coastal erosion in Egypt. He gave a summary of the Egyptian legislation system regarding coastal erosion and the previous efforts made towards a national strategy for ICZM in Egypt. Within the ICZM framework programme it has been recognised that shoreline erosion was a major issue facing development in Egypt. This had been identified earlier and attempts are still underway to contain this issue on the physical, institutional and legal levels. Those attempts are not going at the same pace as the development demands along the shoreline. Examples were presented showing that the concept of shoreline management is not well understood by many key stakeholders in Egypt such as decision-makers, private sector and the public. And thus it is missed in many sensitive areas for erosion. Master plans for shoreline erosion are not well defined for many local areas. Shoreline management plans are missing in most of the local Governorates of the coastal area of Egypt. Co-operation with international institutions and programs such as MAP, PAP/RAC and EUROSION programme is very much needed in Egypt. Development and dissemination of tailored-made shoreline management guidelines could be an area of future co-operation, particularly if translated into Arabic language, as well as development of a communication toolbox with case studies from the southern part of the Mediterranean. Consideration of case studies in sensitive areas exposed to erosion is another much needed area. A similar example is the Fuka-Matrouh ICAM project which was implemented by the PAP/RAC and concluded 7 years ago. Many of the recommendations made

have not been taken into account for the re-planning of this area. Expanding the EUROSION database to include the south of the Mediterranean for eroding shorelines and the wind/wave climate is another area. EGY-MED wave Atlas (developed at the Cairo University) could be a useful tool for that. Utilising the materials produced by EUROSION as teaching material for EDUCOM@MED could be an area of co-operation. EDUCOM@MED is a graduate program on ICAM, produced under the EU/TEMPUS fund among 4 Mediterranean universities in co-operation with PAP/RAC.

20. Mr. H. Heurtefeux, Head of Coastal Research and Monitoring Service, Environment Directorate, EID Méditerranée, spoke of new perspectives of beach management in France. With 24.9 % of coast facing erosion (according to the latest evidence) France is very concerned with this issue. According to the EUROSION programme, the French regional administrative entity called "Languedoc-Roussillon" has a very high exposure to coastal erosion. For several decades, the coastal management in France was to thwart erosion and to hold the line. Attempts to fix the shoreline involved the use of hard defences (breakwaters, groynes, and seawall) often in front of built up areas but sometimes in front of natural areas as well. Consequences are more than 250 "classical" defence structures along a 300 km long coastline. Even if this answer to erosion is local, its repercussions on nearby littoral systems are disastrous. That's why maintaining the current coastline protection without any alteration is not sustainable from any perspective. New perspectives of beach management appear in the two case studies presented. The first example concerns a specific area with preservation (because of an old abbey, very close to the shoreline) and variety of coastal types (dune systems, wetlands, sandy beaches, barrier beaches with inlets). To preserve this specific area it will be decided to manage realignment thanks to dune creation, economic activities moved and seawalls removed. The second example concerns a "natural" sandy beach between two seaside resorts. Thirty years ago a minor road has been built on the dune. This road will be destroyed to restore natural dune dynamic and stop anarchic parking. These two case studies prove that holding the line is no longer officially regarded as a realistic long-term option for coastal management in France.

21. Mr. L. E. Cipriani, of the General Directorate of Territorial and Environmental Policies of the Tuscany Region, had a presentation on coastal erosion management in Italy. The coastal area has long been recognised as an important natural resource for many Mediterranean countries, providing a vital source of income from tourist exploitation. However other productive sectors, such as agriculture, commerce and industry - with the associated need of rapid communications, conflict with the former and more sustainable activity. In addition, coastal infrastructures, such as harbours and ports, create *foci* of urban development and of infrastructure convergence. With predicted sea level rise and the increased movement of populations toward coastal areas, coastal protection studies have an extremely important socio-economic role. Historically, there have been many types of coastal protection schemes in Italy – from the Roman rip-rap protecting the *via Severiana* along the Latium coast to the latest beach de-watering systems installed at Ostia, Procida and Alassio, although the most evident beach protection projects for the Italian coastal communities are the engineered hard structures visible along the shoreline. These include, but are not limited to, seawalls, breakwaters, groins, jetties and rip-rap revetments. Other, less visible coastal protection schemes include beach nourishment projects and submerged engineered structures. Albeit these constructions support short-term objectives of protection, they fail to rectify the initial problem of contemporary shoreline erosion *vis-à-vis* the imbalance between the supply of sediment input and the volume of sediment being removed. In many cases these structures have exacerbated the problem both locally (increased wave energy from reflected waves expedites the removal of sediment offshore) and regionally (the removal of nearshore littoral sediment from the sediment budget). Furthermore, these structures have usually resulted in the loss of valuable dry beach area in the immediate vicinity and high costs for continuous structure maintenance.

22. Mr. Cipriani informed of recent policy changes in Italy that have shifted the responsibility for programming, planning and management of the coastal zone from the State to Regional and Local Administrations. This shift in policy coincides with the development of European

Commission recommendations (e.g. the EUROSION Study) addressing ICZM strategies for its member States prompting the need for increased stakeholder participation in local coastal zone management decisions. These policy changes have encouraged coastal scientists and engineers to test and implement new shore protection strategies in line with new directives. Evidence shows that traditional methods of shoreline protection in Tuscany (Italy) using hard engineering techniques such as groins, seawalls and breakwaters, cannot be supported as long-term strategies. Presently, there is a wide support to replace or modify these *archaeostructures* with soft engineering techniques such as sand and gravel nourishment or submerging the existing structures below MSL. The working slogan for this group of coastal scientists is “Back-To-The-Beach”. Two innovative coastal restoration projects have been recently undertaken in Tuscany. One comprises the lowering of the existing detached breakwaters, while simultaneously constructing gravel nourishment bounded by small groins. The second project, based on the results from experimental submerged groin structures, aims at reducing the present emerged groin and breakwaters which have modified the coastal landscape and induced downdrift erosion. Preliminary results are positive for both designs and provide more appropriate protection strategies in line with new regional laws for integrated coastal management. Future shore protection projects plan to use similar designs if the results of long-term monitoring programmes and physical models are positive – both in untreated areas currently eroding and also with the intention of replacing existing defence structures in stabilised areas with these new softer options. EUROSION recommendations have been presented to several countries where the coastal development is still in progress, and they give the opportunity to address it in a more sustainable fashion preventing mistakes and anticipating problem solutions.

23. Ms. M. Snoussi, Professor at the Department of Earth Sciences, Faculty of Sciences, University Mohamed V, Rabat, Morocco, presented an overview of the coastal zone of Morocco. The coastal zone of Morocco, which is nearly 3,500 km long bordering the Mediterranean Sea and the Atlantic Ocean, forms one of the main socio-economic nerve centres of the country. More than 60% of the population lives in the coastal cities which also host about 90% of the industries. Beaches and coastal resorts constitute a large percentage of the GDP. However, due to diverse human pressures, many coastal areas already experience acute environmental problems such as coastal erosion, pollution, degradation of dunes and saline intrusion in coastal aquifers and rivers. It is estimated that two thirds of the Moroccan coasts are retreating. Accelerated sea level rise will intensify the stress on these areas causing flooding of coastal lowlands, erosion of sandy beaches and destruction of coastal wetlands.

24. Ms. Snoussi presented two case studies to illustrate the coastal erosion in Morocco: the coast of Tangier bay, located on the strait of Gibraltar, which has been severely impacted by human activities, and the coastal area of Saïdia in the easternmost part of the Mediterranean coast which is still comparatively undeveloped but is planned to become one of the most important coastal resorts in the near future. In Tangier, the development of the city, extension of the port, high population density, huge urbanisation, and development of tourism in the 1990's, have led to severe erosion in the eastern part of the bay (2-3 m/y), which has in turn had a negative impact on the tourism income. In spite of the construction of two groynes and a breakwater to protect the hotels, the beach continued to retreat. The Saïdia beach comprises a long stretch of sandy beach interrupted only by the Moulouya mouth which constitutes the most important wetland in the Mediterranean coast of Morocco. The coastline of the Moulouya delta has been severely eroded following the construction of the Mohamed V dam. The adjacent beaches have evolved in an erosion/sedimentation context. Many efforts have been done to restore the dunes and protect the wetland within the framework of the Medwetcoast programme. Application of the IPCC methodology to assess the vulnerability of the Moulouya coastal zone to climate change has enabled to quantify the areas at risk of inundation and erosion due to accelerated sea-level rise. Using a GIS-based inundation analysis and an erosion modelling approach, the potential physical impacts were investigated and the most vulnerable socio-economic sectors at risk assessed. The results indicate that nearly 25% and 60% of the area will be lost to flooding under a minimum and a maximum inundation levels respectively. The most severely impacted sectors are expected to be the residential and recreational areas, the

agricultural lands, and the natural ecosystems. Shoreline erosion would concern 50% and 70% of the total area in 2050 and 2100 respectively. This assessment is of great concern insofar as the tourism development of the region is based mainly on the beach as an economic resource. In view of these expected severe losses due to sea-level rise, and the huge development in progress in the region, response strategies require identifying the most appropriate adaptation options. It is suggested that on the short-term scale, periodic beach nourishment associated with breakwaters and dune restoration, is the best option available against erosion and direct inundation of the tourist resorts at risk. Even if important autonomous adaptations could occur, the response of the Moulouya wetland will also require planned adaptation. The most useful option to preserve this valuable ecosystem is to declare it a protected area and leave it evolving with the nature. On a medium term, Integrated Coastal Zone Management plan, including building regulation, urban growth planning, institutional capacity building and awareness upgrading must be adopted. This plan should deal with both sea level rise and other impacts of global change, and ensure that coastal development does not increase vulnerability to sea level rise.

25. Mr. B. Todorovic, Public Enterprise for Coastal Zone Management, Budva, Serbia and Montenegro, informed the meeting on coastal erosion issues in Montenegro. The coastal erosion problem was not an issue in the past in Montenegro, especially on the rocky coast. Only in the past 20 to 30 years, erosion-caused changes started on the sandy parts of the coast, on the beaches. The main reason for this are human activities in the area. The urbanisation of the sandy beach hinterland caused an erosion problem from another aspect as well. The flows of the torrents that bring sediments to the beach were cut off, or large areas were artificialised so no sediment could be collected and transported to the beach. The big storms of December 1999 and January 2000 that hit the Montenegro coast caused huge damage to the primary breakwater (jetty) of the Port of Bar, and destroyed beach walls at the Petrovac, Miločer and Sutomore beaches. After that, the Public Enterprise for Coastal Zone Management started a survey of coastal erosion in Montenegro and produced several projects for repair and revitalisation of the damaged coast. In 2004, the Public Enterprise started the first monitoring of sand movement on the Petrovac, Pržno and Mogren beaches. Since this activity has only started recently, basic measurements and simple methods were used for measuring the depths on the defined profiles. These measurements were performed 4 times during one year and the changes in sediment thickness were recorded. The Public Enterprise for Coastal Zone Management is aware that the monitoring of coastal processes and an updated database are the key foundation for all future activities on the coast. Accordingly, they need to link all the data existing in different institutions in Montenegro into one integrated database. The problem they face is that currently there are scarce data and for some parameters, data either do not exist or are not available. Also, experts specialised in coastal erosion do not exist in Montenegro, and they have to rely on the information from the studies made during the SFRY time or foreign experiences. The Public Enterprise is interested to start the collection of coastal processes data and building of a database according to the tools and mechanisms adopted in successful international projects, such as EUROSION. For that, They would need help with capacity building, training and equipment, of which some they are planning to obtain from their own resources. The exchange of experience, information and data with other Adriatic and Mediterranean countries would be of a great benefit for them.

26. Mr. A. Bein, Project Manager on Eroding Coastal Cliffs, the Jerusalem Institute for Israel Studies, made a presentation entitled: The Eroding Cliff Shores of Israel - Policy and Mitigation Alternatives within their Socio-economic, Legal, & Environmental Context: Background and Description of the Problem. The management of eroding cliff shores presents challenge to national and local stakeholders. Tolerance to natural process is limited because of intensive demand on limited space, high property values and highly sensitive urban infrastructure. Defensive measures required as "emergency actions" are often implemented without sufficient attention to interrelated natural as well as anthropogenic processes, and space is not left for the processes to take place without causing damage to assets. The Israeli coastal sector which stretches over some 170 km in length, embraces about 70 km of a high coastal cliff, and is experiencing significant beach erosion and cliff retreat. Current annual average figures for cliff

retreat along the Israeli coastline are estimated at values between 5 and 60 cm/y, with an average of about 20 cm/y. Long shore sand transport from the Nile eastward and northward, which nourishes the shores of the south-eastern Mediterranean, provides a natural buffer against erosion. However, the sand budget is in deficit as the result of the Aswan Dam on the Nile River, the mining of sand before the '60's for building material and the local accumulation of sand on the up shore side of coastal structures. The dynamics of coastal processes have not always been taken into account by Municipalities nor have the future impacts of sea level rise been given due consideration. In face of the high costs of coastal defence for cliff shores, Municipalities are turning to national authorities, requesting that they take over the responsibility for financing defensive measures and covering claims for compensation.

27. Mr. Bein informed the meeting that the Government of Israel had decided to prepare a policy document on the problem of eroding cliffs shores which would be scientifically and technically based, and address policy and mitigation alternatives within their socio-economic, legal, & environmental context. Following the government decision, a multidisciplinary co-ordinated approach has been undertaken under the Ministry of the Environment and the Prime Minister Office. The operation managed through the Environmental Center of the Jerusalem Inst., includes four professional teams: an economical-planning team; a legal team; a geological-oceanographic team; and a coastal engineering team. The main activities and issues to be addressed are the following: i) Hazard mapping (classification of cliff according to geologic, geomorphologic and geotechnical characteristics; employment of GIS tools on rectified air photos to measure cliff retreat over the last 50-80 years; modelling of wave regime to assess *wave set up and run up* and employ sedimentological models to simulate beach erosion; integration of data to quantify coastal processes and assess possible implications of climate change and sea level rise on cliff stability; preparation of future scenarios /20, 50 and 100 years/ and transform scenarios into maps of areas likely to be exposed to hazards); ii) Mitigation alternatives (review of mitigation alternatives /*state of the art*, world-wide actual experience/; identification of coastal cliff sections which require protection and classify them according to urgency, public value, real estate value, etc.; presentation of feasible alternative measures for reducing level of risk, addressing their local and regional effects and provide cost estimate); iii) Economic aspects (*Costs of alternative management options*: 'hard' solutions, 'soft' solutions, ongoing maintenance, relocation, compensation; *Valuation of assets in areas at risk* /private properties, building rights, recreation areas, cultural assets, natural assets); iv) Legal aspects (distinguish between the extent that *national authorities are responsible* /'lack of care'/ and those where risk or negligence is the *responsibility of the property owner* /according to existing legislation or whether legal changes are needed/; *Responsibility* /rights to take action to protect private property, claims of negligence for lack of taking measures to prevent damage, availability & cost of insurance against loss, as for earthquakes/; *Liability* /proven cause-effect, ability to identify scale of damage caused, ability to prove responsibility for causing damage); v) Policy Document and Guidelines (the final document, to be submitted on summer 2007, will include: presentation of policy and mitigation alternatives within their socio-economic, legal, & environmental context; recommendations for governmental management, procedures and activities related to eroding coastal cliff area; criteria for governmental intervention and priorities for allocating budgets).

28. Mr. P. Vital, City Engineer of Netanya and Chairman of the Israel Association of Municipal Engineers, presented the local authority approach to cliff and coast management with special reference to the Netanya Municipality. He first presented the general problems related to the lack of legislation on responsibility and liability, lack of professional knowledge on cliff and coastal erosion, and lack of formulated co-operation between Government Offices (Central and Regional) and Local Authorities. He then briefly described Netanya as covering 13.5 km on the Eastern part of the Mediterranean Sea, situated at the eastern flank of the Nile Littoral Cell. That includes 9 km of severely eroding cliffs which creates immediate risks to people, adjacent buildings, and public spaces. Accordingly, there is an acute need for intervention in order to stabilise the coastal eroding cliffs and mitigate the coastal erosion. In an attempt to resolve the situation, the Environmental and Engineering report is being presented these days to the Ministry of the Environment and the Ministry of the Interior, in order to achieve two objectives:

(a) to obtain approval by the National Coastal Committee; and (2) to formulate a National budget for short-, mid-, and long-term interventions. The proposed methodology consists of the following: i) appointment of team of experts on all relevant professional fields, ii) division in cliff sectors according to geological features; iii) evaluation of stabilisation and preservation methods; iv) evaluation of stages according to need for risk mitigation based on environmental, social, cultural and economic issues. The environmental considerations include natural values, coastal values, rate of coastal erosion, hinterland amenities, and recreational and other public values. The planning evaluation comprises conflicts in sensitive areas, recognition of opportunities for planning conflict mitigation, environmental consideration in the planning process, and cliff monitoring as a planning instrument. Evaluation of causes for cliff erosion will focus on marine action, cliff top drainage, earthquakes, climate change, and human unsustainable activity. The following recommendations are made for cliff management: i) appointment of specialist responsible for monitoring erosion periodically; ii) visual assessment and calculations; iii) reports to the Ministry of the Environment and the Local Authority; iv) priority changes according to periodical monitoring results.

29. Mr. J. P. Doody, United Kingdom, introduced several thematic issues in coastal erosion. Historically the drivers for development on the coast have been food production and economic growth. Environmental considerations were of a low priority if they were considered at all. Where problems of erosion or flooding occurred, it was generally assumed we could build new and better defences to solve them. In more recent years there has been a growing recognition that this is not necessarily the best solution. Indeed in some areas it has been recognised that bigger and 'better' defences may have made the situation worse. Studies in geomorphology have helped create a much greater understanding of how the coast functions. With this understanding it becomes clear that coasts are dynamic and that erosion is part of the dynamic. Eroding cliffs provide sediment for sand dunes and other natural protective structures further along the coast. Problems arise either because human kind have built in a zone vulnerable to erosion or flooding or have changed the conditions such that the coast is more susceptible. The best example of this lies in the Mediterranean where river damming has restricted the movement of sediment from the land to the sea, turning deltas into erosional rather than accretional systems. The EUROSION project has helped to inform our understanding of the need to change policies relating to erosion and flooding control. Of prime importance is the recognition of the role played by sediments in coastal protection and the need to ensure there is a sufficient supply to create protective beaches, sand dunes and saltmarshes. This has helped lead the policy debate away from moving seaward or building bigger defences to one, which "works with nature rather than against it". Any new strategy must therefore rest on a number of key principles: i) learn from our mistakes (e.g. avoid building in vulnerable zones); ii) take account of coastal resilience; iii) understand the implications of global warming and sea level rise; iv) create greater stakeholder involvement (win hearts and minds). Not adhering to these principles can lead to projects that will be costly and unsustainable in the medium to long term.

30. Mr. Trumbic thanked everyone for excellent presentations which provided a good overview of the problems and of what the countries and local authorities were doing. He stressed that the phenomenon of coastal erosion was highly complex and should not be tackled at a local or country level, but rather at a sub-regional or even regional level. Coastal erosion should rise as matter of national priority. In order to achieve that, a cost-benefit analysis will have to be made when taking decisions, and the importance of awareness raising will have to be understood, especially when dealing with such long-term phenomena which do not show effects immediately. As another important issue, he mentioned impact assessment, and especially the EIA.

31. In the ensuing discussion, a number of issues were raised. In order to achieve local stakeholder participation it will be necessary to train them and work with them. Although EIA is very important and obliges those who prepare it to present the results, if the people lack technical knowledge they will not understand it. The best way would be to address the decision-makers first and then go to the local stakeholders. The importance was stressed of climate change for coastal erosion. Sea-level rise will have serious consequences making it impossible

for some areas to cope. Therefore, the existing knowledge should be transferred to the understanding of the politicians. In any case, communication is essential, and co-operation among countries is vital. In order to reach the politicians, it might be beneficial to prepare scenarios and risk maps, as those are easier to understand than technical explanations. Another "instrument" of getting the politicians interested in the environment is making it all look profitable. The importance of civil society was also noted, but it also has to be made aware of the priorities. Approaching the population, one should start from the people living near the problem areas, and then gradually spread ever wider. The wishes of the local population should by all means be taken into consideration in order to achieve a balance with environmental needs, bearing in mind, however, that it is impossible to make everybody happy.

32. Mr. Trumbic presented the conclusions and recommendations of the meeting. Those were thoroughly discussed and adopted as presented in the Annex IV.

33. Mr. N. Iacovou thanked the participants for attending the meeting and for the excellent presentations. He particularly thanked Mr. Trumbic, Director of PAP/RAC, for organising the meeting in Cyprus, Ms. B. Snoeren and Mr. H. Niesing for their support in the part regarding the EUROSION project, and Mr. N. Stipica for the administrative and organisational support to the meeting. Before wishing everyone safe trip home, he gave brief instructions regarding the field trip organised in the afternoon.

34. Mr. Trumbic thanked Mr. Iacovou and his team for organising the meeting so well and for being such excellent hosts, creating great conditions for work. He thanked everyone once again for their efforts, raising hopes that the activity will continue as well as it started.

35. In the afternoon, a field trip was organised to the areas of Larnaca and Limassol where the hosts showed the most prominent examples of coastal erosion and measures taken in the past to combat it.

ANNEX I

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ANNEX II

Agenda

Thursday, March 16

- 09:00-09:30 Registration of the participants
09:30-10:00 Opening of the meeting: welcoming speeches, objectives of the meeting, introduction of the participants, introduction to MAP/PAP
10:00-10:45 Introduction to EU activities on coastal erosion in the context of ICZM and Introduction to the EUROSION project
11:15-12:15 Thematic issues in the EUROSION project: tourism, coastal defence, SEA, GIS database
12:15-12:45 Mediterranean component of EUROSION
12:45-13:30 Discussion on the overall results of the EUROSION project
15:00-15:20 Case study: Coastal erosion in Cyprus
15:20-15:40 Case study: Beach erosion management (Spain)
16:00-17:10 Short presentation of participating experts on coastal erosion in their countries: Albania, Egypt, France, Italy, Morocco, Serbia and Montenegro, Israel
17:10-17:30 Case study: Local authority approach to coping with the severe cliff erosion (Netanya, Israel)

Friday, March 17

- 09:00-09:15 Conclusions of the first day of the meeting
09:15-10:00 Thematic issues in coastal erosion: impact of climate change, assessment of economic impacts of loss of assets, handling responsibility and liability for risk, etc.
10:00-10:30 Discussion on the thematic issues
10:30-11:00 EUROSION findings relevant for the Mediterranean region
11:15-12:00 Discussion
12:00-13:00 Elements of the strategy: Dissemination of the EUROSION results and recommendations in the Mediterranean region
13:00 Closure of the meeting
13:30-19:30 Field trip to Larnaca and Limassol coastal areas

ANNEX III

Address by the Minister of Communications and Works, Mr. Harris Thrassou

Dear Friends,

It gives me great pleasure to address the Expert Meeting "***Towards Mediterranean Regional Strategy on Coastal Erosion: Benefiting from the EUROSION Project***", which is organised in Cyprus for the first time.

I would like to welcome all of you, especially those who have come from abroad to share their experience and discuss coastal erosion issues with us.

As we know, coastal zone is an area of continuous morphological changes, due to its dynamic behaviour and its rapid response to any natural changes or human interventions. The coast is currently eroding despite the development of a wide range of measures to protect shorelines from eroding and flooding.

We consider the organising of this Expert Meeting regarding erosion as very important, since we believe that it contributes to the dissemination of knowledge and gives the opportunity to all the scientists and experts to join their knowledge and efforts for the common task, that is the management of coastal erosion in Europe and the Mediterranean.

Like most Mediterranean countries, severe erosion problems are encountered along the coastline of Cyprus. At the same time, the coastal zone of the free part of Cyprus is under increasing pressure of economic development, particularly tourism development, 90% of which is concentrated in coastal areas.

At early 90's, the Government of Cyprus decided to proceed/implement a coherent strategic framework in order to reconcile development requirements and exploitation within coastal zones, with the need to protect, conserve and where necessary improve coastal areas.

The Government of Cyprus gives high importance to this matter and through a number of studies, either using community programmes/funds (MEDSPA, CAMP etc.) or its own funds (study with National Technical University of Athens) aims at finding proper methods to protect the coastline and improve its quality without any serious consequences to the environment.

We hope that the outcome of this meeting would be a step to the correct direction and help to achieve the scope and tasks of the EuroSION project.

Dear friends,

I am confident that the speakers will share with you the wealth of their knowledge and experience in their fields of expertise as well as their ideas, suggestions and thoughts.

Concluding, I would like to wish you all a very productive meeting and a pleasant stay in Cyprus.

ANNEX IV

Conclusions and Recommendations

1. High-level decision-makers should be sensitised on the issue of the coastal erosion. One opportunity to do so is the forthcoming PAP/BP/METAP project on awareness raising and creating policy framework for integrated coastal area management, to be carried out within the context of the EU/MEDA SMAP programme. This programme is focused on ICAM. As the number of issues has to be identified in the region, which are supposed to be of the highest priority for decision-makers, coastal erosion could be one of them. In early April 2006, a meeting is scheduled to take place in Split where regional experts will discuss the implementation of the project. The issue of coastal erosion will be forwarded as critical for many Mediterranean countries.
2. For the next meeting of the Contracting Parties to the Barcelona Convention a specific recommendation on coastal erosion will be prepared, and will be addressed to the Contracting Parties with a request to take the issue of coastal erosion seriously.
3. INFO/RAC, the newly-established centre of MAP in charge of information management and information strategy of MAP, should be asked to develop a specific information strategy on coastal erosion.
4. The Mediterranean Commission for Sustainable Development intends to revisit the issue of ICAM by re-establishing the respective working group. The WG will outline a new set of issues that will reflect the current reality of the Mediterranean coastal areas. PAP/RAC will make everything possible that the issue of coastal erosion is prioritised. The WG will propose to CP the relevant recommendation.
5. Smaller projects on coastal erosion could be developed in the future CAMPs. It is also up to the national authorities to put this issue forward when proposing the list of activities in specific CAMP projects.
6. The Protocol on ICAM is entering the negotiation phase. As there is a specific article in the protocol that deals with the issue of coastal erosion, PAP/RAC will make every effort that it be retained in the final text. The support of CPs is requested in this endeavour.
7. PAP/RAC is ready to offer support when developing project proposals on coastal erosion to be financed from other sources.
8. The work on the regional strategy for coastal erosion could start. Since the wealth of technical material on this issue exists, and the problems associated with it are quite well known, the political support should be sought in order to gain wide regional consensus on the need to develop the strategy as well as to find means to develop it. During the next meeting of the CPs to the Barcelona Convention, a more specific political action could be organised.
9. The possibilities should be explored to include coastal erosion as an issue to be dealt with in the forthcoming GEF Project "Strategic Partnership for the Mediterranean Large Marine Ecosystem" that is being prepared by MEDU.
10. The special web page devoted to coastal erosion in Mediterranean should be created on the PAP/RAC web site.
11. It was suggested that the current initiative should be carried on. In order to secure continuity, it would be advisable that the same group of experts attending the present meeting continues following the future activities. It was also suggested that a task a group should be established to devise policy guidelines.
12. Although people living along the coast do not care about the coastal erosion, they are the right people to be addressed and their awareness of the issue should be raised. For the purposes of promoting the concept of shoreline management, among other measures, positive examples from the region and wider should be publicised. Also, the EUROSION brochure should be translated to more languages to secure a wider promotion of the project findings and results.
13. Coastal erosion issues should be brought to the national agendas, and appropriate legislation should be provided to manage coastal erosion.
14. Educom@Med could be a vehicle for education on coastal erosion.
15. A series of case studies should be set up to be used as EUROSION 2.