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PRIORITY ACTIONS PROGRAMME

UNITED NATIONS ENVIRONMENT PROGRAMME

INTEGRATED MANAGEMENT STUDY FOR THE AREA OF IZMIR

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NOTE

This document is a synthesis of a number of sectorial papers and interim reports prepared by a joint PAP and MMI working team over the period 1991-1993. The authors of these papers are Prof. C. Arkon, Prof. T. Balkas, Mr. A. R. Gulerman, Dr. F. Juhasz, Dr. U. Marinov, Mr. A. Pano, Prof. E. Scicluna, Ms. N. Talu, Mr. I. Trumbi}, Mr. V. Veldi} and Mr. H. Yildirim.

A draft of this document, which had been prepared by Mr. I. Trumbi}, Assistant Director of PAP/RAC and Mr. V. Veldi}, PAP consultant, and which had been reviewed by Mr. A. Pavasovi}, Director of PAP/RAC, was presented at a conference held in Izmir on 29-30 September 1993. The final text of the document took into account the comments and suggestions received during that conference.

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LIST OF ABBREVIATIONS

PAP/RAC - Priority Actions Programme / Regional Activity Centre
MMI - Metropolitan Municipality of Izmir
MAP - Mediterranean Action Plan
CAMP - Coastal Area Management Programme
IMS - Integrated Management Study
ICAM - Integrated Coastal Area Management
ICMP - Integrated Coastal Master Plan
CPP - Country Pilot Project
OECD - Organization for Economic Co-operation and Development
GIS - Geographical Information System
EIA - Environmental Impact Assessment
TOBBIM - The Union of Industrial Chambers of Industry
EBSO - Aegean Region Chamber of Industry
UNEP - United Nations Environment Porgramme
IZSU - Izmir Water and Sewerage Authority
DSI - State Hydraulics Works
SPO - Prime Ministry State Planning Organisation
AYKOME - Directorate for Coordination of Infrastructure in MMI
UKOME - Directorate for Transport Coordination in MMI
SPA/RAC - Specially Protected Areas / Regional Activity Centre

EXECUTIVE SUMMARY

1. Following a decision of the Sixth Ordinary Conference of the Contracting Parties to the Barcelona Convention held in Athens in 1989, the Turkish Government and the Mediterranean Action Plan (MAP) signed in June 1990 "An Agreement Relative to the Preparation of the Coastal Area Management Programme for the Bay of Izmir - Turkey".

2. One of the most important activities envisaged within Coastal Area Management Programme (CAMP) "The Bay of Izmir" is the preparation of an Integrated Management Study (IMS) for the area of Izmir based on the integrated approach to coastal and marine areas management (ICAM), developed by MAP's Priority Actions Programme (PAP).. That approach is consistent with the objectives for integrated management and the sustainable development of coastal areas and the marine environment established at the UN Conference on Environment and Development, held in Rio de Janeiro in 1992. The Study was prepared during the 1991-1993 period as a joint effort of a team of Turkish and PAP experts.

3. The Study integrates results of the majority of activities undertaken within the framework of CAMP "The Bay of Izmir". It's task was to synthesise available knowledge of the ecosystems, i.e. to offer an insight, as comprehensive as possible, into the state and ways of the use of resources in the Metropolitan Municipality of Izmir (MMI) area; to bring into focus the existing problems and conflicts with regard to the use of resources, and to provide a general framework for the formulation of adequate programmes of action to achieve a sustainable development in the area concerned.

4. In the first, analytical part of the study, relevant aspects of the development of the Izmir area to date are studied on the basis of available data. A special attention is paid to the analysis of environmental impacts of development. It is observed that urban growth, taking place since the 1960s, has been increasingly devouring the space of MMI regardless of the value of its natural resources. In spite of their great efforts, the local, as well as regional and national authorities, have not been able to channel such a growth which affects almost all the spheres of economic life, bringing about conflicts between different users and creating an ever larger gap between the development processes and the quality of environment. Indiscriminate occupation of land for illegal housing has taken great proportions in Izmir.

5. Izmir, together with a number of "satellite" cities, is a major industrial area. In many cases, however, the location of industries in that area was guided solely by the principles of economic efficiency which took into account only the employment effects of the projects and their contribution to GDP. At present, the city of Izmir is burdened by such a structure of development factors which highly endanger the quality of environment (polluting industries, transportation etc.). This, coupled with difficulties to establish an appropriate and well coordinated control over the use of natural resources

and pollution, brought about environmental degradation, resource depletion and pollution-related damages.

6. The analyses of concentrations of noxious wastes in the natural systems indicate that the permissible limits of threat to the human environment in the area of MMI are over-stepped, and that the capacity of the ecosystem is insufficient to absorb the large amount of wastes that are presently being discharged from numerous pollution sources. The available data and analyses also show that every single component of the environment is seriously endangered, while the pollution of some of the components, especially the waters of the Izmir Bay, has exceeded the critical point. The findings of IMS indicate that the development of Izmir has reached a stage at which direct benefits of urbanization and vigorous economic growth are overshadowed by the costs of environmental degradation.

7. It is also observed that many problems relative to environmental degradation and pollution of the Izmir area result from institutional drawbacks, such as: insufficient cross-sectorial (horizontal) and institutional (vertical) coordination and integration of activities at various institutional levels; divergences in policy objectives pursued by various authorities; lack of sufficient funds for environmental purposes including the development of a consistent ecological monitoring; absence of an adequate system of integrated planning and management. Regardless of the day-to-day management of pollution control and the existence of a long-term plan for sewerage, collection and treatment, there is no strategy recommending how the Izmir Bay area and its resources should be managed in an environmentally acceptable manner. Nor are there policies, goals or management structure adequately coordinated to provide a framework for conflict resolutions.

8. A number of uncertainties concerning both the land use and the coastal area management implications have been identified. The most important of them are:

   (a) initiatives to minimize the urban sprawl (illegal housing) into ecologically sensitive areas;
   (b) environmental impacts of the proposed wastewater disposal on the water quality of the Bay;
   (c) the rate of recovery of the Inner Bay, including the residual side-effects of a long-term, heavy concentration of pollutants accumulated in the sediment of the Inner Bay;
   (d) effects of continuing urban discharge and agricultural run-offs entering the Bay.

   These uncertainties, as well as other problems observed, raise the need for a permanent monitoring and research aiming at detailed analyses and assessment of the state of environment in the Izmir Bay area, calling for interventions to be made in order to change the present course of development.

9. In its prospective part, the Study offers an outline of a possible urban growth of the MMI area bringing into focus its implications on the state of environment. Two options of the future urban growth have been elaborated on: one, based on the persistence of the existing trends, and the other, based on the moderate urban growth anticipating the probability for some development policy measures to be implemented with a view to slowing down and reversing the hitherto course of the polarized regional development. The first, "trend" option, assumes that the population of MMI will increase from 2 to 5 million in the 1991-2025 period. Such growth means a further excessive concentration of the population in the coastal sections of MMI. This would cause a growing problem of deteriorated quality of life due to pollution loads some of which could reach the level

three to four times higher than the present one. A special problem, however, refers to the tendency of urban growth to consume the remaining land resources. It was observed that the available land to support further urban growth in the MMI area is very scarce. This leads one to the conclusion that a continuation of the existing trends would be incompatible with the requirements of an environmentally sound development and would ultimately lead to a massive resource depletion.

10. The results arrived at through the study point out the urgent need for changing the existing trends of growth and development in the Izmir area. To satisfy this need there must be a change in setting the basic goals, strategies and policies of the future long-term development. What is actually needed is seeking to establish the balance between the socio-economic development and the best use of limited natural resources - the problem that must be accorded high priority by the planners and decision makers of MMI.

11. The past experience obtained in Izmir and other coastal regions of the world experiencing a similar rate of development suggests that for achieving a sustainable pattern of development a largely improved management structure would be needed. Consequently and in parallel with the changed strategy of future development of the Izmir Bay area, IMS emphasizes the necessity for an integrated management system, usually referred to as Integrated Coastal and Marine Area Management (ICAM), to be adopted. There are two essential issues concerning the operationalization of ICAM. The first one is setting up of the boundaries for ICAM, while the second one refers to the establishment of workable and well coordinated institutional arrangements to support integrated management of the area concerned.

12. It is suggested that the Izmir metropolitan region be one of the viable options in determining the coverage of ICAM. The second option is to take the Izmir Province as a management area. Namely, considering the dynamic nature of the coast and the complex links between land and water that influence and are influenced by the coast, the broader (regional) perspective appears to offer merit for ICAM. As for the institutional arrangements to support ICAM, one of the possible and workable solutions frequently arrived at in the coastal areas similar to Izmir is the establishment of an Integrated Coastal Management Committee as the main decision-making body responsible for the regional development which is in harmony with economic, social and environmental aspirations of the region's inhabitants. The functions and responsibilities of the Committee would include coordination of the development of the region, monitoring and control over the use of natural resources, preparation of various legal acts and policy measures for sustainable development, and preparation and implementation of regional and integrated master plans for the area. A statutory legal basis could be provided to the Committee by an Act of Parliament. The Turkish Government has accepted in principle the idea of Coastal Management Units as the main bodies responsible for the management of major coastal regions. Alternatively, the Committee could operate as an informal regional body in which case difficulties may be expected in reaching and enforcing decisions.

13. In addition to well coordinated and workable institutional arrangements, a logical step forward towards the implementation of ICAM process is the preparation of the Integrated Coastal Master Plan (ICMP) for the Izmir area. The preparation of ICMP aims at providing a new, operational planning and management basis which should - through a thorough research and integrated approach to the analysis of development alternatives - determine an optimal long-term strategy and structural model of sustainable development of the Izmir area, as well as a long-term concept and measures of protection and enhancement of the quality of environment.

14. In order to stop or reduce the negative impacts of the current processes in the region, the study proposes a list of measures to be taken in the interim period between the adoption of this study and the preparation of the Integrated Coastal Master Plan of Izmir. The measures are divided in two groups:

    (i) ***Urgent measures,*** which should be implemented immediately after the adoption of the Study by the MMI and other regional and national authorities. The aim of these measures is to stop or, at least, to slow down the processes which are the most harmful to the environment in the area concerned.

    (ii) ***Middle-term measures,*** to be carried out in the subsequent 5-year period. The aim of these activities is to create conditions for the introduction and establishment of the ICAM process. They are also meant to be an input for the Integrated Coastal Master Plan for the Izmir area.

15. The Integrated Coastal Master Plan of the Izmir area should be prepared in the interim 5-year period. The objectives of ICMP are to create conditions for making operational decisions in the implementation of the ICAM process, relative to the realization of the concept of sustainable development in the area concerned. This includes:

    (i) detailed elaboration of the most appropriate cross-sectorial management strategy of the area;

    (ii) definition of physical requirements that the implementation of that strategy may generate;

    (iii) preparation of the plan of actions by which that strategy could be implemented;

    (iv) a detailed proposal of the site-specific land and sea uses;

    (v) policy measures to be taken and instruments to be used in the plan implementation.

16. A draft version of the Integrated Planning Study for the area of Izmir was presented at the conference held in Izmir on 29-30 September 1993. The conference was honoured by the attendance of His Excellency Minister of the Environment, Governor of the Izmir Province and Mayor of Metropolitan Municipality of Izmir. Also were present the representatives of interested ministries, local authorities, universities and numerous institutions. The conference accepted the Study and adopted recommendations for its implementation and follow up.

Chapter I

INTRODUCTION

1. Background

Following a decision of the Sixth Ordinary Conference of the Contracting Parties to the Barcelona Convention held in Athens in 1989, the Turkish Government and the Mediterranean Action Plan (MAP) signed in June 1990 "An Agreement Relative to the Preparation of the Coastal Area Management Programme for the Bay of Izmir - Turkey".

The Coastal Area Management Programmes (CAMPs) are area-specific activities of MAP, the essence of which lies in the integration of practical knowledge and experience obtained through all MAP components and its application in selected sites of the Mediterranean countries. These programmes were launched back in 1987 by the Priority Actions Programme (PAP) of MAP under the name of "Country Pilot Projects" (CPPs). The Izmir CPP was one of the first such projects.

One of the activities envisaged within CAMP "The Bay of Izmir" is the preparation of an Integrated Management Study (IMS) for the area of Izmir using the methodological approach to integrated coastal and marine areas management developed by PAP.

Integrated coastal and marine areas management (ICAM), as defined by PAP, is a long-term continuous process within which mechanisms of response guide actions and changes. It is based on a set of common rules of environmental behaviour, with the aim of providing an effective instrument for achieving balance between the social and economic development through the protection and rational use of coastal resources.

This approach is comprehensive but it does not mean that all the resources and ways of their use in an area should be dealt with in the same manner. This approach is, also, problem-oriented which means that the priority problems to be resolved are identified quickly and efficiently.

The approach is consistent with the objectives for integrated management and the sustainable development of coastal areas and the marine environment established at the UN Conference on Environment and Development, held in Rio de Janeiro in 1992. In the case of Izmir, one of the most important goals of the integrated management study is to define actions which will lead ultimately to the preparation and implementation of a new Integrated Coastal Master Plan (ICMP) of Izmir.

Simultaneously with the preparation of the Study, several other activities have been undertaken within the framework of this CAMP. The Study is an "umbrella" document

integrating the results of these activities. The list of documents prepared within the framework of CAMP "The Bay of Izmir" is given in Annex I.

Preparation of the Study started in October 1991 after a working team had been established of local experts from the Planning Department of Metropolitan Municipality of Izmir (MMI) and PAP-recruited international and national experts. Its preparation was preceded by a number of preliminary and complementary activities, and followed by some new ones:

(i) A training course on the methodology of integrated planning was organized in Izmir in December 1989 for planners from various Izmir institutions. The course was attended by more than 20 participants from MMI, Governorate of Izmir, Dokuz Eylul University and other institutions;

(ii) In December 1990, a PAP mission visited Izmir to discuss with the responsible persons from MMI the organizational issues pertaining to the preparation of the study;

(iii) PAP/RAC suggested, as part of an OECD programme on coastal resource management, the preparation of a case study on the environmental management of the Bay of Izmir. The study contains a survey of existing practices in environmental management as well as a proposal for its improvement. Findings of this case study are used in the preparation of the integrated management planning study;

(iv) A training programme on the Geographic Information System (GIS) for local experts was conducted in two phases. The first phase included an orientative course for the organizers of GIS activities in MMI. The course was held in Split (Croatia) in September 1990 and lasted two weeks. The second phase included a training course for the Izmir local team. That phase lasted six months and was carried out through five PAP missions. The training was performed on the PC level and software used was pcARC/INFO. The participants of the programme were trained how to use pcARC/INFO for a range of planning applications. Another benefit of the training programme was the establishment of a GIS database as a support to the IMS preparation. *The majority of figures in this document are outputs of the GIS database.*

(v) Preceding the drafting of the Integrated Management Study, a workshop was organized on the assessment of the state of environment and development in MMI, in November 1992. The workshop discussed the main issues of integrated management of the area of Izmir as well as an interim report which contained a number of sectorial documents. A draft of IMS was then prepared on the basis of conclusions and suggestions given during that workshop.

(vi) The draft IMS was presented at a meeting held on 29-30 November 1993. The meeting was attended by Mr. R. Akcali, Minister of the Environment, Mr. K. Aktas, Governor of the Izmir Province and Mr. Y. Cakmur, Mayor of MMI, representatives of the Ministry of the Environment, other Ministries and state institutions, regional and local authorities and institutions, as well as a number of experts. The meeting discussed the draft IMS, accepted its results and recommended, among others, to the national and local authorities: (a) to examine the need for a new institutional arrangement which would lead to a better environmental management of the region; (b) to continue to introduce, develop and utilize modern tools and techniques for coastal management, such as GIS, development-environment scenarios and EIA; (c) to undertake immediately urgent measures recommended in IMS; and (d) to the Ministry of the Environment, to continue with its coordinating role and guidance in the follow up of the programme. This, the final text of IMS took into account the meeting discussions and conclusions.

2. Character, Objectives and Benefits of the Study

2.1. Character of the Study

The hitherto planning activities in the area of Izmir have been mostly concentrated on the preparation of land-use planning documents, particularly the Master Plan of Izmir and its revisions. These documents are sectorial in nature, exhibiting an insignificant degree of integration between the spatial, economic and environmental aspects of development. Regardless of its shortcomings, the existing Master Plan provided a solid basis for the preparation of IMS.

IMS had the following tasks:

Phase I

- to synthesize available knowledge of the ecosystems, i.e. to offer an insight, as comprehensive as possible, into the state and ways of use of resources in the MMI area;
- to analyze institutional mechanisms regulating the use of resources; and
- to identify major issues of the development of MMI with regard to environmental disturbances they are causing.

Phase II

- to assess the consequences if the existing problems fail to be resolved; and
- to define a framework for the desirable development of the area of Izmir.

Phase III

- to synthesize and cross-relate all sectorial reports which address various development and environmental aspects pertinent to the Study preparation; and
- to propose legal, institutional, planning and other policy measures to be taken for the implementation of the Study.

The procedure of the study preparation was based on the following:

- carrying out a preliminary research using only the available data (plans, programmes, studies and other soiurces) and benefiting from consultations with relevant local, regional and national authorities, institutions and experts; and
- joint work of local, national and international experts.

2.2. Objectives and benefits of the Study

The impetus for the preparation of the IMS came from the intention of MMI to start preparing a new Master Plan of Izmir. As the development of the city to date has been mostly haphazard there is a disbalance between the urban development, and the possibilities of natural systems to sustain it. Consequently, it is possible to assume that the resource management system in the area is not tailored to respond to the development requirements.

The major objectives of the Study are:

(i) to prepare an environmental profile of the Izmir area based on the existing (secondary) data;

(ii) to establish, in a rapid and rational way, the framework and elements of the ICAM programme, as well as to perform "on-the-job" training of the local experts by applying an established methodological approach;

(iii) to contribute to the mitigation of environmental effects of various developmental activities, and to establish a management framework for a desirable use of coastal resources;

(iv) to propose general objectives and policy guidelines for the activities towards a long-term development harmonized with the carrying capacity of the ecosystem;

(v) to propose a methodological and organizational framework for the preparation of the Integrated Coastal Master Plan for the area of MMI.

2.3. Structure of the Study

This study is divided into three parts, namely the analytical part (Chapters 2, 3 and 4), the prospective part (Chapters 5 and 6) and the part which summarizes measures and policy recommendations to be taken for the implementation of the study (Chapter 7).

Chapter 2 provides a brief description of the area natural resources and process of development. Its first section attempts to integrate all the natural features and to categorize, on the basis of their cumulative effects, the MMI area into zones of different "environmental constraints" or "development opportunities". The second section of this chapter is focused on the consequences rapid population growth brings to the Metropolitan Municipality of Izmir., It also briefly describes various economic sectors and identifies their impact on the overall development of the city.

Chapter 3 pays a special attention to the environmental impacts of development. In its first section, the state of various urban and non-urban uses, the problems and issues associated with the land management in MMI, and the current state of resources use are examined. The second section deals with the main areas of environmental concern (waste management, various forms of pollution) and attempts to identify the major agents responsible for the environmental degradation of the Izmir area.

Chapter 4 addresses the problems and issues of the existing institutional arrangements for environmental management. It describes the existing institutional and decision-making structure which includes several levels of decision making (national-regional, metropolitan and district), and explains the role and power of various institutions in charge of managing individual environmental sectors in the area concerned.

Chapter 5 summarizes, in the first section, the major problems of the hitherto development of Izmir with regard to environmental disturbances, pollution damages and resource use conflicts they cause. The second section of this chapter offers an outline of two options of a possible urban growth and assesses their impacts on the state of environment. The first option is based on a persistence of the existing trends - the "trend" or "do-nothing" option. The second one is based on slowing down the urban growth - the "moderate" option.

Chapter 6 discusses some of the crucial steps and issues that are relevant for the development and implementation of an Integrated Coastal and Marine Area Management process. It includes the following:

(i) Policy recommendations, as well as the general goals and objectives of sustainable development and the environmental protection;

(ii) Definition of the coastal area of Izmir for management purposes and a proposal of one of the possible models of institutional arrangements to support coordination and implementation of ICAM;

(iii) Proposal for the preparation of the Integrated Coastal Master Plan for the area of Izmir (methodological approach, organization of work, etc.);

(iv) Tasks and recommendations relative to the establishment of an integrated and comprehensive information system which is a *sine qua non* prerequisite for an effective planning and management.

Chapter 7 summarizes major findings and provides a list of urgent and middle-term measures actions to be taken in the interim period between the adoption of this study and the preparation of the Integrated Coastal Master Plan for the Izmir area.

3. Working Team

The following working team of local as well as international experts recruited by PAP/RAC was involved in the IMS preparation:

Metropolitan Municipality of Izmir

- Mr. Ali Riza GULERMAN, Urban and Regional Planner, Director, Reconstruction and Implementation Division, Head of the MMI working team;
- Mr. Ahmet OZER, Urban and Regional Planner, Head of Planning Department;
- Mr. Kudret YASA, Urban and Regional Planner, Head of the Master Planning Bureau.
- Ms. Beril BERGIN, Urban and Regional Planner, Planning Department;
- Ms Ulya TANRIVERDI, Environmental Engineer, Environmental Health Department;
- Ms. Meral USKUP, Urban and Regional Planner, Planning Department;

Ministry of Environment

- Ms. Nuran TALU, Urban and Regional Planner, Head of the International Relations Department;
- Mr. Hami YILDIRIM, Urban and Regional Planner.

PAP/RAC

- Mr. Ivica TRUMBI], Urban and Regional Planner, Head of PAP working team;
- Prof. Cemal ARKON, Urban and Regional Planner, Dokuz Eylul University, Turkey;
- Prof. Turgut BALKAS, Marine Scientist, Middle East Technical University, Turkey;
- Dr. Ferenc JUHASZ, Economist, OECD, France;
- Dr. Edward SCICLUNA, Economist, University of Malta, Malta;
- Mr. Vlado VELDI], Urban and Regional Planner, Town Planning Institute of Dalmatia, Croatia.

PART ONE

PROFILE OF THE IZMIR AREA

Chapter II

NATURAL RESOURCES AND PROCESS OF DEVELOPMENT

4. Natural Characteristics and Resources

4.1. Topography

Encompassing the Bay of Izmir, the area of the Metropolitan Municipality of Izmir is a terrain ranging in height from 0 to 1,000 m above sea level. Approximately 16% of the MMI area exceeds 400 m above sea level. A considerable percentage of the territory (48%) falls within the altitudes of 50-400 m, while the remaining parts of MMI (36%) lie below 50 m above sea level (see Figure 4.1). The terrain is dominated by gently inclined flatlands (gradients of less than 6%), but the level of the terrain generally changes quickly from these gradients to as much as 30% which makes these parts of the area equally unsuitable for agriculture and building construction. (see Figure 4.2).

Figures 4.1 and 4.2 show that the topography of the northern shores of the Bay is quite different from the southern shores. Much of the land of the northern shore is low and flat river delta[1], some of which is suitable for farming but much of it is too saline for agricultural use[2]. The ground water table is very close to the surface. The remaining one-third of the northern shore is characterised by fairly high and steep-sloping hills unsuitable for urban development. There is an alluvial plain which stretches along the shoreline. The southern shore is characterised by steep sloping hills along the most of its length, and by a narrow alluvial plain squeezed in.

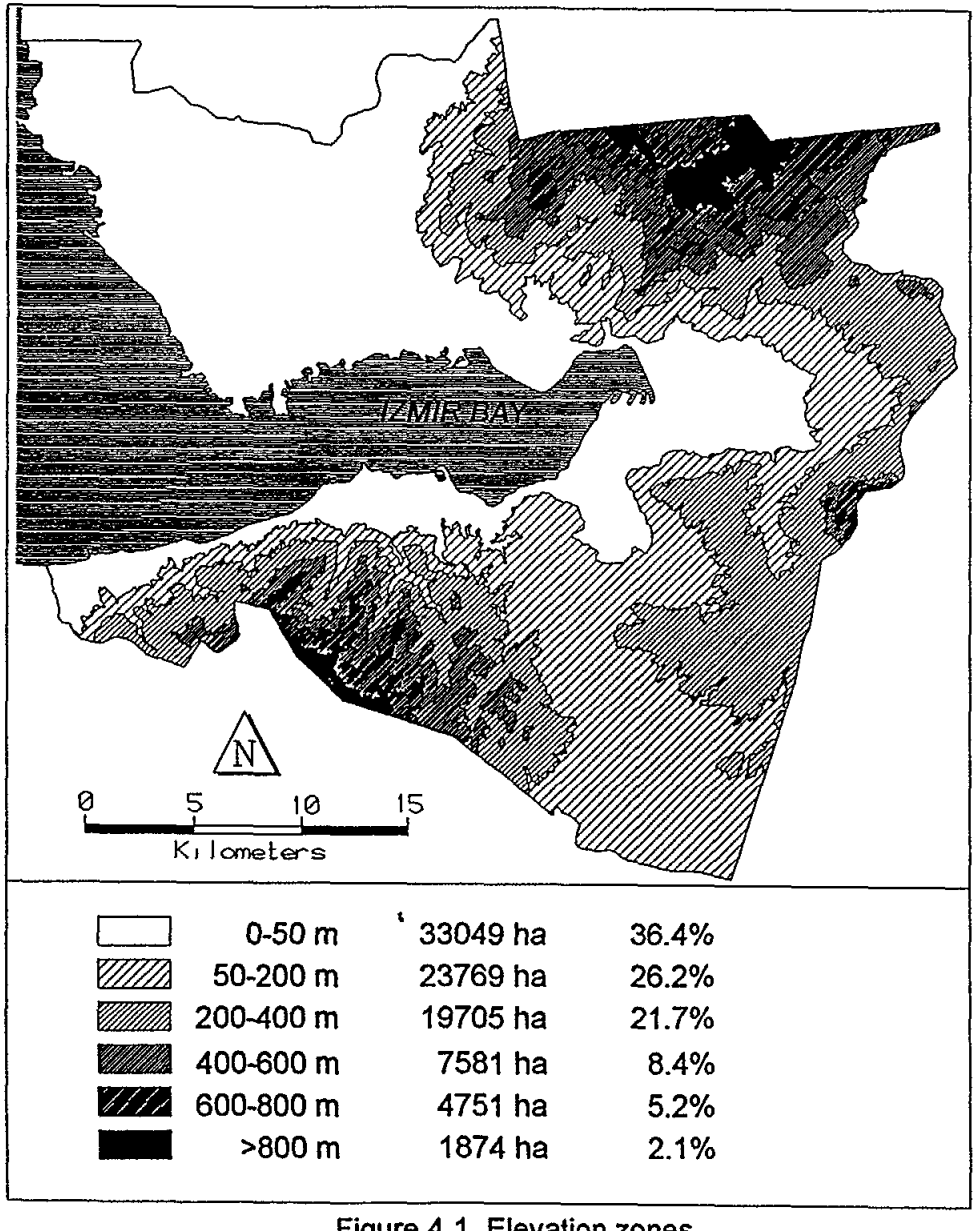
Hills to the north and south extend eastward of the Bay, flanking a valley approximately 5 km wide and 10 km long. The valley is known as the "Bornova plain". At its eastern end, it elevates gradually from the sea level up to 80-90 meters. The plain is alluvial and has been primarily used for agriculture. However, attracted by the availability of ground water, urban activities have been recently moving into the Bornova plain.

As regards the topography of the MMI area, the following can be concluded:

- Due to the steep hillsides, the areas for urban development are limited and reduced to alluvial patches, slopes of the hills along the Bay shores, the Bornova plain, and a relatively high plateau which extends southward of the

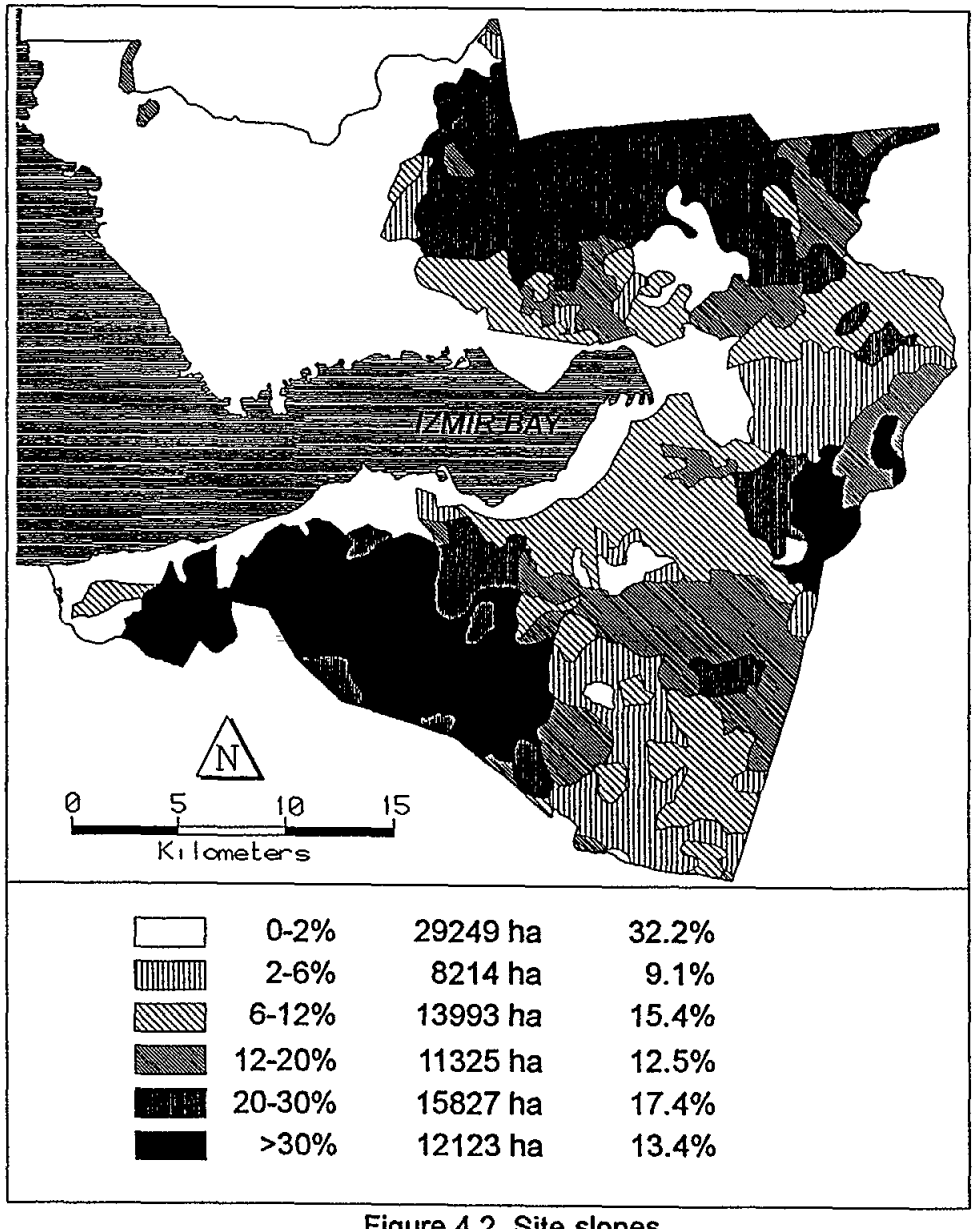
[1] Alluvial sediments brought by the Gediz river.

[2] Salt marshes and the undrainable Cigli Plain.



0-50 m	33049 ha	36.4%
50-200 m	23769 ha	26.2%
200-400 m	19705 ha	21.7%
400-600 m	7581 ha	8.4%
600-800 m	4751 ha	5.2%
>800 m	1874 ha	2.1%

Figure 4.1. Elevation zones



0-2%	29249 ha	32.2%
2-6%	8214 ha	9.1%
6-12%	13993 ha	15.4%
12-20%	11325 ha	12.5%
20-30%	15827 ha	17.4%
>30%	12123 ha	13.4%

Figure 4.2. Site slopes

central Izmir. That plateau is about 4 km wide and 12 km long, varying in elevation from 50 meters in the north to approximately 120 meters at its southern end.

- The high terrains which surround the Izmir agglomeration generate stable air masses trapping the pollutants overcasting the city. This indicates that the air quality in Izmir will continue to deteriorate as long as the emissions grow.

4.2. Geology

The predominant units constituting the geological foundation of the study area are the Mesozoic, Tertiary and Quaternary formations (Figure 4.3).

Mesozoic - The flysch formations are composed of clay schist, sandstone, arkose, conglomerate, calschist, crystalline or dolomitic limestone, red limestone or radiolarite and quartzite with intersection of calcite and quartz veins. These rocks have extreme folding; and are thus classified as metamorphic formations. The flysch formations outcrop east of Izmir at the edge of Bornova Plain, and southwest of Izmir near Balcova-Kizilbeher.

Tertiary - Neogene undifferentiated formations consist of interbedding conglomerate, sandstone, marl clay, limestone and tuff. Marl and limestone components of these formations are found northeast of Izmir, and also at Tepecik and Gultepe. Marl and clay outcrop at Buca and Sirinyer. The tertiary volcanic series erupted during the Miocene period. They are composed of andesite, agglomerate and tuff which outcrop between Kadifekale and Goztepe (Yesilyurt, Hatay) and also along the north side of Bornova, Bayrakli, Tornali and Karsiyaka.

Quaternary - Alluvium has been deposited at Bornova, Camdibi, Mersinili, Alsandak, Karsiyaka and Balcova. It is composed of predominantly silty clay, clay, sand and (in the lower layers) sand and gravel beds. The alluvium of the Karsiyaka area is composed of delta deposits of the Gediz river.

4.3. Seismicity (earthquake hazard)

Since MMI falls within a first-degree seismic risk region, the earthquakes have been very frequently felt. Of two major faults forming the Bay of Izmir, the northern one is only about 25 km long, while the southern fault extends nearly 250 km in the east-west direction. There is also the third fault intersecting the area due North-South. Earthquake records show that heavy damages occurred in the vicinity of Izmir in the years 688, 1653, 1688, 1850 and 1880. This fact suggests that the earthquake hazard should be one of the primary concerns of the MMI authorities.

4.4. Climate

The climate of the MMI area may be described as hot and humid during the summer, and mild and humid during the winter. The yearly average temperature is 17°C, ranging between 26°C in July and 7.6°C in January. The yearly average rainfall amounts to 543 mm (1.5 mm/day). More than 50% of the precipitation occurs during the winter months, the highest amount being in January (117 mm), the lowest in July (2.5 mm) dropping to mere 0.2 mm in August. Such a distribution of rainfall points out the danger of summer droughts and forest fires. Table 4.1 shows the average seasonal meteorological data taken at the Cigli station (Lat. 38°30', Long. 27°01').

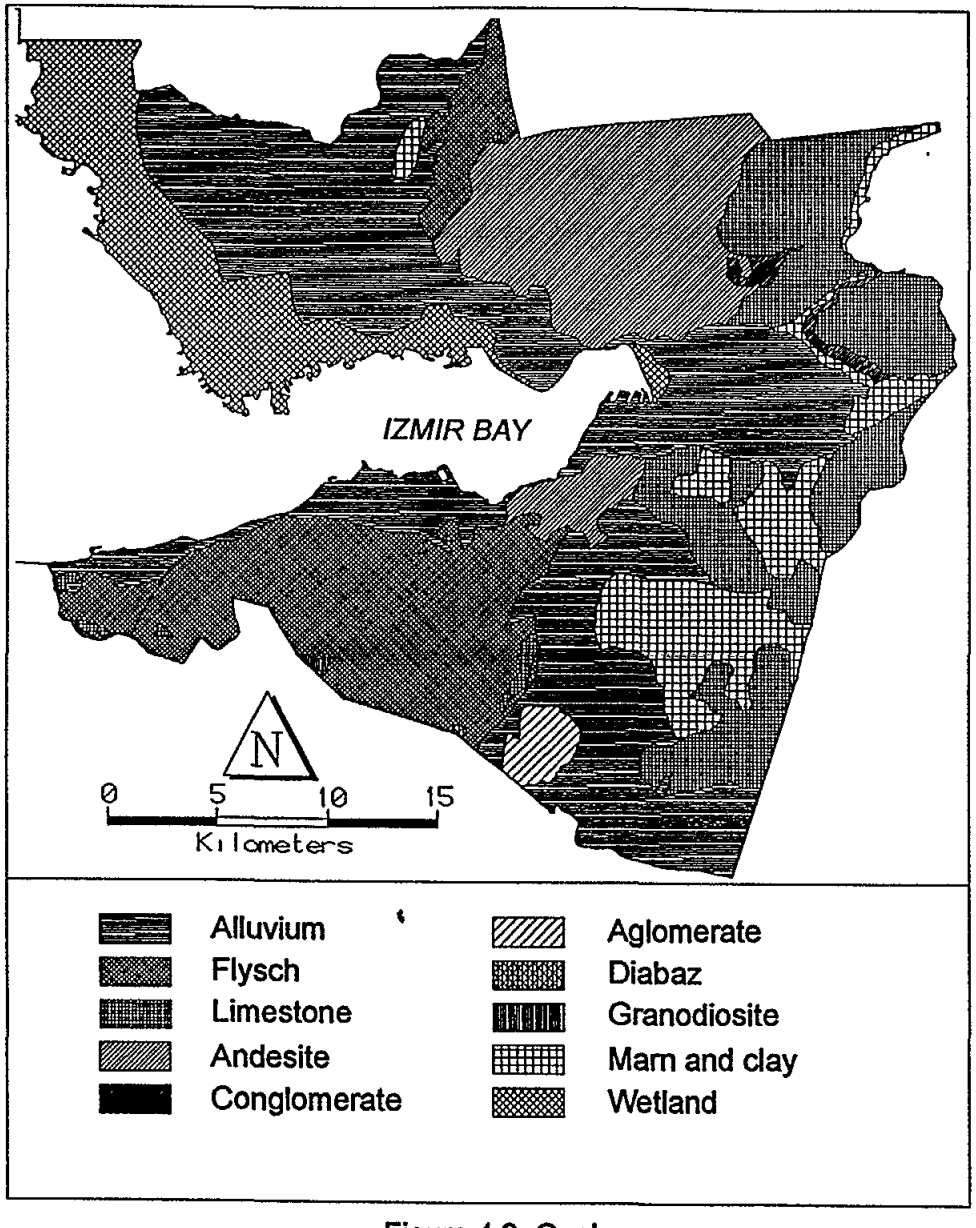


Figure 4.3. Geology

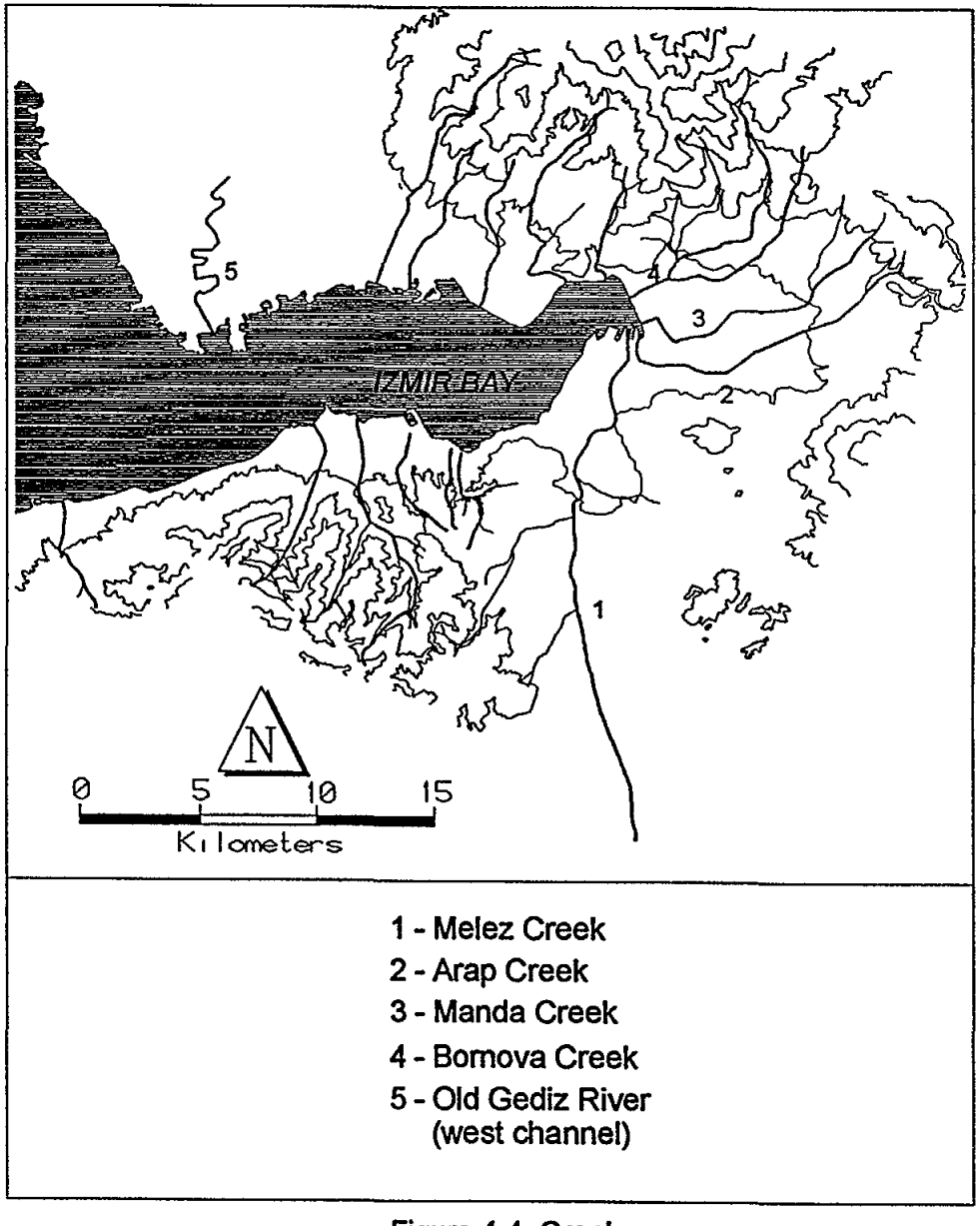


Figure 4.4. Creeks

Table 4.1: *The Seasonal Meteorological Conditions of the Area - Cigli Station*

Month	Temp.°C	Wind speed m/sec	Wind-direction	Rainfall mm	Pan evaporation mm	Global radiation cal/cm^2/d	Inv.number of days
Winter	9.3	4.8	ESE	304.2	251.6	228	50
Spring	17.6	4.1	NNW	62.3	291.5	492	22
Summer	24.8	4.2	NNW	19.3	939.2	546	39
Fall	14.8	4.0	NNW	103.6	175.8	266	29

Source: Marinov, U., A. Pano and M. Libharer (1988). Environmental Impact Assessment of the Izmir Sewage Treatment Project. Split: PAP/RAC.

The long-term wind direction data taken at the Izmir-Guzelyali station (Lat. 38°26', Long. 27° 10') show that the prevailing wind throughout the summer season blows from the west, while those taken at the Cigli station show that it blows from the North and the North-West (Table 4.2). The air current from the Cigli area makes a turn westward during the summer somewhere between the southern and northern banks of the Bay.

Table 4.2: *The Long Term Data for the Izmir - Guzelyali Station*

Months	Direction
January	SSE
February-April	SE
May-October	W
November-December	SE

Source: same as Table 4.1

The wind regime is quite unique[3] and largely affected by the land-sea breeze locally known as "imabat". Unfortunately, the extensive urban concentration along the coastal belt inadvertently cuts off this very important inflow of cool air into the city which might have improved the city's poor air quality. Equally important to emphasize is that the calm fore-noons on sunny spring and summer days are usually under a photochemical smog indicated by a reddish crown over the densely populated lower zones of the city. This goes on until the afternoon sea breezes break up the stable air masses over the city.

4.5. Hydrology

Almost the entire study area drains into the eastern part of the Izmir Bay. The steep shores are drained through small creeks running down the numerous ravines and small valleys which extend near-perpendicular to the shoreline. The Bornova plain is drained westward, through the Bornova, Manda, Kocasu and Arap Creeks. The plateau to the south is drained through the Melez Creek which flows northward, entering the Bay near its eastern end (see Figure 4.4).

Several creeks draining the steep shores have no constant yield and usually dry out during the summer months depending on precipitation. Although the Melez Creek and the four creeks of the Bornova plain have significant yields during most of the year, they are practically non-existent in late summer.

[3] During the summer months, there is an on-shore breeze during the day and an off-shore breeze at night.

Apart from the quantity, these water courses also vary in quality. Being heavily contaminated by the pollution load from domestic and industrial sources or by pesticides used in agriculture, none of these can be used for any form of human consumption[4].

Considering the amount needed for current let alone the future demand, water that can be used for human consumption is relatively scarce in the MMI area. A great deal of the current MMI water supply relies on ground water sources, wells, springs and artificial lakes (The Balcova and Tahtali Dams). However, as both surface and ground water sources are threatened by contamination, the protection of fresh water resources is vital to the area. The location of wells within the city of Izmir and catchment areas around dams are given in Figure 4.5.

4.6. Land capability

According to the available data obtained from Dokuz Eylul University, there are about 80 different soil units[5] in the MMI area divided into eight (8) capability classes determined according to their potential for cultivation. Although the analysis of these classes has revealed that most of the areas in MMI are severely limited to cultivation, still there are considerable areas with minor limitations to cultivation where the choice of crops raised is relatively large.

As shown in Figure 4.6, the areas of MMI with the highest agricultural potential are those which are also attractive for the development and growth of the Izmir agglomeration (the Bornova Plain, the high plateau southward of the central Izmir, etc.). This, coupled with the need to protect these valuable land resources, speaks in itself of the limitations for the future city growth.

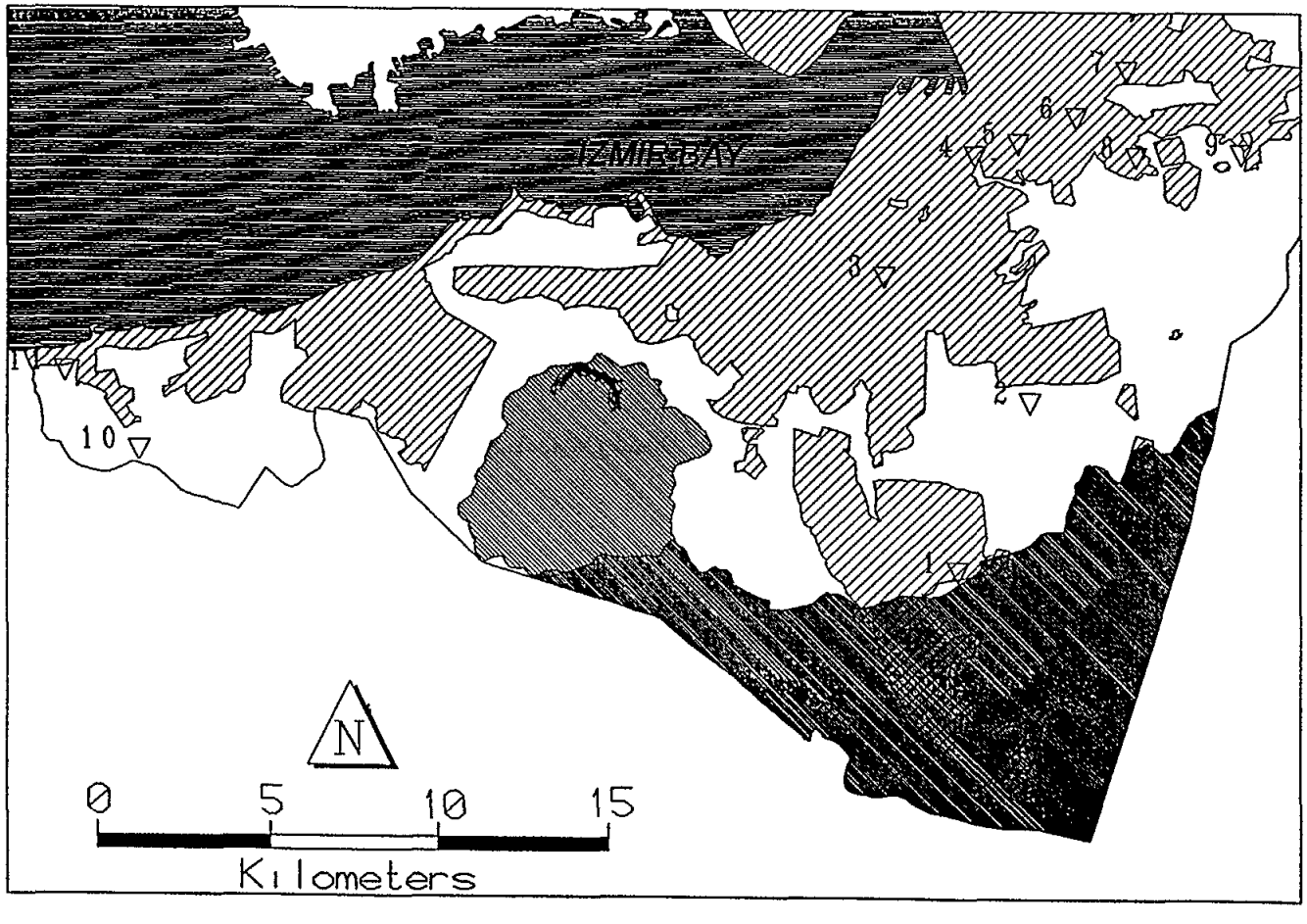
4.7. Erosion Risks

The geological composition of soils and steep hillsides make the study area prone to powerful erosion processes which have already started where the original vegetation cover is damaged. Data obtained from Dokuz Eylul University allow for division of the MMI area into four zones, depending of their susceptibility to the erosion.

As shown in Figure 4.7 the first zone (areas of low susceptibility) mainly covers the terrain up to 50 m of altitude with slopes of less than 3-5% (The Menemen and Cigli plain at the north, the alluvial plain which stretches along the southern shore, and a part of the Bornova plain). The total surface area falling into the first zone is approximately 34,000 ha. The second zone (areas of moderate susceptibility) covers mainly the plateau southward of the central Izmir, as well as the higher parts of the Bornova plain. Its surface area amounts to 13,000 ha. The third zone, i.e. areas of high susceptibility to erosion, cover as much as 32,000 ha, that is more than 35 per cent of the total MMI surface. These areas include mainly the northern and eastern parts of MMI characterized by high and steep sloping hills. Obviously, such areas are far from being suitable for the construction of large vertical structures. Finally, the fourth zone, i.e. areas exposed to very high erosion risks, cover approximately 11,500 ha or more than 12% of the MMI surface. They can be found mostly in the hilly part of the southern shores which is inclined more than 30 %.

[4] This issue is discussed extensively in chapter 10.2.

[5] These soil units are characterized by a unique combination of properties that distinguish them from one another (soil type, structure, slope class, deepness, erodibility class, limitation factors, etc.).



CATCHMENT AREAS AROUND DAMS

Balcova dam

Tahtali dam

Groundwater resources within the city of Izmir

Resource	Depth (m)	Capacity (l/sec)
1. Sarnickoy	130	40-70
2. Kangol	spring	3-8
3. Buca	130-140	76-170
4. Halkapinar	200-250	800-1600
5. Camdıbi	80-100	30-50
6. Altındag	80-100	10-80
7. Bornova	40-45	10-30
8. Isıkkent	45	5-12
9 Pınarbası	30-48	32-125
10. Kavacik	spring	5-10
11. Gizelbahce	40	130

Built-up areas

Figure 4.5. Wells and catchment areas around dams

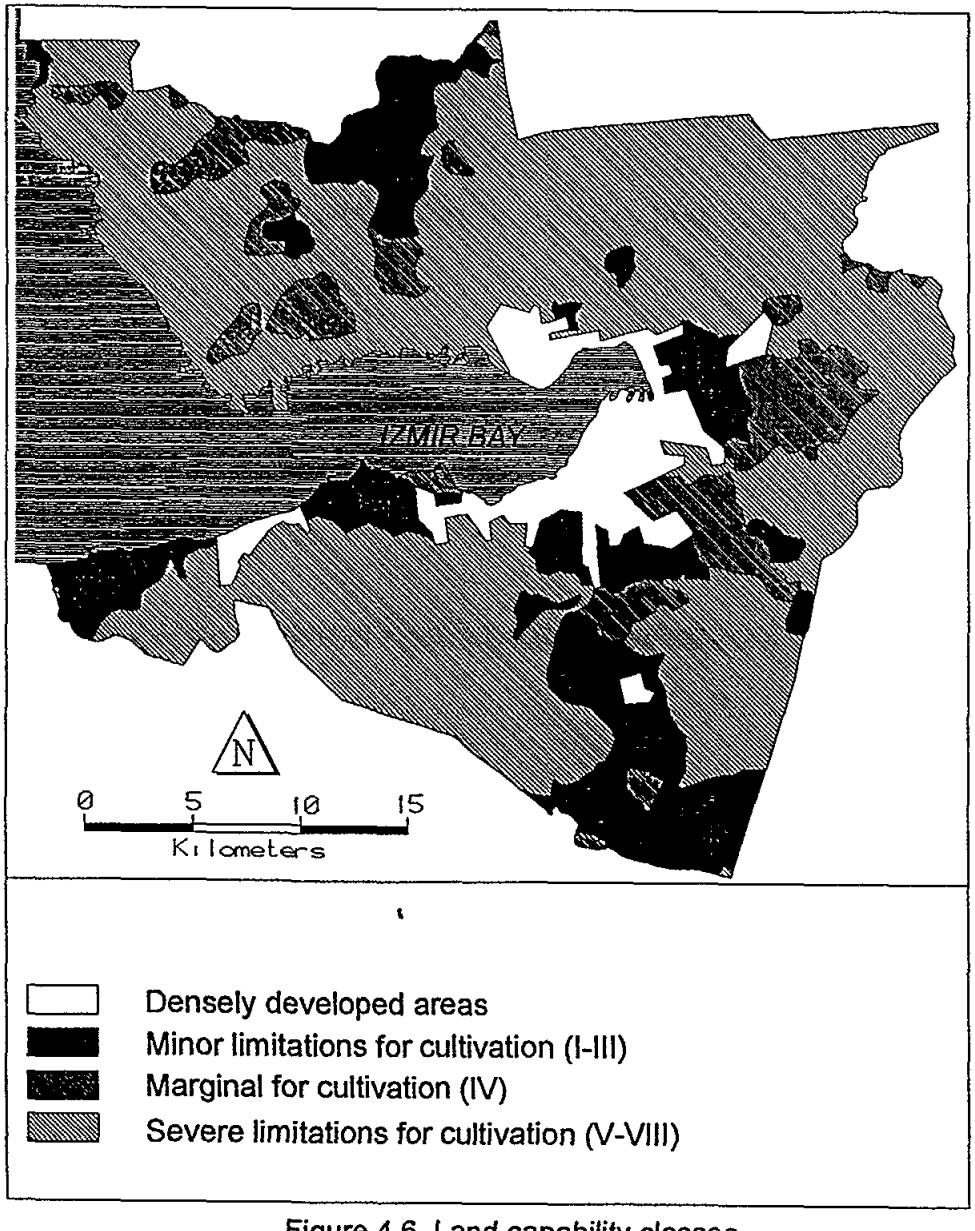


Figure 4.6. Land capability classes

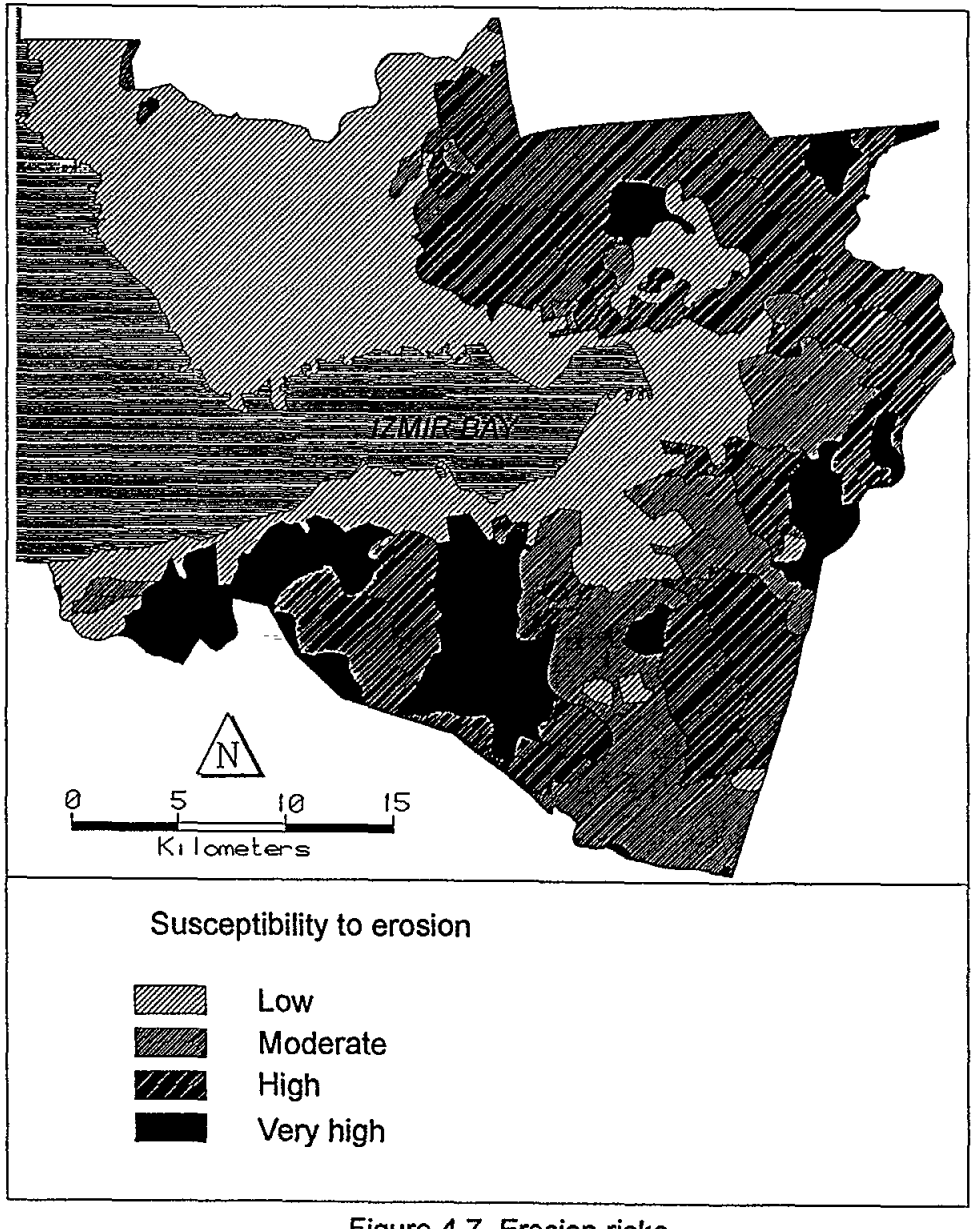


Figure 4.7. Erosion risks

4.8. Areas of outstanding natural value

According to available data, the MMI areas of outstanding natural value are the following:

- *The Izmir bird sanctuary*, a relatively large wetland area on the northern shores of the Izmir Bay. The sanctuary is a habitat of 3 million birds of 184 different species.
- *The Camalti saltpan and Homa Dalyan wetland area,* located at the northern-most end of the MMI area. This valuable area is an important habitat for a variety of flora and fauna species. The saltpan and the Dalyan cover approximately 800 hectares of land including various lagoons, salt marshes and salt ponds. The halophilic plants dominate in the saltpan; reeds and rushes are found in the marshes. Tamarisk can be found in the dunes, while asphodel, tamarisk, oak, and fig-tree are observed in the hills surrounding the area. Pubfish, loach, mullet, crabs, barbel, eels, meadow frog, green frog, night frog, freshwater tortoise and water snakes live in the area. So far 182 bird species have been identified in the saltpan. The major species of the area are flamingo, Dalmatian pelican, ruddy shelduck, little egret, spur wing plover, silt and caspatian tern.
- *Hot and mineral springs* of a high therapeutic effect, located on the southern shores of the Izmir Bay (Balcova).
- *Forest areas and areas of the Mediterranean flora* on higher terrains and viewpoints, particularly in the southern parts of the Izmir agglomeration. These aesthetically and functionally valuable forest areas must be protected from uncontrolled felling and natural hazards (forest fires, etc.).

Some of the above spatial entities and sites of outstanding natural value are already protected (Camalti saltpan and Homa Dalyan), while the others should be properly evaluated and protected from undesirable future uses with a view to maintaining the ecological balance and enhancing the attractiveness of the landscape.

4.9. Characteristics of the Izmir Bay

4.9.1 General characteristics

The Bay of Izmir is one of the largest bays of the Turkish Aegean coast. It extends about 24 km in the East-West direction and its average width is about 5 km. It is roughly L-shaped. From the standpoint of its topographical and hydrographical characteristics, the Bay consists of three sections: the Inner Bay, the Middle Bay, and the Outer Bay (see Figure 4.8).

The Inner Bay, with its water capacity of 600 million cubic meters and the surface area of 65 square kilometers, extends between the head of the Bay and the Yenikale lighthouses. It is an oval-shaped body of water with relatively narrower and shallower areas to the north-east and west where there is a shipping channel. The north-east area forms the bayhead and contains the port facilities.

The Middle Bay continues up to the Kokala Point wherefrom the Outer Bay (which is also divided into two sections) stretches out to the mouth of the Bay. The Middle Bay and the Outer Bay have the capacity of 900 million and 10 billion cubic meters respectively. The former covers a surface area of 57 and the latter 417 square kilometers. The two subsections of the Outer Bay are the Near Outer Bay and the Far Outer Bay divided by a line

drawn down the New Gediz river mouth and further to the northernmost tip of the Uzun Island.

4.9.2 Bathymetry

A bathymetric map of the whole Bay area was prepared in 1962 by the State Observation Hydrography and Oceanography Institute (see Figure 4.8). This map is now unreliable because of the long time passed since its preparation. Changes may have occurred in the bottom of the Bay along the Bornova shoreline due to deposition or disturbance of the bio-ecological balance of which studies have been carried out recently. However, each of these studies had a purpose of its own, producing only detailed strip-maps of restricted locations. Therefore, the general characteristics of the Bay bathymetry are based on the above mentioned bathymetric map (Figure 4.8). Bottom cross-sections of the Izmir Bay at five (5) locations, as well as its bottom profile in the longitudinal direction, are presented in Figure 4.9.

As shown in Figures 4.8 and 4.9, the bottom slopes in the lateral direction form the northern and north-western coastlines of the Bay are mild, i.e. the northern part of the Bay is shallow (depth ranging from 0 to 10 meters, within 2-4 kilometres off shore). The bottom slopes from the southern coastlines are steep, reaching rapidly the depth of 20 meters.

The maximum depth at the cross-sections presented in Figure 4.9 varies between 15 and 60 meters. More important, however, are the longitudinal sections indicating the existence of two shallower areas which adversely affect the water exchange within the Bay (see cross-sections A-A and D-D in Figure 4.9).

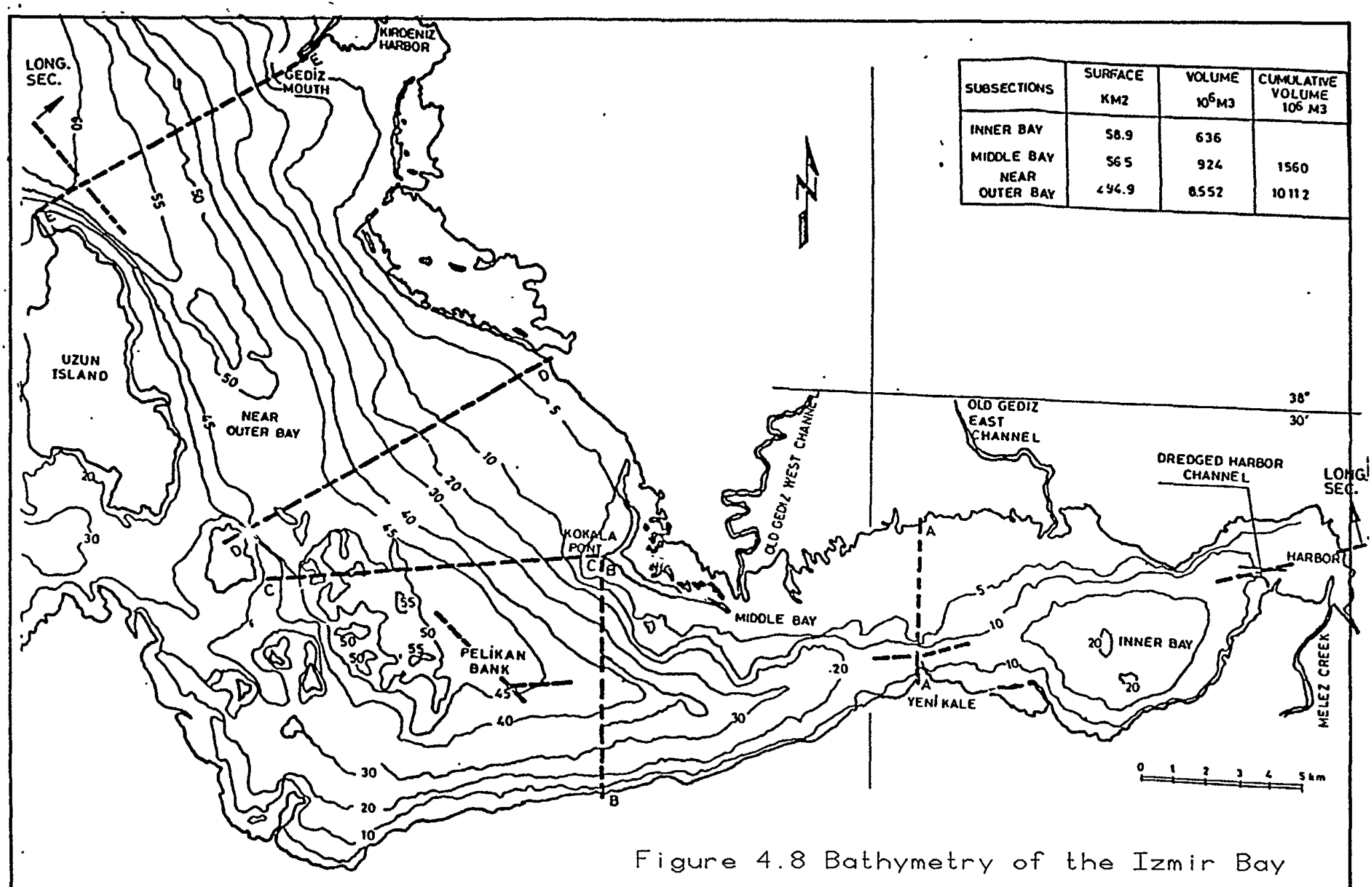
The Inner Bay, containing the Izmir harbour facilities, is actually a lake having a narrow outlet at Yenikale, at the western edge of this part of the Bay. A small underwater peninsula of land and rock blocks the cross-section at Yenikale from the north, so that only a narrow channel remains for the passage of ships (see cross-section A-A in Figure 4.9).

Generally, the sections of the Bay are distinguished from one another by their different depth characteristics. The sea depth of the Inner Bay ranges between 0 and 20 meters, with the average depth of 10 meters. The depth of the Middle Bay ranges between 0 and 40 meters, the average depth being 16.3 meters. The Outer Bay has a relatively constant depth ranging between 40 and 60 meters, with an average of 29 meters.

4.9.3 Mixing of the Bay water

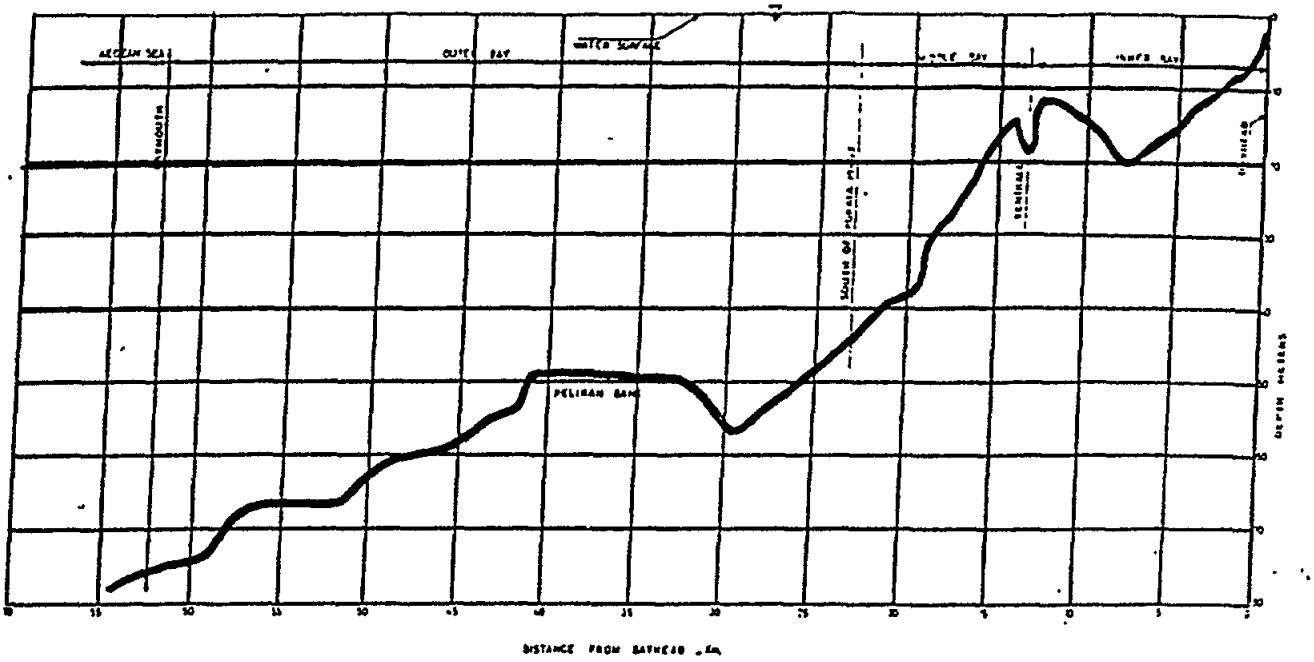
Mixing in bays, estuaries and coastal waters is caused by combined mechanisms, mainly those related to one of three sources: the wind; the tide; and density differences (such as those caused by inflow of river or wastewater into an estuary or bay). The analysis of mixing in terms of the interaction of advection and diffusion in bays and estuaries is quite complicated. Most of the analyses to be found in the engineering technical literature discuss the effect of only one or at most two mixing sources, for example, the current driven by wind in a tideless bay or the circulation driven by the river inflow in a tideless estuary.

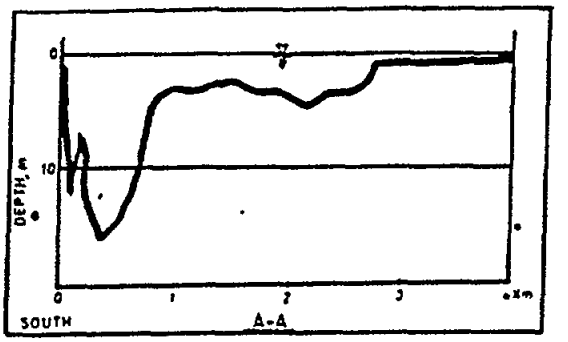
In locations where the diurnal tidal variations are significant and the shape of the land mass is restrictive, tidal currents may be of an order of magnitude that may be extremely useful in the disposal of wastewater. Unfortunately, the very low tidal variations in the Izmir Bay result in little or no water currents, except in locally restricted cross sections such as Yenikale.

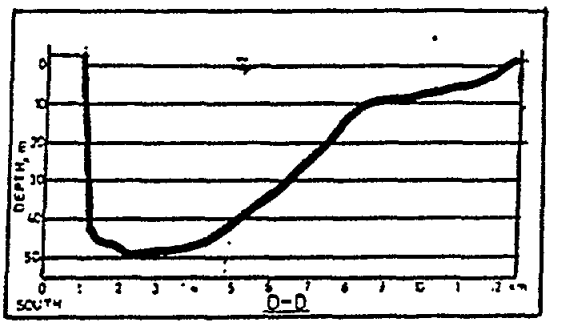


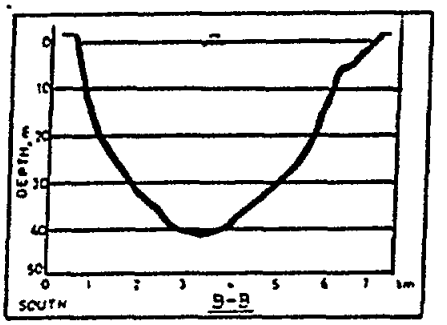
SUBSECTIONS	SURFACE KM2	VOLUME 10^6M3	CUMULATIVE VOLUME 10^6 M3
INNER BAY	58.9	636	
MIDDLE BAY	565	924	1560
NEAR OUTER BAY	494.9	8552	10112

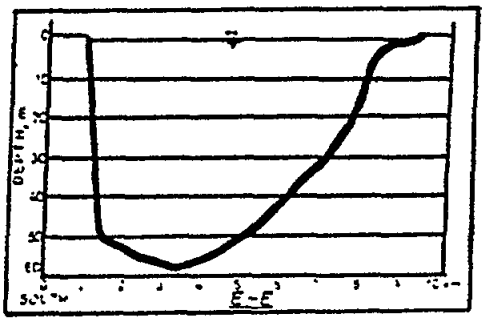
Figure 4.8 Bathymetry of the Izmir Bay











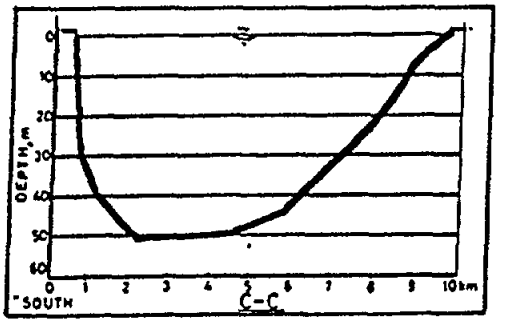


Figure 4.9

BOTTOM PROFILE AND CROSS SECTIONS OF İZMIR BAY

According to another source, tidal currents in the open areas of the Izmir Bay are negligible, and the effects of wind set-up almost completely mask the tidal effects.[6]

Vertical mixing can be caused to some extent by connective currents due to the density changes through warming and evaporation. This effect is, however, almost annulled in the Izmir Bay by the strong temperature stratification during the summer months. Some mixing during the fall overturn may be attributed to this cause.

Winds are the main mixing sources in the surface layer of the Izmir Bay. It was observed that winds play a very important role in the sanitary quality of the Bay water. Namely, the winds not only provide the water currents which result in dispersion of wastes to relieve localised pockets of very poor water quality, but also the turbulence at the water surface needed for supply of oxygen from the air to the water. Some studies indicate that winds affect the sea currents to a depth of at least 5 meters.[7]

The waste waters are usually less dense because they contain less dissolved matter and are often warmer. When conditions are such that waste waters are not completely mixed with the receiving saline waters, the wastewater tends to rise to the surface and override the salt water. Such a behaviour can also be encountered in the Izmir Bay. Based on the above and other available information concerning variation of physical parameters (temperature, density, salinity etc.), it was estimated that:

- the Inner Bay is a vertically homogeneous body of water all year long;
- the Middle and the Outer Bay are vertically homogeneous during autumn and winter, but have two main layers in spring and summer; and
- the bottom layer is uniform in all areas of the Middle and the Outer Bay.[8]

Summarising the mixing conditions in the Izmir Bay water the following may be stated:

- the principal cause of mixing in the upper layer is the wind;
- the surface currents are in the same direction as the wind;
- during the summer the dominating current is toward the east, as a result of both dominating wind direction and make-up of water lost by evaporation; and
- during the winter the dominating current direction is toward north-west, as induced by the wind.

4.10. Environmental zoning of the MMI area: a synthesis

Natural features of the MMI area have been analyzed so far as separate environmental issues. In this section, an attempt is made to integrate all the natural features and to categorize, on the basis of their cumulative effects, the area into zones of different "environmental characteristics" and "development opportunities" for a set of land-use options (urban development, agriculture etc.).

[6] Camp Harris Mesara (1971). Izmir Sewage Project: Master Plan and Feasibility Report.

[7] Holfelder (1981). Izmir Sewage Project. Ankara-Freiburg.

[8] Nival P., *et al*., (1988). Fact-Finding Mission to Assess the State of Pollution of the Izmir Bay. Split: PAP/RAC.

As the first step in breaking the MMI area into different environmental zones, a set of "environmental objectives" was formulated:

a) *Preservation of resources*
   - water resources
   - agricultural resources
   - forest resources
   - fishing and recreational resources

b) *Avoidance of hazards*
   - erosion hazard
   - terrain stability

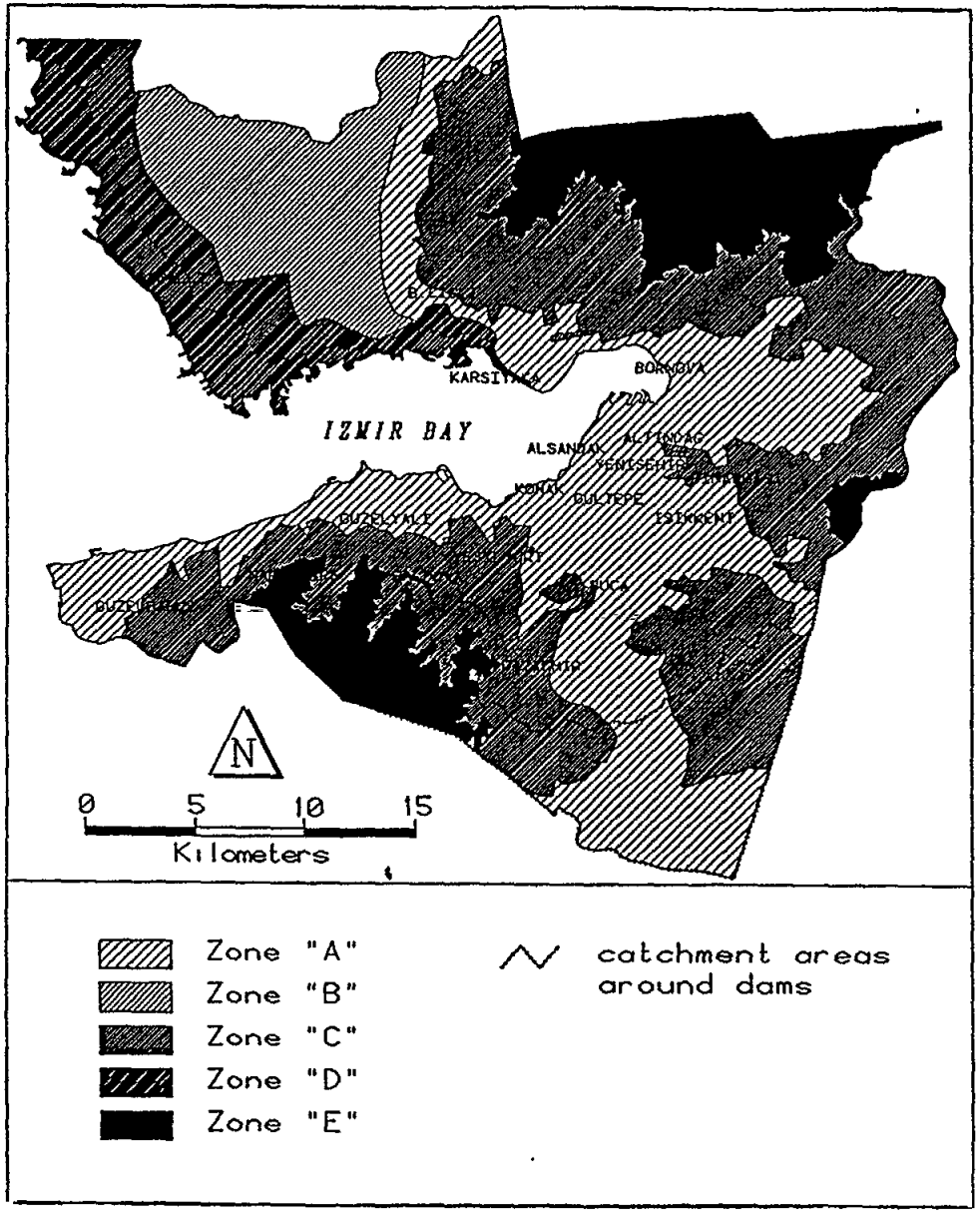
c) *Accessibility*
   - relief

These objectives were, furthermore, translated into a set of related natural factors which were ranked and mapped as individual constraints with respect to various land-use options (see Box 1.). Environmental zones were then determined by overlaying all factor maps showing individual constraints and their ranking, and by delineating areas within which the environmental characteristics were more or less homogeneous.

According to the environmental inventory, the whole MMI area can be divided into five broad zones showing different sensitivity to land-use options. These zones are marked in Figure 4.10 by letters A, B, C, D and E.

BOX 1. ENVIRONMENTAL OBJECTIVES AND RELATED NATURAL FACTORS USED IN THE CATEGORIZATION OF THE MMI AREA INTO ZONES

Environmental objective	***Related natural factor(s)***	***Ranking of attributes by degree of constraint***
Preservation of water supply resources	Catchment areas	In catchment areas Outside of catchment areas
Preservation of agricultural potential	Land capability	Minor limitations to cultivation Marginal to cultivation Severe limitations to cultivation
Preservation of forest resources	Existing forestry	Areas under forest Potential first priority areas for afforestation
Preservation of fishing and recreational resources	Natural identity	Wetlands serving as nursery grounds for marine fish species Natural plant and animal associations significant to aquatic life Areas in relatively natural state No identified significance
Accessibility	Relief	Altitude zones
Avoidance of slope constraints	Site slope	Steeply dissected terrain (>30%) Steep or hilly terrain Other terrain
Erosion hazard	Susceptibility to erosion	Areas of high susceptibility Areas of moderate and low susceptibility



ZONE	DEVELOPMENT OPPORTUNITIES	ENVIRONMENTAL CHARACTERISTICS
"A"	Urban Development Agriculture	Alluvial coastal strip; Flat and gently undulating terrain; Valuable agricultural land with minor or marginal limitations for cultivation; Availability of ground water sources;
"B"	Agriculture Limited urban development	Lowlands (delta); Too flat (run-off constraints); Poor soils to build on; Ground water close to surface Valuable agricultural land;
"C"	Limited urban development Forests	Steep slopes; Zones exposed to erosion if vegetation depleted; Terrain with severe limitations for cultivation;
"D"	Fauna preservation Natural protection	Wetland area; Saline and unconsolidated soil unsuitable neither for agriculture nor construction; Important habitat for a variety of flora and fauna species significant to aquatic life;
"E"	Upland forests Recreation Natural conservation	Steep hills or mountains; High erosion risks if forests cleared; Rapid run-off hazard

Figure 4.10. Zones of the MMI area showing different sensitivity with respect to land-use options

Zone "A"

The zone includes about 30% of the MMI area. It has been designated for urban development without serious difficulties in terms of cost required for overcoming physical constraints of development. This zone covers accessible, flat and/or gently sloping terrains up to the altitude of 200 meters. It consists mainly of alluvial patches of land, hillsides along the shore of the Bay, the Bornova Plain, and the relatively high plateau extending southward from the central Izmir. The zone is also characterised by availability of water resources.

In terms of incidence of the factors that render this zone unsuitable for urbanization, it is observed that the major aquifers and the productive soils are an important value and thus a constraint to urban development. In other words, much of the land suitable for urbanization in this zone is also a highly productive agricultural land. Furthermore, the southern parts of this zone are within the catchment areas of the Balcova and Tahtali dams, while in the Bornova plain there are many ground water sources pumped for water supply. There, a development that generates toxic wastes, biological discharges or sewage should be prohibited.

Zones "B" and "C"

Zone "B" includes the flat and non-consolidated fertile alluvial plain with a water table close to the surface. As such, it is more suitable for agriculture than for urban development.

Zone "C" covers a steeper sloping area with the altitude ranging between 200 and 600 meters. The absence of large areas of relatively flat land makes this zone difficult for the construction of infrastructure or residential structures. Also, large parts of this zone are exposed to high and very high erosion. There are few groundwater sources and the land is characterized by moderate to severe limitations for agriculture. This zone, covering more than one third of the MMI area, is categorized as an area of limited opportunities for intensive urban development. It is suitable for afforestation and recreation rather than agriculture. This area, when properly afforested, will be able to support low- to middle-density urban development, particularly in its low-laying parts.

Zones "D" and "E"

In its larger part, zone "D" covers the wetland areas of saline, non-consolidated soil which are suitable neither for agriculture nor construction. Besides, containing various lagoons, salt marshes and saltponds, this zone is a habitat of a variety of flora and fauna species important for aquatic life. It should therefore be preserved in its natural state.

Zone "E" is a high terrain surrounding the Izmir agglomeration. Erosion and run-offs are the principal problems in this zone, making it unsuitable for development and cultivation. The conservation efforts must therefore be focused on the preservation of the natural vegetation cover (forests) because of its role in diminishing run-offs, reducing erosion and sedimentation as well as in sustaining wild life.

5. Development Process

5.1. Population growth

A continuing high increase of population in the MMI area has been a main demographic feature in the recent past. Over a period of thirty years (1960-1990), the population grew more than threefold, from 520 thousands to more than 1.78 million.

The average annual growth rate for the MMI recorded over the intercensal periods of 10 years varied from 4.3 to 4.6 percent between 1960 and 1980, and dropped below 4.0% over the 1980-1990 period. The notable difference in growth rates between the 1960-1980 and 1980-1990 periods suggest that the rate of population increase in the MMI is gradually declining. However, it has been (and still is) considerably faster than that in the remaining areas (districts) of the Izmir province, which has in the last 30 years been increasing at the average rate of only 1.7% (see Tables 5.1 and 5.2).

Table 5.1: *Size of the population and population change between 1960 and 1990*

AREA	YEAR			
	1960	**1970**	**1980**	**1990**
MMI*	520,676	797,357	1,255,796	1,780,476
Remaining Districts	542,814	629,816	720,967	914,294
IZMIR PROVINCE	1,063,490	1,427,173	1,976,763	2,694,770
TURKEY	27,754,820	35,605,176	44,736,957	56,473,035

***MMI** - Total population of the Metropolitan Municipality of Izmir (population by districts, subdistricts and villages are included);

Source: SIS (1960, 1970, 1980, 1990.) Population survey for the Province of Izmir. Ankara:SIS.

Table 5.2: *Population growth rates (%)*

PERIOD	1970/60	1980/70	1990/80	1990/60	INDEX 1990/1960
MMI*	4.35	4.65	3.55	4.18	341.95
Remaining Districts	1.50	1.36	2.40	1.75	168.43
IZMIR PROVINCE	2.98	3.31	3.14	3.15	253.39
TURKEY	2.52	2.31	2.35	2.39	203.47

***MMI** - Total population of the Metropolitan Municipality of Izmir (population by districts, subdistricts and villages are included);

Source: Same as Table 5.1.

The overall increase of population in the area of MMI has been influenced by the positive values of both migration and natural population growth. Regarding the natural growth, it should be noted that the socio-economic conditions prevailing in the area of Izmir have been particularly conductive to the fertility rate decline. According to reliable approximations, the total fertility rate over a 20-year period (1970-1990) declined from more than 3.5 (children per mother) to 2.5 - a trend generally characteristic of the later stages of the demographic transition.

Although the natural increase made a sizeable contribution to the population growth in the MMI, the role of migration has been quite influential, due to its long-term multiplicative effect on the metropolitan growth. Unfortunately, the lack of reliable historic statistical information at district levels precluded the efforts in studying net-migration flows in terms of their intensity towards the area in concern. Therefore, what was taken into account were approximations. The fact that the average annual rates of natural growth in the area of MMI

and its surroundings have been slightly lower than those of the country as a whole (around 2%) indicates that a very high increase of the total MMI population in the 1960-1990 period was mostly the effect of an extensive immigration (approximately 55-60% of the total population growth). A large portion of this migration came from the inland parts of the Aegean region (approx. 60%).

Apart from intra-regional migration processes, migrants from other regions of the country have also moved to Izmir (approx. 40% of the total immigration flows), due to the "pull" factors present there (job opportunities, possibilities for investment, better living conditions). In view of that, it is important to note that the hinterland area influencing development processes in MMI actually extends well beyond its boundaries, almost to the Anadolia region, wherefrom, due to poor conditions of life, the people continue to migrate to larger cities, Izmir being one of the most popular destinations.

Table 5.3: *Age profiles of the MMI population in 1970 and 1985 - percentage shares of selected age-group*

AGE GROUPS	AGE GROUPS (%)		
	1971	1985	INDEX
0-19	42.80	40.00	93.48
20-29	16.73	20.24	120.99
30-59	32.67	33.09	101.29
>60	7.80	6.67	85.46
OAC	0.18	0.166	91.42

Note: OAC - Old-age coefficient (>60/0-19)
Source: Same as Table 5.1

The migration pattern has over the last 30 years been characterized by a selective inflow of the predominantly younger population having a strong impact on the general features of the age structure of population in the MMI. Nowadays, the age profile of the MMI population speaks of a strong prevalence of young adults. Taking into account the long-run effects, often called "population momentum", this young-age profile of the MMI population is a guarantee that the number of births will be relatively large, even if the fertility rates continue to decrease as it was the case over the analyzed 30-year period (see Table 5.3).

5.2. Population distribution

There are at least two periods of the demographic development of the MMI area that can be distinguished. The first period, up to 1960, was characterized by a rapid growth of the core of the Izmir agglomeration (the Konak district) whose contribution in the total MMI population reached the peak in the late sixties (60%).

After the sixties, the pace of population growth in the core slowed down considerably. At the same time, the neighbouring districts around the central Izmir (Buca, Bornova, Karsiyaka) were experiencing an accelerated growth, so that between 1960 and 1990 their population size changed from 162 to 900 thousand, and their participation in the total MMI population increased from 31.2% to 50.9%, this being the highest recorded increase in the Izmir province in that period. That can be attributed to the powerful territorial expansion of the Izmir agglomeration. Between 1960 and 1990, the number of residents of these areas increased more than four times, reflecting an enormous population pressure.

Table 5.4: *The population of MMI: 1960-1990 (absolute figures and percentages, by districts)*

AREA	YEAR	Growth rates (%)			INDEX	YEAR
	1960	1960-70	1970-80	1980-90	1990/60	1990
KONAK						
Tp	358,225	3.62	3.44	2.01	244	874,597
Up	296,635	3.03	2.85	5.04	292	866,700
Rp	61,590	6.07	5.33	-27.10	13	7,897
(%)Tp	68.80					49.12
BUCA						
Tp	32,555	5.44	6.77	6.70	625	203,383
Up	30,170	5.70	6.98	6.80	660	199,130
Rp	2,385	2.50	0.70	2.67	178	4,253
(%)Tp	6.25					11.42
BORNOVA						
Tp	52,019	5.55	6.01	5.68	535	278,300
Up	25,015	2.90	6.14	16.28	1,091	272,860
Rp	27,004	7.57	5.93	-25.20	20	5440
(%)Tp	9.99					15.63
KARSIYAKA						
Tp	77,877	6.17	6.76	4.52	545	424,196
Up	64,194	6.52	6.55	6.28	652	418,721
Rp	13,683	4.34	7.91	-18.90	40	5,475
(%)Tp	14.96					23.82
TOTAL						
Tp	520,676	4.35	4.65	3.55	342	1,780,476
Up	416,014	3.84	4.28	6.67	422	1,757,411
Rp	104,662	6.20	5.76	-23.46	22	23,065
(%)Tp	100.00					100.00

Note: **Tp** - Total population; **Up** - Urban population; **Rp** -suburban population; **%Tp** - % of total population
Source: Same as Table 5.1.

Today, the coastal belt of the Izmir Bay is heavily urbanized, with the average population density of more than 2,500 persons per square kilometer. Such density, 10 to 20 times higher than the density in the remaining districts of the province, indicates that the future regional development and population distribution can no longer be based on the persistence of the existing process of polarization. Quite the contrary, the slower pace and the decreasing rate of population growth in the last 10 years, and particularly after 1985, could be a signal indicating that Izmir is approaching its saturation in terms of physical occupation of the space. On the other hand, the recorded relative growth rates of the surrounding urban centres could also be a signal that the regional development has reached the turning point at which polarization trends give way to an intra-regional dispersion[9].

[9] A 1980-1985 migration analysis of the Izmir province supports this interpretation. Namely, the positive immigration-emigration balance in that period was 82,436 in the Izmir province, 438,559 in the centre of the province (MMI), 45,721 in the urban sector (MMI excluded), and 7,118 in the rural sector of the province. This suggests a considerably changed migration pattern approaching a balanced dispersion over the urban areas.

5.3. An outline of economic activities

A preliminary analysis of the Izmir economic structure reveals the fact that the importance of the coastal region for the country as a whole was far greater than what its size might have suggested. The high level of development, achieved in 1970s, owes much to the favourable natural conditions. In terms of present economic resources Izmir has, beyond, doubt a special pull-factor. This in turn has attracted another factor vital for the process of development - human resources.

Table 5.5: *Population by economic activity, 1985 (MMI, Izmir province and Turkey)*

Economic activity	MMI	Province	Turkey
Agriculture, forestry and fishing	8,756	320,844	12,118,533
Industry	144,164	178,603	2,345,719
Mining and quarrying	845	1,933	137,126
Manufacturing	142,528	175,528	2,185,369
Electricity, gas and water	791	1,142	23,224
Services	305,019	397,562	5,985,613
Construction	35,192	49,528	750,546
Wholesale retail trade, hotels	78,133	100,135	1,382,636
Transport	25,016	34,719	615,888
Financing, insurance etc.	26,483	30,776	389,254
Community soc. and pers. services	140,195	182,404	2,847,289
TOTAL	**457,939**	**897,009**	**20,449,865**

Adapted from: SIS (1986). Census of Population by Administrative Division-Turkey. Ankara: SIS Publishing.

The sectorial employment structure presented in Table 5.5 suggests that MMI has a powerful manufacturing industry and highly developed trade and tourism. The figures are generally valid for the Izmir province as a whole, where the shares of manufacturing industry, trade, business-community and social services are above national average.
Judging by the sectorial value added growth rates, it appears that the Izmir province as a whole has experienced an above average growth rate in almost all its sectors. In 1986 the industry's value added in Izmir grew by 9.2 per cent (in real terms), while the national average stood at 8.7 per cent. For services the gap is larger (8.7 per cent for Izmir and 6.4 per cent for the national average). The value added growth as measured by Gross Domestic Product (GDP) was higher than the national average by slightly less than one per cent (8.13 per cent for Izmir and 7.3 per cent for Turkey).

Table 5.6: *Sectorial Labour Force Growth Rates, Izmir and Turkey, 1970 to 1985 (per cent increase over 15 years)*

Sector	Izmir	Turkey
Agriculture	16.1	18.5
Industry	82.2	67.6
Services	103.0	89.0
Total	57.3	38.1

Source: State Institute of Statistics (1971, 1986).

Over the observed 15-year period the sectorial labour force rates in Izmir grew differently from the national average. As can be seen in Table 5.6 the agricultural sector's labour force grew by 16 in Izmir and by 18.5 per cent for the whole country. Industry's labour force, however, grew by 82.2 per cent, while the national average was 67.6 per cent. Services in Izmir grew by a notably higher rate during this decade and a half - 103 per cent, while in the whole of Turkey it grew on average by 89 per cent. Taken as a whole during the same 15 years, the labour force grew by 57.3 per cent in Izmir and 38.1 per cent in Turkey. These figures show that the continuous influx during that period was producing new labour force available at all times. Needless to say, without the labour demand generated by the economy, this might have exploded into a gross unemployment.

Table 5.7: *Value Added Per Capita in Industry, 1988, Izmir, Istanbul and Turkey*

Area	No. of Establishments	Value added TL	Persons Engaged	V.A. Per Employer mill.TL
Izmir	549	3,670,548	87,072	42.2
Istanbul	2,262	7,230,572	284,124	25.4
Turkey	5,422	25,424,212	955,217	27.7

Source: SIS (1988). Annual Manufacturing Industrial Statistics (establishments with more than 25 persons). Ankara: SIS.

In fact, not only was the economic performance of the Izmir province over the time better than that observed on the national scale, but the productivity as measured by the value-added per-capita in industries was higher than that observed in other provinces. Table 5.7 shows that while the industrial establishments employing more than 25 persons managed to produce 42.2 million TL per capita, in Istanbul this figure stands at 25.4 million TL, while the national average stands at 27.7 million TL. The difference in productivity is very significant. Ranking the provinces of Turkey according to their shares in GDP and GDP per capita (1985), Izmir stands in the second and third place respectively (Industrial Chamber of Istanbul, 1988). The analysis of GDP per capita in the last ten years shows that in Turkey it was $1,269 in 1981 and $1,944 in 1990. In Izmir, on the other hand, it increased from $2,166 to $3,258. From the economic activities point of view, the highest shares in the GDP of Izmir are generated by industry and services, as well as by the agricultural sector.

5.3.1 Industry and the Port

A large-scale, extensive industrial development has been the supporting force behind the vigorous economic growth of Izmir over the last 40-year period. Most of the industries in Izmir were established in the Inner Bay region due to several factors, namely:

- land suitable for siting of industries and water availability (especially in the Bornova Plain);
- economies of scale existing in the city;
- proximity of the coast and, especially, the existence of a port; and
- availability of resources, especially manpower.

An indicator of intensive industrialisation is the number of industrial establishments. The Union of Industrial Chambers of Turkey (TOBBIM) reports that the number of the members of the Chamber of Industry in Izmir reached 1,353 in 1986. However, one should not forget

that all the industrial establishments are not registered with the Chamber, suggesting that their number is much higher. According to EBSO (Aegean Region Chamber of Industry) address book published in 1990 there is about 2,300 large- and medium-scale industries in Izmir, i.e. 33% of all industries located in the Aegean Region. By adding small-scale manufacturing units, the number of industries located in the Izmir agglomeration is likely to have exceeded 6,500.

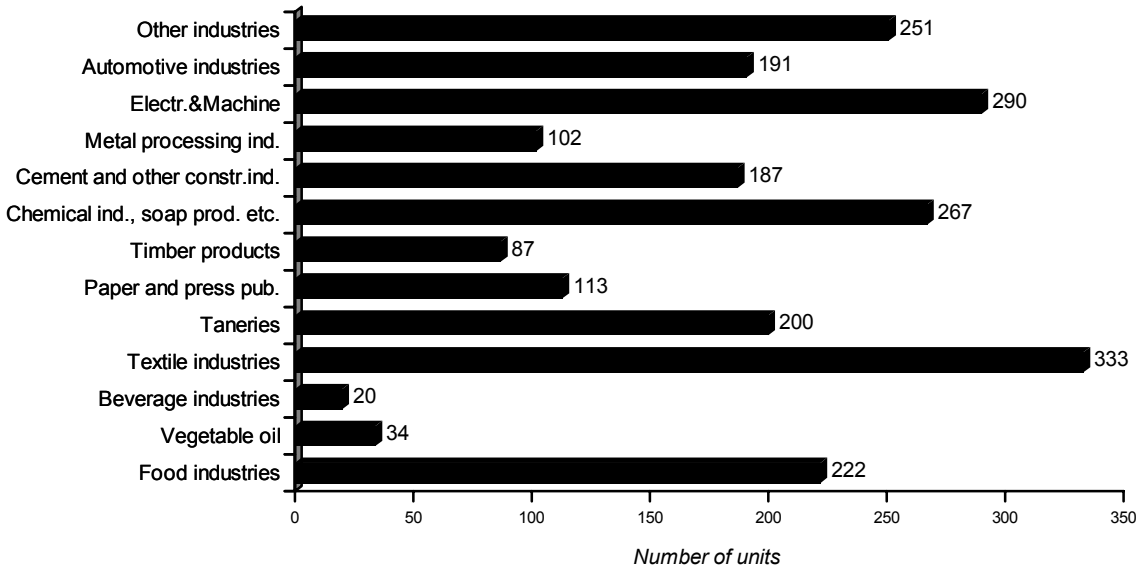


Figure 5.1: Large and medium-scale industries in MMI, 1990

As shown in Figure 5.1, the main types of industry in Izmir are food industries, beverage manufacturing and bottling, tanneries, vegetable oil and soap production, chemical industries, paper and pulp factories, textile industries, metal processing, timber products and processing etc. Equally important to mention is the production of more than 1 million tons of salt.[10]

Besides being Turkey's important industrial centre, Izmir is its second largest port servicing a substantial portion of the country's external trade. The Izmir port accounts for 25% of annual exports and 55% of imports of Turkey. Being a trans-shipment point for marketing agricultural produce, the Izmir port has a large servicing area including the fertile agricultural lands of Afyon, Manisa, Denizli, Mugla and Usak. The average yearly number of commercial ships stopping in the harbour is approximately 2,000. The harbour also provides support for a commercial fishing fleet, private boats, and the Navy. The storage capacity of the port is 200,000 tons.

5.3.2 Agriculture and Fisheries

Because of its rich natural resources, Izmir is one of the regions with extensive agricultural activities. This region participate with almost 15 per cent in the country's total agricultural production. The most productive agricultural land lies to the north, east and south of the city of Izmir, i.e. in the alluvial plains around Seferihisar, Kemalpasa, Menemen and Torbali.

[10] Balkas T.I., and F. Juhasz (1991). Preliminary study on the costs and benefits of measures for the reduction of degradation of the environment from land-based sources of pollution and activities in coastal area of the Bay of Izmir. Athens: UNEP/MAP.

There, the agricultural production is concentrated on olives, cotton, citrus, cereals, and dairy farming.

As far as commercial fishing is concerned, information on the amount of catch in the past years is scarce, but it is known that the amount of fish has steadily dropped in the last 20 years. Currently, the figures showing the fish stock for commercial fishing and the catch level in the Bay area are estimated at 217.6 tons/year and 65-87 tons/year, respectively.[11]

5.3.3 Tourism

Tourism is yet another resource for the city of Izmir which entertains numerous tourists who visit a variety of historic sites and archaeological remains (Bergama, Efes), tourist resorts (Cesme, Bodrum, Kusadasi etc.) and nature reserves (Izmir bird sanctuary). Numerous holiday resorts which can be easily accessed from the city contribute significantly to the income from tourism.

Table 5.8: *Registered domestic and foreign visitors, Izmir province, 1990*

DISTRICT	VISITORS			OVERNIGHT STAYS		
	Foreign	Domestic	Total	Foreign	Domestic	Total
Izmir Merkez*	185,138	200,598	385,736	287,424	356,050	643,474
Bornova	3,402	5,196	8,598	4,297	13,396	17,693
Karsiyaka	3,556	8,077	11,633	5,074	13,561	18,635
Aliaga	178	3,213	3,391	721	6,932	7,653
Bergama	1,351	383	1,734	1,635	489	2,124
Cesme	31,350	37,293	68,643	246,290	118,427	364,717
Dikili	824	564	1,388	7,524	4,031	11,555
Foca	18,965	1,383	20,348	81,652	4,305	85,957
Karaburun	7	168	175	41	547	588
Seferihisar	3,462	1,821	5,283	17,351	10,234	27,585
Selcuk	26,537	2,870	29,407	39,108	3,925	43,033
Urla	1,746	2,058	3,804	13,344	5,677	19,021
Kusadasi**	315,005	86,941	402,006	1,168,613	179,116	1,347,729
T O T A L	**591,581**	**350,565**	**942,146**	**1,873,074**	**716,690**	**2,589,764**

*Izmir Merkez includes Konak and Buca districts.
**Kusadasi is outside of the Izmir province.
Source: Culture and Tourism Directorate of the City of Izmir (1991).

At present, coastal (summer) tourism is the main tourist development pattern in Izmir region. There is, however, an international fair which is held between August 20 and September 20 which brings thousands of visitors to the city of Izmir every year. In 1990 2,589,764 overnight stays were registered within the wider Izmir area. Foreign tourists make more than 70% of the total overnight stays. They prefer hotel accommodation and stay longer than domestic tourists. The average length of stay of all tourists is 2.7 days which is much shorter than in other Mediterranean tourist areas.

[11] Source: same as footnote 10.

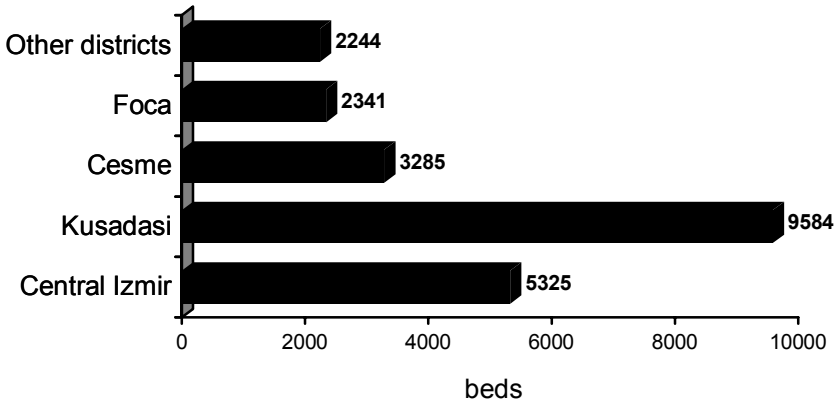


Figure 5.2: Registered accommodation capacities

As shown in Figure 5.2, there were around 23,000 beds registered in 1990 in the wider Izmir area. The majority of the establishments are located in the central Izmir, and in the adjacent resorts (Kusadasi, Cesme, Foca) where the current investment in the public sector is bound to increase the quality and quantity of the tourism offer. In the city of Izmir the lingering conflict between tourism and other economic sectors and deteriorating environmental situation makes it less attractive to visitors. Judging by the average length of stay which is only 1.6 days, one can conclude that the city of Izmir is at present only a point of transit for the neighbouring tourist resorts (Cesme, Kusadasi, Bodrum, etc.).

Chapter III

DEVELOPMENT–ENVIRONMENT INTERACTIONS

6. Land Use

Owing to the rapid population growth, industrialization and urbanization, Izmir has in the last 40-year period experienced dramatic changes in land use structure. Under these circumstances, various problems concerning utilization of land and land resources have emerged. This chapter attempts to examine the major problems and conflicts associated with the use and management of MMI land resources with special onus on the urban land.

6.1. Issues concerning dynamics of the urban land development

The inescapable fact underlying any discussion on land utilization in the area of MMI is the sheer scale and pace of urbanization, particularly prominent after 1950. Since that period the use of land resources in the MMI area has been intensified especially along the major circulation axes of Konak, Buca, Bornova and Karsiyaka districts. This resulted in an extensive linear expansion of urban development.

As a result of that expansion, the overall land-use structure of MMI has in the last forty years changed a great deal. Today, more than 30% of that area is used for urban purposes and less than 70% for those non-urban.

During the last 40 years period, the urban land expanded more than four times (see Table 6.1), with the rate of land conversion very often faster than the population growth[12]. Under these circumstances various problems pertaining to the utilization of land have emerged.

Table 6.1: *Breakdown of general land use categories (Analysis of change from 1950 to 1992)*

Category	1950	1992	Index 1992/50	(%)
Urban Land (in ha)	6,900	29,600	429	32.7
Non-Urban Land (in ha)	83,800	61,100	73	67.3

Source: PAP/RAC MMI GIS database.

One of the most critical problems is the accelerated conversion of high-quality agricultural land to urban uses. The available data[13] show that about 44% (11,500 ha) of the total 26,000

[12] As no comprenhensive statistics of land use in Izmir is available, the local GIS team has prepared some tentative estimates on the basis of available data. Calculations show that over the studied 40-year period, more than 500 hectares have been converted to urban uses every year (residential, industrial, etc.).

ha of the agricultural land have been converted to urban uses over the last 40 years, while approximately 14% (3,700 ha) was neglected or degraded into pastures, bushes, shrubs etc.

The remaining 42% of land is still being used for agriculture. Parts of this land are located within the Izmir agglomeration or along its expansion axes (the Bornova plain, the south and the north axes). It is therefore realistic to expect the persistence of high pressures on the transformation of these lands into building sites.

One of the major problems is also the devastation and/or degradation of forests, this being the consequence of many factors such as grazing, fires, and especially uncontrolled felling for new construction sites or conversion of forest land into agricultural areas. Degradation, followed by climatic and other natural factors (erosion, etc.) largely changed the image of vast lands within the MMI into derelict areas of sparse undergrowth (degraded forests, pasture land, barren land, etc.) covering almost 50% of the total non-urban land. As the natural process of rejuvenation is slow in such cases, afforestation and intensive care for young trees should be a priority. Figure 6.1 provides information on the present structure of non-urban land by type of land use.

6.2. Built-up areas: a general outlook

The average population density which, in spite of the fact that the population is increasing, stays at the level of 70 persons per hectare indicates that the whole built up area of MMI is still dispersely used. Today, all settlements around the Izmir Bay are interconnected, thus forming a single urban ring which extends 25-30 kilometers outward from the city core. Figure 6.2 provides information on the built-up land by type of land use.

6.2.1 Housing: two models of residential development

In MMI, more than 54% of the built-up area (not counting the zones of special use) are residential. Two different models of residential development can be observed: the medium-to-high-density model and the low-density model.

The high-density model of residential development (gross residential density of more than 150 per/ha) is found mostly in the narrow coastal belt and in the centres of the MMI districts municipalities. This model can be generally accepted as representative of a rational use of land. However, the fact that the densities of some central parts of the city[14] exceed 300 persons per hectare indirectly implies congestion, overload to the existing infrastructure, lack of space for public services, parks, urban landscaping, etc. as well as a lower quality of urban environment (noise, air pollution, etc.).

The low-density model (gross residential density below 150 per/ha) is found along the edges of the Izmir agglomeration. Frequently, this model is characterized by ill-planned and ill-designed family houses on land with no infrastructure. Judging by the average gross residential density, it may be assumed that the interior spare capacity of the existing low-density residential areas is large enough to accommodate a portion of the future population growth without affecting the quality of life. However, infilling of the low-density residential

[13] Data on non-urban land by type are not fully reliable due to the lack of relevant statistics. The GIS team working in Izmir has therefore made some rough estimates on scales 1: 50,000 and 1:1,00,000.

[14] Karsiyaka, Bayrakli, Bornova (its southern part), Kucukyali and Yesilyurut are the high-density zones with more than 300 persons/ha, while Buyuk Cigli and Kuyuk Cigli, Ornekkoy, Bornova, Camdibi, Gultepe, West Buca and Karabaglar have the density ranging between 150-300 persons per hectare.

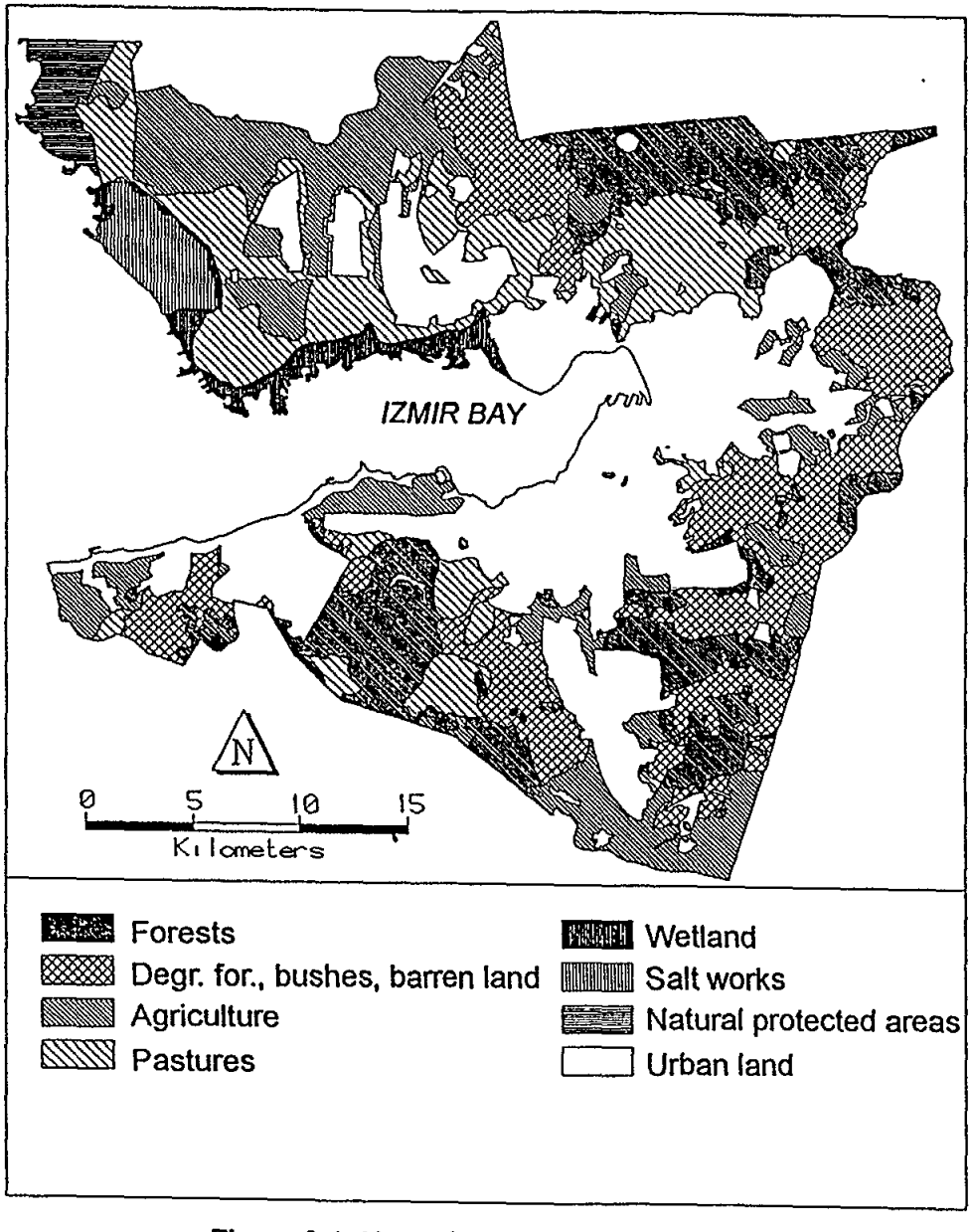


Figure 6.1. Non-urban land by type of land use

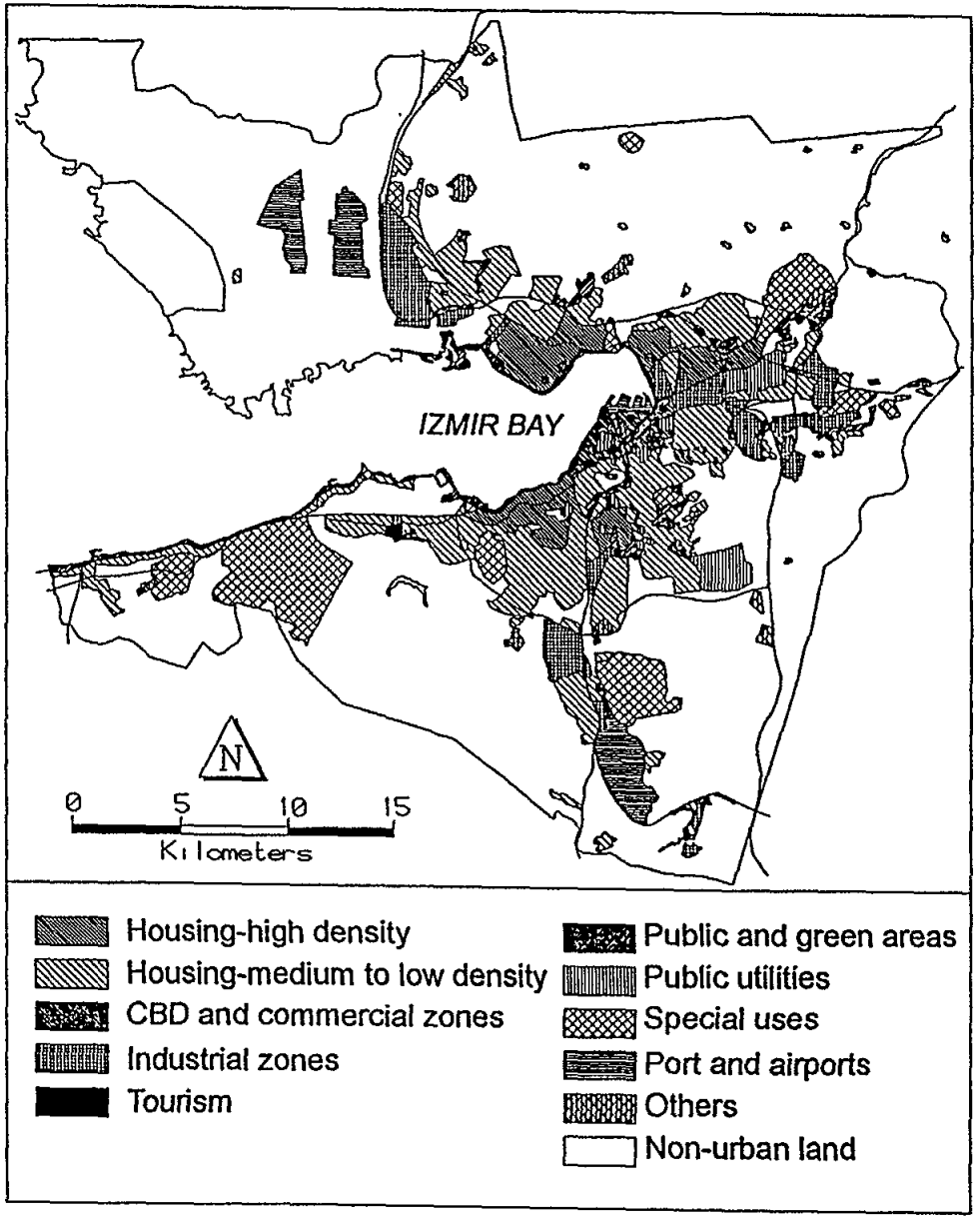


Figure 6.2. Built-up land by type of land use

zones is quite a problem since they are poorly organized and often located on the sloping hillsides in or around the city. Their reconstruction (building of appropriate infrastructure and infills to increase the density) requires extensive demolition, which increases the construction costs. Therefore, there is a high degree of probability that, due to the lack of local control over the use of land, the future urban growth will continue to encroach on the non-urban land.

A relatively large portion of the low-density housing in the MMI area is mostly the result of an indiscriminate occupation of land by illegal housing (gecekondu) which has taken enormous proportions, partly due to insufficient land-use control and policies which failed to slow down migration inflows in Izmir, or to provide enough equipped land at an acceptable price for low-income households. This has not only given rise to the marginal (informal) sector of employment, but has also spurred the low-income households to move to the edges of the city which have not been covered by city plans and where land is cheaper. Thus, a part of the urban growth "escaped" control, and the phenomenon of gecekondu neighbourhoods has been a lingering feature in MMI since the 1950s.

According to some estimates, some 700 thousand inhabitants (42%) of the total MMI population live today in illegal residential zones. There is hardly a district where illegal housing has not been observed. As shown in Figure 6.3, the highest percentage has been recorded in the Karsiyaka district and the lowest in Bornova.[15] Incomplete and poorly developed infrastructure systems and lack of appropriate urban equipment are typical of these areas. The construction of houses there has been much quicker than the construction of communal infrastructure. So far, the planning activities of the municipalities have been restricted to efforts in checking the uncontrolled growth, to the introduction of some development coordination, and to the provision of services for these areas.

6.2.2 Industry: a major generator of environmental pollution

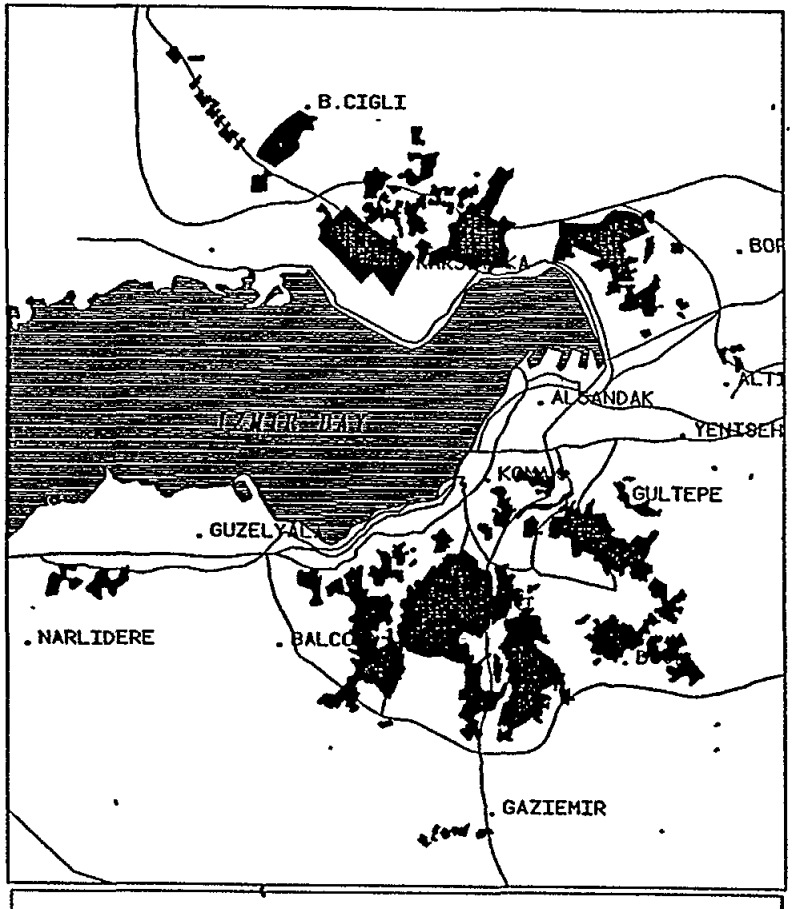
There is, as estimated, about 2,300 large- and medium-scale industries concentrated in the Izmir agglomeration (32% of the total in the Aegean Region[16]). These industries, together with small manufacturing units, occupy more than 4,000 hectares of land. The largest number of industries can be found within the wider central zone, in the coastal belt, along the southern communication axes of the Konak district, and in the Bornova plain (see Figure 6.4).

The most important industries of MMI may be characterized as:

- heavy users of land and fresh water;
- users of considerable amounts of the low-heating-value lignite used to meet their energy needs, and heavy polluters of air;
- generators of large amounts of industrial residues which are being discharged into numerous streams running to the Inner Bay, adding to the already high level of marine pollution; and
- generators of an excessive in-out transportation flow and commuters' movement, resulting in congestion, bottlenecks along the main urban arteries, noise, polluted air, etc.

[15] In addition to the concentration of people in low-density areas (gecekondu), this also includes the high-density illegal housing in the areas outside the coverage of the Master Plan.

[16] Source: EBSO address book (1990). These are only estimates, since there is a number of unregistered (informal) establishments.

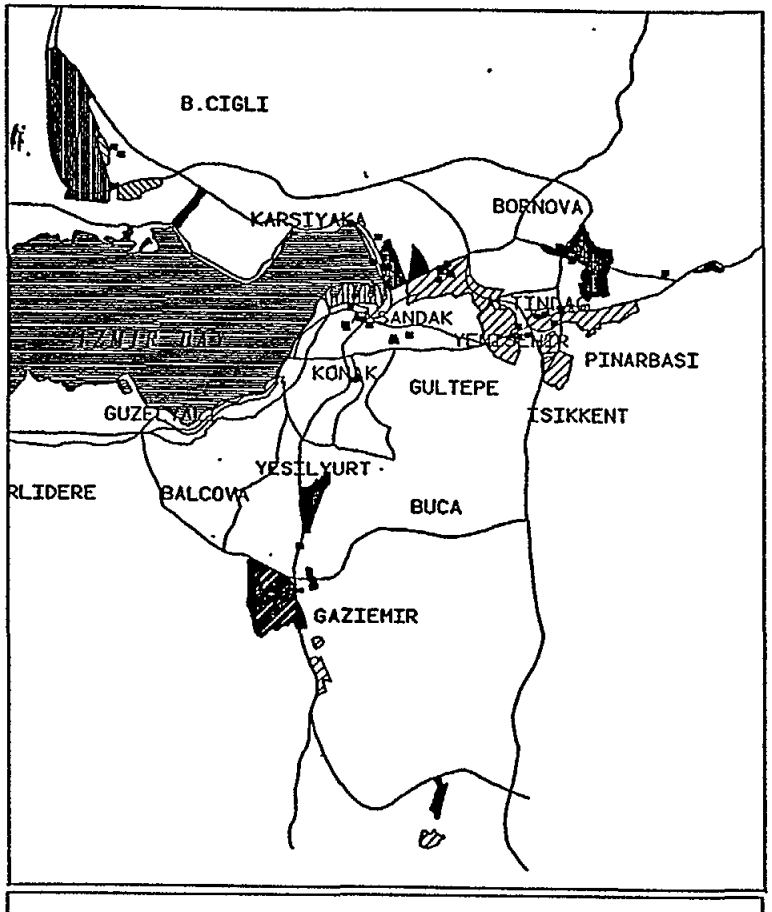


Illegal housing covered by the improvement plans

Illegal housing, 1988 (percentages, by districts)

	Merkez	Karsiyaka	Bornova	MMI
Population	1,077,980	424,196	278,300	1,780,476
Legal housing (%)	57.45	52.22	71.82	57.90
Illegal housing (%)	42.55	47.78	28.18	42.10

Figure 6.3. Illegal housing



Free enterprise zone
Ataturk Organize Sanayi Bolgesi
Other industrial zones
Urban working areas
Storage
Port
Distribution of the most polluting industries

Figure 6.4. Industry

Among these industries, tanneries are the heaviest contributors to the pollution load. The total value added to economy by the tanneries is very high, but their total pollution load is indeed matching. In addition to a high chromium load, tanneries also discharge high amounts of organic substances, increasing COD and adversely affecting the receiving water bodies (see Box 2.) Furthermore, tanneries are major point sources of sulphur dioxide and nitrogen oxides emission (a consequence of the inadequate equipment and low-quality fuels being consumed).

Paint industries are also among high contributors to the economy of Izmir and heavy polluters of the environment. Wastewater discharged from these industries has a high chemical oxygen demand (COD) containing high amount of total solids (TS) and heavy metals[17]. It is apparent that the wastewater originating from these sources will have strong adverse effects on the environment even if treated by secondary treatment, since the trace of organic matter and certain fractions of the heavy metals can not be removed by conventional treatment techniques. Textile industries of Izmir are also largely contributing to the environmental disturbance with their organic loads to the receiving water bodies.

BOX 2. TOXIC ORGANIC LOADS OF THE TANNERY WASTE WATERS

It is known that the tannery wastes amount to 20-100 m^3 per ton of hides processed. This means that the tanneries of Izmir registered with TOBBIM (a total annual amount of 40,000 tons and an average wastewater quantity of 80 m^3 per ton of product) discharge 8,800 m^3/day of wastewater. Total annual load of organic compounds, under the no-treatment condition, is shown in the table below. Therefore, for the above-mentioned 31 tanneries with a total capacity of 40,000 tons, the total phenolic substances discharge might be as high as 42 kg/day, which is very high indeed. While evaluating this figure, one should not forget that the actual amount is probably much higher when all the tanneries are taken into account. The effect of this discharge on the receiving bay waters is their toxicity to the aquatic life.

Toxic Organic Loads of the Tannery Waste Waters

Parameter	Average Concentration mg/L	Average Load kg/day
Aromatics	0.300	2.64
Organohalogens	0.050	0.44
Phenols	4.758	41.87
TOTAL		**44.95**

Source: Balkas T. and U. Yetis (1992). Environmental Profile of Izmir. Split: PAP/RAC.

[17] The average COD and TS content of the paint industry wastewaters is estimated as approx. 4,000 and 1,000 mg/l respectively. The heavy metals which may be present are antimony, barium, cobalt, copper, iron, lead, manganese, nickel, silver and zinc. Polychlorinated biphenyls (PBCs), phenolic substances and some toxic organics such as chloroform, carbon tetrachloride, vinyl chloride etc., are also known to be present in the paint industry's wastewater.

Most industries in the Bornova plain discharge large amounts of organic matter, suspended solids and floatable content effluents into a nearby ditch, draining into Manda creek which runs through agricultural areas before finding its way into the Bay.

There are two problems which need to be pointed out. The first pertain to the increasing conflicts arising between industry and other activities in the area (fisheries, tourism and recreation, protection of water resources, housing, etc.) posing development constraints and requiring high social costs for the elimination of these conflicts. Another problem of equal importance is related to the impact of the existing location of industries on the value of adjacent areas. This problem is particularly felt in the coastal and central parts of the Izmir agglomeration where the land appears as an "expensive" development factor due to the competition of different users over land. But, the inability to charge the industrial sector a full social cost of operation, including pollution and congestion, only stimulates it to move towards the attractive parts of the agglomeration which are better equipped with infrastructure.

As of lately, being the response to mounting conflicts, new tendencies have been observed of dealing with the problem by organization of new industrial zones. One of these zones is the "Ataturk Organize Sanayi Bolgesi" which has been set up by the Aegean Region Chamber of Industry on an area of approximately 690 ha which extends 3.5 km northward of Izmir. It contains (or will contain) 18 different types of industries totaling 335 establishments[18]. With such a high number of industries, it is to be expected that the pollution load will increase considerably. However, the concentration of establishments will cause the costs of the provision of infrastructure and pollution abatement measures to decrease considerably[19].

6.3. Master Plan implementation: major issue of land management

The Master Plan adopted in 1973, being the first long-term comprehensive plan[20] made for the area, is the basis for a long-term management of the urban development of Izmir. The plan stipulated a linear macro form characterized by the following land-use pattern: new industrial areas were reserved for polluting industries and manufacturing enterprises which were to be dislocated from the city core; new residential areas were planned close to the major working zones; maximum densities were determined for some residential zones; measures were identified for the protection of historical heritage from deterioration; and land required for infrastructure was determined and reserved by the city government.

However, despite a strong political will and intention to implement the plan, it appears, judging by the way the land has been used, that the process of urbanization in the area of MMI moved in the direction which has by-passed the provisions of the Master Plan. This points to the fact that the Plan failed to anticipate the processes taking place during the last twenty years. Speculations over the reasons attributed to that failure are numerous and require to be examined.

[18] However, if one takes into account numerous small establishments and companies, the total figure is much higher amounting, according to some reports, to as many as 500 establishments in that district.

[19] The construction of a wastewater treatment plan with a capacity of 5,000 kg/day of BOD load was envisaged in that industrial zone.

[20] Before the Master Plan, several other plans were made. They, however, included only the areas within the boundaries of the Municipality of Izmir which is much smaller than the present MMI area (René Daugter 1925, Le Corbusier 1948, K. Ahmet Aru 1951, and Bodmer 1959).

The Plan might be said as being too static, placing much emphasis on detailed layouts and zoning of the expected land use. As such it focused on desirable metropolitan land use at a future point of time, rather than on the process through which to achieve it, and relied heavily on regulatory-restrictive rather than development-oriented instruments for its implementation. Furthermore, it did not pay enough attention to various important issues (such as, social ability to conform to spatial regulations, availability of resources for plan implementation, land and property market conditions, etc.) influencing urban development.

The Plan implementation faced considerable problems from the very beginning, to mention only the following major ones:

(1) Decisions departing from the assumption that a significant portion of the public investment will push the planned development of the city in the desired direction seemed to be unrealistic, because the land ownership structure was not considered carefully.

(2) Cadastral maps of the plan area were not completed by the time the plan was approved (1973).

(3) There were considerable delays in the preparation of the 1:5,000 and 1:1,000 scale detailed plans.

(4) The linear macro form development necessitated powerful control mechanisms which have not been properly implemented.

However, the most severe disturbances in the physical space may be attributed to the illegal construction. Tackling the problem has been reduced to a mere "accounting" of the areas which have fallen pray to illegal development, and the action has been taken only to legalize something which was already there. Furthermore, the Master Plan has, due to its frequent revisions, evolved into a mosaic of separate 1:5,000 or 1:1,000 scale plans drawn for particular areas which were not adequately integrated into a cohesive long-term planning document.

Considering the above, it is obvious that the local authorities, in spite of much effort put into it, failed to channel rapid urban growth[21]. Apart from the reasons mentioned above, the problem which should be pointed out lies in the fact that the local authorities do not have enough funds ready for land banking and provisions of the serviced urban land at right locations. As a result, there is only a limited number of sites equipped with communal infrastructure ready to accommodate new residents at acceptable price, particularly those belonging to the low-income groups. Under such circumstances, the massive rural in-migrations towards Izmir continue to generate pressures for land to build on, spurring expansion towards the outskirt undeveloped areas along the agglomeration edges, pushing the prices of land beyond its agricultural value, and opening grounds for excessive land speculations speeding up the transformation of non-urban to urban uses. At the same time, local authorities simply do not have accurate and updated information concerning land and property market conditions which renders them incapable of "tightening up" the control screw over the use of land and the master plan implementation, nor providing basis for a sound land taxation system which would secure social gains and, thereby, financial consolidation of these very authorities.

[21] A part of the problem is directly related to the measures and instruments of national policy which has so far been inefficient in controlling the urban growth and curbing the pressure of rural migrants on the Izmir area.

7. Use of Water Resources

Since the early 1960s, when the city of Izmir entered the period of rapid urbanization and industrialization, the water resources of the MMI area have been used mostly for urban water supply (see Figure 7.1). At present, the total water production for urban purposes in MMI area is estimated at 110 million m^3 per year. About 90% of that water comes from groundwater sources extracted through wells or springs scattered over the immediate city area and the adjacent communities, while the remaining 10% comes from an artificial lake (see Table 7.1). More than 50% of the water entering the supply system is unaccounted for. Of other water eventually reaching the consumers, more than 75% is used by municipal users (households, commerce). The mean specific consumption amounts to 140-145 l/day/person, while the maximum value reaches 180 l/day/person.

Table 7.1: *Water Sources of Izmir*

Sarikiz-Goksu	1750.0 l/sec
Halkapinar (groundwater)	1800.0 l/sec
Menemen (groundwater)	800.0 l/sec
Other groundwaters	850.0 l/sec
Balcova Dam	400.0 l/sec

Adapted from: IZSU (1987). Revision of final design for supply and distribution of potable and industrial water. Izmir:ISZU.

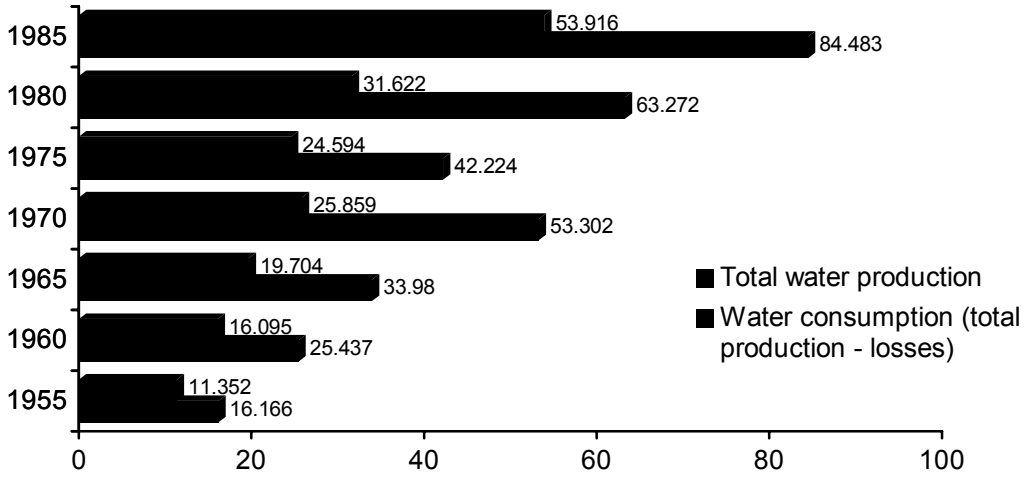


Figure 7.1*: Total water production (in million m^3) for urban purposes in MMI, 1950-1985*

A majority of city residents have piped water. Over the last decades, the city authorities have made significant efforts to improve and extend the water distribution network. This particularly refers to the introduction of additional structures (pumping stations, tanks), increase of transport capacities, and a more even distribution of the network over the agglomeration area. Currently, the water distribution network covers an area up to the isoline 300 meters above sea level.

However, in spite of the above mentioned efforts, the water supply system still suffers from certain shortcomings with regard to both coverage and quality, which is a consequence of the public sector having difficulty to keep the water supply infrastructure provision at pace with the rapid and extended urban growth. In this context, several problems should be pointed out.

Firstly, the current use of water is not rational. As already mentioned, 40 to 50% of the water is lost along the mains between the intaking point and the consumer, which is the percentage higher than that in other Mediterranean cities. These losses are mainly due to inappropriate construction and maintenance of the network, although one of significant causes is illegal tapping of water (uncontrolled supplies along the network).

Secondly, pathogens if traced in the drinking water may cause serious problems. The reason is that, due to fractures in the pipelines of the water distribution system, and due to direct pollution of the water resources, the water supplied to the city will not be safe enough for drinking. At present, desinfection of drinking water uses gas and liquid chlorine injected at 27 points along the network.

Thirdly, all of the local water sources used for water supply have been used in full and are unable to meet the increasing water requirements resulting from rapid population growth and industrial concentration in the Izmir agglomeration. Consequently, the problem of unstable relationship between the water supply and its demand in Izmir causes occasional shortage of water and restriction of its supply, particularly during the summer months. This, in turn, lead the people, and some industries as well, to look for other sources of supply, such as wells being drilled without control.

And finally, the major water resources, such as the Halkapinar and Bornova groundwater aquifers, are being consumed rapidly, and their capacities for water supply is constantly decreasing. In addition, they are under constant threat of direct pollution, especially the ones nearer to the industrial and housing areas. This is especially true of the Bornova groundwater aquifer. Subject to heavy metal contamination by industry, these sources already started demonstrating a certain degree of variation in their quality. This may become a serious problem in near future, since a more extensive treatment may be required to make these sources adequate for human consumption.

Bearing in mind the above circumstances, it can be concluded that the water resources within the city of Izmir and in its immediate vicinity are unable to meet the future needs, both in terms of quality and quantity. Consequently, potable water must be brought from sources outside the metropolitan area, requiring expensive engineering services and works such as tunnels, dams, etc. For the future it is planned to use more of the Sarkiz springs, and to start using water of Tahtali Dam, Turgutlu groundwater, Besgoz and Akpinar sources, and Medar Dam.

8. Waste Disposal

8.1. Liquid waste disposal: a major polluter of the Bay

At present, more than 70% of the Izmir area is covered by the sewerage network. Exceptions are the south-western parts of Izmir (Narlidere, Guzelbahce), and parts of residential areas (gecekondu) built without any plan at the edges of the agglomeration. There, the problem of sewage disposal is resolved by septic tanks. However, waste waters are disposed from

these tanks by infiltration, at a great risk of polluting potable water lines. Another problem is filtering of waste waters from septic tanks or cesspits into the ground water. Due to a high demand for sewage tankers, these can rarely be made available in time. Therefore, some septic tanks and cesspits produce overspills. At the same time, at some non-sewered areas, especially the gecekondu areas, domestic waste waters are discharged directly onto the street, producing odors and presenting a high risk of spreading diseases, either by direct contact or by insect vectors.

In the areas covered by the sewerage network, considerable differences can be noted in the quality and capacity of the system. Problems occur in almost all coastal, mostly densely populated areas of the agglomeration, where the network is old and of a combined type. In these zones, high population density, flat slopes, and storm water frequently cause surcharging of the old sewers, blockages and sometimes collapse of the conduits. Therefore, the sewerage network in these areas requires urgent reconstruction. However, the greatest problem of the existing sewerage system lies in the present wastewater disposal practice: the wastes of Izmir, consisting of 105,000 m^3/day of industrial discharges, and 308,000 m^3 of sewage, have been (and still are) dumped directly into the Inner Bay through 128 canals and 10 streams, without any pre-treatment.

In order to protect the Izmir Bay from degradation, State Hydraulics Works (DSI) started in 1969 an Izmir sewerage project. A U.S-Turkish consortium, Camp Harris Mesara, completed the preparation of a master plan in 1971, and recommended the conveyance of all the waste waters to a single wastewater treatment plant to be constructed in the unused salt-flats of the Old Gediz River delta area. Following the preparation of this master plan, the construction of the pump station and collection system began in 1983, together with the second master plan made by ISZU and the Holdfelder consulting firm. As a matter of fact, it was the revision of the previous plan. The general strategy adopted in that plan was the same as the one of the first master plan. However, the proposed treatment system was different. The first plan suggested the use of a three-stage lagoon system (aerated ponds, facultative ponds and polishing ponds), whereas the second master plan recommends the activated sludge treatment system. Considering the Inner Bay eutrophication, discharge of treated effluents to the Outer Bay through a sea outfall is recommended by both plans. However, the second master plan recommends for the future the discharge of effluents into the Old Gediz River west channel.

Another studies conducted by Dokuz Eylul University (1985), as well as by Black and Veatch (1988), suggested the present waste water treatment plant concept which consists of a combination of two treatment systems: anaerobic ponds to be followed by facultative ponds and polishing ponds, and two-stage aerated ponds to be followed by polishing ponds.

8.1.1 Wastewater treatment plant

The proposed site for the wastewater plant is the Old Gediz River delta area, south of Cigli airport (see Figure 8.1). The wastewater treatment plant will initially treat a wastewater flow of 8.9 m^3/sec, and than the capacity will gradually increase to 19.1 m^3/sec by the year 2020. The treatment plant will be serving 2.4 million people initially, and 4.85 million people by the year 2020. The capacity will be increased by adding more lagoons and by converting some of the anaerobic ponds to aerated ponds.

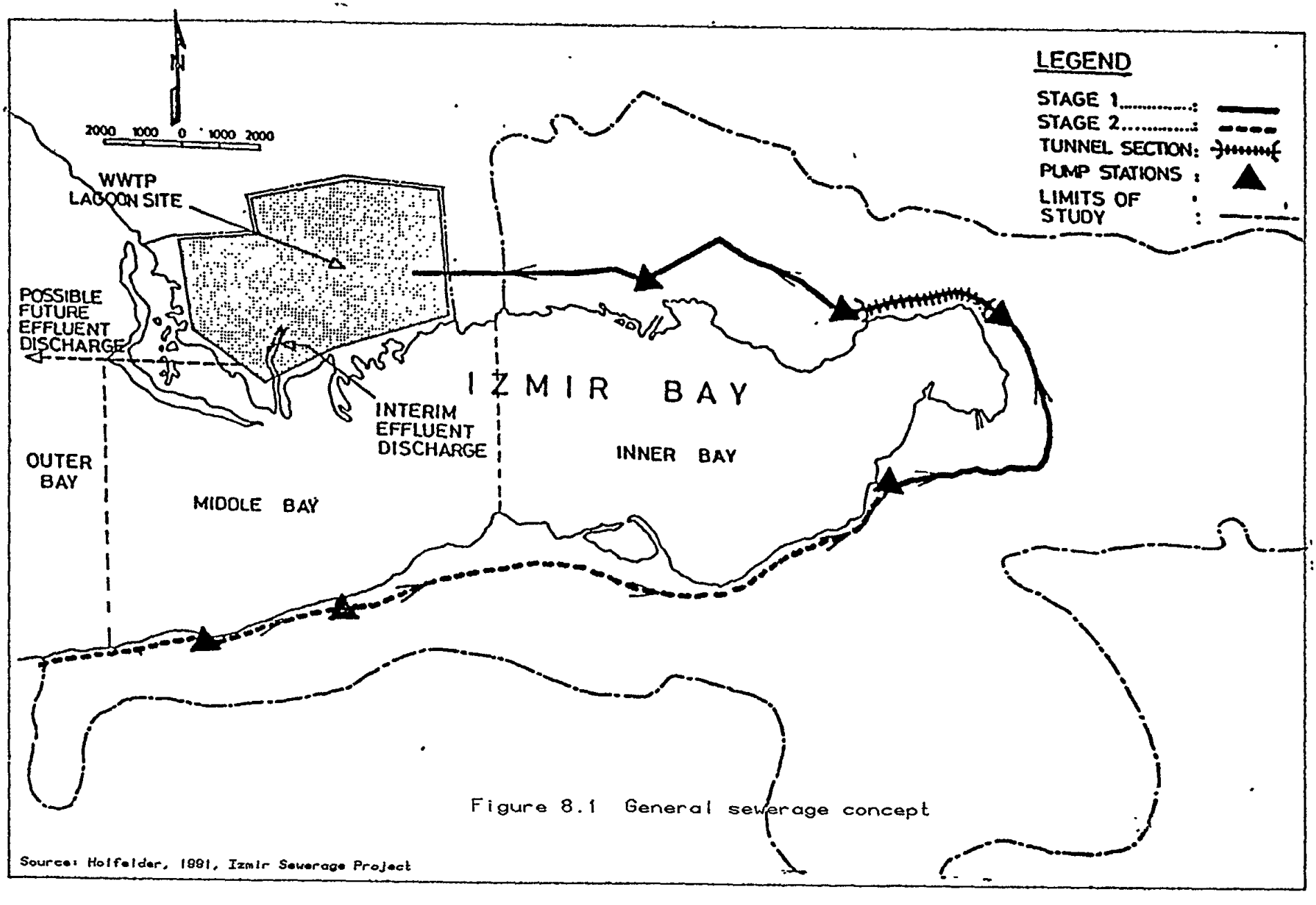


Figure 8.1 General sewerage concept

Source: Holfelder, 1991, Izmir Sewerage Project

The wastewater treatment plant will ultimately cover an area of 2,240 ha: 980 ha of the unaerated system, 645 ha of the aerated system, 475 ha of grit and sludge drying lagoons, and 140 ha of roads, buildings, etc. The most important adverse effect of the system may be odours, and this may be prevented by good maintenance of the ponds. However, some recent studies performed by Dokuz Eylul University suggest that the odours would not be as serious problem as it was assumed.

8.1.2 Wastewater collection system

The first stage of the wastewater collection system includes the construction of 49 km of main interceptors which will convey the waste waters from Guzelbahce to Cigli (wastewater treatment plant side), 90 km of trunk sewers, and 4 pump stations (see Figure 8.1).

The second stage which includes the collection of the waste waters from Menemen will be conveying in the bay about 15 per cent of the domestic waste waters produced; whereas the first stage is for the conveyance of about 85 per cent of the domestic waste waters and all of the industrial waste waters. It is reported that the number of pump stations will increase to 6 (which are in Guzelbahce, Abdullah Aga, Gumruk, Bayrakli, Karsiyaka and Cigli) in the completion of the project.

8.1.3 Disposal of the treated wastewater

The treated wastewater would be discharged to the Middle Bay through the Old Gediz River. This would be through a surface outfall.

The treated wastewater, however, is expected to contain a relatively high concentration of suspended solids (about 120 mg/l especially during the spring and summer months), nitrogen and phosphorous (about 27 mg/l and 10 mg/l respectively). Furthermore, the effluent which will flow to the Middle Bay is of a low salinity and could override the saline Bay water, drifting in the direction of the wind.

Considering the above facts, the main problem related to proposed effluent discharge into the Middle Bay is a high load of nutrients (nitrogen and phosphorus) it will carry. This will probably have the potential to trigger eutrophication processes resulting in an excessive growth of plankton and blooming of red tides. The proposed solution of effluent disposal through the Old Gediz River is likely to have negative effects on the salt production which is located in the vicinity of the west channel of Gediz. The zone of intake of the water used for salt production would be close to the point of effluent discharge to the Bay, and may be affected by pollutants contained in that effluents.

For these reasons, the necessity for an examination of alternative solutions for discharge of treated water utilizing a submarine outfall is strongly recommended by UNEP/PAP/RAC.

8.3. Solid waste management

In recent years, urbanization, changes in the living conditions, and increasing consumerism have created a rapid and steady rise in the per capita production of solid wastes in Izmir. There, the collection of refuse is taken care of by each of the municipalities that form the MMI, and the resource recovery is in hand of private and public firms. Wastes are separated at the source of collection. After collection and conveyance to transfer stations, wastes are transported to processing plants where recyclable materials are isolated and organic substances composted. The transfer stations and processing plants are the responsibility of MMI. Currently, about 1,500 tons per day of solid wastes generated by the metropolitan area

are processed in Uzundere Composting Plant (to be closed in a foreseen future) and disposed in the new Harmandali landfill located at the north edge of the agglomeration. That landfill covers an area of 900,000 m^2 and has the capacity to meet the needs of MMI for at least 15 years.

As landfill sites near the city are rare, waste recycling seemed a viable option because there is an active market for recycled materials. Namely, MMI receives, on annual basis, bids from private contractors for the purchase of compost, paper, textiles, plastic and metals.

9. Energy

According to available data, energy demands in the MMI area are satisfied mainly by burning coal, oil, or liquid petroleum gas (LPG), as well as by electricity which is an important source of energy, particularly for the large-scale steel industry. Apart from these, significant efforts have been made in the recent years to introduce some additional sources of energy, such as solar and geothermal. However, at present, these environmentally sound energy sources are being increasingly used only for domestic water heating purposes (solar energy), and for heating greenhouses and some other facilities in the Balcova area (geothermal energy). On the other hand, the electricity provided by the national interconnected network is occasionally subject to outages and rationing during the peak periods, and the tariffs are rather high.

Consequently, the crude oil processed at the Aliaga Oil Refinery located about 60 kilometers north of Izmir and especially the low-heating-value local lignites are still the two main sources of primary energy for the area under concern. According to data given in a study on air pollution in Izmir[22], the quantities of these sources for residential and industrial usage have in 1988 been estimated at 2,256,810 tons of lignite equivalent burned in Izmir. The breakdown of this amount according to fuel type, i.e. 1,237,500 tons of lignite versus 277,176 tons of liquid fuels, clearly points at the fact that all categories of fuel users and especially industry, as a major consumer, generally prefer the low-heating-value coal to the higher heating but more expensive fuel oil.

Besides being of a very bad quality in terms of heating value, all types of the coals burned in Izmir have often high contents of sulphur, moisture and ash. This, followed by the inefficient design of boilers burning these fuels, creates considerable air pollution problems.

Unlike lignite, fuel oils are characterized by high heating values (almost three times higher than lignite). However, having high sulphur contents, these energy sources also create serious air pollution problems.

The above also refers to the more than a century old coke and municipal gas factory of Izmir. Providing only a limited contribution to the energy needs of the city, this facility creates great air and water pollution problems in the Alsancak area, which is one of the most densely populated areas of the Izmir agglomeration. Besides ammonia disorption into the air, and tar leaks into the surroundings, it also pollutes the Izmir harbour by its waste waters that are discharged into the sea.

[22] Muezzinoglu A. (1989). Air Pollution in Izmir - Report Prepared for Japan Consulting Institute within the Scope of Natural Gas Feasibility Study of the Metropolitan City of Izmir. Izmir: Dokuz Eylul University.

10. State of the Environment in MMI

10.1. Marine pollution

A synthesis of the data generated by various monitoring programmes performed in the bay shows that the bay, especially the Inner Bay, is heavily polluted by nutrients and organic matter as a result of both primary and secondary production and coliform bacteria. Mercury and cadmium concentrations in this part of the bay are higher than background levels, especially in sediments, but the levels of metals are not high enough to indicate serious metal pollution. Very high concentrations of mercury and cadmium in the source streams indicate that the potential for metal pollution is high, and metal pollution will probably be a problem in the future.

The main pollutants affecting the bay water quality are organic matter, suspended matter, hydrocarbons, metals and pathogenic organisms. The pathways through which these pollutants reach the Bay are[23]:

- domestic and industrial wastes: 50%
- rainfall: 15%
- bay activities and ship traffic: 4%
- rivers and streams: 10%
- erosion: 8%
- agricultural sources: 10%
- other sources: 3%

As mentioned earlier, the waste output of Izmir inhabitants consisting of 105,000 m^3/day of industrial discharges, and 308,000 m^3/day of sewage, is dumped into the Bay waters through 128 canals and 10 streams. The estimated flux of pollutants to the Bay waters by domestic and industrial discharges is given in Table 10.1.

Table 10.1: *Daily Wastewater Loads for the Year 1990 (kg/day)*

	Domestic	Industrial	Total
BOD	131,800	116,800	248,600
TSS	158,000	55,000	213,000
Nitrogen	12,300	2,600	14,900
Phosphorus	3,500	160	3,660

Source: Balkas T.I., and S. Tuncer (1989). Natural Characteristics of the Izmir Bay and the Impact of the Wastewater. Split: PAP/RAC.

Physical and chemical parameters measured in the Bay (see Box 3.) suggest that the *coastal zone* in both Inner and Middle Bay have different characteristics compared to the other parts of the Bay far from the coast. All of the pollution indicators monitored were in an order of magnitude higher in the coastal stations due to discharge of large quantities of pollutants to this narrow zone. Highest pollution concentrations were measured in coastal stations located within the Izmir city limits. However, coastal stations located in the Middle Bay also showed high pollutant concentrations compared to the relatively clean waters of the Middle and Outer bays. Salinity values reported for this coastal zone are much lower than the corresponding values for the open bay. Lower pH and very high suspended matter and turbidity were also measured in this section.

[23] Balkas, T.I., and S. Tuncer (1989). Natural Characteristics of the Izmir Bay and the Impact of the Waste Water. Split: PAP/RAC.

BOX 3. PHYSICAL AND CHEMICAL PARAMETERS OF THE POLLUTION OF THE IZMIR BAY

A study of Balkas and Tuncer (1989) which was based on a statistical evaluation of previous data obtained during the 1988 monitoring programme attempted at determining the state of pollution of the Izmir Bay. The data quality of the monitoring programme was found to be satisfactory for physical parameters. However there are several doubts regarding the quality of data for some of the chemical parameters, especially nutrients and metals in the sea water. This was attributed to the techniques used in sampling and analysis of these pollutants.

Physical Parameters

The data on physical parameters are given in the table below. The missing data points were 1.2%,1.3%,1,6%,5.6%, 2.1%, 12%, 0.5%, for pH, temperature, salinity, conductivity, suspended solids, turbidity, and dissolve oxygen, respectively. With the exception of conductivity and turbidity, measurements are satisfactory complete. However, a rather large scale fraction of data points were missing for these two parameters, especially for turbidity.

Table A. *Statistics of Physical Parameters Measured in the monitoring programme**

	Average	Median	Max.	Min.	N
pH	8.2±0.2				823
Temp	17±5	20	30	10	835
Salin	37±6	22	43	1	834
Con	46±9	32	62	1.5	802
TSS	42±45	126	252	1.7	270
TURB	85±111	362	715	10	747
D.O.	7.5±1.5	6.7	13	0.5	846

* Units are: °C for temp. (temperatures), 0/00 for Salin (salinity), mmho for CON (conductivity), mg/l for TSS (total suspended solids), TU for Turb (turbidity), mg/l for D.O. (dissolved oxygen)

Chemical Parameters

Statistics of the chemical parameters is given in Table B. All chemical parameters are measured only in surface waters. Nutrients and BOD are measured in all stations. Metal and COD are measured in a limited number of stations. Metal analysis was not carried out every month. Because of that, the available metal data are enough to establish spatial distribution of elements in the bay, but they are not enough to study temporal variations.

Table B*. Statistics of Chemical Parameters Measured in the monitoring programme**

	Average	Median	Max.	Min.	N
PO_4	31±37	98	195	0.3	217
NO_3	19±18	46	91	0.3	201
NO_2	15±18	45	91	0.1	211
BOD_5	28±60	210	420	1.2	261
COD	1,500±1,000	2,000	4,000	33	46
SW Hg	0.077±0.075	0.23	0.4	0.014	29
SD Hg	0.08±0.06	0.1	0.19	0.012	30
SW Cd	0.35±0.25	0.52	0.93	0.12	55
SD Cd	0.44±0.23	0.51	1.0	0.03	44

* Units are: μg/l for phosphate, nitrate, nitrite, SW-Hg, SW-Cd, mg/l for BOD_5, COD, μ/g for SD-Hg, and SD-Cd.

Source: Balkas T., and S. Tuncer (1989). Natural Characteristics of the Izmir Bay and the Impact of the Wastewater. Split: PAP/RAC.

The most serious pollution of the bay is by nutrients. Nutrient concentration measured in the Inner Bay were several orders of magnitude higher than those found in clean waters. The oxygen levels in the Inner Bay decrease to dangerously low levels (around 3 mg/l), especially

in the summer. Oxygen in some parts of the coastal section completely disappears in the summer and, as a result of these anaerobic processes, produce an obnoxious smell. Red tide occurrence is reported to have increased in frequency in recent years. In addition to heavy eutrophication, high concentration of faecal coliform, and poor visibility in the water are characteristics of the Inner Bay.

Metal pollution in the Bay is not a serious problem at this point. However, high mercury and cadmium concentrations measured in source streams indicate that the potential for pollution is available, and precautions must be taken.

Generally, the Inner Bay which is a shallow water body having a limited water exchange with the Outer bay and the open sea, shows all indications of heavy pollution. Pollution of the Inner Bay is predominantly caused by discharge of untreated domestic and industrial waste waters. Polluted loads discharged have been (and still are) constantly increasing and thus enlarging the polluted area. Expansion of the zones of pollution in the Inner Bay between the years 1972 and 1980, in terms of effects of biochemical parameters on the benthic species, are shown in the Figure 10.1.

The Middle Bay is a transition zone, and with such characteristics it must be monitored very carefully in the future phases of the monitoring programme. Variation of pollutants in this part of the Bay shows that the pollution of the Inner Bay is spreading gradually, and monitoring of this part of the Bay can provide information on the rate of advance of the pollution.

The Outer Bay is comparatively non-polluted. Physical parameters show that the water which is 50-70 meters deep, is stratified between May and October, and mixes well in the remainder of the year. Values of most of the physical and chemical parameters measured are comparable to values reported for clean marine environments.

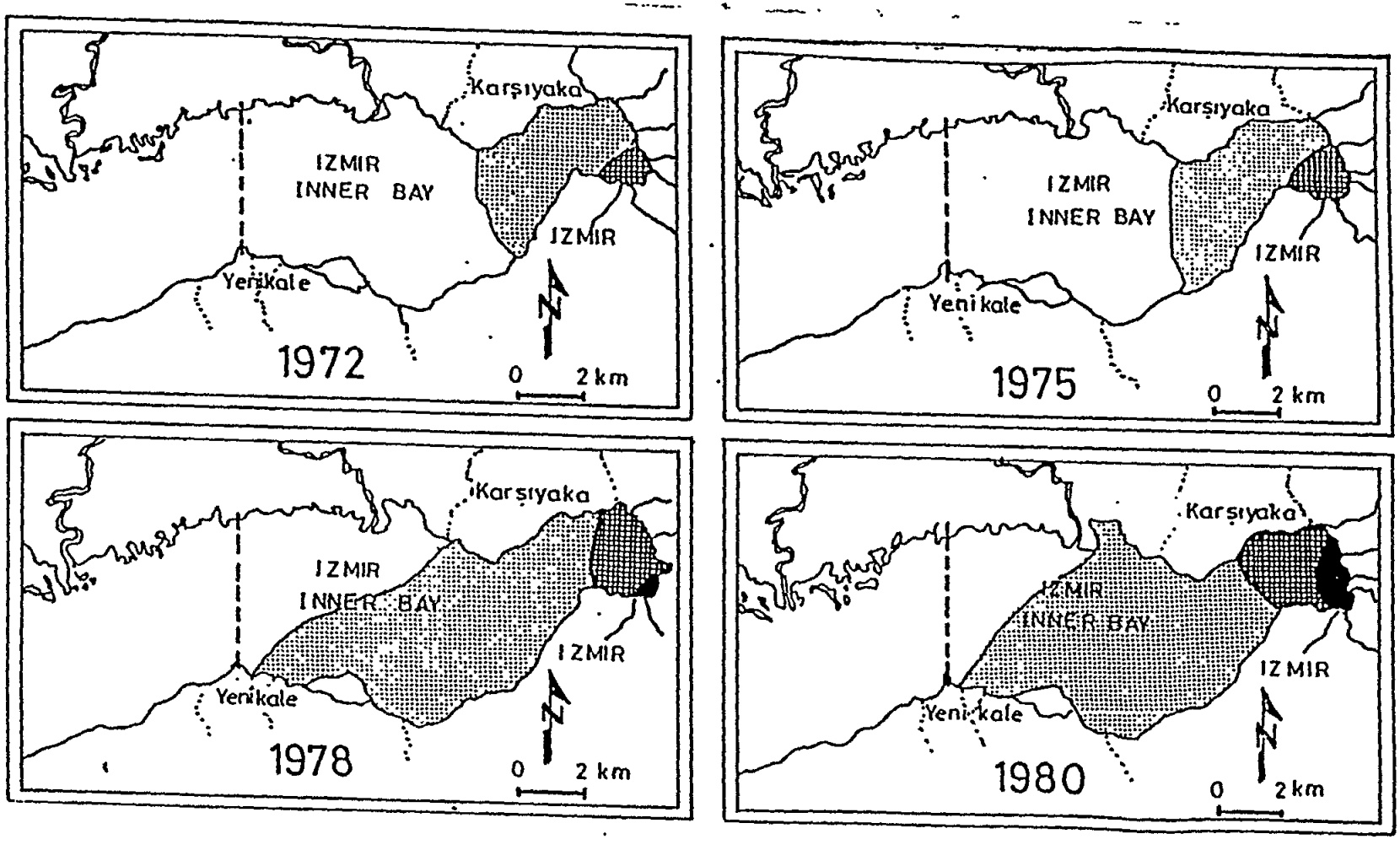
10.2. Water pollution

As already noted, one of the pathways through which the land-based pollutants reached the Bay is stream transportation. Although data concerning fluxes of the dissolved pollutants transported via streams are scarce, still some estimates of the amounts of total suspended substance (TSS), nitrogen and heavy metal were possible to be made and are given in Table 10.2.

Table 10.2: *Fluxes of dissolved pollutants via streams*

Streams	TSS ($ton*yr^{-1}$)	N ($ton*yr^{-1}$)	Cr ($kg*yr^{-1}$)	Cd ($kg*yr^{-1}$)	Hg ($kg*yr^{-1}$)
Bostanli	710	7.5	19-73	0.5-1.4	0.7-2.4
Ilica	3,000	33.2	26-100	0.6-2.0	0.9-3.3
Bornova	4,100	23.1	26-100	1.0-2.4	1.8-12.9
Manda	6,900	131.0	120-210	1.5-3.0	2.2-10.7
Arap	5,400	59.5	217-790	0.9-2.9	1.3-4.5
Halkapinar	340	3.8	26-100	0.7-2.0	0.9-3.3
Melez	7,300	110	440-4,400	1.5-5.1	0.9-23.4
Poligon	1,300	4.5	5.0-19	0.1-0.4	0.2-0.6
Old Gediz River		61.6	55-210	1.4-4.1	1.9-6.9

Source: Balkas T., and U. Yetis (1992). Environmental Profile of Izmir. Split: PAP/RAC.



Much Polluted Zone Polluted Zone Semi Polluted Zone

Expansion of the zones of pollution in Izmir Inner Bay

Source : Kocatas, A., 1981, "Izmir Korfezinde pollusyonun bazi fizikokimyasal ve biyolojik etkilerinin mevsimsel ve yillara bagli degisimleri"

Figure 10.1

Streams carry mostly industrial discharges, and only a small fraction of domestic discharge. Most of the heavy metals are due to the industrial discharges, and are carried by streams. The table does not include discharges by the Gediz river which discharges 295,000 tons of TSS, and 4,900 tons of nitrogen each year. Amounts of pollutants discharged by Gediz river are higher than the total amounts discharged by other streams. The particles discharged by streams contain toxic substances and are an important source of pollution in the bay.

The impact of urbanization on freshwater resources ranks as one of the problems which might become critical in the Izmir if present trends continue. Namely, environmental pollution due to spreading of the city inevitably threaten these resources, primarily the aquifers in the Bornova plain, as well as those in the areas of intensive agriculture (Menemen). Research made have shown that the groundwaters of the Bornova plain are being increasingly polluted by heavy metals. This is mostly due to the heavy concentration of pollution-causing industries in that area (cement, iron industry etc.).

10.3. Air Pollution

Since 1984, the air quality has become one of the major problems of the city of Izmir, although the most critical environmental problems of the city were still the surface water contamination and the pollution of the Bay. However, air pollution problems are becoming of increasing concern since the cases of pollution due to power generation, domestic coal heating, quality of commercial heating equipment, transportation and industrial emissions have become of major interest of the public recently. Table 10.3 shows the levels of sulphur dioxide and particulate matter concentration in air in Izmir for the years 1987-1990. As can be seen from that table, there are slight increases both in average sulphur dioxide and in particulate matter concentrations for 1987 to 1990. On the other side, the number of days on which the concentrations of these two pollutants exceed the short term limit values are almost steady for the same period.

Table 10.3: *Average, Minimum and Maximum Concentrations of Sulphur dioxide and Particulate Matter (PM) in air in Izmir for the years 1987-1990 ($\mu g/m^3$)*

Year	Average		Minimum		Maximum		Days exceeding the short term limit value	
	SO_2	PM	SO_2	PM	SO_2	PM	SO_2	PM
1987	61	72	26	16	98	187	N	N
1988	87	94	38	22	163	222	3	9
1989	92	107	41	44	156	198	N	3
1990	-	-	-	-	-	-	-	3

Source: SIS (1992). Environmental Statistics: Air Pollution. Ankara: SIS.

Reliable data for obtaining a complete picture of all the emissions in Izmir do not exist. However, with the positive influence of the Air Quality Protection Regulation, industries started to apply to responsible authorities for obtaining emission permits. For these applications, measured data related to stack gas analysis, gas flow rates, and pollutant loads were necessary. On-site data collection for the industries needing scientific and technical help was then performed. Combined effects of the monitored plants, acting as major point sources are found for sulphur dioxide and nitrogen oxides emissions. The rounded and added up emission load figures are given in Table 10.4. Tanneries located at the central part of the Izmir agglomeration are separately treated as they will be altogether moving to the Tanneries Organised District that is being established at the north of the Menemen Plain.

Table 10.4: *Annual Industrial Emissions Considered as Major Stationary Sources*

Emitting Industries	Emissions (kg/h)	
	SO_2	NOx
Industries in Izmir	1,450	670
Tanneries in Izmir	52	22
Kemalpasa Adjacent Zone	875	118
Other Adjacent Zones	6,810	918
TOTAL	9,187	1,728

Source: Muezzinoglu A. (1989). Air Pollution in Izmir. Izmir: Dokuz Eylul University

The emission potentials are based on normal production capacities. Izmir emission values cover only those industries located inside the MMI area. In order to be counting for the presence of unidentifiable sources emitting at full rates, a safety factor of 2.5 was then considered. Thus, for the region covering the MMI area and its adjacent zones an estimate for total emission mounts up to:

- Sulphur dioxide: 22,052 kg/hr;
- Nitrogen dioxide: 4,320 kg/hr.

When only the city of Izmir is considered, these figures are:

- Sulphur dioxide: 1,502 kg/hr;
- Nitrogen dioxide: 692 kg/hr.[24]

Figures for sulphur dioxide emissions add up to 13,157 tons per year and Nitrogen dioxide emissions add up to 6,062 tons per year the contribution of major industrial activities in the city.

According to some other estimates for the year 1983-1985 covering both industrial and domestic emissions, a breakdown of total summer and winter emissions in the study area was found as:

- October-April: 26,035 tons of SO_2;
- Other months: 8,550 tons of SO_2.

For apportioning these total emissions over the city, it was divided into 1x1 km^2 grids. The result showed that out of the 640 grids, 131 cover the zone with highest density of population, 228 cover fairly dense population areas and 281 cover only sparsely populated areas. By taking weighted averages of the total emissions, the following were generated:

- High density grid emit 3.56 g SO_2; 4.08 g PM per second-grid;
- Fairly dense grids emit 1.78 g SO_2; 2.04 g PM per second-grid;
- Sparsely populated grids emit 0.89 g SO_2; 1.02 g PM per second-grid.

[24] For more information see: Muezzinoglu A. (1989). Air Pollution in Izmir. Izmir: Dokuz Eylul University.

10.4. Soil degradation

As already noted, geological composition of soil and steep hillsides make the study area prone to powerful erosion processes to which the inadequate soil management strongly contributes. Observing the MMI area, one can identify some activities which are the main causes of soil losses. First of all, it is a large scale vegetation clearance for construction sites. Agricultural expansion into physically and ecologically fragile and erodable areas generates the same effects. Unfortunately, clearing has seldom been done in a planning way. Inadequate land management practices and deforestation have consequently been the most significant contributor to a powerful erosion process in MMI.

Related to soil pollution is the acute problem of domestic and, especially, industrial wastewater discharge. It has been already noted that most industries located in the Bornova area discharge large amounts of organic matter, suspended solids and floatable effluents into a nearby ditch, draining into the Manda and other streams which run through the agricultural area before finding its way into the Inner Bay. Effluents, including micro-elements present in waste waters affect the ionic balance of soils as a result of accumulation and toxification in time. This, in turn, causes a decrease in the quality and quantity of the produce. Besides, water pollution reaching agricultural lands is a very significant contributor to changes in the physical, chemical and biological quality of soil, resulting in a decrease in fertility or, perhaps even more important, in bio-accumulation of toxic materials in vegetation. With their entrance to the food chain, serious health problems may occur.

Aside from the above, sulphur dioxide and fluorine emissions from stacks of the existing industry, as well as improper use of fertilizers in agricultural production can also be significant contribution to the soil pollution in the area.

10.5. Noise Pollution

In recent years, noise pollution has become a serious problem in Izmir, as well as in other big cities of Turkey. The noise measurements made for various selected districts in the city yield levels that are in excess of the limits set by international standards as well as the limits envisaged in the Noise Control Regulation. The result of these analyses done by the Metropolitan Municipality of Izmir are shown in Table 10.5.

Table 10.5: *Noise Levels (dB) in Various Districts of Izmir Measured by MMI*

Site	**Hour of day**											
	7 h	**8 h**	**9 h**	**10 h**	**11 h**	**12 h**	**13 h**	**14 h**	**15 h**	**16 h**	**17 h**	**18 h**
Karsiyaka	73	82	855	81	78	79	77	75	755	78	83	84
Halkapinar	80	87	88	86	84	83	83	81	82	81	84	86
T.Hospital	73	77	80	76	75	77	79	80	81	80	80	81
Cumhuriyet	72	75	77	76	78	78	78	80	80	80	80	81
Montro	75	81	80	78	78	78	80	82	83	81	82	84
Basmane	76	83	87	84	85	85	87	85	84	84	85	85
Cankaya	77	84	87	85	85	84	84	85	83	86	86	86
Konak square	74	81	85	84	83	83	82	84	85	86	84	85
Bayramyeri	80	84	86	86	85	85	85	86	85	85	87	88
Hatay Ucyol	79	83	85	84	83	84	84	85	84	85	85	85
Hatay Nokta	78	82	84	84	82	83	83	83	82	84	84	84
F.Altay square	74	78	80	78	77	79	80	78	77	79	82	83

Source: Environmental Health Department of MMI

Chapter IV

INSTITUTIONAL ARRANGEMENTS

11. Existing Institutional Arrangements

In the MMI area, four levels of decision making authorities are responsible for environmental management: central governmental authorities in Ankara, the Provincial Governor, the Metropolitan Municipality of Izmir and the District Councils.

All major government departments are directly involved either in the development or in the provision of services in Izmir and consequently have either direct impact or influence on management of the environment. The ministries and agencies involved in Izmir are:

- Ministry of Construction and Settlement shares the responsibility with MMI for settlement planning and consequently for the growth of the area. In addition, its agencies, the General Directorate of State Hydraulic Works (DSI), and the Bank of Provinces (Iller Bank) are responsible for water resource management in the area; and General Directorate for Highway implements the Highways Traffic Law.
- Ministry of Industry and Trade is responsible for industrial policy and for the location of industries.
- Ministry of Agriculture and Rural Affairs is responsible for the protection of agricultural land, as well as pollution control in irrigated areas.
- Ministry of Health is responsible for environmental quality measurements and the enforcement of the Health Act.
- Ministry of Tourism has a major responsibility in coastal zone planning and development and is organising and promoting tourist facilities.
- Prime Ministry's State Planning Organization (SPO) is the main body responsible for the preparation of the five-years development plans and annual implementation programmes covering all sectorial development throughout the country.
- Ministry of Environment, recently elevated from the status of Under-secretariat, is the authority implementing the Environment Law and coordinating the environmental responsibilities of the other Ministries.
- Ministry of Transport carries the responsibility for the management of coastal waters and marine resources, especially for sea transport and fisheries.
- Ministry of Defense occupies a significant area in MMI including a part of the shoreline, particularly the Navy which is a major user of the port and the Bay.

The Governor's Office for the Province of Izmir, and the Governor, are the "government" of the province. The Governor is assisted by the provincial representatives of the above mentioned ministries. They are responsible for implementing the policies of their ministries including the enforcement of the Environment Law. It is the responsibility of the Governor to ensure cooperation between the various ministries and MMI. There is a special commission in the Governor's office dealing with the environment. The Governor's Office has considerable discretion in the implementation of its responsibilities and consequently, given that the various policy objectives are often not clearly delineated, its influence on environmental management can be decisive.

Metropolitan Municipality of Izmir is the local metropolitan authority with clearly defined responsibilities under the 3030 Act of 1984. The main responsibilities of MMI are: planning and development, general coordination (with various ministries), construction, social and cultural affairs, health and environment, and management of public services within its jurisdiction. District Municipalities associated with MMI operate in close cooperation and have rights and responsibilities in the field of environment similar to MMI.

Other District Municipalities in the Izmir Metropolitan Region also have a high degree of independence in settlement planning but for certain environmental services, e.g. sewerage, they depend on the Ministry of Construction and Settlement.

Areas between the MMI boundaries and District Municipalities are directly under the management of various Ministries and the Governor.

12. The Decision-making Process

Because of the national importance of Izmir many of the decisions concerning the area of MMI are taken at national level or are the consequence of national economic and social policies.

12.1. Specific environmental responsibilities of MMI

Besides being entrusted with the responsibility for settlement planning, MMI has a broad range of environmental management duties. The most important are:

- environmental health and protection;
- provision of water supply and sewerage;
- protection of natural areas;
- provision of mass transport;
- control of food quality;
- waste disposal; and
- control of pollution-related industrial plants.

The two major coordinating Directorates are in operation for integrated management of a number of environmental fields:

(a) AYKOME - Directorate for Coordination of Infrastructure; and

(b) UKOME - Directorate for Transport Coordination

AYKOME has the following duties and responsibilities:

- to ensure the provision of infrastructure services within the MMI boundaries; and
- to prepare an annual infrastructure investment programme in accordance with the long-term development plan.

UKOME has the responsibility to coordinate and prepare the transportation plans, as well as to implement tasks related to these plans.

12.2. Pollution control under MMI

From the short description given above it emerges that certain pollution control responsibilities and preventive policies are exercised through the coordinating activities of UKOME and AYKOME. These are particularly important because they can take the form of preventive actions rather than reactive ones. Such prevention policy measures include public transport planning aiming to reduce pollution and congestion from the use of private vehicles. However, such measures as motor vehicles exhaust control is the responsibility of the Directorate of Highways of the Ministry of Construction and Settlement.

More specific pollution control activities are undertaken by the "Environmental Health and Social Services Section" of the Health Department of MMI within its inner boundary (Konak, Karsiyaka, Buca, Bornova). Environmental regulations outside the inner boundary of the MMI are enforced by the Ministry of Health.

Specific activities undertaken by the Environmental Health Section of MMI are: air and sea pollution control; solid waste control; and worker's health control. This Environmental Section of MMI could issue directives on fuel usage, on sulphur content of coal, and on control of household heating systems. On the other hand, the authority of MMI over government factories, most of them old and heavily polluting, and other governmental facilities is not well defined and thought to be minimal.

Concerning water pollution there are divided responsibilities:

- drinking water quality is monitored by Department of Health and controlled by DSI; and
- sewage collection works are divided between IZSU (Izmir Water and Sewerage Authority), State Water Works (DSI) and Iller Bank (Bank of Provinces).

One of the pollution problems is the impact of pollution from various sources on water supply in the MMI. DSI is responsible for water supply but cannot control sources of pollution. In addition, there are some conflicts between municipality planning and DSI planning to protect watershed areas.

In order to monitor and control the significant users of the sewage system an Industrial Discharge Control Programme has been implemented in Izmir. Being transferred from MMI to IZSU this programme currently include the following activities:

- identification of "significant" industrial and commercial users;
- development of a practical Sewer Use Regulation; and
- monitoring industrial discharge to assure compliance with regulations.

12.3. Financing of MMI

It is not easy to form a complete picture of the MMI revenue raising and expenditures. In particular a number of special funds (fines etc.) are not included in the accounts and the operations of the various business enterprises are also outside the normal accounts.
Main expenditure items are: road investments, construction, parking, staff expenditure, other investments and transfer expenditures (buying land, municipal enterprises, Iller Bank transfer etc.).

Main revenue items are: tax income (5% of all taxes collected by the Central government from Izmir province is paid back to the municipality); Iller Bank contribution (5% of the net income of MMI is paid to Iller Bank, which retains 20% and pays the rest back on the basis of population growth); publicity tax, amusement tax, real-estate tax (based on minimum values published by government every four years and used for tax and expropriation); communication tax, custom duties (collected by the Municipality in the port of Izmir), income tax, institutional income, operation profit, other incomes.

From the environmental point of view two issues require further examination:

(1) How much money (and from which sources) is available for pollution control and other environmental needs; and how much money is raised directly from users/polluters through charges, fees, taxes and penalties?

(2) Given the environmental needs and objectives, are financial resources anywhere near sufficient to achieve them?

To be able to analyse these questions more detailed and additional information is needed.

12.4. Assessment of preventive environmental policies

Preventive environmental policies are at least as important as pollution control policies and this is particularly true in the context of the MMI agglomeration areas where control policies can be relatively expensive and difficult to implement. It should be emphasized that for preventive policies (as well as for effective sound resource management and provision of environmental amenities) not only the area of MMI but the whole Izmir Metropolitan Region need to be considered, while looking at larger management units such as the Province of Izmir or the Aegean Coastal Region could be helpful in some instances.

Such an approach is essential because developments outside the MMI will inevitably impact and put pressure on the environment of MMI. For example, industrial or housing developments around MMI will add to the pressure in the form of additional traffic, additional demand for liquid and solid waste disposal etc. Developments in the city of Aliaga have already impacted on the development of MMI.

One aspect of preventive policies is related to settlement planning and land use management. However, in the case of MMI the planning efforts include the whole of MMI, but in fact the effective implementation power of MMI is restricted to the inner municipalities. Although there is admittedly a cooperative arrangement between the municipalities over the whole of the Metropolitan Region it is not possible to evaluate its effectiveness from the point of view of preventing environmental pressures. Furthermore, the municipalities have no power over areas between the municipality boundaries which are under jurisdiction of the Ministry of Construction and Settlement.

In the same context, there is an overlap between the municipalities and the Ministry of Construction and Settlement over seashore line boundaries. It is the Ministry which implements the Coastal Law and decides on the boundaries of the municipalities along the seashore line. Given the environmental importance of the Bay of Izmir the Ministry's role is crucial in the management of the shoreline.

In general, the Ministry has no right to influence developments within the municipalities but according to Article 9 of the Construction Law the Ministry can change municipal planning. Such changes have been made in the case of Izmir:

- original proposal for the new airport has been changed resulting in noise pollution over the metropolitan area;
- original proposal for a new commercial harbour was made for the Outer Bay; this was changed to an enlargement of the old harbour in the Inner Bay; and
- proposed recreation areas have been reduced and replaced by housing.

It is also important to stress the problem of the planned construction of settlements over the watershed area of Tahtali Dam which is a consequence of inappropriate coordination of plan-making agencies with the MMI planning authorities.

There can be and there are conflicts over industrial development also. Namely, under article 9 of the Construction Law the Ministry can locate large, heavy and state-owned factories within the municipality irrespective of municipal plans.

12.5. Management of the Bay area

The management of the Bay's environment is partly the responsibility of MMI, partly the various ministries and the Governor, and more directly Ministry of Transportation (concerned with shipping and harbours), Ministry of Defense (shipyard and naval port) and Ministry of Agriculture (responsible for fisheries).

Even though the Bay is probably the main economic and environmental asset of the region and the largest investment is being undertaken to protect the Bay (sewerage project), there is no coordinating body in existence with the specific objective to ensure the protection of the Bay.

Apart from the day-to-day management of pollution control and the definite plan for sewerage collection and treatment, there is, at present, no overall strategic direction to indicate how the Bay and its resources could be managed in a sustainable manner. Nor are there any policies, goals or management structure to guide decision-making within a transparent process and to provide opportunity for conflict resolution.

PART TWO

ELEMENTS OF THE INTEGRATED COASTAL AND MARINE AREA MANAGEMENT

Chapter V

TOWARDS AN ENVIRONMENTALLY SOUND PLANNING AND MANAGEMENT OF THE AREA OF IZMIR

An analysis of the present state of the MMI area showed the existence of numerous problems and difficulties resulting, primarily, from the rapid changes which occurred over the last 40 years. This part of the study aims at synthesising these problems. In addition, it is also an attempted look into a possible future of the MMI area, made on the basis of existing data analysis. Since this study does not pretend to be a plan, it has not been possible to suggest precise measures for meeting the desirable future of the Izmir area. What this study offers is only an outline of possible development options with a view to identifying their impacts on the state of environment. It also hopes to give some guidelines and policy recommendations for achieving a sustainable pattern of development in the area concerned.

13. Evaluation of the Hitherto Development of the Area with Respect to the Environment: Key Problems

13.1. Development-environment interactions

Urban Growth

13.1.1. The greatest problem preventing environmentally sound development of the MMI is the sheer scale and pace of urban growth, which is causing rapid transformation of the MMI natural environment into a vast man-made environment and which has set into motion continuous demands for more land for building. Under such circumstances the balance between the need for protection, preservation and conservation of natural amenities and the extent of their substitution by built environment has been seriously disturbed.

Illegal housing

13.1.2. The ecological balance has been disturbed not only because of the inability of the coastal section of the MMI to accommodate the pressure of human activities, but also because of the way in which the urban population has been settling in that area. The hitherto development of the city of Izmir has been largely based on *extensive spreading of illegal housing (gecekondu)*. Environmental implications of such housing are reflected primarily on the following:

- accelerated and irreversible loss to housing of valuable agricultural and other land resources which should have been preserved in their natural state;

- occupation of hazard-prone areas (steep hillsides) or areas exposed to high erosion risk; and
- destruction of the green spaces both within and around the city.

13.1.3. Illegal settlements are usually not serviced by public infrastructure. In many cases, there is no sewerage in these settlements, and untreated domestic water is discharged onto the street or in any nearby body of water. Besides, the illegal settlements are also home to many small-scale, often informal, manufacturing units which discharge their own wastes into the environment.

13.1.4. So far, the authorities have not been able to respond adequately to the massive immigration flows which have, due to the lack of sufficient serviced land at affordable prices, generated pressure for expansion towards peripheral, undeveloped areas of Izmir. There, the rising land prices opened up the process of giving priority to all forms of urban development at the expense of valuable land resources. Dealing with this problem has been reduced to a reactive approach, i.e. to mere "recording" of the areas which have fallen pray to new illegal development, and the action has resorted only to legalising something which is already there.

13.1.5. Continuation of these trends may be very upsetting, as that would mean not only that the remaining unrenewable land resources will continue to be consumed, but also that there is a threat for the environment of the MMI to experience impacts far beyond its carrying capacity.

Concentration of industry

13.1.6. Along with the rapid population growth, the area of MMI has been burdened by the problems of a large-scale industrial development. The greatest problem is the concentration of a large number of polluting industries, which have, due to insufficient environmental control, generated adverse environmental effects. High investments in these industries have not always contributed favourably to the development of the MMI economy. While the concentrated development of these industries in or around the Inner Bay was instrumental in increasing the production efficiency, it also gave rise to disadvantages usual of such concentrations, reflected in various forms of environmental destruction. The pollution of the sea is particularly serious, as the alteration of water conditions and the natural values of the Inner Bay have restricted considerably the opportunities for tourism, recreation and near-coast fishing.

13.1.7. In many cases, the location of industries in or around the MMI area was guided solely by the principles of economic efficiency which took into account only the employment effects of the projects and their contribution to GDP. Industrial pollution, in spite of a fairly elaborate management structure of the MMI area, has not been fully recognized as a "negative externality", so measures could not be effectively introduced to "internalize" that externality and discourage the growing concentration of polluting industries around the Inner Bay.

13.1.8. Spreading of Izmir, as well as the need to protect and enhance the quality of the environment, brought about significant changes in terms of directions of and conditions for further development of industry in the MMI area. The size and number of potential sites for building new (and even for the survival of the existing) industries is significantly reduced.

Infrastructure systems

13.1.9. The state of the infrastructure systems in the MMI area is unsatisfactory. None of the systems deserve to be called a "complete system". The public sector has had large difficulties in keeping the provision of infrastructure at pace with the rapid urban growth.

Sewerage

13.1.10. Building and reconstruction of the sewerage network has been constantly lagging behind the general development of the MMI area. Disposal of waste waters which are still being discharged directly into the Inner Bay without any treatment stands as one of the major causes of the high level of pollution of the Bay.

13.1.11. The decision to build a wastewater treatment plant in the delta of the Old Gediz River is a response to the pressure to provide an adequate sewerage system. However, the solution to discharge the treated effluent into the Bay must be studied carefully, as the most recent proposal to discharge treated effluents into the Middle Bay through the Old Gediz River might, due to the high nutrient load it will carry, trigger eutrophication processes in that part of the Bay. Moreover, it is realistic to expect that the nutrient loads will be transported from the Middle Bay to the Inner Bay, especially during the summer. Besides, the proposed solution of effluent disposal to the bed of the Old Gediz River is likely to have negative effects on salt works which are located in the vicinity of the west channel of the Gediz. The nearby wetland area (Homa Dalyan) might also be seriously affected.

13.1.12. The key to the evaluation of the impact of effluent discharge in the Bay are Environmental Impact Assessment studies (EIA) which should consider not only the proposed disposal, but also the alternative locations in the Middle and/or Outer Bay tentatively selected for the submarine outfall.

Water supply

13.1.13. The water supply system still suffers from certain technical shortcomings. Particularly pronounced is the problem of losses in the distribution network which often exceed 50% of the provided drinking water. In an attempt to meet the ever-growing needs for water, water resources in the immediate area of Izmir and its vicinity are being excessively pumped. Regardless of over-exploitation they are still unable to meet the needs so that fresh water must be brought from sources outside the MMI area, which requires expensive engineering services and structures, such as tunnels and dams.

Energy

13.1.14. Most of the sources of primary energy in Izmir (mostly local lignite and crude oil) are used in ways that cannot be tolerated. Being a major source of primary energy especially for industries, lignites are often used as mined, i.e. without enough washing or cleaning. In general, the coals burned in Izmir are of low-heating value containing much sulphur, humidity and ash. Furthermore, technical properties of furnaces burning coal and oil are a lot to be desired. All this adds to the pollution of air in Izmir.

Transport

13.1.15. Concentrations of human activities in the Izmir area have generated considerable transportation problems. In the morning and afternoon peak hours, the major urban arteries, particularly those intersecting the densely populated neighbourhoods of Izmir, become noisy and air-polluted traffic bottlenecks.

13.2. State of the environment

13.2.1. As already stated, the city of Izmir is burdened by such a structure of development which has negatively impacted the quality of environment (polluting industries, transportation, etc.). Difficulties encountered by the MMI to establish a well coordinated environmental control only augmented the problem opening the path for ever increasing conflicts between the users of resources and for resulting pollution-related damages (see Box 4.). The available data and analyses indicate that every single component of the environment is endangered.

BOX 4. DAMAGES RESULTING FROM ENVIRONMENTAL DEGRADATION OF THE BAY AREA

(1) **Tourism losses:** in mid-1950's the Bay was of high recreational value; taking this value as a starting point for tourism in Turkey, the cumulative losses up to 1990 can be put between 1.55 and 3 million tourists or between 9 and 18 million overnight stays.

(2) **Recreation losses:** the inhabitants of the MMI area cannot use the Inner and Middle Bay and have to travel to the Aegean coast for weekend recreation.

(3) **Dredging costs** are incurred to keep the shipping channels open and free from siltation. The siltation is largely caused by inappropriate land management practices in the watershed basins around the Bay.

(4) **Ground water losses** can be attributed to leakage from tributaries, from domestic waste waters and solids, from surface wastewater and intrusion of sea water. Reduction of pollution from all these sources with the help of the sewerage system and separate industrial treatment would reduce damage to ground water.

(5) **Izmir Bird Sanctuary** is threatened by the degradation of the Bay.

(6) **Fishing losses** are caused by pollution and include loss of shellfish, as well as finfish. Pollution also affects potential for aquaculture in the Bay area. Both the quantity of fish caught and the variety of fish species declined.

(7) **Salt production losses** (the Bay area produces 1 million tons of salt) may considerably affect the area economy.

(8) **Damage to human health** occurs due to the lack of sewerage particularly in the gecekondu areas and due to water-based activities in the Bay: swimming, wind surfing, boating and fishing. No such activities should be allowed in the Inner Bay.

Source: Balkas, T.I., and F. Juhasz (1991). Preliminary Study on the Costs and Benefits of Measures for the Reduction of Degradation of the Environment from Land-based Sources of Pollution and Activities in Coastal Areas of the Bay of Izmir. Athens: UNEP.

The Izmir Bay

13.2.2. Measurements of physical, chemical and bacteriological indicators show that the capacity of the ecosystem of the Izmir Bay is insufficient to receive the present quantity of wastes discharged from numerous sources. The scientific evidence based on various

studies suggest that the pollution of the Inner Bay has already exceeded the critical point.

13.2.3. Degradation of organic substances discharged into the Inner Bay have caused depletion of dissolved oxygen in the sea water resulting in an anoxic condition and bad smell, a typical indicator of the anaerobic process. A very low oxygen concentration in that part of the Bay have caused most of the marine life to disappear. Suspended solids continually deposited at discharge points are gradually filling up the Inner Bay. Due to the presence of suspended matter (including planktonic organisms) the increased turbidity is impeding the process of photosynthesis. Furthermore, pathogenic micro-organisms and viruses in surface waters reaching the Inner Bay may provoke a variety of diseases. Thus, the use of the Inner Bay for fishing, recreation and tourism is very much limited.

13.2.4. The new sewerage system will contribute significantly to the reduction of pollution of the Inner Bay and its regeneration. In this regard, however, there are two issues which require special consideration. Firstly, in addition to the new sewerage system, the improvement of the water quality of the Inner Bay will also depend on efforts to reduce the pollution load from sources such as agriculture and urban run-off. The second issue refers to the rate of recovery of the Inner Bay which is not possible to estimate at this point. However, having in mind the accumulation of organic matter in the sediment over a long time and the low rate of exchange of water masses in the Inner Bay, it may be claimed that the recovery of the Inner Bay will not be a quick process and that it will have some negative side effects. Namely, once the untreated sewage stops entering the Inner Bay, it is very likely that the decomposition of organic matter contained in the sediment will release nutrients in the water column and, consequently, trigger phytoplankton bloom.

13.2.5. The Middle Bay also falls in the category of endangered parts of the Bay. It is a transition zone which needs to be monitored very carefully, because the monitoring results suggest that the pollution of the Inner Bay is gradually spreading towards the Middle Bay.

Air quality

13.2.6. The quality of air in MMI is affected by the concentrations of particulate matter, sulphur dioxide and nitrogen oxide. Most of the air pollutants are product of vehicular exhaust, low quality fuels burned in Izmir, and inadequate design of furnaces burning those fuels. Apart from that, Izmir is surrounded by high terrains which create stable air masses trapping pollutants over the city. So, as long as source emissions continue, the air quality in Izmir will be decreasing.

Soil and vegetation cover degradation

13.2.7. Not only the sea and air, but also the soil and vegetation cover are exposed to various forms of pollution and destruction. In the first place, the increasing demand for urban land, as well as for agricultural land, resulted in the land clearance for building and agricultural purposes, reducing the land which should have been preserved in the natural state, decreasing the level of flood (run-off) protection, and spurring erosion processes. At that, the barren land, left without natural protection against negative effects of the atmospheric factors, gradually looses its physical, chemical and biological properties. Another important consequence of land clearance is the change of land-scape. Although MMI possesses forest management plans and programmes, it seems that they are poorly applied and implemented.

13.2.8. Soil degradation and pollution also result from inappropriate use of fertilizers in agriculture, and from sedimentation of pollutants infiltrating the soil through air and water.

Water quality

13.2.9. As for the water quality, almost all streams in the MMI area are seriously polluted by domestic sewage and industrial waste waters. The streams contain high levels of nitrogen, suspended solids, toxic substances including heavy metals, which affects their utilization for agricultural purposes and human consumption. Furthermore, due to the concentration of various polluting industries, the groundwater resources are also subject to pollution. This is particularly true of the Bornova groundwater aquifers which are contaminated by heavy metals originating from iron and other polluting industries situated in or around its catchment area. Although the impact of urbanization on freshwater resources in the city of Izmir and its immediate vicinity ranks as the critical environmental problem, it has not yet been studied on a long-term basis.

Noise

13.2.10. This area suffers from noise pollution due to air and road traffic. Noise levels are particularly high around airports, take-off and landing corridors, and along the major traffic lines in the central parts of the agglomeration.

Environmental hazards

13.2.11. Since the MMI area is categorized as the first-degree earthquake zone, a part of the low-quality illegal housing situated on steep hillsides is exposed to great risk of destruction by earthquakes. The lack of appropriate and comprehensive micro-seismic zoning of the MMI area impedes the preparation of a detailed assessment of threatened areas and the development of measures that should be employed to avoid or mitigate potential earthquake hazard.

13.2.12. The low-laying coastal areas, especially the beaches on the south shore and the wetland areas in the north (Tuzla, Camalti Saltpan, Homa Dalyan), are endangered by the expected sea level rise which is assumed to be one of the consequences of global warming over the next century. In addition to flooding, which might occur primarily along narrow and flat low-laying areas, the expected sea level rise might provoke sea water intrusion into the ground water and cause the water table level to rise. Accordingly, the change of salinity level may affect the quality of the agricultural land adjacent to the water. Within the MMI area this problem might become critical along its northern shores where much of the land is covered by low and flat river delta with groundwater table very near to the surface.

13.2.13. Equally important to emphasize is that the expected sea level rise is bound to affect the proposed wastewater treatment plant which is planned to be built in the Old Gediz River delta. At present, the implications of sea level rise, are taken into consideration neither in the Master plan nor in the Izmir Sewerage and Stream Control project.

13.3. Institutional framework and decision making

13.3.1. The use of natural resources is basically an institutional issue. The growing problems relative to the environmental degradation and pollution in the MMI clearly indicate that the hitherto environmental management system has not been able to respond adequately to the changing needs of the area. This was mostly due to inability

of the metropolitan, provincial and national authorities to cope with the rapid growth of population and activities in and around the MMI area.

13.3.2. Another reason for the relative inefficiency of the environmental management is the diverging policy objectives pursued by various authorities. The MMI authorities are deeply concerned with environmental problems and management; the Governor's Office is more concerned with balancing the apparently conflicting economic and environmental objectives; while, in taking decisions, the various governmental development departments are primarily guided by the principle of economic efficiency. It is obvious that there is no well coordinated mechanism of decision making and no single authority entrusted with environmental management of the Izmir Bay area, especially on a long term.

13.3.3. Lack of sufficient funds for environmental purposes, including the development of a consistent ecological monitoring, inhibits the environmental management efforts. The shortage of funds reflects partly the inability of MMI to raise funds for environmental purposes, and partly the priorities of the Government in allocating public funds.

13.3.4. The absence of cost recovery for environmental services has also been noted as a barrier to generating sufficient revenues for critical infrastructure projects, including the maintenance and improvement of the existing systems.

13.3.5. It has also been noted that the MMI authorities lack mechanisms for taxing the land value gains resulting from investments in infrastructure, land registration and titling. Consequently, there are no sufficient public funds for the implementation of urgent urban development programmes (land banking, and provision of serviced land for low-income groups at a right location in order to prevent construction of more unplanned/illegal settlements in environmentally vulnerable areas).

14. Possible Development Options

The principal objective of this section is to provide a hypothetical projection of a possible urban growth of the MMI area by the year 2025, as well as to identify the resource requirements and its implications on the environment.

Since the urban growth is directly or indirectly determined by various factors, the basic prerequisite for any projection is the preparation of scenarios where each scenario anticipates a certain course of action and its effects on the use of resources and state of the environment. The preparation of scenarios within CAMP "The Bay of Izmir" was planned to be conducted by the Blue Plan as a parallel and complementary activity to the preparation of this study. Unfortunately, being beyond the control of PAP/RAC, this activity had not been completed and an alternative approach had to be chosen. It included the preparation of development outlooks as a very simple form of scenarios. Of course, at this stage it would be hardly possible to provide a multitude of options or to work out in detail every single development outlook. Therefore, only two options were proposed as the starting point for making projections.

The first option is the so-called **"trend"** or **"do nothing"** option which is based on the persistence of the existing development trends. Its purpose is to show how negative or even unacceptable a future situation can be in terms of population size, environmental damages and land resource requirements, if nothing is done to alter the trend of polarization in the area of MMI.

Possible alternative to the above option is the **"moderate growth"** one which anticipates a certain change of the existing trends. Bearing in mind the set time horizon, it could hardly be speculated that the existing negative aspects of the development process will wholly stop affecting the area of MMI. Therefore, no big changes were anticipated.

A. "Trend" option

This option is based on the persistence of the processes observed in the area of MMI during the last 10-year period, as well as on the hypothesis that no policy measures that may spur the process of regional dispersion will be applied.

Consequently, the option assumes the so-called "no policy" development model in which dispersion processes will be based on a more or less spontaneous course of events. It means that the lack of governmental intervention aimed at creating positive externalities in or near small towns will discourage relocation of firms out of Izmir where risk as well as profit influence the location decisions. In the meantime, the concentration of activities in Izmir will continue to attract population towards the Bay area.

Following the trends observed during the 1980-1990 period, this option assumes that the MMI area will maintain a positive migration balance, with average annual immigration rates never falling below 2 per cent over the whole 1990-2025 period.

As far as the vital components of the population are concerned the "trend" option is conventional in the sense that it assumes a gradual decline of birth and death rates. Consequently, due to the influence of socio-economic and environmental conditions that will prevail in the MMI area, the total fertility rate is assumed to decline considerably - from 2.5 in 1990 to 2.0 in 2025. The change is expected to be linear. At the same time, as the consequence of the assumed decline of death rates, it is expected that the life expectancy at birth will increase up to 70 years at the end of 2025 time horizon.

B. "Moderate" option

Bearing in mind the increased congestion of the coastal area, as well as the favourable socio-economic conditions prevailing in the region, the "moderate" option of the future urban growth has been assessed as more acceptable than the "trend" option. It anticipates a gradual change of the existing trend through the implementation of such policy measures which will stimulate the slowing down and reversing the hitherto course of polarized regional development. This "moderate growth" option has the following characteristics:

- balanced development of the settlement system as a whole, which implies the development of individual settlements according to their location, size, as well as their function within the overall system; and
- completion and extension of the municipal infrastructure network and services in medium-size and small centers.

The objective of these improvements is to make the location for activities in medium-size and small centers less risky for economy, and to re-distribute the population and lessen the pressure on the coastal area of MMI.

Owing to better opportunities to be provided by the development of other cities in the region, this option anticipates a gradual decrease of immigration rates in Izmir at the beginning, and their stabilization at an acceptable level at the end of the projected period (less then 1% after

2000). Furthermore, this option is based on the similar assumptions concerning fertility and mortality rates as the previous one.

14.1. Population growth

As shown in Table 14.1, the "trend" option assumes that in the period between 1990-2025 the population of MMI will increase from 1.78 to 5.1 million. As a consequence of the decline in fertility rates, the overall pace of population growth will be slowed down, particularly during the later decades of the projected period. Still, the population of Izmir will continue to grow relatively fast.

Since the rates of population growth are not linear (see Table 14.2), it may be said that the increase of more than 3.3 million persons in the 35-year period represents an average annual growth rate of 2.8% (40% -natural increase; 60%-migration). Such growth means a further and very intensive immigration flow to Izmir.

Table 14.1: *Population projection (in '000) for the year 2025 - "Trend" growth option*

Population	1990	2000	2015	2025
Total	1,740	2,512	3,951	5,117
0-4 (%)	9.7	9.6	8.5	7.9
5-14 (%)	18.5	17.4	16.7	15.7
15-64 (%)	67.5	68.4	69.8	70.2
64+ (%)	4.2	4.7	5.0	6.2

Table 14.2: *Annual Rates of Changes - "Trend" growth option*

	91-95	95-00	00-05	10-15	15-20	20-25
CBR per 1000	20.5	20.2	19.5	17.5	16.8	16.3
CDR per 1000	7.9	7.7	7.6	7.7	7.8	7.9
Growth rate %	3.7	3.5	3.2	2.8	2.7	2.5

Note: CBR - crude birth rate; CDR - crude death rate; RNI - rate of natural increase

Contrary to the above option, the "moderate growth" option depends on moderately decreasing growth rates which will be lower than those observed in the 1960-1990 period (Table 14.4). The resulting population figures expected in 2025 (less than 4 million inhabitants) is more acceptable than those under the existing trend conditions (see Table 14.3).

Table 14.3: *Population projection (in '000) for the year 2025 - "Moderate" growth option*

Population	1990	2000	2015	2025
Total	1,740	2,100	3,358	3,940
0-4 (%)	9.7	9.6	8.3	7.8
5-14 (%)	18.5	17.1	16.3	15.1
15-64 (%)	67.5	68.0	68.7	68.1
64+ (%)	4.2	5.4	6.7	8.9

Table 14.4: *Annual Rates of Changes - "Moderate" growth option*

	91-95	95-00	00-05	10-15	15-20	20-25
CBR per 1000	21.3	21.0	20.1	17.9	17.3	16.8
CDR per 1000	7.6	7.5	7.5	7.7	7.9	8.2
Growth rate %	3.6	2.9	2.4	1.9	1.7	1.5
Note: CBR - crude birth rate; CDR - crude death rate;						

14.2. Labour force increase

The "trend" growth option assumes a continuous and intensive flow of labour force towards Izmir throughout the whole 1990-2025 period (see Table 14.5). Such an increase means:

- continuous high population pressure for new jobs which would absorb a great deal of investments in order to reduce imbalance in the labour market and, consequently, cut down the amount of these investments needed to overcome growing welfare and environmental problems of the area; and
- further extensive concentration of economic activities, including the growth of traditional, labour-intensive sector of Izmir economy which is considered of low quality with regard to income generation.

Table 14.5: *Labour force increase in the period 1990-2025 (in '000) -"Trend" growth option*

Period	1990-95	1995-00	2000-05	2010-15	2015-20	2020-25
Situation at the beginning	1,181	1,450	1,717	2,381	2,760	3,165
Situation at the end of the period	1,450	1,717	2,031	2,760	3,165	3,592
Growth	269	267	314	379	405	427
Growth rate (%)	22.7	18.4	18.3	15.9	14.6	13.5

In such circumstances it is likely to expect that the balance among demographic, economic and environmental components of development will be difficult to establish during the projected period (1990-2025), and that the efforts of the MMI authorities to change radically the existing economic structure and curb the hitherto excessive growth will be less successful.

As far as the "moderate" growth option is concerned, the dynamics of the labour force shows a gradual decrease of the excessive influx (see Table 14.6). On the long run, it is acceptable since the gradual decrease of demographic investments will release considerable funds for financing the improvement of the quality of life in Izmir.

Table 14.6: *Labour force increase in the period 1990-2025 (in '000) - "Moderate" growth option*

Period	1990-95	1995-00	2000-05	2010-15	2015-20	2020-25
Situation at the beginning	1,181	1,443	1,653	2,093	2,380	2,507
Situation at the end of the period	1,443	1,653	1,896	2,380	2,507	2,685
Growth	262	210	243	287	127	178
Growth rate (%)	22.1	14.5	14.7	13.7	5.3	7.1

14.3. Environmental implications

The persistence of the existing trends of urban growth in the MMI area are bound to have serious adverse effects on the environment as the pollution load will rapidly increase. As shown in Box 5., it is predicted that over the next 30 years the wastewater flow rates, organic pollution, suspended solids and toxic material loads are likely to reach the level three to four times higher than the present one. Contrary to the above, the "moderate" growth option assumes a slower increase of wastewater flow rates and pollution loads but does not expect the pollution problems to be eliminated. In this regard, it should be noted that the proposed treatment plant will significantly contribute to the reduction of pollution of the Bay. However, large quantities of pollutants that are expected to be discharged by run-off will continue to deteriorate the Bay area[25], particularly its northern shallow coasts, in the hinterland of which intensive urban and industrial development is bound to take place. The utilization of sea resources in this part of the coast will continue to be negatively affected by urban development taking place in the immediate hinterland unless adequate protection measures are taken.

The total amount of solid wastes in the MMI area is also expected to increase from the present 1,500 tones to more than 3,900 tones[26] per day ("trend growth option"), or up to 3,000 tones ("moderate" growth option). This is likely to become a serious problem since the capacity of the Harmandali landfill will hardly meet the needs of the area in by the end of 1990-2025 period. With limited sites suitable for solid waste disposal, the city of Izmir should start to look seriously into resource recovery system (waste re-use and recycling) as a viable option for resolving the solid waste problem.

BOX 5. EXPECTED WASTEWATER FLOW AND POLLUTION LOADS IN MMI BY THE YEAR 2025

ITEM		"Moderate" growth option	"Trend" growth option
	1993	2025	2025
Total wastewater discharge (1000 m^3/d)	691	1,481	1,900
BOD, kg/day	267,000	670,000	853,000
TSS, kg/day	206,000	535,000	681,000
Nitrogen, kg/day	27,800	77,900	100,000
Phosphorus, kg/day	8,500	22,900	30,000

Source: Marinov, U., A. Pano, and M. Libhaber (1989). Environmental Impact Assessment of the Izmir sewerage treatment project. Split: PAP/RAC.

As for water supply, large efforts will have to be undertaken not only to improve and extend the distribution network, but also to meet the increasing water demand. Taking into account a gradual increase in *the average water consumption* which is in the period between 2020-

[25] It is well known that the urban and agricultural run-offs carry all kinds of pollutants, such as: heavy metals, suspended solids, Nitrogen, Phosphorus and organic matter. The total annual pollution load that is (and will be) discharged in this way does not necessarily have to be much smaller than that of urban wastewaters.

[26] The amount of solid wastes is estimated on the basis of a simple linear extrapolation.

2025 assumed to be around 450-480 l/day/person with water losses between 25-30%[27], it will be necessary to bring to the city of Izmir about 26-28 m^3/second of water at the end of the projected period ("trend" growth option), or less than 22 m^3/sec ("moderate" growth option). As already noted, these water demands will be met from sources outside of the metropolitan area, requiring an expensive engineering services and works. Therefore, the Sarkiz Spring, the Tahtali Dam, the Torgutlu groundwater, Besgoz and Akpinar sources and the Medar Dam should start to be used.

Judging by the available data the capacities of these, as well as other already utilized sources within the MMI area will be able to meet the growing needs of population in the planning period according to both development options (the "trend" and the "moderate" growth options). However, should the present non rational water consumption continue, the area is bound to face water shortage. The rational consumption and reduction of losses along the water mains are imperative. This is possible by a better maintenance and control of the supply network, including cut-offs of possible illegal supply connections and progressive charging for consumption when the allowed averages are exceeded. Besides, it would also be a useful effort to make a long-term estimate of water supply and demand in the Izmir region as a whole in order to decide on the eventual re-use of urban wastewater for agriculture.

The persistence of the existing trends of urban concentration is bound to have adverse effects on the quality of water. Surface accumulations and groundwaters will equally be imperilled. It is, therefore, expected that some of the sources of water supply will be threatened too, primarily the sources in the Bornova plain. Accumulations in the immediate vicinity of the city (the Balcova Dam, the Tahtali Dam) will probably be under constant threat either directly by air pollution, or indirectly by wash-out of pollutants from the watershed area. Consequently, the increased costs of monitoring the quality of water supply and the high capital outlays for treatment facilities must be constantly re-assessed in order to protect public health and safety.

A special problem concerning the persistence of the existing trends of urban growth refers to the tendency of consuming the remaining land resources. Namely, if the trend continues with the average gross population density of less than 75 persons per hectare of total land used for urban purposes, it is likely that the urbanized land in MMI will expand by 150%, i.e. from 296 km^2 in 1992 to more than 700 km^2 in the year 2025. Furthermore, if future urban development takes the form of higher densities (average gross population density of 100-120 persons per hectare of total land used for urban purposes), the land requirements to meet future development will take about 570 to 600 km^2 altogether. According to the "moderate growth" options it is assumed that the total urban land will, at current density of development, expand to 570 km^2 by the year 2025, or to 500 km^2 with the density of 100-120 persons per hectare.

If we take into account the categorization of the MMI area into zones of different "environmental constraints" with respect to various land-use options (see Chapter 4.10), the analysis of land availability for future urban development within the most prospective zones show the following:[28]

[27] The above assumption is based on the regional demands model presented in the Water Supply Study by IZSU, (1986). According to that model, water consumption was assumed to be as follows: a) up to 200 l/day/person in the winter of 2020 for domestic use and 300 l/day/person for total use; b) up to 258 and 378 l/day/person, respectively, in the summer of 2020. Water losses were assumed to be up to 25% by the 2020 .

[28] This analysis has been made using the GIS data base PAP/RAC and local experts have prepared for MMI.

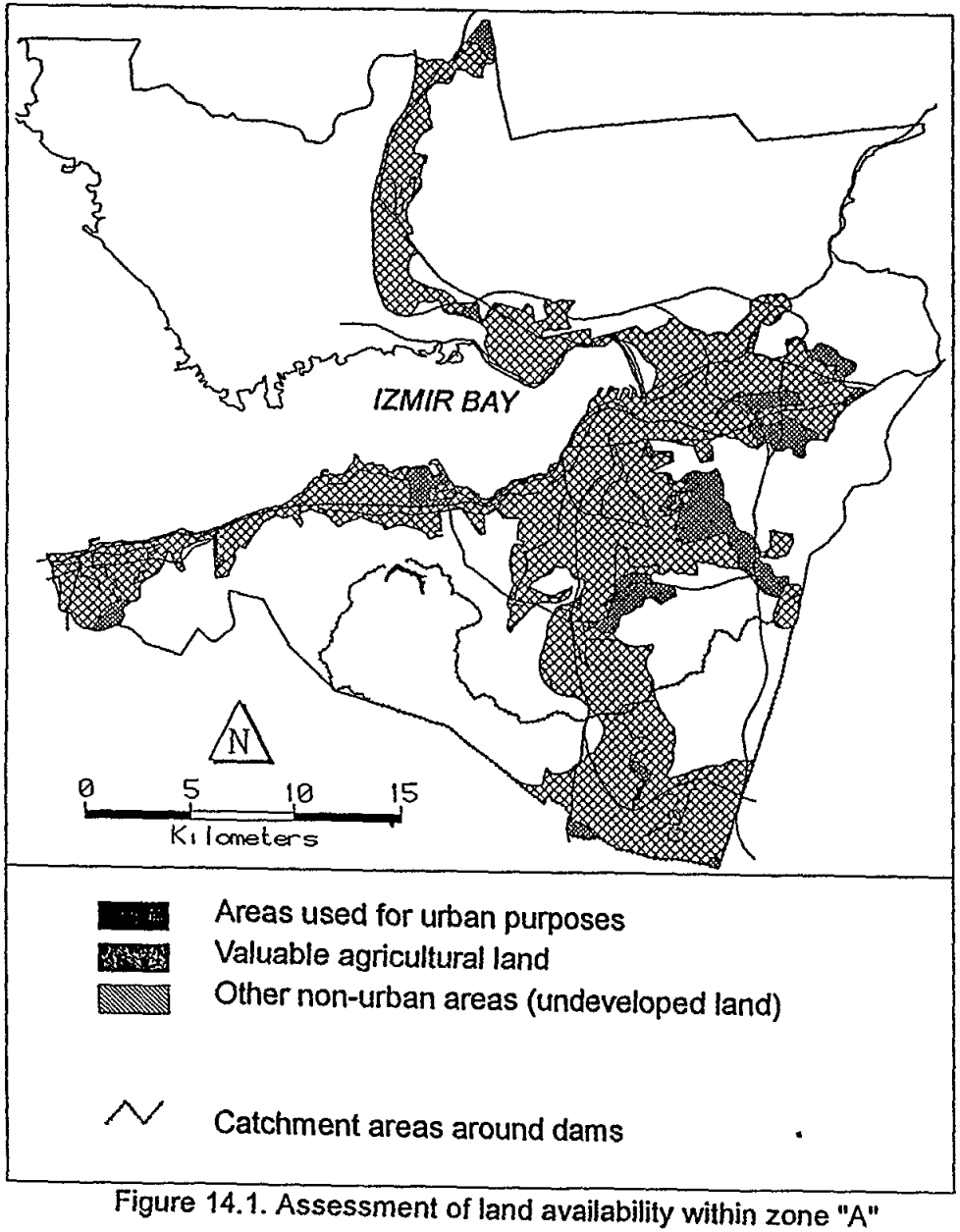


Figure 14.1. Assessment of land availability within zone "A"

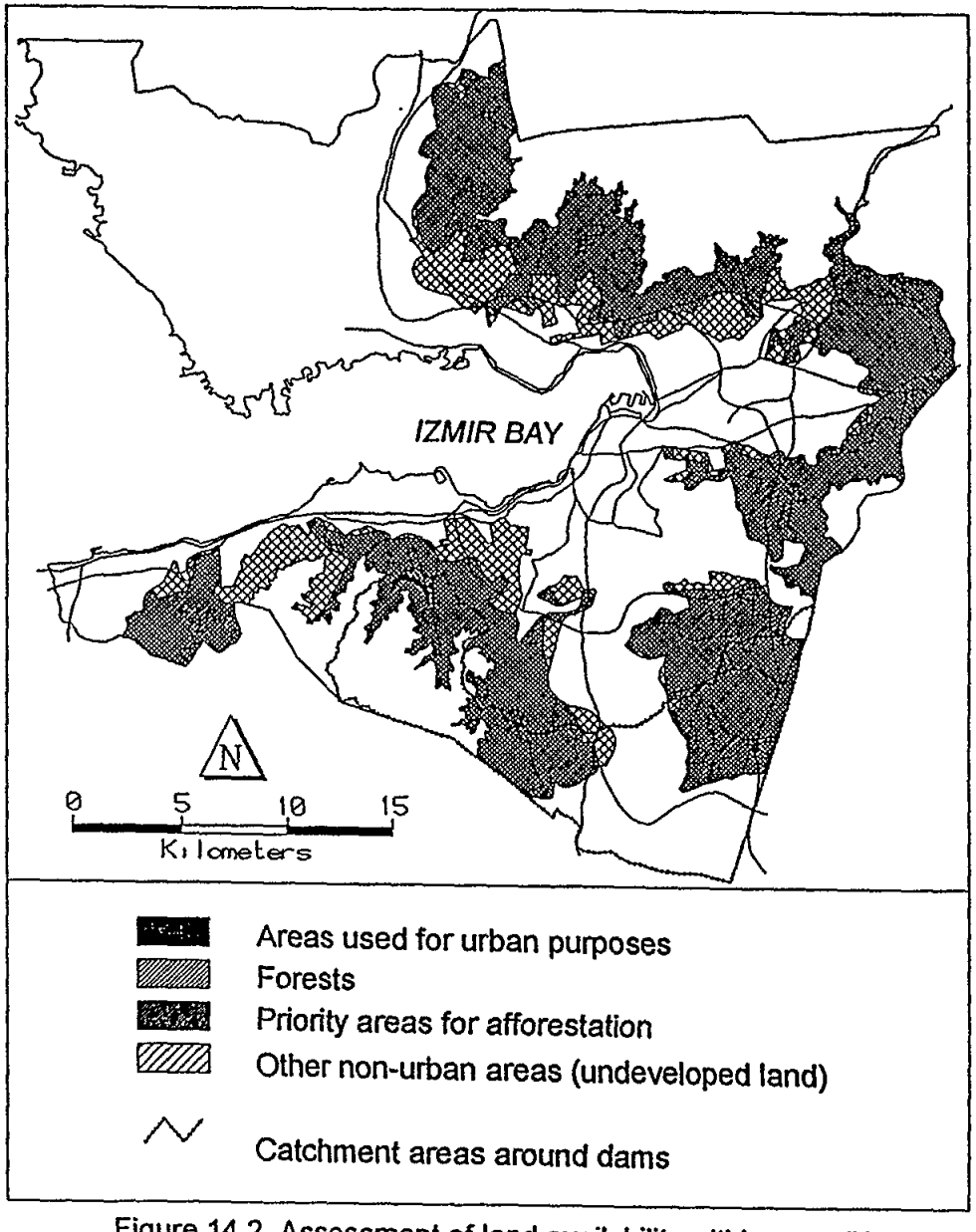


Figure 14.2. Assessment of land availability within zone "C"

- Zone "A", where the land is most habitable, and where urban development can take place without serious difficulties, most of the land has already been utilized, so that the reserves of free spaces (undeveloped land) for urbanization are small (see Figure 14.1). In this zone, most of the land to build on can be provided by interpolation, reconstruction, or re-zoning in low-density areas.
- The largest potential sites (undeveloped land) for building are within zone "C", but mainly on steep slopes often exposed to erosion risks. The limitations are higher than those in zone "A", both in terms of additional expenses required for overcoming physical, infrastructural and other constraints of development, and in terms of efforts towards environmental protection (see Figure 14.2).

It is obvious that the remaining undeveloped land to support future urban growth in the MMI area is very scarce. Consequently, the proposed development options are bound to have serious implications on the future land use. This is particularly true for the "trend" growth option which would lead to excessive uses of available land resources. As indicated in Figures 14.1 and 14.2, habitable fringe of the agglomeration, including agricultural and forest areas, would be probably converted to urban uses.

Under constant population pressure, the solution of housing problems is likely to become even more difficult. It may cause further spreading of uncontrolled illegal housing, even towards the areas which need to be preserved in their natural state.

It is obvious that, due to the scarcity of serviced land, the urban growth based on the persistence of the present trends will lead to further concentration of activities and population in the central areas of the agglomeration, which will considerably disturb the structure of use of urban areas on the expense of green and other public spaces.

As a conclusion, it is claimed that the "trend" growth option is hardly acceptable, both from the environmental and the economic point of view. Serious environmental and development problems, including massive resource depletion, can be expected in future unless measures are taken to alter the course of ongoing processes. The analyses of environmental implications and availability of land for urban development also indicate that the MMI area will be faced with difficulties in accommodating the inhabitants and associated activities anticipated even in the "moderate" growth option. In this regard, it is of crucial importance for MMI to recognise the scarcity of land resources - the problem that must be accorded high priority by the planners and decision-makers. Scarcity of available land, coupled with the growing environmental problems that may be expected due to increased pollution loads, call for immediate actions aiming at the preparation of comprehensive developmental scenarios which will reduce uncertainties and determine a desirable future for the Izmir area. The scenarios should lay ground for the preparation of a new Integrated Coastal Master Plan for the area concerned.

In the following chapters of this study an attempt is made to give some suggestions and recommendations for the formulation of adequate programmes of action to achieve a sustainable pattern of development in the Izmir area.

Chapter VI

ELEMENTS OF THE INTEGRATED COASTAL AND MARINE AREA MANAGEMENT

15. The Need for Integrated Coastal and Marine Area Management (ICAM)

In the preceding sections, a review of the problems and issues of development-environment interactions in the MMI has been made, indicating clearly how negative or even unacceptable a future situation can and will be if nothing is done to alter the existing trends.

It has also been noted that the excessive urban growth, taking place since the 1960s, has been increasingly devouring the space of the MMI regardless of the value and fragility of its natural resources. The uncontrolled power of such expansion affected almost all spheres of economic life, bringing about conflicts between different uses, at the expense of those zones and activities which are not economically strong enough (tourism, agriculture, recreation, fisheries) to fight the interests of the more propulsive ones. All this justifies the warning that the continuation of the existing trends would be in total discrepancy with the requirements of environmentally sound development. There are two crucial and mutually related issues which should be strongly emphasized.

The first one refers to the need for changing the existing trends of growth and development in the MMI area. *This primarily calls for a change in setting the basic goals, strategies and policies of the future long-term development.* What is actually needed is seeking to establish the balance between the social and economic development and the best use of area's limited natural resources. The balance seen from this point of view is not simply a matter of preventing pollution and conserving the natural environment. What is further needed, is an orientation towards sustainable development accepted as a goal of both economic and environmental policies.

Secondly, a full recognition of the pressing problems is not all what it takes. The experience of Izmir and of other coastal regions of the world with similar rate of development suggests that for achieving a sustainable pattern of development (i.e. to reduce the existing and to prevent future pollution, to conserve the resource base while ensuring a relatively effective economic growth) a largely improved management structure is needed. Consequently and in parallel with the changed strategy of future development, what **is** of crucial importance for the area of Izmir is to adopt an integrated management system usually referred to as Integrated Coastal and Marine Area Management (ICAM).[29]

[29] The ICAM system, including its purpose, concept, stages and tools, is explained in detail in UNEP MAP/PAP document "Guidelines for Integrated Coastal and Marine Area Management" (1993).

ICAM is an ***adaptive process of resource management for environmentally sustainable development in coastal areas***. It is not a substitute for sectorial planning, rather it focuses on the linkages between sectorial activities to achieve more comprehensive goals, such as:

- to identify where resources can be harnessed without their degradation or depletion;
- to renew or rehabilitate damaged resources for new uses;
- to ensure the integrity of ecosystems biodiversity;
- to guide the level of use to make sure that the carrying capacity of the resource base is not exceeded;
- to ensure that the rate of loss of resources does not exceed the rate of replenishment;
- to reduce risks to vulnerable resources;
- to encourage complementary rather than competitive activities;
- to ensure that environmental and economic objectives are achieved at tolerable cost to society, etc.

From the methodological point of view, ICAM requires:

- a multidisciplinary approach;
- problem-solving and not problem-transfer;
- priority to prevention rather than cure; and
- a precautionary approach, leaving options open where current knowledge is insufficient.

Fundamental to ICAM is a comprehensive understanding of the relationships between coastal resources, their uses and the mutual impacts of development on the economy and on the environment. These relationships need to be understood and expressed not only in physical and environmental terms, but also in economic terms as they are important for planning, policy formulation, implementation and performance evaluation. As coastal resources are used simultaneously by different economic and social sectors, integrated management can only be accomplished when all these uses, users and relationships are clearly understood. This approach is consistent with the objectives for integrated management and sustainable development of coastal areas and marine environment, established at the UN Conference on Environment and Development, held in Rio de Janeiro in 1992.

Three distinct stages are needed to develop and implement ICAM: (a) initiation; (b) planning (preparation of the Integrated Coastal Master Plan); and (c) implementation of the Master Plan (see Figure 15.1).

In the case of Izmir, it may be understood that the initiation stage has been already completed wherein a clearly expressed willingness expressed by authorities and inhabitants to change the present situation, the outset of the sewerage project, and the activities undertaken within the framework of CAMP "The Bay of Izmir" are the triggering factors for a future better management. Being the major step towards launching the process of ICAM, this study discusses some of the crucial issues of the second stage, that is, the preparation of an integrated master plan for the area. These issues include the following:

(i) Policy recommendations, as well as promotion of the general goals and objectives of development and environmental protection;

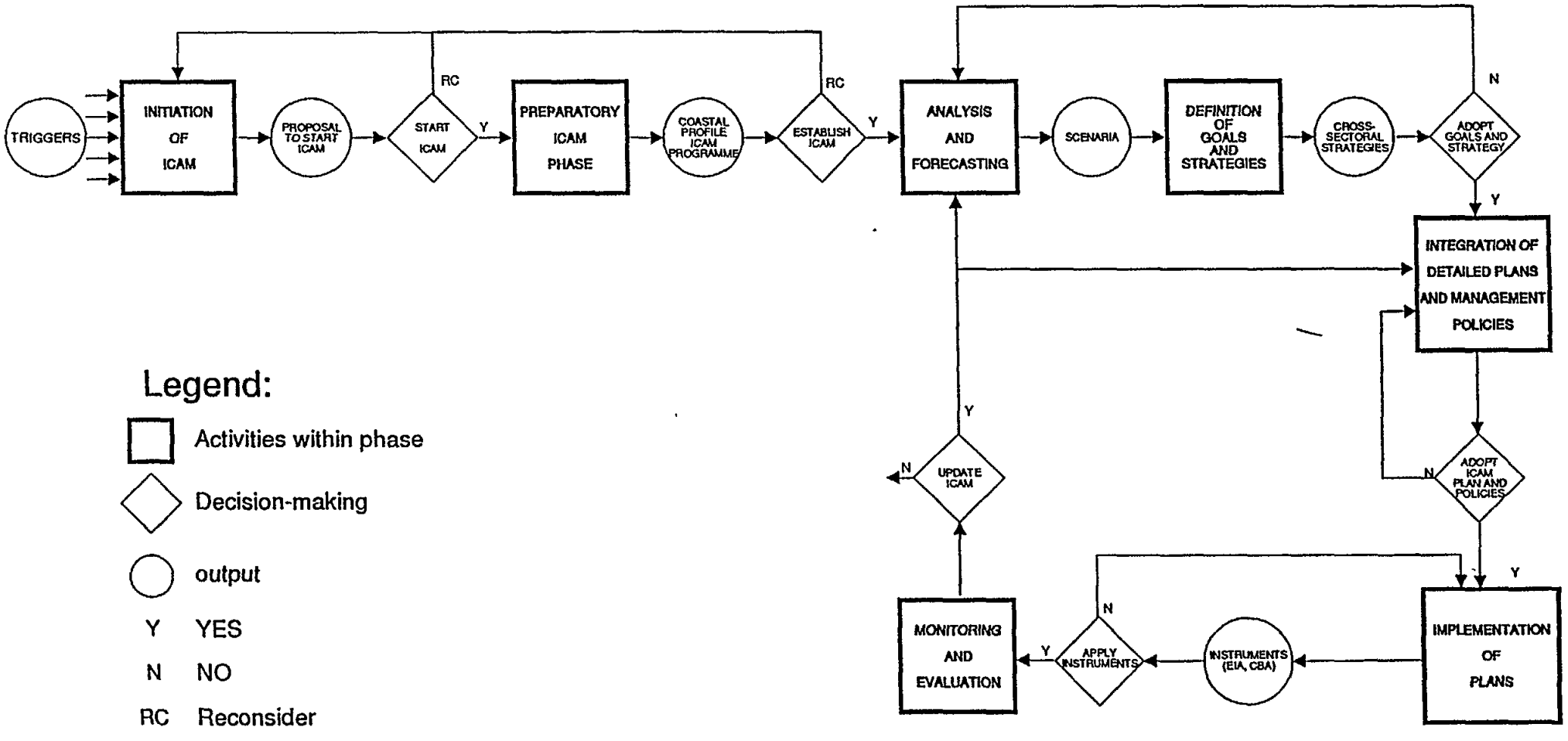


Figure 15.1. FLOWCHART FOR INTEGRATED COASTAL AND MARINE AREAS MANAGEMENT (ICAM) PROCESS

(ii) Setting up boundaries of the coastal area of Izmir for management purposes and offering a proposal of one of the possible models of institutional arrangements to support coordination and implementation of ICAM;

(iii) Elements for the preparation of the Integrated Coastal Master Plan for the area of Izmir (methodological approach, organization of work, specification of activities, etc.);

(iv) Tasks and recommendations relative to the establishment of an integrated and comprehensive information system which is a sine qua non prerogative for an effective planning and management.

16. Goals and Policy Recommendations for Sustainable Development of the Area

16.1. Development strategy concerns

16.1.1. As noted above, an attempt has been made to recommend the goals and objectives that need to be taken into consideration in formulating a viable strategy and policy of the future sustainable development in the MMI area. These goals and objectives are primarily based on the determination that the existing trends of economic development and rapid urban growth which are increasingly shallowing the natural amenities of the area be changed or slowed down by adopting a selective model of development and a consistent implementation of environmental conservation and recovery methods. The proposed development concept is based on the following facts:

(i) Development of Izmir has reached a stage when direct benefits of the industrial concentration and vigorous economic growth are being overwhelmed by costs of environmental degradation;

(ii) Persistence of the existing trends of urban growth will cause two problems: (a) further resource depletion (encroachment on the remaining land resources), and (b) deteriorated quality of life due to pollution.

16.1.2. From the economic point of view, the adoption of a selective (qualitative) model of environmentally sound development implies a gradual transformation of the existing economic structure which should be based on the following key issues:

(i) *A more intensive development of the tertiary and quaternary sectors* to match the role and importance of Izmir as a macro-regional centre (transport, commerce, banking and finances, tourism, education, etc.).

(ii) *A more selective approach in choosing new industrial programmes which will stimulate technologically propulsive and coastal-oriented activities* (contrary to the past and current processes of a haphazard litoralization, the new programmes should rest primarily on the selection criteria adopted with regard to the sea-oriented economy).

(iii) *Introduction of new, locationally flexible and ecologically acceptable production structures of small size*. Sites available in the coastal belt and in the wider central zone of the city of Izmir can take only those production capacities: (i) which do not require much land (intensive users of the physical space); (ii) which do not pollute the environment and do not generate large amounts of waste water; (iii) which can fit in the existing and planned spatial

and functional structure of the city (within or near the residential and other urban zones).

(iv) *Modernization and technological transformation of the existing industrial capacities with a gradual closing down of those units which are in conflict with its environment.* All the polluting industries should comply to the anti-pollution measures. It is also crucial for the MMI economy to promote development programmes which will be able to bear the costs of environmental resuscitation and recovery of the area, including the Bay of Izmir.

(v) *Meeting the spatial, infrastructure and other requirements to enable re-location of the manufacturing sector in less conflicting zones at the outskirts or outside the MMI area.* A better organization of industrial zones ("Ataturk Organize Sanayi Bolgezi" for example) would relieve the pressure on those parts of the Izmir agglomeration in which, with the exception of "ecologically clean" industries, new industries should not be permitted. (central parts of Izmir, the coastal strip, the Bornova plain).

(vi) *An alternative location for harbour and port facilities within the area of Izmir Metropolitan Region should be examined and final decision on the port location be made before the Master Plan is completed,* in order to prevent further degradation of the Inner Bay on the one hand, and to leave enough room for the harbour system to operate normally and develop, on the other.

16.1.3. In view of the quality and quantity of available resources, the above model of development aims at curbing the persistent trends of excessive concentrations of people in the MMI area. Moreover, the population growth in the MMI area must be reduced radically in the near future**.** This calls for immediate action aimed, first and foremost, to reduce the influx of rural population in the urban area of MMI. (In order to inhibit the damaging effects of further urban expansion of Izmir, it is estimated that the annual immigration rate should be reduced to less than 1% which, coupled with the expected gradual decline of the fertility rates, may guarantee a moderate-to-decreasing growth of total population of the area - that is, less than 3.5 million inhabitants by the year 2025).

16.1.4. Measures to discourage migration flows towards Izmir should rely on the policy and strategy of control over the sources of urban growth at the local level. However, such measures are hard to determine at present, primarily because the control over the development of urban land and housing construction have so far been ineffective. Keeping in mind the fact that the squatter settlements have been (and still are) the predominant destination for migrants, it is important to stress that the migration flows toward Izmir might be diverted not only by the provision of new jobs, but also by the provision of urban serviced land, especially for the low-income population at locations outside the MMI area. This may discourage the illegal housing to continue.

16.1.5. The slowing down of migration flows towards Izmir might cause an excessive growth of the surrounding medium- and lower-order centres located close enough to Izmir to benefit from the spillover. Therefore, *the relevant authorities need to anticipate the future processes and take a more active role in controlling the urban growth along the development axes in the bordering areas of Izmir,* mainly within the boundaries of Aliaga, Menemen, Foca, Kemalpasa, Cumovasi, Torbali, Urla, Seferihisar and Cesme districts. From that point of view, Manisa, which is of right size and which has enough economic power to support industrial development, should also be considered as a possible complementary counterpole to Izmir.

16.2. Environmental policy concerns

16.2.1. A general picture of the state of quality of human environment in the area of MMI and indications of serious threats to some particular components of the ecosystem (the aquatorium of the Izmir Bay, in the first place) speak in themselves of the need for an effective management of natural resources as one of the priorities on which the strategy and policy of the future development of MMI should be based. Some of the recommendations to achieve this goal are the following:

16.2.1.1. Harmonization of the future development with the receptive capacities of the ecosystem, potentials of the area, and requirements of their protection and recovery. It has been already pointed out that the analyzed concentrations of noxious wastes in the natural media indicate that the permissible limits of threat to human environment in the area of MMI are largely overstepped, and that the capacity of the ecosystem is insufficient to receive the large amount of waste material that is presently being discharged from numerous pollution sources. The MMI authorities should therefore: (i) adopt preventive and precautionary policy approach so as to minimize (if not avoid) further degradation of the environment, and (ii) start (or continue) taking concrete actions towards its gradual recovery;

16.2.1.2. *Building up of an organized and efficient system of pollution control and monitoring of the quality of environment* with a view to imposing responsibilities for the enforcement of adopted environmental standards on those who are generating pollution. In this regard, it is necessary to take the following steps:

(i) The Environmental Health Directorate of MMI, which is responsible for the pollution control activities within the inner boundaries of MMI (the Karsiyaka, Buca, Konak and Bornova districts), should be strengthened both in terms of human resources and organizational structure, as well as in terms of technical and financial resources.

(ii) A more efficient coordination and cooperation should be established among the responsible national and regional institutions, and with various non governmental organizations (universities and institutes) involved in research and monitoring of the state of environment in order to: (i) complete the knowledge and facilitate exchange of information, (ii) standardize the quality of human environment at the local level and upgrade legal instruments with the aim to mitigate and reduce pollution (Ambient Environmental Quality Standards, Effluent and Emission Standards, Technology Based Standards, etc.).

(iii) The MMI, and the national authorities whenever applicable, should also promote the use of various economic instruments, such as pollution charges, marketable permits, subsidies, deposits and return systems, penalties and other enforcement incentives. It seems that the implementation of economic instruments and incentives have so far been quite ineffective. This is particularly true for the penalties for failure to meet environmental requirements, as well as for pollution charges which, in the case of Izmir, appear to be much too low. Furthermore, what should be noted is the fact that 80% of the means collected from pollution charges, go to the Ministry of Environment and only 20% to the Municipality which, therefore, has no interest to impose pollution

charges in a more efficient way. It seems important to examine all legal possibilities with a view to changing the above ratio.

16.2.2. It is also important, as a preventive measure, to prepare an EIA study for each project and activity which is assessed as being a potential source of pollution. This measure should be enacted to assure that possible impact on the environment be detected and assessed early in the planning process. UNEP MAP/PAP developed a practical procedure of EIA for projects and activities which may have impact on the environment and is ready to provide assistance to the local authorities in preparing such EIAs.

16.3. Protection and recovery of the Izmir Bay

16.3.1. As already noted, pollution of the Izmir Bay is the major environmental problem in the area since the eutrophication of its inner part has already started and is spreading progressively. The decision to build a sewerage system and a treatment plant in the Old Gediz river delta has so far been the most important response to the pressure to protect the Bay from further degradation. However, that project is but one response to the problems the Bay is facing. In this context, several other issues are of importance for securing an effective protection of the Bay resources:

16.3.1.1. Firstly, while contributing significantly to the reduction of pollution of the Bay, the planned sewage system and treatment plant should not be expected to eliminate it completely due to large quantities of pollutants which will continue to be discharged directly into the Bay by run-off. Therefore, an effort should be made to identify the overland flow paths and develop a strategy for the management of run-off and other non-point sources of pollution**.** This is likely to involve inputs from both land-use planning and water engineering services of MMI.

16.3.1.2. The second issue refers to the proposed discharge of treated wastewater into the Middle Bay directly through the old bed of the Gediz river and, possibly later, through a submarine outfall. However, the main problem related to discharges of treated wastewater into the Middle Bay is its high nutrient load which may trigger eutrophication. Therefore, to evaluate in detail the effects of waste water discharge on the water quality of the Bay, an EIA of the proposed discharge through the Old Gediz river, as well as an EIA for one or two alternatives of the submarine outfall should be made**.** The experience of PAP suggests that each of these EIAs can be made by the local universities with the assistance of national experts and PAP/RAC.

16.3.1.3. The third issue refers to the problem of the recovery of the Inner Bay which will be hard to resolve in a foreseeable future, due to a heavy concentration of pollutants accumulating in the sediments over a long time. Therefore, it is of extreme importance to study the recovery process in order to determine its rate and residual side effects. MAP/PAP prepared an outline of the recovery programme within this CAMP [30].

[30] Programme of this activity was prepared by Dr. Paul Nival and is given in UNEP/MAP/PAP document "Environmental Management and Recovery of the Izmir Bay" (1988).

16.3.1.4. The fourth issue refers to the improvement of the existing day-to-day monitoring programme which should be validated for chemical parameters being direct indicators of pollution of the Bay. The water quality control should be also incorporated in the next programme phases. Apart from the day-to-day monitoring, it is also recommended to start a long-term cooperative research programme and systematic collection of data on all relevant marine environmental parameters**.** These data will be needed not only for studying the rate of recovery, but also for predicting the effects of global climate changes on the living marine resources and the marine environment as a whole. The activity should also include a coordinated observation and research programme in order to minimize uncertainty concerning the expected sea level rise in the bay area, as well as to anticipate its possible consequences on low-laying areas and enable various preventive measures to be adopted. This monitoring programme can be implemented by the Institute for Oceanography in Izmir with the assistance of UNEP/MAP, if required.

16.4. Protection of fresh water resources

As noted in the preceding sections, pollution caused by the tremendous urban growth of Izmir threatens the fresh water sources. To prevent their further contamination and to secure a stable water supply, it is necessary:

16.4.1. To undertake a comprehensive study of the protection of water sources and of the long-term changes of their quality, covering the area of MMI and its immediate vicinity. The study will serve as the basis for defining various land-use planning and/or zoning requirements (minimum lot size, distribution of septic tanks, zones under sanitary protection, etc.). The study is impossible to carry out without a continuous monitoring of water quality and pollution sources.

16.4.2. To protect (if not conserve) the environment around dam construction sites and their catchment areas. This especially applies to the Tahtali Dam.

16.4.3. To stop issuing building permits for industries using large amounts of water in their technological process, as well as to stimulate re-location of the existing ones from the Bornova Plain.

16.4.4. To control the use of groundwater sources and prevent their excessive pumping.

16.4.5. To stop illegal wastewater discharges endangering both the surface water and aquifers. In this regard, to assure success of the Industrial Discharge Control Programme that is being implemented by IZSU, a number of subjects need attention. These include:

(i) Monitoring of the industrial pre-treatment facilities: several of the existing industrial pre-treatment plants are not meeting discharge standards. The most efficient enforcement methods possible should be adopted to ensure that the effluent discharge is an integral part of the program to clean up the watercourses and the Izmir Bay.

(ii) Sludge disposal: sludge produced by the required pre-treatment facilities should have to be disposed of in an environmentally safe manner. Monitoring and control of the industrial sludge should be added to the responsibility of the Industrial Control group in IZSU Regulations should be formulated to facilitate this control.

(iii) Analytical Laboratory: to monitor compliance with the regulations, an efficient analytical laboratory is required.

16.4.6. To exert rigorous control over the use of fertilizers in agriculture and undertake appropriate preventive measures for the protection of groundwater sources, especially those at Menemen.

16.4.7. To start a long-term programme of analysis of water quality of the Gediz river. This is very important not only for the prevention of pollution of the Outer Bay but also for the water supply of Izmir the sources of which are affected, directly or indirectly, by the Gediz river.

16.5. Air pollution control and abatement

16.5.1. In order to define regulatory instruments such as Ambient Air Quality Standards and Emission Standards for Stationary Sources, it is necessary for the MMI authorities *to start collecting and completing data on the type, location and emission characteristics of the major stationary sources of pollution within the wider area of the city (cadastre of emissions).* This will enable the preparation of **a recovery plan** by which the large polluters will be forced to make technical and technological improvements and comply to the set standards and protection measures.

16.5.2. To be able to determine the state of air pollution and register changes in the pollution level, it is necessary *to extend the network of measuring stations* and, in accordance with the local conditions and decisions of authorized institutions, *set up an effective monitoring programme.*

16.5.3. In order to reduce air pollution in Izmir, it is important *to promote and encourage a gradual substitution of the existing sources of energy by those (natural gas, better quality fuels etc.) which will be environmentally more acceptable* (the main energy sources currently used in the MMI area are crude oil and local lignites of low heating value). At the same time, the regulations pertaining to the construction of stacks should be in accordance with the Air Quality Protection Regulation in order to ensure adequate atmospheric dispersion of air pollutants.

16.5.4. To control the vehicular movement, an overall transportation plan is necessary. In such a plan, which is being prepared for the Izmir area, *mass transportation facilities must be foreseen with less pollutant emissions* per vehicle. Also, the use of leaded gasoline must be reduced. Inspection and maintenance of vehicles must be effectively planned and carried out.

16.5.5. Wherever the available space so permits, it is necessary to *create green belts and/or sanitary-protection zones*, primarily in the areas where industry and housing meet, as well as along major transportation arteries.

16.6. Soil protection

16.6.1. Soil is a very sensitive component of human environment in the area of Izmir. It has been exposed to various processes of degradation and pollution, primarily erosion and pollution from the air, run-off and waste waters due to the lack of an appropriate collection and discharge system, as well as an ever more intensive use of fertilizers and pesticides in agriculture. Bearing all this in mind, there are several issues which should be considered.

16.6.2. Firstly, to prevent further damaging effects of erosion it is necessary *to undertake a series of anti-erosion measures* especially with regard to steep sloping deforested terrains. These measures include:

(i) afforestation and cover improvement of bushland, contour trenches, intensive care of young forests, etc; and
(ii) contour farming, ripping, terracing, etc.

16.6.3. Secondly, the protection of soil from excessive utilization of fertilizers and pesticides require the following:

(i) to establish a mechanism of systematic control of the quantity, composition and ways of use of fertilizers and pesticides in agriculture;
(ii) to educate farmers and instruct them how to use fertilizers and other compounds; and
(iii) to upgrade measurements and analyses of soil samples to enable timely interventions for prevention and recovery, as well as to determine the zones of saturation with regard to the acceptable limits of soil pollution.

16.7. A sound use of limited land resources

16.7.1. Given the quality and quantity of available land in the area of Izmir which is a critical constraint for further development, the MMI authorities should aim to implement a more efficient land management. Some of the key directions to achieve that goal are the following:

Forests and Agricultural Land

16.7.2. Preservation of agricultural land should be an integral part of the overall land use and management strategy. For that purpose, appropriate legislative and planning measures should be reinforced to prevent further unnecessary loss of valuable agricultural land, especially the land along or around the expansion axes of the city (the south, the north and the Bornova-Kemalpasa axes). This is possible to achieve by imposing restrictions on the conversion of agricultural use to other uses. This should, however, be preceded by a comprehensive study of all relevant factors (accessibility, homogeneity, structure, soil class, etc.) resulting in a classification of agricultural land with regard to the conditions to be met for each particular type of crops.

16.7.3. A deteriorating state of forests (uncontrolled felling for construction sites, and forests which are not properly taken care of and their conversion into agricultural areas) calls for a better forest management. Recognizing the recreational and protecting role of forests in maintaining the bio-ecological balance, it is essential for the MMI authorities to improve the management of forests by means of:

(i) promoting the planning practice and implementing measures to prevent further unnecessary loss of forests to construction or agriculture; and
(ii) encouraging afforestation according to already developed programmes, particularly in the areas where afforestation would have both protective and rehabilitation character.

Urban Land

16.7.4. Preliminary analyses and assessments have shown that the urbanization process in the Izmir area is largely by-passing the basic principles of the Master Plan in force. Needless to say, the bulk of disturbances taking place in the physical space are the consequence of a permanent flow of migrants towards the peripheral, as yet undeveloped areas. Under the conditions of a highly speculative land market, this left room for the process of transformation of agricultural land and other environmentally sensitive locations into building land. Therefore, a consistent public control over the sources of urban growth in Izmir and, in particular, control over the use, transactions and prices of land are crucial elements of the policy which aims at an efficient land organization and protection. To this end, it is necessary:

(i) To set up and update databases on land and property market conditions and urban growth, in order to define appropriate strategies for the improvement of land market performance and, also, to evaluate the impact of various public interventions on land value. Furthermore, these data will enable structuring the land taxation system for MMI, as fiscal tools cannot function properly without accurate information on land value. Also, such information is a valuable basis for governmental planning and decision making, as well as for private investment.

(ii) To develop an efficient mechanism for taxing value gains resulting from investments in infrastructure, land registration and titling. The gains should be geared to land acquisition and the implementation of urgent development programmes such as, provision of serviced land for low-income groups at right locations in order to prevent sprawling or building of illegal settlements in environmentally vulnerable areas.

(iii) To introduce gradually a system of economically realistic charges for communal services in order to rationalize the consumption and secure means for the implementation of important infrastructure projects (sewerage, water supply, etc. especially in poorer urban areas), and thereby to discourage new settlers in the area. Further efforts will be also needed towards a better use of available financial resources. This requires the following:

- utilization of non-traditional financing techniques including an increased reliance on the public-private cost-sharing approach;
- better coordination between various institutions involved to avoid duplication of work and to reduce costs; and
- encouraging urban development in close proximity to the existing services and facilities. (Many of the neighbourhoods scattered along the edges of Izmir agglomeration are without piped water and sewers and are far from fire, medical and other services.).

(iv) Introduce measures to ensure an effective use of under-utilized or vacant urban land by means of re-development.

(v) To provide appropriate planning solutions for a rational use of limited land resources, in other words, to abandon the hitherto practice of static physical planning, adopt a more dynamic approach and move to the preparation of a comprehensive plan incorporating short-term detailed plans, programmes and projects. These issues will be discussed extensively in the following chapters.

16.8. Areas of particular value

Specially Protected Areas

16.8.1. So far only the Camalti saltpan and the Homa Dalyan wetland area have been put on the list of Specially Protected Areas in MMI. Regardless of the fact that this area is protected by law, the plans to extend the existing salt works as well as the proposed effluent discharge into the Middle Bay may cause considerable damage to it.

16.8.2. In addition to the Homa Dalyan, the wider area around the Balcova dam is also recognized as a significant scenic and natural resource of particular value for the water regime, as well as for tourism and recreation (hot and mineral springs, preserved natural landscapes and view points). Therefore, it is worth to develop a legal framework for its protection.

Coastal Belt

16.8.3. With the exception of the wetland area along the northern shores of the Izmir Bay, the entire coastal belt of MMI is a saturated area, almost fully developed. In order to rehabilitate this area a careful consideration should be given to the ways of protecting the remaining undeveloped and/or less densely developed coastal areas from inappropriate uses by channeling the building development deeper inland in order to ensure an undisturbed access to the coastline and improve the visual and recreational functions of the coast.

16.8.4. In this regard, particular attention should be accorded to the old urban core which is one of the basic elements of Izmir identity deserving a better urban protection and control. Consequently, the preparation of a study is here recommended which would identify the sites and buildings of historic and architectural value and propose immediate measures for their protection, by means of: (i) appropriate documenting; (ii) interventions in situ; (iii) determining their appropriate use.

16.9. Natural risks and hazards

Seismic risks

16.9.1. The Izmir area is a seismically active zone prone to earthquakes. Due to the present trends of urbanization and development, the exposure of that area to seismic risk has increased enormously. A prerequisite for the mitigation of seismic risk is the existence of an effective policy defining the process of seismic risk management. A seismic approach within ICAM of earthquake-prone areas is indispensable, requiring in particular an adequate land-use planning, based on seismic macro-and micro-zoning, and construction improved by adopting seismic building codes.

Climate change

16.9.2. "Greenhouse gases" (CO_2, CH_4, N_2O, chlorofluorocarbons) generated by human activities have already accumulated in the atmosphere to such a level that climate may have already started to change, and the continuation of this change may now be inevitable. The increase of greenhouse gases over the last 100 years may cause global warming in the range of 0.4 - 1.1°C, and predictions suggest that temperatures may increase by 1.5 - 4.0°C in 20 to 30 years. One of the major effects of global warming is a rise in sea level due to the melting of glaciers and thermal expansion of oceanic waters. Superimposed on these effects will be local tectonic activity and subsidence. The rises in temperature and the sea level could affect coastal and marine areas, particularly in relation to:

- surface and groundwater flow and river regimes (water supply availability, incidence of floods and sediment transport);
- movement of main water masses (waves, currents, tides, erosion of the coastline, tidal range);
- natural ecosystems due to increased temperature; and
- occupation and use of coastal land due to sea level rise.

The impacts of such changes may include:

- an increased sea water intrusion into the coastal aquifers;
- further difficulties in providing supply of freshwater;
- increased inundation under storm conditions in unprotected coastlines and low-lying areas;
- increased shore erosion;
- loss of natural vegetation in marginal climatic or soil areas; and
- possible increased risk of forest fires.

Considering the above facts it is of interest to study the possible implications of expected climatic changes on the Izmir bay area.

17. Institutional Arrangements for ICAM

There are two essential issues concerning the operationalization of ICAM. The first one is setting up of boundaries for ICAM, while the second one refers to the establishment of workable and well-coordinated institutional arrangements to support integrated management of the area concerned. These two issues are discussed in the following sections.

17.1. Setting up the boundaries for integrated coastal area management

In general, the coastal area covered by ICAM need to be defined in such a way as to allow the management of all activities that may impact the resources and the environment of the area. From both the functional and scientific point of view, the extent of the zone will vary according to the nature of the problem. The boundaries of the coastal zone should extend as far inland and as far seaward as necessary to achieve the objectives of an effective management. Another way of defining boundaries is the "ecosystem approach" which implies that the on-shore axis includes part of the hinterland and its watershed area.

To manage the area under jurisdiction of MMI, and the whole of the Bay area (the Inner, the Middle and the Outer Bay) in a sustainable way it is essential to create a management system covering a much larger area than the one under jurisdiction of MMI. The criteria for determining such an area is the physical space in which human activities and natural processes have significant impacts on the MMI and Bay area. Figure 16.1 indicates the population growth in urban centres in the wider area of Izmir. These centres are located either in the Province of Izmir (Figure 16.2) or in, what may be called, the Izmir Metropolitan Region (Figure 16.3). While deciding upon the planning area for ICAM, one should consider the following:

- some of the municipalities outside MMI, such as Aliaga and Kemalpasa, are growing faster that the MMI area;

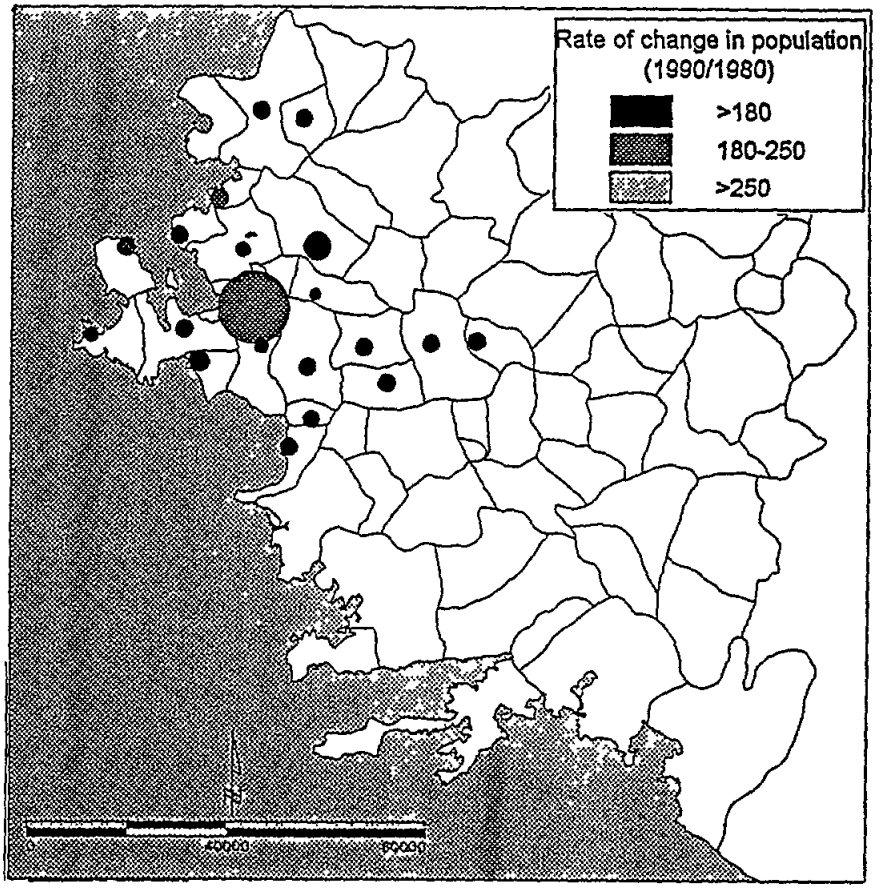


Figure 16.1. Urban centres around Izmir

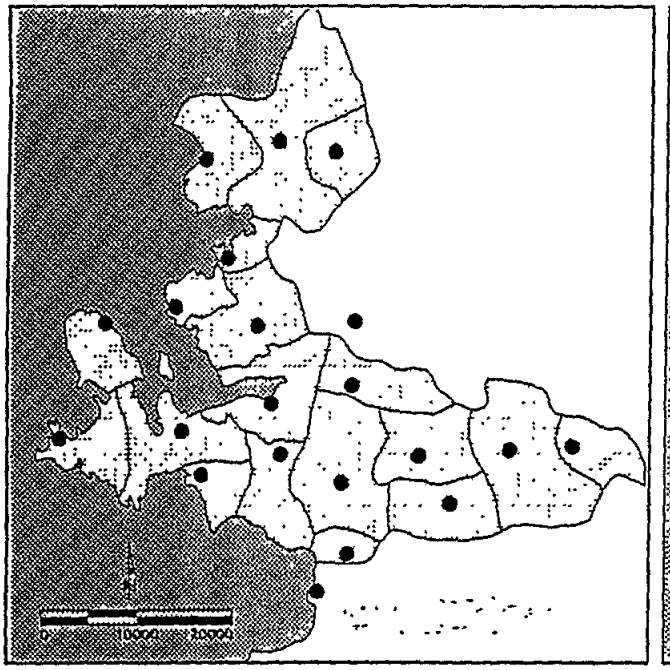


Figure 16.2. Izmir Province

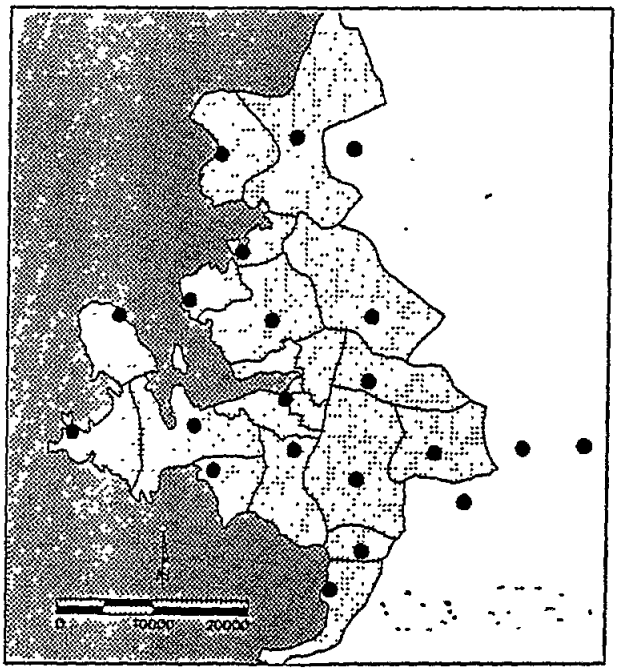


Figure 16.3. Izmir Metropolitan Region

- outside the boundaries of MMI, the economic development is taking place along certain axes, namely: the Izmir-Aliaga axis (petrochemical, thermo-electric industry, housing, tourism, recreation); Izmir-Kemalpasa axis (metal industry, chemical, textile, cement, brick and food industry); the Izmir-Cumovasi-Torbali axis (automobile industry and agricultural machinery); the extension of this axis towards Selcuk and Kusadasi (tourism and recreation); Izmir-Urla-Seferihisar and Cesme (tourism, secondary homes and recreation);
- the area outside MMI contains an additional half a million inhabitants in close vicinity of the two million living within the boundaries of MMI;
- in various forms, the activities specified above and the waste water produced by the additional half a million inhabitants have impact on the environment of MMI and the Bay.

For these reasons **the Izmir Metropolitan Region could be one of the options in determining coverage for ICAM.** Although it is not an administrative unit it approximates closely to the area of the Izmir Province - a provincial administrative unit under the Governor. Exceptions are the municipalities of Kusadasi and Manisa which are part of the Izmir Region, but not the Province, and the eastern corner of the Province which is not part of the Region. The second option is to take the **Izmir province as a management area**. This would, however, leave out the two municipalities (Kusadasi and Manisa) which impact the Province and the MMI. Another option - that is **to adopt the boundaries of MMI as the boundaries of ICAM** - seems less acceptable since it narrows the focus with regard to the planning and management of the area. Namely, considering the dynamic nature of the coast and the complex links between land and water that influence and are influenced by the coast, the broader (regional) perspective appears to offer merit for ICAM.

17.2. A framework for institutional arrangements

Like in other coastal areas with similar rates of growth, the existing institutional arrangements in Izmir have proved insufficient to support effective integrated management of the area. Many development and other problems relative to environmental degradation and pollution of the area result from hitherto institutional drawbacks and divergence in policy objectives pursued by various authorities (see Chapter 4). It is obvious that there is no well coordinated mechanism of decision making, and that the establishment of adequate institutional arrangements stands as one of the priorities in the operationalization of the ICAM process.

One of the possible and workable solutions frequently arrived at in the coastal areas similar to Izmir is the establishment of an Integrated Coastal Management Committee as the main decision making body responsible for the regional development which is in harmony with economic, social and environmental aspirations of the region. The functions and responsibilities of the Committee would include coordination of the development of the region, monitoring and control over the use of natural resources, preparation of various legal acts and policy measures for sustainable development, preparation and implementation of regional and integrated master plans for the area.

The members of the Committee would be the Governors of the Provinces involved, the Mayor of MMI, and the mayors of district municipalities. The Ministry of Environment would be represented in the Committee together with other relevant ministries and government departments (Ministry of Construction and Settlement, Ministry of Transport, State Planning

Organization etc.). The inclusion of representatives of the local industry and public interest groups should be also considered.

A statutory legal basis could be provided to the Committee by an Act of Parliament. The Turkish Government has accepted in principle the idea of Coastal Management Units as the main bodies responsible for the management of major coastal regions. Alternatively, the Committee could operate as an informal regional body in which case difficulties may be expected in reaching and enforcing decisions.

Since the establishment of the Committee stands as the basic prerequisite for the successful implementation of the ICAM process, there is an urgent need for a study which would examine how to harmonize the above mentioned functions and responsibilities of the Committee under the legal and institutional conditions prevailing in Turkey. The study should also suggest the most suitable structure of the Committee, including an evaluation of how the existing regional and local institutions, agencies and departments can be utilized and re-organized to provide an adequate professional support in operationalization of the integrated management system. Annex II illustrates a model of institutional arrangements that could be set up in Izmir.

18. Elements for the Preparation of the Integrated Coastal Master Plan for the Area of Izmir

18.1. The need for a new Integrated Coastal Master Plan

The reasons for the preparation of a new Integrated Coastal Master Plan for the Izmir area (ICMP) are indeed numerous. They are stemming from criticism of the hitherto practice in the domain of control, land use, protection and enhancement of the environment in the area. There are two critical issues which require special consideration.

The first issue is closely related to the master plan approach adopted by MMI during the 1970s. That approach placed emphasis on a **desirable** use of the metropolitan land at a certain point of time in the future. Consequently, the master plan, which was adopted in 1973, focused on the end-state product, rather than the process of achieving the set goal. By virtue of its static and physical focus, the master plan has proved inadequate to prevent and especially to channel the excessive urban growth of the Izmir agglomeration. It rather seems to have succeeded in channeling only 40% of residential development in the areas allocated for that purpose. The rest are the gecekondu settlements which have escaped control and sprawled into the areas reserved for other purposes or outside the coverage of the master plan. The master plan has undergone several revisions and evolved into a series of separate detailed plans drawn for particular areas without integration into a cohesive long-term planning document. Furthermore, many of the initial planning goals adopted back in 1973 have lost relevance over time. All this speaks of the fact that MMI has lost a sound basis for regulating the major flows of development in its physical space, and justifies the need for a new master plan.

The second issue refers to the attitude with regard to the environment which was rarely understood as a framework for development. Being the result of such the attitude, planning was reduced to mere "urbanization of the physical space" failing to recognize the complexity of environment as a factor of development. This, coupled with the lack of cross-sectorial coordination and control over the development of various coastal activities, has to a large extent contributed to natural resources depletion, environmental degradation and conflict of

uses in the case of Izmir. Therefore, the resulting seriously disturbed spatial and ecological balance calls for the development and implementation of the ICAM process and, as a crucial step to this end, the preparation of a new, integrated coastal master plan (ICMP).

18.2. Methodological approach, goals and tasks of the ICMP preparation

The preparation of ICMP includes, first and foremost, the creation of a new, updated operational planning basis and determination - through a thorough research and integrated approach (multidisciplinary and inter-sectorial) to the analyses of development options - of the following:

(i) An optimal long-term strategy and structural model of development of MMI and its territorial units (strategy of a long-term economic development harmonized with the receptive capacities, values and comparative advantages of the area, concept of urbanization including the most suitable distribution of population, as well as a set of efficient measures of public control over the use of land for urban purposes).

(ii) An optimal way of developing the physical space based on the analysis of natural (environmental sensitivity and hazards) and man-made conditions, including a detailed site-specific land and sea use proposal wherein sectorial policies, programmes of action and investment are well integrated.

(iii) A long-term strategy of the use of natural resources (agricultural areas, forests, marine resources, etc.), including measures to mitigate or eliminate negative consequences of the hitherto practice.

(iv) A long-term concept and measures of protection and enhancement of the quality of human environment, including the areas of high natural value and cultural heritage.

(v) Long-term plans for the construction of infrastructure systems.

To meet these requirements, ICMP must contain, in addition to the long-term strategy and policy of sustainable development, the elements of its implementation in stages and the procedure of plan approval and periodic revisions. In this regard, the methodological approach adopted in preparing ICMP should enable it being constituted as "a structure of events" unlike "a structure of static images" which characterizes the old master plan. What is here advocated, is the use of a successive scenarios method, which implies the introduction of a considerable degree of flexibility in the planning process and enables institutions entrusted with ICMP implementation to respond, through monitoring and feedback, to the changes which might occur in the planning area.

ICMP should also outline the administrative framework of the plan implementation, as well as policies which can be implemented by existing laws and regulations and those which require new legislation, and suggest the agencies which will play a key part in the process. In addition, ICMP should ascertain the following:

- how the development control system will operate and to what extent the existing system can be utilized;
- the legal basis and, if possible, the administrative body which will exercise the development control; and
- powers invested in public agencies or corporations for compulsory land acquisition, land banking, land lease, and the practice pursued in land valuation in cases of public land acquisition and restriction of private development rights for the plan implementation purposes.

ICMP should also:

- propose a form of control, such as building permits, planning permissions, licenses for industries, zoning regulations, development briefs, design directives, etc.;
- define expenditure priorities and technical personnel requirements of the plan implementation; and
- specify the instruments to be used in the plan implementation (for more details see UNEP/MAP/PAP document "Guidelines for Integrated Coastal and Marine Area Management").

As to the spatial coverage, it is realistic to expect that ICMP will cover the area which is under the jurisdiction of MMI. However, in order to achieve full accord between the MMI and the Municipalities within the Izmir Metropolitan Region with regard to the basic elements of strategy and policy of global development, the boundaries of ICMP should be extended in dependence of the phenomenon and issue being observed and studied (metropolitan region or Izmir province).

18.3. Methodological basis and phases of ICMP preparation

The methodological approach adopted in ICMP is accordant with the general methodological principles and procedures contained in the UNEP/MAP/PAP document "Guidelines for Integrated Coastal and Marine Area Management". It takes account of the knowledge and experiences obtained through the preparation of similar planning documents. The preparation of ICMP will thus be carried out in several phases and sub-phases, each being a thematic entity. From the methodological point of view, the following two most important phases, namely (a) analysis and forecasting phase; and (b) preparation of the planning documentation, should be noted.

18.3.1 Analysis and the forecasting phase

The purpose of work within this phase is to provide an analytical basis for the specification of goals and guidelines of the future strategy of sustainable development of the Izmir area. The work of this phase includes the following:

(i) Assessment and analysis of the existing state of the natural and the socio-economic system;

(ii) Assessment and analysis of development potentials and trends;

(iii) Forecasts and projections of development options, including an inter-sectorial synthesis with the definition of relationship between the future requirements for goods and services and the capacity of the area's natural resources to sustain these requirements);

(iv) Elaboration of the preliminary planning preferences with regard to long-term development (alternative cross-sectorial scenarios, the optimum strategy, etc.).

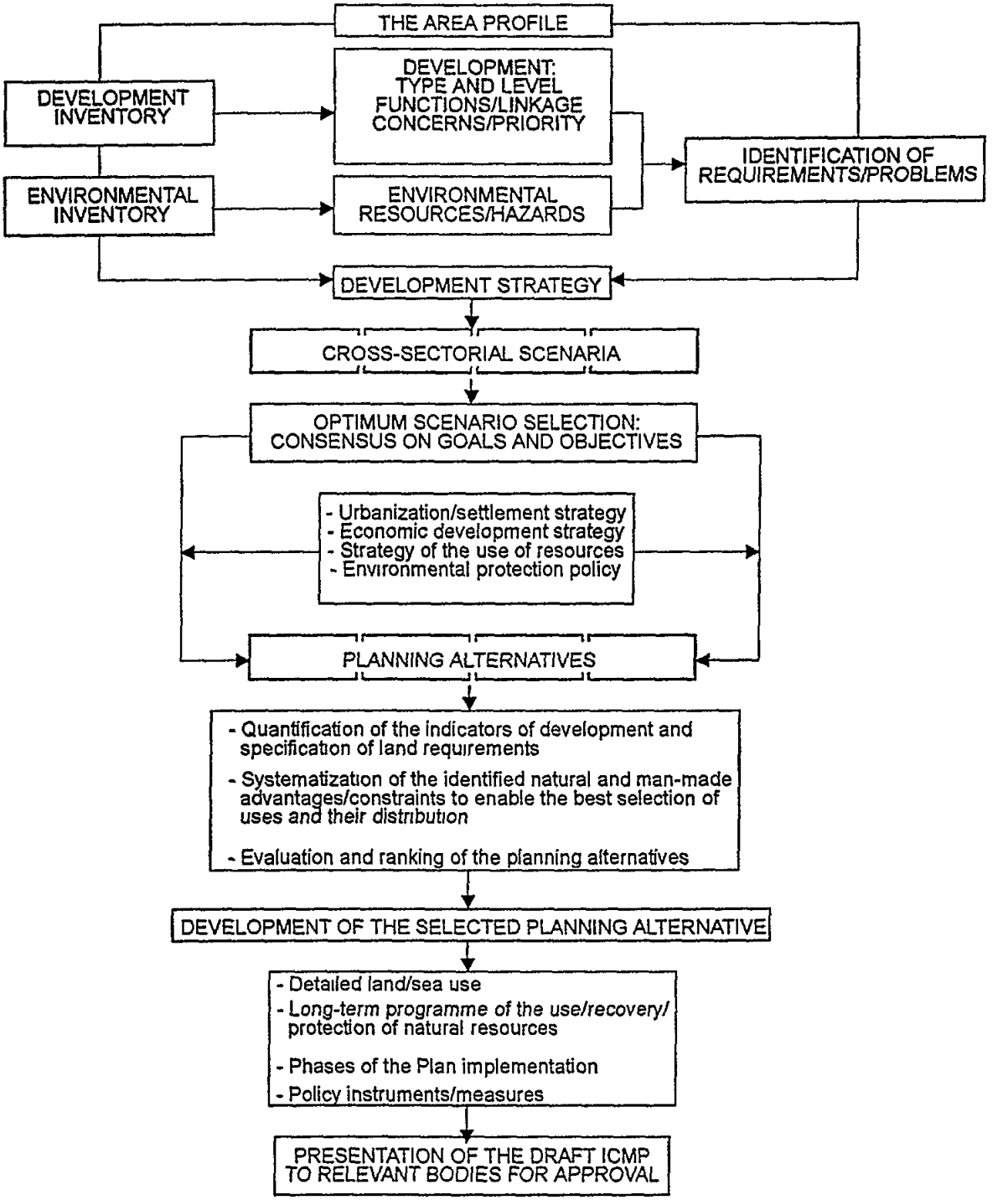


Figure 18.1: *Methodological procedure for ICMP preparation*

18.3.2 Preparation of the plan

The preparation of the plan may be divided into four steps:

(i) *Quantification of the indicators of development and specification of land requirements;*

(ii) Systematization of the identified natural and man-made opportunities and constraints to enable the best selection of uses and their distribution;

A simplified scheme of the methodological procedure for ICMP preparation is shown in Figure 18.1.

18.4. Organization of work

Since the preparation of ICMP is a complex task, it is necessary to establish multidisciplinary working team of the following functional structure:

- **The Steering Committee** is a body composed of outstanding national and international professionals specialised in various fields, and representatives of the Integrated Coastal Management Committee (see Chapter 17.2) which is to be the major decision making body for the Izmir coastal area. The Steering Committee meets from time to time, i.e. after the completion of each key phase. It will be responsible for:
  - overall methodological coordination of the ICMP preparation; and
  - appraisal and revision of outputs of each phase and those of each thematic entity.
- **The Synthesis Team** is entrusted with the coordination of work in all the phases, including harmonization of various different (sectorial) objectives, views and decisions, evaluation and ranking of development strategies and planning alternatives, as well as selection of the final planning concept. This team should include representatives of the MMI Planning Department, local universities and representatives of other institutions (IZSU, etc.) who have relevant experience and knowledge. They are, at the same time, leaders of the preparation of various thematic entities of the plan.
- **Coordinator of the ICMP preparation** is one of the experts of the Synthesis Team. He/she will, among others, be entrusted with organization and coordination of work of the entire working team.
- **The Working Groups** are entrusted with the tasks of information gathering, study and planning. The groups should be mostly composed of representatives of the MMI Planning Department. This implies the extension of the Department's planning team to include a wide range of specialists (sociologist, economist, environmentalist, marine scientist, computer analyst, civil engineer, geographer, demographer, etc.) and thereby ensure a multidisciplinary approach.
- **A separate group of experts** is recommended for data automation and managing of GIS database to be developed in parallel with the ICAM preparation.

19. The Need for a Comprehensive Information System to Support ICAM

The existence of the comprehensive information and monitoring system is prerogative for the ICAM process. However, in the case of MMI, this is one of the weakest points which require much future attention. Most of the problems in this regard lie in the present system of data collection, storage and dissemination. Some of the problems are listed below.

19.1. Information gaps and problems

19.1.1. In overviewing the information capable to meet the needs for effective planning and management of the Izmir Bay area it has been recognized that a considerable amount of data they require is being collected by local planning and other departments and institutions, as well as by regional and central government bodies. However, because much of these data is in a form which cannot be adequately correlated or is not accessible, there are information gaps which might produce either incomplete analysis of the problems or duplicating special surveys which are usually expensive. Therefore, there is a need for coordination of data collection, recording and supply at local authority level. Equally, there is a need (wherever possible) for data acquired by government agencies, universities and public boards to be made available to local authorities in a usable form.

19.1.2. In pursuing their individual methods of acquiring and holding information, data-collection institutions tend to think only of their own particular needs. This, whilst being understandable, is hardly acceptable, since the ICAM planning requires an interwoven fabric of information to satisfy its needs and objectives for reducing uncertainty in the knowledge and understanding of the environment.

19.1.3. A considerable amount of data on the Izmir Bay area have been at the level of administrative units (province, district, or census tract). Because of frequent boundary changes, it is difficult to establish stable and uniform time-series. Furthermore, the areas (zones) which explain social, economic and physical (environmental) pattern, are rarely the same as those found in statistical sources, and zones frequently overlap. There is, thus, a need for creating a basic unit of planning which can allow for aggregation to form larger units.

19.2. Recent Initiatives - PAP/RAC training programme on Geographical Information System

19.2.1. One of the most recent and widely used data management tools is the computer based Geographic Information System (GIS), which consists of a number of application modules. An overview of possible application modules to be supported by GIS is given in Annex III. PAP/RAC has carried out the training programme on GIS for local experts within CAMP "The Bay of Izmir". As already noted, the training of local GIS team in Izmir was performed on PC level with the software support of pcARC/INFO.

19.2.2. The GIS training programme provided an introduction to many related and complex subjects which feed into GIS.[31] Another benefit of the GIS training programme is the establishment of a GIS database supplementing the course topics on various aspects of GIS and the modelling capabilities of pcARC/INFO. However, although designed to support training activities, the established GIS database still comprises a large volume of spatially oriented data and associated attributes that cover environmental and resource characteristics of the MMI area at the scale 1:50,000. The GIS database could be considered as a core of the information system for macro level GIS applications in supporting planning activities within the context of ICAM. To this end, the following should be done:

- coverages and associated attribute files that currently exist in the GIS database must be updated;

[31] For more details see: PAP (1992). Training Programme on Geographical Information System - Final report. Split: PAP/RAC.

- the existing GIS database should be extended, both in terms of its content and area it currently covers; and
- an Information Steering Group (or Information and Monitoring Sub-Committee as a part of the overall ICAM institutional structure) should be set up, comprising members of the local Universities, the MMI Planning Department and other institutions interested in and responsible for planning and environmental management (IZSU, SDI, etc.). The team will concentrate on outlining the structure and preparing the guidelines for data collection and processing needed to support the preparation of Integrated Coastal Master Plan, as well as the permanent environmental quality monitoring of the MMI area and the Izmir Metropolitan Region.

PART THREE

CONCLUSIONS AND RECOMMENDATIONS

Chapter VII

CONCLUSIONS AND RECOMMENDATIONS

20. Major Findings and Policy Recommendations

This section summarizes and presents the major findings of IMS.

20.1. Being an "umbrella" document integrating results of the majority of activities undertaken within the framework of CAMP "The Bay of Izmir", the Integrated Management Study indicates that serious environmental and developmental problems can be expected in the Izmir Bay area unless measures are taken to alter the course of ongoing processes and secure sustainable development.

20.2. In the first, analytical part of the study, various aspects of hitherto development of the Izmir area are studied on the basis of existing data. A special attention is paid to the analysis of environmental impacts of development. The following is concluded:

(a) In spite of their efforts, the local authorities seems to have failed to channel the urban growth which is increasingly devouring the space of MMI and affecting almost all spheres of economic life, bringing about conflicts between different users and making the gap between the development and the environment ever larger.

(b) The city of Izmir has been burdened by such a structure of development which largely affects the quality of its environment (polluting industries, transportation, etc.). This, together with the lack of appropriate and well coordinated control over the use of natural resources and pollution, resulted in environmental degradation, resource depletion and pollution-related damages.

(c) Every single component of the environment is endangered, while the pollution of some, especially the aquatorium of the Izmir Bay, has already exceeded the critical point. The development of Izmir has reached a level at which direct benefits of urbanization and economic growth become overwhelmed by the costs of environmental degradation.

20.3. A number of uncertainties concerning both the land use and the coastal area management implications have been identified in the study. The most important of them are:

(a) initiatives to minimize the urban sprawl (illegal housing) into ecologically sensitive areas;

(b) environmental impacts of the proposed wastewater disposal on the water quality of the Bay;

(c) rate of recovery of the Inner Bay, including the residual side-effects of heavy concentration of pollutants accumulated over time in sediment of the Inner Bay; and

(d) effects of urban discharge and agricultural run-offs entering the Bay.

These uncertainties, as well as other problems observed, raise the need for permanent monitoring, research and assessment of the state of environment in the Izmir Bay aiming to change the course of development.

20.4. Many problems relative to environmental degradation and pollution of the Izmir seem to result from institutional drawbacks, such as: insufficient cross-sectorial (horizontal) and institutional (vertical) coordination and integration of activities at various institutional levels; diverging policy objectives pursued by various authorities; lack of sufficient funds for environmental purposes including the consistent ecological monitoring; and absence of an adequate system of integrated planning and management. Here, like in other coastal areas experiencing the similar rate of development there is no well coordinated mechanisms of decision making, and no single authority entrusted with the environmental management of the area.

20.5. In its prospective part, the Study offers an outline of a possible urban growth of the MMI area bringing into focus its implications on the state of environment. Two options of the future urban growth have been discussed: one, based on the persistence of the existing trends, and the other based on the moderate urban growth anticipating the probability for some development policy measures to be implemented to slow down and reverse the hitherto course of regional development. According to the first, "trend" option, further concentrations should be expected in the coastal sections of MMI, as well as deterioration of the quality of life due to increased pollution load. A special problem, however, is the urban growth which tends to consume the remaining land resources. It was found that the available land to support further urban growth in the MMI area is very limited and that the persistence of the existing growth trends would ultimately lead to massive resource depletion.

20.6. The findings of the study confirmed that the existing trends of growth and development in the Izmir area must be urgently and radically changed. There must primarily be a change in setting the basic goals, strategies and policies of the future long-term development. What is actually needed is to establish a balance between the socio-economic development and the use of limited natural resources, a problem which must be accorded highest priority by the planners and decision makers of the MMI.

20.7. Here, as in other coastal regions experiencing a similar rate of development, an advanced *management structure is needed to support sustainable development***.** Thus, and in parallel with the changed strategy of development of the Izmir Bay area, the study stresses the need for an integrated management system usually referred to as Integrated Coastal and Marine Area Management (ICAM) to be adopted.

20.8. In addition to securing well coordinated and workable institutional arrangements, the preparation of the Integrated Coastal Master Plan (ICMP) for the area of Izmir is a logical step towards the implementation of the ICAM process. The ICMP should provide a new, operational planning and management basis. In other words, the ICMP is expected to determine (through research and analysis of development alternatives) the optimal long-term strategy and structural model of sustainable development of the area, and to recommend a concept of long-term measures of protection and enhancement of the environment.

21. Recommended Measures

The measures, listed below are divided in two groups:

(I) ***Urgent measures*** which should be implemented immediately after the adoption of the Study by the MMI and other regional and national authorities. The aim of these measures is to stop or, at least, to slow down the processes which are the most harmful to the environment in the area concerned.

(II) ***Middle-term measures*** to be carried out in the interim 5 year period. The majority of these measures should result in a number of outputs to be used in the Integrated Coastal Master Plan for the Izmir area.

21.1. Urgent measures

- A comprehensive programme should be adopted of modernization, technological transformation and/or re-location of polluting industries in less conflicting industrial zones at the outskirts of the MMI area. The programme should also contain a proposal for gradual closing down of those units which are not able to comply to anti-pollution measures or to bear costs of environmental recovery of the area. (see Chapter VI, section 16.1).
- A policy should be adopted immediately aimed to prevent further concentration of industries using large amount of water in their technological process, as well as stimulate the existing ones to be displaced form the Bornova plain. (Chapter VI, section 16.4).
- A consistent public control over the use and transaction of land should be implemented in parallel with the provision of serviced land for low-income population at the locations outside the MMI area. (Chapter VI, section 16.7).
- The urban growth along the development axes in the bordering areas of Izmir (the Izmir-Aliaga; the Izmir-Bornova-Kemalpasa; the Izmir-Cumovasi-Torbali; the Izmir-Urla-Seferihisar and Cesme axis) should be controlled through a better cooperation and coordination between various authorities involved in planning and management of these areas. (Chapter VI, section 16.1).
- The environment around the Tahtali Dam and its catchment areas must be protected immediately and the effective control over the use of groundwater sources should be established in order to prevent their excessive pumping. (Chapter VI, section 16.4).
- The existing Industrial Discharge Control Programme should be enlarged and improved in parallel with the introduction of enforcement measures aimed at stopping illegal wastewater discharges which endanger the surface water and aquifers. Control over the industrial sludge must be the responsibility of the Industrial Control Group in IZSU. (Chapter VI, section 16.4).
- Expansion of farming over ecologically fragile and erodable areas, as well as further inappropriate vegetation clearance for construction should be prevented. This also includes the encouragement of afforestation in accordance with already developed programmes. (Chapter VI, sections 16.6 and 16.7).
- The use of fertilizers in agriculture should be monitored carefully in order to protect the groundwater sources, especially those at Menemen. (Chapter VI, sections 16.4 and 16.6).

- Programmes to create green belts and/or sanitary protection zones should start to be implemented wherever the available space so permits, primarily in the zones of the city where industry and housing meet, as well as along major transportation arteries. (Chapter VI, section 16.5).
- The remaining undeveloped and/or less densely developed coastal areas should be protected from inappropriate uses by directing building development deeper inland in order to ensure an undisturbed access to the coastline and improve the visual and recreational quality of the coastal belt. (Chapter VI, section 16.7).
- The expansion of salt works towards the Homa Dalyan area should be stopped. (Chapter VI, section 16.7).
- An Environmental Impact Assessment (EIA) of the proposed discharge of treated wastewater through the old bed of the Gediz River should be prepared. (Chapter VI, section 16.3).
- Alternative locations for port facilities within the area of Izmir Metropolitan Region should be examined and final decision on the port location should be made before the Master Plan is started. (Chapter VI, section 16.1).
- A programme concerning collection of data on the type, location and emission characteristics of the major stationary sources of air pollution within the wider area of the city (cadastre of emissions) should be prepared, as a prerogative of a recovery plan by which the heavy polluters will be forced to make technical and technological improvements. It is necessary to extend the network of measuring stations and set up a comprehensive monitoring programme. (Chapter VI, section 16.5).
- The existing day-to-day monitoring programme of the Bay aquatorium should be improved and validated for chemical parameters which are direct indicators of pollution of the sea water. Water quality control provisions must be also incorporated in the programme. (Chapter VI, section 16.3).
- A more efficient cooperation and coordination among the responsible national and regional institutions, as well as universities and institutes involved in research and monitoring of the state of environment should be set up in order to prepare and implement programmes aimed to: (i) complete the knowledge and facilitate the exchange of information, and (ii) standardize the quality of environment at the local level and upgrade the anti-pollution regulatory instruments. (Chapter VI, section 16.2).
- Municipal departments, especially Environmental Health Directorate and Planning Department of the Planning, Construction and Implementation Division of the MMI, as well as other institutions (Industrial Control Group in IZSU) responsible for urban planning and pollution control in the area should be strengthened both in terms of structure and expertise, as well as in terms of financial resources. (Chapter VI, section 16.2).
- A study of institutional arrangements to support integrated management of the Izmir area should be prepared urgently. Taking into account the legal and institutional conditions prevailing in Turkey, the study should examine: (i) the best possible solutions for the establishment of a single authority (Integrated Coastal Management Committee) entrusted with the environmental management of the Izmir area; and (ii) how the existing regional and local institutions, agencies and departments should be utilized and re-organized to provide adequate professional support in operationalization of the integrated management system. (Chapter VII, section 17.2).

- A study on the application of economic instruments for environmental management should be prepared. (Chapter IV, section 17.2).
- The activities related to the establishment of the GIS database to support the Master Plan preparation should be continued. A GIS Steering Group (or Information and Monitoring Sub-Committee) composed of the members of local universities, planning departments and other institutions dealing with planning and environmental management should be set up in order to devise a programme for coordinating the building of the geoinformation system (GIS). (Chapter VI, section 19).

21.2. Middle-term measures

The following actions are recommended to be taken in the subsequent 5-year period.

A. Monitoring and completion of environmental knowledge

- An efficient system of pollution control and monitoring of the quality of environment should be built up imposing responsibilities for the enforcement of adopted environmental standards on all those activities which are generating pollution. (Chapter VI, section 16.2).
- A long-term cooperative programme of research and systematic collection of data concerning all relevant marine parameters should be launched. These data will be used for studying the process of recovery of the Inner Bay and for predicting the effects of global climate changes on the coastal and marine environment. (Chapter VI, section 16.3).

B. *Legal and administrative measures*

- The quality of human environment should be standardized at the local level and the regulations (Ambient Environmental Quality Standards, Effluent and Emission Standards, Technology Based Standards etc.) should be upgraded. (Chapter VI, section 16.2).
- A legal basis should be set up at the national level for the preparation of EIA studies for each project and activity which is assessed as being a potential source of pollution or harmful for the environment. (Chapter VI, section 16.2).
- National legal frameworks should be examined with a view to change the present allocation of funds collected from pollution charges in Izmir. (Chapter IV, section 12.3).
- An organizational framework should be set up to enable the building at the local level of an accurate database on land and property market conditions and urban growth. This database is needed to define appropriate strategies for the improvement of land market performance. (Chapter VI, section 16.7).
- An efficient mechanism for taxing land value gains resulting from public investments in infrastructure, land registration and titling should be developed at the MMI level. The collected taxes should be kept for the acquisition of land needed for urban development. (Chapter VI, section 16.7).
- A system of pricing of communal services should be set up at the MMI level in order to rationalize the use of natural resources and secure funds for the implementation of important infrastructure projects. (Chapter VI, section 16.7).

- A legal basis for establishing Specially Protected Areas (SPA), in accordance with the proposal to be prepared by Regional Activity Centre for Specially Protected Areas of MAP, should be provided at national level. (Chapter VI, section 16.8).

C. Institutional Arrangements

- Well coordinated and workable institutional arrangements should be set up to support the implementation of ICAM process. The first and the most important step towards this end is the establishment of an Integrated Coastal Management Committee as the main decision-making body responsible for the development of the Izmir area. A statutory legal basis should be provided to the Committee by the relevant legislative body (Turkish Government has accepted in principle the idea of setting up Coastal Management Units responsible for the implementation of ICAM process). The Committee must be established before the preparation of the Integrated Master Plan is started. (Chapter VII, sections 17.1 and 17.2).

D. Planning actions

The planning actions recommended below should be undertaken before the work on the preparation of the Integrated Coastal Master Plan starts:

- A comprehensive study of the protection of water sources and of possible long-term changes of their quality, covering the area of MMI and its immediate vicinity should be prepared as a basis for defining various land-use planning and/or zoning requirements. (Chapter VI, section 16.4).
- EIAs should be prepared for one or two alternative locations of the submarine outfall in the Middle and/or Outer Bay. (Chapter VI, section 16.3).
- Development/environment scenarios should be prepared at the regional level taking into account scenarios which were made at the Mediterranean level by the Blue Plan Regional Activity Centre of MAP. (Chapter VI, section 18).
- A study should be undertaken to examine the possibilities for a gradual substitution of the sources of energy currently in use. (Chapter II, section 9).
- A hazard assessment and risk management study should be prepared for major industrial and energy installations and the transportation system of the Izmir area.
- A study of the quality of agricultural land in the wider area of MMI should be prepared. It should include all relevant factors (accessibility, homogeneity, structure, soil class, erodibility class etc.) determining the quality of agricultural land for each particular type of crops. (Chapter VI, section 16.8).
- A study should be prepared aiming at identifying the sites and buildings of historic and architectural value with special reference to the conservation and revitalization of the old urban core. (Chapter VI, section 16.7).
- A study should be prepared of possible implications of the expected climate change on the Izmir Bay area. (Chapter VI, section 16.9).
- Seismic and seismo-tectonic macro- and micro-zoning of the entire MMI area should be made. This will provide a basis for various planning and management measures to be taken to mitigate (if not eliminate) earthquake hazards. (Chapter VI, section 16.9).

E. Integrated Coastal Master Plan (ICMP)

- The Integrated Coastal Master Plan for the Izmir area should be prepared over the next 3-5 years period. The objectives of ICMP are to create conditions for operational decisions to be made in the course of the ICAM process. This includes: (i) detailed elaboration of the most appropriate and selected cross-sectorial management strategy of the area; (ii) definition of physical requirements that the implementation of that strategy may generate; (iii) preparation of the plan of actions by which that strategy could be implemented; (iv) detailed site-specific land and sea-use proposal; and (v) policy measures and instruments to be used in the plan implementation. (Chapter VI, section 18).
- The ICMP should be preceded by preliminary actions leading to the definition of relevant terms of references for its preparation. These actions should start immediately after the approval of this Study and will include: (i) definition of an overall methodological and organizational framework accordant with the ICAM approach; and (ii) setting up the boundaries and time horizon of the Plan.

ANNEXES

Annex I

LIST OF DOCUMENTS PREPARED WITHIN THE FRAMEWORK OF CAMP "THE BAY OF IZMIR"-TURKEY

A. Documents prepared in the first phase of the Integrated Management Study for the area of Izmir:

Arkon, C. (1992). The limits of future development of Metropolitan Municipality of Izmir. Split: PAP/RAC.

Arkon, C., and A. R. Gulerman (1991). A review of planning studies in Metropolitan Municipality of Izmir. Split: PAP/RAC.

Balkas, T., and N. Yetis (1992). The environmental profile of the Izmir area. Split: PAP/RAC.

Juhasz, F. (1991). Institutional aspects and the decision making process for environmental management. Split: PAP/RAC.

Juhasz, F. (1993). Institutional arrangements for Integrated Coastal and Marine Area Management in the Izmir area. Split: PAP/RAC.

Scicluna, E. (1992). Economic aspects for environmental management. Split: PAP/RAC.

Talu, N., and H. Yildirim (1992). Coast-hinterland interrelations in the area of Izmir. Split: PAP/RAC.

Veldi}, V. (1992). Study of the population potential of the Metropolitan Municipality of Izmir. Split: PAP/RAC.

Veldi}, V. (1992). Study of the existing and expected land use in the Metropolitan Municipality of Izmir. Split: PAP/RAC.

B. Documents prepared within other activities of PAP and other organizations which are relevant for the Study

Balkas, T., and S. Tuncer (1990). Natural characteristics of the Izmir Bay and the impact of wastewater. Split: PAP/RAC.

Balkas, T., and F. Juhasz (1991). Preliminary study on the costs and benefits of measures for the reduction of degradation of the environment from land-based sources of pollution and activities in coastal areas of the Bay of Izmir. Athens: UNEP.

Gultay, N., and I. Tutum (1988). On-site report on the area of Izmir. Split: PAP/RAC.

Margeta, J., M. Ga~i}, and P. Nival (1989). Fact-finding mission to assess the state of pollution of the Izmir Bay. Split: PAP/RAC.

Pano, A., M. Libhaber, and U. Marinov (1989). Environmental Impact Assessment of the Izmir sewerage treatment project. Split: PAP/RAC.

PAP (1992). Training programme on Geographical Information System - Final report. Split: PAP/RAC.

Trumbi}, I. (1989). Integrated planning study for the area of Izmir - Workplan. Split: PAP/RAC.

Tutum, I. (1988). Proposal relative to the organization of a preliminary study of the integrated plan of the Izmir area. Split: PAP/RAC.

Annex II

A MODEL OF INSTITUTIONAL ARRANGEMENTS FOR ICAM

As the use of natural resources is basically an institutional problem the establishment of the related well coordinated arrangements stands as one of the crucial prerequisites for a successful implementation of the ICAM process. An attempt is made below to propose a model of institutional arrangements that could be set to support coordination and implementation of ICAM at the level of Izmir Metropolitan Region (designated management area). The proposed model implies that no new bodies should be created and that the existing ones be used to form the following Committee and Sub-Committees:

(i) Integrated Coastal Management Committee;
(ii) Information and Monitoring Sub-Committee;
(iii) Analysis, Forecasting and Evaluation Sub-Committee;
(iv) Planning Sub-Committee;
(v) Implementation Sub-Committee.

Integrated Coastal Management Committee

This is to be the main decision making body for the Izmir Metropolitan Region being responsible for the development of the region in harmony with economic, social and environmental aspirations of its inhabitants. Its responsibilities would include coordination of the development of the region, approval of major decisions reached by the various sub-committees, and development and implementation of the Regional and Integrated Coastal Master Plans for the area concerned.

The membership of the Committee would consist of the Governors of the Provinces involved, the Mayor of the MMI, the mayors of the main district municipalities, and the chairmen of the four sub-committees.

A statutory legal basis could be provided to the Committee by an Act of Parliament. The Turkish Government has accepted in principle the idea of Coastal Management Units as the main bodies responsible for the management of major coastal regions. Accordingly, this Committee could be the first body formed for such a purpose. Alternatively, the Committee could operate as an informal regional body which may, however, create difficulties in reaching and enforcing decisions.

The Committee should have a small permanent secretariat which should ensure that proper notification procedures set out under the proposed institutional structure are carried out (e.g. notification of all major development projects to all participants) and to ensure that meetings are duly prepared and held with appropriate participation.

Information and Monitoring Sub-Committee

This Sub-Committee would be responsible for data collection, and for devising a policy and programme for coordinating development of a comprehensive information system needed for ICAM (see Annex III.).

Analysis, Forecasting and Evaluation Sub-Committee

The data collected by the Information and Monitoring Sub-Committee have to be analysed for a full understanding of relationships between various activities and their impacts on natural resources and the environment (the cause-effects relationships). The results of these analyses can then be employed to project the future socio-economic development and its impacts on resources and the environment. These results can then be fed back to the Committee for ICAM for setting goals and strategies. This is an iterative process to take place until generally acceptable goals are found.
At an early stage three Groups can be established under this Sub-Committee: Current Activities/Impacts Group, Forecasts/Impacts Group and Projects/Impacts Group. The work of the Groups would provide the basic input both on the sectorial level (e.g. using an energy scenario and its implications for the environment) and on the project level (e.g. the consequences of a major coal-fired power plant for the surrounding settlements, tourism development etc.). Evidently, there has to be a close cooperation between the three Groups.

Planning Sub-Committee

The Planning Sub-Committee would be responsible for devising a policy and coordinating the preparation of various plans within the area under concern. In the case of Izmir Metropolitan Region two types of planning procedures are expected to be followed: one for regional planning, and the other for detailed plans, including Integrated Coastal Master Plan for the MMI and others for the municipalities outside of the MMI.

The Regional Plan would be of crucial importance for the region and it would have to be prepared in line with national economic plans adjusted to accommodate sustainable development objectives. It has to contain certain basic parameters such as population growth projections with regard to the ability of the region to provide infrastructure (water supply, waste water collection and treatment, energy supply etc.). These projections need to be supported by budgetary planning. In addition, certain activities have to be assigned to specific areas. For example, areas assigned for tourism development should be protected from both air and water pollution and consequently no industrial or energy plants should be planned in their vicinity without strict pollution control. Although in a large scale, the regional land use plan for the Izmir Metropolitan Region should be backed by statutory enforcement and will need consensus of all the major development agencies, as well as of the MMI and the district municipalities.

Integrated Master Plans for the MMI and other district municipalities have to be prepared on a more detailed basis appropriate for urban planning, taking into account provisions of the Regional Plan, the environmental and conservation objectives, free public access to the shores of the Bay, etc. During the master plans preparation the results obtained from the Analysis, Forecasting and Evaluation Sub-Committee should be taken into account.

Implementation Sub-Committee

This Sub-Committee would have two specific goals. One is to ensure necessary prerequisites for the implementation of the Regional Plan and municipal master plans. The other is to supervise the implementation of plans and report back to the Coastal Management Committee. For these purposes three working groups are proposed: Legal Group, Financing Group and Infrastructure Group.

The task of the Legal Group would be to ensure that the contradiction between various laws and regulations, passed over a considerable length of time are clarified, responsibilities in terms of land and water areas defined, and titles to land made clear.

The task of the Finance Group would be to prepare programmes for the financing of the plans preparation and implementation. This would require a great deal of coordinated effort between various Ministries, the MMI and municipalities of the Izmir Metropolitan Region.

The Infrastructure Group should have the task of overseeing the provision of the necessary infrastructure in line with the population and industrial growth.

Annex III

AN OVERVIEW OF POSSIBLE APPLICATION MODULES TO BE SUPPORTED BY GEOGRAPHIC INFORMATION SYSTEM

Geoinformation system to support ICAM process in the Izmir area can be viewed as the system of various application modules, each of them represents a collection of closely linked tasks and functions which are now or will be carried out by one or more users involved in ICAM of Izmir Bay area. Tentative application modules and their functions which are expected to be of particular interest in supporting integrated management of the Izmir Bay area are briefly described below:

(a) ***Environmental Monitoring Module*** - must provide analytical, mapping and reporting capabilities related to environmental monitoring. The data used by the module should originate from monitoring programmes that are or will be established to control the Izmir Bay water pollution, air, soil and fresh water pollution, as well as other environmental impacts. The module capabilities should provide a basis to gain insight into environmental conditions and trends;

(b) ***Resource Inventory/Hazard Module -*** must provide capabilities for collecting information on natural resource base of the Izmir Metropolitan Region and analyzing the rate of transformation of these resources. This would include fresh water resources both in terms of their quantity and quality, marine resources and their quality, rate of reclamation in the Bay area, forest resources, wetlands and natural habitats, wildlife, cultural and archaeological resources;

(c) ***Land Use/Environmental Planning Module -*** must provide capabilities for manipulating and "modelling" geographic relationships between land use and environmental features;

(d) ***Land Development Module -*** must provide a set of capabilities for managing the land development process;

(e) ***Land Regulation Module -*** must supply procedures for processing of zone changes and other land use regulation cases through the city and region. The module will be closely associated with the Land Development Module;

(f) ***Building Permits and Inspection Module -*** must provide capabilities for handling for applications building permits and supporting building inspections;

(g) ***Economic Development Module -*** must include a set of capabilities for collecting data and analyzing development trends;

(h) ***Transportation Analysis and Planning Module -*** must provide capability for analysis and display of road, area and land use information to support transportation planning. This module must have capabilities for analyzing and display of optimum routes for operations such as solid waste collection, public transportation etc.;

(i) ***Network Facilities Planning Module -*** must provide procedures for analyzing networks (other than roads) and planning for system expansion. This module would be used for planning of network facilities such as water supply, sewer, electrical system etc. ;

(j) ***Facilities Siting Module -*** must provide capabilities which allow identification of optimum locations for facilities, based upon a set of siting criteria;

(k) ***Basemap Maintenance Module -*** must provide a set of software procedures for automation and maintenance of all the basemap data for the proposed ICAM area. This would include updating and maintenance geodetic control points, topographic features etc.;

(l) ***Area Mapping and Reporting Module -*** must provide capabilities to update and maintain the area boundaries and area attributes; to analyze and display (maps and reports) of area data; to aggregate smaller units for area anaysis.

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