



**UNITED NATIONS ENVIRONMENT PROGRAMME
MEDITERRANEAN ACTION PLAN**



MED POL



WORLD HEALTH ORGANIZATION

**MUNICIPAL WASTEWATER TREATMENT PLANTS IN
MEDITERRANEAN COASTAL CITIES**

**LES STATIONS D'EPURATION DES EAUX USEES MUNICIPALES
DANS LES VILLES COTIERES DE LA MEDITERRANEE**

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Responsibility for the preparation of this document was entrusted to WHO (Dr. G. Kamizoulis). Data provided by National MED POL Coordinators have also been included in this report.

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PREFACE

Throughout the centuries and long before the start of the industrial revolution, men have been using the sea as the most convenient place for the disposal of wastes resulting from human activities. The sea's self-purification ability has been largely abused. Dumping of domestic, industrial, and radioactive wastes, as well as the run-off from agricultural products have not only created considerable hazards to human health but have also endangered the marine environment.

The global concern about the importance of the marine environment dates back to 1972 when, in Stockholm, the United Nations Conference on Human Environment underlined the growing importance of marine pollution. During the same year in London, the Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matters was adopted. This Convention entered into force in 1975.

The major problems linked to the uncontrolled disposal of wastes in the marine environment were found to be:

- a) Dispersion of pathogen organisms capable of endangering human health;
- b) toxic effects on aquatic life - including human life - caused by the various chemical substances reaching the marine environment;
- c) deterioration of the quality of seawater - eutrophication - resulting from the widespread dispersion of nutrients and other organic and inorganic matters.

The above-mentioned problems do not affect the area of activities of one single international organization or of one single country. Instead, they have an impact at global level, therefore several institutions of international character such as UNEP, WHO, IMO, OECD and others, developed programmes aimed at finding solutions to their respective priority problems.

At the level of the European Region, since the late 70's, studies and reports prepared by scientists and researchers from different European countries indicated that the quality of the marine environment of the Mediterranean Sea was deteriorating. The studies clearly demonstrated the urgency for introducing remedial measures to stop the pollution of the Mediterranean Sea.

The causes for this reduction in the quality of the marine environment are numerous and most of them are interconnected, resulting in a very complex pollution situation.

One of the important causes of marine pollution is the high rate of population growth that the coastal zones of the Mediterranean Basin have experienced since the 1960's and 1970's. This widespread population growth has been accompanied by an increase in the standard of living leading to an equal increase in industrial development to satisfy the needs of the population.

As a consequence of urban and rural development in areas of extraordinary geographical beauty, the tourist population visiting those places has not ceased to grow. This increase in population has had a profound impact on the quantity and quality of wastes produced. Quite often during the tourist season, municipal services in charge of the safe disposal of solid and liquid wastes are totally unable to cope with the additional waste-load that invariably reaches the coastal waters.

However, in spite of the importance of pollution loads originating directly from human agglomerations in coastal areas, they appeared to be of minor importance when compared to other forms of pollution originating inland and discharged into the sea by various means. Discharges from “inland” municipal, industrial and agricultural districts, which are only partially treated or even in untreated form, are still reaching the sea through the hydro-graphic river network of the Mediterranean Basin.

Municipal wastewater is discharged directly into the immediate coastal zone, either untreated or subjected to various treatment procedures, through outfall structures of variable length, or reaches the sea by seepage as a result of leaks in sewerage systems or other causes. Municipal sewage carries increased loads of nutrients such as nitrogen and phosphorus, and a heavy load of micro-organisms, including bacterial and viral pathogens. In cities and large cities, it usually contains a variety of chemical wastes both from households and from industries discharging directly into the public sewerage system.

PART I

1. ABOUT THE STUDY

1.1 Historical Background of the Study

This deterioration of the marine environment drew the attention of the Governments of the Mediterranean Region and following a series of scientific meetings and intergovernmental discussions, a comprehensive programme named ***The Mediterranean Action Plan*** was drafted. An Inter-Governmental Meeting on the Protection of the Mediterranean Sea, convened by the United Nations Environment Programme (UNEP) in Barcelona, Spain (1975) ratified and approved the above-mentioned Programme, most currently known as MAP.

A year later, at a conference convened by UNEP in Barcelona, representatives of Mediterranean countries adopted the legal support needed for the implementation of the MAP Programme. More specifically, in February 1976 the Barcelona Conference adopted and signed a landmark document that became known as ***The Barcelona Convention***. This is an international agreement reached between Mediterranean Countries for the protection of the Mediterranean Sea against pollution.

In addition to the “Barcelona Convention”, the Conference adopted and signed two supplementary Protocols. One concerned the preventive measures required for protecting the Mediterranean Sea against the dumping of polluting matters from ships and aircraft and the second protocol referred to the establishment of international cooperation to reduce pollution resulting from accidental spills of oil and other harmful substances. Both protocols were adopted and signed simultaneously with the Barcelona Convention, and entered into force in February 1978.

The legal framework of the MAP Programme has been enlarged and modified several times since the adoption of the Barcelona Convention. Amongst the most important legal instruments developed and approved, mention has to be made of three additional protocols:

- i. The Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-based Sources. This Protocol was adopted and signed in Athens in May 1980 and entered into force in June 1983. The amended Protocol was adopted and signed in Syracuse in 1996;

- ii. the Protocol concerning the protection of special Mediterranean Priority Areas. This protocol was adopted and signed at Geneva in April 1982 and entered into force in March 1986;
- iii. the Protocol for the protection of the Mediterranean Sea from pollution resulting from exploration and exploitation of the continental shelf, the seabed and its subsoil, adopted and signed in Madrid but not yet in force.

A subject of major concern has been the preparation of appropriate legal instruments to deal with land-based sources of pollution. According to estimations made, land-based sources of pollution constitute more than 80% of the total pollution load of the Mediterranean Sea.

The ***Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources*** classified polluting substances dividing them into two main categories; a “black list” for substances that eventually have to be eliminated and a “grey list” for those substances, pollution by which has to be restricted.

In the 1995 Barcelona Resolution the Contracting Parties affirmed their determination to use MAP as a tool for sustainable development. To this end the Barcelona Convention was revised and MAP was reformulated with the title of MAP Phase II, while the Mediterranean Committee on Sustainable Development (MCSD) was established as a consultative body to the partners in sustainable development in the Mediterranean. MAP's component programme for pollution monitoring and research in the Mediterranean Sea (MED POL) then entered into its third phase for the period 1996 - 2005.

The present study is related to the agreement made in 1985, in Genoa, Italy, when the Contracting Parties to the Barcelona Convention reviewed the previous cooperation established, and adopted a new declaration named ***The Genoa Declaration***, to cover the second decade of the Mediterranean Action Plan. Ten targets to be achieved by the end of the decade were approved. Amongst the targets approved, one of the priorities was the establishment of sewage treatment plants in all cities around the Mediterranean Sea with more than 100,000 inhabitants and appropriate outfalls and/or appropriate treatment plants for all cities with more than 10,000 inhabitants.

At the level of the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities, the United Nations Environment Programme convened in Washington in 1995 an Intergovernmental Conference to adopt the above-mentioned Plan of Action. The Conference clearly defined the need for action at the various levels of interventions required. Thus, at national level, emphasis was placed on the introduction of strategies and measures to enable the appropriate management of priority problems. Recognizing the need for the participation of countries in regional and sub-regional arrangements, the Conference stressed the importance of ensuring at national level the resources and instruments required for the effective functioning of regional and sub-regional arrangements.

In what concerns the role and involvement of the World Health Organization, the Fiftieth World Health Assembly at Geneva, concerned about the potential risks to human health resulting from the deterioration of the Marine Environment endorsed the Washington Declaration. Therefore, Member States were urged to support the implementation of the Global Programme of Action in general, especially with regard to public health aspects. They were also urged to participate in the development of a clearinghouse for the implementation of the Global Programme of Action and, in particular, to support WHO's efforts to lead the development of the clearinghouse mechanism for information on sewage.

1.2 Scope and Purposes of the Study

The chain of events leading to the discharge of wastewater in the marine environment is very simple and it is constituted by three basic elements:

- a) Production of wastewater (domestic, industrial, agricultural, and others);
- b) a network of pipes or conduits, (sewerage system), to convey the wastewater to a place of treatment prior to final disposal, or directly to the disposal place when there is no treatment available;
- c) the outfall system to discharge the wastewater into the marine environment.

The study presented in this document concerns the functioning of wastewater treatment plants. It refers to point "b" above and finds its justification from several studies made on the subject at different times and by different institutions. For example, the situation in the European Region concerning wastewater disposal as found at the end of the United Nations Programme on the International Water and Sanitation Decade, (1980-1990), drew the attention of all Member States of the region to this problem and demanded the implementation of remedial measures.

WHO/EURO published the data gathered during the decade. Regarding the collection of wastewater, the figures of the evaluation made at the end of the decade showed that a large proportion of houses in urban agglomerations were still not connected to a sewerage network. The problems in those areas were caused by slum districts in the urban fringes where there was a lack of appropriate technology for the safe disposal of domestic wastes. In the rural areas, scattered villages and isolated dwellings were usually served by individual systems not always constructed according to hygienic standards.

Regarding wastewater treatment and disposal, for the International Water and Sanitation Decade, the percentage of wastewater undergoing appropriate treatment was considered to be insufficient. The analysis made showed the following situation:

- a) A relatively large number of urban agglomerations did not have adequate wastewater treatment facilities. This problem was of particular concern to the Mediterranean coastal cities where the capacity of the existing services was found to be insufficient to cope with the extra charge of seasonally fluctuating populations;
- b) of the total volume of sewage produced, primary treatment represented 14% of the total. Secondary treatment represented 47%, and tertiary treatment was being applied to 18% of the treatment plants reported. The remaining 21% volume of wastewater was being discharged into the environment without treatment;
- c) of both treated and untreated sewage, 62% was being discharged mainly into inland fresh-water bodies: rivers, lakes, lagoons, etc., while 30% was being discharged directly into the marine environment. The remaining 8% were being discharged into land for irrigation purposes or for aquifers recharging;
- d) the disposal of sludge was found to be effected as follows: 14% into the sea, 3% into surface waters, 42% onto farmland, 31% used as landfill, and the remaining part was being incinerated.

Several years after the Barcelona Convention and at the end of the Water Decade, the MAP Programme considered it necessary to review the status of wastewater treatment in Mediterranean coastal cities of more than 10,000 persons. The Genoa Declaration established that sewage treatment plants were to be made available to all cities with more than 100,000 inhabitants and that appropriate outfalls and/or treatment plants for all cities with more than 10,000 inhabitants were also to be provided.

The scope or geographical extension of the study conducted includes all Mediterranean coastal countries. The purpose is the collection of data at country level in order to update and analyse information concerning the population served by wastewater treatment plants and the quality of the treatment provided.

The specific objectives of the Study are quoted below:

1. Update the list of coastal cities and cities of more than 10,000 persons in all the coastal countries of the Mediterranean Sea, bringing the information as close as possible to the present;
2. collect data in all Mediterranean coastal cities and cities of more than 10,000 persons concerning the existence of wastewater treatment plants;
3. collect data on the years of service of wastewater treatment plants;
4. collect data on the amount of wastewater treated per day and per plant;
5. collect data on the quality of wastewater treatment, (primary, secondary, tertiary, or other degree of treatment);
6. collect data concerning the volume of water discharged into the marine environment, treated or untreated, and on the places of discharge;
7. make a comprehensive analysis of the above-mentioned data at country and at regional level permitting an assessment of the present needs and the formulation of appropriate conclusions.

1.3 Methodology and Procedures of the Study

The planning, methodology and working procedures of the study were prepared within the framework of the MED POL Programme.

The collection of information at national level was left to the officially designated National MED POL Coordinator. In order to standardize the collection of data, special statistical forms were prepared together with relevant guidelines for the completion of the forms.

The National MED POL Coordinators were requested to gather the most recent information available from official sources only and to submit the information received to the Coordinating Unit. Base data resulting from previous activities (land-based sources of pollution and pollution hot spots) were used to form the basis on which information was exchanged. In addition, and due to difficulties encountered in some countries, external consultants were engaged. The draft document was presented to the Meeting of MED POL National Coordinators held in Reggio Calabria, 20-23 June 1999. This present document reflects the comments and additional information received subsequent to the above meeting.

2. MUNICIPAL WASTEWATER IN THE MEDITERRANEAN

2.1 Characteristics of Municipal Wastewater in the Mediterranean

Municipal wastewaters are waters originating in households, catering establishments, public health facilities, schools, commercial and other non-productive activities. Wastewaters from tourist resorts have the same characteristics as domestic wastewater. However, municipal wastewaters may contain industrial wastewaters as well, either with or without previous treatment.

In addition to the wastewaters mentioned, sewers also convey some groundwater and precipitation that infiltrate into sewers and, in the case of combined sewerage systems, part of the precipitation from surface runoff.

The volume of wastewater reaching the sewerage systems in particular communities depends upon many factors. For the Mediterranean region, water consumption of 150-250 l/cap per day (can be substantially less in some countries and cities) can be taken as a reasonable estimate. Of the total quantity that is conveyed to communities by means of water supply systems, 70-80% reaches the sewerage system, the rest evaporating or infiltrating into the soil. This does not include industrial wastewater, which, according to local circumstances, should also be taken into account. Nor does it include infiltration inflow into the sewer, which depends upon hydrological conditions in each community.

Daily and seasonal variations in wastewater flows depend upon both the climatic conditions and the size of community. In coastal communities of the Mediterranean, seasonal variations can be particularly pronounced due to tourist activity.

The composition of municipal wastewater depends upon many factors, particularly upon the standard of living, climatic conditions, the degree of development of water supply systems and available quantities of water. Chemical composition varies in different cities, especially relative to industrial wastes. Generally, in municipal wastewater on which the influence of industrial waste is not significant, two thirds of the total suspended and dissolved matter is considered to be of organic origin.

Frequently, the basic parameters of the composition of municipal wastewater are cited to be: BOD₅ (biochemical oxygen demand at 20°C over 5 days), suspended solids, and indicator micro-organisms (coliforms). The BOD₅ parameter does not denote the total oxygen consumption for the decomposition of organic matter. An alternative oxygen demand of the organic matter, the COD parameter (chemical oxygen demand), can be measured faster and more accurately. In untreated domestic wastewater, the BOD₅/COD ratio ranges between 0.4 and 0.8. The major constituents of domestic wastewater include total solids, dissolved solids, suspended solids, nitrogen (as N), phosphorus (as P), chlorides (Cl), alkalinity, grease, and BOD₅.

It should be pointed out that the concentration of waste matter in water depends on the water consumption per capita per day. In Mediterranean countries, due to limited available quantities of water as well as low daily consumption, higher concentrations of waste matter may be expected in domestic wastewater.

Besides the mentioned main constituents of wastewater, also of interest may be the total dissolved solids and specific ions, such as sodium, calcium, magnesium and boron. The concentration of dissolved solids in untreated wastewater will be similar to that in the water used for water supply, taking into account the increase caused by its use in households. In communities with a more pronounced contribution of industrial wastewaters to municipal wastewater, specific compounds/elements, such as phenols, pesticides, chlorinated

hydrocarbons, Cd, Zn, Ni, and Hg, etc., may also be expected. These constituents are of particular concern due to their toxicity and because they tend to resist conventional methods of wastewater treatment.

The number of micro-organisms in domestic wastewater depend on the conditions of health of the population and primarily of indicator organisms which can be more easily estimated in wastewater than the pathogens. These include coliforms, faecal streptococci, shigella, salmonella, *Pseudomonas aeruginosa*, *Clostridium perfringens*, *Mycobacterium tuberculosis*, protozoan cysts, helminth ova, enteric viruses.

2.2 Impacts of Nutrients

Enrichment of waters with plant nutrients, primarily nitrogen and phosphorus, stimulates aquatic primary production. This process applies to both fresh and marine waters and in its most generic definition is called 'eutrophication'. Its most serious manifestations are algal blooms (red tides), algal scum, enhanced benthic algal growth, and at times a massive growth of submersed and floating macrophytes.

Visibly, eutrophication and its side effects cause discolouration of waters, reduced transparency, unsightliness and disturbance to bathers thus impairing recreation. Dense macrophyte and macro-algae agglomerations chop channels, lagoons and estuaries impairing fishery and navigation and reducing flow and the holding capacity of freshwater reservoirs, etc.

When aging, the decaying organic material consumes, and in serious cases depletes the oxygen reserve of the water causing an array of secondary problems such as mortality, formation of corrosive and other undesirable substances such as CO₂, CH₄, H₂S, NH₃, organoleptic (taste and odour producing) substances, organic acids, toxins, etc.

Sticking algal material and high pH can cause dermatitis and conjunctivitis, and ingestion of algae can cause diarrhoea in sensitive individuals. The development of toxin producing algae in the marine environment, when accumulated in fish, particularly shellfish, is a threat to human health.

Among the problems of perhaps widest concern in the marine environment is the apparent spread and increase in frequency of algal blooms of toxic algae involved in causing paralytic and diarrhetic shellfish poisoning (PSP and DSP, respectively, produced by saxitoxin and other toxins in certain dinoflagellates and chrysophyceae), both already known for some time, and the appearance of new forms previously unknown or ignored such as amnesic shellfish poisoning (ASP) produced by domoic acid in diatoms.

2.3 Impacts of Pathogens

The main types of human exposure to pathogenic micro-organisms in the marine environment is through direct contact with polluted seawater and/or sand, including ingestion of the former while swimming or bathing and through consumption of contaminated seafood.

Concern about actual and potential adverse health effects arising out of such exposure has been expressed worldwide, particularly during the last two decades.

Health hazards arising from the presence of pathogenic micro-organisms in the Mediterranean marine environment can be considered as particularly significant as a result of a heterogeneous variety of factors, including the following:

- a) Although the general situation is progressively improving through the establishment of sewage treatment facilities and the construction of submarine outfall structures, the bulk of municipal sewage in most parts of the region is still currently being discharged untreated into the immediate marine coastal zone, in many instances in the vicinity of recreational and/or shellfish areas;
- b) apart from the 130 million inhabitants estimated to live permanently along the Mediterranean coastline, over 100 million tourists visit the area annually. During the summer months, the sea constitutes the main recreational amenity for local and tourist populations alike, as a result of which most beaches, especially those in the vicinity of cities and tourist resorts, are heavily overcrowded, particularly on weekends. The heterogeneous nature of beach populations further facilitates the spread of infections;
- c) prevailing warm climatic conditions not only result in a relatively long bathing season, but are also responsible for longer exposure to seawater and/or beach sand, as compared to the situation in other, more temperate, countries;
- d) water and shellfish quality control measures vary from country to country. In many cases, control measures in terms of quality criteria and standards are practically wholly based on "acceptable" concentrations of bacterial indicator organisms. While such organisms can provide a reasonable estimate of the degree of sewage pollution, and perhaps a relative satisfactory correlation with concentrations of bacterial gastrointestinal pathogens, they have not so far been accepted as providing any clear correlation with the presence and density of either viruses or non-gastrointestinal pathogens and the biotoxins from algae (PSP, DSP). In general, there is very little control over the quality of beach sand, which has only recently commenced to be recognized as a factor to be considered in the transmission of a number of skin and other contact infections, including fungal ones.

On a very general level, pathogenic micro-organisms present in seawater, sediments and beaches can be broadly divided into two categories: those that affect the gastrointestinal tract, and those that affect other parts of the body. As far as the former category is concerned, all the diseases which are spread by the faecal-oral route, and whose aetiological agents are shed in the faeces of diseased individuals or carriers could be contracted by swimming in sewage-polluted waters. Apart from diseases affecting the gastrointestinal tract, a number of diseases or disorders affecting the eye, ear, skin, upper respiratory tract and other parts of the body have been associated with bathing.

2.4 Municipal Wastewater Treatment

Wastewaters are treated in order that they may either be discharged in a controlled manner into the water systems or reused. The following results are achieved by wastewater treatment:

- Separation of solids from the liquids, directly or indirectly after the transformation of dissolved substances into solids.
- separation of liquids from water;
- separation of gases from water;
- transformation of dissolved or dispersed substances into liquids or gases not having characteristics of a pollutant (H₂O, CO₂, NO₃, N₂);

- reduction of the number of micro-organisms causing diseases.

Water treatment is carried out applying physical operations and chemical and biological processes. In order to eliminate wastes from the water, different operations and processes are applied at a facility defined as a water treatment plant. Depending upon the degree of treatment, operations and processes are mostly grouped so that they differ in their treatment effect:

- i) Pre-treatment involves the application of operations with which bulky matter, sand and gravel, greases and oils are removed from wastewater;
- ii) Primary treatment includes the application of physical and/or chemical treatment procedures for municipal wastewaters with which at least 50% of suspended matter is removed and BOD₅ values are reduced at least 20% from initial concentrations;
- iii) Secondary treatment involves the application of physical, chemical, biological and other procedures which in municipal wastewaters reduce the concentration of suspended matter and BOD₅ by 70-90%, and COD concentrations at least 75%;
- iv) Tertiary treatment includes the application of physical, chemical, biological and other procedures which in municipal wastewaters reduce the concentration of nutrient salts by 80%, and remove other specific wastewater parameters, achieving values unattainable by means of secondary treatment;
- (v) Disinfection is a special process which is undertaken to further reduce the number of micro-organisms in treated water.

Other classifications of degrees of treatment are also applied. Thus, the conventional treatment methods include primary and secondary treatment. Tertiary treatment involves the application of advanced technology. For the reuse of water, besides the most frequently applied methods described above, alternative methods are also used.

It is, therefore, very important that for each specific case an appropriate wastewater treatment method is applied. This implies the need to apply such a degree of treatment, or the selection of operations and processes which, depending upon the location and manner of wastewater discharge, meet the ecological, sanitary, aesthetic and economic requirements. The need to evaluate the operation and maintenance costs, as well as the educational level of the region for which the treatment plant is planned, should be particularly stressed. Many very sophisticated and expensive plants have become completely useless or ineffective in a short time due to inappropriate maintenance.

With the removal of wastes from water, solid and liquid matter, which cannot be directly discharged into the environment due to human health risks and disturbances in the ecosystem, remain in concentrated form in the plant. Special attention should be paid to the residues of sedimentation procedures (primary and/or secondary), called "sludge".

2.5 Wastewater Discharge into the Sea

Wastewater discharge into the sea is the most common manner of final wastewater disposition in coastal residential and tourist communities, as well as in industrial zones in the Mediterranean. In numerous small and medium size communities untreated wastewaters are still discharged into the coastal sea by means of outlets. The consequences in the form of local pollution of the sea are considerable. The upgrading of such a state, complying with the

Genoa Declaration, is possible with the application of marine outfalls, given appropriate water treatment or a higher degree of treatment and a coastal outlet. The application of marine outfalls is based on the principle of self-purification of waste in the sea. The necessary condition is the constant exchange of relatively clean seawater, in which waste dilution, dispersion and decomposition take place. The selection of the manner of discharge depends upon hydrographical, topographical and geological conditions in the coastal zone and oceanographic conditions in the sea.

3. RESULTS ACHIEVED

3.1 Brief Summary of Data Collection

Data from 19 Mediterranean countries were progressively collected until country summaries were produced using the most reliable information available. The following is a list, in alphabetic order of the countries involved in the study.

Albania, Algeria, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Morocco, Slovenia, Spain, Syria, Tunisia and Turkey.

Great variations in the data collected between countries and between cities were found. Such variations are considered normal as they reflect the existing differences between the quantity and the quality of wastewater services provided. The procedures and the time that each country adopted for the collection of this kind of data could also explain the differences found. Thus, while some countries have a relatively up-to-date list of coastal cities with the present population, other countries are using figures of a population census carried out several years ago because no better figures are available.

In view of the above-mentioned difficulties, a comparative analysis of data in between countries is not possible because the picture taken of the various countries corresponds to a picture taken at different times.

The tables and graphs presented in Part II of this document reflect the situation as reported and at the time the different country reports were made. For each individual country the present situation could now be a little worse or a little better depending upon the progress made by each country to cope with the ever increasing need for more and better wastewater treatment facilities.

3.2 Constraints Encountered

The Study faced several constraints that deserve the consideration of Contracting Parties to take the required measures needed to improve monitoring of the quality of the marine environment.

Acknowledgement should be made of the efforts made by national MED POL Coordinators to overcome the many constraints encountered.

The most important constraints encountered are quoted below:

- Data concerning wastewater production, collection, treatment and final disposal was available but sometimes limited, incomplete, or scattered amongst several services and institutions of national or private character.

- In a number of countries, it is literally impossible to ascertain the actual seasonal increase of population because there is no established mechanism permitting the assessment of such increase. In addition, the recording of the fluctuation of population taking place during weekends is almost beyond any possible control. “National tourists” during weekends join the influx of foreign tourists creating “service peaks” exceeding the design capacity of wastewater systems. Therefore, such information is not included in the study although it was intended to cover this aspect.
- The study was also intended to collect data on the population served by wastewater treatment plants. However, many countries reported the absence of wastewater treatment plants while at the same time reported a given number of populations served. Obviously, the figure reported as population served referred to the population connected to a wastewater collection network sometimes having a wastewater treatment plant, sometimes without a treatment plant.
- The study did not permit the establishment of a clear difference between the four situations that can be encountered:
 1. A city served totally by a sewerage network and a wastewater treatment plant with the capacity of treating the total amount of sewage produced and collected by the network. (Discharge of 100% treated sewage).
 2. A city served totally by a sewerage network and a wastewater treatment plant, but the capacity of the plant does not permit the treatment of the total amount of sewage produced. (Discharge of treated and untreated sewage).
 3. A city with no treatment plant but with sewerage network covering 100% of the population. (Discharge of 100% untreated sewage).
 4. A city with no treatment plant but with a sewerage network not covering the total population of the city. (Discharge of untreated sewage, plus existence of autonomous wastewater disposal systems, i.e., septic tanks).
 5. A fifth situation can be envisaged. A city with no sewerage networks at all and served only by autonomous systems. However, this situation usually does not exist for tourist coastal cities of more than 10,000 persons.
- In view of above-mentioned constraint, an assumption was made: that a sewerage network covering the total population serves all cities.
- Accurate reporting on the Degree of Treatment of wastewater also proved to be difficult. In many instances the information was not available. There was sometimes confusion with regard to the accepted classification of wastewater treatment. The study proposed to use the standard classification for Primary, Secondary and Tertiary Treatments.
- The collection of data on the amount of wastewater treated and untreated and on the place and conditions of discharge was equally difficult. National MED POL Coordinators made an exhaustive search looking for all available data and managed to present some data on this issue. Great variations between countries and between cities were found concerning the amounts of treated and untreated wastewater. The variations were recorded in terms of cubic metres per person per day or in terms of population equivalent.

- With regard to the year of construction, information was not always available. Some plants were reported open to production as far back as 1950.
- The collection of information concerning upgrading of plants was also difficult and sometimes records were not available. Therefore, some plants were recorded as having primary treatment only, when in reality additional units for secondary treatment are already operational.
- Equally difficult was the updating of information concerning plants that had temporarily interrupted their services. In some cases there is the possibility of plants been reported as "out of service" when in fact, they were back in operation just a few months after the survey.

3.3 General Considerations on the Contents of the Tables

- 1) The study is meant to examine the coastal cities that discharge their municipal wastewater into the sea, thus contributing in one way or another to the pollution of the sea. Rivers that are the recipients of water discharges from inland cities, treated or untreated, also representing a municipal wastewater pollution point source in the Mediterranean have not been taken into account in this present document;
- 2) some countries have reported the capacity of the treatment plant related to population equivalent (PE). This is reflected in the tables under the appropriate column heading; while the column 'population served' does not appear;
- 3) occasionally, when adding the population served by a treatment plant to the remaining population which is supposed to be served by at least a sewerage network, the figure obtained is below the resident population reported. This is mostly, but not always, explained by accepting the fact that a sector of the population uses septic tanks or cesspools or other similar methods of wastewater disposal;
- 4) for the purpose of preparing the pie charts, where treatment plants are referred to as "under construction", they have been counted as operational;
- 5) where more than one date appears under the column "year of construction", it means that the plant was renovated or expanded.

3.4 General Tables and Graphs

Summary of Results		%
a) Total number of countries	19	
b) Total number of cities	545	
c) Total number of cities with more than 100,000 inhabitants	101	
d) Total number of cities with more than 100,000 inhabitants served by a treatment plant	79	79%
e) Total number of cities with more than 100,000 inhabitants not served by a treatment plant	22	21%

f) Total number of cities with more than 10,000 inhabitants and less than 100,000 inhabitants	444	
g) Total number of "resident" population found	58,799,000	
h) Population served by a sewerage network and a treatment plant	41,445,000	70%
i) Population served by a sewerage network only	17,378,000	30%
j) Cities without a wastewater treatment plant	132	24%
k) Cities with no information at all	39	7%
l) Cities with a wastewater treatment plant	374	69%
m) Primary treatment	83	22%
n) Secondary treatment	241	65%
o) Tertiary treatment	37	10%
p) Unknown treatment	13	3%
q) Total cubic metres of wastewater treated per day	8,037,000	47%
r) Total cubic metres of untreated wastewater per day	9,001,000	53%
s) Total wastewater, cubic metres per capita per day	0.290	

A visual image of the above-mentioned results is presented in the graphs at the end of Part II.

4. COUNTRY FACTS

4.1 Albania

Four coastal cities were reported with a resident population of 254,000 persons. Seasonal increase of population varied from 5% to 20% and the total population receiving wastewater disposal services reached 262,000 persons. However, due to population mobility sizeable changes in the number of inhabitants may have occurred.

4.2 Algeria

A total of 38 coastal cities with a resident population of 4,297,000 persons were reported. This total includes the large urban agglomerations of Algiers, Annaba, Bejaia, Mostaganem, Oran and Skikda.

For this reason, the total population served by wastewater treatment plants reached 3,146,400 persons or 73.6% of the total population to be served. The remaining 26.4% of the population, (1,124,800 persons), are supposed to be connected to a piped sewerage network.

When analysing the same data in terms of number of cities, the percentage of cities without a wastewater treatment plant appeared rather high, 55% (21 cities).

4.3 Croatia

Eleven coastal cities were recorded with a resident population of 905,400 persons. The seasonal increase reported varied from 10% to 300%. However, the total population served (by a network with a treatment plant and by a network only) appeared to be less (654,000 persons) than the total resident population.

The percentage of cities without a wastewater treatment plant is high: 45% (five cities out of a total of 11). Primary treatment is the only kind of treatment reported.

An interesting remark is the fact that the production of untreated wastewater per capita per day is of: 0.14 cu.mt, while for treated wastewater, production is reported as being: 0.07 cu.mt. only.

4.4 Cyprus

Only one out of four localities has no wastewater treatment plant and secondary and even tertiary treatment were reported. However, an important sector of the total population (80,000 persons or 35% of the total), appear as being served by a sewerage network only.

No information was provided regarding the quantity of untreated wastewater for the cities of Larnaca and Limassol. The production per capita per day of treated and untreated wastewater was: 0.11 and 0.08 cu.mt respectively.

4.5 Egypt

A total of 11 coastal cities with a resident population of 4,363,000 persons were recorded, most of them residents of Alexandria and Port Said.

The number of cities with a wastewater treatment plant is 7, or 64% of the total. However, the two above-mentioned large coastal cities of Alexandria and Port Said are still producing large quantities of untreated wastewater rising thus the general figure of untreated wastewater to 33% of the total wastewater produced.

Out of the seven treatment plants reported, one corresponded to primary treatment and two more to the secondary treatment type. Three additional secondary treatment plants were reported as being under construction. No information was available for the localities of Burg el Arab, El Daba, Hamman and Sidi Barrani. It was assumed that a sewerage network was serving them.

4.6 France

The study covered a total of 39 coastal cities with a resident population of 2,822,000 persons.

Seasonal increase of population varied between 3% for the smallest increase, to more than 1000% for the largest.

4.7 Greece

A total of 53 localities were reported with a resident population of 5,751,000 persons. The most frequent seasonal increase of population was situated between 10% to 50%, with 0% for the lowest increase to 190% for the maximum reported. The total seasonal population appears to be rather important, over 1,000,000 persons.

Information regarding the quantities of treated and untreated wastewater was available and according to the data produced the amount of untreated wastewater reaching the marine environment is only 10% of the total. The production per capita per day was of 0.16 cu.mt for treated water and of 0.08 cu.mt. for untreated wastewater.

Athens Greater Area was reporting as having primary treatment only, while secondary treatment is under construction. No information was provided concerning the quantity of untreated wastewater produced.

4.8 Israel

Nine localities were reported. Detailed information per locality concerning seasonal population increase was not available.

The coverage of services provided reached 100% of the population. The 9 plants appeared as being relatively new (constructed between 1980 and 1997).

Secondary and tertiary treatments were predominant. The total quantity of wastewater treated per day appears to be 529,000 cubic metres. An average production of 0.10 cu.mt. per capita per day was found.

4.9 Italy

The collection of data for Italy was entrusted to a local consultant because the Italian administration system has been decentralized into regions, therefore making the collection and uniform presentation of data a difficult, costly and time-consuming process. The consultant travelled to different cities, where appropriate, made telephone contacts and also used bibliographic data for the preparation of the study as presented in Part II. Also presented in the Part II is formal data published, in line with national methodology for presentation of data, by the National Institute of Statistics of Italy.

The study covered a total of 164 cities with a resident population of 14,767,000 persons. Detailed information concerning seasonal population increase was provided. The fluctuating population in summer time appeared as being rather important, close to 4,000,000 persons.

Including the seasonal tourist population, the total population receiving services reaches a figure of 14,000,000. A sewerage network serves half of this population with a treatment plant. The other 50% possess a piped sewerage network only and sewage is discharged raw mainly through submarine outfalls.

The existence of 97 treatment plants was reported (56%). No information was available for 25 localities (16%) and for the remaining 44 localities (28%), no treatment plant was reported.

Treatment of wastewater was distributed as follows: primary treatment 28 plants (30%); secondary treatment 51 plants (47%); tertiary treatment 11 plants (12%), and for the remaining 7 plants (11%), no information on the degree of treatment was available.

With regard to the age of the treatment plants, some of them started to operate since the early 50's but the majority appeared as having started in the 70's and 80's.

4.10 Lebanon

Seven coastal cities were reported with a resident population of 2,256,000 persons, nearly half of them coming from Beirut Greater Area. The seasonal increase of population did not appear to be important, just 100,000 persons.

Only one of the seven cities, (Beirut), reported to have a wastewater treatment plant of the primary type. Thus, a treatment plant serves only 27% of the population, while the remaining 73% are using a piped wastewater network only.

The total wastewater produced was reported as being 297,120 cubic metres per day, 70% of which is untreated and discharged raw in the marine environment.

4.11 Libya

The survey covered 17 coastal cities with a resident population of 4,062,000 persons. No report was available concerning seasonal population increase. When adding the population served by a treatment plant to the one supposed to be served by a sewerage network only, the total appeared to be less than the resident population reported. The difference encountered is significant, 1,833,000 persons.

Most likely the actual population served is higher than reported and septic tanks or cesspools serve the remaining fraction.

The degree of wastewater treatment selected is mainly of the tertiary type (9 plants), with 3 plants using secondary treatment. No information was given on the degree of treatment in use for the remaining five treatment plants reported. The plants were constructed in the early 70's and 80's.

4.12 Malta

One single wastewater treatment plant, constructed in 1983 is providing services to a total of eight localities. This is a tertiary treatment plant with sand-filtration and chlorination treating about 17,000 cu.mt of wastewater per day.

Different sewerage networks discharging a total of 75,000 cubic metres of raw sewage serve other localities.

The treatment plant serves approximately 55% of the population and around 80% of the treated sewage produced are discharged through submarine outfalls in the marine environment. Wastewater re-utilization for agricultural purposes is common in Malta.

Three new treatment plants are to be constructed in the coming years at Ic-Cumnija, Ras il-Hobz and Wied Ghammieq, while the existing plant situated in Marsascala will be upgraded to cater for a large amount of wastewater.

4.13 Monaco

One single locality is reported with a resident population of 35,000 persons. A sewerage network together with a secondary treatment plant provides wastewater facilities. A total amount of 18,500 cubic metres of wastewater is produced per day. The plant was

constructed in 1987 and also treats the wastewater from nearby French coastal areas for a total of 70,000 inhabitants.

The average production of wastewater per capita per day was found to be: 0.26 cubic metres.

4.14 Morocco

Four coastal settlements reported in the Mediterranean Sea with a resident population of 1,220,000 persons. No information was given with regard to seasonal increase. Two tertiary plants in Nador and Al-Haceima were reported as treating 18,400 cubic metres of wastewater per day. As the other two coastal cities do not have a treatment plant, 90% of the total sewage produced (61,119 cu.mt/day) is being discharged raw into the marine environment.

4.15 Slovenia

There are three coastal localities with a resident population of 76,000 persons. Seasonal increase of population varied between 13% to 46%.

4.16 Spain

A total of 83 coastal cities were reported with a resident population of 6,884,000 persons. The information given for seasonal increases was very limited. The data collected permitted to establish that a total population of 16,864,000 has access to wastewater facilities.

Information was also received on the number of P.E. (population equivalent) that corresponds to the needed capacity for treatment.

4.17 Syria

Seven Mediterranean coastal settlements were reported with a resident population of 1,408,000 persons. Data for the seasonal increase of population was given for four localities.

This information indicates that probably, around 410,000 persons are served by individual autonomous wastewater services such as septic tanks or other similar devices.

The total amount of untreated wastewater produced reached the figure of 186,128 cubic metres per day with an average figure of 0.19 cu.mt. per capita per day.

4.18 Tunisia

A total of 32 coastal cities were reported with a resident population of 5,449,000 persons. From the information provided on the kind of services, it was possible to find out that 2,499,000 (45% of the total) are served by a sewerage network together with a wastewater treatment facility. An additional 870,000 persons (24% of the total) are supposed to be served by a sewerage network only.

A total of 40 treatment plants were reported. Secondary treatment was predominant, 34 plants (95%). Six plants were reported having tertiary treatment, (Gabes).

The use of small treatment plants using different treatment methods such as: Biological Digesters, Waste Stabilization Ponds, Aerated Lagoons, etc. is very common in Tunisia, as well as the re-utilization of wastewater for agricultural purposes.

The total amount of wastewater produced reached the figure of 303,858 cubic metres per day.

4.19 Turkey

A total of 44 coastal cities were reported. Increases of seasonal population were not reported.

5. CONCLUSIONS AND REMARKS

5.1 Conclusions

- a) The Study clearly indicates that in spite of the efforts of Mediterranean countries to improve their information system, there are still important gaps to overcome. Among the most important ones detected are:
- Inaccurate population data, or existing information not updated, especially that concerning seasonal increases of population;
 - incomplete or diffuse information on the generation of wastewater treated or untreated;
 - insufficient information concerning the kind of services being provided to the population. For example: exact population serviced by treatment plants, by a sewerage network only, by other disposal systems; or simply information on the degree of treatment plants in operation, (primary, secondary or tertiary);
 - data on the year of construction of plants was also incomplete. This information is needed for upgrading services and re-dimensioning systems according to the present needs.
- b) Acknowledgment has to be made to the work accomplished by the National MED POL Coordinators to overcome the constraints encountered. Thanks to their efforts, enough data could be gathered to permit this analysis.
- c) The importance of maintaining the most recent data on the population cannot be overemphasised. This information is of vital importance for:
- the design of new wastewater disposal systems;
 - monitoring the functioning of existing systems;
 - evaluating the performance of existing systems;
 - maintaining an “alert mechanism” permitting early detection of any pollution risk of the marine environment and thus protecting the population involved.
- d) Recording of seasonal population movements is not yet under control. For many countries no information was available. Yet, this information is vital for estimating the “services peaks”. It is indispensable for estimating appropriate dimensions of piped networks, of treatment plants, and of the personnel and supplies needed at the time of maximum output of the system units.

- e) Total protection against wastewater discharges requires other studies involving other forms of pollution. For example, the use of septic tanks, the discharges of sludge from treatment plants, and the discharging of wastewater from recreational marine vessels.

5.2 Remarks

- a) The dispersion of data is probably the main cause of the absence of valuable information needed for the control of the quality of the marine environment. To be able to overcome these constraints, a coordinating mechanism can be applied at national levels, and it can be supported by an appropriate legislation covering central, intermediate and peripheral levels.
- b) Collection of accurate data on seasonal variations of population is not an easy task. Therefore, considering that both the benefits and the problems arising from tourism will impact directly on local population, it is at this level that recording of seasonal population movements should be developed.
- To this effect and with the collaboration of community authorities, a local community committee can be created with full responsibility for the management of the marine environment of the locality;
 - the responsibilities of such committee can be of a varied nature, including the monitoring of water uses and water quality, as well as the control of population movement;
 - the participation of health and environmental authorities is also indispensable.
- c) With regard to the collection of technical data, considering that as a result of privatisation a central control of information on wastewater production, treatment and disposal is becoming more and more difficult, the only solution available appears to be to leave the collection of data to the local levels. However,
- in order to avoid the use of many different kinds of technical reports that nobody will be able to put together, it should be the responsibility of the central level, to produce standard forms;
 - the standard forms can be prepared in such a way so as to permit the reporting of each and all kinds of potential situations that could arise at local level.
- d) It is proposed that in order to supplement the present study, similar investigations should be conducted in small Mediterranean coastal cities concerning the following wastewater pollution problems:
- infiltration of wastewater coming from poorly designed septic tanks constructed in the vicinity of the shorelines;
 - periodical discharge in the marine environment of the content of septic tanks, (use of vacuum trucks);
 - periodical discharge of residual pollutant material coming from existing primary, secondary or tertiary treatment plants.

- e) The important contribution of large coastal cities to the modifications to the marine environment has to be acknowledged. The large urban agglomerations along the Mediterranean Sea of countries like Spain, Italy, Greece, Turkey, Egypt and Tunisia play a fundamental role in the equilibrium of the marine ecosystem.

PART II

MUNICIPAL WASTEWATER TREATMENT FACILITIES

Legend

Degree of treatment

Primary treatment	includes the application of physical and/or chemical treatment procedures for municipal wastewaters with which at least 50% of suspended matter is removed and BOD ₅ values are reduced at least 20% from initial concentrations.
Secondary treatment	involves the application of physical, chemical, biological and other procedures, which in municipal wastewaters reduce the concentration of suspended matter and BOD ₅ 70-90%, and COD concentrations at least 75%.
Tertiary treatment	includes the application of physical, chemical, biological and other procedures which in municipal wastewaters reduce the concentration of nutrient salts 80%, and remove other specific wastewater parameters, achieving values unattainable by means of secondary treatment.
Pre-treatment	involves the application of operations with which bulky matter, sand and gravel, greases and oils are removed from wastewater.

Planning and designing of urban wastewater treatment projects in Mediterranean coastal cities (MAP/UNEP/PAP - 7/TC.4/1, 1992)

Symbols

Discharge

DI = discharge directly into the sea
SO = discharge through a submarine outfall
SS = discharge through many small submarine outfalls
RB = discharge is re-used

Source of information

A: LBS Project
B: Pollution Hot Spots Project
C: Data reported by the MED POL National Coordinator
D: Additional comments made by the MED POL National Coordinators
E: Additional comments made after the meeting of MED POL National Coordinators in Reggio Calabria (June 1999)

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ALBANIA**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Durres	120.0		135.0	No	-	-	-	-	1,200.0	DI	B
Lezha	12.0		13.0	No	-	-	-	-	1,027.0		A
Saranda	12.0		14.7	No	-	-	-	-	1,083.0		A
Vlora	110.0		99.0	No	-	-	-	-	11,000.0	DI + SS	B
Remarks: <i>Due to mobility of population the data on permanent population are estimated only and some changes may have occurred</i>											

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ALGERIA (1)**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Ain Benian	35.7		35.7	No		-	-		4,290.0	DI	C
Ain Taya	21.6		21.6	No		-	-		2,592.0	DI	C
Ain Temouchent	49.8	49.8		*Yes	1962	Secondary	-		5,977.0	DI	C
Ain Turck	21.4	11.0	10.4	*Yes	1975	Secondary	-		2,554.0	DI	C
Algiers	1,860.0	1,822.0	38.0	Yes	1987	Secondary	-	RD	253,000.0	RD+DI	B
Annaba	388.5	349.6	38.9	Yes	1978	Lagoon	23,310.0	RD + DI	72,310.0	RD + DI	B
Aokas	11.8	6.0	5.8	*Yes	1984	-	-		1,424.0	DI	C
Arzew	41.0		41.0	No		-	-		4,923.0	DI	C
Azeffoum	14.0		14.0	No		-	-		1,681.0	DI	C
Bejaia	150.8	146.3	4.5	Yes	1985	Secondary	6,000.0	DI	23,000.0	RD+DI	B
Beni-Haoua	12.7		12.7	No		-	-		1,527.0	DI	C
Beni-Saf	32.1		32.1	No		-	-		3,857.0	DI	C
Bordj El Bahri	19.0		19.0	No		-	-		2,282.0	DI	C
Bord El Kiffan	61.0		61.0	No		-	-		7,324.0	DI	C
Bou Ismail	27.0		27.0	No		-	-		3,249.0	DI	C
Bou Merdes	22.3		22.3	No		-	-		2,681.0	DI	C
Cherchell	33.2		33.2	No		-	-		3,992.0	DI	C
Collo	24.5		24.5	No		-	-		2,934.0	DI	C
Dellys	24.9		24.9	No		-	-		2,989.0	DI	C
Douaouda + Kolea	49.6	39.5	10.1	*Yes	1987	Secondary	-		1,211.0	RD	C +E
El Aouana	12.7		12.7	No		-	-		1,529.0	DI	C
El Kala	19.5	17.6	1.9	*Yes	1987	Secondary	-		2,342.0	DI	C

Remarks: * Plant out of service

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ALGERIA (2)**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
El-Harrach	47.7		47.7			-	-		5,724.0	DI	C1
Fouka	26.7		26.7			-	-		3,212.0	DI	C1
Ghazaouet	50.6		48.0	No		-	-		9,272.0	RD+DI	B
Gouraya	13.6		13.6			-	-		1,629.0	DI	C1
Hadjout	33.3		33.3			-	-		3,999.0	RD	C1
Jijel	69.8		67.7	No		-	-		8,372.0	DI	C1
Mers El Kebir	11.4		9.2	No		-	-		1,375.0	DI	C1
Mostaganem	116.6		109.6	No		-	-		17,192.0	DI	B
Oran	708.4	651.7	56.7	*Yes		-	-		98,000.0	DI	B
Skikda	175.0		168.0	No		-	-		37,000.0	RD+DI	B
Staouali	23.7	22.5	1.2	Yes		Secondary	269.0	RD	143.0	DI	C1
Tenes	26.5		26.5			-	-		3,179.0		C1
Tichy	11.0	9.9	1.1	*Yes	1975	Secondary	-		1,322.0	DI	E + C1
Tipaza	15.8		12.6	No		-	-		1,895.0	DI	C1
Zeralda	20.5	20.5		*Yes	1977	Primary	-		2,458.0	DI	C1
Ziama Mansouriah	12.9		11.6	No	1977	Primary	-		1,544.0	DI	C1
Remarks: * Plant out of service											

C1 - Data reported by the MED POL National Coordinator (source: National Office of Statistics, Services by Ministère chargé de l'hydraulique)

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: CROATIA**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Dubrovnik	50.0	45.0	5.0	Yes		Primary		SO +SS	-	-	B
Makarska	11.9	8.9	3.0	Yes	1979	Primary	2,600.0	SO	650.0	SS	C1
Primosten*	2.0	1.6	0.9	Yes	1988	Primary	1,200.0	SO	300.0	SS	C1
Pula	63.9	56.0	7.9	Yes	1986	Primary	-	SO+SS	-	-	B
Rijeka	206.2	185.0	21.2	Yes	1994	Primary	41,000.0		16,000.0		B
Rovinj	11.3	7.0	4.3	Yes	1985	Primary	1,200.0	SO	4,900.0	DI+SS	C1
Sibenik	60.0		48.0	No	-	None	-	-	-	SS	B
Solin	13.0			No	-	None	-	-	8,500.0	DI	C1
Split	350.0		180.0	No	-	None	-	-	45,000.0		B
Susak (*) (**)	0.5		80.0	No	-	None	-	-	4,000.0	DI	C1
Zadar	136.6			No	-	None	-	-	12,750.0	SS	B
Remarks: * Included due high seasonal population increase ** Including the islands of Ilovik and Unije											

C1 - Data reported by the MED POL National Coordinator (source: Croatian Waters)

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: CYPRUS**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Famagusta (Greater Area)	29.0	12.0	17.0	Yes		Secondary	2,140.0	RB	6,055.0	SS	A
Larnaca	55.0	46.0	9.0	Yes	1997	Secondary	1,800.0	RB	-	-	B + E
Limassol	130.0	89.0	41.0	Yes	1995	Tertiary	10,500.0	RB	-	-	B + E
Paphos	13.0		13.0	No		None	-		-		B

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: EGYPT**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Alexandria	3,328.0	2,300.0	1,028.0	Yes	1994	Primary	75,000.0	Lake+DI	-	SS	C1
Baltim	34.0		34.0	Under Construction		Secondary	10,000.0	DI	-	-	C2
Burg el Arab	41.0		41.0	No		-	-	-	-	-	C2
Dumya (Damietta)	118.0	118.0		Yes	1994	Secondary	60,000.0	Lake	-	-	C2
El Arish	100.0	100.0		Yes	1982	Secondary	3,500.0	Desert	-	-	C3
El Daba	38.0		38.0	No		-	-	-	-	-	C1
Hammam	33.0		33.0	No		-	-	-	-	-	C1
Marsa Matruh	87.0		87.0	Under Construction		Secondary	50,000.0	RB	-	-	C2
Port Said	495.0	495.0		Yes	1997	Secondary	190,000.0	Lake	-	-	C2
Rashid (Rosetta)	69.0		69.0	Under Construction		Secondary	20,000.0	RB	-	-	C2
Sidi Barrani	20.0		20.0	No		-	-	-	-	-	B

C1 - Data reported by the MED POL National Coordinator (source: AGOSD - Alexandria General Organization for Sanitary Drainage)

C2 - Data reported by the MED POL National Coordinator (source: NPOWSD - National Organization for Potable Water and Sanitary Drainage)

C3 - Data reported by the MED POL National Coordinator (source: local governorate)

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: FRANCE (1)**

City	Permanent Population (in 000)	Population Equivalent (in 000)	Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
Adge	20.2	215.0	Yes	1969	Secondary	21,529.0	River	-	-	E
Ajaccio (Corsica)	53.1	80.0	Yes	1981	Secondary	9,948.0	SO	-	-	E
Antibes	72.8	195.0	Yes	1990	Secondary	20,681.0	SO	-	-	E
Argeles sur-Mer**	7.3	60.0	Yes	1957	*Primary	9,132.0	SO	-	-	E
Bastia (North)	17.5	40.0	Yes	1990	*Primary	4,823.0	SO	-	-	E
Bastia (Arinella)	27.2	50.0	Yes	1972	Secondary	2,451.0	SO	-	-	E
Berre L'Etang	10.4	21.0	Yes	1936	Secondary	1,520.0	SO	-	-	E
Borgo Littoral**	5.9	30.0	Yes	1993	Primary	2,250.0	SO	-	-	E
Bormes L.M. le Lavandou**	4.9	85.0	Yes	1969	*Primary	7,374.0	SO	-	-	E
Cagnes sur mer	56.4	130.0	Yes	1959	Secondary	18,338.0	SO	-	-	E
Calvi**	4.6	60.0	Yes	1995	Primary	3,348.0	SO	-	-	E
Canet en Roussillon**	9.6	75.0	Yes	1977	*Primary	5,941.0	River	-	-	E
Cannes - Mandelieu	144.0	225.0	Yes	1977	Primary	37,919.0	SO	-	-	E
Cavalaire**	6.5	50.0	Yes	1980	*Primary	6,036.0	SO	-	-	E
Frejus - Reyran	65.2	185.0	Yes	1983	Primary	29,792.0	SO	-	-	E
Hyeres L'Almanarre	47.8	108.0	Yes	1970	*Primary	18,703.0	SO	-	-	E
Istres La Romaniquette	12.9	16.0	Yes	1975	Secondary	2,697.0		-	-	E
Istres Rassuen	19.9	55.0	Yes	1979	Secondary	4,524.0		-	-	E
La Ciotat	32.7	50.0	Yes	1990	*Primary	7,119.0		-	-	E
La Londe les Maures**	6.4	40.0	Yes	1981	Primary	2,472.0	SO	-	-	E
Marignane La Palun	40.6	70.0	Yes	1982	Secondary	9,835.0	Canal	-	-	E
Marseille	889.4	1,630.0	Yes	1987	*Primary	185,935.0		-	-	E
Martigues Port de Bouc	51.6	100.0	Yes	1978	Secondary	10,521.0	SO	-	-	E

Remarks: (1) Volume calculated, supposing 0.2 m³/d per PE
* Primary treatment involves physical chemical treatment (secondary treatment planned)
** Included due to high seasonal population increase (approx. 5 - 10 times)

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: FRANCE (2)**

City	Permanent Population (in 000)	Population Equivalent (in 000)	Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
Menton	27.8	80.0	Yes	1995	Primary	9,735.0	SO	-	-	E
Montpellier	237.7	260.0	Yes	1968	Secondary	43,111.0	River	-	-	E
Narbonne sur Plage	10.2	26.0	Yes	1996	Secondary	2,124.0	SO	-	-	E
Nice	354.4	690.0	Yes	1988	Secondary	73,391.0	SO	-	-	E
Rognac	10.8	16.0	Yes	1953	Secondary	2,249.0	SO	-	-	E
Roquebrune-Cap-Martin	12.6		No		None	-	-	3,889.0	-	E
Saint Chamas	25.5	35.0	Yes	1982	Secondary	2,600.0		-	-	E
Sainte Maxime	10.4	50.0	Yes	1983	*Primary	4,610.0	SO	-	-	E
Sanary	20.1	68.0	Yes	1985	*Primary	6,793.0	SO	-	-	E
Sausset les Pins - Ville**	9.7	18.5	Yes	1986	*Primary	3,051.0	SO	-	-	E
Sete	59.9	95.0	Yes	1972	Secondary	19,784.0	SO	-	-	E
St Cyprien**	9.9	85.0	Yes	1995	Secondary	6,627.0	Harbour	-	-	E
St Laurent du Var	40.5	80.0	Yes	1982	Secondary	7,983.0	River	-	-	E
St Raphael - Agay**	8.2	25.0	Yes	1983	Primary	3,029.0	SO	-	-	E
Toulon Cap-Sicie	250.2	95.0	Yes	1997	*Primary	41,697.0		-	-	E
Toulon (East)	66.1	550.0	Yes	1983	*Primary	12,777.0	SO	-	-	E
Vallauris	24.3	50.0	Yes	1981	*Primary	4,340.0	SO	-	-	E
Vitrolles	36.9	60.0	Yes	1974	Secondary	11,393.0	River	-	-	E

Remarks: (1) Volume calculated, supposing 0.2 m³/d per PE
* Primary treatment involves physical chemical treatment (secondary treatment planned)
** Included due to high seasonal population increase (approx. 5 - 10 times)

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: GREECE (1)

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Aidipsos*	4.1	18.0		Under Construction		Secondary				-	E
Agios Nicolaos Lassithiou	10.0	25.0		Yes	1987	Secondary				-	E
Aigio	22.3	12.0	10.3	Yes		Secondary	960.0		1,458.0	-	A
Alexandria	16.0	16.0		Yes		Secondary	2,300.0		-	-	A
Alexandroupoli	45.0	21.0	24.0	Yes		Secondary	1,260.0		1,140.0	-	A
Argostoli*	7.5	15.0		Yes	1995	Secondary				-	E
Athens, Greater Area	3,345.0	3,345.0		Yes		Primary	660,000.0	SO + DI		-	B
Chania	50.2	30.0		Yes		Secondary	8,640.0		-	-	A
Chios	23.4	7.2	16.2	Yes		Secondary	3,496.0		849.0	-	A
Corfu	39.9	48.9	12.1	Yes		Secondary	8,800.0	-	7,145.0	-	A
Elefsina	23.0	23.0		Yes		Secondary	3,312.0	-	-	-	A
Ermoupoli	14.7	18.0	4.0	Yes		Secondary	2,590.0	-	1,928.0	-	A
Halkida	55.0	32.0	23.0	Yes		Secondary	1,601.0	-	1,810.0	-	A
Heraklio	117.0	540.0	360.0	Yes	1996	Tertiary	12,000.0	SO	8,000.0	-	B
Ierapetra	13.0	13.0		Yes		Secondary	2,900.0	-	-	-	A
Igoumenitsa	20.0	30.0		Under Construction		Secondary				-	E
Kalamata	43.6	35.0	8.6	Yes		Secondary	5,249.0	SO	1,951.0	-	A
Kalymnos	16.4		16.4	No		None	0.0	-	958.0	-	A
Katerini	39.1	18.2	20.9	Yes		Secondary	1,224.0	-	2,066.0	-	A
Kato Achaia*	5.3	20.0		Yes	1989	Secondary				-	E
Kavala	55.7	59.0		Yes		Secondary	6,848.0	-	-	-	A
Kiato*	9.2	16.0		Yes	1997	Secondary				-	E
Komotini	40.1	40.1		Yes		Secondary	5,900.0	-	-	-	A
Korinthos	30.0	60.0		Yes		Secondary	7,200.0	-	-	-	A

Remarks: * Included due to seasonal population increase

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: GREECE (2)**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Kos	15.5	17.0	10.0	Yes		Secondary	1,799.0	SO	1,112.0	-	A
Lavrio	10.6	10.6		Yes		Secondary	1,580.0	-	-	-	A
Lefkada*	6.7	17.4		Yes	1990	Secondary				-	E
Loutraki	11.2	68.7		Yes		Secondary	11,540.0	-	-	-	A
Markopoulo	10.4	18.5		Yes		Secondary	8,640.0	-	-	-	A
Megara	20.1		25.0	No		None	-	-	2,660.0	-	A
Messolonghi	13.0	18.0		Yes		Secondary	3,910.0	SO	-	-	B
Mykonos*	5.4	16.0		Yes	1996	Secondary				-	E
Mytilini	27.0		34.0	No		None	-	-	19,202.0	-	A
Nafpaktos	11.0	14.0		Yes		Secondary	2,880.0	-	-	-	A
Nafplio	11.0	11.0		Yes		Secondary	2,000.0	-	-	-	A
Nea Makri	13.1	65.0		Yes		Secondary	11,520.0	-	-	-	A
Patras	155.0	180.0		Yes		Secondary	22,320.0	-	-	SS	B
Preveza	15.0	8.5	11.5	Yes		Secondary	2,590.0	-	3,500.0	DI	B
Pylos	11.9		13.5	No		None	-	-	-	-	A
Rethymno	23.4	9.0	23.0	Yes		Secondary	5,760.0	-	14,401.0	-	A
Rhodes	43.0	14.0	16.0	Yes		Secondary	4,800.0	SO	5,520.0	-	A
Salamina	21.0		21.0	No		None	-	-	-	-	A
Seitia*	7.3	20.0		Under Construction		Secondary					E
Skiathos*	5.1	26.0		Yes	1996	Secondary				-	E
Thessaloniki Greater Area	1,330.0	850.0	480.0	Yes		Secondary	69,000.0	SO	22,700.0	DI	B
Thira	19.0		7.5	No		None	-	-	774.0	-	A
Volos	116.1	135.0		Yes	1985	Secondary				-	E
Xylokastro*	7.0	15.0		Yes	1997	Secondary				-	E
Zakinthos	10.2	30.0		Yes	1997	Secondary				-	E

Remarks: * Included due to seasonal population increase

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ISRAEL**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m ³ /day)	Discharge of Treated Wastewater	Wastewater Untreated (m ³ /day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Akko	45.0	45.0		Yes	1993	Primary	12,000.0	SO	-	-	B + E
Ashdod	155.0	155.0		Yes		Secondary	20,000.0	RB	-	-	E
Ashqelon	92.0	92.0		Yes		Secondary	17,000.0	RB	-	-	E
Gush-Dan/Shafdan* (Tel Aviv area)	2,500.0	2,500.0		Yes	1985/97	Secondary	300,000.0	RB	-	-	B + E
Hadera	68.0	68.0		Yes	1997	Secondary	25,000.0	RB + D	-	-	E
Haifa	500.0	500.0		Yes	1965/98	Secondary	95,000.0	RB + RD	-	-	E
Herzlia	82.0	82.0		Yes	1998	Secondary	15,000.0	SO	-	-	E
Nahariyya	41.0	41.0		Yes	1991	Primary	10,000.0	S0	-	-	B + E
Netanya	155.0	155.0		Yes	1976/95	Secondary	35,000.0	RB	-	-	E

Remarks: Shafdan = Sewage sludge (15,000m³/day, 0.8% TSS, Outfall)

Note: The following data tables (Italy (1) - (7)) were prepared by a consultant and based on information collected from various regional authorities in Italy.

**MUNICIPAL WATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ITALY (1)**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Aci Castello (Sicily)	18.0		18.0	Yes	Under Construction						B
Acireale (Sicily)	46.2		50.0	Yes	Under Construction						B
Agrigento	55.2	25.0	30.2	Yes	1996	Secondary	4,000.0	DI	6,000.0	DI	Region
Agropoli	18.0		18.0	No		None	-	-	6,000.0	SO	Region
Alassio***	11.6	22.0		***		Secondary	-	-	-	-	Region
Albenga***	22.0	35.0		***		Secondary		-	-	-	B
Albissola Marina***	5.9	12.0		***		Secondary		-	-	-	B
Alghero (Sardinia)	39.0		39.0								B
Amalfi	5.6		6.0	No		None	-	-	3,500.0	DI	Region
Amantea	12.0	12.0		Yes	1982/90	Secondary	2,678.0	DI	3,500.0	DI	Region
Ancona	101.3	65.0	36.3	Yes	1984	Tertiary	41,500.0	DI	8,500.0	DI	Region
Anzio	33.5		40.0								B
Arenzano*	11.2	12.0		*		Secondary	-	-	-	-	Genova
Augusta (Sicily)	34.2		34.2	No		None	-	NA	120,000.0	DI	B
Avola (Sicily)	31.3		31.3	No		None	-	-	70,000.0	DI	ISTAT
Bacoli**	26.5	22.0		**		Secondary	-	-	-	DI	Region
Bagheria, (Sicily)	47.0	29.0	18.0	Yes	1980	Primary	15,000.0	DI	9,000.0	DI	Region
Bagnara Calabria	11.0		11.0	No		None	-	-	-	-	B
Barcellona Pozzo di Gotto	40.5	22.0	18.5	Yes	1980/96	Primary	7,000.0	DI	7,000.0	DI	Region
Bari-Barletta	376.0		376.0	No		None	-	-	5,136,028.0	-	B
Bellaria	12.8		12.8			-	-	-	-	-	B
Bisceglie	47.4	15.0	32.4	Yes	1976	Secondary	10,000.0	DI	25,000.0	DI	Local body
Bordighera	11.1		11.1								B

Remarks: * Connected to Genova Plant
** Connected to Napoli Plant
*** Connected to Savona Plant

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ITALY (2)**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Brindisi	95.0	50.0	45.0	Yes	1980	Secondary	50,000.0	DI	-	-	B
Cagliari A (Sardinia)	270.0	230.0	40.0	Yes	1985	Primary	86,400.0	DI	15,000.0	DI	Region
Cagliari B (Sardinia)	550.0	550.0		Yes	1990	Secondary	172,800.0	DI	-	-	Region
Caorle	11.1	11.0	12.0	Yes	1980	Tertiary	30,000.0	SO	4,000.0	CH	Region
Capo d'Orlando (Sicily)*	12.0	12.0		Yes*	1980	Primary	6,000.0	DI	-	-	Region
Cariati	9.2	10.0		Yes	1978	Primary	3,628.0	DI	1,700.0	DI	Region
Carovigno	14.6	3.2	11.4	Yes	1950	Primary	1,700.0	DI	6,000.0	DI	Local body
Castel Volturno	15.1		15.1	No		None	-	-	6,000.0	DI	Region
Castellammare del Golfo	13.5		13.5	No		None	-	-	10,000.0	DI	Region
Castellammare di Stabia	68.7		68.7	No		None	-	-	30,950.0	DI	Region
Catania, Sicily	333.0	170.5	162.5	Yes	Under Construction		-	-	150,000.0	SO + DI	Region
Cattolica	15.1										B
Cecina	24.6										B
Cefalu	13.8	9.5	4.3	Yes	1980	Primary	4,500.0	DI	3,000.0	DI	Region
Cervia	25.0	25.0		Yes		Tertiary	10,958.0	DI	-	-	B
Cesenatico	20.4		20.4								B
Cetraro	10.4	7.0	3.4	Yes	1982	Primary	2,346.0	DI	2,300.0	DI	Region
Chiavari	28.6		28.6			-	-	-	-	-	B
Chioggia	53.2	87.0	16.0	Yes	1990	Secondary	23,000.0	RD	4,000.0	RD	Region
Ciro Marina	14.1		15.0	No		None	-	-	8,000.0	DI	Region
Civitanova Marche	37.2	43.0	7.0	Yes	1975	Primary	30,800.0	DI	5,000.0	DI	Region
Civitavecchia	51.2		60.0								B
Crotone	59.0	41.6	38.4	Yes	1970	Secondary	10,000.0	DI	9,000.0	DI	Region
Ercolano**	61.2	61.2		**		Secondary	-	-	-	DI	Region
Falconara Maritima	30.1	65.0		Yes	1987	Secondary	25,500.0	CH	-	-	Region

Remarks: * Plant out of service
** Connected to Napoli Plant

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ITALY (3)**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Fano	54.0	48.6	5.4	Yes	1980	Primary	12,000.0	DI	1,200.0	DI	Region
Finale Ligure*	12.7	25.0		*		Secondary	-	-	-	-	B
Follonica	21.4		21.4								B
Forio (Ischia)	11.5		15.0	No		None	-	-	4,000.0	SO	Region
Formia	35.0	60.0	10.0	Yes	1997	Secondary	18,000.0	SO	3,000.0	DI	Local authority
Forte dei Marmi	9.5		9.5			-	-	-	-	-	B
Franravilla al mare	21.7	44.0	6.0	Yes	1974	Secondary	16,000.0	SO	2,000.0	DI	Region
Gaeta	22.3		40.0	No		None	-	-	6,000.0	DI	Local authority
Gallipoli	20.0		35.0	No		None	-	-	-	-	B
Gela	73.0		73.0	No		None	-	-	-	-	B
Genova	679.0	679.0		Yes	1980	Secondary	175,000.0	SO	-	-	B
Gioia Tauro	18.5		18.5	No		None	-	-	-	-	B
Giovinazzo	21.0	12.0	11.0	Yes	1970	Secondary	5,000.0	DI	5,000.0	-	Local body
Giulianova	22.0	38.0	7.0	Yes	1970	Secondary	12,000.0	RD	2,000.0	RD	Region
Grado	9.1	9.9	2.1	Yes	1982/86	Primary	20,000.0	SO	3,000.0	DI	Region
Grottamare	12.8	12.8		Yes	1987	Secondary	9,000.0	CH	-	-	Region
Iesolo	22.2	153.0	32.0	Yes	1970	Secondary	50,000.0	RD	10,000.0	RD	Region
Imperia	40.7		40.7								B
Ischia Island	16.0	59.0	75.0	Yes	1986	Primary	12,000.0	-	15,000.0	SO	Region
La Maddalena (Sardinia)	11.0		15.0	No		None	-	-	10,000.0	SO	Min. Env.
La Spezia	110.0	42.0	68.0	Yes	1980	Secondary	7,400.0	-	12,000.0	DI	B
Ladispoli	19.3		30.0								B
Lavagna	13.4	20.0	6.0	Yes	1980	Primary	7,200.0	SO	2,000.0	DI	Province

Remarks: * Connected to Savona Plant

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ITALY (4)

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Lerici**	12.2			**		Secondary	-	-	-	-	B
Licata (Sicily)	41.3		41.3	No		None	-	-	20,000.0	DI	Region
Lipari (Lipari Islands)	10.3	15.0	30.0	Yes	1980	Primary	3,000.0	DI	3,000.0	DI	Region
Livorno	167.0	154.0	13.0	Yes	1984	Secondary	30,800.0	-	3,000.0	DI	B
Loano***	11.2	20.0		***		Secondary	-	-	-	-	B
Locri	12.7		12.7	No		None	-	-	-	-	B
Malfas (Lipari Islands)	0.9		0.9	No		None	-	-	-	-	B
Manfredonia	58.0		58.0	No		None	-	-	-	-	B
Margherita di Savoia	12.4		12.4	No		None	-	-	13,000.0	DI	Region
Marsala (Sicily)	80.2	25.0	56.2	Yes	1980	Primary	5,000.0	DI	20,000.0	DI	Region
Massa Lubrense	12.0		15.0	No		None	-	-	12,000.0	SO	Region
Mazara del Vallo, (Sicily)	47.8	15.0	32.8	Yes	1980	Primary	3,500.0	DI	8,000.0	DI	Region
Messina, Sicily	231.7	43.4	188.3	Yes	1970/80	Unknown	17,280.0	DI	75,000.0	DI	Region
Milazzo, Sicily	32.0	32.0		Yes		Primary	-	NA	-	-	B
Mola di Bari	25.8	15.0	10.8	Yes	1989	Secondary	6,000.0	DI	7,000.0	-	Local body
Molfetta	66.8	30.0	36.8	Yes	1990	Tertiary	12,500.0	DI	18,000.0	-	Local body
Mondragone	22.2		22.2	No		None	-	-	7,500.0	DI	Region
Monopoli	46.7	25.0	21.7	Yes	1987/88	Tertiary	7,700.0	DI	19,000.0	-	Local body
Monte di Procida*	12.5	12.5		*		Secondary	-	-	-	-	Region
Muggia	13.2	13.2		Yes	1997	Tertiary	15,000.0	SO	-	-	B
Napoli West	1,067.4	1,448.8		Yes	1986	Secondary	361,324.0	SO	100,000.0	SO	Region
Napoli East****		1,750.0		Yes	1986	Secondary	-	SO	397,440.0	SO	Region
Nettuno	33.8		50.0								B
Olbia, Sardinia	41.0		41.0	No		None	-	-	10,000.0	RB	Min. Env.
Remarks: * Connected to Napoli Plant ** Connected to La Spezia Plant *** Connected to Savona Plant **** Plant not operating											

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ITALY (5)

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Orbetello	15.0		25.0	No		None	-	-	-	-	B
Ortona	22.6	28.0	9.0	Yes	1974	Secondary	8,500.0	RD	2,500.0	RD	Region
Otranto	5.2	2.3	7.7	Yes	1981	Secondary	1,700.0	DI	4,000.0	DI	B
Pachino, (Sicily)*	21.4		21.4	*		Unknown	-	-	30,000.0	DI	Region
Palermo (Sicily)	698.6	90.0	608.6	Yes	1996	Secondary	18,000.0	DI	122,000.0	DI	Region
Palmi	19.1		19.1	No		None	-	-	-	-	B
Paola	17.1		17.1			-	-	-	-	-	B
Patti (Sicily)	13.0		10.0	No		None	-	-	-	-	B
Pesaro	88.7	79.0	9.7	Yes	1971	Primary	20,000.0	DI	2,300.0	DI	Region
Pescara	122.2	80.0	42.0	Yes	1970	Tertiary	20,000.0	RD	12,000.0	RD	Region
Pietra Ligure**	9.6		15.0	**		Secondary	-	-	-	-	B
Pietrasanta	25.0		25.0						-		B
Pineto	12.0	78.0		Yes	1970	Secondary	25,000.0	RD	5,000.0	RD	Region
Piombino	36.8		36.8			-	-	-	-	-	B
Polignano a Mare	15.8	5.0	10.8	Yes	1980	Tertiary	2,700.0	DI	6,000.0	DI	Region
Portici***	69.0	75.0		***		Secondary	-	-	-	-	Region
Porto Empedocle, (Sicily)	17.0		17.0	No		None	-	-	-	-	Region
Porto San Giorgio	16.0	16.0		Yes	1970	Secondary	-	CH	-	-	Region
Portoferraio (Elba)	11.0		11.0								Region
Pozzallo (Sicily)	17.2	13.0	4.2	Yes	1960	Primary	3,500.0	DI	1,000.0	DI	Region
Pozzuoli***	75.1	80.0		***		Secondary	-	-	-	-	B
Priolo, (Sicily)	11.5	68.0	12.0	Yes	1980	Secondary	30,000.0	SO	5,000.0	DI	Min. Env.
Procida	10.6	6.6	4.0	Yes	1986	Primary	1,641.0	SO	1,000.0	DI	Region

Remarks: * Temporarily out of service
** Connected to Savona Plant
*** Connected to Napoli Plant

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ITALY (6)

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Quartu Sant'Elena (Sardinia)*	61.6	61.6		*		Secondary	-	-	-	-	B
Rapallo	27.4	49.0	5.0	Yes	1980	Primary	10,720.0	SO	1,000.0	DI	Province
Ravenna	135.0	135.0		Yes	1983	Tertiary	37,182.0	DI	-	-	B
Recco	10.1	14.0	6.0	Yes	1980	Primary	3,800.0	SO	1,500.0	DI	Province
Reggio Calabria	177.6		177.6	No		None	-	-	-	-	B
Riccione	32.9		32.9								B
Rimini	128.0		128.0								B
Riposto (Sicily)	14.0		15.0	No		None	-	-	7,000.0	DI	B
Roseto degli Abruzzi**	21.1	25.0		**		Secondary	-	-	-	-	B
Rosignano Marittimo	30.0		30.0								B
Sabaudia	14.2		29.0	No		None	-	-	5,000.0	DI	Region
Salerno	148.9		148.9	No		None				SO	Region
San Benedetto del Tronto	42.6	45.0		Yes	1977	Secondary	45,000.0	CH	-	-	Region
San Remo	56.0		56.0								B
Sant' Antioco (Sardinia)	12.3		12.3	No		None	-	-	3,000.0	DI	Region
Santa Agata di Militello	12.8	9.6	3.2	Yes	1980	Primary	2,800.0	DI	1,500.0	DI	Region
Santa Margherita Ligure	11.0	14.7	8.3	Yes	1980	Primary	5,300.0	SO	3,000.0	SO	Province
Santa Marinella	11.8		15.0								B
Savona	73.0	327.0	63.0	Yes	1990	Secondary	52,000.0	DI	10,000.0	DI	Region
Sciacca (Sicily)	38.3		38.3	No		None	-	-	17,000.0	DI	Region
Senigallia	41.1	41.1		Yes	1974	Secondary	30,000.0	CH	-	-	Region
Sestri Levante	20.4	26.0	14.0	Yes	1980	Primary	8,000.0	SO	4,000.0	DI	Province
Siderno Marina	16.2		16.2	No		None	-	-	-	-	B

Remarks: * Connected to Cagliari Plant
** Connected to Pineto Plant

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: ITALY (7)**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Silvi*	12.7	15.0		*		Unknown	25,000.0	RD	-	-	Region
Siracusa, (Sicily)	126.0	80.0	80.0	Yes	1980	Secondary	160,000.0	DI	160,000.0	DI	Min. Env.
Sorrento	16.5		20.0	No		None	-	-	15,000.0	SO	Region
Soverato	10.4	4.6	5.8	Yes	1986	Primary	2,400.0	DI	3,000.0	DI	Region
Taormina (Sicily)	10.1		10.1	No		None	-	-	5,500.0	DI	Region
Taranto**	232.3	320.0		Yes	1978/90	Unknown	85,000.0	-	-	DI	Region
Termini Imerese (Sicily)	26.5	9.5	17.0	Yes	1980	Primary	3,000.0	DI	6,500.0	DI	Region
Termoli	28.5	42.5	7.5	Yes	1980	Secondary	17,500.0	CH	2,500.0	DI	Region
Terracina	37.0	20.0	17.0	Yes	1980	Secondary	5,000.0	DI	5,000.0	DI	Private
Torre Annunziata	52.9		60.0	No		None	-	-	28,000.0	DI	Region
Torre del Greco	101.4		150.0	No		None	-	-	49,000.0	SO	Region
Trani	50.4	30.0	20.4	Yes	1983/90	Tertiary	8,200.0	DI	20,000.0	DI	Local body
Trapani (Sicily)	69.5		75.0	No		None	-	-	20,000.0	DI	Region
Trieste	223.0	173.0	100.0	Yes		Secondary	155,000.0	SO	45,000.0	DI	B
Vado Savona	144.0	133.0	11.0	Yes	1990	Secondary	52,000.0	SO	-	-	B
Varazze	14.2	10.0	4.2	Yes	1980	Primary	11,220.0	SO	2,200.0	SO	Region
Vasto	32.9	19.0	14.0	Yes	1982	Secondary	7,000.0	RD	5,000.0	RD	Region
Venezia	337.0	290.0		Yes	1980	Tertiary	130,000.0	DI	-	-	B
Ventimiglia	25.3		25.3								B
Viareggio	57.5		57.5								B
Vico Equense	19.0		20.0	No		None	-	-	10,000.0	SO	Region
Vieste	13.3	10.0	13.3	Yes	1978	Secondary	4,000.0	DI	9,000.0	DI	Local body
Vietri sul Mare	9.4		15.0	No		None	-	-	-	SO	Region
Villa San Giovanni	13.0		13.0	No		None	-	-	-	-	B
Villabate (Sicily)	14.9		15.0	No		None	-	-	6,000.0	DI	Region

Remarks: * Connected to Montesilvano Plant
** Plant does not operate efficiently

Note: The following tables were prepared in Italy using the same data and format obtained from the National Institute of Statistics of Italy

WASTEWATER TREATMENT - SERVED MUNICIPALITIES AND SERVED POPULATION EQUIVALENT

Region	Permanent Population	Served Municip.	Municipal. No Inform.	No. of Connected Houses	S.P.E.*	Age of Plants (Years in %)		
						0 - 10	10 - 20	>20
VENETO	4,415,309	73.4	26.6	1,030,176	5,409,191	43	53	4
FRIULI, VENEZIA, GIULIA	1,193,217	73.1	26.9	355,899	1,471,812	38	62	-
LIGURIA	1,662,658	72.3	27.7	636,482	2,090,162	66	30	4
EMILIA ROMAGNA	3,924,348	88.3	11.7	1,318,851	5,708,175	55	44	1
TOSCANA	3,528,225	75.3	24.7	1,068,063	6,258,307	47	49	4
MARCHE	1,438,223	72.8	27.2	424,781	1,204,027	64	35	1
LAZIO	5,185,316	70.3	29.7	1,529,168	4,011,793	38	52	10
ABRUZZO	1,262,948	56.1	43.9	364,840	896,472	57	42	1
MOLISE	331,990	65.4	34.6	98,945	189,284	63	37	-
CAMPANIA	5,708,657	60.3	39.7	1,357,790	5,380,499	54	42	4
PUGLIA	4,065,603	78.6	31.4	984,592	5,320,666	32	66	2
BASILICATA	611,155	72.5	27.5	176,239	422,542	52	48	-
CALABRIA	2,079,588	53.3	46.7	555,281	1,535,440	57	37	6
SICILIA	5,025,280	62.3	37.7	1,411,618	2,088,044	47	50	3
SARDEGNA	1,657,375	74.4	25.6	464,417	1,224,940	55	41	4
Totale	42,089,892			11,777,144	43,204,354			

* Served Population Equivalent, including seasonal fluctuation

WASTEWATER TREATMENT PLANTS AND SERVED POPULATION EQUIVALENT IN ITALIAN COASTAL REGIONS

RUNNING TREATMENT PLANTS TOTAL OF WHICH DISCHARGING INTO

REGION	COASTAL		MUNICIPALITIES		SEA		RIVERS		LAKES		OTHERS		UNDER CONSTRUCTION ^o		
	Type of Treatment	No. of Plants	SPE*	No. of Plants	SPE*	No. of Plants	SPE*	No. of Plants	SPE*	No. of Plants	SPE*	No. of Plants	SPE*	No. of Plants	Of which in coastal municipalities
VENETO	I	317	105,157	8	3,065	-	-	274	94,496	-	-	43	10,661	15	
	II	372	2,026,924	38	298,030	2	111,000	293	1,831,679	9	14,060	68	70,185	9	
	III	36	3,277,110	10	875,573	1	10,000	30	2,501,260	-	-	5	765,850	4	
	Sub-tot	725	5,409,191	56	1,176,678	3	121,000	597	4,427,435	9	14,060	116	846,696	28	4
FRIULI VENEZIA GIULIA	I	269	334,713	9	270,901	7	268,117	198	39,640	9	701	55	26,255	9	
	II	197	857,230	8	366,940	2	354,000	144	420,229	3	1,450	48	81,551	10	
LIGURIA	III	7	279,869	3	28,150	3	130,810	3	147,500	-	-	1	1,559	1	
	Sub-tot	473	1,471,812	20	665,991	12	752,927	345	607,369	12	2,151	104	109,365	20	4
EMILIA ROMAGNA	I	243	212,584	79	180,356	5	169,160	213	40,027	1	90	24	3,307	18	
	II	139	1,069,621	74	929,900	14	677,234	118	390,577	-	-	7	1,810	12	
	III	8	807,957	2	447,167	2	447,167	6	360,790	-	-	-	-	1	
	Sub-tot	390	2,090,162	155	1,557,423	21	1,293,561	337	791,394	1	90	31	5,117	31	9
TOSCANA	I	650	124,334	3	2,050	-	-	597	117,703	2	300	51	6,331	8	
	II	413	2,347,539	16	123,100	-	-	382	2,186,764	1	800	30	159,975	19	
	III	72	3,236,302	13	1,304,300	-	-	63	3,152,964	-	-	9	83,338	6	
Sub-tot	1,135	5,708,175	32	1,429,450	-	-	1,042	5,457,431	3	1,100	90	249,644	33	1	
MARCHE	I	140	93,553	17	73,674	4	53,939	70	32,352	1	275	65	6,987	9	
	II	337	2,262,740	60	567,904	9	316,467	297	1,909,523	1	5,800	30	30,950	25	
	III	36	3,902,014	12	262,676	1	82,376	33	3,817,138	2	2,500	-	-	12	
	Sub-tot	513	6,258,307	89	904,254	14	452,782	400	5,759,013	4	8,575	95	37,937	46	5
LAZIO	I	159	32,529	-	-	-	-	99	21,625	-	-	60	10,904	13	
	II	210	681,920	36	375,990	1	12,700	196	663,446	1	700	12	5,074	11	
	III	17	489,578	9	440,378	-	-	17	489,578	-	-	-	-	3	
	Sub-tot	386	1,204,027	45	816,368	1	12,700	312	1,174,649	1	700	72	15,978	27	2
ABRUZZO	I	55	34,989	3	15,500	2	15,100	48	16,611	3	1,778	2	1,500	1	
	II	246	2,202,797	45	1,646,320	5	27,770	226	2,152,117	3	2,100	12	20,810	39	
	III	38	1,774,007	15	1,677,700	5	197,000	31	1,513,507	1	26,000	1	37,500	21	
	Sub-tot	339	4,011,793	63	3,339,520	12	239,870	305	3,682,235	7	29,878	15	59,810	61	6
MOLISE	I	149	28,245	9	1,085	-	-	133	23,570	-	-	16	4,675	17	
	II	148	599,697	41	311,989	2	750	133	587,820	-	-	13	11,127	35	
	III	6	268,530	2	250,000	-	-	6	268,530	-	-	-	-	3	
	Sub-tot	303	896,472	52	563,074	2	750	272	879,920	-	-	29	15,802	55	3
MOLISE	I	26	3,740	-	-	-	-	19	2,216	-	-	7	1,524	1	
	II	47	161,244	2	10,138	-	-	41	154,270	1	2,775	5	4,199	42	
	III	4	24,300	1	3,000	-	-	1	4,000	-	-	3	20,300	5	
Sub-tot	77	189,284	3	13,138	-	-	61	160,486	1	2,775	15	26,023	48	-	

* Served Population Equivalent, including seasonal fluctuation

^o Plants in realization or let out on contract

**RUNNING TREATMENT PLANTS
TOTAL OF WHICH DISCHARGING INTO**

REGION	Type of Treatment	COASTAL		MUNICIPALITIES		SEA		RIVERS		LAKES		OTHERS		UNDER CONSTRUCTION ^o	
		No. of Plants	SPE*	No. of Plants	SPE*	No. of Plants	SPE*	No. of Plants	SPE*	No. of Plants	SPE*	No. of Plants	SPE*	No. of Plants	Of which in coastal municipalities
CAMPANIA	I	26	634,932	3	615,800	3	615,800	23	19,132	-	-	-	-	7	
	II	167	4,736,982	39	2,405,561	15	1,174,563	147	2,410,344	3	1,143,675	2	8,400	33	
	III	9	8,585	1	300	1	300	8	8,285	-	-	-	-	9	
	Sub-tot	202	5,380,499	43	3,021,661	19	1,790,663	178	2,437,761	3	1,143,675	2	8,400	49	8
PUGLIA	I	28	352,077	6	92,783	1	23,000	12	130,477	-	-	15	198,600	-	
	II	111	4,441,789	47	3,039,485	15	2,339,993	66	1,559,968	-	-	30	541,828	2	
	III	30	526,800	14	246,180	3	102,695	15	294,700	1	15,000	11	114,405	3	
	Sub-tot	169	5,320,666	67	3,378,448	19	2,465,688	93	1,985,145	1	15,000	56	854,833	5	5
BASILICATA	I	8	24,084	1	650	-	-	6	6,830	-	-	2	17,254	1	
	II	38	271,306	10	45,640	1	1,000	30	227,506	6	29,529	1	13,271	9	
	III	20	127,152	3	6,600	-	-	19	122,921	1	4,231	-	-	6	
	Sub-tot	66	422,542	14	52,890	1	1,000	55	357,257	7	33,760	3	30,525	16	3
CALABRIA	I	41	58,301	7	39,052	1	30,500	35	26,400	-	-	5	1,401	4	
	II	113	1,392,340	70	1,127,196	14	399,483	80	888,364	1	50,000	18	54,493	32	
	III	5	84,799	4	84,199	-	-	4	84,199	-	-	1	600	1	
	Sub-tot	159	1,535,440	81	1,250,447	15	429,983	119	998,963	1	50,000	24	56,494	37	12
SICILIA	I	17	74,091	10	65,294	7	63,114	10	10,977	-	-	-	-	1	
	II	126	1,836,678	55	1,484,318	16	963,560	89	796,306	3	13,701	18	63,111	35	
	III	6	170,275	4	99,375	-	-	5	156,775	-	-	1	13,500	5	
	Sub-tot	149	2,081,044	69	1,648,987	23	1,026,674	104	964,058	3	13,701	19	76,611	41	13
SARDEGNA	I	32	33,029	3	1,901	-	-	26	22,324	4	9,750	2	955	7	
	II	236	793,811	68	321,513	12	93,881	197	607,268	4	35,951	23	56,711	16	
	III	20	398,100	9	291,530	3	52,250	15	344,670	-	-	2	1,180	10	
	Sub-tot	288	1,224,940	80	614,944	15	146,131	238	974,262	8	45,701	27	58,846	33	11
TOTAL	5,374	43,204,354	869	20,433,273	157	8,733,729	4,458	30,657,378	61	1,361,166	698	2,452,081	530	86	

* Served Population Equivalent, including seasonal fluctuation

^o Plants in realization or let out on contract

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: LEBANON**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Batroun	51.0		51.0	No		-	-	-	6,120.0	SS	B
Beirut Greater Area	1,200.0	720.0	880.0	Yes		Primary	87,000.0	SO	105,000.0	SS	B
Jounieh	200.0		200.0	No		-	-	-	2,400.0	SS	B
Jubayl, (Jbail), (Byblos)	66.0		66.0	No		-	-	-	7,920.0	SS	B
Saida - Ghaziye (Sidon)	205.0		205.0	No		-	-	-	24,600.0	DI	B
Sour (Sur or Tyre)	181.0		181.0	No		-	-	-	21,720.0	SS	B
Tripoli - (Tarabalus)	353.0		353.0	No		-	-	-	42,360.0	-	B

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: LIBYA**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Al Bayda	120.0	60.0		Yes	1980	Tertiary	7,000.0	RB	-	-	D1
Al-Brega	75.0	23.0		Yes	1990	Tertiary	3,500.0	-	-	-	C1
Al Khums	350.0	40.0		Yes	1987	Tertiary	8,000.0	RB		-	D1
Al Qarabulli (Garabulli)	80.0			No	-	-	-	-	-	-	D1
Az Zawiyah	280.0	66.0		Yes	1987	Tertiary	13,200.0	RB		-	D1
Benghazi	750.0	300.0		Yes	1975	Tertiary	70,000.0	RE	14,000.0	-	B
Darnah	105.0	47.3		Yes	1987	Tertiary	20,000.0	RB	-	-	B
Ejdabia	85.0	75.0		Yes		Tertiary	15,000.0	RB	2,000.0	-	C1
Misratah	178.0	55.0		Yes		Tertiary	25,360.0	-	-	-	D1
Sabratah	40.0	35.0		Under Maintenance		-	6,000.0	-	-	-	C1
Sirt	327.0	35.0		Yes		-	27,600.0	-	-	-	D1
Surman	39.0		39.0	Yes	Under Construction		21,000.0	-	-	-	C1
Tripoli	1,200.0	960.0		Yes	1982	Tertiary	110,000.0	RE	34,000.0	SS + DI	B
Tubruck	95.0	90.0		Yes	1985	Secondary	33,000.0	RB	-	-	C1 + D1
Zanzour	69.0	40.0		No	-				-	-	C1 + D1
Zlitan	101.0	26.0		Yes	1987	Secondary	6,000.0	RB	-	-	D1
Zuwarah	168.0	20.0		Yes	1987	Secondary	12,000.0	RB	-	-	D1

C1 - Data reported by the MED POL Coordinator (source: Dir. of Environment Protection and Drainage Departments)

D1 - Additional comments made by the MED POL National Coordinator (source: Ministry of Housing and Utilities)

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: MALTA**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
B'Kara*	21.5	21.5		Yes	1983	Tertiary	*(17,000)	RB	-	-	C1
Fgura	11.4		11.4	No		-	-	-	**(75,000.0)	SO	C1
Gozzo	26.0		26.0	No		-	-	-	**(75,000.0)	SO	B
Gzira/Ta'Xbiex	10.5		10.5	No		-	-	-	**(75,000.0)	SO	C1
Hamrun*	13.7	13.7		Yes	1983	Tertiary	*(17,000)	RB	-	-	C1
Mosta*	17.4	17.4		Yes	1983	Tertiary	*(17,000)	RB	-	-	C1
Paola*	11.9	11.9		Yes	1983	Tertiary	*(17,000)	RB	-	-	C1
Qormi*	18.4	18.4		Yes	1983	Tertiary	*(17,000)	RB	-	-	C1
Rabat*	13.2	13.2		Yes	1983	Tertiary	*(17,000)	RB	-	-	C1
S Gwann*	12.2	12.2		Yes	1983	Tertiary	*(17,000)	RB	-	-	C1
Sliema	12.3		12.3	No		-	-	-	**(75,000.0)	SO	C1
St. Julian's	10.3		10.3	No		-	-	-	**(75,000.0)	SO	C1
Zabbar	13.7		13.7	No		-	-	-	**(75,000.0)	SO	C1
Zejtun	11.3		11.3	No		-	-	-	**(75,000.0)	SO	C1
Zebbug*	10.1	10.1		Yes	1983	Tertiary	*(17,000)	RB	-	-	C1

Remarks: * All these cities are served by the same wastewater treatment plant which commenced operation in 1983 and treats about 17,000 cu.mt of wastewater per day
** Cities served by different sewerage networks discharging a total of 75,000 cu.mt of wastewater per day through submarine outfalls. Two in Malta: Ic-Cumnija and Wied Ghammieg, and one at Ras il-Hobz on Gozo Island

C1 - Data reported by the MED POL Coordinator (source: Dir. of Environment Protection and Drainage Departments)

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: MONACO**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Total for Monaco*	30.0	70.0		Yes	1987	Secondary	18,500.0	SO	0.0	0.0	C1 + E
Remarks: * The plant also treats wastewater from nearby coastal areas of France containing 40,000 inhabitants											

C1 - Data reported by the MED POL National Coordinator (source: Dir. of Environment Protection and Drainage Departments)

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: MOROCCO**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Al-Hoceima	122.0		46.0	Yes		Tertiary	8,400.0	-	-	-	B + E1
Nador	269.0	73.0	86.0	Yes	1978/91	Tertiary	10,000.0	DI	-	-	B + E1
Tanger	425.0		323.0	Yes	Under Construction		-	-	33,123.0	DI	B + E1
Tetouan	404.0		214.0	Yes	Under Construction		-	-	27,996.0	DI	B + E1

E1 - Additional comments made after the meeting of MED POL National Coordinators in Reggio Calabria (June 1999). Source: Secr. d'Etat Chargé de l'Environnement

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: SLOVENIA**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Izola	13.0		12.0	No		-	-	-	4,990.0	SS	E
Koper	46.0	25.0	21.0	Yes	1992	Primary	12,700.0 *	DI/River	2,600.0	DI + SS	E
Piran	17.0	15.0	2.0	Yes	1986/92	Primary	10,300.0**	SO	600.0	-	E
Remarks: * <i>Direct measurement</i> ** <i>Estimated on the basis of the pumps operation time</i>											

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: SPAIN (1)**

City	Permanent Population (in 000)	Population Equivalent (in 000)	Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
Adra	15.0	25.5	Yes		Pretreatment		SO			C1 + E1
Aguilas	24.8	68.5	Yes		Secondary					C1 + E1
Algeciras	100.6	175.0	No	-	None	-	-	-	-	C1 + E1
Alicante (including Campello)	336.4	735.0	Yes (2)		Secondary (2)					C1 + E1
Almazora	15.3	67.5	Yes		Secondary					C1 + E1
Almeria	147.0	389.5	Yes		Secondary					C1 + E1
Almunecar	15.2	39.0	Under Construction		Secondary					C1 + E1
Altea	28.3	41.0	Yes		Secondary					C1 + E1
Arenis de Mar (incl. Canet de Mar)	24.1	48.0	Under Construction		Secondary					C1 + E1
Barcelona	755.6	1,354.0	No		None		-			C1 + E1
Benalmadena	24.6	237.0	Yes		Secondary		SO			A + C1 + E1
Benicarlo	18.5	70.0	Yes		Pretreatment		SO			C1 + E1
Benidorm	92.8	340.0	Yes (2)		Secondary (2)					C1 + E1
Blanes	25.3	62.0	Under Construction		Secondary					C1 + E1
Burriana	25.4	46.0	Yes		Secondary					C1 + E1
Calpe	10.9	50.0	Yes		Secondary					C1 + E1
Calvia (Municipio)	37.2	136.0	Yes (5)		Tert. 3, Sec. 2					C1 + E1
Cambrils	12.4	29.0	Yes		Secondary					C1 + E1
Cartagena	146.6	200.0	Yes		Secondary					C1 + E1
Castell - Playa de Aro	21.4	60.5	Yes		Secondary					C1 + E1
Castellon de la Plana	138.5	350.0	Yes		Secondary					C1 + E1
Ceuta	68.8	143.0	No		None					C1 + E1
Ciudadela (Menorca)	17.8	94.0	Yes (2)		Secondary (2)		SO			A + C1 + E1
Ciudadela (Municipio)	20.7	99.0	Yes (2)		Secondary (2)					E1
Cullera	20.0	120.0	Yes		Secondary					E1
Deltebre	9.9	12.5	No		None					E1
Denia	35.5	77.5	Yes		Secondary					E1

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: SPAIN (2)

City	Permanent Population (in 000)	Population Equivalent (in 000)	Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
Eivissa (Ibiza)	29.2	63.5	Yes		Secondary		SO			A + E1
El Vendrell	13.6	28.0	Under Construction		Secondary		SO			A + E1
Estepona	35.6	49.0	Yes		Secondary		SO			A + E1
Fuengirola	43.0	129.6	Yes		Secondary		SO			A + E1
Gandia	76.9	280.0	Yes		Secondary			-		E1
Javea	16.6	45.0	Yes		Secondary					A + E1
La Linea de la Concepcion	57.6	94.0	Under Construction		Primary		SO			A + E1
Lloret de Mar	21.6	77.0	Yes		Secondary					E1
Mahon (Menorca)	23.5	56.0	Yes		Primary					E1
Malaga	560.6	800.0	Under Construction		Secondary		SO			E1
Marbella	84.2	137.0	Yes		Secondary		SO			A + E1
Masnou - Premia del Mar	48.2	83.0	Yes		Secondary					E1
Mataro (incl. Vilassar de Mar)	130.0	212.0	Yes		Secondary		SO			A + E1
Melilla	59.6	124.0	Yes		Secondary					E1
Motril - Salobrena	46.2	67.0	Under Construction		Secondary					E1
Nerja	13.3	39.0	No		None					E1
Nules	11.5	40.0	Yes		Secondary					E1
Oliva	20.3	23.6	Yes		Secondary					E1
Palamos (incl. Parafrugell)	27.3	59.5	Yes		Secondary					E1
Palmas de Mallorca	278.2	478.0	Yes		Tertiary					E1
Pineda (incl. Malgrat de Mar y Calella)	35.6	100.0	Under Construction		Secondary					E1
Pollenca	10.1	32.0	Yes		Tertiary					E1
Prat de Llobegat	64.1	91.5	No		None					E1
Pucol	60.4	100.0	Yes		Primary*					E1

Remarks: * Physical-chemical treatment

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: SPAIN (3)**

City	Permanent Population (in 000)	Population Equivalent (in 000)	Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
Roquetas de Mar	12.1	19.0	Yes		Pre-treatment		SO			E1
Sagunto (El Puerto de)	58.3	105.0	Yes		Secondary					E1
San Adrian del Besos*	1,317.1	2,182.0	Yes		Primary					E1
San Carlos de la Rapital	10.5	22.0	Yes		Tertiary					E1
Santa Eulalia del Rio	3.6	24.5	Yes		Secondary		SO			A + E1
San Javier	14.5	70.0	Yes		Secondary					E1
San Pedro del Pinatar	11.8	30.0	Yes		Secondary		SO			A + E1
San Pere de Ribes - Sitges	17.8	55.5	Under Construction		Secondary		SO			A + E1
Santa Pola	15.4	125.0	Yes		Secondary					E1
Tabernes de la V.	16.0	32.0	Yes		Secondary					E1
Tarifa	11.1	20.0	No		None					E1
Tarragona	99.0	163.0	Yes		Secondary					E1
Torreveja	25.9	200.0	Yes		Secondary					E1
Torrox	8.5	15.0	No		None					E1
Valencia	987.6	1,500.0	Yes (2)		Prim. 1, Sec. 1					E1
Velez - Malaga	29.2	53.0	No		None					E1
Viladecans (incl. Castellfedels)	192.7	258.0	Yes		Secondary		SO			A + E1
Vilanova y la Geltru	45.9	87.0	Yes		Secondary		SO			A + E1
Vilaseca y Salou	17.6	86.0	Yes		Secondary					E1
Villajoyosa	13.7	60.0	Yes		Secondary					E1
Vinaroz	19.9	60.0	Yes		Pre-treatment		SO			E1
Remarks: * Includes parts of Barcelona, Badalona and Santa Coloma										

C1 - Data reported by the MED POL Coordinator (source: Ministry of Environment)

E1 - Additional comments made after the meeting of MED POL National Coordinators in Reggio Calabria (June 1999). Source: source: Ministry of Environment

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: SYRIA**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Banias	143.0		143.0	No		None	-	-			E
Hwaez, Burg Islam	10.0		10.0	No		None	-	-	194.0		A + E
Jableh	167.0		167.0	No		None	-	-	25,017.0	SS	B + E
Karfis, Senao	13.0		13.0	No		None	-	-	44.0		A + E
Lattakia	746.0		500.0	No		None	-	-	112,028.0	SS	B + E
Maltan al Sahel	10.0		2.0	No		None	-	-	972.0	-	A + E
Tartous	319.0		164.0	No		None	-	-	47,873.0	SS	B + E

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: TUNISIA (1)**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network*								
Bizerte	103.0	32.0	71.0	Yes	1997	Secondary	1,597.0				E1
Gabes	209.0	94.0		Yes	1995	Secondary	10,003.0				E1
Ghar El Melh	5.0		5.0	No		None					E1
Ghannouche	11.0			No		None					E1
Hammamet (SE1, SE2, Hammamet Sud)**	49.0	33.0		Yes	1980/87	Secondary	8,449.0				E1
Jerba (Houmt Souk, Tanit, Dar Jerba, Sidi Mehrez, Sidi Slim, Modulaire)	1120.0	40.0	80.0	Yes (6)	1971/1971 1972/1981/1995	Secondary Tertiary	11,753.0				E1
Kalaa El Anellus	13.0	8.0	5.0	Yes	1994	Tertiary	449.0				E1
Kelibia	34.0	30.0	4.0	Yes	1976	Secondary	3,204.0				E1
Korba	30.0			No		None					E1
Mahdia	153.0	78.0	75.0	Yes	1995	Secondary	3,360.0				E1
Mahres	13.0	5.0		Yes	1994	Secondary	590.0				E1
Menzel Bourguiba	66.0	56.0	10.0	Yes	1997	Secondary	3,838.0				E1
Menzel Temime	30.0			No		None					E1
Monastir (El Ghedir, Dkhila, Frina)**	54.0	87.0		Yes (3)	1962/1979/1995	Secondary	5,604.0				E1
Nabeul (SE3, SE4)**	52.0	110.0		Yes	1979/1981	Secondary	12,861.0				E1
Sahline	12.0	6.0	6.0	Yes	1993	Secondary	2,627.0				E1
Sayada	12.0	22.0		Yes	1993	Secondary	969.0				E1
Sfax	462.0	323.0	128.0	Yes	1983	Secondary	24,874.0				E1
Soliman	23.0	31.0		Yes	1983	Secondary	2,473.0				E1
Sousse (Nord, Sud)	357.0	278.0	79.0	Yes (2)	1978/1980	Secondary	29,158.0				E1
Tabarka	13.0	14.0		Yes	1993	Tertiary	2,493.0				E1
Tunis	(1,778.0)										E1

Remarks: * There is a programme to connect this part of the network with the treatment plants. (In some cases work is actually underway, while for others it is still under study).
** In addition to the water system of the city, plants are also connected to water systems of tourist or industrial areas (for which water consumption is more important). This is why the number related to population served (population equivalent) in the second column, is higher than that of the permanent population (that of the cities), which is shown in the first column.

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: TUNISIA (2)**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network*								
Tunis Centre (Charguia-Choutrana)	1268.0	991.0	257.0	Yes (2)	1958/1981	Secondary	126,905.0				E1
Tunis Nord (côtière nord)	144.0	111.0	33.0	Yes	1981	Tertiary	15,423.0				E1
Tunis Sud (Rades, Sud Méliane)**	366.0	421.0	45.0	Yes (2)	1976/1982	Secondary	36,088.0				E1
Zarzis (Souihel, Lella Mériam Zarzis Ville)	72.0	8.0	64.0	Yes (3)	1980/1982/1992	Secondary	1,158.0				E1
Remarks: * <i>There is a programme to connect this part of the network with the treatment plants. (In some cases work is actually underway, while for others it is still under study.</i> ** <i>In addition to the water system of the city, plants are also connected to water systems of tourist or industrial areas (for which water consumption is more important). This is why the number related to population served (population equivalent) in the second column, is higher than that of the permanent population (that of the cities), which is shown in the first column.</i>											

E1 - Additional comments made after the meeting of MED POL Coordinators in Reggio Calabria (June 1999). Source: National Agency for the Protection of the Environment (ANPA)

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: TURKEY (1)**

City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Alanya	110.0	57.0		Yes	1998	Primary	19,286.0	SO			A + E
Aliaga	32.3			No		None	-	-	-	-	E
Anamur	60.4			No		None	-	-	18,432.0	-	E
Antalya Main City	500.8		506.0	No		None	-	-	80,938.0	SO	B
Ayvalik	28.3		26.0	Yes	1984	Primary				SO	A + E
Beldibi*	3.2			Yes		Secondary	7,600.0				E
Bitez*	2.6			Yes	1997	Secondary	3,500.0				E
Bodrum	23.7	130.0		Yes	1993	Primary	31,450.0	SO			A + E
Burhaniye	27.1	21.8		Yes	1992	Primary	32,892.0	SO			E
Camyuva	3.2			Yes	1995	Secondary	11,800.0				E
Canakkale	62.5	77.0		Yes	1989	Primary	27,648.0	SO			A + E
Cesme	19.5	386.0		Yes		Primary	169,444.0				A
Dalaman	16.6										A
Dikli	11.6	40.0		Yes	1992	Primary	10,806.0	SO			A + E
Dortyol	55.1										E
Edremit	52.3			Yes	1996	Secondary	15,955.0				E
Erdemli	38.8		108.0	No		None	-	-	-	-	B
Fethiye	48.1	45.0		Yes	1989	Primary	17,971.0	SO			A + E
Finike	10.7										E
Gazipasa	15.5										E
Icmeler*	5.7			Yes	1997	Secondary	10,000.0				E
Iskenderun	166.2										E
Izmir	2,061.4		2,018.0	No		None			392,256.0		E
Kalkan*	1.9			Yes	1996	Secondary	4,000.0				E

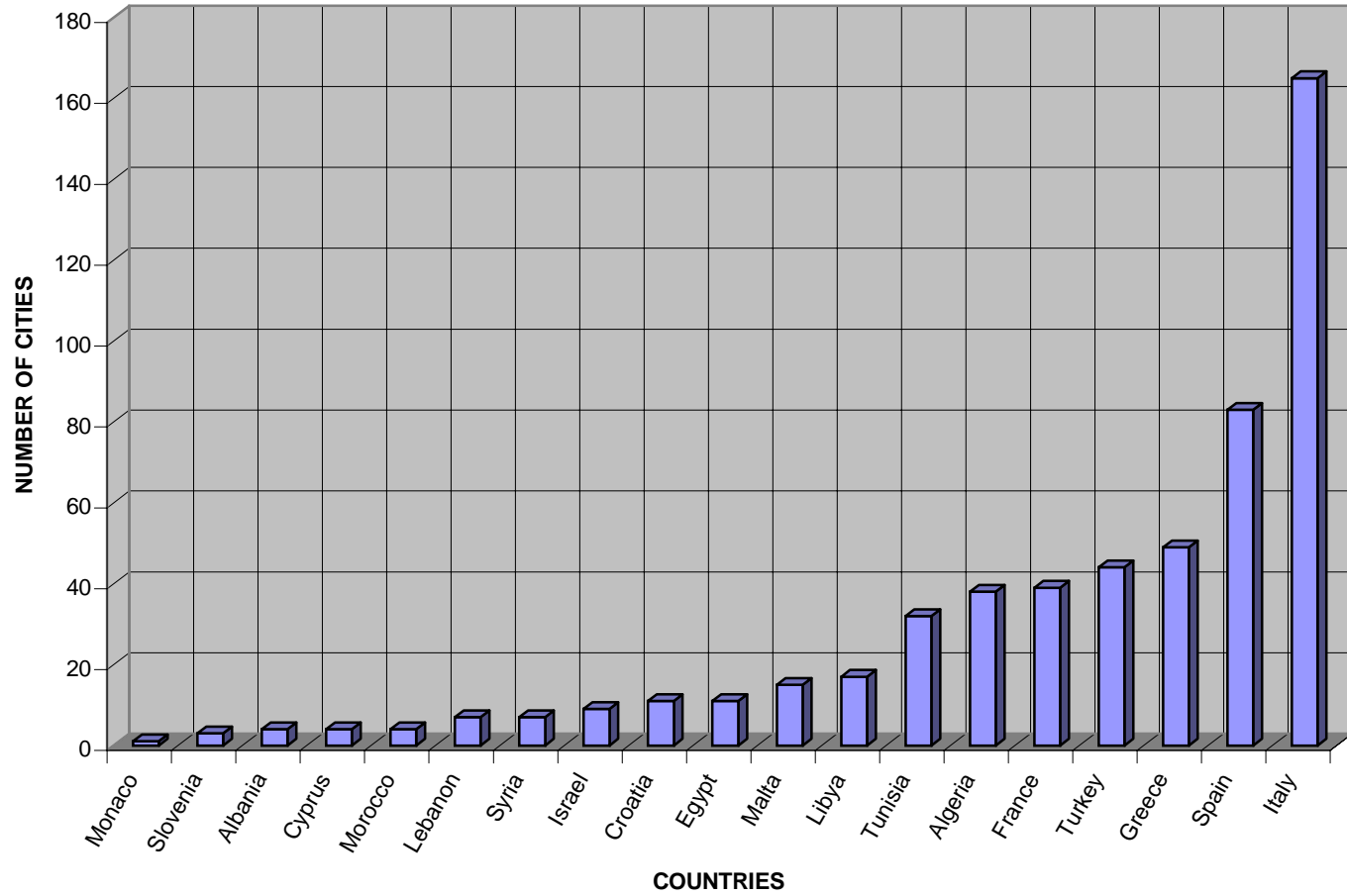
Remarks: * Included due to seasonal population increase

**MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN COASTAL CITIES WITH POPULATION OVER 10,000
Country: TURKEY (2)**

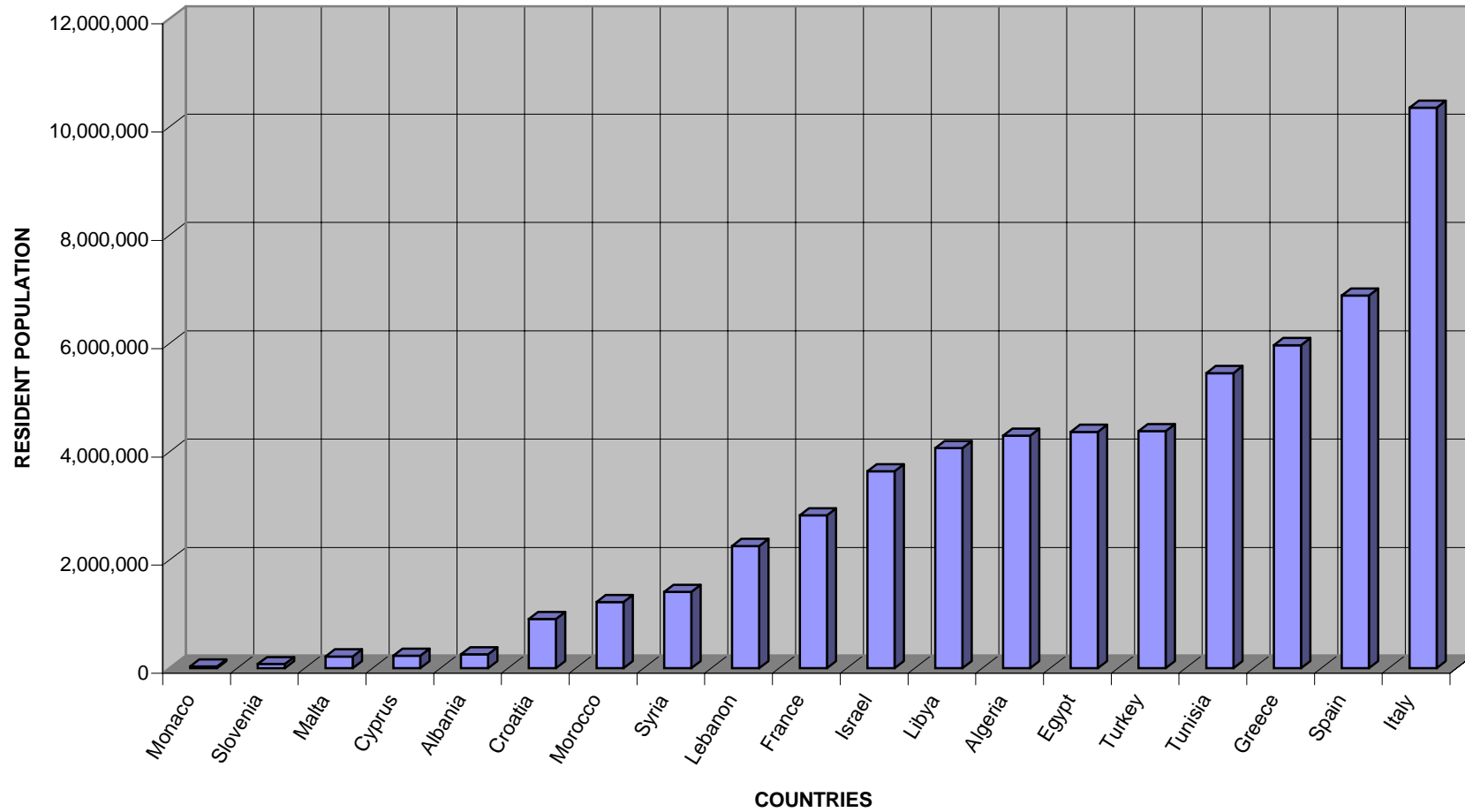
City	Permanent Population (in 000)	Population Served (in 000)		Wastewater Treatment Plant	Year of Construction	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Source of Information
		Plant+Network	Network								
Kemer*				Yes	1995	Secondary	12,800.0				E
Kiziltepe*				Yes	1992	Secondary	9,500.0				E
Kumluca	22.0										E
Kusadasi	37.1	200.0		Yes		Primary	41,666.0	SO			A + E
Manavgat	76.3	39.2		Yes	1982	Primary	5,760.0				E
Marmaris	22.6	122.0		Yes	1995	Primary	29,722.0	SO			E
Mersin	499.5		632.0	Yes	1994	Primary	379,238.0				B + E
Samandag (Hatay)	33.5										E
Sarigerme*				Yes	1995	Secondary	4,500.0				E
Serik	27.5			Yes		Secondary	6,336.0				E
Side - Titreyengol*				Yes	1995	Secondary	10,000.0				E
Silifke	85.0		64.0	No		None	-	-	10,368.0	-	B + E
Tarsus	192.4	20.0	113.0	Yes	1994	Primary	3,060.0		18,270.0	DI	B + E
Turkbuku* (Golturkbuku)	2.8			Yes	1997	Secondary	3,000.0				E
Yakacik	29.1										E
Yenihisar	11.4										E
Zetinly - Gure - Akcay	21.1			Yes		Secondary	24,000.0				E

Remarks: * Included due to seasonal population increase

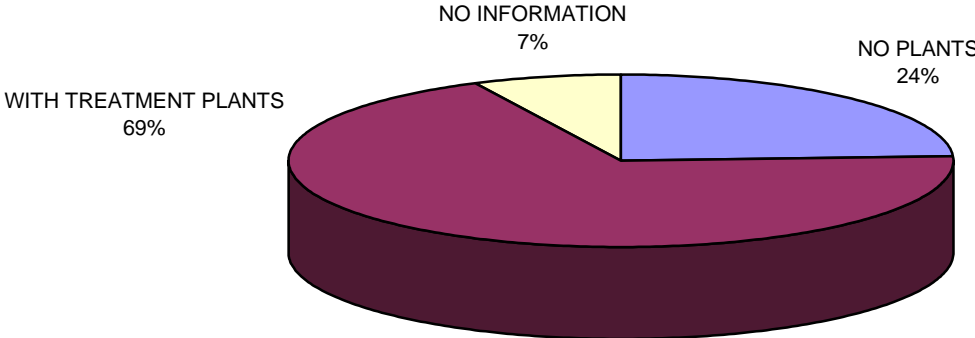
MEDITERRANEAN COASTAL CITIES



MEDITERRANEAN COASTAL POPULATION



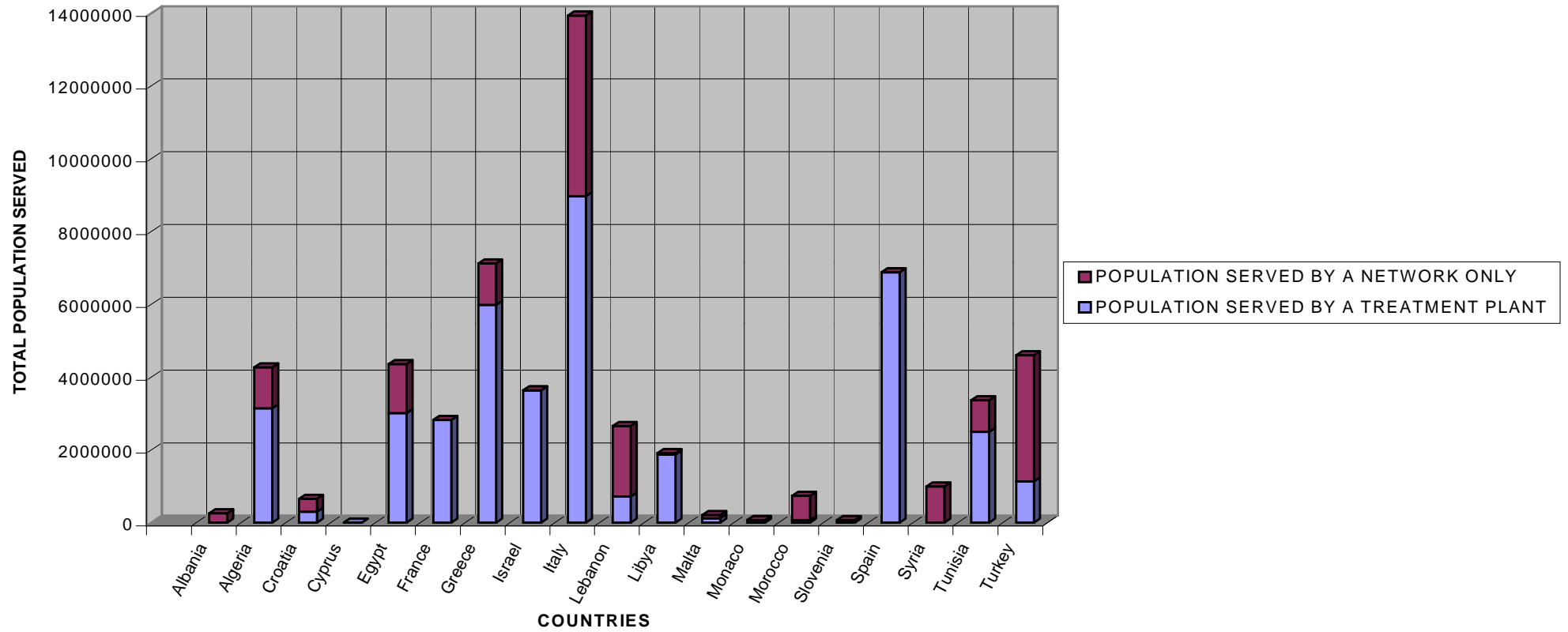
AVAILABILITY OF TREATMENT PLANTS IN CITIES (10,000 <POP< 100,000)



AVAILABILITY OF TREATMENT PLANTS IN CITIES WITH POPULATION OVER 100,000



TREATMENT FACILITIES SITUATION



DEGREE OF TREATMENT

