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DISCHARGE FROM MUNICIPAL WASTEWATER TREATMENT PLANTS INTO RIVERS FLOWING INTO THE MEDITERRANEAN SEA

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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 United Nations Conference on Human Environment (Stockholm, 1972) underlined the growing importance of the protection of the marine environment. During the same year in London, the Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matters was adopted which 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 report 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 Mediterranean Sea.

The causes for the deterioration 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 hydrographic 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 microorganisms, 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

The protection of the marine environment is an important issue that concerns the countries of the Mediterranean Region. The Mediterranean Action Plan (MAP) that was convened by the United Nations Environment Programme (UNEP) and was approved by all countries (Barcelona, 1975) is a common effort for the protection and upgrade of the marine environment.

In 1976 the representatives of the Mediterranean countries adopted the legal support needed for the implementation of the MAP Programme at a conference convened by UNEP in Barcelona. More specifically, in February 1976 the ***Barcelona Convention*** was signed as an international agreement between Mediterranean Countries for the protection of the Mediterranean Sea against pollution.

In addition to the Barcelona Convention, the Barcelona 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 preparation of appropriate legal instruments to deal with land-based sources of pollution is an issue of major concern since it is estimated that land-based sources of pollution constitute more than 80% of the total pollution load of the Mediterranean Sea.

The Protection* of *the Mediterranean Sea Against Pollution from Land-Based Sources Protocol classified substances that have a deleterious effect on the aquatic environment in two main categories; a "black list" for substances that eventually have to be eliminated and a "grey list" for those substances, by which pollution has to be reduced.

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 11, 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.

In Genoa, Italy (1985), 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, 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 Report on the Municipal Wastewater Treatment Plants in the Mediterranean Coastal Cities

The marine environment is subjected to various pressures, which are mostly related to wastewater discharge. The production of wastewater is attributed to human (domestic, industrial or agricultural) activities where use of water is very important and consequently the production of wastewater is inevitable.

The MAP Programme in 2000 (several years after the Barcelona Convention and at the end of the Water Decade) reviewed the status of wastewater treatment in Mediterranean coastal cities of more than 10,000 persons. The study was conducted in the year 1999 and the results were published at the MAP technical Report Series No 128 (2000).

According to the Genoa Declaration 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 should also to be provided.

The scope of the study presented in the year 2000 provided information for all Mediterranean coastal countries, that was related to the collection of data for each country concerning the population served by wastewater treatment plants and the degree of the treatment provided. The 2000 MAP report included the following information:

1. List of coastal cities with population (permanent and seasonal) greater than 10,000 persons reflected the situation in each country of the Mediterranean.
2. Existence of WWTPs serving all Mediterranean coastal cities with population more than 10,000 persons;
3. Years of operation of the wastewater treatment plants;
4. Quantity of wastewater treated per day and per plant;
5. Degree of wastewater treatment, (primary, secondary, tertiary, or other degree of treatment);
6. Quantity of wastewater discharged into the marine environment, treated or untreated, and way of discharge;

A comprehensive analysis of the collected data at country and at regional level and assessment of the needs and the formulation of appropriate conclusions followed the collection of all available information. Review of the 2000 report was published in 2004, including comparison for the two reporting periods (2000 and 2003).

A report prepared in 2006 and published in 2008 completes the information of the years 2000 and 2004 regarding wastewater treatment in coastal areas of the Mediterranean region, with data collected by each country and referred to towns with population of between 2,000 and 10,000 inhabitants.

The planning, methodology and working procedures of the study were prepared within the framework of the MED POL Programme, following the same indications of the 2000 study. More specifically, the information was collected at national level and included the following:

1. Update of the list of coastal cities with population between 2,000 – 10,000 inhabitants
2. Collect data on the number of WWTPs that serve coastal cities
3. Collect information on the quantity of wastewater treated
4. Collect data on the provided degree of treatment
5. Collect data on the quantity of treated and untreated wastewater and respective way of discharge
6. Evaluation of the provided updated information

1.3 Methodology and Procedures of the present Study

The present study presents the situation regarding wastewater treatment in cities with population greater than 2,000 persons, located close to major rivers that end-up in the Mediterranean Sea. In this synthesis report the data collected from each country involved in the task are presented and elaborated in order to provide an overview of the current status.
The planning, methodology and working procedures of the study were prepared within the framework of the MED POL Programme. The preparatory work was mainly related to the identification of rivers and cities that should be included in the task. For each country a list of rivers and respective cities located in vicinity to these rivers was prepared following common criteria.

Rivers: The Mediterranean basin hydrology is very heterogeneous ranging form alpine regime with early summer maximum, to typical Mediterranean regime with winter high and summer low flows, to semi-arid regime of the south coast with gradual increase of summer drought and development of floods. About 80 rivers have been identified to contribute to the pollution of the Mediterranean Sea, mainly in the form of organic load and nutrients. The rivers included in the study have been selected based on the water discharge flows to the Mediterranean. The study area for each river is from the sources to mouth of the river including all the tributaries. The following table presents the countries, rivers and respective number of cities and towns which are involved in the task.

Country	River	Cities and towns reported
Albania	Buna	6
Albania	Drini	24
Albania	Mati	18
Albania	Semani	3
Albania	Shkumbini	18
Albania	Vijose	17
Algeria	Beni Messous	1
Algeria	Chéliff	7
Algeria	Cities with no direct reference to rivers	11
Algeria	El Harrach	1
Algeria	Embouchure Oued Soummam	1

Country	River	Cities and towns reported
Algeria	Embouchure de Oued Cherka	2
Algeria	Embouchure de Oued Kebir	5
Algeria	Embouchure de Oued Saf Saf	4
Algeria	Embouchure oued Mafragh	5
Algeria	Fodda	1
Algeria	Ghazlia	1
Algeria	Mazzafra	1
Algeria	O Seybouse	1
Algeria	O. Djemaa	1
Algeria	O. Meboudja	1
Algeria	O. Meboudja	1
Algeria	O.Bouthmira	1
Algeria	Ouahrane	1
Algeria	Oued Bouzedjar	1
Algeria	Oued el Hallouf	1
Algeria	Oued Feraraa	1
Algeria	Oued Mekhaissia	1
Algeria	Oued Messida	1
Algeria	Oued Ouzert	1
Algeria	Oued Tafna	2
Algeria	Oued Tayeb	1
Algeria	Réghaia	1
Croatia	Neretva	11
Croatia	Krka	2
Croatia	Cetina	6
Croatia	Čikola	1
Croatia	Dragonja	1
Croatia	Mirna	1
Croatia	Raša	1
Croatia	Zrmanja	1
Egypt	Nile	215
France	Aude	8
France	Rhone	78
France	Var	3
Greece	Akheloos	3
Greece	Aliakmon	12
Greece	Axios	10
Greece	Evros	6
Greece	Nestos	1
Greece	Strymon	13
Italy	Adige	33
Italy	Arno	25
Italy	Brenta	18
Italy	Pescara	10
Italy	Po	50
Italy	Reno	13
Italy	Tevere	20
Italy	Volturno	9
Morocco	Moulouya	6
Spain	Ebro	58

Country	River	Cities and towns reported
Spain	Jucar	8
Turkey	Buyuk Menderes	9
Turkey	Ceyhan	1
Turkey	Gediz	8
Turkey	Goksu	4
Turkey	Lamas	1
Turkey	Manavgat	1
Turkey	Meric/Evros	3
Turkey	Nahrelasi	2
Turkey	Seyhan	2

Cities and towns: Cities and towns with a population over 2,000 persons located approximately 5 km from the river area have been included in the list. The population of each city was extracted from public domain databases. All countries were welcomed to review and update the preliminary populations reported according to their inventories.

The information was collected at national level and included the following:

1. List of cities with population greater than 2,000 persons located near major rivers that end-up in the Mediterranean region and their respective population
2. Number of WWTPs that serve these cities
3. Quantity of wastewater treated and respective way of discharge
4. Degree of treatment
5. Quantity of untreated wastewater and respective way of discharge

2. MUNICIPAL WASTEWATER IN THE MEDITERRANEAN

2.1 Characteristics of Municipal Wastewater in the Mediterranean

According to a common definition, municipal wastewater refers to a mixture of domestic wastewater (residential settlements and services which originates predominately for human metabolism and for household activities) and industrial wastewaters. Industrial wastewaters are discharged to sewerage collection systems or directly enter the wastewater treatment plants, with or without previous treatment. Sewers may also convey groundwater and precipitation that infiltrate into the sewerage networks.

The quantity of wastewater entering the sewerage networks is site specific and depends upon on different factors. For the Mediterranean region, water consumption is to the order of 150-250 l/cap per day, a figure that in many areas of the region may be reduced significantly, although in some cases extreme consumptions have been noticed, which may be attributed to the high summer consumptions of tourist areas. Of the total quantity of water supplied to the communities 70-80% reaches the sewerage system, while the rest is infiltrated into the soil (e.g. irrigation of gardens). This figure does not include possible industrial wastewater production, which depends on local conditions and economy and should also be taken into account, or infiltration inflow into the sewer, which depends upon hydrological conditions in each community.

Wastewater flows depend upon both the climatic conditions and availability of sources and the size of the community while at the same time in coastal communities of the Mediterranean, seasonal variations can be particularly pronounced due to tourist activity.
With respect to the quality characteristics of wastewater, these are related to the standard of living, climatic conditions, water supply systems, the available quantities of water, and composition of industrial wastes.

The basic quality parameters of municipal wastewater are the organic load (BOD_5 biochemical oxygen demand at 20°C over 5 days and the COD parameter), suspended solids, nutrients (nitrogen as N, phosphorus as P) and pathogens. In untreated domestic wastewater, the BOD_5/COD ratio ranges between 0.4 and 0.8.

The concentration of each substance in wastewater depends on the water consumption per capita per day. In the Mediterranean countries, due to limited available quantities of water, expressed as low daily consumption, higher concentrations can be expected in domestic wastewater.

Further to the main pollutants of wastewater, the presence of other substances such total dissolved solids and specific ions, such as sodium, calcium, magnesium and boron may also occur in wastewaters. In communities where industrial activity is intense the contribution of industrial wastewaters to domestic wastewater, is related to the presence of specific compounds/elements, such as phenols, pesticides, chlorinated hydrocarbons and metals (Cd, Zn, Ni, and Hg, etc.). These substances are of particular concern due to their toxicity and because they tend to resist conventional methods of wastewater treatment.

The presence of micro-organisms in municipal wastewater depends on the conditions of sanitation of the population and primarily of indicator organisms, which can be more easily estimated in wastewater than the pathogens, (coliforms, faecal streptococci, shigella, salmonella, *Pseudomonas aeruginosa, Clostridium perfrigens, Mycobacterium tuberculosis,* protozoan cysts, helminth ova, and enteric viruses).

2.2 Impacts of Nutrients

The increase in the rate of introduction of organic matter to an ecosystem, which is related to nutrient enrichment enhancing primary production, is known as eutrophication. The main nutrients causing eutrophication are nitrogen in the form of nitrate, nitrite or ammonium and phosphorus in the form of ortho-phosphate. The ratio of nitrogen to phosphorus compounds in a water body is an important factor determining which of the two elements will be the limiting factor, and consequently which one has to be controlled in order to avoid eutrophication incidents. For freshwaters the limiting factor is in most cases phosphorous and in coastal water nitrogen. Wastewater disposal to fresh waters must be thoroughly studied and take into consideration the influence of nutrient discharges. It should be noted however, that a great amount of nutrients in freshwater is attributed to intensive agricultural activity which is not always accompanied by good agricultural practices and consequent increased nutrient runoffs.

Silicate is essential for diatom growth, but it is assumed that silicate input is not significantly influenced by human activity. Its most serious impact to the aquatic environment and mainly coastal waters is related to algal blooms (red tides), algal scum, enhanced benthic algal growth and at times a massive growth of submersed and floating macrophytes.

In addition to the effect on the aquatic ecosystem eutrophication and its side effects, cause discolouration of waters, reduced transparency and disturbance to bathers thus impairing recreation activities. 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.

The decaying organic material results to oxygen depletion of the water causing an array of secondary problems such as death of the benthic fauna, formation of corrosive and other undesirable substances such as CO_2, CH_4, H_2S, NH_3, organoleptic (taste and odour producing) substances, organic acids, toxins, etc.

Attachment of algal material and high pH can cause dermatitis and conjunctivitis, while 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.

2.3 Impacts of Pathogens

The direct discharge of untreated wastewater into aquatic environment and livestock breading (controlled or free) are the predominant reasons for the microbial pollution and deterioration of the environment. The general situation is progressively improving through the wastewater treatment facilities and in the case of discharges to the sea, the construction of submarine outfalls.

Microbial pollution of the Mediterranean is mainly attributed to the permanent population that is concentrated at the Mediterranean Coast, whereas the seasonal population is also attributing (equally) to the microbial load during the summer period.

In freshwaters microbial pollution is related to untreated wastewater discharges, as well as to livestock breading (controlled or free) which in most cases is practiced in vicinity to water bodies.

The presence of pathogenic micro-organisms in the aquatic environment may result to impact of the public health, through direct contact with polluted water, including ingestion of while swimming and through consumption of contaminated seafood.

Microbial pollution of the aquatic environment may affect the gastrointestinal tract, or 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 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 in waters where microbial pollution occurs.

2.4 Municipal Wastewater Treatment and Discharge

The collection and treatment of wastewaters results into point source pollution load that is discharged into the environment. When there is absence of collection and treatment facilities, the untreated wastewater influences the environment in a form of non-point source of pollution, which is more difficult to quantify.

Wastewater treatment is achieved through physical, chemical and/or biological processes. Depending upon the degree of treatment, the following processes are identified:

i) Pre-treatment refers to the removal of bulky matter, sand and gravel, greases and oils from wastewater;
ii) Primary treatment includes the application of physical and/or chemical treatment processes for municipal wastewaters that lead to 50% reduction of suspended matter and by 20% reduction of organic load (BOD_5);
iii) Secondary treatment involves the application of physical and/or chemical, biological and processes, which in municipal wastewaters reduce the concentration of suspended matter and BOD_5 by 70-90%, and COD concentrations at least 75%. When biological treatment is applied a minimum reduction of nutrients to the order of 20% can be also achieved.
iv) Tertiary treatment includes the application of physical and/or chemical, biological and other procedures which in municipal wastewaters reduce the concentration of nutrient salts by 80%.
v) Disinfection is a separate process, which is applied in order to further reduce the number of pathogenic micro-organisms in treated water.

The application of advanced treatment processes (e.g. filtration, additional chemical treatment), combined with the process of disinfection, results in better effluent quality. Depending on the degree of the treatment provided and additional legal requirements, wastewater can be reused for agricultural (restricted or unrestricted irrigation etc) or other purposes (urban water, industry).

The most important factors that should be considered when evaluating and selecting unit operations and processes for each case are:

- process applicability, performance
- environmental constraints (way of discharge, type and specific characteristics of recipient, long-term impact to the aquatic environment)
- maintenance and operation requirements (cost, personnel, education level of the personnel)

In any case the treatment and discharge of wastewater to the aquatic environment should follow the respective to each country, legislation in force. For example, countries that are members of the European Union should follow the provisions of the Directive 91/271/EC concerning urban wastewater treatment and provide for example, for discharges to fresh-water and estuaries from agglomerations of between 2000 and 10000 p.e. at least secondary treatment or an equivalent treatment.

In cases of wastewater discharges to rivers the selection of the degree of treatment should consider the specific characteristics of the recipient, in terms of quantity (e.g. rivers with significant flow variations), and quality (e.g. nutrient concentrations), as well as the possible long-term impacts to the aquatic environment. Minimum reduction of nutrients is a good practice, which could then increase the assimilated capacity of the recipient in order to avoid phenomena of eutrophication and oxygen depletion in the water bodies.

Wastewater treatment results to the production of sludge during primary and/or secondary sedimentation. Disposal of sludge in the environment without prior treatment may result in significant pollution and threat to public health. The legal framework regarding sludge disposal (at least according to EU Legislation) is progressively encouraging sludge reuse into agriculture. The current trend for sludge utilisation and reuse is combined to the adoption of the term “biosolids” rather from “sludge”.

3. RESULTS ACHIEVED

3.1 Brief Summary of Data Collection

Data from 10 Mediterranean countries were progressively collected until country summaries were produced using the most reliable information available. In alphabetic order, the countries involved in the study were:

Albania, Algeria, Croatia, Egypt, France, Greece, Italy, Morocco, Spain and Turkey.

For each individual country the situation is briefly described in the next section, while the reported information by each country is presented at the end of Part I. The graphs presented in Part II of this document reflect the overall situation as reported.

3.2 Constraints Encountered

Considering the specific characteristics and possible difficulties experienced by each country during the reporting, it was inevitable to avoid a series of constraints.

The most important constraints encountered are quoted below:

- In some cases the requested forms were not fully completed. For example, although information regarding the quantity of treated wastewater (i.e. wastewater production, collection, treatment and final disposal) was provided, that was not the case for untreated wastewater discharges. That was also the case for the population reported, a figure which was missing in several cases.

- With respect to the type of discharge of wastewater the guidelines provided could not be applied in most cases of mainland wastewater treatment plants. As expected the main way of wastewater disposal is direct (through a discharge pipe) or indirect (through a stream) discharge of the effluent to the river. Reuse of wastewater is an alternative way of management, whereas other types reported included disposal to the ground or to forests. It should be noted however, that practically the sewage produced from the cities located in the catchment area of a river, one way or another ends up to the river. In the analysis, three types of sewage discharge were identified: “DI” for direct or indirect disposal to the river, “RB” for reuse of wastewater and “Other” for other types of discharge (ground, forest). Please also note that in cases where discharge to the sea through the rivers was reported, this was also considered as DI, as all rivers flow to the sea.

- For some cities the wastewater treatment is provided from wastewater treatment plants located in coastal cities. These particular plants have already been reported in previous MAP Technical Reports, thus they have been excluded from the analysis.

- According to the provided information, the following possibilities were identified:

    1. A city served totally by a wastewater treatment plant with the capacity of collecting and treating the total amount of sewage produced. (*Discharge of treated wastewater*).
    2. A city partially served by a sewerage network and thus the wastewater treatment plant treats part of the sewage, while the remaining quantity of sewage produced from the cesspools is indirectly discharged to the river. (*Discharge of treated and untreated wastewater*).
    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 individual wastewater disposal systems, e.g. septic tanks*).
5. A city served by more than one wastewater treatment plant (*Discharge of treated wastewater*).
6. A city served by a wastewater treatment plant located to another city (*Discharge of treated wastewater*).

3.3 General Considerations on the Contents of the Tables

- The study examines the cities with population of more than 2000 that discharge their municipal wastewater (treated or untreated) into major rivers that end up to the Mediterranean Sea, thus indirectly contributing to the pollution of the marine environment.
- With respect to the quantity of wastewater treated and untreated and the way of disposal, some countries probably experienced difficulties in completing the required information, due to lack of adequate and reliable data. Variations of the sewage production per capita per day were observed between the countries, which in some cases could not be justified.
- With respect to the quantity of untreated wastewater discharged, the provided information is limited and thus, a concrete conclusion regarding the quantity of sewage discharged untreated cannot be easily drawn.

An important issue that needed careful consideration was related to the situation in Egypt. Due to the high population of the cities (215 cities were reported) located in vicinity to the River Nile (approximately 25.000.000 people), which is about 58% of the total population reported from all countries in the Mediterranean, it was evident that any insufficient or incomplete information regarding the situation in these cities with the respect to the wastewater treatment facilities, would directly affect the results of the analysis during which the information from all countries is combined. Thus, at this stage and considering the facts for Egypt as presented in section 4.4, it was decided not to include Egypt at the statistical analysis, which follows.

3.4 General Tables and Graphs - Summary of Results

Country	River number / country	Total Cities reported	Population reported	% of population
Albania	7	86	1,778,671	4.05
Algeria	26	56	1,102,565	2.50
Croatia	8	24	304,908	0.74
Egypt	1	215	25,524,190	58.08
France	3	89	3,186,530	7.25
Greece	6	45	411,281	0.94
Italy	8	178	7,702,982	17.53
Morocco	1	6	322,962	0.73
Spain	2	66	789,509	1.80
Turkey	9	31	2,804,983	6.38
Total	70	797	43,947,544	100.00

Total number of countries	9
Total number of cities	582
Total number of rivers	69
Total number of wastewater treatment plants	310

	Number	%
Total number of wastewater treatment plants	582	
Cities without a wastewater treatment plant	206	*35%*
Cities with a wastewater treatment plant under construction / projected	11	*2%*
Cities with a wastewater treatment plant on maintenance /out of operation	5	*1%*
Cities with a wastewater treatment plant	360	*62%*

	Number	%
Wastewater treatment plants in operation	346	
Pre-treatment	1	*0.3%*
Primary treatment	117	*33.8%*
Secondary treatment	136	*39.3%*
Tertiary treatment	85	*24.6%*
Unknown treatment	7	*2.0%*

Total number of cities for which population was reported	577	Cities served by a treatment plant	Cities not served by a treatment plant
Cities with more than 100,000 inhabitants	26	21	5
Cities with more than 10,000 inhabitants and less than 100,000 inhabitants	247	132	115
Cities with less than 10,000 inhabitants	304	210	94

	Cities served by a treatment plant	Cities not served by a treatment plant
Cities with more than 100,000 inhabitants	*81%*	*19%*
Cities with more than 10,000 inhabitants and less than 100,000 inhabitants	*53%*	*47%*
Cities with less than 10,000 inhabitants	*69%*	*31%*

Population reported	18,423,354	
Population served by a sewerage network and a treatment plant	12,098,527	*66%*

Total cubic metres of wastewater treated per day (for reported information)	3132939	*75%*
Total cubic metres of wastewater reused per day (for reported information)	312874	*7%*
Total cubic metres of untreated wastewater per day (for reported information)	742033	*18%*

Total wastewater, litres per capita per day – average from all	180

Disposal	Treated wastewater	Untreated wastewater
Discharged directly (through pipe) or indirectly (through stream) to the river	161	54
Wastewater reused	54	0
Other way of disposal	2	18

The results obtained are presented in a form of graphs at the end of Part II of the report.

4. COUNTRY FACTS

4.1 Albania

Albania has six large rivers which flow in the Mediterranean namely Buna, Drini, Mati, Semani, Shkumbini and Vijose. In total 86 cities are identified with total population of 1,098,671 inhabitants. All cities are lacking wastewater collection and treatment facilities. No data have been reported regarding the situation of the quantity of untreated wastewater discharged to the rivers.

4.2 Algeria

From the preliminary inventory of major rivers in Algeria, 2 rivers were selected (Cheliff and Isser). From the reported information data from 26 rivers and streams were reported (Beni Messous, Bouthmira, Bouzedjar, Chéliff, Cherka, Djemaa, el Hallouf, El Harrach, Feraraa, Fodda, Ghazlia, Kebir, Mafragh, Mazzafra, Meboudja, Mekhaissia, Messida, Ouahrane, Ouzert, Réghaia, Saf Saf, Seybouse, Soummam, Tafna, Tayeb).

Regarding the cities and respective facilities it should be noted that the cities which were reported to the MAP TRS no.157 (Annaba, El Bouni, Oran, Ain El Turk, Arzew, Marsa El Hadjaj, Jijel, Sidi Ben Adda, Ténès, Sidi Abderahmane, Skikda, Kerkera, Collo , Filfila , Bejaia, Souk El Tenine et Melbou, Aokas) were excluded from the analysis. The same was the case for the cities Hamrouche Hamoudi, Hamadi Krouma and El Hadaiek which are served by the WWTP of Skikda which discharges to the sea (MAP TRS no.157), the city of Guantra El Hamra which discharges to Lake Mellah and Larbi Ben M'Hidi, which is reported to discharge to the sea through a submarine outfall.

Consequently 56 cities are included in the analysis, with reported resident population of 1,102,565 persons. With respect to the wastewater treatment facilities, these are limited to eight cities, all served with secondary treatment. Disposal of treated (2198 m^3/d), as well as untreated sewage (37185 m^3/d) is performed through streams to the respective rivers.

The total population served by wastewater treatment plants is 223,176 habitants, corresponding to 20% of the total population reported. According to the available information about 257,444 cubic meters of treated wastewater is daily disposed (75% of the total quantity) and 86,666 cubic meters of untreated wastewater (25% of the total quantity) is discharged to the aquatic environment. A limited quantity of sewage (1168 m^3/d) is reused.

4.3 Croatia

From the preliminary inventory of major rivers in Croatia, 2 rivers were selected (Neretva, Krka). However, data for additional 8 rivers were communicated (Cetina, Čikola, Dragonja, Gacka, Lika, Mirna, Raša, Zrmanja). Underground rivers Gacka and Lika were excluded from the analysis, whereas rivers Cetina, Čikola, Dragonja, Mirna, Raša, and Zrmanja are included due to increased flows during winter. Thus, the reported information from the 6 rivers was considered during the elaboration process. 24 cities were reported with resident population of 304,908 persons. With respect to the treatment provided, this is limited to five cities, four with secondary treatment and one with just pre-treatment. Disposal of treated (2198 m^3/d), as well as untreated sewage (37185 m^3/d) is performed through streams to the respective rivers.

4.4 Egypt

River Nile is the major river in Egypt, along which many cities are located. Egypt has over 300 cities, over 4500 villages of population up to 50000 in some cases and about 25000 hamlets or scattered rural communities. Villages of less than 10000 inhabitants are over 27000 from which about 10% are connected to sewer systems, flows of the Vault system in the rest seep to the groundwater or illegally drain to surface water bodies.

Before presenting the facts for Egypt as derived from the respective table it should be noted that these refer to an optimum situation which in many cases is related to projected wastewater treatment facilities.

In total 215 cities were reported. For 144 cities population data were reported with a total figure of 25,524,190. In one case there are no wastewater treatment facilities, whereas the total population served (currently or in future) by the 143 wastewater treatment plants is 25,521,450 inhabitants. For the 71 cities without specific population data the situation is the following. The wastewater treatment plants of 26 from these cities are under construction, 44 refer to rural wastewater treatment plants discharging to drains in the Delta and for one city there is no wastewater treatment plant.

With respect to the treatment provided to the 143 cities, 113 are served with secondary treatment and 31 with primary treatment. For most of these cases (136/143) the treated wastewater drains to the neighbouring basins and for the remaining plants final effluent is discharged to forests. For untreated wastewater disposal, there is absence of specific information.

According to the available information about 8,593,000 cubic meters of treated wastewater is (or will be) daily disposed (practically all quantity reported).

4.5 France

In France, 3 rivers were included in the inventory (Aude, Phone and Var). 94 cities were reported, discharging to the rivers with permanent population 1,625,569 inhabitants. With respect to the treatment provided, all cities are served with wastewater treatment plants either through a central treatment plant, or with individual systems. In the case of France it must be underlined that some wastewater treatment plants collect wastewaters from more than one city (e.g. Saint Fonts), whereas some cities have several wastewater treatment plants (e.g. Carcassonne). Furthermore, three cities (Aigues-Mortes, Saint Paul, Colomars) are served by wastewater treatment plants located in coastal cities, which have been previously reported (MAP TRS no.157). These cities are excluded from the analysis due to the fact that their impact has been already considered. Additionally the cities of St- Julien-en Genevois (Collected to Aïre in Switzerland) and Saint Martin du Var (Collected to Castagnier) were also not included due to the lack of data for the treatment provided.

Population equivalent adds up to 3,186,530 inhabitants, served by existing wastewater treatment facilities. According to the available information 1,038,535 cubic meters of treated wastewater is daily disposed. Regarding untreated wastewater, no specific data has been reported, other than references to incidents of direct overflow into the Rhone in order not to avoid overload of the wastewater treatment plants during heavy rains.

With respect to the treatment provided from the wastewater treatment plants, 2 were designed for primary treatment, 53 for secondary treatment and 16 for tertiary treatment. The disposal of treated wastewater refers to direct disposal to the rivers or wastewater reuse.

4.6 Greece

From the preliminary inventory of major rivers in Greece, 6 rivers were identified (Akheloos, Aliakmon, Axios, Evros, Nestos, Strymon). 45 cities were reported, discharging to the 6 rivers with population equivalent 411,281 inhabitants. With respect to the treatment provided, 17 cities are served with wastewater treatment plants, 4 with secondary treatment and 13 with tertiary treatment. The disposal of treated, as well as untreated sewage in the cases where sewerage collection network has been constructed is through the rivers indirectly to the sea, whereas absence of such infrastructure implies the presence of septic tanks, and thus, part of untreated sewage (about 60%) infiltrates to the groundwater.

The total population served by wastewater treatment plants (permanent and seasonal) is 318,794 habitants, corresponding to 78% of the total population reported. According to the available information about 64,390 cubic meters of treated wastewater is daily disposed (76% of the total quantity) and 19,480 cubic meters of untreated wastewater (24% of the total quantity) is either disposed to the aquatic environment or the groundwater.

4.7 Italy

From the preliminary inventory of major rivers in Italy, 8 rivers were identified (Adige, Arno, Brenta, Pescara, Po, Reno, Tevere, Volturno). 178 cities were reported, discharging to the 8 rivers with population 7,702,982 inhabitants. With respect to the treatment provided, almost all cities are served with wastewater treatment plants (168 out of 178), 113 with primary treatment, 1 with secondary treatment, 51 tertiary treatment and 3 without information regarding the degree of treatment. The disposal of treated wastewater is not clearly stated; however wastewater reuse is reported for 50 cases. For untreated wastewater disposal methods, there is absence of specific information.

The total population served by wastewater treatment plants is 5,251,648 habitants, corresponding to 68% of the total population reported. According to the available information about 1,050,330 cubic meters of treated wastewater is daily disposed (57% of the total quantity), 298,567 cubic meters of treated wastewater is daily reused (16% of the total quantity) and 490,851 cubic meters of untreated wastewater (27% of the total quantity) is either disposed to the aquatic environment or the groundwater.

4.8 Morocco

Morocco has one large river which flow in the Mediterranean, Moulouya. 23 cities were reported, from which 17 are located in the coastal zone of the Mediterranean. These cities were excluded from the analysis and the remaining 6 are considered. Regarding the situation of the wastewater treatment plants three cities have wastewater treatment plant which are currently extended (two with activated sludge and one with lagoons)and for the other three cities new wastewater treatment plants are under construction (all with lagoons). With respect to the quantity of treated and untreated wastewater, as well as ways of disposal, not data was been included.

4.9 Spain

From the preliminary inventory of major rivers in Spain, 2 rivers were identified (Ebro, Jucar). 66 cities were reported, discharging to the 2 rivers with permanent population 789,509 inhabitants (for some cities the figure in the parenthesis was considered). With respect to the treatment provided, almost all cities are served with wastewater treatment plants (63 out of 66), 1 with primary treatment, 56 with secondary treatment and 6 tertiary treatment. The disposal of treated wastewater in most cases refers to unspecified way of disposal to river basin, direct disposal to the two rivers or wastewater reuse.

Permanent population for the 63 cities served by wastewater treatment plants adds up to 787,096. Population equivalent was reported for 53 cities corresponding to 1,062,452 inhabitants. The available information for the population served by the wastewater treatment plants is very limited and refers to 27 cities with 363,621 inhabitants. According to the available information about 351,772 cubic meters of treated wastewater is daily disposed, whereas for untreated wastewater disposal, there is absence of specific information.

4.10 Turkey

From the preliminary inventory of major rivers in Turkey, 9 rivers were identified (Buyuk Menderes, Ceyhan, Gediz, Goksu, Lamas, Manavgat, Meric/Evros, Nahrelasi, Seyhan). 31 cities were reported (the city of Taskent was excluded due to the low population reported), discharging to the 9 rivers with population 2,804,983 inhabitants. With respect to the treatment provided, 9 cities are served with wastewater treatment plants, 8 with secondary treatment and 1 with primary treatment. The disposal of treated wastewater in all cases is through the rivers to the sea and in only one case directly to the sea. For untreated wastewater, septic tanks are reported from which part of sewage infiltrates to the groundwater, as well as disposal to creeks and then rivers and in two cases direct disposal to the sea.

The total population served by wastewater treatment plants is 2,095,904 inhabitants, corresponding to 75% of the total population reported. According to the available information about 369,884 cubic meters of treated wastewater is daily disposed (77% of the total quantity) and 107,851 cubic meters of untreated wastewater (23% of the total quantity) is either disposed to the aquatic environment or the groundwater.

5. CONCLUSIONS

a) All countries responded to the call to provide information regarding the municipal treatment facilities at the cities with population greater than 2,000 inhabitants, close to large rivers that end up in the Mediterranean.

b) According to the information provided from the countries the general conclusion is that the situation can be characterised as acceptable, since 66% (excluding Egypt) of the reported population is served by wastewater treatment facilities still needing considerable improvement.

c) From the reported information 75% of the wastewater produced is treated in 346 wastewater treatment plants and mainly disposed directly or indirectly to the rivers. A small percentage of treated wastewater is reused (7%) and the remaining quantity (18%) discharged untreated (mainly as septage), indirectly influences the rivers.

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.

Disinfection whenever practiced falls under the secondary treatment. It is not reported as tertiary treatment.

Symbols

Discharge

DI = discharge directly (through pipe) or indirectly (through stream) to the river
RB = discharge is re-used
Other = other types of discharge (ground, forest)

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN CITIES WITH POPULATION MORE THAN 2,000 IN THE VICINITY OF BIG RIVERS
Country: ALBANIA

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Buna	Shkoder	10261	NO						
Buna	Shiroke	6583	NO						
Buna	Oblike a Madhe	9776	NO						
Buna	Bushat	6183	NO						
Buna	Trush	11282	NO						
Buna	Velipoje	8026	NO						
Drin	Shtiqen	8628	NO						
Drin	Gostil	8622	NO						
Drin	Kukes	8622	NO						
Drin	Kolsh	8622	NO						
Drin	Gjegjan	8617	NO						
Drin	Vranisht	8604	NO						
Drin	Kalimash	8621	NO						
Drin	Shemri	8312	NO						
Drin	Bujan	4345	NO						
Drin	Breg-Lum	4621	NO						
Drin	Fierze	4621	NO						
Drin	Lekbibaj	4335	NO						
Drin	Apripa	4702	NO						
Drin	Krume	8604	NO						
Drin	Qelez	6183	NO						
Drin	Guri I Zi	11267	NO						

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Drin	Vau I Dejes	11277	NO						
Drin	Ranxe	11370	NO						
Drin	Barbullush	11679	NO						
Drin	Baba	11679	NO						
Drin	Shengjin	9783	NO						
Drin	Lezhe	12371	NO						
Drin	Kallmet I Madh	13236	NO						
Drin	Ishull-Lezhe	12379	NO						
Mati	Lene	9212	NO						
Mati	Gjon	13786	NO						
Mati	Kraste	8786	NO						
Mati	Guri I Bardhe	14713	NO						
Mati	Klos	8492	NO						
Mati	Bejn	8488	NO						
Mati	Gurre e Madhe	8780	NO						
Mati	Komesi	8666	NO						
Mati	Lis	8469	NO						
Mati	Burrel	8477	NO						
Mati	Ulez		NO						
Mati	Beshkashi	8406	NO						
Mati	Milot	16383	NO						
Mati	Lac	19337	NO						
Mati	Zejmen	15829	NO						
Mati	Shenkoll	14434	NO						
Mati	Fushe-Kuqe	11064	NO						
Mati	Shen Ded Gjoni	9570	NO						
Semani	Libofshe	22948	NO						
Semani	Rusaman	22965	NO						

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Semani	Seman	22673	NO						
Shkumbini	Perrenjas	8980	NO						
Shkumbini	Qukes	8001	NO						
Shkumbini	Librazhd	7991	NO						
Shkumbini	Labinot-Mal	18718	NO						
Shkumbini	Shushice	18718	NO						
Shkumbini	Elbasan	18740	NO						
Shkumbini	Bradashesh	18740	NO						
Shkumbini	Vidhas	18751	NO						
Shkumbini	Cerrik	18764	NO						
Shkumbini	Shtermen	18740	NO						
Shkumbini	Bishqem	18751	NO						
Shkumbini	Peqin	19134	NO						
Shkumbini	Rogozhine	28758	NO						
Shkumbini	Rrogozhine	28758	NO						
Shkumbini	Luz i Madh	32664	NO						
Shkumbini	Gose	32488	NO						
Shkumbini	Bicukas	26792	NO						
Shkumbini	Cerme-Proshke	30077	NO						
Vijose/Aoos	Konitsa (Greece)	2874	NO						
Vijose	Leskovik	3809	NO						
Vijose	Petran	5309	NO						
Vijose	Permet	5617	NO						
Vijose	Kelcyre	6899	NO						
Vijose	Katundishte	5869	NO						
Vijose	Tepelene	6909	NO						
Vijose	Memaliaj	6903	NO						
Vijose	Sinanaj	7504	NO						

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Vijose	Sevaster	13440	NO						
Vijose	Selenice	16204	NO						
Vijose	Armen	15261	NO						
Vijose	Hekal	13172	NO						
Vijose	Gorishove	22608	NO						
Vijose	Trevllazer	14759	NO						
Vijose	Novosele	15219	NO						
Vijose	Bishan	18706	NO						
Vijose	Levan	22229	NO						
Remarks:									

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN CITIES WITH POPULATION MORE THAN 2,000 IN THE VICINITY OF BIG RIVERS
Country: ALGERIA

WILAYA	Oued *	Ville**	Population permanente (en milliers)	Station d'épuration des eaux usées	Méthode d'épuration des eaux usées	Degré de traitement des eaux usées	Eaux usées traitées (m3/ jour)	Rejet d'eaux usées traitées	Eaux usées non traitées (m3/ jour)	Rejet d'eaux usées non traitées	OBS
Annaba *** (Source RGPH2008)** ******En absence d'instrument métrologique débit, le volume rejeté est estimé sur la base de 80% de la dotation moyenne en eau potable , de l'ordre de 150l/hab/j	O Boudjemaa	Annaba	232.664	En cours de construction (580700eq/hab)	Traitement biologique	Prétraitement T.primaire, T. secondaire, T.tertiaire (2)			27919.6	DI O. Boudjemaa (3)	(2) :Le rejet subit un prétraitement avant l'évacuation vers la mer. (3) : Les eaux usées de l'ouest de la ville rejoignent l'oued puis la mer par un canal exutoire.
	O Seybouse	El Bouni	127.492	En cours de construction (580700eq/hab)	Traitement biologique	Prétraitement T.primaire, T. secondaire, T.tertiaire			15299	O. Boudjemaa O Seybouse	
		El Hadjar	27.163	Non					3259.5	O Seybouse O. Meboudja	
	O. Meboudja	Sidi Amar	80.186	Non					9622.3	O. Meboudja	
		Chetaibi	5.216	Oui	Traitement biologique	T primaire	625.9	DI			Le module épuratif est à l'arrêt, une opération de rénovation est prise en charge par l'Hydraulique.

WILAYA	Oued *	Ville**	Population permanente (en milliers)	Station d'épuration des eaux usées	Méthode d'épuration des eaux usées	Degré de traitement des eaux usées	Eaux usées traitées (m3/ jour)	Rejet d'eaux usées traitées	Eaux usées non traitées (m3/ jour)	Rejet d'eaux usées non traitées	OBS
Oran		Oran	1.500.000	En cours de réalisation	lagunage	75%	240.000	Sebkha	65.000	SS	
		Ain El Turk	31977	En projet	Mécanique	65%	3262	Mer	575	DI	
		Bousfer	16140	En cours de réalisation	Mécanique	65%	1646	Terre agricole	290	DI	
		Al Ancor	9840	A l'arrêt	Mécanique	65%	Aucune information	Terre agricole	Aucune information	DI	
		Arzew	94873	En projet	Mécanique et biologique	75%	9677	Réutiliser dans l'industrie	1707	SS	
		Marsa El Hadjaj	13609	En projet	Mécanique	75%	1388	Mer	245	DI	
Jijel		Jijel	146546	Oui	Traitement biologique	Secondaire	30 000	DI			
El Taref	Embouchure oued Mafragh	Ben M'hidi	38 000	Néant	Décantation	Méthode inadéquate bassin sous dimensionné	28.6	Néant	Néant	Vers oued Bounamoussa qui fait jonction avec oued Kebir pour former l'embouchure de la Mafragh	
	O.Bouthmira	Echatt	39 000	Néant	Décantation	Méthode inadéquate bassin sous dimensionné	31.2	Néant	Néant	Vers Oued Boukhmira qui diverse ses eaux dans la mer.	
	Embouchure Oued Mafragh	Sidi M'barek	4000	Néant	Décantation	Méthode inadéquate bassin sous dimensionné	3.2	Néant	Néant	Vers l'embouchure de oued Mafragfh	
	Embouchure Oued Mafragh	Berrihane	8200	Néant	Décantation	Méthode inadéquate bassin sous dimensionné	6.5	Néant	Néant	Vers oued Kebir qui fait jonction avec oued Bounamoussa pour former l'embouchure de la Mafragh	

WILAYA	Oued *	Ville**	Population permanente (en milliers)	Station d'épuration des eaux usées	Méthode d'épuration des eaux usées	Degré de traitement des eaux usées	Eaux usées traitées (m3/ jour)	Rejet d'eaux usées traitées	Eaux usées non traitées (m3/ jour)	Rejet d'eaux usées non traitées	OBS
El Taref	Embouchure Oued Mafragh	Sebaa	3700	Néant	Décantation	Méthode inadéquate bassin sous dimensionné	3.9	Néant	Néant	Vers oued Kebir qui fait jonction avec oued Bounamoussa pour former l'embouchure de la Mafragh	
	Embouchure Oued Mafragh	Righia	4300	Néant	Décantation	Méthode inadéquate bassin sous dimensionné	3.5	Néant	Néant	Vers oued Kebir qui fait jonction avec oued Bounamoussa pour former l'embouchure de la Mafragh	
	Oued Messida	Souarekh	9000	Néant	Décantation	Méthode inadéquate bassin sous dimensionné	7.1	Néant	Néant	Vers Oued Messida qui diverse ses eaux vers la mer.	
	Lac Mellah	Guantra El Hamra	3900	STEP	Biologique	80%	3.2	Lac Mellah	Néant		
Ain Temouchent (Toutes les opérations sont prises en charges par le secteur de l'hydraulique)	Oued Sennane	Sidi Ben Adda	13.499	Oui	Biologique à boue activée				1.619,88		La STEP en cours d'etude

WILAYA	Oued *	Ville**	Population permanente (en milliers)	Station d'épuration des eaux usées	Méthode d'épuration des eaux usées	Degré de traitement des eaux usées	Eaux usées traitées (m3/ jour)	Rejet d'eaux usées traitées	Eaux usées non traitées (m3/ jour)	Rejet d'eaux usées non traitées	OBS
Ain Temouchent	Oued Tayeb	Terga	8.084	Non				DI	970.08	DI	STEP proposée pour le programme de 2009
Suite	Oued Feraraa	Bouzedjar	4.424	Oui	Oxydation alternée	95% théoriquement	1920	DI	530,88	DI	L'étude de la STEP de Bouzedjar est en voie d'achèvement et la réalisation en voie de lancement.
	Oued Tafna	Beni Saf	43.131	Oui	Biologie à boue activée				5.175,72	DI	La STEP en cours d'etude
	Oued Tafna	Oulhaca	15.492	Non					1.859,04		
	Oued el Hallouf	Ould el Kihal	3.539	Non					424,68		STEP proposée pour le programme de 2009
	Oued Bouzedjar	M'said	4.378	Non					525,36		
	Oued Ouzert	Ouled Boudjemaa	6.083	Non					729,96		STEP proposée pour le programme de 2009
	Oued Mekhaissia	Sidi Safi	7.493	Oui	Lagunage naturel	95% théoriquement mais l'ONA n'a pas encore effectuée les analyses	1168	RB	899,16	DI	

WILAYA	Oued *	Ville**	Population permanente (en milliers)	Station d'épuration des eaux usées	Méthode d'épuration des eaux usées	Degré de traitement des eaux usées	Eaux usées traitées (m3/ jour)	Rejet d'eaux usées traitées	Eaux usées non traitées (m3/ jour)	Rejet d'eaux usées non traitées	OBS
Chlef Les oueds cités sont les affluents de Oued Chéliff	Fodda	Oued El Fodda	36.749 (2006)	Non	Néant	Néant	Néant	Néant	1861	1861	
	Cheliff	Ouled Abbes	5328	Non	Néant	Néant	Néant	Néant	521	521	
	Chéliff	Oum Drou	6909	Non	Néant	Néant	Néant	Néant	390	390	
	Chéliff	Chlef	162. 912	Oui	Boues activées	= 90%	9000	9000	5820	5820	
	Cheliff	Chéttia	64.723	Non	Néant	Néant	Néant	Néant	4401	4401	
	Ouahrane	Ouled Fares	13.281	Non	Néant	Néant	Néant	Néant	2357	2357	
	Cheliff	Oued Sly	37.054	Non	Néant	Néant	Néant	Néant	2935	2935	
	Cheliff	Boukadi	33.237	Non	Néant	Néant	Néant	Néant	2384	2384	
	Cheliff	Sobha	16.805	Non	Néant	Néant	Néant	Néant	938	938	
	Ghazlia	Heranfa	6526	Non	Néant	Néant	Néant	Néant	305	305	
	Les agglomérations situées dans le sous bassin versant côtier de Dhahra										
	Mer	Beni Haoua	3890	Non	Néant	Néant	Néant	Néant	388	388	
Chlef suite	Mer	Oued Goussine	2346	Non	Néant	Néant	Néant	Néant	280	280	
	Allala	Ténès	45.466	Non	Néant	Néant	Néant	Néant	2991	2991	
	Mer	Sidi Abderahmane	4425	Non	Néant	Néant	Néant	Néant	386	386	
	Mer	El Marsa	10.248	Non	Néant	Néant	Néant	Néant	264	264	
Skikda	Embouchure de Oued Saf Saf	Skikda	177.402	En cours de réalisation	Traitement Biologique	80-90%	42.000	40.000			
		Hamrouche Hamoudi	13132								
		Hamadi Krouma	21.292								
		El Hadaiek	13.913								
		Zerdezas	13.879	Non					1665.48	Rejet en mer via l'oued	
		Said Bousbaa	8054	Non					966.48	Rejet en mer via l'oued	
		El Harrouch	47.159	Non					5659.08	Rejet en mer via l'oued	
		Salah Bouchour	29.364	Non					3523.68	Rejet en mer via l'oued	
		Ramdane Djamel	26.587	Non					3190.44	Rejet en mer via l'oued	
		Beni Béchir	9.567	Non					1148.04	Rejet en mer via l'oued	

WILAYA	Oued *	Ville**	Population permanente (en milliers)	Station d'épuration des eaux usées	Méthode d'épuration des eaux usées	Degré de traitement des eaux usées	Eaux usées traitées (m3/ jour)	Rejet d'eaux usées traitées	Eaux usées non traitées (m3/ jour)	Rejet d'eaux usées non traitées	OBS
Skikda		Tamous	44550	Non					5346	Rejet en mer via l'oued	
		Kerkera	27742	Non					3329.04	Rejet en mer via l'oued	
		Ahmed Salem	3352	Non					402.24	Rejet en mer via l'oued	
		Hadjiria	4552	Non					546.24	Rejet en mer via l'oued	
		Bin El Ouidene	19913	Non					2389.56	Rejet en mer via l'oued	
	Embouchure de Oued Siel	Collo	35644	Non					4277.28	Rejet en mer via l'oued	
	Embouchure de Oued Cherka	Ouled Mazzouz	2755	Non					330.60	Rejet en mer via l'oued	
		Beni Zid	19678	Non					2361.36	Rejet en mer via l'oued	
	Embouchure de Oued Kebir	Boumaiza	3952	Non					474.24	Rejet en mer via l'oued	
		Bekkouche Lakhdar	15956	Non					1914.72	Rejet en mer via l'oued	
		Ain Chatchar	15531	Non					1863.72	Rejet en mer via l'oued	
		Azzaba	55472	Non					6656.64	Rejet en mer via l'oued	
		Djendel	8867	Non					1064.04	Rejet en mer via l'oued	
	Embouchure de Oued Righa	Filfila	28475	Non					3417	Rejet en mer via l'oued	
	Emissaire en mer plage de Larbi Ben M'Hidi	Larbi Ben M'Hidi	7904	Non					948.48	SO	

WILAYA	Oued *	Ville**	Population permanente (en milliers)	Station d'épuration des eaux usées	Méthode d'épuration des eaux usées	Degré de traitement des eaux usées	Eaux usées traitées (m3/ jour)	Rejet d'eaux usées traitées	Eaux usées non traitées (m3/ jour)	Rejet d'eaux usées non traitées	OBS
Alger	Mazzafra			En voie de lancement	secondaire			Totalité du bassin versant			
	El Harrach			STEP Baraki	Boue activée à moyenne charge	Secondaire	150.000m3/j				
	Réghaia			STEP Reghaia	À moyenne charge	Secondaire	80.000 m3/j actuellement elle assure 40.000 - 50.000 m3/j				
	Beni Messous			STEP Beni Messous	Procédé à moyenne charge	Secondaire	50.000m3/j				
Bejaia	O. Seghir	Bejaia	165.000	En cours de réalisation	Traitement biologique	Traitement secondaire	9600	DI	10.000	DI	
	O. Djemaa	Tichy	11.000	Non					1200	DI	
	O. Agrioun	Souk El Tenine et Melbou	7000	En cours de réalisation	Traitement biologique	Traitement secondaire	900	DI		DI	
	Embouchure cap Aokas	Aokas	8000	Oui	Traitement biologique	Traitement secondaire	1000	DI		DI	
	Embouchure Oued Soummam	Sidi Ali Lebhar	25.000	En cours de réalisation	Traitement biologique	Traitement secondaire	3000	DI		DI	

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN CITIES WITH POPULATION MORE THAN 2,000 IN THE VICINITY OF BIG RIVERS
Country: CROATIA

River	City	Permanent Population (in 000)	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Neretva	Opuzen	2730	no	-	-	-	-	355	DI
Neretva	Metković	13571	No	-	-	-	-	11764	DI
Neretva in Bosnia and Herzegovina (census 1990)									
Neretva	Čapljina	27882	no	-	-	-	-	3625	DI
Neretva	Buna	3494	no	-	-	-	-	454	DI
Neretva	Mostar	126628	no	-	-	-	-	16462	DI
Neretva	Potoci	9517	no	-	-	-	-	1237	DI
Neretva	Jablanica	12691	no	-	-	-	-	1650	DI
Neretva	Čelebići	2499	no	-	-	-	-	300	DI
Neretva	Konjic	43878	no	-	-	-	-	5704	DI
Neretva	Polje bijela	3368	no	-	-	-	-	438	DI
Neretva	Glavaticevo	2000	No	-	-	-	-	240	DI
Cetina	Omiš	6422	Yes	Mechanical	Pre-treatment	500	DI	335	DI
Cetina	Trilj	2387	Yes	Biological	Secondary	200	DI	86	DI
Cetina	Sinj	11565	Yes	Biological	Secondary	977	DI	526	DI
Cetina	Glavice	3860	No	-	-	-	-	463	DI
Cetina	Brnaze	3240	no	-	-	-	-	389	DI
Cetina	Otok	3166	no	-	-	-	-	317	DI
Krka	Kistanje	2000	no	-	-	-	-	240	DI
Krka	Knin	11746	no	-	-	-	-	1527	DI

River	City	Permanent Population (in 000)	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Čikola	Drniš	3253	no	-	-	-	-	423	DI
Zrmanja	Obrovac	2000	no	-	-	-	-	260	DI
Raša	Raša	2000	No	-	-	-	-	260	DI
Mirna	Buzet	2000	Yes	biological	secondary	208	DI	52	DI
Dragonja	Buje	3011	yes	biological	secondary	313	DI	78	DI
Underground rivers ending to the Adriatic sea									
Gacka	Otočac	4446	no	-	-	-	-	578	DI
Lika	Gospić	6031	no	-	-	-	-	784	DI
Lika	Lički Osik	2000	no	-	-	-	-	240	DI
Remarks:									

- Underground rivers Gacka and Lika were not inculded in the statistical analysis.

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN CITIES WITH POPULATION MORE THAN 2,000 IN THE VICINITY OF BIG RIVERS
Country: EGYPT

	River	City	Served Population[1] (Rounded)	Wastewater Treatment Plant	Wastewater Treatment Method [2]	Degree of Treatment of Wastewater	Wastewater Treated (10^3 m3/day) Design Capacity [2]	Discharge of Treated Wastewater[3]	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
1.	Nile	Abu Simbel	6480	Yes	Lagoons	Primary	5	Green Belt	-	-
2.	Nile	Kalabsha	2740	No	Lagoons	Primarry	1	Land		
3.	Nile	Aswan Kima **(Aswan Governorate)**	202400	Yes	Lagoons	Primary	56	Forest		
4.	Nile	Aswan (Balana)	95000	Yes	Lagoons	Primary	26	Forest		
5.	Nile	Aswan (ElHagger)	85300	Yes	Lagoons	Primary	17	Forest		
6.	Nile	Aswan (Allaki)		Yes	Extended Aeration	Secondary	40	Forest		
7.	Nile	Kom Ombo	74260	Yes	Oxidation Ponds	Primary	32	Forest		
8.	Nile	Edfu	65900	Yes	Oxidation Ponds	Primary	20	F & Drain #		
9.	Nile	Nasr	6250	Yes	Oxidation Ponds	Primary	2	Drain #		
10.	Nile	Qena **(Qena Governorate)**	185300	Yes	Extended Aeration & Trick Filters*	Secondary	76	F & Drain #		
11.	Nile	Dishna	55600	Yes	Oxidation Ponds	Primary	22	Drain #		
12.	Nile	Abo Tashet	13160	Yes	Oxidation Ponds	Primary	15	Drain #		
13.	Nile	Arment	80400	Yes	Oxidation Ponds	Primary	20	Drain #		
14.	Nile	Asta**	67800	Yes	Oxidation Ponds	Primary	20	Drain#		
15.	Nile	Qous	60700	Yes	Oxidation Ponds	Primary	16	Drain #		
16.	Nile	Nag Hammadi	40700	Yes	Oxidation Ponds	Primary	20	Drain #		
17.	Nile	Naqada	23200	Yes	Oxidation Ponds	Primary	10	Drain #		
18.	Nile	Farshot	54200	Yes	Oxidation Ponds	Primary	20	Drain #		
19.	Nile	Qift	22100	Yes	Oxidation Ponds	Primary	10	Drain #		
20.	Nile	Esna	80500	Yes	Oxidation Ponds	Primary	25	Drain #		

	River	City	Served Population[1] (Rounded)	Wastewater Treatment Plant	Wastewater Treatment Method [2]	Degree of Treatment of Wastewater	Wastewater Treated (10^3 m3/day) Design Capacity [2]	Discharge of Treated Wastewater[3]	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
21.	Nile	Luxor **(Luxor City Council)**	95300	Yes	Trick Filters& Ext ended Aerat	Secondary	23	Forest		
22.	Nile	Sohag East **(Sohage Governorate)**	137500	Yes	Surface Aeration	Secondary	55	Drain #		
23.	Nile	Sohag West	180000	Yes	Surface Aeration & Trick Filters	Secondary	60	Drain #		
24.	Nile	Balyana	49300	Yes	Oxidation Ponds	Primary	38	Drain #		
25.	Nile	Maragha	36800	Yes	Oxidation Ponds	Primary	30	Drain #		
26.	Nile	El Monsha	62200	Yes	Surface Aeration	Secondary	24	Drain #		
27.	Nile	Gerga	109000	Yes	Surface Aeration	Secondary	65	Drain #		
28.	Nile	Temma	40700	Yes	Oxidation Ponds	Primary	25	Drain #		
29.	Nile	Tahta	38300	Yes	Oxidation Ponds	Primary	32	Drain #		
30.	Nile	Asyut **(Asyut Governorate)**	400500	Yes	Surface Aeration	Secondary	130	Drain #		
31.	Nile	Al Qosia	71400	Yes	Oxidation Ponds	Primary	25	Drain #		
32.	Nile	Dairut	71600	Yes	Oxidation Ponds	Primary	33	Drain #		
33.	Nile	Manfalut	84300	Yes	Oxidation Ponds	Primary	16	Drain #		
34.	Nile	Sahel Saleem & Badary	75200	Yes	Oxidation Ponds	Primary	23	Drain #		
35.	Nile	Abo Tig	75000	Yes	Oxidation Ponds	Primary	17	Drain #		
36.	Nile	Abnoub & Elfath	102000	Yes	Oxidation Ponds	Primary	70	Drain #		
37.	Nile	El Menyia **(Menyia Governorate)**	235700	Yes	Surface Aeration	Secondary	96	Drain #		
38.	Nile	Mattayi	47300	Yes	Extended Aerat	Secondary	10	Drain #		
39.	Nile	Dair Mouas	42700	Yes	Extended Aerat	Secondary	10	Drain #		
40.	Nile	El Adoaa	17600	Yes	Extende Aerat	Secondary	5	Drain #		
41.	Nile	Bani Mazar	76000	Yes	Trick Filters	Secondary	20	Drain #		
42.	Nile	Malawi	143000	Yes	Trick Filters	Secondary	40	Drain #		
43.	Nile	Samaluit	96100	Yes	Trick Filters	Secondary	25	Drain #		
44.	Nile	Maghagha	27400	Yes	Trick Filters	Secondary	10	Drain #		
45.	Nile	Abo Qurkas	98500	Yes	Trick Filters	Secondary	40	Drain #		
46.	Nile	Beni Suef **(Beni Suef Governorate)**	265000	Yes	Trick Filters	secondary	50	Drain #		

	River	City	Served Population[1] (Rounded)	Wastewater Treatment Plant	Wastewater Treatment Method [2]	Degree of Treatment of Wastewater	Wastewater Treated (10^3 m3/day) Design Capacity [2]	Discharge of Treated Wastewater[3]	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
47.	Nile	El Wastta	38700	Yes	Trick Filters	Secondary	20	Drain #		
48.	Nile	Beba	62100	Yes	Trick Filters	Secondary	20	Drain #		
49.	Nile	El Fashin	66300	Yes	Trick Filters	Secondary	20	Drain #		
50.	Nile	Samastta	38500	Yes	Extended Aeration	Secondary	10	Drain #		
51.	Nile	Nasser	46400	Yes	Extended Aeration	Secondary	20	Drain #		
52.	Nile	Ahnasia	35200	Yes	Extended Aeration	Secondary	10	Drain #		
53.	Nile	El Saff	18000	Yes	Oxidation Ponds	Primary	5	Drain #		
54.	Nile	Atffieh	22600	Yes	Oxidation Ponds	Primary	5	Drain #		
55.	Nile	Shubra Mant	30400	Yes	Extended Aeration	Secondary	10	Drain #		
56.	Nile	Dohormus	27700	Yes	Extended Aeration	Secondary	10	Drain #		
57.	Nile	Haumadia	122300	Yes	Trick Filters	Secondary	20	Drain #		
58.	Nile	El Ayat	115200	Yes	Trick Filters	Secondary	28	Drain #		
59.	Nile	El Badrashin	98000	Yes	Trick Filters	Secondary	20	Drain #		
60.	Nile	Greater Cairo (Zenin)	1320000	Yes	Activated Sludge	Secondary	330	Al Mouhiet Drain to Nile		
61.	Nile	Greater Cairo (Abo Rawsh)	1600000	Yes	Lagoons	Primary	1200	Al Rahawy Drain to Nile		
62.	Nile	Greater Cairo Shubra El Kama (Balkas)	1200000	Yes	Lagoons and Activated Sludge	Primary & Secondary	550	Shbien El Kanater Drain to Nile		
63.	Nile	Greater Cairo (El Berka)	2200000	Yes	Activated Sludge	Secondary	550	Belbas Drain		
64.	Nile	Greater Cairo (Hellwan)	1800000	Yes	Surface Aeration	Secondary	450	El Saff Canal		
65.	Nile	Greater Cairo (Gabal El Asfar) Phase I	2000000	Yes	Surface Aeration	Secondary	600	Belbas Drain		
66.	Nile	Greater Cairo (Gabal El Asffr) Phase II	4800000	Yes	Surface Aeration	Secondary	1200	Belbas Drain		
67.	Nile	Kaha	37900	Yes	Extended Aeration	Secondary	10	Drain[5]		
68.	Nile	Sariyqos	23000	Yes	Extended Aeration	Secondary	10	Drain[5]		
69.	Nile	Kafr Showuqr	24200	Yes	Surface Aeration	Secondary	10	Drain [6]		
70.	Nile	Benha **(Qlubia Governorate)**	163000	Yes	Surface Aeration	Secondary	70	Drain [6]		

	River	City	Served Population[1] (Rounded)	Wastewater Treatment Plant	Wastewater Treatment Method [2]	Degree of Treatment of Wastewater	Wastewater Treated (10^3 m3/day) Design Capacity [2]	Discharge of Treated Wastewater[3]	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
71.	Nile	Shbien El Kanater	63500	Yes	Oxidation Ponds	Primary	20	Drain [6]		
72.	Nile	Towah	44500	Yes	Surface Aeration	Secondary	15	Drain [6]		
73.	Nile	Kaliob	117000	Yes	Surface Aeration	Secondary	60	Drain [6]		
74.	Nile	Shbien El Kom (**Monofia Governorate**)	188300	Yes	Surface Aeration	Secondary	80	Drain[5]		
75.	Nile	Monof	94000	Yes	Surface Aetation	Secondary	30	Drain[5]		
76.	Nile	El Bagour	38800	Yes	Surface Aeration	Secondary	15	Drain[5]		
77.	Nile	Beket El Sabaa	54000	Yes	Trick Filters	Secondary	20	Drain[5]		
78.	Nile	El Sohadda	50900	Yes	Trick Filters	Secondary	20	Drain[5]		
79.	Nile	Ashmoun	120600	Yes	Ext Aerat & T F	Secondary	40	Drain[5]		
80.	Nile	Tala	32000	Yes	Trick Filters	Secondary	20	Drain[5]		
81.	Nile	Zagazek (**Sharkia Governorate**)	231000	Yes	Surface Aeration	Secondary	100	Drain [6]		
82.	Nile	Abo Keber	104100	Yes	Surface Aeration	Secondary	30	Drain [6]		
83.	Nile	Menia ElKameh	62500	Yes	Surface Aeration	Secondary	20	Drain [6]		
84.	Nile	Al Ebrahimia	45200	Yes	Trick Filters	Secondary	20	Drain [6]		
85.	Nile	Abo Hammad & Korain	56100	Yes	S Aeart, TF	Pri & Sec	30	Drain [6]		
86.	Nile	El Koniat	59200	Yes	Trick Filters	Secondary	20	Drain [6]		
87.	Nile	El Hosania	29500	Yes	Extended Aeration	Secondary	10	Drain [6]		
88.	Nile	Mashtol El Souk	47100	Yes	Extended Aeration	Secondary	15	Drain [6]		
89.	Nile	Deiarb Negim	42100	Yes	Extended Aeration	Secondary	20	Drain [6]		
90.	Nile	Kafr Saker	30000	Yes	Surface Aeration	Secondary	10	Drain [6]		
91.	Nile	Awlad Saker	19500	Yes	Extended Aeration	Secondary	10	Drain [6]		
92.	Nile	Anshas	60000	Yes	Extended Aeration	Secondary	20	Drain [6]		
93.	Nile	Fakkos	73000	Yes	Extended Aeration	Secondary	20	Drain [6]		
94.	Nile	Hehia	45000	Yes	Extended Aeration	Secondary	10	Drain [6]		
95.	Nile	Kofour Negim	40600	Yes	Extended Aeration	Secondary	10	Drain [6]		
96.	Nile	Mansoura (**Dakahlia Governorate**)	429300	Yes	Surface Aeration	Secondary	165	Drain [6]		
97.	Nile	El Mattaria	106700	Yes	Surface Aeration	Secondary	40	Drain [6]		

	River	City	Served Population[1] (Rounded)	Wastewater Treatment Plant	Wastewater Treatment Method [2]	Degree of Treatment of Wastewater	Wastewater Treated (10^3 m3/day) Design Capacity [2]	Discharge of Treated Wastewater[3]	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
98.	Nile	Gamallia	71700	Yes	Trick Filters	Secondary	20	Drain [6]		
99.	Nile	Meniat El Nasr	58500	Yes	Trick Filters	Secondary	20	Drain [6]		
100.	Nile	El Senbilawan	87700	Yes	Surface Aeration	Secondary	20	Drain [6]		
101.	Nile	Belkas	105500	Yes	Trick Filters	Secondary	40	Drain [6]		
102.	Nile	Dekrins	69400	Yes	Surface Aeration	Secondary	20	Drain [6]		
103.	Nile	Shirbin	56600	Yes	Surface Aeration	Secondary	20	Drain [6]		
104.	Nile	Elmanzalla	72500	Yes	Surface Aeration	Secondary	20	Drain [6]		
105.	Nile	Aga/Zifta	53000	Yes	Surface Aeration	Secondary	20	Drain [6]		
106.	Nile	Meat Salseel	31200	Yes	Surface Aeration	Secondary	10	Drain [6]		
107.	Nile	Meet Gamr	131000	Yes	Surface Aeration	Secondary	40	Drain [6]		
108.	Nile	Talkha	76700	Yes	Surface Aeration	Secondary	20	Drain [6]		
109.	Nile	Temia El Amadded	13900	Yes	Surface Aeration	Secondary	10	Drain [6]		
110.	Nile	Tanta **(Garbia Governorate)**	437000	Yes	Surface Aeration	Secondary	160	Drain[5]		
111.	Nile	El Mehalla ElKobra	466100	Yes	Surface Aeration	Secondary	100	Drain [6]		
112.	Nile	El Santa	36200	Yes	Surface Aeration	Secondary	20	Drain[5]		
113.	Nile	Samanoud	57900	Yes	Trick Filters & AL	Secondary	20	Drain[5]		
114.	Nile	Kafr El Zayat	79700	Yes	Surface Aeration	Secondary	70	Drain[5]		
115.	Nile	Fesha Seleem	9700	Yes	RBC	Secondary	3	Drain[5]		
116.	Nile	Nahtaie	8400	Yes	UASB	Secondary	3	Drain[5]		
117.	Nile	Qutor	25200	Yes	Surface Aeration	Secondary	10	Drain[5]		
118.	Nile	Bashbiesh	26200	Yes	Extended Aeration	Secondary	10	Drain[5]		
119.	Nile	Shtrak	9200	Yes	RBC	Secondary	3	Drain[5]		
120.	Nile	Damnhour **(Behara Governorate)**	244300	Yes	Extended Aeration	Secondary	80	Drain[5]		
121.	Nile	Abo Homos	36800	yes	Extended Aeration	Secondary	30	Drain[5]		
122.	Nile	Housh Esa	47200	Yes	Surface Aeration	Secondary	20	Drain[5]		
123.	Nile	Etia El Baroud	44800	Yes	Extended Aeration	Secondary	10	Drain[5]		

	River	City	Served Population[1] (Rounded)	Wastewater Treatment Plant	Wastewater Treatment Method [2]	Degree of Treatment of Wastewater	Wastewater Treated (10^3 m3/day) Design Capacity [2]	Discharge of Treated Wastewater[3]	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
124.	Nile	Kom Hamada	41200	Yes	Extended Aeration	secondary	10	Drain[5]		
125.	Nile	Al Mahmoudia	27700	Yes	Extended Aeration	Secondary	14	Drain[5]		
126.	Nile	Kafr El Dawar	121000	Yes	Extended Aeration	Secondary	40	Drain[5]		
127.	Nile	Kafr Shaik **(Kafr El Shaik Governorate)**	162000	Yes	Extended Aeration	Secondary	60	Drain[5]		
128.	Nile	Dosuik	106300	Yes	Surface Aeration	Secondary	40	Drain[5]		
129.	Nile	Fowaa	64200	Yes	Surface Aeration	Secondary	20	Drain[5]		
130.	Nile	Al Hamoul	48300	Yes	Surface Aeration	Secondary	20	Drain [6]		
131.	Nile	Sedi Salem	52000	Yes	Extended Aeration	Secondary	10	Drain[5]		
132.	Nile	Qlien	36700	Yes	Extended Aeration	Secondary	10	Drain[5]		
133.	Nile	Moutobas	31200	Yes	Extended Aeration	Secondary	10	Drain[5]		
134.	Nile	El Riyad	17900	Yes	Extended Aeration	Secondary	10	Drain[5]		
135.	Nile	Damietta **(Damietta Governorate)**	134900	Yes	Surface Aeration	Secondary	40	Drain [6]		
136.	Nile	Kafr El Battiek	28300	Yes	Surface Aeration	Secondary	10	Drain [6]		
137.	Nile	Kafr Saad	30100	Yes	Surface Aeration	Secondary	5	Drain [6]		
138.	Nile	Kafr El Arab	18300	Yes	Surface Aeration	Secondary	5	Drain [6]		
139.	Nile	El Rowda	17800	Yes	Surface Aeration	Secondary	5	Drain [6]		
140.	Nile	Kafr El Galab	22100	Yes	Surface Aeration	Secondary	5	Drain [6]		
141.	Nile	El Zarka	27400	Yes	Surface Aeration	Secondary	5	Drain [6]		
142.	Nile	Ras El Bar	53900	Yes	Surface Aeration	Secondary	10	Drain [6]		
143.	Nile	El Wasttany	12300	Yes	RBC	Secondary	2	Drain [6]		
144.	Nile	Asro	19200	Yes	Surface Aeration	Secondary	2	Drain [6]		
145	Nile	Meat El Koly	20600	Yes	Surface Aeration	Secondary	3	Drain [6]		
Rural WWTPs Discharging to Drains in the Delta										
146	Nile	Meat Damses **(Dakahlia Governorate)**		Yes	Surface Aeration	Secondary	2	Drain [6]		
147	Nile	Samaha		Yes	Surface Aeration	Secondary	1	Drain [6]		
148	Nile	El Mokata		Yes	Surface Aeration	Secondary	2	Drain [6]		
149	Nile	Damas		Yes	Surface Aeration	Secondary	2	Drain [6]		

	River	City	Served Population[1] (Rounded)	Wastewater Treatment Plant	Wastewater Treatment Method [2]	Degree of Treatment of Wastewater	Wastewater Treated (10^3 m3/day) Design Capacity [2]	Discharge of Treated Wastewater[3]	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
150	Nile	El Nasima		Yes	Surface Aeration	Secondary	2	Drain [6]		
151	Nile	Salmon		Yes	Surface Aeration	Secondary	1	Drain [6]		
152	Nile	Meat Fatak		Yes	Surface Aeration	Secondary	2	Drain [6]		
153	Nile	El Azz		Yes	Surface Aeration	Secondary	2	Drain [6]		
154	Nile	El Baramon		Yes	Surface Aeration	Secondary	2	Drain [6]		
155	Nile	Badawi		Yes	Surface Aeration	Secondary	4.5	Drain [6]		
156	Nile	Damoh		Yes	Surface Aeration	Secondary	2	Drain [6]		
157	Nile	New Bremal		Yes	Surface Aeration	Secondary	2	Drain [6]		
158	Nile	Batra		Yes	Surface Aeration	Secondary	2	Drain [6]		
159	Nile	Meat Elkarma		Yes	Surface Aeration	Secondary	2	Drain [6]		
160	Nile	Berkat Gatas **(Behara Governorate)**		Yes	Oxidation Pond	Primary	1	Drain[5]		
161	Nile	Besentwai		Yes	Oxidation Pond	Primary	2	Drain[5]		
162	Nile	Elseien		Yes	Oxidation Pond	Primary	2	Drain[5]		
163	Nile	Kazara		Yes	Oxidation Pond	Primary	2	Drain[5]		
164	Nile	Ledia		Yes	Trick Filters	Secondary	2	Drain[5]		
165	Nile	Arimon		Yes	Oxidation Pond	Primary	3	Drain[5]		
166	Nile	Nikla El Enab		Yes	Oxidation Pond	Primary	3	Drain[5]		
167	Nile	Elkom ElAkadar		Yes	Oxidation Pond	Primary	2	Drain[5]		
168	Nile	Sanhour		Yes	Oxidation Pond	Primary	2	Drain[5]		
170	Nile	Kom Eltrafia		Yes	Oxidation Pond	Primary	1	Drain[5]		
171	Nile	Waked		Yes	Oxidation Pond	Primary	3	Drain[5]		
172	Nile	Babian		Yes	Oxidation Pond	Primary	2	Drain[5]		
173	Nile	El Adllia **(Demietta Governorate)**		Yes	Oxidation Pond	Primary	2	Drain [6]		
174	Nile	El Kahiata		Yes	Oxidation Pond	Primary	1	Drain [6]		
175	Nile	Awlad Khalf		Yes	Oxidation Pond	Primary	1.2	Drain [6]		
176	Nile	El Rahamna		Yes	Oxidation Pond	Primary	1.6	Drain [6]		

	River	City	Served Population[1] (Rounded)	Wastewater Treatment Plant	Wastewater Treatment Method [2]	Degree of Treatment of Wastewater	Wastewater Treated (10^3 m3/day) Design Capacity [2]	Discharge of Treated Wastewater[3]	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
177	Nile	Sharbas		Yes	Extended Aerat	Secondary	1.7	Drain [6]		
178	Nile	El Rowda		Yes	Extended Aerat	Secondary	1.7	Drain [6]		
179	Nile	El Wastani		Yes	Extended Aerat	Secondary	1.5	Drain [6]		
180	Nile	Kafr Saad ElBalad		Yes	Extended Aerat	Secondary	1.5	Drain [6]		
181	Nile	Kafr Selman		Yes	Extended Aerat	Secondary	1.7	Drain [6]		
182	Nile	Kafer El Galab		Yes	Extended Aerat	Secondary	2.7	Drajn [6]		
183	Nile	Meat Abo Talab		Yes	Extended Aerat	Secondary	1.7	Drain [6]		
184	Nile	El Serw		Yes	Extended Aerat	Secondary	2.7	Drain [6]		
186	Nile	Danahla		Yes	Surfacce Aerat	Secondary	2.7	Drain [6]		
187	Nile	Znkalon **(Sharkia Governorate)**		Yes	Surface Aerat	Secondary	2	Drain [5]		
188	Nile	El Blashon		Yes	Surface Aerat	Secondary	2	Drain [5]		
189	Nile	Nowag		Yes	Surface Aerat	Secondary	2.4	Drain [5]		
190	Nile	Mehalet Zayad		Yes	Surface Aerat	Secondary	2	Drain [5]		
191	Nile	Mehalet Badr Hallawa		Yes	Surface Aerat	Secondary	2	Drain [5]		
WWTPs Under Construction										
192	Nile	Nemert Al Basal **(Garbia Governorate)**		Yes	UASB	Secondary	3	Drain [6]		
193	Nile	Shoni		Yes	RBC	Secondary	6	Drain [6]		
194	Nile	Abswy		Yes	RBC	Secondary	5	Drain [6]		
195	Nile	Bashtel		Yes	RBC	Secondary	3	Drain [6]		
196	Nile	Kfana El Asab		Yes	RBC	Secondary	8	Drain [6]		
197	Nile	Harbiet		Yes	UASB	Secondary	5	Drain [5]		
198	Nile	Dahshama		Yes	UASB	Secondary	3	Drain [5]		
199	Nile	Al Azizia		Yes	UASB	Secondary	5	Drain [5]		
200	Nile	Berwin		Yes	UASB	Secondary	3	Drain [5]		
201	Nile	Al Sanafier		Yes	UASB	Secondary	6	Drain [5]		
202	Nile	Srinbay (**Behara Governorate)**		Yes	RBC	Secondary	3	Drain [5]		

	River	City	Served Population[1] (Rounded)	Wastewater Treatment Plant	Wastewater Treatment Method [2]	Degree of Treatment of Wastewater	Wastewater Treated (10^3 m3/day) Design Capacity [2]	Discharge of Treated Wastewater[3]	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
203	Nile	El Makaria		Yes	RBC	Secondary	3	Drain [5]		
204	Nile	El Dahria		Yes	RBC	Secondary	6	Drain [5]		
205	Nile	Kafr Abo Naser **(Dakahlia Governorate)**		Yes	RBC	Secondary	8	Drain [6]		
206	Nile	Borg Nour Al Homos		Yes	RBC	Secondary	8	Drain [6]		
207	Nile	Abo Dawouid		Yes	RBC	Secondary	6	Drain [6]		
208	Nile	Darien		Yes	RBC	Secondary	8	Drain [6]		
209	Nile	Daheer & Awlad Sabri		Yes	RBC	Secondary	1	Drain [6]		
210	Nile	Sahragt El Swagra		Yes	Trick Filters	Secondary	8	Drain [6]		
211	Nile	Aghour El Kobra **(Qulobia Governorate)**		Yes	UASB	Secondary	6	Drain [5]		
212	Nile	Zawiet Balkan		Yes	RBC	Secondary	5	Drain [5]		
213	Nile	Kafr Mouas **(Monofia Governorate)**		Yes	RBC	Secondary	3	Drain [5]		
214	Nile	Sabac El Sahak		Yes	RBC	Secondary	3	Drain [5]		
215	Nile	Umm Kanan		Yes	RBC	Secondary	8	Drain [5]		
216	Nile	Zawiet Razin		Yes	SBR	Secondary	20	Drain [5]		
217	Nile	Sakalta **(Sohag Governorate)**		Yes	Extended Aerat	Secondary	15	Drain [5]		

*) WWTPs No. 8-59 discharge in the Nile Main Course in Upper Egypt. No Sperate Drainage system in Upper Egypt.
(1) Statistics of the population for the year 2006, National Bureau of Mobilization and Statistics.
(2) Information provided by the Egyptian Holding Company of Water and Wastewater HCWW, the National Authority of Potable Water and Sanitary Drainage NAPWSD, and The Executive Authority of Potable Water and Wastewater (EEPWW).
(3) Information of Ministry of Water Resources and Irrigation.
(4) Shaded row represent Governorates' Capital.
(5) Drains in Rosetta Basin. Two GC WWTPs No. 60-61discharge in El Mohuit to El Rahawy and other WWTPs discharge in the main drains of Sabal, El-Tahrrer, Zawiet El-Baher, El Garbia Main, El Qlubia Main,Farskour, El-Serw El Asfal.
(6) Drains in Damiatta Basin.

Detailed information on management of domestic wastewater in Egypt is found in World Bank Report #32230-EG, issued in March 2005. The report gives amble information and statistics on wastewater generation in all governorates, cities and rural settlements in Egypt. It describes various wastewater treatment systems in rural Egypt and presents the total treatment capacity at a reference year of 2017. Domestic wastewater in Egypt is 5.1 BCM/year, 37% presently treated, expected to reach 66% in 2017.

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN CITIES WITH POPULATION MORE THAN 2,000 IN THE VICINITY OF BIG RIVERS
Country: FRANCE

River	City	Permanent Population	Wastewater Treatment Plant	Population Equivalent of the plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Remarks
Aude	Font-Romeu-Odeillo-Via	2,009	Yes	15,000	Activated sludge	Secondary	1,303	L'Aude	-	-	-
Aude	Quillan	3,445	Yes	6,000	Activated sludge	Secondary	686	L'Aude	-	-	-
Aude	Espéraza	2,166	Yes	5,000	Primary sedimentation + Trickling filter	NC **	NC **	L'Aude	-	-	-
Aude	Limoux	9,411	Yes	15,000	Primary sedimentation + Trickling filter	NC **	NC **	L'Aude	-	-	-
Aude	Carcassonne	43,937	Yes – St Jean	120,000	Activated sludge	Tertiary	12,000	L'Aude	-	-	-
			Yes – Vilalbe Maquens	1,100	Activated sludge	Secondary	165	Malepère stream			
			Yes - Montredon	1,100	Activated sludge	Secondary	165	L'Aude			
			Yes - Grèzes	500	Activated sludge	Secondary	75	Sabartides stream			
			Yes - Herminis	500	Activated sludge	Secondary	75	Unspecified			
Aude	Trèbes	5,646	Yes	8,000	Activated sludge	Secondary	663	L'Aude	-	-	-
Aude	Cuxac d'Aude	4,343	Yes	3,000	Activated sludge	NC **	NC **	L'Aude	-	-	-
Aude	Coursan	5,248	Yes	9,000	Activated sludge	Secondary	800	L'Aude	-	-	-

River	City	Permanent Population	Wastewater Treatment Plant	Population Equivalent of the plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Remarks
Rhône	St- Julien-en Genevois	9,272	Collected to Aïre in Switzerland (391,000 PE – discharge into le Rhône)								Plan under way for 2010 (plant for 9,500 PE), to collect 4 cities, located in Vuache
Rhône	Bellegarde -sur –Valserine	11,329	Yes	18,000	Activated sludge	Secondary	3,600	Le Rhône	-	-	-
Rhône	Culoz	2,914	Yes	5,000	Activated sludge	Secondary	900	Infiltration Le Rhône	-	-	-
Rhône	Yenne	2,841	Yes	5,000	Activated sludge	Tertiary	437	Le Rhône	-	-	Plant currently, undersized (65% of the nominal discharge)
Rhône	Belley	8,466	Yes	20,000	Activated sludge	Tertiary	4,750	Rhône canal	-	-	-
Rhône	Montalieu-Vercieu	2,590	Yes	4,880	Activated sludge	Secondary	750	Le Fourron (Rhône tributary)	-	-	-
Rhône	Loyettes	2,439	Yes	4,500	Activated sludge	Tertiary	675	Le Rhône	-	-	-
Rhône	Lagnieu	6,643	Yes	8,200	Activated sludge	Secondary	800	Le Rhône	-	-	Plant currently undersized (80% of the nominal discharge) Plan under way for 2009 (Second plant for 400 PE)
Rhône	Pont-de-Cheruy	4,591	Collected to Chavanoz								
Rhône	Chavanoz	4,068	Yes	27,000	Activated sludge	Tertiary	2,500	Le Rhône	-	-	-
Rhône	Cremieu	3,300	Yes	10,000	Activated sludge	Tertiary	1,700	Le Rhône	-	-	The plant is located in Saint Julien de Jalionas)
Rhône	Montluel	6,505	Yes	15,000	Activated sludge	Secondary	3,000	Le Rhône	-	-	Plan under way
Rhône	Jonage	5,679	Yes	8,000	Activated sludge	Secondary	2,400	Le Rhône	-	-	-

River	City	Permanent Population	Wastewater Treatment Plant	Population Equivalent of the plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Remarks
Rhône	Miribel	8,545	Collected to Pierre-Bénite								
Rhône	Neyron	2,295	Collected to Pierre-Bénite								
Rhône	Meyzieu	28,500	Yes	35,000	Biofilters	Secondary	6,000	Jonage canal	-	-	-
Rhône	Decines Charpieu	24,500	Collected to Saint Fons et Meyzieu								
Rhône	Lyon	467,400	Collected to Pierre-Bénite and Saint Fons								
Rhône	Saint-Genis-Laval	19,207	Collected to Pierre-Bénite								
Rhône	Vaulx en Velin	39,600	Collected to Saint Fons								
Rhône	Villeurbanne	134,800	Collected to Saint Fons								
Rhône	Oullins	26,000	Collected to Pierre-Bénite								
Rhône	Pierre-Bénite	9,949	Yes	950,000	Activated sludge	Secondary	300,000	Le Rhône	No quantity available	Several rainfall overflow are discharged into Le Rhône	-
Rhône	Saint Fons	16,400	Yes	700,000	Activated sludge + biofilters	Tertiary	484,000	Le Rhône	No quantity available	Several rainfall overflow are discharged into Le Rhône	-
Rhône	Irigny	8,279	Collected toPierre-Bénite								
Rhône	Feyzin	9,347	Collected to Saint Fons								
Rhône	Saint-Symphorien-d' Ozon	5,217	Collected to Saint Fons								
Rhône	Givors	18,700	Yes	89,750	Biofilters	Secondary	10,000	Le Rhône	No quantity available	Some main sewer are still discharged into Le Rhône	-
Rhône	Chasse sur Rhône	4,896	Yes	18,800	Activated sludge	Secondary	3,000	Le Rhône	-	-	-
Rhône	Loire sur Rhône	2,273	Collected to Givors								
Rhône	Ampuis	2,538	Collected to Vienne								
Rhône	Vienne	30,600	Yes	65,000	Activated sludge	Secondary	10,000	Le Rhône	-	-	-
Rhône	Condrieu	3,579	Collected to Saint Alban du Rhône								
Rhône	Pelussin	3,436	Yes	5,700	Activated	Secondary	1,000	La Valencize	-	-	-

River	City	Permanent Population	Wastewater Treatment Plant	Population Equivalent of the plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Remarks
					sludge						
Rhône	Chavannay	2,323	Yes	16,000	Activated sludge	Tertiary	2,000	Rhône canal	-	-	Plant located in Saint Alban du Rhône
Rhône	Saint Maurice l'Exil	5,523	Yes	7,000	Activated sludge	Tertiary	900	Rhône canal	-	-	-
Rhône	Le Péage-de-Roussillon	6,338	Collected to Roussillon								
Rhône	Roussillon	7,813	Yes	24,200	Activated sludge	Secondary	5,200	Rhône canal	-	-	Plant often overloaded
Rhône	St-Rambert-d'Albon	4,359	Yes	10,400	Activated sludge	Secondary	2,200	Rhône canal	-	-	-
Rhône	St-Vallier	4,051	Yes	16,000	Activated sludge	Secondary	2,900	Le Rhône	-	-	-
Rhône	Tain – Hermitage	5,764	Yes	17,500	Activated sludge	Tertiary	2,164	Le Rhône	13 rainfall overflows	Le Rhône	-
Rhône	Tournon-sur Rhône	10,582	Yes	26,000	Activated sludge	Secondary	3,367	Le Rhône	Diagnosis under way	-	-
Rhône	La Roche de Glun	3,065	Yes	8,000	Activated sludge	Tertiary	1,680	Le Rhône	-	-	-
Rhône	Pont de l'Isère	2,604	Collected to la Roche de Glun								
Rhône	Cornas	2,197	Yes	2,500	Activated sludge	Secondary	NC **	Le Rhône	-	-	-
Rhône	Bourg les Valence	18,300	Collected to Valence								
Rhône	Guilherand-Granges	10,700	Yes	33,000	Activated sludge	Tertiary	2,500	Le Rhône	-	-	-
Rhône	St-Peray	6,963	Collected to Guilherand-Granges								
Rhône	Valence	64,900	Yes	150,000	Activated sludge	Secondary	30,000	Le Rhône	-	-	-
Rhône	La-Voulte-s-Rhône	5,165	Collected to Le Pouzin								
Rhône	Le Pouzin	2,668	Yes	12,700	Activated sludge	Secondary	2,700	Rhône tributary	-	-	-
Rhône	Loriol-sur-Drome	5,779	Yes	12,000	Activated sludge	Tertiary	790	Rhône tributary	-	-	Network extension plan
Rhône	Portes les Valence	9,712	Yes	76,000	Activated sludge	Secondary	7,000	Rhône tributary	-	-	-
Rhône	Charmes sur Rhône	2,325	Yes	3,000	Activated	Secondary	650	Le Rhône	-	-	-

River	City	Permanent Population	Wastewater Treatment Plant	Population Equivalent of the plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Remarks
					sludge						
Rhône	Montélimar	31,349	Yes	35,000	Activated sludge	Secondary	6,500	Rhône canal	-	-	New plant under construction (95,000 PE, activated sludge) The old one will be stopped
Rhône	Le Teil	8,285	Yes	7,500	Activated sludge	Secondary	NC **	Le Rhône	-	-	-
Rhône	Chateauneuf du Rhône	2,252	Yes	2,300	Activated sludge	Secondary	NC **	Le Rhône	-	-	-
Rhône	Viviers	3,768	Yes	2,500	Activated sludge	Secondary	700	Le Rhône	-	-	-
Rhône	Donzère	4,760	Yes	15,000	Activated sludge	Secondary	1,380	Rhône canal	-	-	-
Rhône	Bourg-Saint-Andéol	7,328	Yes	6,800	Activated sludge	Secondary	700	Le Rhône	-	-	-
Rhône	Pierrelatte	11,980	Yes	18,600	Activated sludge	Secondary	3,200	Le Rhône	-	-	These data are for the new plant under construction, end of the construction: 2009
Rhône	Lapalud	3,412	Yes	5,400	Activated sludge	Tertiary	1,050	Le Rhône	-	-	-
Rhône	Pont-Saint Esprit	9,661	Yes	10,000	Activated sludge	Secondary	1,500	Le Rhône	-	-	-
Rhône	Mondragon	3,353	Yes	4,000	Activated sludge	Tertiary	600	Rhône canal	-	-	-
Rhône	Orange	27,999	Yes	22,000	Activated sludge	Secondary	1,200	La Meyne	-	-	New plant under construction (45,000 PE) end of the construction : 2009 The old one will be stopped
Rhône	Caderousse	2,712	Yes	1,800	Activated sludge	Secondary	300	Le Rhône	-	-	-

River	City	Permanent Population	Wastewater Treatment Plant	Population Equivalent of the plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Remarks
Rhône	Chateauneuf –du-Pape	2,098	Yes	7,000	Activated sludge	NC **	NC **	NC **	NC **	NC **	NC **
Rhône	Roquemaure	5,207	Yes	7,500	Activated sludge	Secondary	1,000	Le Rhône	-	-	-
Rhône	Sorgues	18,100	Yes	63,000	Activated sludge	Secondary	10,300	L'Ouvèze (Rhône tributary)	-	-	-
Rhône	Villeneuve-les-Avignon	12,078	Collected to Avignon								
Rhône	Le Pontet	17,100	Collected to Avignon								
Rhône	Avignon	90,800	Yes	150,000	Primary sedimentation	Primary	54,000	Le Rhône	-	-	Extension under construction in order to reach a secondary degree of treatment, end of the construction : 2010
Rhône	Aramon	3,869	Yes	4,500	Activated sludge	Secondary	705	Le Rhône	-	-	-
Rhône	Beaucaire	14,900	Yes	27,500	Activated sludge	Secondary	6,000	Le Rhône	-	-	New plant under construction for 2010 (40,000 PE) The old one will be stopped
Rhône	Tarascon	13,100	Yes	20,000	Activated sludge	Secondary	3,400	Le Rhône	-	-	-
Rhône	Fourques	2,702	Yes	4,000	Activated sludge	Secondary	NC **	Little Rhône	-	-	-
Rhône	Bellegarde	6,109	Yes	8,000	Activated sludge	Secondary	NC **	Rhône canal	-	-	-
Rhône	Saint Gilles	13,100	Yes	14,400	Activated sludge	Tertiary	3,000	Le Rhône	-	-	-

River	City	Permanent Population	Wastewater Treatment Plant	Population Equivalent of the plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Remarks
Rhône	Arles	52,400	Yes (Raphele Moule)	4,000	Activated sludge	Secondary	915	Rhône canal	-	-	-
			Yes (La Principale)	50,000	Activated sludge	Secondary	10,000	Le Rhône	-	-	-
			Yes (Mas Thibert)	1,700	Activated sludge	Secondary	NC **	Arles canal	-	-	-
Rhône	Aigues-Mortes	6,798	Collected to le Grau du Roi (cf MAP Technical Reports Series no, 157)								
Var	Saint Paul	2,874	Collected to Cagnes-sur-Mer (cf MAP Technical Reports Series no, 157)								
Var	Vence	17,150	Yes – Vence Nord	12,000	Activated sludge	Secondary	1,100	Lubiane stream	-	-	Plan under way for 2012 (25,000 PE) The old plants will be stopped
			Yes – Vence Malvan	10,000	Activated sludge	Secondary	1,150	Malvan stream			
Var	Levens	3,700	Yes – La Gumba	3,000	Activated sludge	Secondary	300	Gumba small valley	-	-	Plan under way for 2012 (5,000 PE) The old plants will be stopped
			Yes – Le Rivet	700	Trickling filter	Primary	40	Levens stream			
Var	Saint Martin du Var	2,210	Collected to Castagnier								
Var	Colomars	3,129	Collected to Castagnier and Nice (cf MAP Technical Reports Series no, 157)								

River	City	Permanent Population	Wastewater Treatment Plant	Population Equivalent of the plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Remarks
Var	Saint Laurent du Var	27,252	Yes	80,000	Activated sludge	Secondary	14,000	Le Var	-	-	Extension plan for 2010, in order to add a tertiary treatment, probably a membrane treatment

***** Data No Communicated***

(1) City:

In this study, a city is considered to be situated in proximity of big rivers as it is situated at less than 5 kilometres from this one.

Some Mediterranean costal cities have already been listed in previous studies MAP Technical Reports Series. These cities are not taken into account in the current study, but they are listed in the document named “Table 2” as a reminder.

(2) Population:

The National Institute of Statistic and Economical Studies (INSEE) supplied the most recent number of permanent inhabitants for each city.

(3) Wastewater:

Every data relative to municipal wastewater have been searched through Water Agency, local communities and wastewater treatment plant managers.

Some wastewater treatment plants collect wastewaters from more than one city, whereas some cities have several wastewater treatment plants. That is why it is not always easy to compare the plant population equivalent with the city population.

For this study we have the use of yearly average daily outflows.

When the column “Wastewater untreated” is empty, it means that either a collective treatment plant collects the whole wastewaters, or that a part of the wastewater is treated by individual systems.

As there is no quantity available, we have to notice that rainfall overflows are located on many cites’ networks in order not to overload plants during heavy rains.

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN CITIES WITH POPULATION MORE THAN 2,000 IN THE VICINITY OF BIG RIVERS
Country: GREECE

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Additional information
Akheloos	Neokhorion	3208	DNO					641.60	80% DI through stream 20% Septic tanks	The WWTP is out of operation. Part of the sewerage network has been constructed.
Akheloos	Katokhi	2890	N					578.00	Septic tanks	
Akheloos	Lepenou	2227	N					445.40	Septic tanks	To be served by the WWTP of Agrinio
Aliakmon	Aiani	2074	N					414.80	25% DI through stream 75% Septic tanks	Part of the sewerage network has been constructed.
Aliakmon	Meliki	3102	N					620.40	Septic tanks	
Aliakmon	Neapoli	2351	N					470.20	DI through stream	The sewerage network has been constructed.
Aliakmon	Servia	3290	N					658.00	DI through stream	The sewerage network has been constructed.
Aliakmon	Siatista	5642	N					1128.40	DI through stream	The sewerage network has been constructed.
Aliakmon	Velventos	3497	N					699.40	DI through stream	The sewerage network has been constructed.
Aliakmon	Aiyinion	4280	Y	Biological treatment	Secondary treatment	856.00	DI through stream			

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Additional information
Aliakmon	Argos Orestikon	7595	Y	Biological treatment	Tertiary treatment	1519.00	DI through stream			Served by the WWTP of Kastoria
Aliakmon	Grevena	10500	Y	Biological treatment	Tertiary treatment	2100.00	DI through stream			
Aliakmon	Kastoria	28200	Y	Biological treatment	Tertiary treatment	5640.00	DI through stream			
Aliakmon	Makrohorion	4843	Y	Biological treatment	Tertiary treatment	968.60	DI through stream			Served by the WWTP of Veroia
Aliakmon	Veroia	54000	Y	Biological treatment	Tertiary treatment	10800.00	DI through stream			
Axios	Koufalia	2189	DNO					437.80	45% DI through stream 55% Septic tanks	The WWTP is out of operation. Part of the sewerage network has been constructed.
Axios	Anatolikon	2539	N					507.80	Septic tanks	
Axios	Khalkidon	3749	N					749.80	Septic tanks	
Axios	Kimina	3692	N					738.40	Septic tanks	
Axios	Nea Malgara	2443	N					488.60	Septic tanks	
Axios	Nea Mesimbria	2343	N					468.60	Septic tanks	
Axios	Vathylakos	2198	N					439.60	Septic tanks	
Axios	Europos	2425	UC					485.00	90% DI through stream 10% Septic tanks	The WWTP is under construction. Part of the sewerage network has been constructed.
Axios	Khalastra	7298	UC					1459.60	90% DI through stream 10% Septic tanks	The WWTP is under construction. Part of the sewerage network has been constructed.
Axios	Polykastron-Axioupoli	9842	Y	Biological treatment	Tertiary treatment	1614.09	RB	354.31	Septic tanks	
Evros/Meric	Ferai	5206	N					1041.20	25% DI through	Part of the

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Additional information
									stream 75% Septic tanks	sewerage network has been constructed.
Evros/Meric	Nea Vissa	2844	N					568.80	Septic tanks	
Evros/Meric	Tikheron	2031	N					406.20	30% DI through stream 70% Septic tanks	Part of the sewerage network has been constructed.
Evros/Meric	Didimotikhon	15000	Y	Biological treatment	Tertiary treatment	3000.00	DI through stream			
Evros/Meric	Orestias	24000	Y	Biological treatment	Tertiary treatment	4800.00	DI through stream			
Evros/Meric	Souflion	4258	Y	Biological treatment	Tertiary treatment	340.64	DI through stream	510.96	Septic tanks	
Nestos	Khrisoupolis	16000	Y	Biological treatment	Tertiary treatment	3200.00	DI through stream			
Strymon	Nigriti	5620	DNO					1124.00	DI through stream	The WWTP is out of operation
Strymon	Terpni	2189	DNO					437.80	DI through stream	The WWTP is out of operation
Strymon	Neon Petritsion	2373	N					474.60	DI through stream	The sewerage network has been constructed.
Strymon	Neos Skopos	2991	N					598.20	DI through stream	The sewerage network has been constructed.
Strymon	Skoutari	2614	N					522.80	Septic tanks	
Strymon	Iraklia	3551	UC					710.20	Septic tanks	The WWTP is under construction
Strymon	Sidirokastro	5911	UC					1182.20	DI through stream	The WWTP is under construction. The sewerage network has been constructed.
Strymon	Choristi	2625	Y	Biological treatment	Tertiary treatment	525.00	DI through stream			Served by the WWTP of

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater	Additional information
										Drama
Strymon	Doxato	7280	Y	Biological treatment	Secondary treatment	1456.00	DI through stream			
Strymon	Drama	46000	Y	Biological treatment	Tertiary treatment	9200.00	DI through stream			
Strymon	Kalampaki	3489	Y	Biological treatment	Tertiary treatment	697.80	DI through stream			Served by the WWTP of Drama
Strymon	Prosotsani	5882	Y	Biological treatment	Secondary treatment	1058.76	DI through stream	117.64	Septic tanks	
Strymon	Serres	75000	Y	Biological treatment	Tertiary treatment	15000.00	DI through stream			

Remarks: Due to unavailability of specific information a wastewater production of 200 l/inh/d was considered in all cases

DI trough stream: discharge of sewage to a stream which flows to the main river or tributary of the river

UC Under construction

DNO Constructed but does not operate

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN CITIES WITH POPULATION MORE THAN 2,000 IN THE VICINITY OF BIG RIVERS
Country: ITALY

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Adige	Malles Venosta	4835	yes	——	Primary	676,9	——	290,1	——
Adige	Silandro	5733	yes	——	primary	802, 62	——	343,98	——
Adige	Merano	33656	yes	——	primary	4711,84	——	2019,36	——
Adige	Lana	9759	yes	——	primary	1366,26	——	585,54	——
Adige	Bolzano	94989	yes	——	tertiary	13298,46	RB	5699,34	——
Adige	Appiano	12657	yes	——	tertiary	1771,98	RB	759,42	——
Adige	Caldaro	6852	yes	——	primary	959,28	——	411,12	——
Adige	Ora	3022	yes	——	tertiary	423,08	RB	181,32	——
Adige	Mezzolombardo	5941	yes	——	primary	831,74	——	356,46	——
Adige	S. Michele all' Adige	2399	yes	——	primary	335,86	——	143,94	——
Adige	Lavis	7591	yes	——	primary	1062,74	——	445,46	——
Adige	Trento	104946	yes	——	primary	14692,44	——	6296,76	——
Adige	Folgaria	3086	yes	——	primary	432,04	——	185,16	——
Adige	Rovereto	33422	yes	——	primary	4679,08	——	2005,32	——
Adige	Mori	8471	yes	——	primary	1185,94	——	508,26	——
Adige	Ala	7348	yes	——	primary	1028,72	——	440,88	——
Adige	Lazise	6055	yes	——	primary	847,7	——	363,3	——
Adige	Bussolengo	16986	yes	——	primary	2378,04	——	1019,16	——
Adige	Verona	253208	yes	——	primary	35449,12	——	15192,48	——
Adige	Zevio	12035	yes	——	primary	1684,9	——	722,1	——
Adige	S. Giovanni Lupatoto	21298	no	——	——	——	——	4259,6	——

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Adige	S. Bonifacio	17513	yes	——	primary	2451,82	——	1050,78	——
Adige	Minerbe	4588	yes	——	primary	642.32	——	275,28	——
Adige	Legnago	24274	yes	——	primary	3398,36	——	1456,44	——
Adige	Villa Bartolomea	5368	yes	——	primary	751,52	——	322,08	——
Adige	Badia Polesine	10431	yes	——	tertiary	1460,34	RB	625,86	——
Adige	Lendinara	12173	yes	——	tertiary	1704,22	RB	730,38	——
Adige	Boara Pisani	2507	yes	——	primary	350,98	——	150,42	——
Adige	Rovigo	50289	yes	——	primary	7041,72	——	3017,34	——
Adige	Anguillara Ven.	4739	yes	——	primary	663,46	——	284,34	——
Adige	Cavarzere	15504	yes	——	primary	2170,56	——	930,24	——
Adige	Loreo	3718	yes	——	tertiary	520,52	RB	223,08	——
Adige	Rosolina	6144	yes	——	primary	860,16	——	368,64	——
Arno	Stia	3008	yes	——	primary	421,12	——	180,48	——
Arno	Poppi	5873	yes	——	primary	822,22	——	352,38	——
Arno	Bibbiena	11462	yes	——	primary	1604,68	——	687,72	——
Arno	Subbiano	5485	yes	——	primary	767,9	——	329,1	——
Arno	Terranuova Bracciolini	11181	no	——	——	——	——	2236,2	——
Arno	Bucine	9320	yes	——	primary	1304,8	——	559,2	——
Arno	Montevarchi	22239	no	——	——	——	——	4447,8	——
Arno	San Giovanni Valdarno	16993	yes	——	primary	2379,02	——	1019,58	——
Arno	Figline Valdarno	16301	yes	——	primary	2282,14	——	978,06	——
Arno	Incisa in Val d' Arno	5503	yes	——	primary	770,42	——	330,18	——
Arno	Bagno a Ripoli	25232	yes	——	primary	3532,48	——	1513,92	——
Arno	Pontassieve	20610	yes	——	primary	2885,4	——	1236,6	——
Arno	Fiesole	14085	yes	——	primary	1971,9	——	845,1	——
Arno	Firenze	356118	yes	——	primary	49856,52	——	21367,08	——

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Arno	Cambi Bisenzio	37249	no	——	——	——	——	7449,8	——
Arno	Lastra a Signa	17938	yes	——	primary	2511,32	——	1076,28	——
Arno	Montelupo Fior.	11240	no	——	——	——	——	2248	——
Arno	Empoli	44094	yes	——	primary	6173,16	——	2645,64	——
Arno	San Miniato	26365	yes	——	primary	3691,1	——	1581,9	——
Arno	Fucecchio	21139	no	——	——	——	——	4227,2	——
Arno	Pontedera	24971	no	——	——	——	——	4994,2	——
Arno	Bientina	6115	yes	——	primary	856,1	——	366,9	——
Arno	Cascina	38359	yes	——	primary	5370,26	——	2301,54	——
Arno	S. Giuliano Terme	30392	no	——	——	——	——	6078,4	——
Arno	Pisa	89694	yes	——	primary	12557,16	——	5381,64	——
Brenta	Levico Terme	6325	Yes	——	primary	885.5	——	379,5	——
Brenta	Rocegno	2475	Yes	——	primary	346,5	——	148,5	——
Brenta	Borgo Valsugana	6177	Yes	——	primary	864,78	——	370,62	——
Brenta	Grigno	2340	Yes	——	primary	327,6	——	140,4	——
Brenta	Arsie	2806	Yes	——	primary	392,84	——	168,36	——
Brenta	Enego	2017	yes	——	primary	282,38	——	121.02	——
Brenta	Bassano d. Grappa	40736	Yes	——	primary	5703,04	——	2444,16	——
Brenta	Marostica	12848	Yes	——	primary	1798,72	——	770,88	——
Brenta	Rosu (a)	12516	no	——	——	——	——	2503,2	——
Brenta	Sandrigo	7904	Yes	——	primary	1106,56	——	474,24	——
Brenta	Cittadella	18743	Yes	——	primary	2624,02	——	1124,58	——
Brenta	Piazzola sul Brenta	10682	Yes	——	primary	1495,48	——	640,92	——
Brenta	Vigonza	19458	Yes	——	primary	2724,12	——	1167,48	——
Brenta	Padova	204870	Yes	——	primary	28681,8	——	12292,2	——
Brenta	Stra	7031	no	——	——	——	——	1405,86	——

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Brenta	Dolo	14442	Yes	fitodepuration	tertiary	2021,88	——	866,52	——
Brenta	Piove di Sacco	17517	Yes	Biological	secondary	2452,38	——	1051,02	——
Brenta	Chioggia	51779	Yes	——	——	7249,06	——	3106,74	——
Pescara	Montereale	2930	Yes	——	——	410,2	——	175,8	——
Pescara	Pizzoli	3047	yes	——	——	426,58	——	182,82	——
Pescara	L' Aquila	68503	yes	——	Primary	9590,42	——	4110,18	——
Pescara	Pratola Peligna	7814	yes	——	Primary	1093,96	——	468,84	——
Pescara	Popoli	5566	yes	——	Primary	779,24	——	333,96	——
Pescara	Torre de Passeri	3161	yes	——	Primary	442,54	——	189,66	——
Pescara	Scafa	3987	yes	——	Primary	558,18	——	239,22	——
Pescara	Manoppello	5637	yes	——	tertiary	789,18	RB	338,22	——
Pescara	Cepagatti	9097	yes	——	Primary	1273,58	——	545,82	——
Pescara	Chieti	52486	yes	——	Primary	7348,04	——	3149,16	——
Po	Paesana	3072	yes	——	Primary	430,08	——	184,32	——
Po	Saluzzo	15647	yes	——	tertiary	2190,58	RB	938,82	——
Po	Villafranca Piemonte	4795	yes	——	tertiary	671,3	RB	287,7	——
Po	Carignano	8647	yes	——	tertiary	1210,58	RB	518,82	——
Po	Moncalieri	53350	yes	——	tertiary	7469	RB	3201	——
Po	Torino	865263	yes	——	tertiary	121136,82	RB	51915,78	——
Po	Settimo To.	46982	yes	——	tertiary	6577,48	RB	2818,92	——
Po	Gassino Torinese	9015	yes	——	tertiary	1262,1	RB	540,9	——
Po	Chivasso	23648	yes	——	tertiary	3310,72	RB	1418,88	——
Po	Saluggia	4074	yes	——	Primary	570,36	——	244,44	——
Po	Trino	7605	yes	——	Primary	1064,7	——	456,3	——
Po	Crescentino	7609	yes	——	tertiary	1065,26	RB	456,54	——
Po	Casale Monferrato	35244	yes	——	tertiary	4934,16	RB	2114,64	——

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Po	Valenza	20339	yes	——	Primary	2847,46	——	1220,34	——
Po	Castelnuovo Scr.	5624	yes	——	tertiary	787,36	RB	337,44	——
Po	Sale	4246	yes	——	tertiary	594,44	RB	849,2	——
Po	Sannazzaro de' Burgondi	5802	yes	——	Primary	812,28	——	348,12	——
Po	Casei Gerola	2536	yes	——	tertiary	355,04	RB	152,16	——
Po	Pavia	71214	yes	——	Primary	9969,96	——	4272,84	——
Po	Stradella	10763	yes	——	tertiary	1506,82	RB	645,78	——
Po	Gasalpusterlengo	13895	yes	——	tertiary	1945,3	RB	833,7	——
Po	S. Colombano al Lambro	7258	yes	——	tertiary	1016,12	RB	435,48	——
Po	Codogno	14408	yes	——	Primary	2017,12	——	864,48	——
Po	Caorso	4511	yes	——	tertiary	631,54	RB	270,66	——
Po	Cremona	70887	yes	——	tertiary	9924,18	RB	4253,22	——
Po	Busseto	6841	yes	——	tertiary	957,74	RB	410,46	——
Po	Sissa	3946	yes	——	Primary	552,44	——	236,76	——
Po	Gasalmaggiore	13818	yes	——	Primary	1934,52	——	829,08	——
Po	Sabbioneta	4288	yes	——	tertiary	600,32	RB	257,28	——
Po	Colorno	7971	yes	——	Primary	1115,94	——	478,26	——
Po	Viadana	16933	yes	——	tertiary	2370,62	RB	1015,98	——
Po	Guastalla	13886	yes	——	tertiary	1944,04	RB	833,16	——
Po	Luzzara	8517	yes	——	tertiary	1192,38	RB	511,02	——
Po	Suzzara	17643	yes	——	Primary	2470,02	——	1058,58	——
Po	S. Benedetto Po	7502	yes	——	tertiary	1009,4	RB	432,6	——
Po	Ostiglia	7210	yes	——	tertiary	908,04	RB	389,16	——
Po	Sermide	6486	yes	——	Primary	603,68	——	258,72	——
Po	Castelmassa	4312	yes	——	tertiary	386,96	RB	165,84	——
Po	Ficarolo	2764	yes	——	Primary	2203,74	——	944,46	——

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Po	Bondeno	15741	yes	——	tertiary	1397,06	RB	598,74	——
Po	Occhiobello	9979	yes	——	Primary	18338,88	——	7859,52	——
Po	Ferrara	130992	yes	——	tertiary	553,14	RB	237,06	——
Po	Polesella	3951	yes	——	tertiary	293,58	RB	125,82	——
Po	Crespino	2097	yes	——	Primary	816,48	——	349,92	——
Po	Berra	5832	yes	——	tertiary	370,3	RB	158,7	——
Po	Corbola	2645	yes	——	Primary	2889,6	——	1238,4	——
Po	Adria	20640	yes	——	Primary	683,48	——	292,92	——
Po	Ariano nel Polesine	4882	yes	——	tertiary	1945,3	RB	833,7	——
Po	Taglio di Po	8284	yes	——	Primary	1159,76	——	497,04	——
Po	Porto Tolle	10666	yes	——	Primary	1493,24	——	639,96	——
Reno	San Marcello Pist.	7142	yes	——	Primary	999,88	——	428,52	——
Reno	Porreta Terme	4646	yes	——	Primary	650,44	——	278,76	——
Reno	Vergato	6730	yes	——	Primary	942,2	——	403,8	——
Reno	Monzuno	5254	yes	——	Primary	735,56	——	315,24	——
Reno	Sasso Marconi	13793	yes	——	tertiary	1931,02	RB	827,58	——
Reno	Casalecchio di Reno	33029	yes	——	tertiary	4624,06	RB	1981,74	——
Reno	Bologna	371217	yes	——	tertiary	51970,38	RB	22273,02	——
Reno	Cento	29297	yes	——	Primary	4101,58	——	1757,82	——
Reno	Poggio Renatico	7679	yes	——	Primary	1075,06	——	460,74	——
Reno	Malalbergo	7248	yes	——	Primary	1014,72	——	434,88	——
Reno	Molinella	13727	yes	——	Primary	1921,78	——	823,62	——
Reno	Argenta	21648	yes	——	Primary	3030,72	——	1298,88	——
Reno	Alfonsine	11724	yes	——	Primary	1641,36	——	703,44	——
Tevere	Pieve S. Stefano	3316	yes	——	Primary	464,24	——	198,96	——
Tevere	Sansepolcro	15693	yes	——	Primary	2197,02	——	941,58	——
Tevere	S. Giustino	10394	yes	——	tertiary	1455,16	RB	623,64	——

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Tevere	Citta di Castello	37889	yes	——	Primary	5304,46	——	2273,34	——
Tevere	Umbertide	15254	yes	——	Primary	2135,56	——	915,24	——
Tevere	Perugia	149125	yes	——	tertiary	20877,5	RB	8947,5	——
Tevere	Deruta	8090	yes	——	Primary	1132,6	——	485,4	——
Tevere	Marsciano	16336	yes	——	Primary	2287,04	——	980,16	——
Tevere	Todi	16704	yes	——	Primary	2338,56	——	1002,24	——
Tevere	Prato	172499	yes	——	Primary	24149,86	——	10349,94	——
Tevere	Baschi	2649	yes	——	Primary	370,86	——	158,94	——
Tevere	Castiglione in T.	2261	yes	——	tertiary	316,54	RB	135,66	——
Tevere	Orte	7781	yes	——	Primary	1089,34	——	466,86	——
Tevere	Magliano Sabina	3745	yes	——	Primary	524,3	——	224,7	——
Tevere	Poggio Mirteto	5168	yes	——	primary	723,52	——	310.08	——
Tevere	Fiano R.	7924	yes	——	tertiary	1109,36	RB	475,44	——
Tevere	Monterotondo	34376	yes	——	primary	4812,64	——	2062,56	——
Tevere	Mentana	16288	yes	——	primary	2280,32	——	977,28	——
Tevere	Roma	2546804	yes	——	primary	356552,56	——	152808,24	——
Tevere	Fiumicino	50535	yes	——	tertiary	7074,9	RB	3032,1	——
Volturno	Venafro	11198	yes	——	primary	1567,72	——	671,88	——
Volturno	Alife	7164	yes	——	tertiary	1002,96	RB	429,84	——
Volturno	Dragoni	2108	yes	——	primary	295,12	——	126,48	——
Volturno	Telese Terme	5756	yes	——	tertiary	805,84	RB	345,36	——
Volturno	Caiazzo	5879	yes	——	primary	823,06	——	352,74	——
Volturno	Capua	19041	yes	——	primary	2665,74	——	1142,46	——
Volturno	S. Maria Capua Vetere	30745	yes	——	tertiary	4304,3	RB	1844,7	——
Volturno	Grazzanise	6830	yes	——	primary	956,2	——	409,88	——
Volturno	Castel Volturno	18639	yes	——	tertiary	2609,46	RB	1118,34	——
Remarks:									

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN CITIES WITH POPULATION MORE THAN 2,000 IN THE VICINITY OF BIG RIVERS
Country: SPAIN

Tributary river	River	City	Permanent Population *(2007)* *	Population Equivalent	Population served	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
SIÓ	Ebro	AGRAMUNT	*5,434*	11,706	not avalaible	Yes	Biological	Secondary	1,878	river basin	None	-
SEGRE	Ebro	AITONA-SERÒS	*4,285*	5,340	not avalaible	Yes	Biological	Secondary	1,896	river basin	None	-
Aitona includes the following cities:	Aitona *(2.376)*, Almenar *(1.909)*											
SEGRE	Ebro	ALCARRÀS	*6,510*	8,601	not avalaible	Yes	Biological	Secondary	2,867	river basin	None	-
NOGUERA RIBAGORÇANA	Ebro	ALFARRÀS-ALMENAR	*6,824*	3,215	not avalaible	Yes	Biological	Secondary	1,519	river basin	None	-
Alfarràs-Almenar includes the following cities:	Alfarràs *(3.228)*, Almenar *(3.596)*											
----------	Ebro	AMPOSTA	12.743[(1)] *(19.805)*	23,095	18,719	Yes	Biological	Secondary	4,499	river basin	None	-
SENILL	Ebro	ARTESA DE SEGRE	*3,737*	5,340	not avalaible	Yes	Biological	Secondary	841	river basin	None	-
----------	Ebro	ASCÓ	2.922[(1)] *(1.616)*	not avalaible	not avalaible	Recently finished construction	Biological	Secondary	not avalaible	not avalaible	None	-
SEGRE	Ebro	BALAGUER	*15,781*	27,404	not avalaible	Yes	Biological	Secondary	5,810	river basin	None	-
MATARRANYA	Ebro	BATEA	*2,112*	6,818	2,094	Yes	Biological	Secondary	396	river basin	None	-
SEGRE	Ebro	BELL-LLOC D'URGELL	*2,372*	2,138	not avalaible	Yes	Biological	Secondary	1,078	river basin	None	-
CORB	Ebro	BELLPUIG	*4,576*	7,506	not avalaible	Yes	Biological	Secondary	1,390	river basin	None	-
SEGRE	Ebro	BELLVÍS	*2,428*	2,053	not avalaible	Yes	Biological	Secondary	598	river basin	None	-

Tributary river	River	City	Permanent Population *(2007)* *	Population Equivalent	Population served	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
SEGRE	Ebro	BORGES BLANQUES, LES	*5,734*	8,355	not avalaible	Yes	aerated lagoons	Secondary	1,682	river basin	None	-
ONDARA	Ebro	CERVERA	*9,093*	12,875	not avalaible	Yes	aerated lagoons	Secondary	1,784	river basin	None	-
----------	Ebro	DELTEBRE	*11,063*	11,524	10,943	Yes	Biological	Secondary	4,268	river basin	None	-
SIURANA	Ebro	FALSET	*2,742*	3,158	2,658	Yes	Biological	Secondary	469	river basin	None	-
----------	Ebro	FATARELLA, LA	*1,170*	2,241	1,180	Yes	Lagoons	Secondary	**231**	river basin	None	-
----------	Ebro	FLIX	3.494[(1)] *(4.006)*	10,743	4,029	Yes	Biological	Secondary	1,121	river basin	None	-
SEGRE	Ebro	FONDARELLA	*19,918*	49,526	not avalaible	Yes	Biological	Secondary	16,884	river basin	None	-
Fondarella includes the following cities:	Vilanova de Bellpuig *(1.119)*, Golmés *(1.610)*, Mollerussa *(13.086)*, Palau d'Anglesola *(1.947)*, Fondarella *(788)*, Miralcamp *(1.368)*											
INFILTRATION ON LAND	Ebro	GALERA, LA	*852*	2,950	818	Yes	Green Filter	Secondary	**300**	Discharge on land (infiltration)	None	-
SEC	Ebro	GANDESA	*3,040*	5,531	3,028	Yes	Biological	Secondary	431	river basin	None	-
----------	Ebro	GARCIA	4.393[(1)] *(553)*	not avalaible	not avalaible	No	-	-	-	-	-	-
SEGRE	Ebro	GUISSONA	*5,253*	7,437	not avalaible	Yes	aerated lagoons	Secondary	2,209	river basin	None	-
SEGRE	Ebro	JUNEDA	*5,481*	6,028	not avalaible	Yes	Biological	Secondary	2,289	river basin	None	-
Juneda includes the following cities:	Juneda *(3.222)*, Torregrossa *(2.259)*											
CORB	Ebro	LINYOLA	*2,655*	7,646	not avalaible	Yes	Biological	Secondary	1,322	river basin	None	-
SEGRE	Ebro	LLEIDA	*132,962*	231,684	not avalaible	Yes	Biological	Secondary	57,206	river basin	None	-

Tributary river	River	City	Permanent Population *(2007)* *	Population Equivalent	Population served	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Lleida includes the following cities:	Lleida *(127.314)*, Alpicat *(5.648)*											
SIURANA	Ebro	MAS-ROIG (BARRANC DEL POU)	*525*	2,370	539	Yes	aerated lagoons	Secondary	*210*	river basin	None	-
SEGRE	Ebro	MONTFERRER	14,716	12,206	not avalaible	Yes	aerated lagoons	Secondary	5,385	river basin	None	-
Montferrer includes the following cities:	Alàs (231), Aravell (88), Bellestar (97), Arfa (163), Castellciutat (451), La Seu d'Urgell *(12.703)*, Montferrer *(983)*											
----------	Ebro	MÓRA D'EBRO	6.261[(1)] *(5.232)*	18,547	8,226	Yes	Biological	Secondary	1,391	river basin	None	-
----------	Ebro	MÓRA LA NUEVA	6.664[(1)] *(3.189)*	See Móra d'Ebro								-
SEGRE	Ebro	OLIANA	*1,938*	2,327	not avalaible	Yes	Biological	Secondary	439	river basin	None	-
NOGUERA PALLARESA	Ebro	POBLA DE SEGUR, LA	*3,089*	13,387	not avalaible	Yes	Biological	Secondary	1,838	river basin	None	-
SEGRE	Ebro	PONTS	*2,682*	4,723	not avalaible	Yes	Biological	Secondary	569	river basin	None	-
SEGRE	Ebro	PUIGCERDÀ	see next row	23,377	not avalaible	Yes	Biological	Secondary	9,108	river basin	None	-
Puigcerdà includes the following cities:	Puigcerdà *(8.949)*, Llívia *(1.388)*, Age (122), Vilallobent (134) (Catalunya, SPAIN) Bourg-Madame, Ur, Vilanova de les Escaldes, Angostrina, Dorres, Estavar, Gorguja, Sallagouse, Llo,											

Tributary river	River	City	Permanent Population *(2007)* *	Population Equivalent	Population served	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
	Ro, Err, Santa Llocaia, Verdingnans, Bajande, Onces (FRANCE).											
----------	Ebro	RASQUERA	2.183[(1)] *(934)*	not avalaible	not avalaible	No	-	-	-	-	-	-
NOGUERA PALLARESA	Ebro	RIALP	*662*	4,991	not avalaible	Yes	Biological	Secondary	434	river basin	None	-
----------	Ebro	SANTA BÀRBARA	*3,805*	6,794	3,613	Yes	aerated lagoons	Secondary	748	river basin	None	-
NOGUERA PALLARESA	Ebro	SORT	*2,264*	3,366	not avalaible	Yes	Biological	Secondary	612	river basin	None	-
ONDARA	Ebro	TÀRREGA	*15,515*	21,780	not avalaible	Yes	Biological	Secondary	2,904	river basin	None	-
----------	Ebro	TIVENYS	6.824[(1)] *(926)*	not avalaible	not avalaible	No	-	-	-	-	-	-
SEGRE	Ebro	TORRES DE SEGRE	*3,693*	4,115	not avalaible	Yes	Biological	Secondary	1,829	river basin	None	-
Torres de Segre includes the following cities:	Soses *(1.672)*, Torres de Segre *(2.021)*											
----------	Ebro	TORTOSA-ROQUETES	13.109[(1)]	49,231	40,937	Yes	Biological	Secondary	7,877	river basin	None	-
Tortosa includes the following cities:	Tortosa *(34.832)*, Roquetes *(7.689)*											
NOGUERA PALLARESA	Ebro	TREMP	*6,404*	2,873	not avalaible	Yes	Biological	Secondary	3,447	river basin	None	-
Tremp includes the following cities:	Talarn *(382)*, Tremp *(6.022))*											
Ebro	Ebro	HARO	*19,832*	64,000	*19,832*	Yes	Extended aeration	Secondary	24,000	Ebro	None	
Ebro	Ebro	CENICERO	*2,070*	3,500	*2,070*	Yes	Extended aeration	Secondary	1,300	Ebro	None	

Tributary river	River	City	Permanent Population *(2007)* *	Population Equivalent	Population served	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Old Ebro river bed	Ebro	FUENMAYOR	*6,768*	10,100	*6,768*	Yes	Extended aeration	Secondary	3,300	Río Antiguo	None	
Ebro	Ebro	LOGROÑO	*160,810*	213,000	*160,810*	Yes	Activated sludge	Secondary	60,000	Ebro	None	
Creek	Ebro	EL VILLAR DE ARNEDO	*714*	1,500	714	Yes	Trickling filter	Secondary	250	Barranco Costeras	None	
Ebro	Ebro	CALAHORRA	*43,613*	68,000	*43,613*	Yes	Activated sludge	Secondary	18,000	Ebro	None	
Ebro	Ebro	RINCÓN DE SOTO	*3,592*	6,700	*3,592*	Yes	Extended aeration	Secondary	3,600	Ebro	None	
Ebro	Ebro	ALDEANUEVA DE EBRO	*2,600*	7,200	*2,600*	Yes	Extended aeration	Secondary	1,800	Ebro	None	
Alhama	Ebro	ALFARO	*9,980*	20,000	*9,980*	Yes	Extended aeration	Secondary	6,000	Alhama	None	
Ebro	Ebro	BRIONES	*860*	2,800	*860*	Yes	Extended aeration	Secondary	800	Ebro	None	
Creek	Ebro	SAN ASENSIO	*1,316*	3,900	*1,316*	Yes	Extended aeration	Secondary	1,100	Barranco del Chorrillo	None	
Najerilla	Ebro	NÁJERA	*9,062*	17,500	*9,062*	Yes	Extended aeration	Secondary	8,500	Najerilla	None	
Ebro	Ebro	ALCANADRE	*833*	1,350	*833*	Yes	Extended aeration	Secondary	450	Ebro	None	
Ebro	Ebro	AUSEJO	*1,000*	2,900	*1,000*	Yes	Trickling filter	Secondary	430	Ebro	None	
Creek	Ebro	PRADEJÓN	*3,787*	7,000	*3,787*	Yes *	Natural lagoons	Primary	1,800	Barranco Costeras	None	
	Jucar	Alberic	10.234		not avalaible	Yes	Extended aeration	Secondary treatment and eliminatioN	2,168	RB (irrigation)	None	
	Jucar	Guadassuar	5.830		not avalaible	Yes	Extended aeration	Secondary treatment	946	RB (irrigation)	None	
	Jucar	Carcaixen	21.753		not avalaible	Yes	Activated sludge	Secondary treatment	37,717	Discharge in Jucar river	None	

Tributary river	River	City	Permanent Population *(2007)* *	Population Equivalent	Population served	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
	Jucar	La Pobla Llarga	4.379					and elimination N y P				
	Jucar	Alzira	43.253									
	Jucar	Algemesi	27.326		not avalaible	Yes	Activated sludge	Secondary treatment and elimination N y P	9,689	Discharge in Jucar river	None	
	Jucar	Sueca	27.593		not avalaible	Yes	Extended aeration	Tertiary treatment and elimination N y P, disinfection UV	8,411	RB (irrigation)	None	
	Jucar	Cullera	23.619		not avalaible	Yes	Extended aeration	Secondary treatment and elimination N y P, disinfection UV	11,752	Discharge in Jucar river	None	

Flows (m3/d) indicated correspond to actual water flows processed by wastewater treatment plants.
The Algemesí wastewater treatment plant serves the municipalities of Algemesí and Albalat de la Ribera.
The Alzira wastewaert treatment plant serves the following municipalities : Alzira, La Pobla Llarga, Carcaixent and Villanueva de Castellón.
(1) data included in the original table.
* *reference data from permanent population IDESCAT (2007).*
** *reference data from permanent population MUNICAT (2005), because data was not avalaible in IDESCAT.*
design flow
estimated flow
(*) A new extended aeration activated sludge plant is under construction. The pond system will remain as a polishing treatment step.

MUNICIPAL WASTEWATER TREATMENT FACILITIES
MEDITERRANEAN CITIES WITH POPULATION MORE THAN 2,000 IN THE VICINITY OF BIG RIVERS
Country: TURKEY

River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Buyuk Menderes	Bekilli	3505	NO					351	Ören Creek--Buyuk Menderes River
Buyuk Menderes	Saraykoy	18370	NO					2021	Büyük Menderes River
Buyuk Menderes	Buharkent	6813	YES	Physical	Primary	1370	Büyük Menderes River	630	Büyük Menderes River
Buyuk Menderes	Kuyucak	7762	NO					776	Cayardı Creek-Buyuk Menderes River
Buyuk Menderes	Nazilli	103759	YES	Biological	Secondary	22500	Büyük Menderes River		
Buyuk Menderes	Yenipazar	6747	NO					675	Septic tanks-Taslidere Creek-Buyuk Menderes River
Buyuk Menderes	Sultanhisar	5975	NO					598	Septic tanks-Buyuk Menderes River
Buyuk Menderes	Kosk	9544	NO					954	Büyük Menderes River
Buyuk Menderes	Kocarli	6732	NO					673	Büyük Menderes River
Ceyhan	Ceyhan	103800	NO					20000	Ceyhan River
Gediz	Gediz	18728	YES	Biological	Secondary	4234	Gediz River		
Gediz	Saphane	3262	NO					326	Şaphane Creek
Gediz	Koprubasi	5002	NO					500	Yergiren Creek

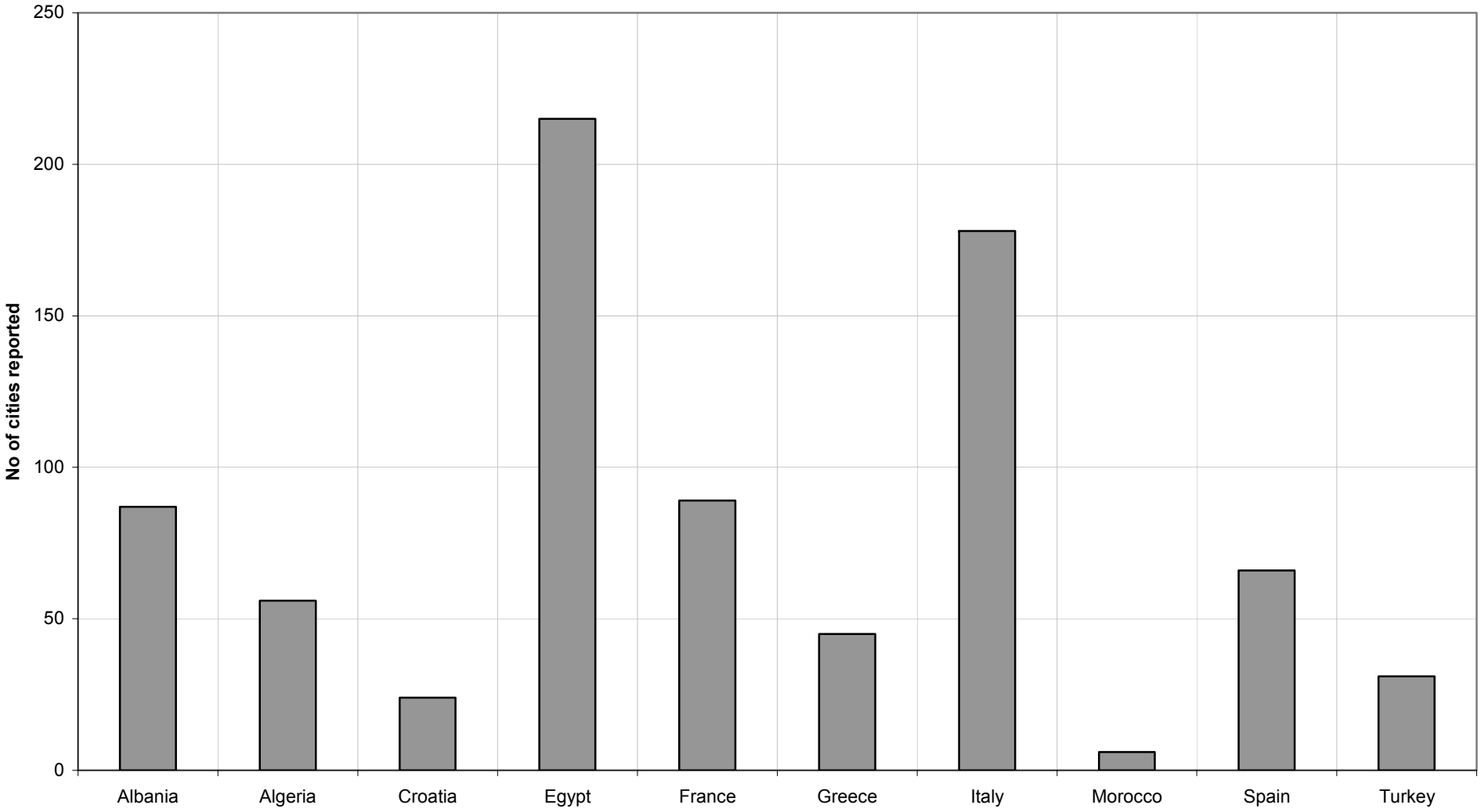
River	City	Permanent Population	Wastewater Treatment Plant	Wastewater Treatment Method	Degree of Treatment of Wastewater	Wastewater Treated (m3/day)	Discharge of Treated Wastewater	Wastewater Untreated (m3/day)	Discharge of Untreated Wastewater
Gediz	Salihli	96594	NO					17500	Alasehir Creek
Gediz	Ahmetli	9517	YES	Biological	Secondary	2280	Gediz River		
Gediz	Turgutlu	111166	NO					21000	Gediz River
Gediz	Manisa[1]	281890	YES	Biological	Secondary	31000	Gediz River		
Gediz	Menemen	53940	NO					14000	DSİ Kanal
Goksu	Taskent[2]	1300	NO					130	Creek
Goksu	Basyayla	3249	NO					325	Creek
Goksu	Hadim	3235	NO					324	Goksu River
Goksu	Mut	31520	NO					3782	Mut Creek
Goksu	Silifke	52961	YES	Biological	Secondary	21500			Goksu River
Lamas	Erdemli	43721	NO					2500	DI-Mediterranean
Manavgat	Manavgat[3]	75163	YES	Stabilization pond	Secondary	26000	DI-Mediterranean	1100	DI-Mediterranean
Meric/Evros	Edirne	136070	NO					13607	Meric river
Meric/Evros	Meric	3196	NO					320	Meric river
Meric/Evros	Enez	3752	NO					375	Meric river
Nahrelasi	Antakya[1]	186243	YES	Biological	Secondary	31000	Asi River		
Nahrelasi	Samandag	42012	NO					5041	Asi River
Seyhan	Feke	4728	NO					473	Feke Creek
Seyhan	Adana[4]	1366027	YES	Biological	Secondary	230000	Seyhan River		

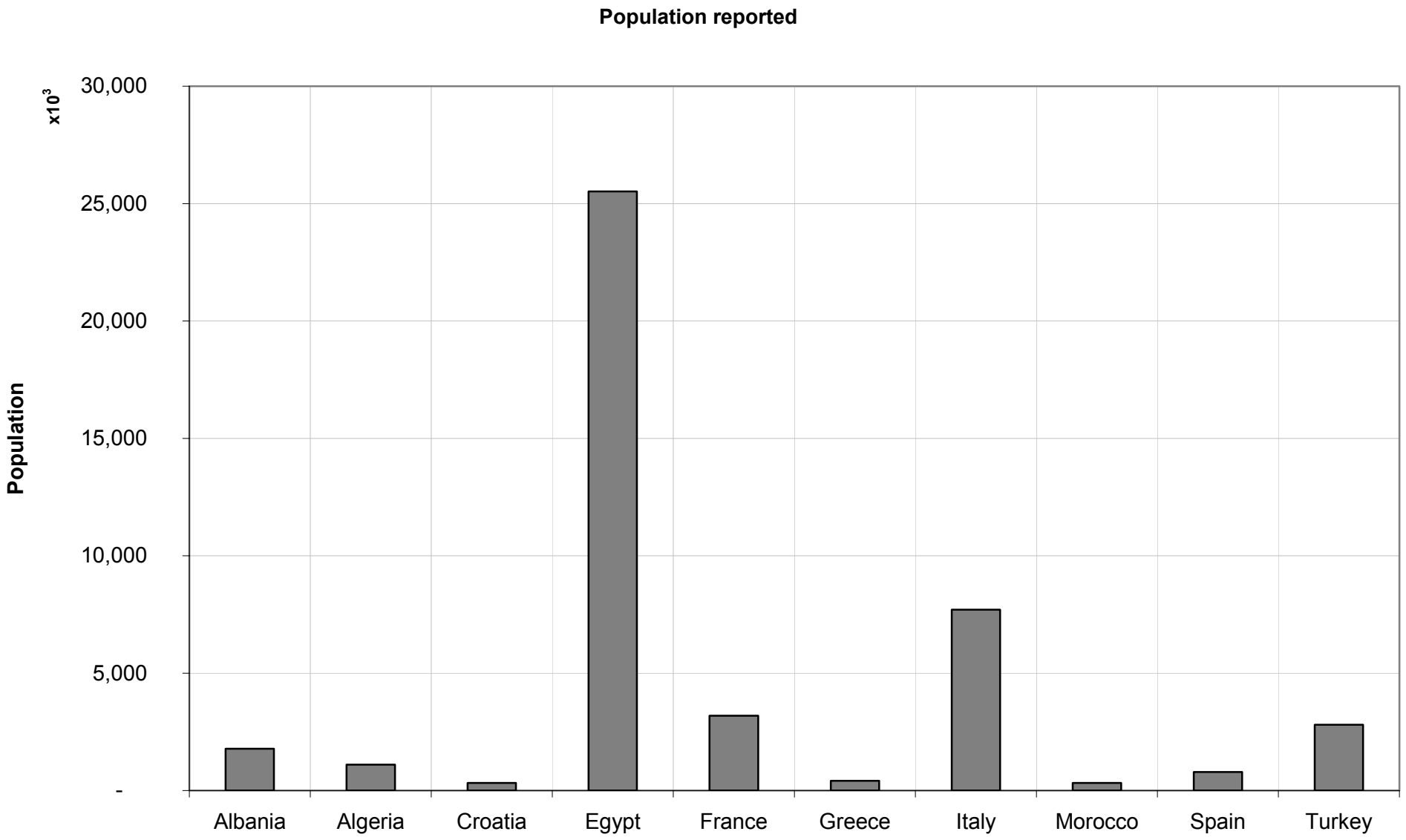
Remarks:
1: The treatment plant is 20 years old. It is trickling filter. They are planning new biological treatment plant (Activated sludge).
2: The population of Taskent is below 2000 according to new populations (2007).
3: The treatment plant is old. They are constructing new biological treatment plant (Activated sludge) and it is almost finished.
4: Adana has two treatment plants. The total capacity is 330000 m^3/day. One is 130000 m^3/day and the other is 230000 m^3/day

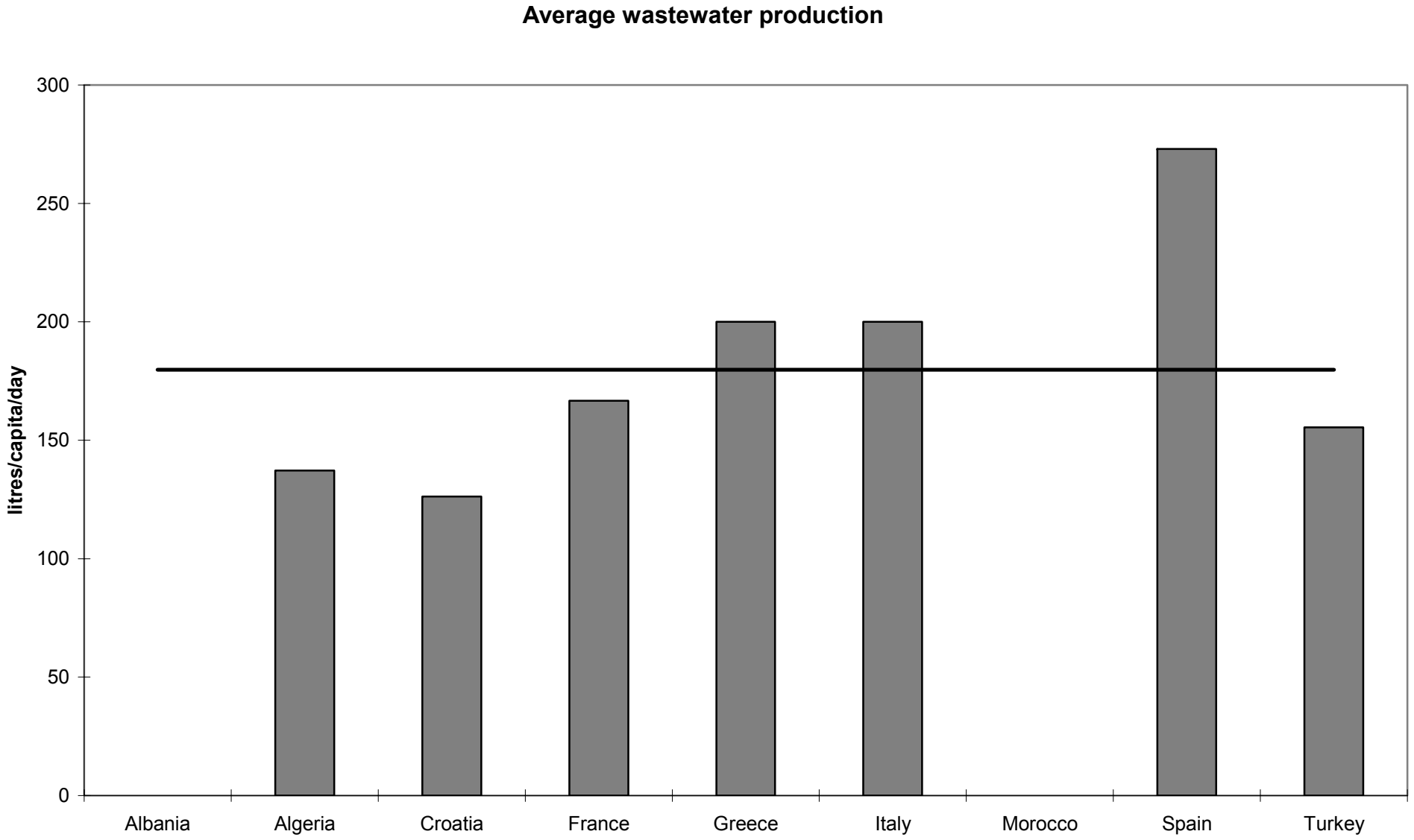
PART II

GRAPHS PRESENTING THE CURRENT SITUATION WITH RESPECT TO WASTEWATER TREATMENT PLANTS IN MAJOR RIVERS THAT END UP IN THE MEDITERRANEAN

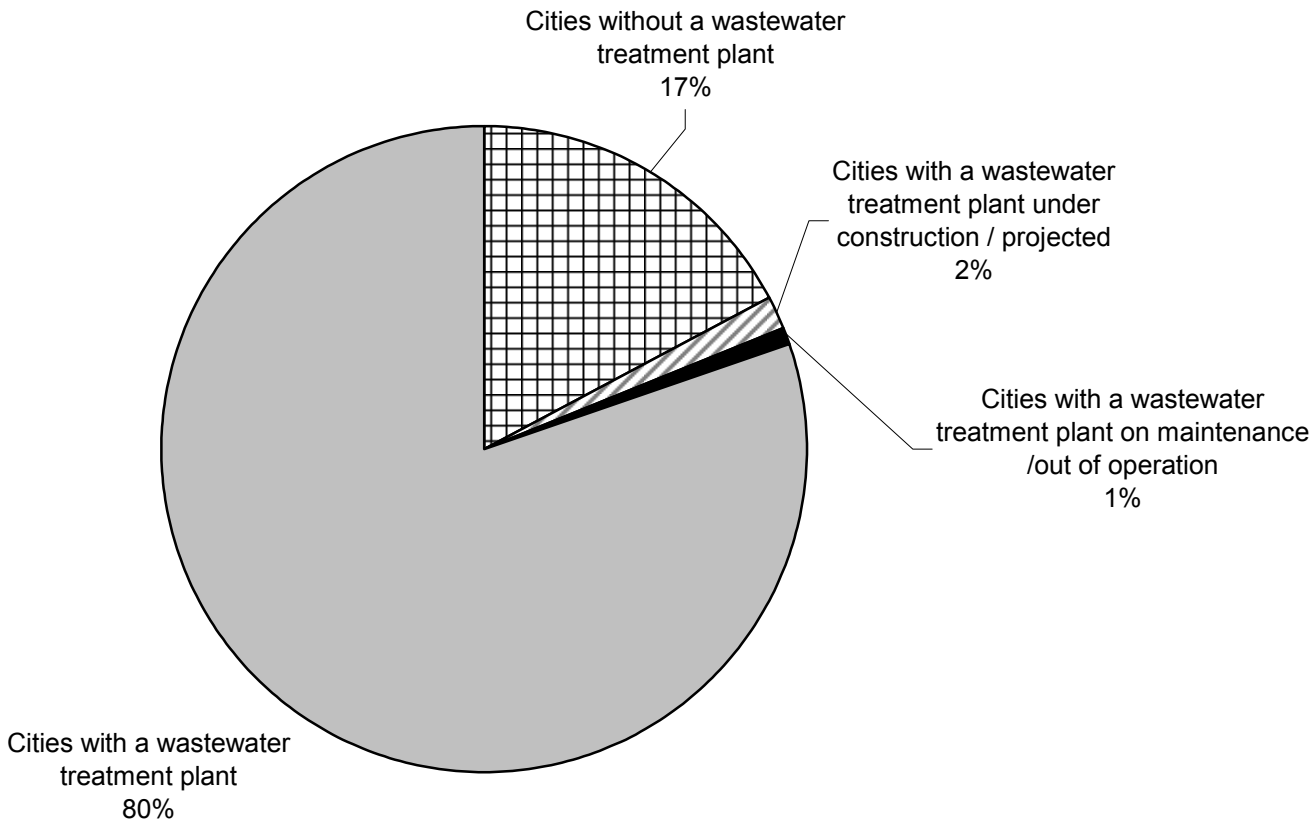
Number of cities with population greater than 2000 close to major rivers




Population reported
Population
x10³
30,000
25,000
20,000
15,000
10,000
5,000
-
Albania
Algeria
Croatia
Egypt
France
Greece
Italy
Morocco
Spain
Turkey

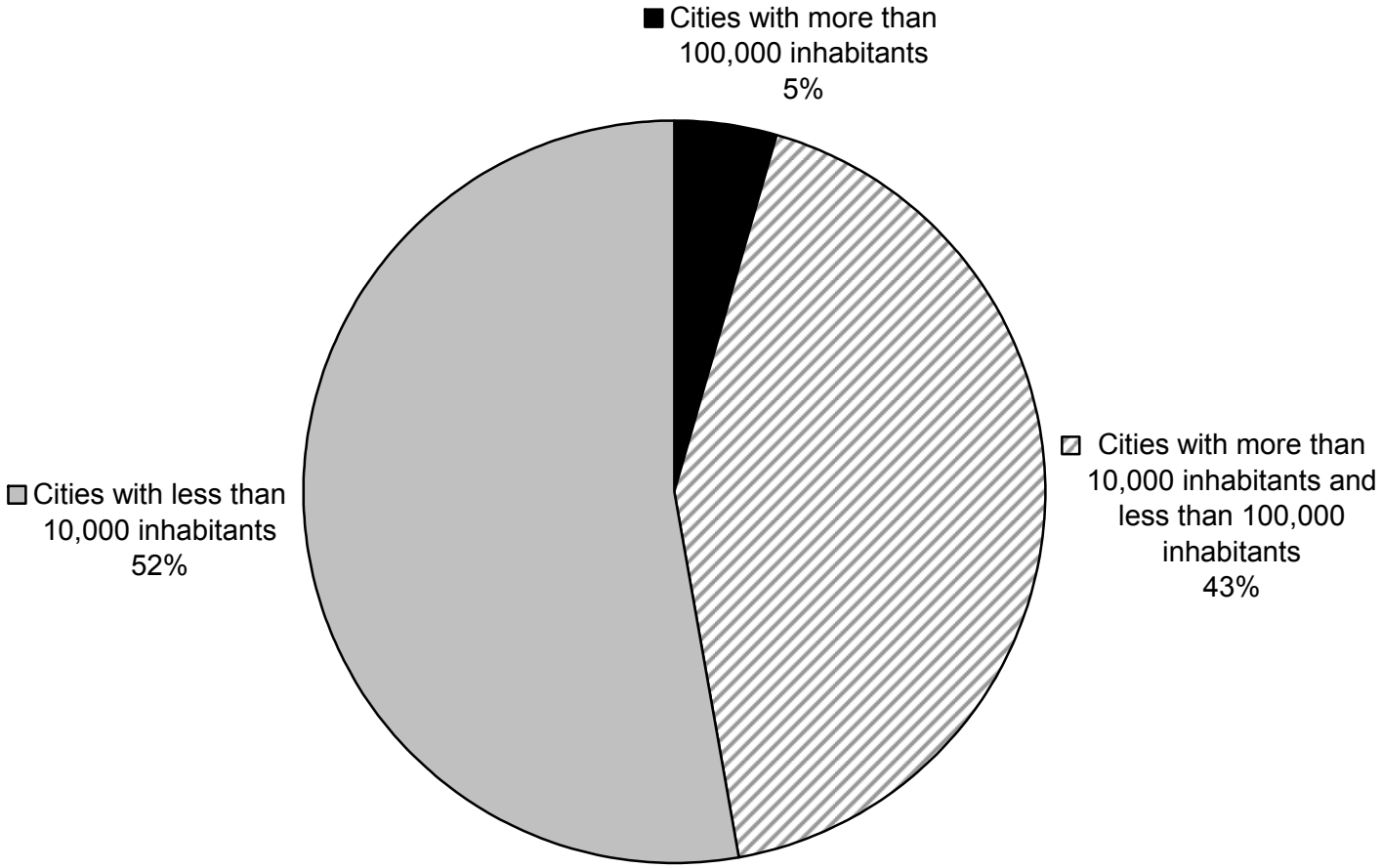

Average wastewater production
litres/capita/day
300
250
200
150
100
50
0
Albania
Algeria
Croatia
France
Greece
Italy
Morocco
Spain
Turkey

Cities and Wastewater Treatment Facilities



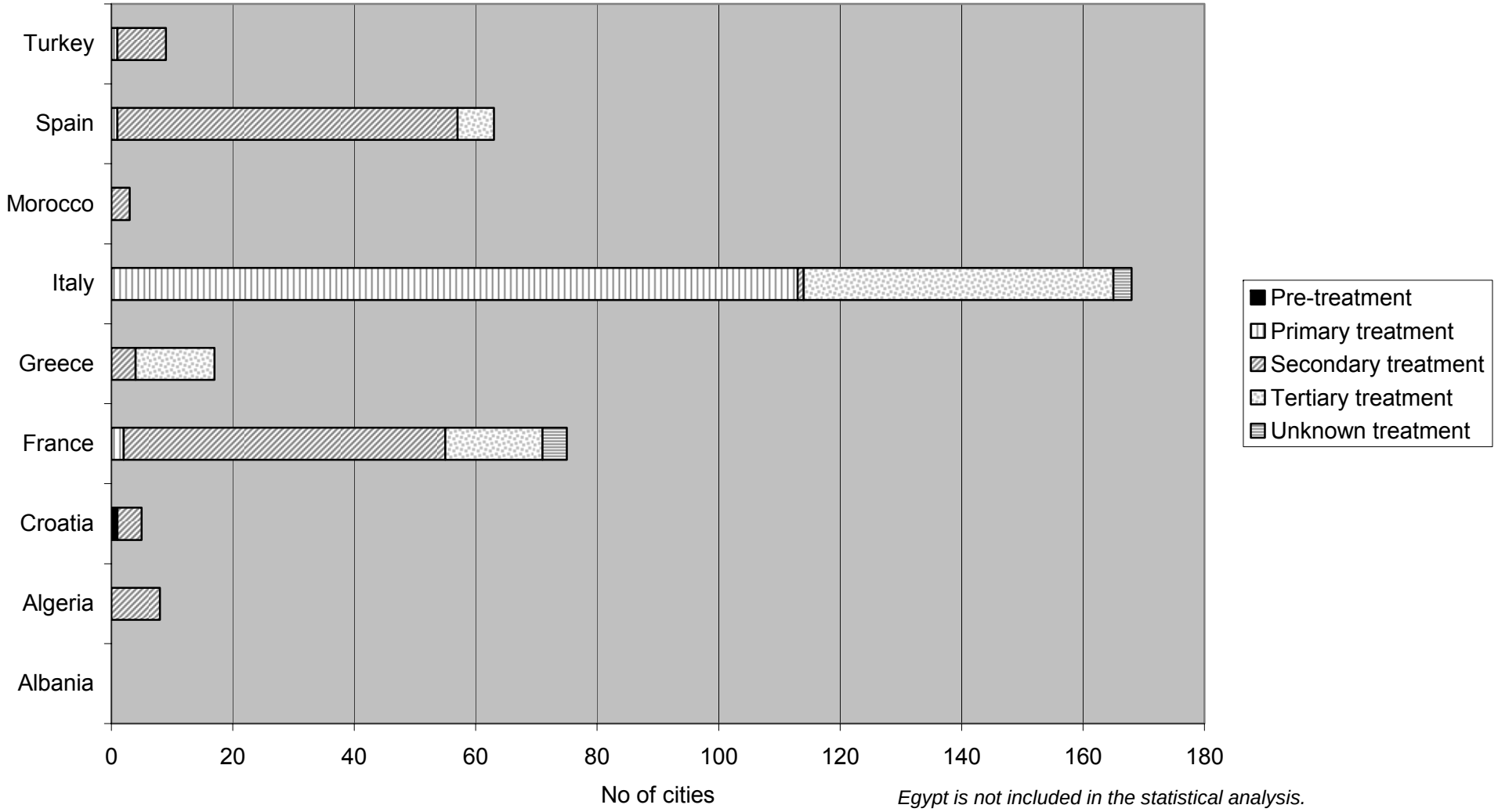
Egypt is not included in the statistical analysis.

No of cities and categorisation (for those cities where information exists)



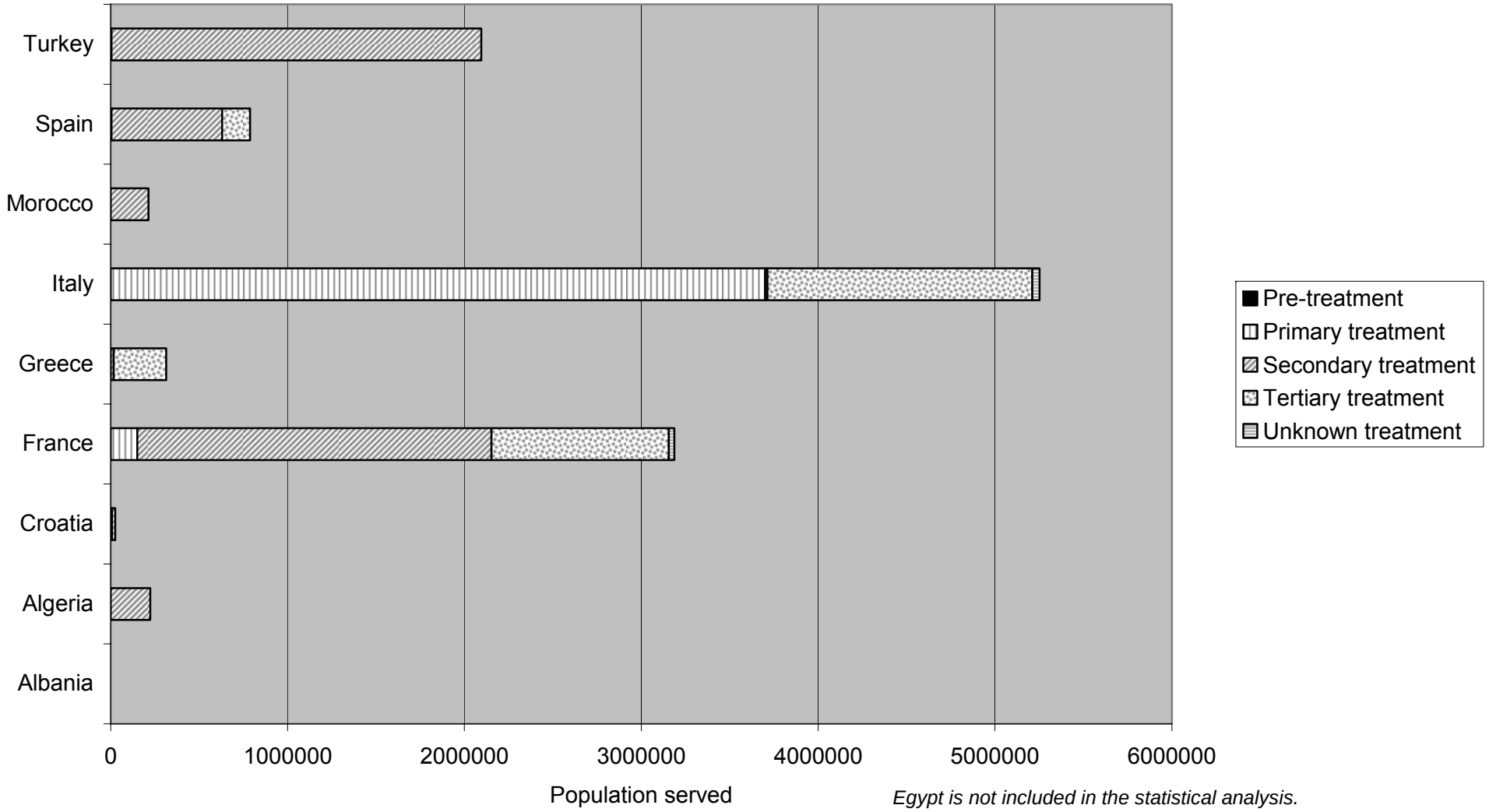
Egypt is not included in the statistical analysis.

Degree of treatment and respective cities served



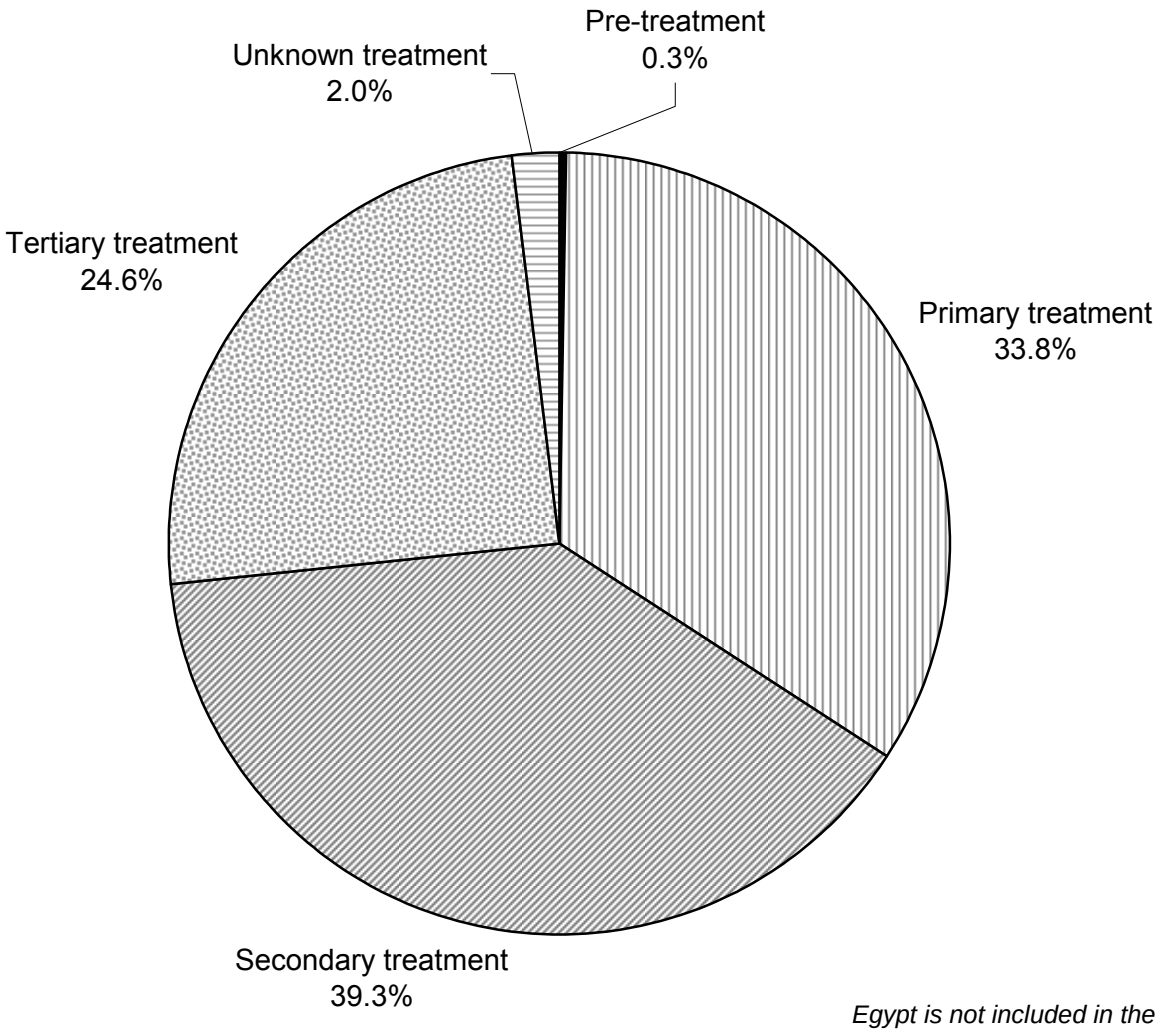
Egypt is not included in the statistical analysis.

Degree of treatment and respective population served



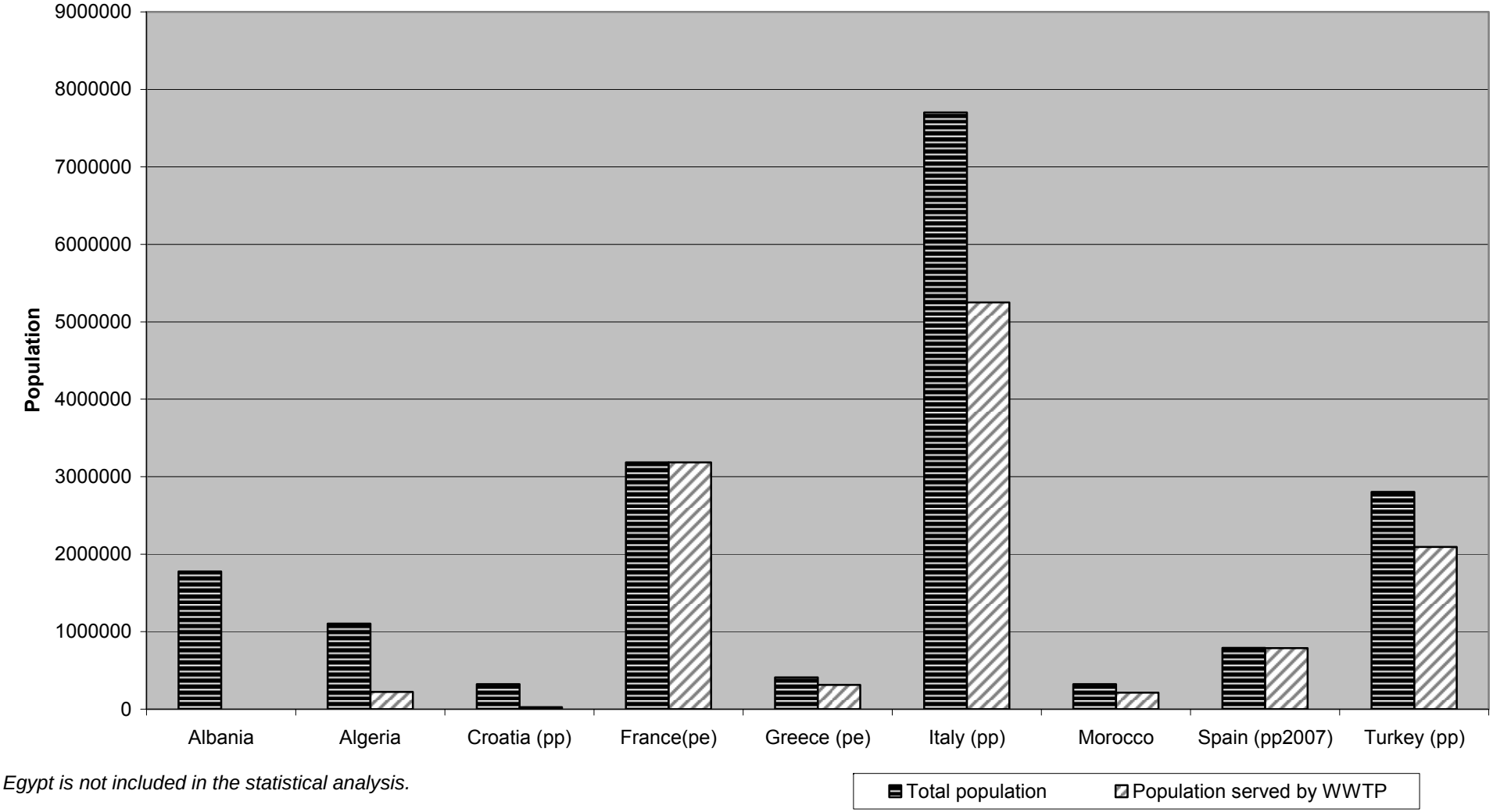
Egypt is not included in the statistical analysis.

Degree of treatment



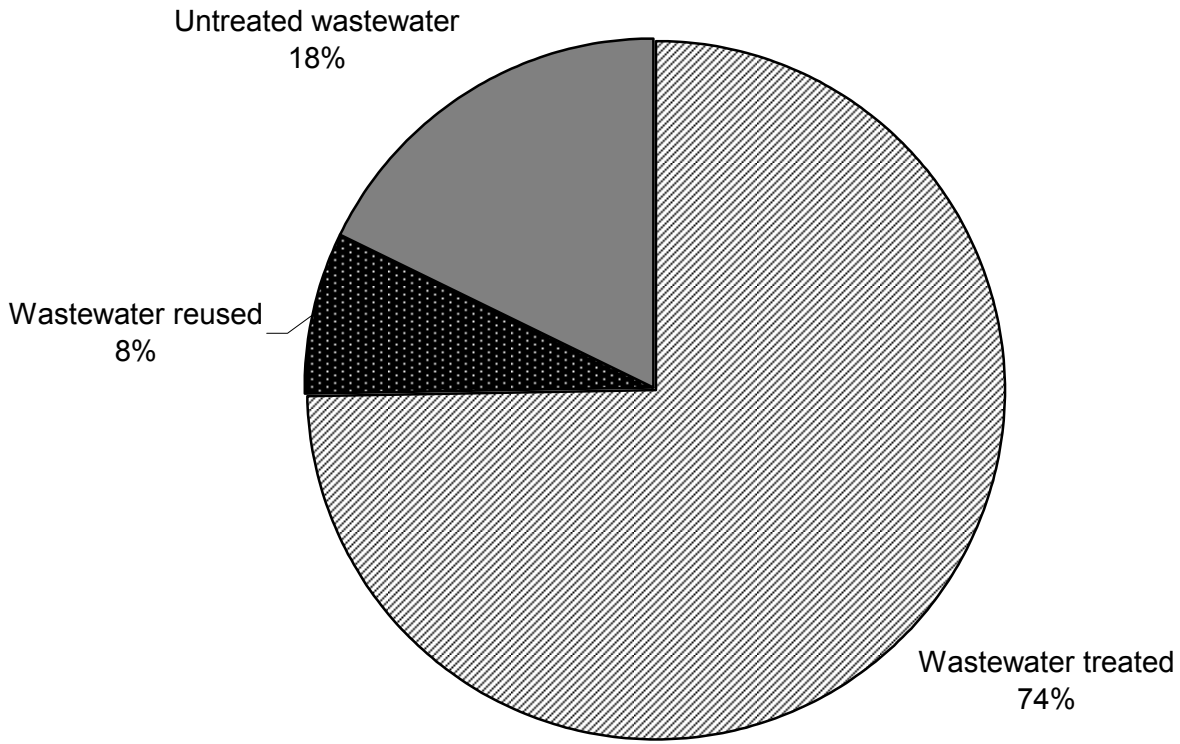
Egypt is not included in the statistical analysis.

Population reported and served by WWTP



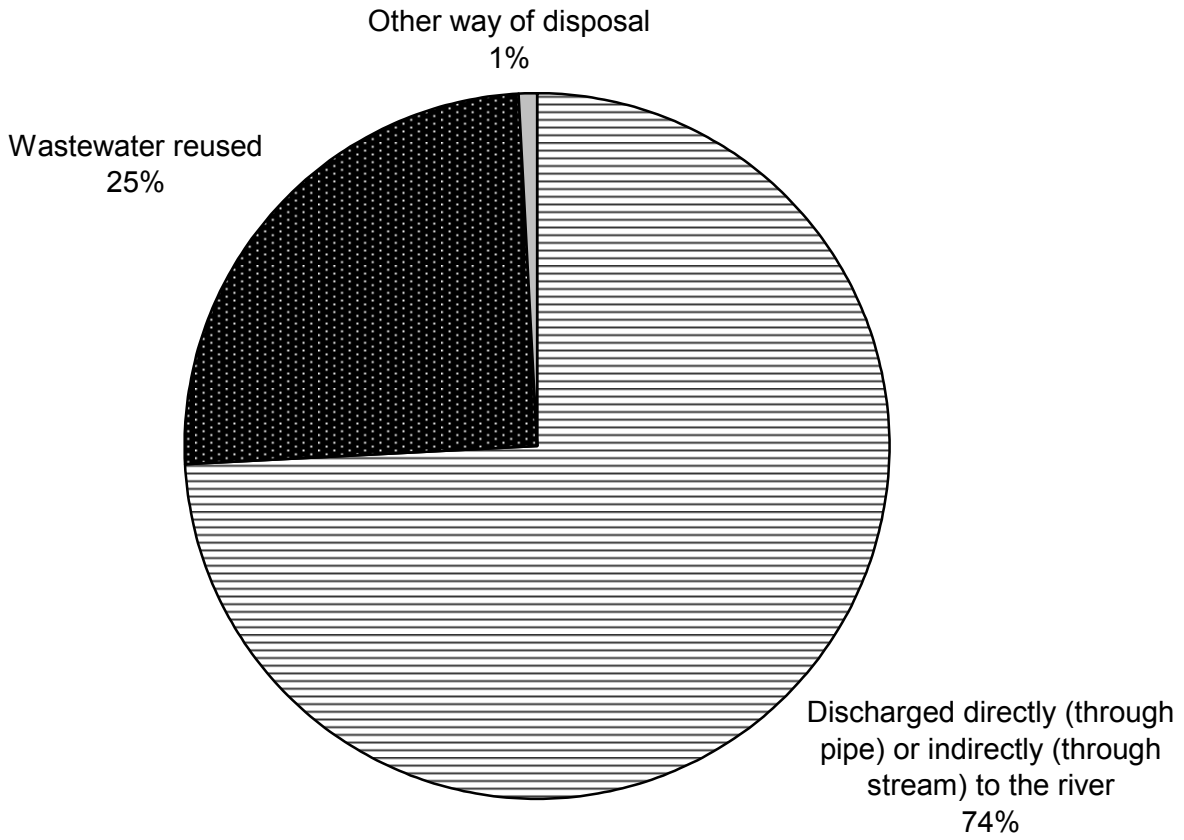
Egypt is not included in the statistical analysis.

Wastewater produced



Egypt is not included in the statistical analysis.

Treated wastewater discharge



Egypt is not included in the statistical analysis.