2.7

ENVIRONMENTAL ASPECT

2.7 Environmental Aspect

2.7.1 Introduction

The section examines the ecosystem concept of river basin management i.e. the importance and need for an integrated river basin management system. It also looks at other aspects of the environment including the current protection zones for potable water supplies and considers whether any further protection zones are desirable.

The section examines the new Bulgarian Environmental Protection Act and how this affects the implementation of Environmental Impact Assessments which, will help to provide an important contribution to our knowledge of environmental quality within the basin.

It can be seen that rivers naturally integrate all the physical, chemical and biological factors within their catchments and, therefore, that effective water quality management can be undertaken only by careful monitoring and understanding of these factors and by modifying (controlling) those which adversely affect water quantity and quality i.e. integrated environmental management which can only be effectively carried out by a river basin authority.

This section provides basic data on land use (including the national parks and special protected areas in the Maritza basin) and indicates the management bodies with which the proposed Water Basin Council will need to liaise in order to achieve a desirable water quality and quantity in its rivers, lakes and groundwater for the benefit of all concerned.

2.7.2 Protected Areas and Species

Table 2.7.1 provides an up to date list of the protected areas while Table 2.7.2 provides a list of all the known species of freshwater fish in the Maritza and its tributaries. Fig. 2.7.1 shows the environmental protection area to be considered.

Proposed and Projected Protection Areas

Attention is drawn here to the Fig. 2.7.1 including 11 sites which have been proposed for protection. These have not been examined in any way but it is hoped that with the imminent implementation of new legislation outlined below these will be given early consideration by the MoEW.

Attention is likewise drawn to 11 Wetland Areas with conservation potential (see Table 2.7.3). Among them, Vinitza - is of special interest for the Maritza basin. This island near Vinitza village (between Popovitza and Parvomay) is about 1km by 0.5km and comprises 17 hectares of natural flood - plain forest, the last in the Maritza basin except for the Tundza river. Thus this type of wetland is threatened with extinction, there being only six of this type in Bulgaria. The Vinitza forest comprises 185 species of vascular plants, the dominant tree species being old white poplars (Populus alba), black poplars (Populus nigra), white willows (Salix alba), crack willows (S.fragilis) etc. Also single trees of European white elm (Ulmus laevis), common oak (Quercus robur), common maple (Acer campestre) etc. are found. There is an abundance of lianas and climbing plants. This unique biotope represents the penultimate stage of tree community succession (the final stage being wet oak and elm forest).

Vinitza island is important as a resting-place for prey avifauna and as a wintering place for the pygmy cormorant (Halietor pygmeus) and cormorant (Phalocrocorax carbo). It is a potential breeding site for the little egret (Egretta garzetta), night heron (Nycticorax nycticorax), squacco heron (Ardeola ralloides), grey heron (Ardea cinerea), pygmy cormorant (Halietor pygmeus) and even glossy ibis (Plegadis falcinellus). The importance

of this island is emphasized by the fact that there was a 600 nest colony of 4 species of egret, herons and pygmy cormorant on the next island until it was deforested 10 years ago.

There are a great number of small islands (between Plovdiv and Dimitrovgrad) with important ecological value covered by natural willow and poplar forests but they are not typical flood plain forests of sub-Mediterranean type as is Vinitza island and *the importance of the Vinitza site for designation as a protected area cannot be over-emphasized.*

2.7.3 Environmental Legislation and Management

It is particularly important to note here that two new pieces of Bulgarian environmental legislation are due to be implemented almost immediately - the recently approved **Environmental Protection Act** and the **Draft Protected Areas Act** due to be approved by Parliament in March 1998.

Environmental Protection Act

An amended version of the Environmental Protection Act has strengthened the Act mainly by increasing the penalties for violations of the Act and introducing a revised, more clearly defined, list of projects for Assessment of the Impact Factor on the Environment (AIFE).

Under Article 32, a person guilty of an offence shall be liable to a fine of from 50,000 to 3,500,000 Levs (previously 1,000 to 150,000). For repeat offenders the fine shall be from 100,000 to 7,000,000 Levs (3,000 to 300,000). For "obviously insignificant" violations the fine shall not exceed 50,000 Levs (200 Levs). Other fines including those from companies have been increased *pro rata.*

The Annex to Article 20 Paragraph (1), item 1 provides a full list of activities and projects which require AIFE according to specified criteria. Over 90 activities are listed in this annex. The latest amendments to the Act (SG No. 85/1997) state (a) that AIFE is also

mandatory if any of these activities are expanded and/or reconstructed and (b) that Municipality Authorities shall assess the impact on the environment of projects, facilities, and activities which are not subject to an obligatory environmental impact assessment, following an order determined by a regulation of the Minister of the Environment and Waters.

Article 21 (1) (Amended, SG No. 85/1997) states that the assessment shall be assigned by the investor or initiator of the activities to *independent experts* who:

1) are professionally competent and are licensed in compliance with a regulation issued by the Minister of the Environment and Waters.
2) have stated that they have no direct interest in the realization of the facility or activity and have not taken part in the designing process.

Protected Areas Act

Present position is as follows.

From discussions held with staff from the COF, the MoEW and NCESD it is apparent that there is no clear line of responsibility at the present time for the management and protection of National Parks, nature reserves and other "protected" areas. A Draft Protected Areas Act was submitted to the Bulgarian Parliament in 1993 but this was not approved and, furthermore, in 1994, MoEW issued internal regulations for the National Nature Protection Service (NNPS).

However, these regulations were never implemented and ever since there has been uncertainty and, indeed, a dispute regarding the management of protected areas between the MOEW and the COF (now renamed National Forestry Board) within the Ministry of Agriculture, Forestry and Agrarian Reform (MOAFAR).

According to the second annual report of the Bulgaria Global Environmental Facility Biodiversity Project (GEF) the result has been that until now there has been no effective

system of protected areas management in Bulgaria. In this Report GEF examined the situation in detail and produced the attached diagram A.1 (Fig. 2.7.2) to illustrate the problem as at July 1997. The main areas of weakness are noted in the comments box while a further complication is that the Rila Park Department comes under the NCESD while other Park Departments report to the REIs.

The prime objective of GEF is to attain "**Improved Management Systems for Biodiversity Conservation in Bulgaria**". GEF has therefore recommended the development of a coherent structure within MoEW in a set of recommendations which are similar to the Regulations for NNPS developed in 1994 and to proposals made to MoEW by the Director of GEF in 1997. The main advantages of these proposals are summarized in the GEF second annual report as follows:

1) Within MOEW, all nature protection functions fall in a logical structure under one Deputy Minister responsible for NNPS. All MOEW officers with nature protection responsibilities report to NNPS.
2) Field-level exercise of biodiversity policy and control in general is by MoEWs biodiversity and forestry officers at the REIs.
3) Park bodies (perhaps called Directorates) exercise biodiversity policy *and are responsible for management functions* in the National Parks; responsibility for other protected areas could remain with the REIs, or in some cases with nearby Park Directorates (this would be clearly defined on a case by case basis).

These proposals are illustrated diagrammatically by GEF in their figure A.1.2. (Fig.2.7.3).

Future Management for Protected Areas

It is pleasing to report that these proposals have now been largely incorporated in the Draft Protected Areas Act dated 8 February 1998. This draft is due to go to the Council of Ministers on March 2, 1998 and thence to the Bulgarian Parliament for its approval. It is

very much to be hoped that this will be approved in its entirety as it should provide a sound basis for effective scientific management of the protected area reserves.

2.7.4 Environmental Overview of the Maritza Basin

(1) Forestry

Table 2.7.4 shows summary of land use in Bulgaria and the study area. As seen in this table, forested land covers just over 35% of the land area in the Maritza river basin but as some of this is bare rock or otherwise unsuitable for tree growth the actual area is estimated at 30%. Most forest is in the upland or mountain area. Discussion with representatives from the Committee of Forest and NGO experts suggest that Bulgarian forests are in a reasonably healthy condition and certainly better than in central Europe.

However, international surveys across Europe have shown a steady increase in defoliation of trees, which is ascribed in part to air pollution and, in southern Europe, to a long lasting period of drought. The Joint report of the United Nations ECE and the European Commission on Forest Condition in Europe (1997) showed that for Bulgaria the degree of defoliation for all forest species (classed as moderate to severe) was 39.2 %.

This indicates that despite a considerable reduction in recent years in Eastern Europe in deposition of sulfur this still remains at levels of around 25 kg S per hectare per year. From the point of view of water quality management, future research may be desirable, particularly in coniferous forest areas where the underlying rocks and soils are deficient in calcium, to ascertain whether acid rain is a significant factor.

Afforestation and clear-felling can be a cause of severe impact on water quality because such activities damage soil structure with subsequent likelihood of erosion and the washing by rainfall of high levels of suspended solids into rivers and lakes or reservoirs. In discussions with the Committee of Forest it became apparent that this problem has been

extremely well known in Bulgaria from the early part of this century and great care is taken to keep erosion under control. Moreover COF advised us that fertilizers are not normally used and that pesticide usage was minimal. Thus, as far as could be ascertained forest operations are not a threat to groundwater or surface water quality.

(2) National Parks, Reserves and Other Protected Areas

From the discussions held with NCESD and GEF and the Widerness Fund, it seems that those who have known the Bulgarian protected areas for many years that these areas are in good health and are showing no signs of degradation or loss of species. However, there is general agreement that monitoring of protected areas is almost non-existent at the present time, partly due to the reasons of complicated management system also to lack of finance.

In general protected areas should not present a problem as far as water quality is concerned but the future Maritza Basin Authority will need to concern itself with wastewater from tourist resorts, restaurants and visitor centers to maintain a high quality of water in these areas. In Rila National Park, for example, there is a problem that considerable amounts of water are taken for potable water supply in the surrounding areas, notably the city of Sofia. The question of compensation flows in streams and the level of groundwater in this National Park will need very careful control because the pressure for further extraction of water is likely to increase.

Here, catchment management planning in collaboration with the NNPS and the water supply authorities will be essential for safeguarding the interests of the park, its aquatic ecosystems and the water supply needs of Sofia.

(3) Agriculture

With an overall coverage of 57% of the land surface agricultural activities are bound to have a major impact on groundwater and river water quality. A prime example is the fact

that groundwater in particular contain high levels of nitrate which can be a serious health problem in drinking water. The application of fertilizers and even the ploughing of soil releases nutrients into the run-off. Intensive farming of animals leads also to unacceptable ammonia concentrations in surface waters which are highly toxic to aquatic life, especially fish, before it is oxidized to nitrate. There can be no doubt that the major source of nitrate in the groundwater of the Maritza river basin is agriculture, especially livestock. In the rivers while the major source is likely to be treated and untreated sewage from towns and villages nevertheless non-point agricultural sources must also be important.

Catchment management planning in respect of agricultural will require:

- improved monitoring;
- routine inspection of farms;
- development of codes of good agricultural practice;
- education of the farming community;
- control of all point sources.

(4) Urban and Industrial Land

Although urban land only occupies 5% of the Maritza river basin, the major concentration of population and industry means that most of the worst polluted "black spots" occur immediately downstream of towns and industrial sites.

However, attention should be drawn here to the problems of mining, particularly mining for metals such as copper, lead, zinc, gold & silver etc. Most of these mines and the associated processing factories are located in the headwaters of the Maritza tributaries in mountain areas. Little analytical data is at present available but information obtained from NCESD indicates that these mines give rise to severe toxic pollution, which may be intermittent in character (following rainfall for example). The result is that streams, which

otherwise are pristine and almost totally unpolluted, are often totally dead with no higher organisms able to survive.

An Environmental Assessment of the impact of emissions from the Pirdop Copper Smelter on soils in the Pirdop-Zlatitza Region which was prepared for the MoEW by the Balkan Science and Education Center of Ecology reveals that severe river pollution is taking place at present. The rivers mainly affected are the Topolnitza and the Pirdopska which receive high concentrations of sulfate, copper, iron, manganese and arsenic. No biological assessment was made but the toxicity of the metals suggests that biologically these rivers are dead.

The report reveals that the mine and copper smelter are responsible for substantial air pollution which results in metal contamination of agricultural land, soils, groundwater and many food crops. Soil acidification is at serious levels. Other findings are that the health of the workers and local inhabitants may be adversely affected.

The report also states that "the condition of the *protected areas"* is also influenced by the activity of CSP Pirdop. The influence on the natural ecosystems of the National Park, Central Balkans is the greatest one. The region is subjected to acid atmospheric deposits and heavy metal pollution. The soils of the region are dangerously polluted and the region of the protected site Vran kamak is slightly polluted.

This report states that there are insufficient monitoring stations on the Topolnitza and Pirdopska rivers to make a proper assessment at the present time. The likelihood is that the other metal mines in the Maritza basin are inadequately monitored or probably not monitored at all.

In the period up to 2015 it is vitally necessary that environmental monitoring of these sites be made a top priority.

The above information strongly supports the need for air pollution studies as a component of integrated river basin management.

(5) Other Problems

In the course of this study a number of other problems have become apparent and deserve mention here;

1) Erosion - in visits to the Maritza river attention was drawn to the growing problem of erosion of the river banks. This is due mostly to the cutting down of trees along the banks.

2) Illegal waste disposal - visits to the river in the vicinity of Plovdiv revealed many examples of dumping waste eg. bottles, plastics, drinks cans, vegetable waste etc in amounts carried by one person to numerous truck loads. These were dumped on the edge of roads, in ditches, on river banks and providing sources of pollution, danger to children and wildlife and a serious eyesore.

(6) The Importance of Catchment Management Planning

From all the data gathered during this necessarily brief study it is evident that the Maritza river has suffered for many years from chronic pollution from many sources throughout much of its length. In general the headwaters of the main river and its tributaries, mostly in forested mountain areas, are in excellent condition but deterioration soon sets in due to a wide range of sources. The steep slope of the river and high water velocity ensure rapid reaeration and natural self-purification but the river rarely has the opportunity to fully recover before it is degraded by a new source.

The study reinforces the view that only firm action by a powerful river basin authority can take the necessary actions to reverse past trends and restore the river to good health. From

the long experience gathered in other countries the ability to control all piped discharges and abstractions is far from adequate and increasingly the ability to influence all land-use policies has been seen as essential to enlightened river management. This is now recognized by the EEC and the forthcoming draft Water Framework Directive will therefore ensure that Catchment Management Planning (CMP) is utilized in all the member countries.

CMP is now being used in the UK in advance of the Directive so that experience in its use is being gained. Essentially CMP is designed to create a framework for co-ordinated and cost effective management and to enable public discussion of all the issues in a democratic manner.

The CMP process can be summarized as follows:

- Production of consultation report
- month period of public consultation
- Action Plan
- Action
- Monitoring
- Review

The river authority prepares a consultation report through internal discussion and informal liaison with appropriate outside bodies. This, rather like the Maritza Study describes the river catchments and sub-catchments, the land uses of these, the activities (industries, farming forestry, mining, urban development etc) reviews the state of the catchment in terms of water quantity and quality and water usage. It then identifies objectives and targets which need to be addressed and provides a list of proposed actions needed to achieve the objectives.

The plan is then presented at a series of public meetings with hundreds of copies made available to organizations, groups and individuals. The consultation plan is widely publicized in the press, local radio and television and made available in all local public libraries.

The next phase, the action plan is based on the views, comments and proposals arising from the 3-month consultation phase. This is a working document for the achievement of improvements to the river environment which are essential to land-use planning and water quality objectives. An important aspect of the action plan is that it will contain commitments on the part of other organizations, statutory bodies and individuals to take their own actions in addition to the actions of the river authority.

The most important part of any management system is action and the action plan now becomes the primary business planning tool of the river authority. It has to ensure that commitments are carried out through regular meetings and consultations with the involved parties and regular monitoring of the river system.

TABLE 2.7.1 PROTECTED AREAS IN MARITZA BASIN

Protected areas	Places	Total Areas (ha)	Year of Establi shment
Strict Reserves			
Central Balkan National Park		53242.2	1991
Dzhendema	Karlovo town	2511.10	1967
Rayskoto pruskalo	Kalofer town	0.50	1965
Steneto	Cherni osum village	1607.50	1979
Boatin	Cherni vit village	1225.70	1967
Stara reka	Karlovo town	1905.90	1981
Rila National Park		83211.1	1992
Ibur	Kostenets town	1701.00	1985
Central Rila Reserve	Rila mountain	12393.7	
Marichini esera - Studenets	Borovets village	1734.50	1967
Rodopi Mountains			
Beglika /Vasil Kolarov/	Batak village	420.00	1960
Koupena	Peshtera town	818.60	1977
Doupkata	Fotinovo Village	65.20	1951
Mantaritsa	Rakitovo town	301.70	1977
Kazanite	Mougla Village	161.00	1968
Kastrakliy	Borino village	124.00	1968
Soskovcheto	Smolyan town	177.50	1968
Chervenata stena	Bachkovo village	229.50	1977
Chamdzha	Hristo Danovo village	5.00	1949
Shabanitsa /Starata gora/	Trigrad village	23.00	1956
Izgoryaloto gyune	Krichim town	32.00	1949
Sredna Gora			
Bogdan	Koprivshtitsa town	114.80	1972
Natural Monuments			
Pazardjik – RI			
Kiselchitsata	Strelcha town	60.50	1972
Goranitsa	Strelcha town	46.70	1972
Garvanov kamuk	Strelcha town	18.00	1972
Tourchanov kamuk	Strelcha town	16.80	1972
Ognyanovsko - Sinitevski Rid	Ognyanovo & Sinit villages	140.00	1982
Sofia – RI			
Donkina gora - Tsarski orel	Koprivshtitsa town	16.00	1979
Golashka peshtera	Golak village	0.50	1981
Smolian – RI			
Bouynovskoto zhdrelo	Bouynovo village	608.60	1971
Trigradsko zhdrelo	Trigrad village	314.00	1963
Nastanska mogila	Devin town	3.00	1968
Ledenitsata	Gela village	6.80	1962

Protected areas	Places	Total Areas (ha)	Year of Establi shment
Choudnite Mostove - Er Kyupriya	Oryahovo village	0.00	1949
Haskovo – RI			
Dervishka mogila	Dervishka mogila village	33.00	1976
Plovdiv – RI			
Lale bair	Asenovgrad town	2.00	1978
Ousoykata	Dobrostan village	4.00	1977
Nahodishte na blatno kokiche	Vinitsa village	19.00	1970
Protected Sites			
Pazarjik - RI			
Arapchal	Velingrat town	220.80	1981
Atolouka - Vasil Petleshkov	Bratsigovo town	177.90	1969
Kleptouza	Velingrat town	344.00	1966
Tumra	Bratsigovo town	735.40	1973
Batashki Snezhnik - Karluka	Batak town	1063.00	1972
Valyavitsite	Velingrat town	82.70	1951
Skalen obraz - Arabushka Polyana	Streicha town	42.00	1972
Skalen obraz - Gabrovitsa	Streicha town	42.00	1972
Manzoul	Panagyurishte town	36.60	1968
Patjova koriya	Oborishte village	81.20	1968
Sokola	Pestera village	127.20	1973
Kamera	Fotinovo village	102.50	1975
Rogachitsa	Velingrat town	126.90	1981
Shiroka polyana	Batak town	100.20	1984
Kaval tepe	Batak town	83.00	1984
Studenata chouchourka	Batak town	73.10	1984
Siuncheva polyana	Batak town	69.30	1984
Toshkov Chaark	Batak town	57.40	1984
Chatuma	Batak town	27.30	1984
Batluboaz	Batak town	154.00	1984
Samodivska polyana	Batak town	132.60	1984
Venetsa	Panagyurishte town	100.50	1968
Sivata Gramada	Panagyurishte town	16.00	1968
Haydushki kladenets	Panagyurishte town	65.40	1968
Kalpazanov grob	Velingrat town	16.20	1968
Byalata skala	Velingrat town	86.60	1968
Aramliets	Ihtiman & Sredna gora towns	140.80	1969
Biljov rut	Tsarovo Village	89.70	1972
Yordanovi polyani	Lesichevo village	71.90	1972
Milevi skali	Semchinovo village	50.00	1976
Petljovo burdo	Batak town	93.50	1972
Rovno	Batak town	47.70	1973
Vinishte	Ravnogor village	148.10	1973
Koriyata	Ravnogor village	27.50	1973

Protected areas	Places	Total Areas (ha)	Year of Establi shment
Kara Bouroun - Balabanliy	Fotinovo village	123.50	1973
Fotinska reka - Ouglijovo Popchelovo	Fotinovo village	314.30	1973
Zarnjovets	Belovo town	37.10	1983
Kreposta Krasen	Panagyurishte town	33.91	1983
Sofia – RI			
Ouloutsite	Doina banya village	370.60	1974
Eledzhik	Mouhovo village	668.00	1975
Smolian – RI			
Chairite	Trigrad village	300.00	1973
Valevitsa	Bostina village	82.30	1975
Mezar Gedik	Hvoyna village	63.00	1971
Srednite livadi	Oryahovo village	70.40	1972
Chutal uluk	Oryahovo village	24.00	1974
Byalata voda - Endeka	Zaburdo village	55.30	1975
Haskovo – RI			
Fosilni nahodki	Ahmatovo village	9100.00	1966
Plovdiv – RI			
Dubite - Konska polyana	Krustevich	294.70	1975
Bolyarinskata gora	Bolyarino & Shishmantsi villages	323.30	1978
Chivira	Karavelovo village	106.50	1966
Vurlishnitsa	Kilsoura town	176.80	1966
Gonda voda	Asenovgrad town	74.10	1970
Besaparski ridove	Ognjanovo village	148	1975
Stara Zagora – RI			
Chirpanskata koriya	Chirpan town	58.00	1966
Bozdouganovska koriya	Groudevo village	310.80	1975
Sokolna	Skobelevo, Asenovgrad	1178.20	1979
Historical Sites			
Obrochishte	Petkovo village	101.50	1966
Barikadite		120	1962
Theren	Batak village	170	1964
Gonda Voda		74	1970
Eledzhik		517	

RI = Regional Inspectorates

TABLE 2.7.2 LIST OF FRESH WATER FISH SPECIES IN MARITZA BASIN

Species *– introduced sp.	usual	often occur	rare	medium rare	very rare	become extinct
Acipenser sturio						+
Acipenser stellatus						+
Salmo gairdneri irideus *		+				
Salmo trutta fario		+				
Salvelinus fontinalis *				+		
Coregonus peled *			+			
Coregonus albula *			+			
Thymallus thymallus *			+			
Esox lucius	+					
Rutilus rutilus	+					
Phoxinus phoxinus	+					
Scardinius erythrophthalmus	+					
Aspius aspius			+			
Tinca tinca	+					
Alburnus alburnus	+					
Abramis brama	+					
Vimba melanops	+					
Chandrostoma nasus	+					
Rhodeus sericeus amarus	+					
Pseudorasbora parva *	+					
Gobio gobio	+					
Barbus cyclolepis	+					
Cyprinus carpio	+					
Carassius carassius	+					
Carassius auratus gibelio *	+					
Hypophthalmichthys molitrix *		+				
Ctenopharyngoton idella *		+				
Ictiobus ciprinellus *			+			
Ictiobus bubalis *			+			
Ictiobus niger *			+			
Noemacheilus barbatulus					+	
Misgurnus fossilis		+				
Cobitis taenia	+					
Cobitis peshevi			+			

Species *– introduced sp.	usual	often occur	rare	medium rare	very rare	become extinct
Silurus glanis	+					
Ictalurus punctatus *			+			
Ictalurus nebulosus *			+			
Anguilla anguilla					+	
Gasterosteus aculeatus					+	
Gambusia affinis holbrooki *	+					
Lepomis gibbosus *	+					
Stizostedion lucioperca	+					
Perca fluviatilis	+					
Gymnocephalus cernnus			+			
Proterorhinus marmoratus			+			

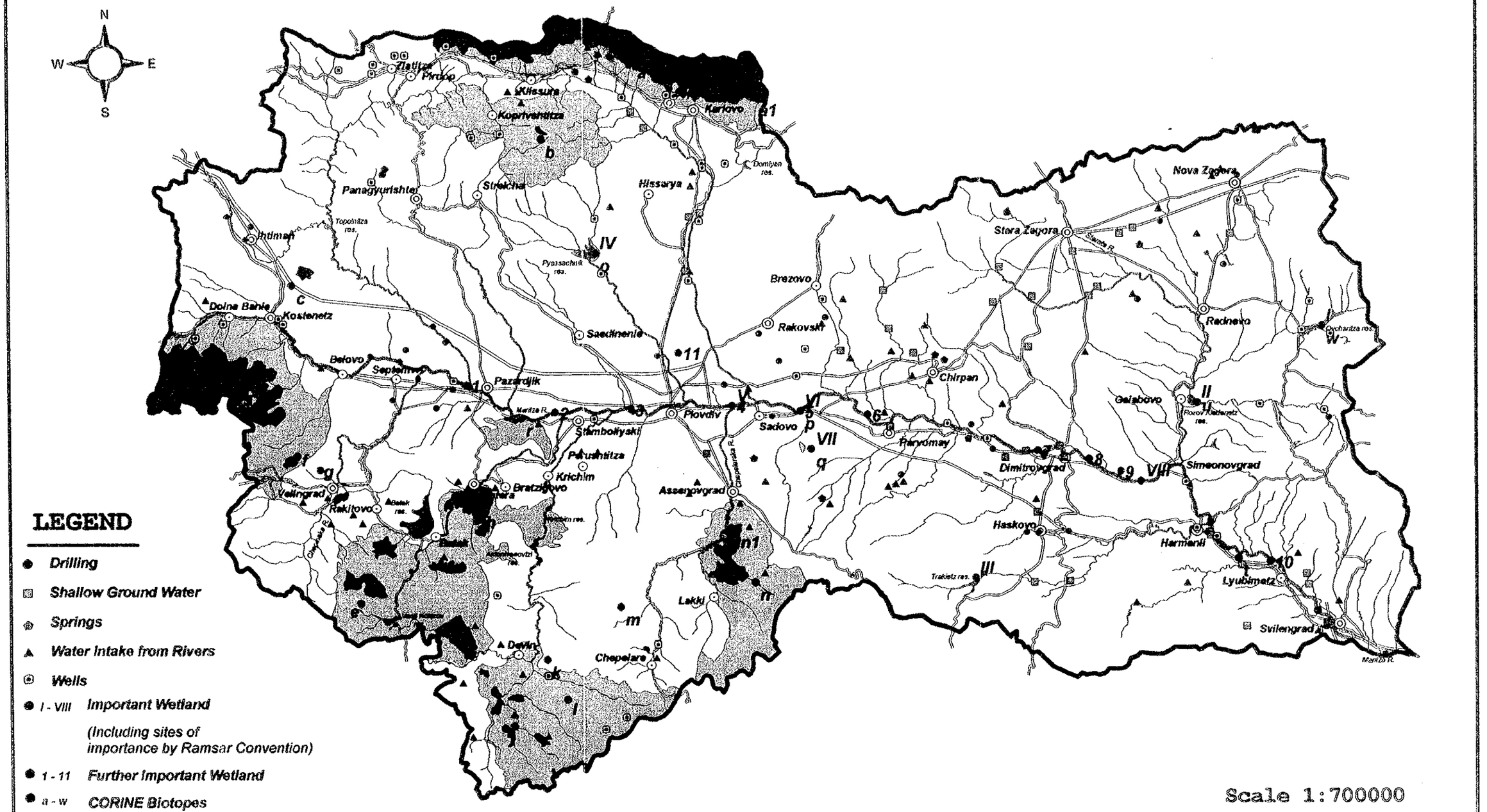
TABLE 2.7.3 IMPORTANT WETLANDS WITH CONSERVATION POTENTIAL IN MARITZA RIVER BASIN

No.	Location	Area [ha]	Short Description
1	Zvanicheve Fishponds near Pazardjik	220	Marshlands around fishponds and dry ponds not in operation, migrating and wintering water fowl (mainly *Anseridae*), Night Heron (*Nycticorax nycticorax*)
2	Trivodnitzi Fishponds	60	Wintering place for Pygmy Commorant (*Phalacrocarax pymeus*), wintering for water fowl, 3 km west of fishpond rare macrophytes
3	Orisare near Plovdiv	250	Resting place for Pygmy Commorant (*Phalacrocarax pymeus*) stable numbers over the last few years, wintering water fowl at sand quarry
4	Chepelarska Confluence	60	Only known wintering place for Night Heron (*Ardeola ralloides*), natural riparian forest (*Alnus nigra, Populus spec., Salix spec.* etc.)
5	Poponitza	>5	Only stand of water lily (*Nymphoidea alba*) inland of Bulgaria, small oxbow lake microhabitat, mainly ground water feded
6	Island Vinitza	17	Natural flood plain vegetation over 185 recorded species of vascular plants, resting place for prey avifauna
7	Upstream of Dimitrovgrad	n.a.	Stand of rare macrophytes. Oxbow water formerly river meander
8	Downstream of Dimitrovgras	n.a.	Important resting place for hundreds of Pygmy Commorant (*Phalacrocarax pymeus*)
9	Sladopole	n.a	Important oxbow, special habitat for rare macrophytes
10	Lyubimetz	n.a.	Breeding place for Gray Heron about 50 pairs, wintering habitat for water fowl
11.	North of Plovdiv	n.a.	Very important as only wintering place on the Balkan Peninsula for Black Stork (*Ciconia nigra*), extensively used rice fields, further resting place for White Heron (*Egretta alba*)

*protected, n.a. not available

TABLE 2.7.4 MAIN LAND USE IN THE STUDY AREA ACCORDING TO THE BULGARIAN CATEGORIES

	Unit	Study Area Maritza Basin	Total for Bulgaria
Area (rounded)	(km)	21,000	111,000
Agricultural land	(%)	57.0	61.5
Forest land	(%)	35.4	34.9
Urban land	(%)	5.0	3.6
Other (e.g. water bodies & protected areas)	(%)	2.6	-



LEGEND

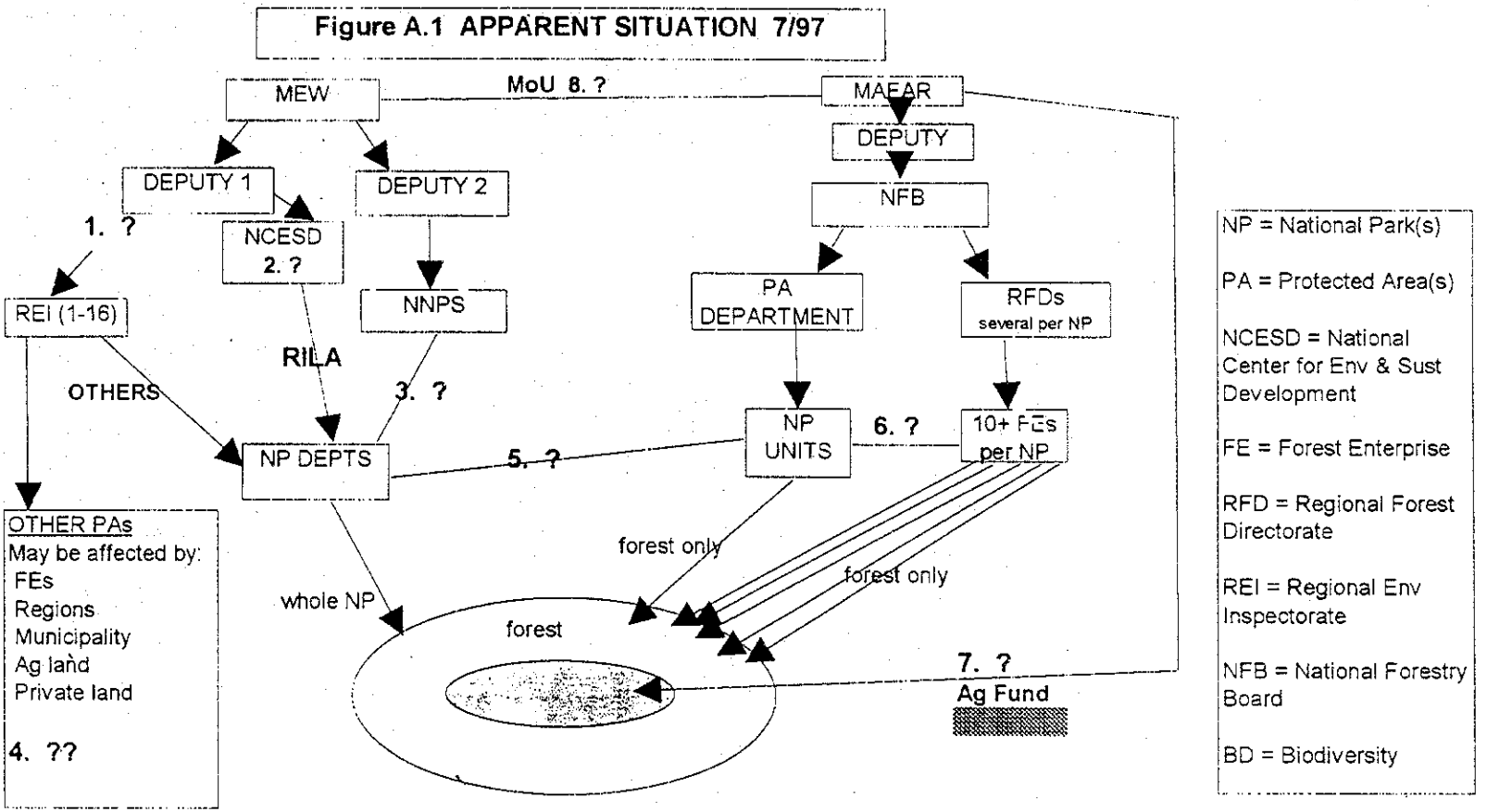
- Drilling
- Shallow Ground Water
- Springs
- Water Intake from Rivers
- Wells
- I - VIII Important Wetland (Including sites of importance by Ramsar Convention)
- 1 - 11 Further Important Wetland
- a - w CORINE Biotopes
- Strict Reserve (IUCN Category I)
- Buffer Zone
- National Park (IUCN Category I)
- Natural Monuments and Protected Sites (IUCN Categories III and IV)
- Projects and Proposals for new Protected Areas

Scale 1:700000

10 0 10 20 km

FIG.2.7.1 ENVIRONMENTAL PROTECTION AREA TO BE CONSIDERED


Jalak



COMMENTS

1. REIs may or may not be under same deputy as NNPS.
2. NCESD; no link to NNPS.
3. No formal reporting link NPPS with REIs or NPDs
4. Admin. links for other PAs (in and out of MEW) unclear.
5. Unclear mandates and relationship of NP units of MEW & MAFAR.
6. Unclear link betweem NP Units and FEs of MAFAR.
7. Ag sector interests in montane Ag Fund lands in PAs unclear.
8. MEW/MAFAR MoU has no subordination for PAs at national or PA level

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FIG. 2.7.2 DIAGRAM TO ILLUSTRATE CURRENT LINES OF MANAGEMENT FOR PROTECTED AREAS
(Source: GEF - 2nd Annual Report)

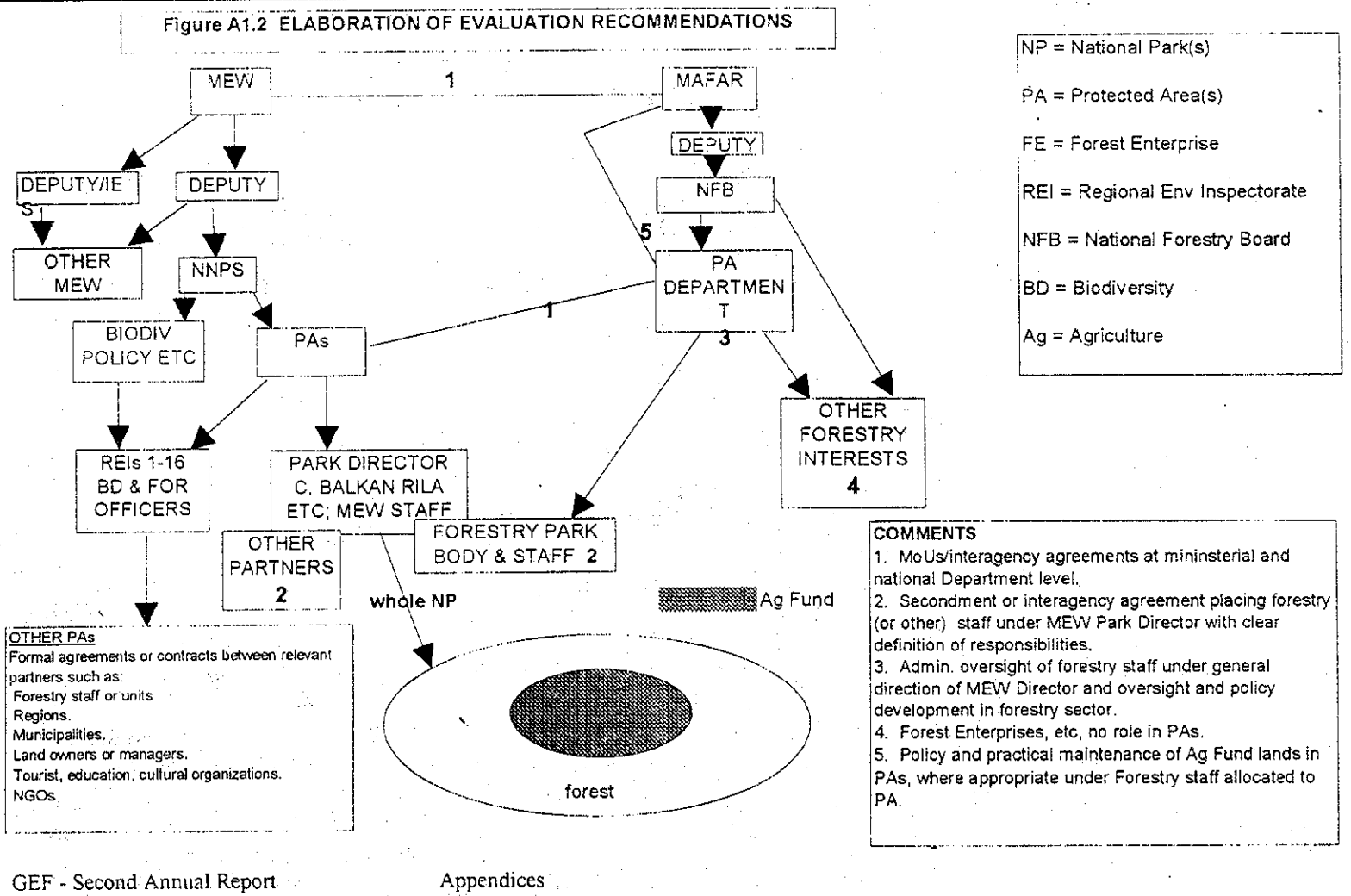

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FIG. 2.7.3 DIAGRAM TO ILLUSTRATE PROPOSED MANAGEMENT STRUCTURE FOR NATIONAL PARKS UNDER THE DRAFT PROTECTED AREAS (Source: GEF - 2nd Annual Report)

2.8

EXISTING STRUCTURES

2.8 Existing Structures

This section describes the present condition of existing facilities of water supply and wastewater treatment in the Maritza River Basin.

2.8.1 Water Supply

(1) Water Supply Systems

Water supply in the Maritza river basin is managed by 7 Water Supply and Sewerage Companies (VIKs) of the Ministry of Regional Development and Urbanization and 5 VIKs of the municipalities. Water Supply Companies in the river basin are as follows:

Region	WS Company	No. Municipality	Owner
Sofia	Sofia	5	State
Plovdiv	Plovdiv	13	State
	Pazardjik	8	State
	Smolian	5	State
	Peshtera	1	Municipality
	Batak	1	Municipality
	Velingrad	1	Municipality
Haskovo	Haskovo	7	State
	Stara Zagora	6	State
Bourgas	Sliven	2	State

Only Plovdiv and Pazardjik Water Supply Companies have the whole responsible municipalities in the Maritza river basin. These systems cover almost all the population in the Maritza River Basin.

(2) Existing Water Supply Facilities

Treatment of the raw water for water supply can be classified into 2 major types as follows:

- Treatment of the surface water or the groundwater by a water supply treatment plant
- Treatment of the groundwater at well sites

The typical treatment process of the water supply treatment plant is 1) Coagulation (by $Al_2(SO_4)_3$ and Ca(OH)2), 2) Sedimentation, 3) Sand filtration, 4) Disinfection, 5) Reservoir storage and 6) Distribution.

There are totally 25 water supply treatment plants managed by the State water supply companies. The production capacity is as follows:

WS company	Total capacity of treatment plants (m^3/y)
Sofia	10,564,560
Plovdiv	6,717,168
Pazardjik	4,761,936
Haskovo	20,813,760
Strara Zagora	no treatment plant

Source : WS Companies' questionnaires

The typical process for the groundwater treatment at a well site is 1) Disinfection of raw water (by Cl_2) and 2) Distribution.

(3) Distribution System

Several types of pipes are being used in the basin, those are: cast iron pipe, steel pipe, steel concrete pipe, asbestos cement pipe, PVC pipe and galvanized pipe. The total length of pipes for different diameters are summarized briefly as follows:

Total length of pipes (km)						
Type	Water Supply Company					Total (km)
	Sofia	Plovdiv	Pazardjik	Stara Zagora	Haskovo	
Asbestos	242.5	3,191.1	1,431.8	1,716.4	1,062.7	7,644.5
Cast iron	-	72.0	17.4	44.6	7.8	141.7
PVC	-	11.7	15.4	2.7	37.9	67.7
Steel	33.9	526.8	398.6	404.4	241.2	1,604.8
Steel concrete	-	-	4.8	5.4	-	10.2
Galvanized	-	-	18.0	-	-	18.0
Total	276.4	3,801.6	1,885.9	2,173.4	1,349.7	9,487.0

Source : Water Supply Companies' questionnaires

The portion of the pipelines is as follows:

Type	Length	
	km	%
Asbestos	7,644.5	80.6
Cast iron	141.7	1.5
PVC	67.7	0.7
Steel	1,604.8	16.9
Steel concrete	10.2	0.1
Galvanized	18.0	0.2
Total	9,487.0	100.0

The major portion of the pipelines in the basin is Asbestos cement, which occupies about 80% of the whole pipe length.

(4) Operation and Maintenance

The operation and maintenance of water supply system are taken care by water supply companies. Main regular works are 1) Control of water intake facilities, 2) Operation of the purification process, 3) Control of water quantity for delivery and 4) Repair of the equipment. The operation and maintenance of water supply system are in principle based on the water supply company's manual and local manual.

2.8.2 Wastewater Treatment

(1) Municipal Town Sewerage Systems

The towns with sewerage system and their population are shown in the following table and Fig. 2.8.1.

Settlements within the Maritza Basin	Number of Settlements of these sizes	Population	Percentage of these Settlements with piped sewerage	Percentage of Population with piped sewerage	Percentage of these Settlements with Treatment Plants
>100,000	2	493,992 = 28.2 %	100 %	90.6%	1 = 50%
100,000 to 10,000	19	540,262 = 30.8 %	94.7 %	84.4%	3 = 15.8%
10,000 to 2,000	76	268,077 = 15.3 %	26.3%	25.2%	1 = 1.3%
<2,000	657	452,360 = 25.8 %	0.0%	0.0%	0
Total	772	1,754,691 = 100 %	0.2%	55.3%	5 = 0.65%

Most of the larger towns have sewer systems, but the pipe systems are old, suffering from a lack of funds and attention. Originally these sewer systems were build of poor quality (laid with hydraulically open joints).

In consequence, now:

1) There is a tendency for the sewage is often heavily diluted with groundwater, springs, water supply leakage etc.
2) In areas where the sewers lie above the ground water table, there is a severe risk of heavy groundwater contamination with the sewage.
3) Sewer systems are often silted and/or surcharged in the flatter areas: Storm water overflows do not necessarily function as intended when designed. There are persistent problems, which will have impact, the watercourse and the health of the river and groundwater.

4) It is believed that the sewage system upgrading and rehabilitation needs have the potential of being the single and most important infrastructure issue facing the Municipalities in the future.

(2) Municipal Treatment Facilities

There are some 5 treatment plants in the river basin (see Fig. 2.8.1). They are at Plovdiv, Nova Zagora, Radnevo, Hissarya and Ihitiman. A further small remote mountain village 'seasonal' works is located at the holiday resort of Pamporovo, which is just lying on the catchment watershed. Of these the 5 main works, all are old and need extensive rehabilitation and repair. Table 2.8.1 summarizes the main features and works capacities.

There is a notable lack of wastewater treatment facilities in the region. Among the 6 wastewater treatment, only three locations were proper treatment being done (Plovdiv, Ihtiman and Pamporovo). At the three other operable sites, "reasons" were given for 'temporary upsets" and the needs to bypass the wastewater and sludge to the river system. Solutions are possible, but priorities seem to lie elsewhere.

(3) Unsewered Towns and Villages

The domestic methods of draining sewage in the villages and the 'unserved' town areas. The practice is to discharge directly to the groundwater by discharge soakaways. Septic tanks are still not common. These underground discharges are a serious threat to the environment.

Unsewered population is estimated to be about 620,000 and it is estimated that there are about 520 small "rural wastewater treatment works needed in the Maritza river basin to serve the remaining villages.

(4) O & M of Municipal Wastewater Systems

Institutional set up

Institutionally, the respective 5 Municipal Water Works are operated by the following water Companies:

Sofia District Water Co.:	Ihtiman WW Treatment Plant
Plovdiv Water Co.:	Plovdiv WW Treatment Plant
	Hissarya WW Treatment Plant
Sliven Water Co.:	Nova Zagora WW Treatment Plant
Stara Zagora Co.:	Radnevo WW Treatment Plant

These works are all suffering from lack of funds, and especially in respect of the last three, an initiative to keep them in operational order. They just don't properly treat the sewage.

Following an initiative by the World Bank, in order to be eligible for Western Funding, in order to approach the 'Privatization" conditions of the EBRD loan agreement and to improve the "Sustainability" of their operations, these Water Companies are currently in the process of Corporate re-organization. It is anticipated that a new O & M set up for the management of water and wastewater systems will emerge in the near future.

Discussions with the Sliven Water Company regarding the need for improved resources and care of such works as the "deficient" plant at Nova Zagora indicates a general hope that after the impact of the New Organization, Privatization may go ahead and the resources would then be available to effect such as the necessary improvements.

The water companies also "operate" the sewer systems in their respective areas.

Operational aspects

As will be evident from the preceding sub section, the main operational problem at the Treatment Works seems to be due to "Institutional System":

1) Funds are low and there is little will to "supervise" and "police" operational efficiency: Much seems to depend on the individual operational management.
2) The main treatment process operation may not improve until the "institutional" problems are solved: The operators have the ability: We believe they simply lack the resources they need and some encouragement from "The System".
3) Although we understand drainage soak aways are "illegal", neither the REI nor the water Companies are Prime movers in any movement to improve the situation and feed these properties to the sewer for treatment (eventually), e.g., insist on proper Septic Tanks or Sewerage to drains.
4) There is no record of Formal Water Co. or REI Prosecutions in Court for wastewater discharge offences.
5) There is no real enforcement of the general requirement to maintain storm overflow discharges or prevent excessive exfiltration.

Maintenance aspects

In effect there is very little preventative maintenance in the treatment works, and possibly none at all in the sewer systems. "Breakdown maintenance" dominated the Nova Zagora and Radnevo Systems (during our visits the systems had broken-down).

With the collapse of the economy all systems seen were run down, and suffering from lack of funds:

1) At Ihtiman and at Plovdiv a degree of maintenance was obviously and probably the result of local managerial interest and care. Effort seemed to have been taken to keep

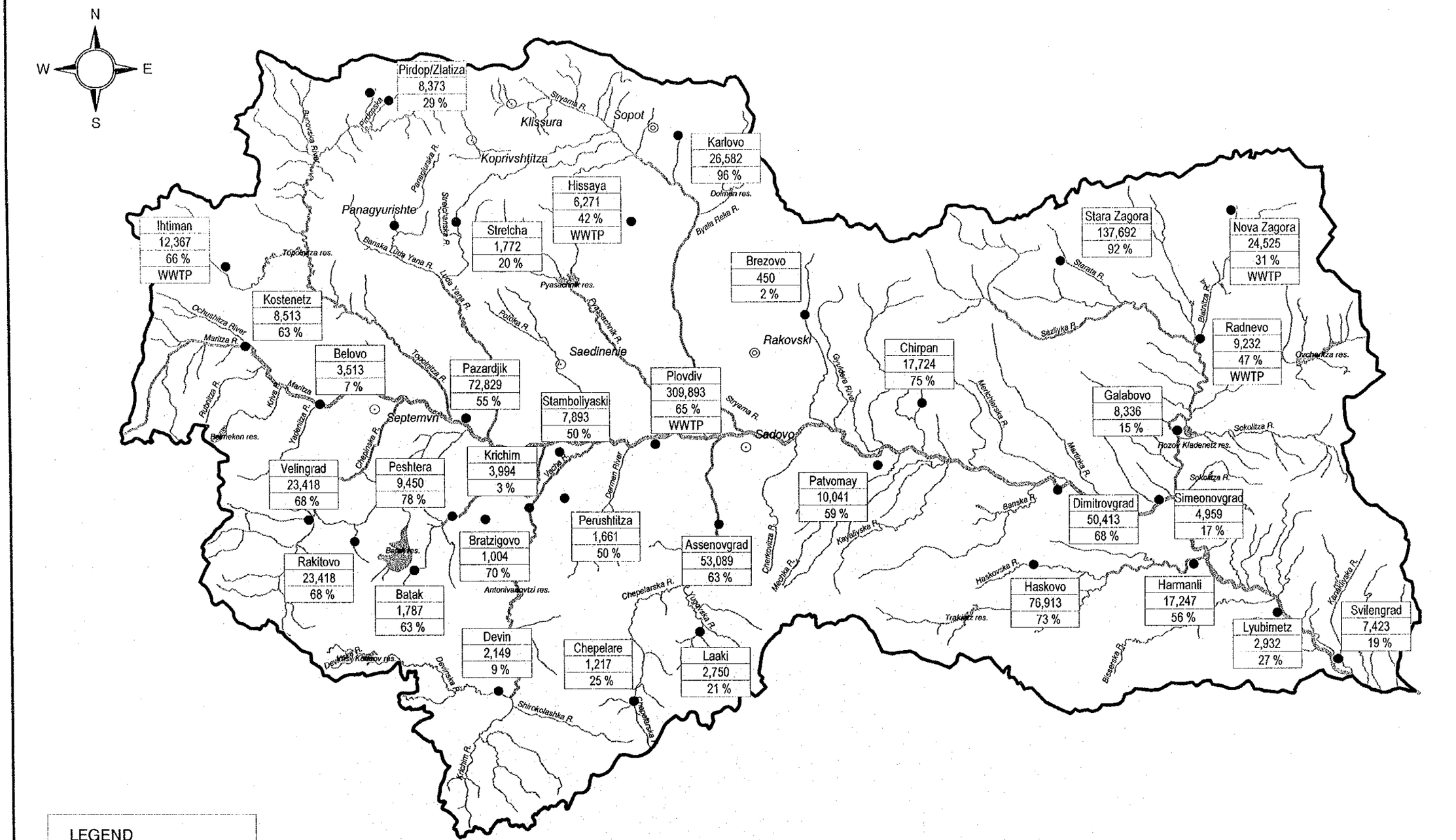
the minimum of the plant "operational", but many of the standby units were out of action.

2) At the other plants breakdowns and total process shut downs seem common.

3) To date the REIs do not seem to 'prosecute' or "fine" these water companies for failing to keep the works in proper operation.

TABLE 2.8.1 OPERATIONAL MUNICIPAL WWTP IN THE MARITZA RIVER BASIN

Town	PE		Design parameters			Operation parameters			Treatment Process Units	
	Design	Present	Q m^3/d	BOD_5 mg/dm^3	SS mg/dm^3	Q m^3/d	BOD_5 mg/dm^3	SS mg/dm^3	Main Stream	Sludge
Plovdiv	870,000	470,000	294,000	168	323	175,800	145	105	Bar screen, PS, Grit chamber, Primary settling tanks, Aeration tanks, Secondary set. Tanks, Disinfection	Sludge thickeners, Thermophilic digestors, Mechanical dewatering
Hisarya	35,228	23,694	9,371	203	275	8,530	150	280	Screens, Grit chamber, Settling tanks, Rot.biocontactors, Secondary set. Tanks, Contact basins,	Drying beds
Nova Zagora	89,354	52,778	17,546	275	384	14,250	200	560	Screens, Grit chamber, Aeration, Primary settling tanks, Aeration tanks Secondary set. Tanks, Contact basins	Sludge thickeners, Open digestors, Drying beds
Radnevo	15,555	2,200	4,200	200	254	3300	36	88	Bar screen, Grit chamber, "Emsher" tanks, Bio-filters, Secondary set. tanks, Disinfection	Sludge thickeners, Drying beds
Ihtiman	72,000	35,904	28,512			14,256	136	102	Screens, Grit chamber, Primary settling tanks, Aeration tanks, Secondary set. tanks, Disinfection	Sludge thickeners, Open digestors, Drying beds
Pamporovo	14,800	13,600	3,197	250	80	2,938	250	80	Screen, Grit chamber, Aeration tank, Secondary set. tanks, Disinfection	Aerobic stabiliser Stone filterpress



LEGEND

Plovdiv	Town
309,893	Population connected
65 %	Swewred by street %
WWTP	WWTP

SCALE 1 : 700000

10 0 10 20 km

FIG.2.8.1 TOWNS WITH SEWERAGE SYSTEMS

CHAPTER 3
MASTER PLAN

3.1

INTRODUCTION

CHAPTER 3 MASTER PLAN

3.1 Introduction

The Maritza river basin is facing water stress by limited available water resources and deteriorated water quality in the river basin.

The water resources of the Maritza river basin is extensively used by agriculture, hydropower, domestic and industrial water supply sectors. The surface water is distributed by numerous structures including dams and intakes as well as inner-basin and inter-basin transfer facilities for irrigation and hydropower. The groundwater is extracted by numerous wells for domestic and industrial water supply. The water resources of the basin are not used in inefficient way and require an optimum management from the basin management aspect.

The river water is affected by many pollution sources, i.e., wastes and refuse from urban areas, factories, mines, agricultural land and livestock farms, of which the hazardous substances could be affecting the health of people, the water users and the environment in the river basin. The basin requires reducing pollution loads from these sources for improvement of the water quality and environmental situation from the environmental management aspect.

In order to formulate an optimum Master Plan for integrated environmental management of the Maritza river basin, a GIS based database has been developed and collected basic data are stored in the database which will be utilized by the Government of Bulgaria after the Study.

Based on the collected basic data, socio-economic frameworks for the target year 2015, land use, structural and nonstructural measures required for environmental management of the basin have been studied.

The Study set the target for the Master Plan to improve and maintain the water quality in sufficient good conditions (class - I or class - II) along the Maritza main stream and her major tributaries by reduction of un-treated loads from major urban centers, industries, livestock farms etc. with structural and nonstructural measures that are consisting of expansion of municipal sewerage treatment capacities, reduction of un-treated wastewater discharge from industry and livestock, strengthening of basin management capacities, strengthening monitoring systems, supporting development studies and investigations, in order to improve or sustain the water resources and the environmental situations.

Also the Master Plan proposes priority projects for F/S and an action plan for implementation of the proposed Master Plan.

In order to assess the water resources and the water quality of the Maritza main stream and her major tributaries, mathematical models i.e., NAM, HD and WQ models, were developed for the basin as technical assessment tools for the Study.

3.2

SOCIO-ECONOMIC FRAMEWORK

3.2 Socio-economic Framework

A macro framework for the socio-economic development of the Maritza river basin has been worked out for the year 2015. The macro framework specified the projected socio-economy in the basin by using the gross regional domestic product (GRDP) and employment by agriculture, industry and services, and the population in urban and rural areas.

According to the macro framework, the GRDP of the Maritza river basin will grow at 6.8% per annum on an average through 2015, supported by the annual average growth of agriculture at 3.0%, industry at 7.5% and services at 7.0%. The total population in the basin will become 1,921,000 in 2015, representing a 10% increase from the population in 1995. The rural population will decrease slightly, and the urbanization ratio will increase to 71% in 2015.

The projection of the GRDP and employment in the Maritza river basin is summarized below:

	GRDP (million Leva in'95 price)		Average annual growth (%)	Employment	
	1995	**2015**	**1995-2015**	**1995**	**2015**
Agriculture	20,000	36,000	3.0	147,000	90,000
Industry	62,000	263,000	7.5	255,000	376,000
Services	72,000	279,000	7.0	244,000	349,000
Total	154,000	578,000	6.8	646,000	815,000

Such socio-economic development as specified above will be supported by various economic activities. Prospects of various agricultural and industrial activities are examined in the following and the agricultural and industrial value-added projected by sub-sector to justify the projected socio-economy in 2015.

3.2.1 Agricultural Value-Added

(1) Introduction

Agricultural land occupies 48.3% of the Maritza river basin, consisting of areas under fruit trees and vineyards, irrigated areas and non-irrigated areas. Most of the agricultural land is arable and suited to various crops depending on irrigation, fertilizer application and other farm management practices. As the land restitution proceeds, farmers will re-establish the cropping patterns that were found successful before 1989 with some changes reflecting new marketing opportunities. Agricultural land use in the basin may change further in the future, but the basic land use patterns established over decades will remain largely the same. The main direction for agricultural development in the basin is to increase value-added for existing crops by adopting better farm management with limited crop conversion.

The agricultural value-added is estimated by crop for 1995 and projected to 2015. First, production value and costs are determined for various crops both under prevailing conditions and under improved conditions expected in the future. Unit value-added is determined by crop in both cases. Second, cropping patterns are associated with the existing agricultural land use, and the present agricultural value-added is re-established. Finally, an attempt is made to project the agricultural value-added to the year 2015 by assuming improved farm management for each of agricultural land use categories.

(2) Indicative Crop Budget

Expenditure of crop production was analyzed by another JICA study for three areas in Bulgaria (JICA, Feasibility Study on the Project for Agricultural Reform in Bulgaria). One of the areas covers a small area in Nova Zagora within the Maritza river basin, where many crops found widely in the basin are cultivated. Improved farm management practices are recommended by this earlier study for cereals, maize and other fodder crops, and various horticultural crops. Expenditure of crop production with and without the improved farm management is adopted from the study as summarized in Table 3.2.1.

To determine production value for various crops, yields and prices are assumed. Present yields are assumed based on agricultural statistics for districts of the Maritza river basin. Yields under the improved farm management are assumed to be 20% higher than the respective present yields for different crops. For international market prices at the farmgate,

price data reported in the earlier study are adopted. Unit value-added per ha with and without the improved farm management is calculated for each crop. Results are given of in Table 3.2.2.

(3) Present Conditions

Agricultural land use

Agricultural land use in the basin is defined by nine land use categories of the CORINE land use map. This comprises non-irrigated agricultural land consisting of annual crops associated with permanent crops, complex cultivation patterns, non-irrigated arable land, and land principally occupied by agriculture with significant areas of natural vegetation, irrigated land consisting of permanently irrigated land and rice fields, and other agricultural lands consisting of fruit trees and berry plantations, vineyards and agro-forestry areas. The agricultural land occupies 1,029,600 ha in total, consisting 734,500 ha non-irrigated land, 221,600 ha irrigated land, and 73,500 ha of others.

Agricultural value-added

Unit value-added per ha is determined for each of the agricultural land use categories. Each agricultural land use category contains a certain mixture of different crops, except paddy fields and vineyards. Unit value-added of each category is determined based on unit value-added of dominant crops. Assumptions on dominant crops and calculation results are summarized in Table 3.2.3.

As seen from Table 3.2.3, the total crop value-added is calculated to be Lev. 11,900 million in 1995, while the total agricultural value-added is estimated above at Lev. 20,000 million in 1995. The balance Lev. 8,100 million or 40.5% of the agricultural value-added is attributable to livestock and other minor activities.

(4) Projection of Agricultural Value-Added

Broadly within the same agricultural land use patterns, agricultural productivity in each land use category will increase in the future. Larger areas will be devoted to crops of higher value-added, and yields will increase through the improved farm management. Only in the category of agriculture with significant natural vegetation, horizontal expansion of agricultural land will take place using part of the land under natural vegetation. Unit value-added of each land use category is determined based on unit value-added of dominant crops with the improved farm management given in Table 3.2.3. Pastures will be partly upgraded into managed pastures to support the boosting of the livestock sub-sector.

The agricultural value-added is projected to the year 2015 under these assumptions. The projection and the assumptions are summarized in Table 3.2.4. As shown in the table, the total crop value-added is projected to increase to Lev. 19,600 million in 2015, representing an annual average increase of 2.53%. To attain the total agricultural value-added of Lev. 36,000 million in 2015 according to the macro framework, livestock and other sub-sectors will have to grow at 3.59% per annum to reach Lev. 16,400 million by 2015. The share of these latter sub-sectors will increase to 45.6% of the agricultural value-added.

3.2.2 Industrial Value-Added

(1) Introduction

The industrial value-added in the Maritza river basin has been estimated by sub-sector for 1995. It is projected here to the year 2015. As Bulgaria has been undergoing major economic turmoils and industrial production declined drastically in early 1990's due to losses of both domestic and export markets, production and export performance in recent years is examined at the national level, first. Prospects of different sub-sector industries are indicated.

Second, industrial development in the Maritza river basin is assessed by sub-sector with respect to raw materials availability and existing facilities as well as markets. Combined with the national level examination, prospects of industrial development in the basin are indicated by sub-sector. Finally, an attempt is made to project the industrial value-added by sub-sector based on assumed growth rates determined in accordance with the assessment.

(2) National Industrial Production and Export Performance

Production and export value by sub-sector of the Bulgarian economy for four recent years from 1989 to 1995 has been expressed in 1995 prices and is summarized in Table 3.2.5. Referring also to national statistics on production and export quantities of different industrial products, past performance and future prospect of each sub-sector industry have been assessed as summarized in Table 3.2.6.

Output of all the sub-sector industries declined drastically in early 1990's. This is due primarily to losses of domestic and export markets. In general, those sub-sectors depending more on the export market decreased their output more significantly. Thereafter, the export started to recover steadily for some sub-sectors and more slowly for some others, but a few sub-sectors have not shown a clear sign of recovery.

In the meantime, export and import structure by country has changed significantly as shown in Table 3.2.7. The dominant shares of the former USSR decreased significantly in both export and import value. The decreases have been compensated largely by increased shares by Western European countries.

On the whole, export value is recovering more rapidly. While the production value in 1995 is only 32% of that in 1989, the export value in 1995 is already 75% of what was attained in 1989. The increase in export value is due to both increased prices in international markets and recovery of export quantities of limited price competitive goods directed to new and old markets.

(3) Sub-Sector Performance and Prospect

Coal is produced in Bulgaria almost exclusively for the domestic market. This is the only sub-sector that did not decrease its production during the early 1990's. The production value, however, declined due to decreases in prices in real terms. Production in this sub-sector will increase only in response to domestic demand as the economy recovers. The oil and gas sector is insignificant in Bulgaria.

The ferrous metallurgy sub-sector has increased its dependence on the export market, as the production value declined but the export value increased over 1989-95. Production quantities are recovering fast for most products. Pig iron and ferro-alloys had recovered by 1995, their production in 1989, and steel production attained in 1995, 94% of production in 1989. This sub-sector will continue to grow as it has comparative advantage for export, if facilities are continually rehabilitated and upgraded.

The non-ferrous metallurgy sub-sector in Bulgaria produces mostly for the domestic market. The production declined sharply at the beginning of 1990's, but the production value recovered by 1995 to 87% of what was attained in 1989, supported by increased prices. Production quantities will continue to increase steadily as the economy recovers.

The machinery and metal works sub-sector decreased its production most drastically, and the production value in 1995 is only 19% of that in 1989, the second lowest next only to the electrical and electronics sub-sector. Most products have not shown any sign of recovery as of 1995. The export value, however, shows a sign of recovery, supported by limited products such as tools, implements and other small metal products and some mechanical appliances. Both export and domestic markets for this sub-sector may recover but only slowly.

Both production and export of the electrical and electronics sub-sector declined drastically. No sign of recovery is seen, while the import value of this sub-sector is increasing. The production and the export value in 1995 was only 11% of the respective value in 1989. Production performance varies distinctly among different commodities. Therefore, product specialization may be a direction to pursue for more promising products such as electric generators, tools and boilers.

The production value of the chemical and oil products sub-sector started to recover by 1995, while the export value has been largely on the increase. Production quantities are recovering fast for most products. Some products in this sub-sector have strong export performance with established markets such as some essential and other industrial oils and

various nitrogen products. Their exports are constrained only by production. This sub-sector will recover fully and expand further.

Sub-sectors of building materials, pulp and paper, wood products, and china and glass products reduced their respective production value, but they show a sign of recovery, except the wood products sub-sector. Export has small shares in respective production, but the export value of these sub-sectors increased significantly. As the domestic demand increases, the export of these sub-sectors will taper off. Import will increase as well.

Sub-sectors of textile, apparel, and leather and footwear are consistently decreasing their respective production value. The production value in 1995 was 29% of that in 1989 for textile, 21% for apparel, and 31% for leather and footwear. In the meantime, the export value of these sub-sectors increased slightly. These increases are supported in part by export processing of those manufactures working on orders from foreign firms and with materials supplied by them as reflected also in increased import. These sub-sectors will grow based on expansion of domestic market and export processing as well as increase in domestic supply of raw materials such as cotton and raw leather.

The food, beverages and tobacco sub-sector is reducing its production value, but its export value is steady due to established markets with reputation for some products. Production quantities in 1989 were fully recovered by 1995 for vegetable oils, grape wines and some other products. These products also have strong export performance. Tobacco products also recovered fast to attain by 1995, 87% of the production in 1989. The domestic market for this sub-sector will recover and further expand with products diversification as income levels increase, and the export market will continue to grow steadily with further specialization.

(4) Assessment of Industrial Development in the Maritza River Basin

Prospects of different sub-sector industries in the Maritza river basin depend on the overall performance of respective sub-sectors at the national level as examined above, and comparative advantages of the basin vis-à-vis other regions with respect to raw materials availability, existing facilities, related industries and services, labor force and other

conditions. Broad assessment is made by sub-sector for industrial development in the Maritza river basin. Table 3.2.8 summarizes major constraints faced by different sub-sectors in the basin and their prospects.

The non-ferrous metallurgy sub-sector is most promising in the Maritza river basin due to the availability of raw materials and existing facilities and technology. The sub-sector is supported by the domestic demand that will increase steadily as the economy recovers. Prerequisites for further growth are to solve existing and anticipated environmental problems and to upgrade some facilities.

The chemical and oil products sub-sector is next most promising, particularly for the export market. Further product diversification in favor of high value products will be realized with additional investments. Promising activities include cosmetics and perfumery, pharmaceuticals including herbal medicine, fertilizer and other sulphur or nitrogen based chemical compounds.

The food, beverages and tobacco sub-sector will continue to be the main thrust of industrial development in the Maritza river basin with continual product development. A key for the domestic market will be product diversification to meet changing demands as income levels increase. For the export market, further specialization will be realized for specific target countries. Examples may include preserved vegetables and temperate fruits as well as live animals to Middle East countries, wines and spirits to Japan, tobacco products to Russia, and fresh vegetables to European countries.

Some existing industries in the machinery and metal works sub-sector have been assessed as competitive in international markets such as polishing machine works in Assenovgrad and metal-cutting machine works in Velingrad. Others would need substantial investments to improve their operation, and some of them may be closed. The electrical and electronics sub-sector as a whole will grow only slowly as limited products will be viable in the domestic and the export markets.

Other indigenous resources based industries have good prospects in the medium to long term, although their growth rates will not be among the highest due to inherent

characteristics of this type of industries. The building materials sub-sector seems viable supported by good quality raw materials as indicated by high export performance even during the depressed economic situation. The wood products sub-sector will attain higher growth as more raw materials currently exported are processed domestically into high value products. The pulp and paper sub-sector as a whole seems viable as manifested by good export performance in recent years, but in the Maritza river basin major renovation of facilities will be required to expand production.

Sub-sectors of textile and apparel may expand in the medium term with substantial foreign investments mainly for export processing. In the short term, existing production capacities can be utilized as the domestic market recovers. Growth of the leather and footwear sub-sector will be based on expansion of raw materials base by import for export processing in the medium term, and by boosting the livestock sector in the long term.

(5) Projection of Industrial Value-Added

Prospects of different sub-sector industries assessed above are broadly reflected in the projection of industrial value-added. Sub-sectors are ranked into high, medium or low with respect to prospects in the Maritza river basin based on their growth prospects in the domestic and the export markets and the contribution of the basin to the respective national production. Even if a sub-sector has low growth prospects as a whole (nationally), the Maritza river basin may contain more viable factories and products if its contribution to the national production is large.

Growth rates of different sub-sectors are assumed depending on their prospects in the Maritza river basin and whether or not they are indigenous resource based. In general, indigenous resource based industries have lower growth rates constrained by the availability of raw materials. Results are summarized in Table 3.2.9.

Using the assumed growth rates, value-added in mining and manufacturing is projected by sub-sector. Results are shown in Table 3.2.10. As seen from the table, the value-added in mining and manufacturing is projected to increase from Lev. 46,100 million in1995 to Lev. 189,500 million in 2015 at an average annual rate of 7.3%. The value-added in

construction and utilities are assumed to increase respectively at 7.0% and 9.2% per annum to make the total industrial value-added Lev. 263,000 million in 2015.

TABLE 3.2.1 EXPENDITURE OF CROP PRODUCTION WITH AND WITHOUT IMPROVED FARM MANAGEMENT

(1) Without improved farm management

(Unit: US$/ha)

Crop	Labor cost	Other variable costs*	Fixed costs**	Total costs	Total costs less labor costs
Wheat	11.8	208.9	37.8	258.4	246.6
Barley	11.8	187.9	37.8	237.4	225.6
Maize	44.4	175.0	86.1	305.5	261.1
Sunflower	7.8	69.7	10.0	87.5	79.7
Sugar beet	58.8	49.0	10.0	117.8	59.0
Tobacco	459.5	357.0	118.0	934.6	475.1
Vegetables	277.6	119.8	38.5	435.9	158.3
Fruit orchard	84.4	64.8	32.5	181.7	97.3
Grapes-vineyard	57.7	76.4	22.5	156.6	98.9
Melons	97.7	45.4	23.5	166.6	68.9
Other crops	46.6	52.2	16.0	114.8	68.2
Alfalfa	16.7	13.1	22.5	52.3	35.6

(2) With improved farm management

(Unit: US$/ha)

Crop	Labor cost	Other variable costs*	Fixed costs**	Total costs	Total costs less labor costs
Wheat	12.1	233.0	43.4	288.5	276.4
Barley	12.1	211.7	43.4	267.2	255.1
Maize	50.0	219.5	86.1	355.6	305.6
Sunflower	7.8	78.9	23.0	109.7	101.9
Sugar beet	71.0	49.2	43.7	163.9	92.9
Tobacco	466.2	355.4	118.0	939.6	473.4
Vegetables	306.4	141.1	38.5	486.0	179.6
Fruit orchard	126.6	75.4	32.5	234.5	107.9
Grapes-vineyard	73.3	83.0	22.5	178.8	105.5
Melons	115.4	60.8	23.5	199.7	84.3
Other crops	128.8	67.6	16.0	212.4	83.6
Alfalfa	21.1	13.1	22.5	56.7	35.6

* Seed, fertilizer, chemicals, mechanization and others

** Water fee, insurance and others

Source: JICA, Feasibility Study on the Project for Agricultural Reform in Bulgaria.

TABLE 3.2.2 INDICATIVE BUDGETS OF CROP PRODUCTION WITH AND WITHOUT IMPROVED FARM MANAGEMENT

Crop	Yield ton/ha		Price* Lev./kg '95 prices	Gross production value Lev./ha		Value-added V/A Lev/ha		% V/A
	Without	with		without	with	without	with	
Wheat	2.5	3.0	10	25,000	30,000	8,000	11,000	37.5
Barley	2.8	3.4	9	25,000	31,000	10,000	14,000	40.0
Maize	4.0	4.8	10	40,000	48,000	22,000	27,000	22.7
Sunflower	1.2	1.5	7.5	9,000	11,000	4,000	4,000	0.0
Sugar beet	16	19	0.7	11,000	13,000	7,000	7,000	0.0
Tobacco	1.4	1.7	100	140,000	170,000	108,000	138,000	27.8
Vegetables	15	18	10	150,000	180,000	139,000	168,000	20.9
Fruit orchard	4.5	5.4	7	32,000	38,000	25,000	31,000	24.0
Grapes-vineyard	4.5	5.4	12	54,000	65,000	47,000	58,000	23.4
Melons	12	14	2.0	24,000	28,000	19,000	22,000	15.8
Other crops				25,000	30,000	20,000	24,000	20.0
Alfalfa	3.5	4.2	1.4	5,000	6,000	3,000	4,000	33.3

* Farmgate price expressed in US dollars converted at US$ 1 = Lev. 68.1 (1995
Source: JICA Study Team

TABLE 3.2.3 ESTIMATION OF AGRICULTURAL VALUE ADDED BY AGRICULTURAL LAND USE CATEGORY, 1995

Agricultural land use	**Area ha**	**Unit V/A* Lev./ha**	**Value added* Million Lev.**	**Explanation**
Annual crops associated with permanent crops	3,328	50,000	166	Mixed cropping of permanent crops and annual crops
Complex cultivation	71,268	15,000	1,069	Mixture of maize, sunflower and other upland crops
Fruit trees and berries	29,249	25,000	731	Fruit orchards
Agriculture with significant natural vegetation	208,945	2,000	418	Some 20% of land under crops of low unit V/A
Grassland	68,152	0	0	
Non-irrigated arable land	419,206	8,000	3,353	Mostly grains
Pastures	55,308	0	0	
Irrigated land	198,974	20,000	3,979	Mixture of maize, vegetables, fodder and other crops
Paddy fields	22,813	20,000	456	Paddy only
Vineyards	43,201	40,000	1,728	Some 85% of land productive
Total-agricultural land	1,120,444		11,900	
Livestock and others			8,100	Difference between agricultural V/A and crop V/A
Total agricultural value-added			20,000	Estimated separately

* in 1995 prices
Source: JICA Study Team

TABLE 3.2.4 PROJECTION OF AGRICULTURAL VALUE ADDED BY AGRICULTURAL LAND USE CATEGORY, 2015

Agricultural land use	**Area ha**	**Unit V/A* Lev./ha**	**Value added* million Lev.**	**Explanation**
Annual crops associated with permanent crops Complex cultivation	74,596	50,000	3,730	Mixed farming with diversified crops
Fruit trees and berries	29,249	30,000	877	Yield increase through improved farm management
Agriculture with significant natural vegetation	208,945	8,000	1,672	Horizontal expansion to use area under natural vegetation
Grassland	68,152	0	0	
Non-irrigated arable land	419,206	15,000	6,288	Mostly grains under improved farm management
Pastures	55,308	-	-	Partly managed pastures reflected in livestock V/A
Irrigated land	198,974	24,000	4,775	More diversified crops and yield increase of existing crops
Paddy	22,813	24,000	548	Yield increase through improved farm management
Vineyards	43,201	40,000	1,728	Yield increase but reduction in area of productive land (~70%)
Total-agricultural land			19,600	2.53% p.a.
Livestock and others			16,400	3.59% p.a.
Total agricultural value-added			36,000	2.98% p.a.

* in 1995 prices
Source: JICA Study Team

TABLE 3.2.5 PRODUCTION AND EXPORT VALUE BY SUB-SECTOR OF BULGARIAN ECONOMY AND STUDY AREA'S CONTRIBUTION TO PRODUCTION

(10^6 Lev., 1995 prices)

	1989			1991			1993			1995			
	Production	Export	Export/production %	Production	Export	Export/production %	Production	Export	Export/production %	Production	Export	Export/production %	Study Area's share %
Coal	21,442	-	0.0	27,073	-	0.0	19,490	3	0.0	13,158	38	0.3	73
Oil and gas	695	-		593	-		947	-	-	720	-	-	0
Ferrous metallurgy	83,454	8,504	10.2	72,162	13,341	18.5	36,953	29,319	79.3	51,427	39,081	76.0	1
Non-ferrous metallurgy	49,205	-	0.0	39,391	-	-	28,339	-	-	42,696	-	-	39
Machinery & metal works	342,782	144,704	42.2	135,940	68,936	50.7	72,240	31,790	44.0	66,382	41,398	62.4	23
Electrical & electronics	285,006	127,695	44.8	89,592	48,874	54.6	34,373	16,349	47.6	31,051	14,058	45.3	15
Chemicals & oil products	263,001	47,451	18.0	229,485	107,627	46.9	122,557	75,470	61.6	181,478	93,293	51.4	11
Building materials	65,882	1,655	2.5	32,145	2,593	8.1	16,187	3,920	24.2	18,301	6,089	33.3	12
Wood products	50,529	3,640	7.2	29,134	6,283	21.6	19,527	9,111	46.7	18,524	9,432	50.9	25
Pulp & paper	20,714	844	4.1	21,026	1,394	6.6	9,664	2,396	24.8	15,857	4,583	28.9	49
China & glass products	15,420	850	5.5	11,799	1,993	16.9	9,044	2,008	22.2	11,197	3,762	33.6	18
Textile	93,844	7,147	7.6	44,961	11,496	25.6	26,988	9,756	36.2	26,911	11,846	44.0	26
Apparel	41,363	6,608	16.0	17,153	4,149	24.2	9,541	9,502	99.6	8,725	11,339	130.0	16
Leather & footwear	30,079	4,004	13.3	13,409	3,287	24.5	9,706	8,511	87.7	9,290	8,992	96.8	23
Printing	8,868	453	5.1	8,870	290	3.3	7,235	144	1.6	9,463	355	3.8	50
Food, beverages & tobacco	423,125	55,961	13.2	274,917	71,213	25.9	147,696	49,611	33.6	112,733	60,782	53.9	23
Others	84,645			28,596			7,397			1,641			
Total	1,962,086	433,979	22.1	1,170,342	367,236	31.4	577,885	278,226	48.1	619,554	339,998	54.9	
Crops				118,234	9,449	8.0	87,469	5,233	6.0	59,087	6,984	11.8	
Livestock				100,509	3,933	3.9	94,185	3,798	4.0	57,141	3,107	5.4	

Source: NSI, Statistical Yearbook, 1994 and 1996

TABLE 3.2.6 PAST PERFORMANCE AND FUTURE PROSPECT OF INDUSTRY BY SUB-SECTOR

Sub-sector	Performance in recent past (1989-95)	Prospect for future
Coal Oil and gas	- Produced almost exclusively for domestic market - Production value decreased but not much - Production quantity of coal was steady	-Production will increase only in response to domestic demand as the economy recovers
Ferrous metallurgy	-Production value declined ,but export value increased -Dependence on export market has become significant -Production quantity recovering fast for most products	-Comparative advantage for export -Domestic market will recover also.
Non-ferrous metallurgy	-Produced exclusively for domestic market -Production value declined but sign of recovery seen	-Production will increase steadily as the economy recovers.
Machinery and metal works	-Production declined sharply, no sign of recovery, yet -Export decline sharply, but sign of recovery seen	-Both export and domestic markets will recover only slowly
Electrical and electronics	-Production and export declined sharply, no sign of recovery -Impact value increasing	-No comparative advantage for most products -Only slaw growth with specialization
Chemicals and oil products	-Production value declined, but export value increased -production quantity recovering fast for most products	-Comparative advantage for export -Domestic market will recover steadily
Building materials Wood products Pulp and paper China and glass products	-Production value declined but started to increase -Export processing increased with increased import	-Export may taper off as domestic demand increases -Import will also increase
Textile Apparel Leather and footwear	-Production value declined sharply , but export value increased -Export processing increased with increased import	-Domestic demand and export processing will determine future production
Printing	-Production value steady -No trend for export value	-Will increase only marginally
Food, beverages and tobacco	-Production value declined sharply -Export value steady due to established markets and reputation -Production quantity increasing for some products -Import increasing rapidly	-Domestic market will recover with products diversification -Export market may expand with further specialization

Source: JICA Study Team based on Table 2.6 and NSI, Statistical Yearbook 1996

TABLE 3.2.7 CHANGES IN EXPORT AND IMPORT STRUCTURE BY COUNTRY

(%)

Country	**Export**		**Import**	
	1989	1995	1989	1995
Former USSR	66.1	34.8	55.8	45.7
Eastern Europe (excluding E. Germany)	12.7	13.6	14.5	7.5
Western Europe (including E. Germany)	12.9	39.4	21.1	38.4
Asia	3.9	5.1	2.4	1.5
Africa	2.3	2.8	1.9	1.6
America	2.1	4.3	4.2	4.6
Oceania	0.0	0.1	0.0	0.7
Total export/import value (10^6 Lev.)				
in current prices	**13,673**	**359,664**	**12,796**	**380,012**
in 1995 price	**452,443**	**359,664**	**423,422**	**380,012**

Source: NSI, Statistical Yearbook, 1994 and 1996

TABLE 3.2.8 ASSESSMENT OF INDUSTRIAL DEVELOPMENT BY SUB-SECTOR IN THE MARITZA RIVER BASIN

Sub-sector	Constraints	Prospects
Coal	-Air pollution associated with coal thermal power -Land degradation -No export market	-Production will increase but only slowly in response to domestic demand.
Oil & gas	-No resources	N.A.
Ferrous metallurgy	-No resources	-Low growth may be induced by companies in other regions
Non-ferrous metallurgy	-Depreciated facilities -Air and water pollution -Soil contamination -No export market	-This is the most promising sub-sector in the Study Area due to the availability of raw materials -Domestic demand will increase steadily as the economy recovers.
Machinery & metal works	-Significant reduction in export market -Heavy debts by some companies -Outdated equipment or inadequate production lines	-Some existing companies will survive, as they are competitive in foreign markets. -Others need substantial investments to improve their operation, or otherwise will be closed.
Electrical & electronics	-Significant reduction in domestic and export markets -Outdated equipment or inadequate production lives -Depreciated assets	-Only limited products will be viable in domestic and export markets. -The sub-sector as a whole will grow only slowly with specialization.
Chemicals & oil products	-Some outdated equipment	-This sub-sector is promising with additional foreign investments especially for high value products such as perfumery, cosmetics, pharmaceuticals and condiments.
Building materials	-Depressed construction industry -Limited production capacity -Outdated facilities	-This sub-sector seems viable supported by good quality raw materials as indicated by good export performance even during the depressed domestic market.
Wood products	-Insufficient raw materials due to dominant export of forestry products	-Domestic processing for high value products seems promising.
Pulp & paper	-Reduction in domestic market -Depreciated assets	-The sub-sector itself seems viable as manifested by good export performance even during the depressed domestic market, but in the Study Area renovation of facilities may be necessary.
Textile Apparel	-Reduction in domestic and export markets	-Export-processing will survive and expand. -Existing production capacities can be utilized if markets recover.
Leather & footwear	-Lack of raw and other materials -Reduction in domestic ad export markets	-Raw materials base may be expanded by import for export-processing in medium term and by boosting livestock sector in long term.
Food	-Reduced raw materials availability due to decline in agricultural production	-This sub-sector has very good prospects for product diversification in domestic market and for specialization in export market.

Source: JICA Study Team based on:
- Production and export/import statistics on industrial goods by NSI,
- Ministry of Territorial Development and Construction , National Center for Territorial Development and Housing Policy, "Strategy for Territorial Development of the Republic of Bulgaria"
- Organization and Development of Transboundary Areas of the Republic of Bulgaria with the Republic of Greece, and
- Limited field observations and interviews.

TABLE 3.2.9 QUALITATIVE ASSESSMENT OF INDUSTRIAL GROWTH PROSPECT IN MID-TO LONG TERM BY SUB-SECTOR IN BULGARIA AND ASSUMED GROWTH IN THE MARITZA RIVER BASIN

	Growth prospect			Study Area's contribution	Prospect in Study Area*	Assumed growth** % p.a.
	Domestic market	Export market	Overall			
Coal	medium	n.a.	Low	Large	Medium	65
Oil and gas			n.a.	n.a.	n.a.	-
Ferrous metallurgy	medium	high	High	Very small	Low	6.0
Non-ferrous metallurgy	medium	n.a.	Medium	Large	High	8.5
Machinery & metal works	low	low	Low	Large	Medium	7.5
Electrical & electronics	low	low	Low	Medium	Low	6.0
Chemicals & oil products	medium	high	High	Medium	High	8.5
Building materials	medium	low	Medium	Medium	Medium	6.5
Wood products	medium	low	Low	Large	Medium	6.5
Pulp & Paper	medium	low	Medium	Large	High	8.5
China & glass products	medium	low	Medium	Medium	Medium	6.5
Textile	medium	medium	Medium	Large	High	9.5
Apparel	medium	medium	Medium	Medium	Medium	7.5
Lather & footwear	medium	medium	Medium	Large	High	9.5
Printing	medium	low	Low	Large	Medium	7.5
Food, beverage & tobacco	medium	high	High	Large	High	8.5

* Prospects in Study Area

	Study Area's contribution		
	Large	*Medium*	*Small*
Overall prospect *High*	High	High	Medium
Medium	High	Medium	Low
Low	Medium	Low	Low

** Assumed growth (% p.a.)

	Indigenous resource-based	More foot-loose
Prospect in Maritza river basin *High*	6.0	-
Medium	6.5	7.5
Low	8.5	9.5

Source: JICA Study Team based on Tables 2.7 and 2.9

TABLE 3.2.10 INDICATIVE PROJECTION OF INDUSTRIAL VALUE ADDED BY SUB-SECTOR

	Estimated Value Added 1995 million Lev.	Assumed growth* 1995-2015 % p.a.	Projected Value Added 2015 million Lev.
Coal	2,100	6.5	7,400
Oil and gas	0	-	0
Ferrous metallurgy	100	6.0	300
Non-ferrous metallurgy	5,800	8.5	29,600
Machinery & metal work	6,300	7.5	26,800
Electrical & electronics	1,500	6.0	4,800
Chemicals & oil products	4,900	8.5	25,000
Building materials	700	6.5	2,500
Wood products	1,500	6.5	5,300
Pulp & paper	2,300	8.5	11,800
China & glass products	700	6.5	2,500
Textile	2,600	9.5	16,000
Apparel	800	7.5	3,400
Leather & footwear	900	9.5	5,500
Printing	1,700	7.5	7,200
Food, beverages & tobacco (including "others")	8,100	8.5	41,400
Private sector	6,100	-	-
Total – Mining and manufacturing	46,100		189,500
Construction	9,200		35,600
Utilities	6,500		37,900
Total industrial value-added	61,800		263,000

* Table 3.10
Source: JICA Study Team

3.3

LAND USE ZONING PLAN

3.3 Land Use Zoning Plan

Land use is very much relating to water quality in the river as well as natural and social environment in the basin. A land use zoning plan is considered as an important measure to conserve water quality for long term perspective and described hereinafter.

3.3.1 Basic Conditions for Land Use Zoning Plan

According to the Socio-economic Framework in this study, the agricultural sector will gradually decrease its share in GRDP while industrial sector will attain the highest growth in the Maritza River Basin. Figures of service sector are the largest share but the share ratio to GRDP is still proportional to present ones. Thus the main economical growth is expected in industry and service sector. Moreover, the urbanization is expected at higher rate and the population in rural area is expected to decrease in the future. The urbanization and industrialization are the key issues related to the management of water quality of the Maritza River basin.

Location of the industries should be satisfied by the availability of infrastructures such as the transportation, energy, water, telecommunication and plenty supply of skilled labors. Therefore, the possibility of the industrial location in this area would be rather limited or considered in the suburbs of large cities. In case the industrial location would be planned in this study area, the location of factories should be integrated into a specific area such as an industrial estate where the basic infrastructure would be totally supplied.

Development potential for land use in the study area seems to be rather limited in terms of agriculture due to the present maximum use of its potential represented by the present land use pattern. According to the macro socio-economic framework of this study, the agricultural sector will decrease both in the employment and the GDP contribution to the national economy. Population in the rural area gradually decreases while the urban population will grow. This means that the maintenance and management of the excellent

agricultural land require special measures to keep the present productivity.

Urbanization will take place mainly at the neighborhood of the existing urban center. Land conversions will take place from the agricultural land to the urbanization land such as housing, road, public facility and industry etc. Re-development or re-construction of the existing urban area will also take place. However, even these future land use change will not make a drastic change on the existing land use pattern due to the low growth of population and the sufficient space of land resources for future demand, population pressure to the land is considered not so high here.

3.3.2 Direction of Land Use by Zoning

A macro land use zoning is presented in Fig. 3.3.1 so as to show the future desirable direction of the land use and the management practice in the study area. Direction of the future land use by zoning is described below.

(1) Forest Area

The forest area mainly distributes at the altitude of higher than 500 meters contour line and the topographical condition is relatively steep slope mountain areas. The lowland area below 500 meters contour line is basically used as a cultivation land and the lowland forest can be seen at spot by spot like a patchwork. The main land use or economic activities in this zone should be focused on the timber production and the reforestation based on a proper management. The recreational use is also possible. The forest area for high quality water resources should be conserved. Erosion potential of the surface soils in the upstream area is higher than that of the low gradient area if the existing vegetation cover is taken off. Therefore, the forest area should be used and managed in a well organized manners as not to cause severe environmental impacts in the downstream area.

(2) Agriculture Area

Distribution of the agricultural land area is limited around the elevation of 250 meters. Above this up to 500 meters, a fruit tree area and a grass land area become dominant. The future land use will be also the agriculture in this area and a spatial extension of the cultivation is not be expected due to the maximum use of its potential land resource in the region. Erosion control practice in the steeper area like the foot slope area of mountains where the land is used as a fruit tree area or a grass land should be promoted. These fertile agricultural land areas are considered as a precious resource for Bulgaria and should be treated carefully.

(3) Urban Area

Urbanization will take place in a rather higher speed in the existing urban center. The existing relatively large size urban centers such as Plovdiv, Stara Zagora, Haskovo, Dimitrovgrad and Pazardjik will still continue their function as local urban centers. Especially the growth potential of those urban centers located close to the Highway No. E 80 connecting to Sofia and Istanbul in the near future will be much higher due to the excellent accessibility to the main traffic line both road and railway. These areas have a possibility to conform so called economical corridor from a long-term point of view.

In the zoning map, a potential urbanization area is set by means of a creation of specific buffer area to each existing urban centers. For those large cities like Plovdiv and Stara Zagora which have more than 100 thousand population, a 1.5 km buffer zone from the outer edge of the existing urbanized area has created to show the potential urbanization area. Based on the same procedure, a 1 km buffer zone for the urban center having 50 to 100 thousand population and a 0.5 km buffer zone for the urban center under 50 thousand population are created respectively. According to the final zoning map, a total urban area is calculated at 1,289 km^2. This figure means that totally 340 km^2 area will increase as urbanized areas compared to the existing urban area.

A land use planning for main regional urban center should be prepared based on the regional development framework. Location of necessary urban facilities, new housing areas, public facility spaces, road networks, commercial centers, industrial areas and so on should be planned based on the environmental consideration. Industry development especially for pollution generative type should be integrated into a specific site so called an industrial estate where the basic infrastructures are totally prepared.

(4) Conservation Area

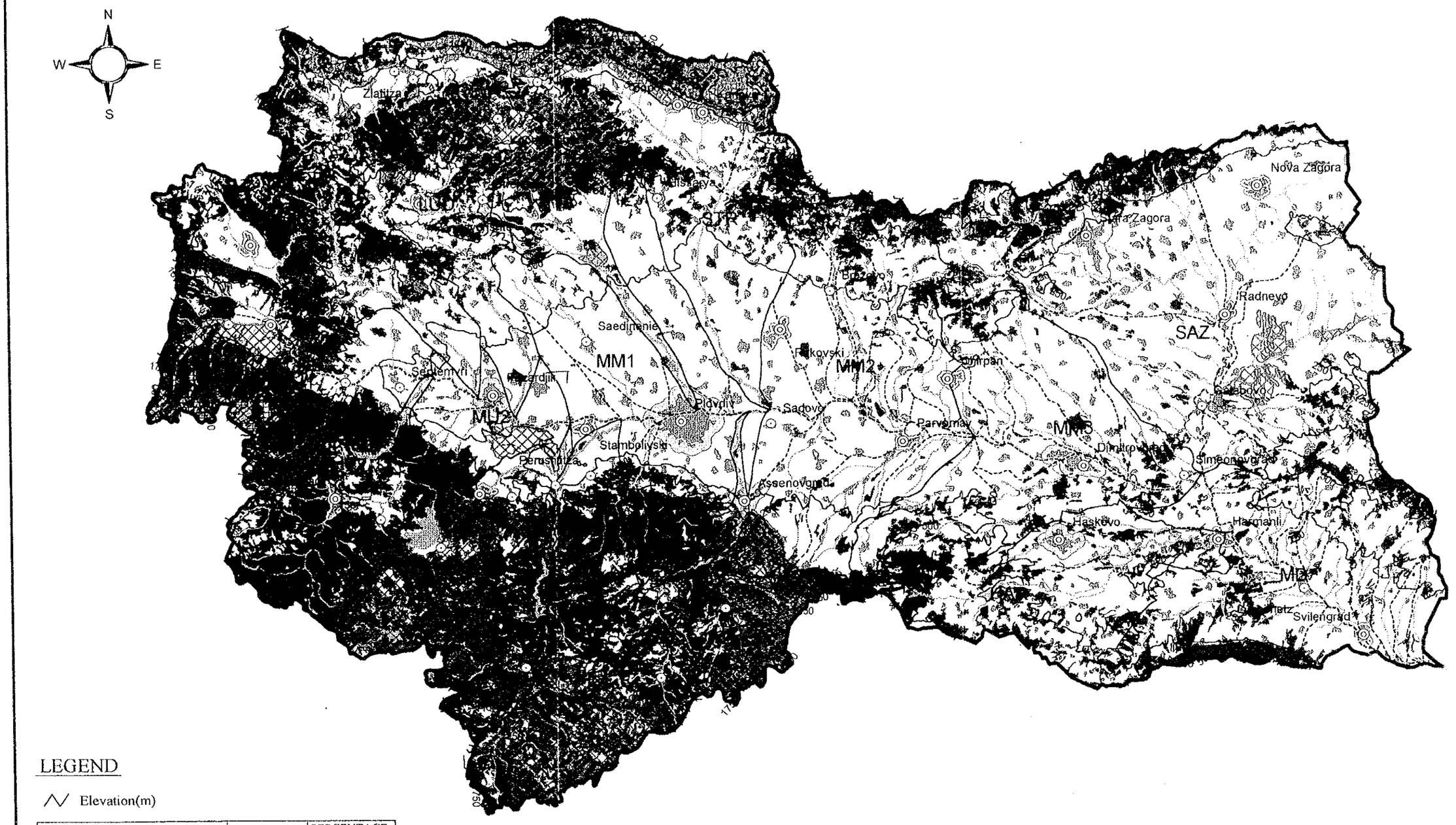
The conservation area is identified by the overlay of the elevation, erosion potential, existing land use and vegetation maps. A steep slope area is a higher potential area for geological hazard like land slide, land collapse or soil surface erosion. The existing forest cover and specific type of vegetation, especially the native groups such as boreal coniferous forest or beech trees, should have a higher conservation value. Forests of the mountainous areas also have a higher value for conservation to conserve water resources. A zoning of the conservation area will be mapped based on these concepts. Land use activities in the conservation area should be conservative so as not to change the existing environment largely.

(5) National Park

Parks and protection areas are designated by the MoEW and mapped. According to these data, a totally 638.3 km^2 area is designated as strictly reserved areas, national parks, natural monuments, protected sites and historical sites. In this study area, two major Bulgarian national parks are partly located, those are the Central Balkan national park and the Rila national park. Economical activities are basically prohibited in these areas except the sustainable activity for local residents. In addition to these existing parks and protection areas, new protected areas are proposed to extend and increase park areas. These existing and proposed parks and protection areas are indicated in the land use zoning map in Fig. 3.3.1.

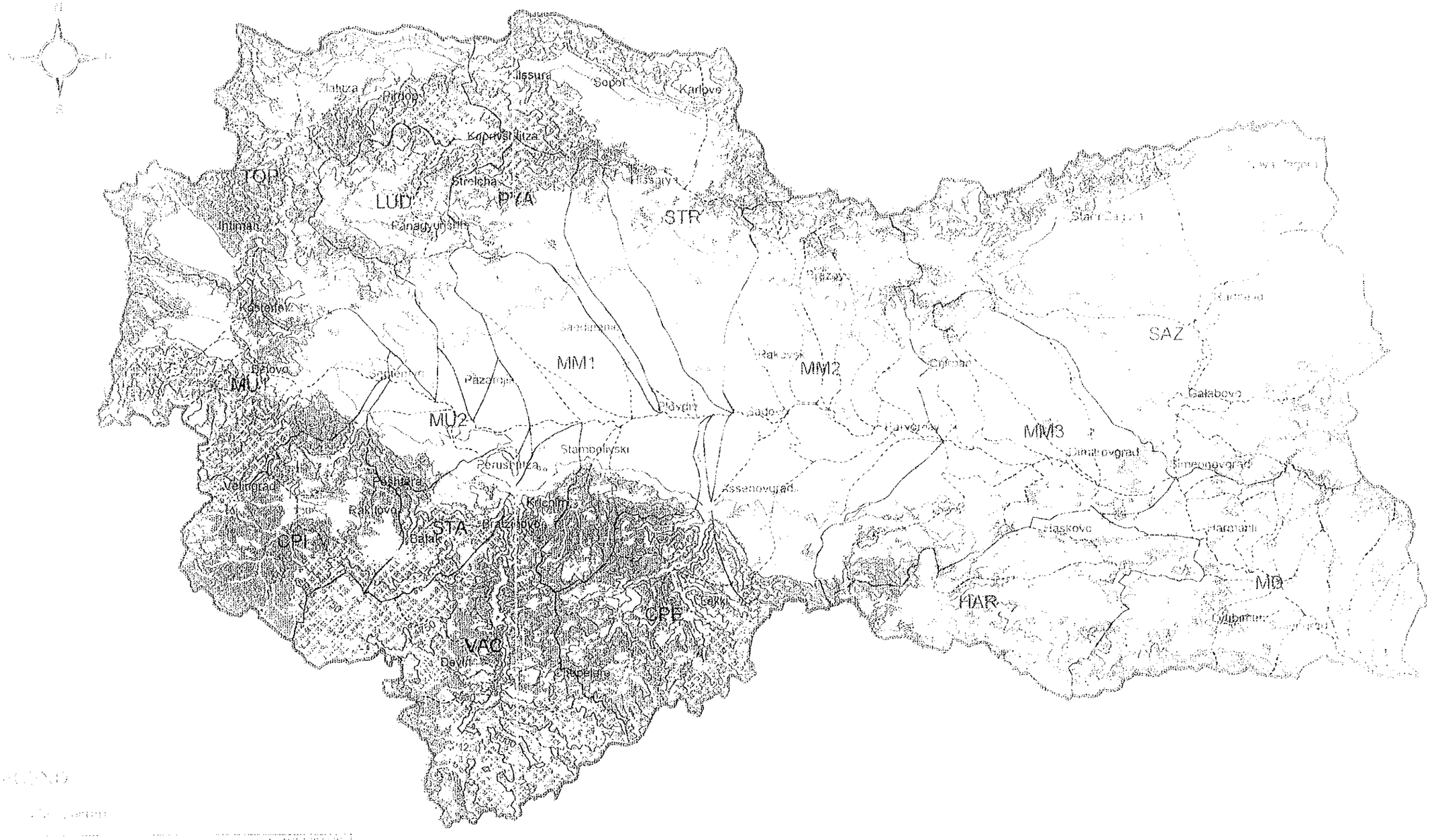
3.3.3 Environmental Sensitive Area

The environmental sensitive area are composed of the steep slope area with more than 15 degree (approximately 30 %), mining sites, soil contaminated areas, conservation areas and national parks. The irrigated and non-irrigated agricultural lands which have relatively higher potential as pollution sources by the chemical fertilizers or pesticides use are also to be considered as a part of environmental sensitive area.



ZONING TYPE	AREA (km²)	PERCENTAGE (%)
Forest Area	6937	32.6
Agricultural Area	12825	60.3
Urban Area	1289	6.0
Conservation Area	3114	14.8
National Park	421	2.0

FIG. 3.3.1 LANDUSE ZONING MAP



LEGEND

Land Use Zone

ZONING TYPE	AREA (Km²)	PERCENTAGE (%)
Urban Area	6937	32.6
Agricultural Area	12825	60.3
Flood Area	1289	6.0
Conservation Area	3114	14.8
Natural Park	421	2.0

Scale 1:700000

10 0 10 20 (km)

FIG. 3.3.1 LANDUSE ZONING MAP