3.11
INITIAL ENVIRONMENTAL EXAMINATION

3.11 Initial Environmental Examination

3.11.1 Introduction

An Initial Environmental Examination (IEE) which is carried out at the outset of the development project planning stage and includes SCREENING and SCOPING of the environmental impacts that may result from each particular project. It is based on easily accessible existing information and data, and incorporates comments and judgements of specialists who are familiar with the environmental impacts of past similar projects. The objectives of IEE are twofold:

1) to evaluate by Screening whether EIA is necessary for the project and, if so, by Scoping, to define its contents;

2) to examine, from an environmental standpoint, the measures for alleviating the adverse environmental effects of the project which require consideration without a full scale Environmental Impact Assessment.

3.11.2 EIA Requirements under Bulgarian Legislation

The Environmental Protection Act (EPA)1997, approved by the Bulgarian Parliament in December 1997, requires *inter alia* that all significant new developments or activities listed in an annex to Article 20 shall be subject to Assessment of the Impact Factor on the Environment (AIFE). AIFE is also required if any of these developments or activities are expanded and/or reconstructed. The Act also states that the appropriate Municipal Authorities shall assess the impact on the environment of projects, facilities and activities which are not subject to obligatory AIFE, following an order determined by a regulation of the Minister of Environment and Water. It is clear from the Annex to this Act that all the proposed sewerage & sewage treatment schemes will require full AIFE (=EIA) under this Act.

Article 21(1) (Amended SG No. 85/1997) of the EPA states that the assessment (AIFE) shall be assigned by the investor or initiator of the project or activity to *independent*

experts who:

1) are professionally competent and are licensed in compliance with a regulation issued by the Minister of Environment and Water.

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.

It follows that the IEE and EIA procedures which are carried out under the guidelines of JICA, while valuable to JICA, will in no way obviate the need for full AIFEs to be carried out in due course by independent experts under Bulgarian law. It is important to note here that JICA specifically recommends, in its guidelines, that the host country's EIA guidelines should be investigated and, in particular, whether the project will be subject to IEE/EIA in that country. It then states that "if the country's guidelines are sufficient *follow their guidelines*".

In view of this recommendation and the requirements under Bulgarian law, it would seem that to carry out a full EIA as part of the Study.

It is worth noting here that each of the large number of small sewerage projects in towns and villages etc will probably require assessment of their environmental impact by the municipal authorities.

3.11.3 Preliminary Environmental Survey for Maritza Sewerage Project

Of the 36 towns the Study team have selected three towns for F/S. The towns which have been selected are Pazardjik, Dimitrovgrad and Stara Zagora. Preliminary project and site descriptions for these towns as required by the JICA Guidelines are provided.

(1) Basic Data for Sewerage Projects

A summary of selected data (population, average flow, average BOD5/day, sewage flow per capita/day and BOD/capita) is shown in Table 3.11.1.

(2) Project Descriptions and Site Descriptions

Project descriptions and site description for each of the selected towns are summarized in Tables 3.11. 2 – 4.

(3) Screening - General Approach

As noted in JICA's 1988 Report, "Sector Study for Development Assistance-Environment", screening is *a process of judgement on whether a development project requires an environmental impact study or not.* In other words, screening is the first judgement in the process of environmental consideration and should commence at the initial stage of the project.

Screening in the guidelines is also based on the above definition, but the evaluation of whether or not the IEE/EIA is required for a project should be based on appropriate ideas and views for harmonizing the sustainable development with the residents livelihood and surrounding environment by taking into consideration the project's features and its environment but not on the quantitative standards.

The screening method used here is based on provisions contained in the annex to the 1985 OECD council recommendations and the 1988 JICA report quoted above and examines the following cross-sectional viewpoints:

- Can the project adversely affect the sustainability of production, which depends mainly on natural resources?
- Will the project significantly affect people's health?
- Will the project lead to a deterioration or loss of valuable living resources and their habitats?
- Will the project have an unreasonable impact on the livelihoods and subsistence of the people concerned?

(4) Screening - Sewerage

The preliminary survey should be based on the following concepts:

- The development project should be planned in such a way as to provide society with sufficient benefits while securing the area's sustainable development and growth without being detrimental to the lives and existence of the residents.
- The development project should be planned in such a way as to maintain harmony with the natural environment and to preserve natural environmental assets.

The JICA approach examines 23* environmental items in the light of the above concepts and determines *for each item* whether or not the environmental impact is sufficient to require an IEE and/or EIA.

*(*NOTE: only 22 items are listed here because there is no coastal zone in the Maritza Basin within Bulgaria.)*

A tentative desk study has been attempted and the results for each of the 3 proposed sewerage schemes is shown in Tables 3.11.5 - 7, based on past experience. The results will need careful revision through site visits and discussions with municipal officials, representatives of pressure groups and local individuals.

(5) Evaluation - General Approach

In carrying out the screening process it is important to compare the pre-existing pollution status and environmental situation *before* commencement with what is anticipated after completion of the projected sewerage system and treatment works. It should not be necessary to point out, for example, that it is generally accepted today that properly designed and efficient waste disposal systems are regarded as essential for public health, for amenity and aesthetic reasons and for protection of the environment.

The results of the Study show that the existing municipal sewerage systems are generally seriously inadequate in extent and carrying capacity, that they tend to leak and overflow

after rainfall, but may carry a lot of infiltration water during dry weather. This situation is made worse by the ingress of solid matter, which further reduces the carrying capacity. The result is that polluting overflows to rivers are common and that sewage can be deposited in the streets with resultant foul odors and risks to health. Only three towns have working treatment plants, but these are either overloaded or badly maintained or both so that the effluents are grossly polluting to the Maritza river or its tributaries.

It could be argued, in the light of this situation, that in virtually every respect the projects - to extend and improve the sewers and to build (or complete existing) wastewater treatment plants to meet the standards of the EC Urban Wastewater Treatment Directive - will benefit the environment and the health of the citizens and therefore carrying out any kind of environmental impact assessment is a waste of time and money.

However, our view is that such an attitude would be a serious mistake and could lead to unforeseen problems in the future whose remedy could result in unnecessary public expenditure.

Thus, while it is undoubtedly the case that a complete sewerage and treatment system will benefit the community as a whole. It is nevertheless important to look rigorously at each of its component parts to ensure that environmental benefits are fully realized or, at least that any potentially harmful effects of these schemes are recognized at the outset and minimized. In order to emphasize this point it is proposed to look at a number of theoretical examples from the 22 items specified in the JICA screening guidelines.

- *Resettlement:*

  The location of a Wastewater Treatment Works requires careful consideration since few people like to live in its vicinity fearing foul odors, fly problems and possibly health risks. If no suitable site exists then it may be desirable to include the cost of moving some residents if the numbers are small - a question for cost/benefit analysis. However, a well run modern plant should present far fewer problems than in the past and there are growing numbers of works situated in the heart of communities without problems.

- *Traffic, noise & vibration:*

  Traffic and civil engineering work in the construction phase can give rise to serious noise, vibration and air pollution problems if close to residential areas and hospitals etc. Also, after completion the transport of large quantities of sludge to a disposal site can give continuing environmental problems, which need to be addressed and minimized.

- *Water rights/common rights:*

  Where the existing systems are already causing pollution and smell the improvements to sewers and treatment works will almost always improve the environment. However, care needs to be taken with these and specially with new systems to ensure that water sources, groundwater and public health are adequately protected.

- *Hazards (risk):*

  Construction sites for sewers and treatment works do provide potential hazards to the workmen involved and more importantly to children who can fall from scaffolding or into manholes or into settlement tanks where drowning is a risk. After completion treatment works and sludge disposal areas are a hazard to children unless adequate measure are taken to prevent entry.

- *Groundwater:*

  Where groundwater pollution exists at present (e.g. from leaking sewers or the discharge of untreated effluents) there should be an improvement in groundwater quality. However care will be needed to protect groundwater (which may be water sources) where new sewers are laid and where sludge disposal sites are established.

- *Fauna and flora;*

  In general a new treatment plant meeting new standards will benefit the aquatic fauna and flora. However, care is needed to protect sensitive areas such as wetlands and nature reserves, which may justify higher standards of water quality.

- *Landscape:*

  Wastewater treatment plants are not often designed to be attractive to look at but this is an area, which merits close attention depending on the works location. Much can be done with sympathetic landscaping and planting of shrubs and trees. There is no theoretical reason why a sewage works cannot be made a showplace for visitors.

- *Water pollution:*

  This is an area in which the projects should have the maximum benefit to the environment. The only likelihood of a problem would be if a new effluent discharge was made to a hitherto unpolluted and/or sensitive water body. However, the EC Directive requires that phosphorus and nitrogen may have to be controlled in such circumstances.

The *evaluation of screening* will need to be carried out in consultation with local representatives for each environmental item using the JICA screening format. For each item it must be decided whether an environmental impact is expected (indicated by Y = Yes) or whether no impact is likely (indicated by N = No). Finally an overall evaluation should be indicated at the foot of the table. Tables 3.11.5 – 3.11.7 show the results of a preliminary desk study which has been done without site visits or consultation for illustrative purposes only. It will be seen that our view is that very few aspects of these proposals are likely to have any adverse environmental impact - indeed the reverse is much more likely. For each item brief comments have been made on which the tentative evaluation is based. The full survey to be carried out in the next stage should enable more detailed comments to be made and, of course, may result in a different evaluation.

(6) Scoping

The JICA Guidelines discuss several available methods for scoping such as the checklist method, the matrix method, the overlay method and the network method, the checklist and the network methods being the most commonly used by most agencies.

The Guidelines state that "for identification of the critical environmental impacts out of the possible impacts of a development project" as required by the definition of scoping in the

"Sector Study for Development Assistance-Environment", it is necessary to include *all* environmental items which can be predicted to arise along with implementation of the project. To accomplish this, the check list method seems the easiest to understand and the most useful.

Based on the JICA Checklist for Scoping tentative evaluations for each proposed project are illustrated in Tables 3.11.8 - 10. In carrying out the scoping procedure the following conditions and procedures should be taken into account:

1) Application conditions

i) Scoping should cover both construction and operation periods.
ii) Scoping should cover the project site and its vicinities and the related water area.
iii) Environmental impacts subject to scoping are those having negative impacts on the existing environment.

2) Evaluation method

The evaluation of each item should be rated in the following categories:

A: Serious impact is expected,
B: Some impact is expected,
C: Extent of impact is unknown but further examination is required, because it may become clear as the study progresses,
D: No impact is foreseeable and IEE/EIA is not required.

At this stage important fields and items for IEE/EIA should be identified with reference to "possible environmental impacts," "useful factors for evaluation," "measures," and "related subjects for study".

TABLE 3.11.1 SUMMARY OF BASIC DATA FOR PROPOSED SEWERAGE AND TREATMENT WORKS

TOWN	POPn	PE	Qm3/day	BODkg/d
Pazardjik	80,921	97,000	29,400	5,240
Dimitrovgrad	50,977	61,000	18,800	3,300
Stara Zagora	149,666	165,000	49,400	8,890

TABLE 3.11.2 PROJECT DESCRIPTION (SEWERAGE): PAZARDJIK

ITEM	DESCRIPTION
Project name	*Pazardjik*
Background	*JICA Study on Integrated Environmental Management for the Maritza River Basin*
Objectives	*Extension of existing sewerage system & completion of treatment plant*
Location	*Sewerage within town/ treatment plant 2.5km East of town*
Executing Agency	*Not yet Known*
Beneficiaries	*Resident population, industries and river environmen*
Type of project	*Construction of sewers,collectors, primary & secondary treatment plant*
Project site	*Area ha. PE:97,000 Sewage vol: 29,400 m3/day*
Sewer system	*Combined system (?)*
Treatment plant	*Method Capacity m3/day*
Sludge disposal method	*Method & site to be decided*
Channel length etc	*Open/culvert length km*
Pumping stations	*Places*
Outlet	*Treated effluent(now untreated to Maritza) to go to Luda Yena (tributary)*
Drainage quality	
Other aspects	

TABLE 3.11.3 PROJECT DESCRIPTION (SEWERAGE): DIMITROVGRAD

ITEM	DESCRIPTION
Project name	*Dimitrovgrad*
Background	*JICA Study on Integrated Environmental Management for the Maritza River basin*
Objectives	*Completion of sewerage system and treatment works*
Location	*Sewerage and treatment plant within town*
Executing Agency	*Not yet Known*
Beneficiaries	*Resident population, industries and river environmen*
Type of project	*Extension of sewerage system and completion of treatment works*
Project site	*Area ha. PE:61,000 Sewage vol: 18,800 m3/day*
Sewer system	*Combined system (?)*
Treatment plant	*Primary + secondary treatment*
Sludge disposal method	
Channel length etc	
Pumping stations	
Outlet	*New works effluent to Maritza (replacing 7 existing untreated discharges*
Drainage quality	
Other aspects	

TABLE 3.11.4 PROJECT DESCRIPTION (SEWERAGE): STARA ZAGORA

ITEM	DESCRIPTION
Project name	*Stara Zagora*
Background	*JICA Study on Integrated Environmental Management for the Maritza river basin*
Objectives	*Construction of treatment works + some extensions to sewerage system*
Location	
Executing Agency	*Not yet Known*
Beneficiaries	*Resident population, industries and river environmen*
Type of project	*Civil engineering construction work*
Project site	*Area ha. PE:165,000 Sewage vol: 49,400 m3/day*
Sewer system	*Combined system (?)*
Treatment plant	*Primary+secondary treatment*
Sludge disposal method	
Channel length etc	
Pumping stations	
Outlet	*Present discharge(untreated) to Sasliyka tributary (gully)*
Drainage quality	
Other aspects	

TABLE 3.11.5 PAZARDJIK : JICA IEE SCREENING

IEE: FORMAT FOR SCREENING		
	Description	Evaluation
SOCIAL ENVIRONMENT		
Resettlement	*Most unlikely that any inhabitants will be displaced*	N
Economic activities	*No likely adverse effects*	N
Traffic & public facilities	*Only temporary disturbance during construction*	N
Split of communities	*Most unlikely*	N
Cultural Property	*Unlikely adverse effects on any property*	N
Water rights/Common rights	*No adverse effects on fishing,water or common rights*	N
Public health conditions	*Averse effects unlikely (should be improved)*	N
Waste problems	*Possible problems during construction+ sludge*	Y
Hazards (risk)	*If care taken, should be no increase in risk*	N
NATURAL ENVIRONMENT		
Topography & Geology	*No effect on topography*	N
Soil Erosion	*Proper management of site work should avoid risk*	N
Groundwater	*Infiltration and/or leachate problems require care*	N
Hydrological Situation	*No adverse effects*	N
Fauna & Flora	*Aquatic flora & fauna should benefit*	N
Metereology	*Should not affect micro-climate*	N
Landscape	*Adverse effects avoidable by good planning*	N
POLLUTION		
Air Pollution	*Possible local problem during construction*	N
Water Pollution	*Project should greatly benefit water quality of river*	N
Soil contamination	*No serious effects*	N
Noise and vibration	*Some problems during construction*	Y
Subsidence	*Should not affect water table;unlikely risk*	N
Offensive odour	*Should greatly improve present situation*	N
Overall Evaluation - is there a likelihood of environmental impact?		N

TABLE 3.11.6 DIMITROVGRAD : JICA IEE SCREENING

IEE: FORMAT FOR SCREENING		
	Description	Evaluation
SOCIAL ENVIRONMENT		
Resettlement	*Not envisaged*	N
Economic activities	*Adverse effects unlikely*	N
Traffic & public facilities	*Temporary disturbance during construction*	N
Split of communities	*Not likely*	N
Cultural Property	*Should have no adverse effects*	N
Water rights/Common rights	*No adverse effects on fishery,water or common rights*	N
Public health conditions	*Shoul result in improvement on current situation*	N
Waste problems	*Possible problems during construction + sludge*	Y
Hazards (risk)	*If proper care taken no increase in risk*	N
NATURAL ENVIRONMENT		
Topography & Geology	*No effects*	N
Soil Erosion	*Proper management os site work should avoid risk*	N
Groundwater	*Infiltration or leachate problems will require care*	N
Hydrological Situation	*No adverse effects*	N
Fauna & Flora	*Aquatic flora and fauna should benefit*	N
Metereology	*No measurable impact*	N
Landscape	*Any adverse effects avoidable with good planning*	N
POLLUTION		
Air Pollution	*Some increase (EG From vehicles) during construction*	N
Water Pollution	*Project should greatly benefit river*	N
Soil contamination	*Care in constructiuon/ezcavation to avoid problems*	N
Noise and vibration	*Local increase during construction*	Y
Subsidence	*Very unlikely*	
Offensive odour	*Should improve on present situation*	N
Overall Evaluation - is there a likelihood of environmental impact?		N

TABLE 3.11.7 STARA ZAGORA : JICA IEE SCREENING

IEE: FORMAT FOR SCREENING		
	Description	Evaluation
SOCIAL ENVIRONMENT		
Resettlement	*Unlikely (depending on site for new treatment works*	N
Economic activities	*Adverse effects unlikely*	N
Traffic & public facilities	*Temporary disturbance during construction*	N
Split of communities	*Not likely*	N
Cultural Property	*Should have no adverse effects*	N
Water rights/Common rights	*No adverse effects on fishery,water or common rights*	N
Public health conditions	*Should result in improvement on current situation*	N
Waste problems	*Possible problems during construction + sludge*	Y
Hazards (risk)	*If proper care taken no increase in risk*	N
NATURAL ENVIRONMENT		
Topography & Geology	*Effects unlikely depending on new works site*	N
Soil Erosion	*Proper management os site work should avoid risk*	N
Groundwater	*Infiltration or leachate problems will require care*	N
Hydrological Situation	*Adverse effects unlikely*	N
Fauna & Flora	*Aquatic flora and fauna should benefit*	N
Metereology	*No measurable impact*	N
Landscape	*Any adverse effects avoidable with good planning*	N
POLLUTION		
Air Pollution	*Some increase (EG From vehicles) during construction*	N
Water Pollution	*Project should greatly benefit river*	N
Soil contamination	*Care in constructiuon/ezcavation to avoid problems*	N
Noise and vibration	*Local increase during construction*	Y
Subsidence	*Very unlikely*	N
Offensive odour	*Should improve on present situation*	N
Overall Evaluation - is there a likelihood of environmental impact?		N

TABLE 3.11.8 JICA CHECKLIST FOR SCOPING (SEWERAGE) :PAZARDJIK

No.	Environmental item	Evaluation	Reason
SOCIAL ENVIRONMENT			
1	Resettlement	C	*Location,size,type of sludge disposal site not yet known*
2	Economic activity	D	*Should not affect econmic activity*
3	Traffic/public facilities	C	*Extent of impact during & after construction not known*
4	Split of communities	C	*Sludge disposal arrangements not yet known*
5	Cultural property	D	*Impact extreme,y unlikely*
6	Water/common rights	C	*Further study needed concerning common rights*
7	Public health conditions	D	*Project should have benefits for public health*
8	Waste problems	C	*Sludge treatment & disposal site not known*
9	Hazards (risk)	C	*Further study needed on safety aspects*
NATURAL ENVIRONMENT			
10	Topography/Geology	D	*Should have no significant impact*
11	Soil erosion	D	*Any impact very unlikely*
12	Groundwater	C	*Study needed of possible leachate?infiltration problems*
13	Hydrological situation	D	*No impact envisaged*
14	Fauna & Flora	C	*Further study desirable*
15	Metereology	D	*No impact*
16	Landscape	C	*Some risk of problem*
POLLUTION			
17	Air pollution	C	*Examination of sludge disposal arrangements needed*
18	Water pollution	C	*Study of measures to preventaccidental discharges needed*
19	Soil contamination	C	*Study of sludge disposal arrangements needed*
20	Noise and vibration	B	*Impact during construction needs study*
21	Subsidence	D	*Very unlikely*
22	Offensive odour		

Evaluation categories

A: Serious impact is expected. B:Some impact is expected.

C: Extent of impact unknown (Further examination needed)

D: No impact expected (IEE/EIA not required)

TABLE 3.11.9 JICA CHECKLIST FOR SCOPING (SEWERAGE) : DIMITROVGRAD

No.	Environmental item	Evaluation	Reason
SOCIAL ENVIRONMENT			
1	Resettlement	C	*Location,size,type of sludge disposal site not yet known*
2	Economic activity	D	*Should not affect economic activity*
3	Traffic/public facilities	C	*Extent of impact during & after construction not known*
4	Split of communities	C	*Sludge disposal arrangements not yet known*
5	Cultural property	D	*Impact extreme,y unlikely*
6	Water/common rights	C	*Further study needed concerning common rights*
7	Public health conditions	D	*Project should have benefits for public health*
8	Waste problems	C	*Sludge treatment & disposal site not known*
9	Hazards (risk)	C	*Further study needed on safety aspects*
NATURAL ENVIRONMENT			
10	Topography/Geology	D	*Should have no significant impact*
11	Soil erosion	D	*Any impact very unlikely*
12	Groundwater	C	*Study needed of possible leachate?infiltration problems*
13	Hydrological situation	D	*No impact envisaged*
14	Fauna & Flora	C	*Further study desirable*
15	Metereology	D	*No impact*
16	Landscape	C	*Some risk of problem*
POLLUTION			
17	Air pollution	C	*Examination of sludge disposal arrangements needed*
18	Water pollution	C	*Study of measure to prevent accidental discharges needed*
19	Soil contamination	C	*Study of sludge disposal arrangements needed*
20	Noise and vibration	B	*Impact during construction needs study*
21	Subsidence	D	*Very unlikely*
22	Offensive odour	B	*Some impact but further study needed*

Evaluation categories

A: Serious impact is expected. B:Some impact is expected.

C: Extent of impact unknown (Further examination needed)

D: No impact expected (IEE/EIA not required)

TABLE 3.11.10 JICA CHECKLIST FOR SCOPING (SEWERAGE) : STARA ZAGORA

No.	Environmental item	Evaluation	Reason
SOCIAL ENVIRONMENT			
1	Resettlement	C	*Sites for treatment works/sludge disposal not known*
2	Economic activity	D	*Should not affect economic activity*
3	Traffic/public facilities	C	*Extent of impact during & after construction not known*
4	Split of communities	C	*Sites for treatment works & sludge disposal not known*
5	Cultural property	D	*Impact extremely unlikely*
6	Water/common rights	C	*Further study needed concerning common rights*
7	Public health conditions	D	*Project should have benefits for public health*
8	Waste problems	C	*Sludge treatment & disposal site not known*
9	Hazards (risk)	C	*Further study needed on safety aspects*
NATURAL ENVIRONMENT			
10	Topography/Geology	D	*Should have no significant impact*
11	Soil erosion	D	*Any impact very unlikely*
12	Groundwater	C	*Study needed of possible leachate?infiltration problems*
13	Hydrological situation	D	*No impact envisaged*
14	Fauna & Flora	C	*Further study desirable*
15	Metereology	D	*No impact*
16	Landscape	C	*Some risk of problem with new treatment works*
POLLUTION			
17	Air pollution	C	*Examination of sludge disposal arrangements needed*
18	Water pollution	C	*Study of measure to prevent accidental discharges needed*
19	Soil contamination	C	*Study of sludge disposal arrangements needed*
20	Noise and vibration	B	*Impact during construction needs study*
21	Subsidence	D	*Very unlikely*
22	Offensive odour	B	*Some impact at treatment wks & sludge site needs study*

Evaluation categories

A: Serious impact is expected. B:Some impact is expected.

C: Extent of impact unknown (Further examination needed)

D: No impact expected (IEE/EIA not required)

3.12
ECONOMIC AND FINANCIAL EVALUATION

3.12 Economic and Financial Evaluation

3.12.1 Background

This section presents economic and financial evaluation for the proposed master plan. Two conditions need to be satisfied in the project evaluation. First, any environmental project should be checked for viability from the national economy point of view. Second, any project should be examined if its financial and social costs would be within affordable and acceptable limits.

3.12.2 Conceptual and Analytical Frameworks

(1) Objectives of Improving Environmental Quality

The objective of improving environmental quality in general is to attain such a level of environmental quality that is sustainable, while supporting various socio-economic activities by human beings at the maximum level possible under such conditions. It is not to realize the cleanest environment nor to restore the pristine natural environment.

Most, if not all, of the human activities involve some pollution or loads to the environment to different degrees. In maximizing the level of various socio-economic activities, the environmental quality would be degraded to such an extent that those human activities could not be sustained. Human activities may be maximized only to the level that would maintain the environmental quality at a sustainable level. The sustainability is the key in both ways in defining the appropriate level of environmental quality. The objective of improving environmental quality, expressed conversely, is to attain the optimum level of pollution from the viewpoint of human beings at present and in the future.

The environment is not static, but rather represents a dynamic state of various elements incessantly interacting one another. Also the environment, however broadly it may be

defined, is subject to external forces. For the environment to be sustainable any constituent elements should not become excessively dominant over others nor should they be dominantly affected by any external forces or stress.

To be sustainable, the environment should be sufficiently robust with strong internal structure, resilient to changes caused by internal or external factors, and not vulnerable to external forces. Such conditions can be ensured only by a certain degree of bio-diversity. Thus, the objective of improving environmental quality is to attain an appropriate degree of bio-diversity.

The environment, if narrowly defined to treat human activities as external, should have sufficient bio-diversity to ensure that it would be robust, resilient and non-vulnerable to changes caused directly or indirectly by human activities. The environment, if broadly defined with human activities, should be sufficiently robust, resilient and non-vulnerable to maintain the bio-diversity that would allow the maximum level of human activities.

(2) Benefits of Improving Environmental Quality

As clarified above, the key in defining the appropriate level of environmental quality is sustainability in two ways: sustainability of environment under the stress of human activities, and sustainability of human activities under given environmental conditions or the degree of bio-diversity. Accordingly, the benefit of improving environmental quality may be defined with respect either to incremental level of human activities that may be supported by the improved environmental quality or to the bio-diversity of the environment itself. The former is measurable at least conceptually, while the latter generally is not.

Measurable benefits of improving water-related environmental quality consist of the following.

1) Increase in regional income derived from:

i) Agriculture due to

- improved land use and management,
- increased availability of productive land, and
- increased availability of water

ii) Other production activities due to

- increased availability of land, and
- increased availability of water,

iii) Recreational and related activities due to

- improved landscape and amenity, and
- higher bio-diversity:

2) Lower social costs for medical and related services due to reduced incidence of water-borne diseases and other health hazards as a result of improved ambient water quality, better availability of drinking water, and rehabilitation of polluted land; and

3) Saving in water treatment costs in downstream areas resulting from improved ambient water quality.

Regional income benefits are more directly measurable. Benefits of lower social costs for medical and related services may also be measurable as savings in medical and hygienic costs. Alternatively, they may also be measured indirectly by increase in regional income, as they would allow more resources, including financial resources and time, to be devoted to other productive activities.

(3) Evaluation Methods for the Master Plan

Based on the perception clarified in the previous subsection and within the frameworks established above, the Master Plan for the integrated environmental management of the Maritza river basin is evaluated in two ways: 1) Evaluation from the national economy point of view and 2) Evaluation of affordability from households and municipality points of view. The evaluation from the national economy point of view assesses the total investment for the Master Plan projects over the planning period up to the year 2015 in the light of public investments that are expected and likely to be devoted to water and wastewater works.

Affordability from households point of view is evaluated by using the results of the survey conducted by the JICA Study Team and other national statistics. This involves estimating the unit value of water for consumers, as the value of improved water quality is measured as increased availability (quantity) of better quality water.

Some kind of user charges need to be introduced to ensure the financial viability of the projects from the municipality point of view. To determine an appropriate level of the user charges, the willingness –to pay by family for improved water quality is estimated. Also, financial conditions of the municipalities are examined to see if initial investment costs would not be excessive loads.

3.12.3 Evaluation from the National Economy Point of View

(1) Public Investments in the Past

Public investments in Bulgaria in the recent past are analyzed by the national statistics. The fixed capital expenditure by the public sector has been decreasing in real terms since 1992. Its proportion to the GDP was at its peak with 20.3 percent in 1992. It has declined since then, largely compensated by increase in private investments to maintain the total at more or less 15 percent of the GDP in recent years

Fixed Capital Expenditure in Bulgaria and Its Proportion to GDP

(Unit: Lev. x 10^6; ratio to GDP in parenthesis)

	1990	1991	1992	1993	1994	1995	1996
Fixed Capital expenditure	9, 793	24, 778 (15. 9)	43, 627 (20. 7)	43, 547 (14. 2)	84, 208 (15. 7)	125, 876 (14. 3)	268, 207 (15. 3)
Public	9, 440	24, 193 (15. 5)	42, 695 (20. 3)	33, 630 (11. 0)	51, 330 (9. 6)	69, 928 (7. 9)	164, 876 (9. 4)
Private	359	635	928	9, 642	32, 517	55, 948	103, 322
GDP		155,747	210, 320	306, 197	536, 577	880, 322	1,748, 701

Source: Statistical Yearbook 1995, 1997

The fixed capital expenditure by the public sector on environment increased its share in the total fixed capital expenditure from 2.2 percent in 1992 to the peak of 4.4 percent in 1994. The share declined since then. The share of public expenditure on water works also increased to reach 2.6 percent of the total in 1994, and declined since then.

Fixed Capital Expenditure on Environment and Its Share in Public Capital Expenditure

(Unit: Lev. x 10^6; % share in paranthesis)

	1990	1991	1992	1993	1994	1995	1996
Public capital expenditure	9, 440	24, 193	42, 695	33, 630	51, 330	69, 928	164, 876
Capital Expenditure on Environment	245 (2. 6)	672 (2. 8)	956 (2. 2)	1, 191 (3. 5)	2, 233 (4. 4)	2, 158 (3. 1)	4, 640 (2. 8)
Expenditure on water and wastewater	100 (1. 1)	339 (1. 4)	562 (1. 3)	728 (2. 2)	1, 309 (2. 6)	982 (1. 4)	2, 134 (1. 3)

Source: Statistical Yearbook 1995, 1997

(2) Projection of Public Investments

The total public investment may not increase as rapidly as investments by the private sector, as more privatization is implemented. It is expected, however, both public and private investments will increase in real terms, as the Bulgarian economy recovers from the present turmoil. In the Maritza river basin, the GRDP is projected to increase at rates higher than

expected at the national level, according to the socio-economic framework for the basin to the year 2015 (Section 3.2). Both public and private investments are expected to increase more rapidly. In general, the following relationship is observed over some extended period of time:

$$\frac{\text{Ratio of total investment to GRDP (\%)}}{\text{Growth rate of GRDP (\% p. a.)}} = \text{ICOR}$$

Where ICOR is the incremental capital-to output ratio.

According to the socio-economic framework for the Maritza river basin, the GRDP is projected to increase at an average rate of 6.8 percent per annum. Assuming a reasonable ICOR value in the range of 3.5 - 4.0, the ratio of the total investment to the GRDP may be more or less 25 percent. This level of investment is larger than observed at the national level in the recent past, but necessary for the Maritza river basin to attain the projected economic growth. Of this total investment 15 percent may be contributed by the public sector, while remaining 10 percent by the private sector.

The share of public investments on environment in general should increase in the future after attaining stability of the national economy. Especially in the Maritza river basin, the shares of public investments in environment in general and water and wastewater works in particular should increase to the levels higher than attained at the national level in the recent past. It is assumed for the projection purpose, these shares will become 5 percent and 3 percent respectively of the total public investment.

Based on these assumptions, the GRDP, the total fixed capital expenditure, and its allocations to the environment and the water and wastewater works are projected.

Projection of Fixed Capital Expenditure and Investment Requirements for Water and Wastewater Works

(Unit: US$)

Year	GRDP	Stage	Cummulative GRDP	Public capital expenditure			Investment requirements for water and wastewater works
				Total	Environment	Water and Wastewater works	
1995	2, 300						
2000	3, 000						
2001	3, 200						
2002	3, 400						
2003	3, 600	I	18, 100	2, 715	135. 8	81. 5	186.5
2004	3, 800						
2005	4, 100						
2006	4, 400						
2007	4, 800						
2008	5, 200	II	25, 900	3, 885	194. 3	116. 6	56.6
2009	5, 500						
2010	6, 000						
2011	6, 400						
2012	6, 900						
2013	7, 400	III	37, 300	5, 595	279. 8	167. 9	90.8
2014	8, 000						
2015	8, 600						
Total				12, 195	609. 9	366. 0	333.9

Source: JICA Study Team

(3) Evaluation of Master Plan Investments

Investment costs necessary for the Master Plan implementation have been estimated (Section 3.8). The total investment is compare by stage with the projected public fixed capital expenditure. As seen from the table, the total investment cost for water and wastewater works estimated by the Master Plan at US$ 333.9 million is smaller than the projected total public fixed capital expenditure of US$ 366.0 million up to the year 2015. However, the investment requirement for Stage I is much larger than the projected public fund allocation during the stage.

Given the expected recovery and the renewed growth of the Bulgarian economy, the

estimated investments on water and wastewater works in the Maritza river basin may be tolerable over the medium to the long term. Whether larger public investments can be made on water and wastewater works in the Maritza river basin during Stage I depends on the recovery of the Bulgarian economy in the next few years and the national policy on environmental improvement as a prerequisite to sustainable economic growth in the median to the long term.

Public investment requirements during initial stages may be reduced in two ways. One way is to defer the implementation of some priority schemes or adopt stage-wise implementation if technically feasible. The other way is to mobilize more financial resources in the private sector: i.e. to fast track the privatization.

However, there is some flexibility between expenditure between environment and water/wastewater fields. The combined total is US$ 217.3 million for Stage I and US$ 975.9 million up to Year 2015. Therefore, considering the combined public capital expenditure for environment with water/wastewater works, financial viability for the M/P will become higher. Actual implementation for the Stage I projects is necessary to be conducted from the highest priority projects such as WWTPs of Pazardjik, Dimitrovgrad and Stara Zagora as well as strengthening of monitoring systems. It is reasonable to introduce some concessional loans to reinforce the investment to implement the Stage I Projects.

3.12.4 Evaluation of Affordability

(1) Unit Value of Water

As clarified above, the value of improved water quality may be measured on the basis of increased availability (quantity) of better quality water. The unit value of water to consumers is estimated here by two methods: one by using domestic water and the other based on irrigation water.

The JICA Study Team conducted a survey on domestic water use in the Maritza river basin. Results related to water charges are summarized in the following table. The overall average for water charges is calculated to be Lev. 267/m^3. Considering the slightly biased sampling against rural areas having smaller unit water charges, the average water charge in the river basin may be more or less Lev. 250/ m^3.

User Charges for Domestic Water Use according to Sample Survey

Item	Urban areas	Semi-urban areas	Rural areas	River basin
Number of families	110	125	70	305
No. of family members	355	426	267	1,048
Monthly water charge (Lev./family)				
Summer	3,598	4,217	3,537	3,838
Winter	1,538	2,264	1,489	1,824
Unit water charge (Lev./m^3)				
Summer	308	357	250	312
Winter	195	238	160	206

Source: JICA Study Teams survey in 1997.

The water charge in general represents the marginal value of water for consumers. The unit value of water, as the average, is usually much larger than the marginal value: i.e. the value of the last unit of water consumed. The difference is most likely larger than the difference in value between water supplied to consumers and its source of water. Therefore, the established value of Lev. 250/m^3 may represent rather a conservative estimate of the water that can be used as a source of water supply.

Unit value-added of irrigated agriculture has been estimated at Lev. 20,000/ha (in 1995 prices), and that of non- irrigated arable land at Lev. 8,000/ha (Section 3. 2). Therefore, the incremental value-added due to irrigation is Lev. 12,000/ ha. The average irrigation water use is assumed to be 800mm per annum or 8,000 m3/ha. The unit value of irrigation water is thus calculated at Lev. 1.5/m^3 in 1995 prices or Lev. 40/m^3 in 1997 prices.

The calculated value of Lev. 40/m^3 of irrigation water is a legitimate estimate of economic value of water to be used for irrigation, which yields lower returns although lower quality water can be used. In accordance with the system of ambient water quality standards for surface water in Bulgaria, the unit value of first class water may be taken to be Lev. 250m^3, while that of third class water to be Lev. 40/m^3.

(2) Willingness-to-pay for Improved Water Quality

The willingness-to pay for improved water quality is estimated here by two indirect method: one based on domestic water use and the other based on expenditure for hygienic and health purposes. According to the same survey, the domestic water use is some 120 liter/capita/day in summer and 80 liter/capita/day in winter. Differences between urban, semi-urban and rural areas are small. Of the total amount, some 30 liter/capita/day may be used for most basic needs that can not be sacrificed under any conditions. If the water quality of water supply source is degraded excessively, this would be the amount of water used by individuals as water treatment costs and thus water charges would become extremely high. In other words, better water quality would allow individuals to enjoy the use of additional water at 90 liter/capita/day in summer and 50 liter/capita/day in winter.

Consumers use the additional amount of water by paying the water charge as they derive at least that amount of benefit equivalent to the water charge. Actually, however, the unit value of water for consumers is much higher than the water charge as clarified above. The estimated value Lev. 250/m^3 is regarded as a conservative estimate of value of the additional water. The total amount of water used additionally in excess of the basic needs is 21.9/m^3/capita/year. Thus the total value of the additional water use is calculated at Lev. 5,475/capita/year. An average family, therefore, would be willing to pay some Lev. 19,000/year.

According to the national statistics, the average household expenditure on hygiene and health care shared 3.3 – 3.7 percent of the total household expenditure during 1994-1997

with the average share at 3.4 percent. According to the sample survey of the JICA Study Team, majorities of families in urban, semi-urban and rural areas have average annual income in the range of US$ 500-1,000 in 1997. The overall average family income may be US$ 800 or Lev. 1,400,000. Applying the ratio at the national level above, Lev. 49,000 may have been used for hygiene and health care. Prevention and treatment of water-borne diseases constitute a good portion of the total medical bill. Thus this expense may represent the upper bound of the willingness-to-pay for improved water quality.

(3) Affordability

The sample survey shows that affordability for household consumers to pay the water charge is about Lev. 2,400/month or Lev. 29,000/year per family on an average. On the other hand, the willingness-to-pay by family for improved water quality has been estimated indirectly to be in the range of Lev. 19,000 – 49,000/year. This implies that the user charge for water supply and sewerage system may be more or less doubled once a domestic wastewater treatment plant becomes operational.

Subsidies from the National Government to the municipalities were in the range of Lev. 3,500 – 8,000/capita in 1996 and Lev. 30,000 – 65,000/capita in 1997 for most municipalities in the Maritza river basin. Subsidy data of the 1st Stage towns for wastewater treatment plant installation according to the Master Plan are shown in the following table.

Government Subsidies for Municipalities Selected for 1st Stage Implementation of Water and Wastewater Plants

		Government Subsidies			
		1996 (Lev x10^3)		1997 (Lev x10^3)	
Municipality	Population	Total	Per capita(Lev)	Total	Per capita(Lev)
Pazardjik	90 286	713 074	7 898	5 453 725	60 405
Plovdiv	344 336	1 159 054	3 366	10 884 008	31 609
Assenovgrad	52 360	196 199	3 747	1 356 707	25 911
Dimitrovgrad	50 977	232 322	4 557	1 619 347	31 766
Haskovo	80 959	427 704	5 246	4 111 133	50 780
Stara Zagora	149 666	679 238	4 538	5 637 145	37 665
Velingrad + Rakitovo	58 672	375 706	6 403	2 905 801	49 526

Source: Ministry of Finance

The per capita subsidies on an average decreased in real terms from some US$ 35 in 1996 to US$ 25 in 1997. Per capita investment costs of wastewater treatment plants have been estimated by the Master Plan for municipalities in the river basin. They range in US$ 41 – 75 for primary treatment and US$ 86 – 148 for primary and secondary treatment. Thus even the investments for primary and secondary treatment are equivalent to a few years subsidies from the national government except a few municipalities.

While the government subsidies constitute the bulk of revenues for many small municipalities, larger municipalities have much larger local revenues. Therefore, the larger municipalities, responsible for the bulk of wastewater discharges, can afford investments for primary and secondary treatment.

3.13

PROJECT EVALUATION

3.13 Project Evaluation

The structural measures and non-structural measures proposed in the master plan were evaluated. The evaluation was conducted from four aspects: technical, financial, social and environment.

3.13.1 Evaluation of the Structural Measures

(1) Technical Aspects

The proposed structural measures in the master plan are the construction or improvement of 36 municipal wastewater treatment plants with following priority orders:

- 1st Priority : 7 towns (to be implemented in year 2001 to 2005)
- 2nd Priority : 10 towns (to be implemented in year 2006 to 2010)
- 3rd Priority : 19 towns (to be implemented in year 2011 to 2015)

The municipal wastewater treatment plants of 1st Priority Towns are planned to have primary and secondary treatments. The municipal wastewater treatment plants of 2nd Priority Towns and 3rd Priority Towns are planned to have primary treatment only. These 36 municipal wastewater treatment plants are planned for reducing domestic BOD load in the Maritza River Basin. In combination with the municipal wastewater treatment plants, reduction of BOD load from industry and livestock as well as reduction of TN load from industry is planned by regulation.

These wastewater treatment plants in combination with regulation of industrial and livestock effluent will improve BOD concentration of river to be better than class-2 of Bulgarian water quality standard. NH4-N concentration will be improved slightly to be class-3 or above class-3. Therefore, the above structural measures will have sufficient effects on the improvement of BOD concentration in the Maritza River. However, these

measures have not sufficient effects on the improvement of NH4-N concentration.

Additional measures such as treatment of nitrification by municipal wastewater treatment plants and more strict regulation for reducing TN load from industry and livestock might be necessary to be considered in the future. However, these additional measures are necessary to be studied after monitoring the effects of water quality improvement by the structural measures with regulations proposed in the master plan.

(2) Financial Aspects

Financial viability of the investment of Master Plan is evaluated by comparing with the public fixed capital expenditure. The total investment cost for water and wastewater works estimated by the Master Plan at US$ 333.9 million is smaller than the projected total public fixed capital expenditure of water and wastewater works (US$ 366.0 million) up to the year 2015. However, the investment requirement for Stage I (US$ 186.5 million) is much larger than the projected public fund allocation (US$ 81.5) during the stage.

Given the expected recovery and the renewed growth of the Bulgarian economy, the estimated investments on water and wastewater works in the Maritza river basin may be tolerable over the medium to the long term. Whether larger public investments can be made on water and wastewater works in the Maritza river basin during Stage I depends on the recovery of the Bulgarian economy in the next few years and the national policy on environmental improvement as a prerequisite to sustainable economic growth in the median to the long term.

Public investment requirements during initial stages may be reduced in two ways. One way is to defer the implementation of some priority schemes or adopt stage-wise implementation if technically feasible. The other way is to mobilize more financial resources in the private sector: i.e. to fast track the privatization.

However, there is some flexibility between expenditure between environment and water/wastewater fields. The combined total is US$ 217.3 million for Stage I and US$ 975.9 million up to Year 2015. Therefore, considering the combined public capital expenditure for environment with water/wastewater works, financial viability for the M/P will become higher. Actual implementation for the Stage I projects is necessary to be conducted from the highest priority projects such as WWTPs of Pazardjik, Dimitrovgrad and Stara Zagora as well as strengthening of monitoring systems considering the real availability of funds. It is reasonable to introduce some concessional loans to reinforce the investment to implement the Stage I Projects.

(3) Social Aspects

The proposed wastewater treatment plants in combination with necessary effluent reduction from industry and livestock by regulation will significantly improve surface water. It will contribute for improving the quality of water source for domestic water supply located along the Maritza Main Stream and tributaries. It also contributes for increasing the potential of usable surface water with better quality. This increased potential can be used for the growth of industrial sector as well as for improving living condition and sanitation of towns and houses. Furthermore, this increased potential of water can be used for improving aquatic natural environment and scenery, which will create better amenity for the people. Therefore, the proposed structural measures will have positive social effects.

(4) Environmental Aspects

Improved water quality and the increased potential of usable water by the structural measures with relating regulations will be useful for natural environment. However, EIA is necessary to be conducted for the proposed priority projects, so that to prevent any harmful effects on natural environment.

3.13.2 Evaluation of Non-Structural Measures

(1) Technical Aspects

The proposed non-structural measures are as follows:

1) Setting-up river basin authority for environmental management;
2) Strengthening of monitoring systems both for water quality, water resources potential and water usage;
3) Regulation of effluent from industry and livestock;
4) Conservation of forest area for water resources including reforestation;
5) Conservation of natural environment including natural parks and important biodiversity;
6) Relating studies and investigations for pollution sources, water use and water control.

Strengthening of monitoring systems will contribute significantly for improving management for water quality and water quantity. Database systems including improved analysis and presentation procedure are necessary to be incorporated with the monitoring systems.

Regulation of effluent is very much effective for improving water quality of the Maritza River Basin, especially for TN load reduction. Therefore, strict regulation with accurate reporting of effluent quality from industry and livestock is necessary to be conducted.

Conservation works will be effective for the preservation and enhancement of water resources as well as natural environment.

Relating studies and investigations are very important for considering concrete improvement plans for the problems relating to water quality and water resources.

(2) Social Aspects

Setting up the river basin authority and conducting environmental management including water quality and quantity management will have significant positive social effects. For the successful implementation of the managing works, people's understanding and participation will be inevitable. Therefore, it is recommendable to conduct appropriate campaigns to inform the importance of the improvement of aquatic environment.

(3) Environmental Aspects

The proposed non-structural measures will have positive effects for improving natural environment.

3.13.3 Results of Evaluation

As a result, the proposed structural measures and non-structural measures are technically feasible and will be effective in financial, social and environmental terms.

3.14

PRIORITY PROJECTS

3.14 Priority Projects

3.14.1 Introduction

From environmental aspects, the improvement of water quality of the Maritza river basin is one of the highest priority measures in the basin. According to the pollution mechanism of the basin, it is identified that the major pollution sources are wastes from major urban centers, industries and livestock farms, because most of the urban centers, industries and livestock farms discharge their sewerage/wastes to the river channels directly or indirectly without treatment. There are six urban wastewater treatment plants in the basin, but only a few WWTP of them are active.

For improvement of the water quality of the Maritza River, it is a basic measure to reduce pollution loads from the major urban centers and the major industries. The Master Plan has proposed rehabilitation or improvement of the 36 municipal sewerage treatment plants by phased expansion.

The major urban centers have been assessed on their pollution loads and effects to the Maritza main stream, and the priority projects for F/S have been selected.

3.14.2 Priority Order of Urban Centers

The priority order of the major urban centers is decided based on the assessment on their pollution loads and estimated impacts to the Maritza main stream. The priority order, design scale and treatment process for each town are proposed in Chapter 3.4:

Number of cities of each priority order is as follows:

1st Priority: 7 cities (Primary and secondary treatment)

2nd Priority: 10 cities (Primary treatment)

3rd Priority: 19 cities (Primary)

The 1st priority cities are consisting of Pazardjik, Plovdiv, Assenovgrad, Dimitrovgrad, Haskovo, Stara Zagora and Velingrad, selected as the heaviest polluters with identified location for treatment facilities, possibly ready for early implementation.

The 2nd priority cities are consisting of heavy polluters without identified locations for treatment facilities. The 3rd priority cities are consisting of smaller cities, mainly discharging to tributaries.

Scenarios to attain the target "to improve the water quality of the Maritza river to class-1 or class-2 by 2015", are proposed as follows:

- To decrease the pollution loads from the urban areas by improvement or construction of the town waste water treatment works,
- To decrease the pollution loads from the industrial and livestock sectors by polluter-pays principle.

According to the assessment of the pollution mechanism in the basin, it is clear that major part of the pollution loads especially TN loads, is identified to be from a few industries. It means that the effective ways to reduce the pollution loads are to reduce the loads from these industries.

3.14.3 Identification of Priority Projects for F/S

The priority projects are selected based on the following criteria:

- Priority order in the national and regional plan,

- Priority order from technical and environmental aspects,

(1) Priority order in the national and regional plan

The national program prepared in 1989 proposed to improve sewerage facilities of 38 locations in the river basin.

(2) Priority order from technical aspects,

The 1st Priority cities from technical aspects identified in the priority basin and based on the present total pollution load and the future potential domestic load, are 7 cities as follows:

- Pazardjik
- Plovdiv
- Assenovgrad
- Haskovo
- Dimitrovgrad
- Stara Zagora
- Velingrad

(3) Priority Cities for F/S

The priority cities for F/S are selected as follows:

- Pazardjik
- Dimitrovgrad
- Stara Zagora

These cities are selected because they are having heavier pollution loads, heavier impact to the Maritza main stream and readiness for early implementation.

3.15

ACTION PLAN

3.15 Action Plan

3.15.1 General

In general, the overall availability of water has been considered to remain constant. However, its availability per capita has been decreasing with time and deterioration in its quality.

Water use conflicts will increase in volume and /or in quality with water pollution. Water related diseases are of considerable significance as causes of both sickness and death, causing large social costs in terms of human health. The proposed Master Plan should be executed properly. For the proposed Master Plan an optimum action plan is required.

The proposed Master Plan consists of the followings (refer to Table 3.15.1):

1. Establishment of an optimum management organization,
2. Establishment of monitoring systems by strengthening of the followings:

    - Meteo-hydrological monitoring networks, including existing, upgrading and new installation,
    - Monitoring network for water usage by irrigation, hydropower, intake weirs, reservoirs, domestic water supply and industrial water supply,
    - Water quality monitoring networks,

3. Execution of preventive measures to reduce pollution loads discharged to the Maritza River:

    - Reduction of pollution loads from 36 urban centers by improvement or rehabilitation of sewerage treatment works,
    - Reduction of pollution loads from top 20 industries by regulation,
    - Reduction of pollution loads from livestock farms by regulation.

4. Maintenance of the data base developed for the basin to support the MoEW to make decision,
5. Utilization of river water quality simulation models developed for the basin as management tools,
6. Execution of development studies proposed to support the data base and decision making:

- Water resources management study in Bulgaria,
- Agricultural development study in the Maritza river basin,
- Water balance study on hydropower systems based on the present and future water demands for irrigation, hydropower, domestic water supply and industrial water supply,
- Rehabilitation of municipal water supply systems,
- Groundwater management study,
- Land use planing study on major urban centers,
- Environmental improvement in urban centers, including solid wastes.

7. Execution of Investigations recommended:

- Sewer systems of major urban centers for rehabilitation or improvement,
- Water supply system of major urban centers for rehabilitation or improvement,
- Industrial effluent,
- Mining sites for preparation against accidental pollution
- Solid waste dumping sites for improvement and rehabilitation,
- Biological monitoring and investigation as a supporting measures for the basin management,
- Post-evaluation of the major river facilities likes dams and reservoirs.

8. Enhancement of people's participation in environmental awareness and education programs for development of a consensus among people on actions to be taken.

3.15.2 Phased Program

(1) Phasing

The phasing plan proposed is as follows:

1.	Preparation period:	2 years (1999-2000)
2.	Phase-1:	5 years (2001-2005)
3.	Phase-2:	5 years (2006-2010)
4.	Phase-3:	5 years (2011-2015)

(2) Action

1) Preparation period: 2 years (1999 – 2000)

The activities to be carried out during this period are to build a firm foundation for the implementation of the short, medium and long-term targets successfully. The proposed activities are as follows:

- to establish a Basin Management Organization for the Maritza River Basin,
- to prepare the training programs for strengthening of the Basin Management Organization,
- to establish an information system,
- to establish effective monitoring, inspection and laboratory operation systems,
- to prepare for implementation of the 1st priority projects,
- to prepare for implementation of the proposed development studies,
- to start investigation on basic data and information.

2) Short-term target: 5 years (2001 – 2005)

- to conduct routine operational activities under the Management Organization,
- to commence and complete the 1st priority projects,

- to commence the preparation works for the 2nd priority projects,
- to complete the 1st priority development studies,

3) Medium term target: 5 years (2006 -- 2010)

- to conduct routine operational activities under the Organization,
- to complete the 2nd priority projects,
- to commence the preparation works for the 3rd priority projects,
- to review the activities proposed for the next stage,
- To conduct necessary development studies.

4) Long term targets: 5 years (2011 – 2015)

- to conduct routine operational activities under the Organization,
- to complete the 3rd priority projects,
- To complete municipal and industrial wastewater treatment plants.
- to establish sustainable use of land and water resources,
- to restoration of the natural purification capacity of the river,
- to review the activities proposed for the next stage.

TABLE 3.15.1 PROPOSED MASTER PLAN FOR RIVER BASIN MANAGEMENT (1/2)

Management Plan		Zoning	Countermeasures	Project Cost (US$ 1000)	
				Structural Measures	Non-structural Measures
1.	**Water Quality Management**	**Priority region including priority towns for pollution control** Priority region: 1) Maritza Upstream 2) Maritza Mid-stream 3) Maritza Downstream Priority towns: 1) 1st priority towns: 7 towns 2) 2nd priority towns: 10 towns 3) 3rd priority towns: 19 towns	**(1) Construction of Domestic Wastewater Treatment Plants (WWTPs)** 1) 1st Stage Towns: 7 towns 2) 2nd Stage Towns: 10 towns 3) 3rd Stage Towns: 19 towns **(2) Regulation for Reduction of Pollution Load** 1) Industry (specially for top 20) 2) Animal breeding farms **(3) Strengthening of Monitoring System for Surface Water Quality**	**213,730** 122,021 36,437 55,272	- -
2.	**Water Resources Management**	**Water resources potential conservation and water demand control** 1) Zone I: For controlling water resources potential 2) Zone II: Medium of Zone I and Zone III 3) Zone III: For controlling water demand	**(1) Strengthening of Monitoring Systems** 1) Meteorology and hydrology 2) Water use facilities **(2) Rehabilitation of Water Supply Systems** 1) 1st stage system 2) 2nd stage system 3) 3rd stage system	**119,815** 64,104 20,141 35,570	**360**
3.	**Land Use and Environmental Management**	**Land use categories and environmental sensitive areas** 1) Forest area 2) Agricultural area 3) Urban area 4) Conservation area 5) National parks and protection areas	**(1) Monitoring of Land Use and Natural Environment** 1) Land use 2) Natural environment		-
			Sub-total	**333,905**	**360**
			Grand total	**333,905**	

TABLE 3.15.1 PROPOSED MASTER PLAN FOR RIVER BASIN MANAGEMENT (2/2)

Management Plan		Proposed Items
4.	**Further Development Studies and Investigations**	**(1) Development Studies** 1) Water resources management study in Bulgaria 2) Agricultural development study in the Maritza River Basin 3) Water balance study on hydropower systems 4) Study on groundwater management 5) Post-evaluation of the existing major river facilities **(2) Investigations** 1) Municipal water supply systems 2) Sewer systems of major urban centers 3) Industrial effluent 4) Mining sites for accidental pollution 5) Solid waste dumping sites 6) Biological monitoring
5.	**Institutional Structure Plan**	1) Establishment of River Basin Management Organization 2) Establishment of Project Implementation Unit (PIU) for supporting the River Basin Management Organization to implement large-scale project(s)
6.	**Phasing of the Master Plan**	Preparation Period : Year 1999 – Year 2000 Phase 1 : Year 2001 – 2005 Phase 2 : Year 2006 – 2010 Phase 3 : Year 2011 - 2015

Remarks:

1st stage towns for domestic wastewater treatment plants:

Pazardjik, Plovdiv, Assenovgrad, Haskovo, Dimitrovgrad, Stara Zagora and Velingrad

CHAPTER 4

FEASIBILITY STUDY

4.1

INTRODUCTION

CHAPTER 4 FEASIBILITY STUDY

4.1 Introduction

For improvement of the water quality of the Maritza river basin, it is an basic measure to reduce pollution loads from the major urban centers, industries and livestock farms, because mostly they discharge their sewerage/wastes to the river channels directly or indirectly without treatment.

The Master Plan has proposed rehabilitation or improvement of the municipal wastewater treatment works of 36 urban centers by three stages from 2001 to 2015 in order to attain the target " to improve the water quality of the Maritza River to class-1 or class-2", and identified three urban centers for F/S. The three urban centers proposed for F/S are Pazardjik, Dimitrovgrad and Stara Zagora. They are shown in Figs. 4.1.1 - 4.1.3.

During the F/S from the end of September through January 1999, the Study has conducted on the followings:

- Field investigation of the proposed sites for wastewater treatment plants,
- Topographic survey and geological investigation on the proposed sites of wastewater treatment plants for the three urban centers,
- Review of environmental sensitive areas and spots in and around the three urban centers,
- Review of required monitoring activities for environmental management,
- Preliminary design of the proposed wastewater treatment plants,
- Estimation of the project costs,
- Review of O&M organization for the projects,
- Environmental impact study on the projects,
- Financial analysis of the projects,
- Preparation of implementation program for the projects.

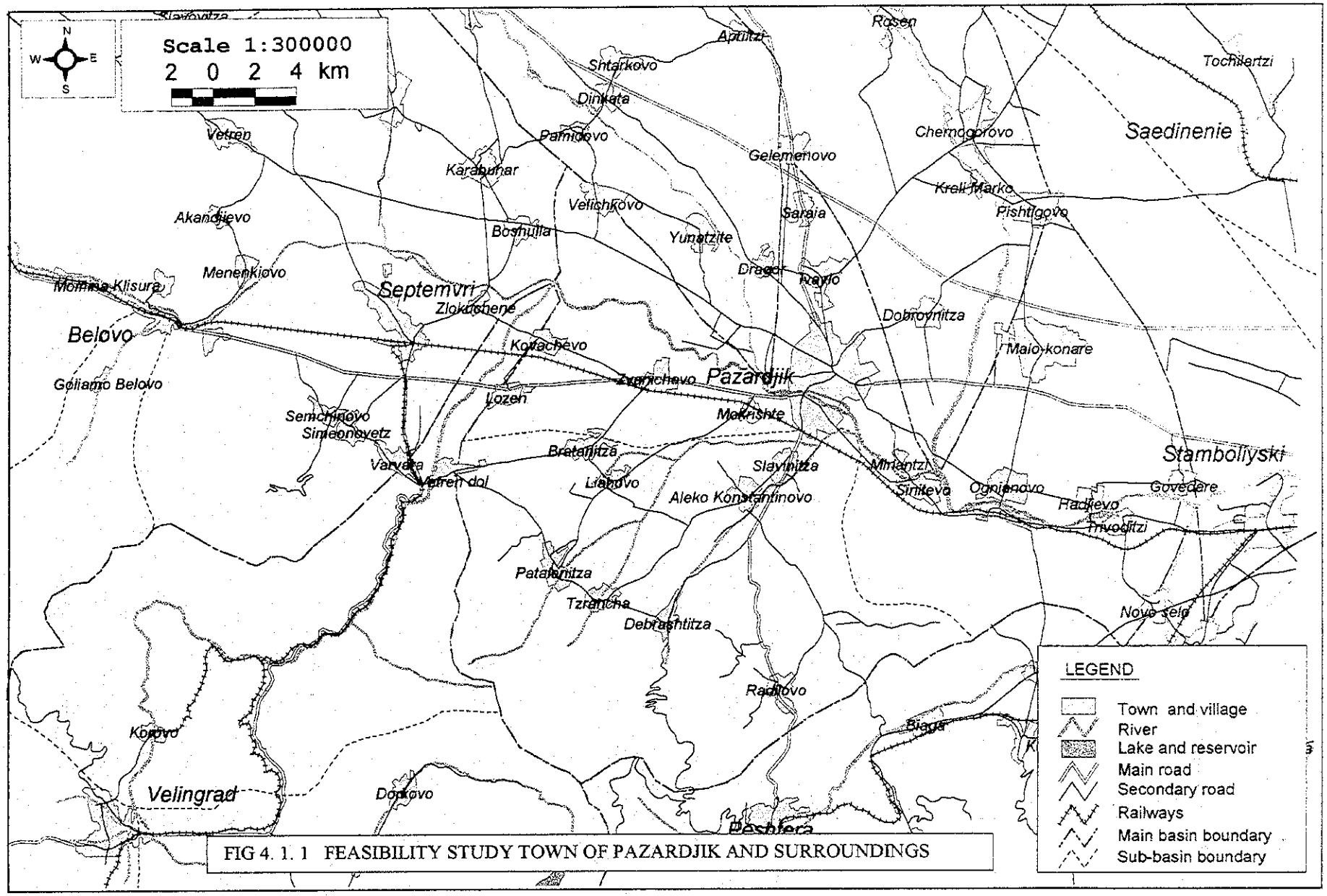

FIG 4. 1. 1 FEASIBILITY STUDY TOWN OF PAZARDJIK AND SURROUNDINGS

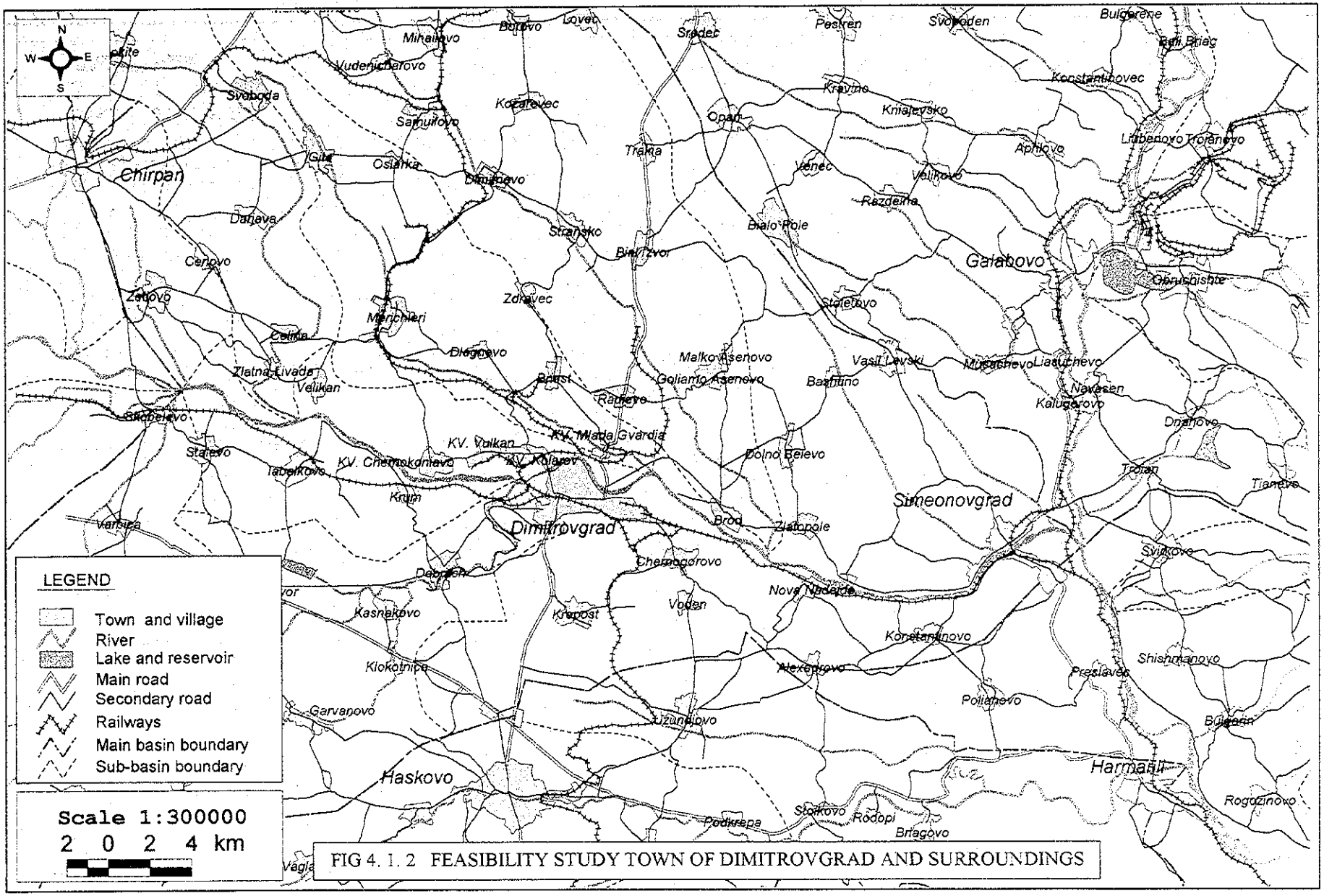

FIG 4. 1. 2 FEASIBILITY STUDY TOWN OF DIMITROVGRAD AND SURROUNDINGS

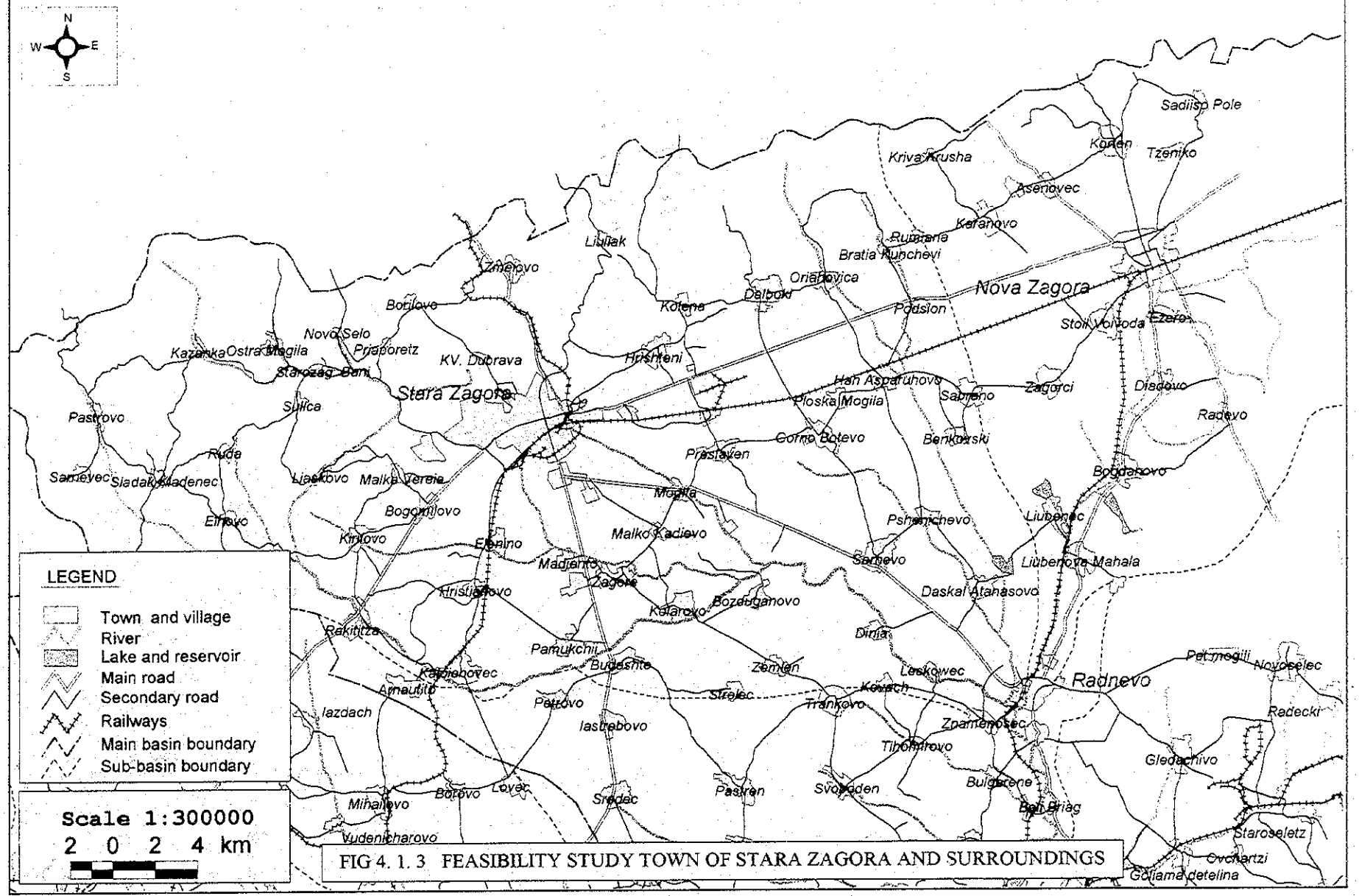

FIG 4. 1. 3 FEASIBILITY STUDY TOWN OF STARA ZAGORA AND SURROUNDINGS