JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF TRANSPORT AND COMMUNICATIONS
MINISTRY OF ENVIRONMENT AND PHYSICAL PLANNING
CITY OF SKOPJE
PUBLIC ENTERPRISE "WATER SUPPLY AND SEWERAGE" SKOPJE

THE STUDY ON WASTEWATER MANAGEMENT IN SKOPJE IN FORMER YUGOSLAV REPUBLIC OF MACEDONIA

FINAL REPORT

APPENDIX (3)

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THE STUDY
ON
WASTEWATER MANAGEMENT
IN
SKOPJE
IN
FORMER YUGOSLAV
REPUBLIC OF MACEDONIA

FINAL REPORT

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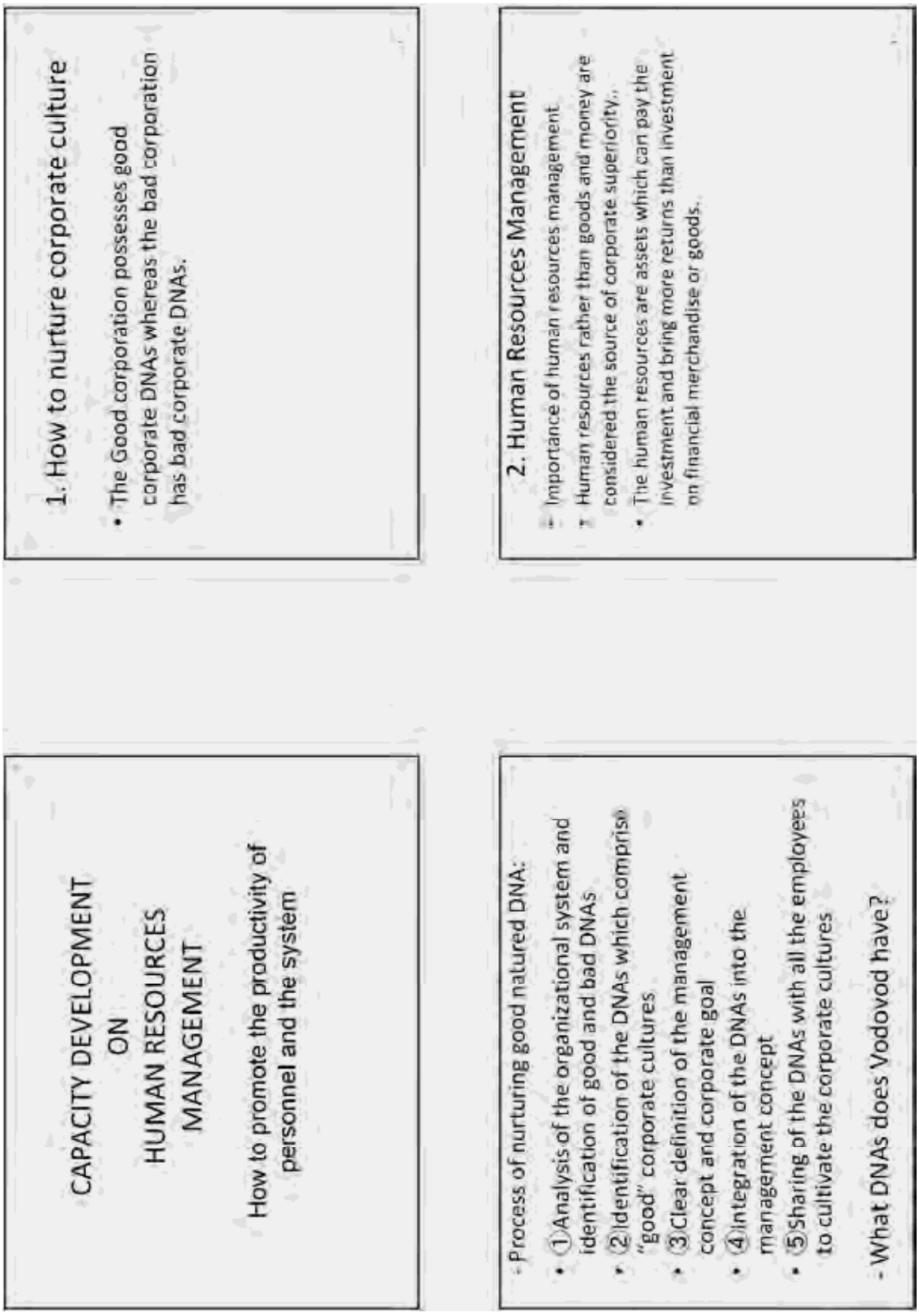
3.1 Capacity Development on Human Resources Management



2. Human Resources Management (con'd)

2.1 Human Resources Management that leads to Competitiveness

*The key words:

- Core competence
  = how effectively to input the business resources
- Sufficiency in manpower:
  In quantity and quality

* Important strategy:

- Clear understanding of what is needed or desirable for the utility;
- Definition of individual staff's role and responsibility in job;
- Autonomous selection of methods for operation;
- Handling of operation on staff's own responsibility

3. Recruitment Strategy

1) How to secure the water utility with competent personnel
   - For sustainable growth of the utility, the employment of trainee executives is vital.
   - Improve the efficiency in the job while satisfying the happiness of employees
2) Factors to be considered for human resources management
   - Development of personnel database
   - Salary and wage systems classified by trade
   - Performance evaluation system for personnel management including staff repositioning and promotion
3) Basic conditions for securing competent human resources
   - The in-house infrastructure which gives employees strong identity with the utility
   - Corporate culture which gives employees high spirits to work

3-1 Staff Positioning Management

- Career Development Program (CDP)
  Proper positioning of personnel shall be undertaken in accordance with the staff property statements. However, future potential of the staff should also be taken into account.
  - Staff positioning management includes staff repositioning aiming at career development, break-up of stagnant staffing, promotion and demotion.
  - Staff repositioning, an important staff management strategy, often results in a change in trade and the course of career, which is deeply related to motivation and capacity development.
  - The main aim of the CDP is to secure the utility with human resources for the future. Hence it should be formed based on short- and long-term business plans and staffing plans.

3-2 Promotion and reassignment

Promotion means upgrade of staff class, e.g., from an ordinary clerk to a subsection chief. Reassignment stands for a change in the scope of job of a staffer, for example, from computer terminal operator to a system engineer.

- Promotion will bring about a higher position and salary.
- Reassignment does not necessarily accompany an increase in salary but an incentive for the staffer in question.
- Manager promotion: A staffer is promoted to a manager, who renders authority to handle personnel management as well.

Table 1 shows a list of personnel with information for their promotion for managers. The persons who have earned a high enough mark will be selected for promotion as a manager.

- CDP will become effective when (1) recruitment management, (2) performance evaluation, (3) training system are synthetically organized and used as a personnel management information system.

4 Nurturing Personnel's Individuality

- The corporate cultures, which nurture individual's personality, must be part of management strategies.
- The provision of attractive working environment is the principal prerequisite for the success of the utility.
- A top-down type management system has an advantage of fast assimilation of business strategies of the management to every employee. However, it is not certain if the management can keep delivering good ideas for a long time.
- Group activities such as an employee-to-propose system, which vitalize individuals and promote participation of employees in part of management, may result in better performance of the utility.

Table 1
Manager Promotion Candidates Evaluation

4 Nurturing Personnel's Individuality-2

- It is not easy to maintain all the required manpower within the utility and train them. → Alternative measures to secure necessary expert manpower include:
  1) to utilize external resources, e.g., universities, technical collages, and companies with advanced technologies.
  2) to employ retired persons and females who possess expertise and experience on a part-time, flex-time basis or the like
- Given this, human resources management in the corporation and remuneration systems should, as shown in Figure 1, be developed to implement system operation in line with the setting of a goal based on the business strategy.

5. CSR (Corporate Social Responsibility) and Stakeholders

- An action guideline is needed for a corporation to earnestly deliver services to customers while contributing to the local community.
- The corporation is responsible for diverse stakeholders such as employees of the corporation, consumers, and local society.
- The responsibilities are composed of legislative, economic, institutional, and social ones which are performed by the corporation's own judgment.
- The CSR shall constitute the corporate asset together with human resources, goods, money and information.

6. Performance Evaluation and Recompense

- The performance evaluation and recompense system is the mechanism to examine the value of performance and capacity of the personnel, which lead to the evaluation of human resources as a whole through the attitude and enthusiasm towards the job of respective personnel in terms of their potential and the magnitude of its usage.
- The management of the utility (Vodovod) can use the performance evaluation and recompense system to fully assess the capacity and performance of its personnel so as to rationally and efficiently utilize them through supervision, training and reassignment (promotion).
- If the examiner (supervisor) is incompetent, however, the resulting performance evaluation will be biased or unfair, and therefore cannot be authoritative. In this regard the training of examiners is important so that they carry out constant and fair evaluation.

6-1 Performance Evaluation and Recompense

- In order for the performance evaluation to be an incentive for efficient work, objective of work, goal to be attained, knowledge to be learned and so forth on the evaluation should clearly be defined so that rating can be made according to achievement toward established criteria.
- To make the evaluation system reliable in terms of objectivity and understanding, the rating of performance and the degree of positive attitude toward the job by staff themselves can be adopted. Such method of rating will make it easier to know staff's aptitude to his job, find issues for development of his capacity, and set a goal for the next term. It will thus make an important tool for a career development plan.

6-1 Review of Salary System and Secure Employment of Competent Personnel

- Salaries = remuneration to labor → cost to the water utilities. – As for human resources management, the control of salaries and wages means rational balancing among the salary level, salary structure, total labor cost and productivity.

1) Appropriate salary structure:

- The personnel cost constitutes large part of utility's fixed cost, and so affects the profitability of the utility. On the other hand, a high salary is attractive to the employees, and therefore the vitality of the utility.
- To realize rationalization of the operation and reform of the organizational structure, some utilities abandon the traditional seniority wage system and adopt a performance- and ability-related salary system. Some other utilities move to their combination.

6-5 Total Reward

- A rewarding system attractive to employees while reducing the cost
- The total reward system generally rationalizes the remuneration for personnel in consideration of not only cash rewards such as salaries and bonuses but non-cash rewards such as social welfare including health insurance, prize, flex time shifting, prolonged vacation and so forth. There may be other incentives than monetary rewards which raise the employee's motivation.
  - Other types of rewards: (Working style) Flex time shifting, work-at-home, child care leave, special vacation; and (self-education) domestic and overseas training, education allowance etc.
  - Other examples: Award by the utility for honor, authority, gratitude from customers etc.

Table: Manpower personnel cost-related

Date:

Division	Category	Term 1	Term 2	Term 3
Personnel cost structure: By job type	Commercial staff	20	35	
	Clerk	10	14	
	Engineer	16	20	
	Technician	54	64	
	Total	100	133	
Personnel cost structure: By position	Director	4	5	
	Sector chief	4	5	
	Division chief	13	14	
	Section chief	28	39	
	Other staff	51	70	
	Total	100	133	
2. Value added (Total sales)		1,034,500	1,266,000	
3. Personnel cost: By cost category	Director's remuneration	27,500	33,540	
	Salary and wages	165,000	228,500	
	Bonus & allowance	103,450	126,000	
	Social security expenses	29,460	32,300	
	Others	16,531	22,310	
	Total	339,941	442,650	
4 Personnel cost/ staff/year		3,399	3,328	
5 Value added per employee		10,345	9,669	
6 Rate of Labor distribution		32.9	34.4	

7-1 Current Salary Structure and Its Revision

*The new trend in the salary structure of businesses is the application of a salary structure based on the merit system and the performance system.

*Salary structure which is easy to understand

1) The weight on the fixed cost decreases while that on the variable cost increases.
2) There will be multiple salary systems instead of a single system.
3) The decision on the salary is based not on the summing-up method but on the absolute amount method.
4) The weight on the age-based and service length based salary decreases whereas that on position-based, function-based and performance-based salary increase.
5) The salary differentials among employees will increase where the function based and performance based salary systems are applied.

*The following form is a model form for computing the revised basic salaries

Table_ Computation of Basic Salaries

Resource for salary hike: 70,000

Code	Name	Div./ Dep.	Class	Salary class	Enter year	Age	Employ ment date	Service length	Current Basic Salary	Contents of Basic Salary			
										Age Salary	Service period salary	Total salary	Job Eval. Salary
1006	A A	G A	5	5	1940	63	1980	23	490,000	111,000	33,000	140,000	350,000
1008	B B	G A	5	4	1950	53	1975	28	465,000	115,000	28,000	143,000	325,000
1101	C C	Bis	4	3	1965	38	1989	14	254,000	100,000	14,000	114,000	240,000
1103	D D	Bis	3	2	1968	35	1988	15	277,000	97,000	15,000	112,000	165,000
1107	E E	Com1	3	4	1964	39	1990	13	267,000	99,000	14,000	113,000	150,000
1215	F F	Com1	2	3	1974	29	1992	11	222,000	91,000	11,000	102,000	120,000
1212	G G	Com1	3	4	1956	47	1990	13	267,000	88,000	13,000	113,000	150,000
1233	H H	Com2	1	4	1966	37	1991	12	162,000	105,000	12,000	117,000	65,000
1341	I I	Com2	1	2	1960	43	1995	8	153,000	80,000	8,000	88,000	55,000
1355	J J	Com2	2	1	1975	28	1995	8	187,000	89,000	8,000	97,000	100,000
Total	10		29			412		145	2,857,000	1,102,000	145,000	1,247,000	2,310,000
Aver.						41		14.5	285,700	110,200	14,500	124,700	231,000

*G.A :General Affairs Div./ Bis: Business Div./ Com1: Commercial Div. 1/ Com2: Commercial Div. 2

Contents of Basic Salary				Perfo rm. Eval.	Perfor m. Eva. Factor	Salary Hike factor	This year's Salary hike				New Salary	Rate of increa s.
Age Salary	Service period salary	Total salary	Job Eval. Salary				Age salary	Servic e period	Job eval. Sal.	Total		
111,000	22,000	140,000	350,000	C	0.6	3.5			-4,440	4,440	494,440	0.90
113,000	28,000	141,000	325,000	B	0.8	4.0	1,000	1,000	11,700	13,700	481,700	2.93
100,000	14,000	114,000	240,000	C	0.5	2.4	1,000	1,000	1,000	6,000	260,000	2.54
97,000	15,000	112,000	165,000	D	0.4	1.2	1,000	1,000	3,300	5,500	282,500	1.99
99,000	12,000	111,000	190,000	A	1.0	3.0	1,000	1,000	6,900	10,900	311,900	3.52
91,000	11,000	102,000	120,000	B	0.8	1.6	1,000	1,000	-4,700	6,700	228,700	3.02
99,000	13,000	112,000	195,000	C	0.6	1.8	1,000	1,000	5,300	7,200	314,200	2.38
103,000	13,000	117,000	65,000	A	1.0	3.0	1,000	1,000	7,900	4,900	186,900	2.69
90,000	8,000	98,000	55,000	E	0.1	0.1	1,000	1,000	200	2,200	160,200	1.50
89,000	3,000	92,000	100,000	C	0.5	3.2	1,000	1,000	3,500	5,500	202,500	2.79
1,002,000	145,000	1,147,000	1,210,000		6	16	9,000	9,000	52,100	70,100	3,007,100	24
100200	14500	114700	121000		0.84	1.76	900	900	5210	7010	300710	2.42

cial Div. 1: Com2: Commercial Div. 2

The process of setting the new basic salaries:

(1) Identify the basic salary of each employee.
(2) Input the Resource for salary hike (e.g., 70,000).
(3) The contents of the age salary, service length salary, job evaluation salary are derived from the table for salary hike factors for job evaluation salaries.
(4) For computing performance evaluation factors, the following table is to be developed.
(5) This year's salary hike amount is mainly (C) distributed to job evaluation salary according to the hike rate factors. The hikes in age salary and service length salary are capped at 1,000.
(6) The new basic salaries (D) are determined.

Table 7 Evaluation Factor Table

Evaluation Factor	A 1.0	B 0.8	C 0.6	D 0.4	E 0.1
Job Class					
1	1.0	0.8	0.6	0.4	0.1
2	2.0	1.6	1.2	0.8	0.2
3	3.0	2.4	1.8	1.2	0.3
4	4.0	3.2	2.4	1.6	0.4
5	5.0	4.0	3.0	2.0	0.5

(Process)

① Determine the total amount of the salary hike resource

② Accordingly, determine the total amount of the new salaries.

③ Install the age salary and service length salary for each employee.

④ Distribute the remainder of the salary hike resource in accordance to with the salary hike factor table.

7-3 Performance Evaluation and the Achievement Reward System

*The performance-based remuneration system means a system in which employee's performance is evaluated and the salary is determined on the evaluation of his achievement toward the goal.

*In the achievement reward system, salaries are determined based on quantitative evaluation of the achievements of individual and department where he belongs during the evaluation period.

-Although the evaluation items are different in regard to the level of the employee's position, the higher the ranking in job such as managers and executive officers of a department, the higher the weight for on operational outcome such as achievement toward the goal.

7-3 Performance Evaluation and the Achievement Reward System (cont'd)

*Likewise, in the form for computing annual salaries for the manager band, the evaluation is made using factors of (1) budget goal attainment, (2) achievement of crucial assignments, (3) deeds of planning and proposal, (4) achievement in rationalization, and (5) technical expertise, (1) and (2) having more weight than others.

*

7-3 Performance Evaluation and the Achievement Reward System (cont'd)

*The following Table presents the method to allocate the resource based on the achievement. The ratio of the fixed part of salary, set at 30% here, can be set at any value.

Table Computation of Achievement Based Allocation Date

Total achievement reward 2,500,000 Total allocation 1,840,000

Code	Name	Dept.	Class	Standard and Monthly salary	Fixed part salary	Factor in Eval.	Factor in Eval. Factor	Allocation factor	Achievement based part	Total annual salary
					30%				Ass. amount	Total salary
1006	A.A.	G.A.	5	480,000	144,000	C	0.6	3.0	204,240	424,200
1008	B.B.	G.A.	5	480,000	144,000	B	0.8	4.0	341,300	485,300
1101	C.C.	Bis.	4	330,000	97,500	C	0.6	3.4	207,500	274,700
1103	D.D.	Bis.	3	180,000	60,000	D	0.4	1.2	102,700	149,700
1107	E.E.	Cont.	3	230,000	69,000	A	1.0	4.0	340,500	470,500
1215	F.F.	Cont.	2	125,000	37,500	B	0.8	1.6	128,200	165,700
1212	G.G.	Cont.	3	180,000	60,000	C	0.6	1.8	153,500	213,500
1233	H.H.	Cont.	1	125,000	37,500	A	1.0	3.0	172,800	210,300
1341	I.I.	Cont.	1	15,000	25,500	E	0.1	0.1	8,800	31,100
1355	J.J.	Cont.	2	50,000	15,000	C	0.6	0.6	102,700	116,700
(Total)	10		29	2,280,000	960,000		7	21	1,840,000	2,560,000
Ave.				228,000	96,000		0.63	3.01	184,000	256,000

7-5 Annual salary system

- Under the annual salary system, salary for each employee is determined by his performance.
- The crucial points to be considered when moving to the annual salary system:

1) Introduce the system when the business is stabilized and starting to grow.
2) The system of performance oriented remuneration should be applied not only for the management but employees.
3) An appropriate personnel evaluation system shall be employed mainly based on the performance reward principle.
4) The evaluation system should be connected with a goal achievement rule.
5) Implementation of the annual salary system which leads to a salary rise.

8 Corporate Cultures (cont'd)

*-The functions of the corporate cultures are the following:

1) The uniformity and the sense of solidarity as a corporation are strengthened, and the employee's behavioral model and criteria are clearly defined.
2) Knowledge, know-how, skills etc. are accumulated as the core competence in the corporation, which are used in the operation.
3) The goal and operational plan of the corporation are clearly recognized, and the identity to the corporation is strengthened.
4) The goal such as operational concept is clearly presented and recognized by the stakeholders of the corporation.

#The tale of Yamaha's corporate cultures

7-3 Performance Evaluation and the Achievement Reward System (cont'd)

(Procedure)

(1)Determine "Total achievement reward"(2,500,000)

(2)Determine the fixed salary part (30%).

(3)Compute the fixed salary part for each personnel and its total (660,000).

(4)Compute the total allocation (2,500,000 – 660,000 =1,840,000)

(5)Distribute the total allocation to each personnel according to the allocation factors.

(6)Calculate the total performance-based remuneration for each personnel (e.g., 165,000+259,200 =424,200)

8 Corporate Cultures

*The personal behaviors and grouped behaviors as organized behaviors influence the performance and productivity of the corporation. ←→Corporate cultures should also be noticed since they are closely connected to the performance of the corporation; →They are considered the fifth operational resource placed next to the human resources, goods, money, and information.

1. The strength of the corporate cultures is derived from the behavioral performance.
2. The corporate cultures greatly influence the goal aimed by the corporation, and the method of activities and selection of measures.

8-2 Improved corporate DNA to be used for human resources development

*The weak corporate cultures = a negative operational asset
→ Should be renovated. • The most important theme = manpower development and reinforcement
- Important principle: the most competent personnel are to be given the largest opportunity.
- Toyota's basic concept is that the development of human resources is the base of manufacture. Although Toyota is famous for the "kanban" system – Toyota style production system, its basic concept is human resources development.
- Bad example: After the WW 2, Japan accomplished miraculous economic growth applying a pyramid-type organizational structure. However, it turned to be an inefficient system after the economic boom since it embodied rigidity in promotion of competent personnel. A corporation needs to flexibly promote competent personnel for the most suitable positions and jobs

9-1 Restructuring of the organizational system (cont'd)

*The representative methods of restructuring:
1) to change the organizational structure from multi-layered system to rather a flat and slim system including elimination of divisions and sections and reduction in the number of layers.
2) to introduce horizontal management system so as to avoid the disadvantage of the vertical management system.
3) to employ a company system within each department in order to achieve speedy decision making and clearly define the responsibilities of each department.

9-1 Restructuring of the organizational system

*The objectives of restructuring: An alteration of the organizational system into one that has higher efficiency and productivity. It does not necessarily mean reduction in manpower.
*To achieve effective restructuring, needed are the acquisition and analyses of information not only on personnel data but also on financial, commercial, production, purchase, logistics etc. based on the results of performance evaluation of each department which would assist the decision making of the management.

9-1 Restructuring of the organizational system (cont'd)

*- Another method of restructuring the organizational system is "reengineering" (redesign of the operation). To this end, not the tasks but business processes must be reviewed and improved.
1) Examine if two or more operations can be reorganized into one.
2) Can incumbent staff be vested in as much authorities as possible?
3) Can operational flows be made more smooth and natural?
4) Can more than two alternatives be provided for a process?
5) Can a specific job be transferred to another section which can do the job more efficiently?
6) Can the checking or control function be minimized?
7) Can the coordination job be minimized?
8) Can the interface (windows) with the outside be minimized?

9-1 Restructuring of the organizational system (cont'd)

*Three methods to apply to restructuring:

1) Negation of specialization and combination of different jobs

- The systems, which are mutually related, are combined into a "team", and all the members of the team should recognize their products, the flow of the process, the procedure of decision making in the utility. In other words, each member shares the information, make a decision by himself and plan and carry out the work.
- The main points of reengineering are that a team deals with more than two jobs, and that the members of the team quickly make a decision while necessary information is organized in a database, and shared by each member.

*Three methods to apply to restructuring: (Continued)

2) A flexible system

- A flexible system can easily deal with a change in the business environment. Minor day-to-day decisions can be left with the subordinate job units. Redundant checks and control can be omitted. Reference and coordination process can be minimized.

3) More weight on processes and provision of plural procedures

- Anomalies should not be found by the result, but always be detected in the process using IT. Then the process and operation should be adjusted.
- With a single standardized procedure, not all the incidents including extraordinary ones can be handled. Therefore plural procedures must be provided for a process, and the selection of the procedure should be made quickly.

After finding the problem area, an action plan is to be provided to reorganize the system. So the sharing of the info on the system be practiced, and training and education should be implemented.

9-2 Implementation of Reengineering

*The crucial key to a successful reengineering is the use of the IT technologies and implementation of restructuring. For this aim, firm implementation as well as redesign of the system is mandatory.

- The processes of restructuring are summarized as follows:

(1)Comprehensive review of the systems, business rules and operational procedures;

(2)A review of the operating system, jobs, business flows, and management system from the business process point of view;

(3)Finally, provision of services to the satisfaction of customers.

- Steps of such reengineering are illustrated in Figure ___

9-3 System Development and Strengthening of Organizational Capacity

*Application of "Solution" 1)

Renovation of the organizational system → rather of objectivity.

Another need to develop a new system from the inherent "strength" or "potential" of the existing system.

To restructure the system, to change the awareness and behavior → crucially important . The restructuring = to make the system to render its maximum capacity and functions and change as planned.

To this end, the capacity of the employees must be developed and their motivation for renovation must be aroused.

9-3 System Development and Strengthening of Organizational Capacity (cont'd)

*- The aims of organizational development are as follows:

1) to alter the organizational system into one that can work to solve the problems.
2) to realize the change so that the barriers between the sub-systems should be eliminated.
3) to make the system which can easily deal with the change in the external environment.
4) to change the system in which the staff's creativity and spirits are effectively raised.

3.2 Operation and Maintenance of Sewerage Facilities

Workshop
On
Operation and Maintenance of
Sewerage Facilities

15 September 2008

I. Organization for Operation and Maintenance (O&M)

1.1 Items of O&M activities for Sewerage (continued)

- 9) Control of water quality
- 10) Upkeep of sewerage registry
- 11) Activities for conservation of environment
- 12) Other activities

I. Organization for Operation and Maintenance (O&M)

1.1 Items of O&M activities for Sewerage

- 1) General affairs
- 2) Execution of budget plan
- 3) Management of assets
- 4) Setting sewerage rate
- 5) Guidance how to install drainage facilities
- 6) Monitoring of industrial wastewater discharge and instruction for improvement
- 7) O&M of sewer network
- 8) O&M of pumping stations and the wastewater treatment plant

- Classification of jobs related to O&M of sewerage facilities

Item of job	Principal jobs
1. General affairs	Enactment of the sewer service code; general affairs; personnel management; payroll and salary matter; budget planning and execution; accounting;
2. Execution of budget	(1) Purchase and logistic management of materials and supplies (2) Contract making of construction jobs assigned (3) Contract of other jobs assigned
3. Asset management	Management of fixed assets, and their maintenance

Item of job	Principal jobs
4. Estimate of sewer service charges	Investigation of customers, and estimate of sewer service charges (inc. estimate of water consumed), charge collection, and study on unpaid charges
5. Guidance how to install home drainage facilities	Guidance for installation of drainage facilities and flush toilets, and their inspection
6. Monitoring of industrial wastewater and guidance to factories	(1)Installation of pre-treatment facilities (2)Examination of application forms for installation of wastewater treatment facilities by factories (3)Guidance to factories for O&M of such facilities (4)Site inspection of factories on the regulation of wastewater quality

Item of job	Principal jobs
8. O&M of pumping and wastewater treatment facilities	
1) Operation	(1) Planning of sewage and sludge treatment activities (2) Planning of operation of mechanical facilities of pumping stations and sewage treatment plant (3) Planning of transportation and disposal of grit, screenings, sludge cake, incineration ashes. (4) Cleaning and upkeep of buildings, horticulture etc. (5) Recording and maintenance of the activities of pumping stations and the wastewater treatment plant (WWTP). (6) Action instruction and operation in emergency cases

Item of job	Principal jobs
7. O&M of sewer network	(1) Planning, design, construction and supervision of inspection and survey of the sewer network (2) Planning, design, construction and supervision of cleaning and dredging of sewers (3) Planning, design, construction and supervision of repair and improvement of sewers

Item of job	Principal jobs
8. O&M of pumping and wastewater treatment facilities	
2) Inspection and maintenance	(1) Preparation of inspection and maintenance plan and procedures of mechanical and electrical equipment (2) Inspection and maintenance of mechanical and electrical equipment
3) Repair and improvement	(1) Planning, design and implementation of repair and improvement work
4) Capacity evaluation	(1) Testing (measurement) of performance of pumps and electrical equipment compared with the original specification (2) Evaluation of the actual capacity of pumps and electrical equipment including estimate of their economic lives

Item of job	Principal jobs
10. Water quality control	(1) Planning of water testing, survey, study etc. (2) Quality testing of sewage and sludge (3) Testing of activated sludge (4) Testing of industrial wastewater (5) Implementation of surveys and studies (6) Compiling and analysis of data and preparation of a report (7) Preparation of instructions on O&M (8) Adjustment and calibration of water quality instruments
11. Management of registers of facilities	(1) Preparation and keeping of registers (2) Updating and access services of the registers (3) Management of drawings and documents

Item of job	Principal jobs
12. Environmental conservation	(1) Planning and implementation of testing of ambient atmosphere (2) Planning and implementation of measurement of noise and vibration (3) Planning and implementation of measurement of odor (4) Planning and implementation of water quality testing of the river where treated sewage is discharged

Item of job	Principal jobs
13. Other Activities related to sewerage facilities	(1) Announcement of the commencement date of services (2) Permission for connecting by other sewer network (3) Request for enactment of the sewerage code and other regulations needed for the operation (4) Collection of O&M charges from the proprietors of other sewer networks with connection to this system (5) Installation, inspection and maintenance of flow meters (6) Flow measurement

Item of job	Principal jobs
14. Other activities	(1) Report to the supervising agencies of the government (2) Examination of work place safety and hygienic protection and their improvement (3) Application for occupation of public areas for O&M jobs (4) Survey and research on sewerage (5) Conducting tour of the facilities of visitors (6) Activities for promotion and public education etc.

1.2 Present Organization of Vodovod

A Director heads up Vodovod with a Deputy Director, Technical Director and two Assistant Directors. There are eight Sectors and two centers, which handle day-to-day activities of Vodovod (Figure 1.1).

1.2 Present Organization for O&M (continued)

Sector Exploitation and Maintenance of Facilities handles the O&M of mechanical and structural facilities including sanitary and storm water pumping stations, chlorination plant, and concrete and brick structures (See Figure 1.3).

1.2 Present Organization for O&M (continued)

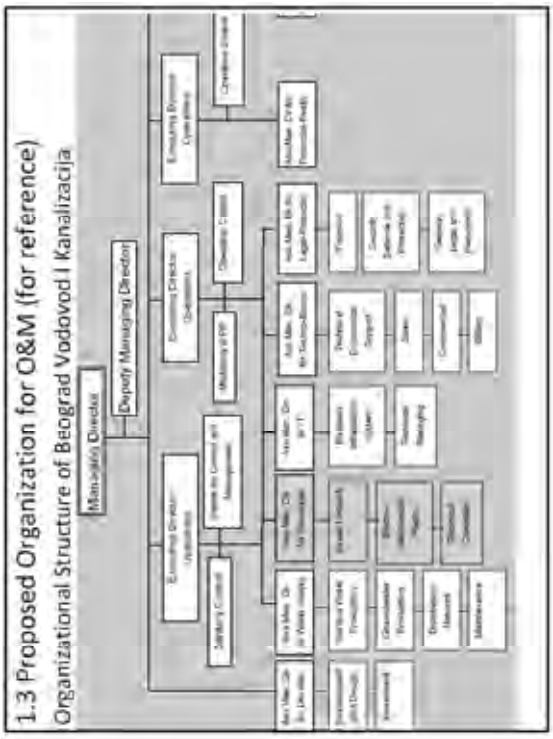
Sector Sewerage is only responsible for the maintenance of the sewer network. The organization of the Sector is shown in Figure 1.2

UD: university degree; HS: high school graduate
HQ: highly qualified;
Q: qualified;
PQ: partially qualified; NQ: not qualified.

1.3 Proposed Organization for O&M

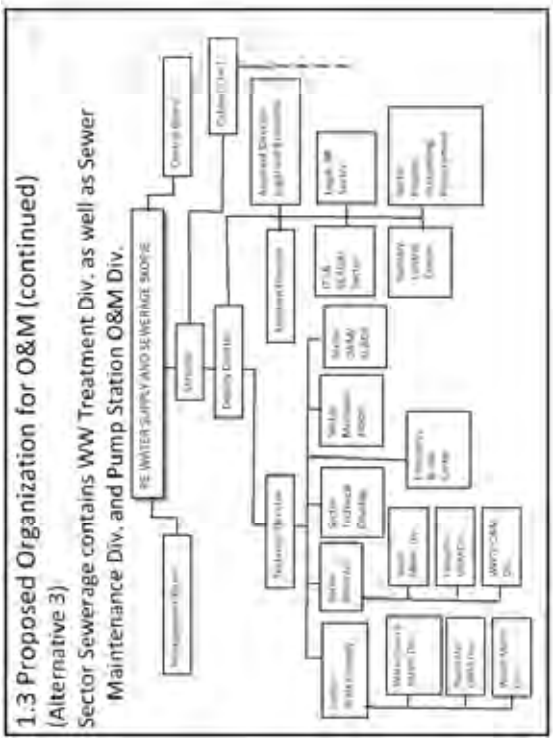
There is no O&M division for the WWTP in Vodovod. It is recommended to created a new Sector for WWTP O&M. The organization of the Wastewater Treatment Sector may consist of the following:

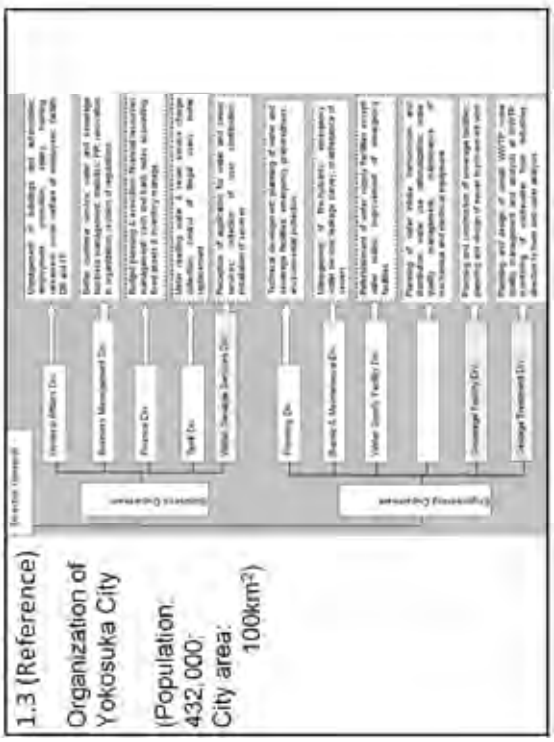
Division/Section	Qualification of Sec. Head	No. and Qualification of other staff
Director	UD	
Administration Division	UD	
General Affairs Section		1 HQ, 1 HS, 1 Q
Warehouse Section		1 HS, 1 NQ
Security Guard Section		1 HS, 2 Q, 2 NQ
Operation Division	UD	
Sewage Treatment Section		2 HQ, 2 HS, 2 Q
Sludge Treatment Section		1 HQ, 1 HS, 2 Q
Maintenance Division	HQ	
Mechanical Section		2 HS, 2 Q, 2 NQ
Electrical Section		2 HS, 2 Q, 2 NQ
Laboratory	HQ	1 HS, 2 Q
Subtotal	5	35
Total		40



1.4 Staff Positioning

- Positioning of staff at the pumping station and WWTP varies depending on:
  - the size of the city, population density, geography, the size and characteristics of the sewerage system, length of time after commissioning of sewer service, location of the drainage area (e.g., whether or not it is vulnerable to flooding).
- Certain qualification is needed for the staff for O&M of the sewerage facilities.





1.4 Staff Positioning(continued)	
Qualification - title	
Job	
Qualification	
1. Sewerage engineer	
Planning & designing1	Facility in charge
1) Academic Background (1)University graduate Sewerage engineering 7 yrs Others 8 yrs (2) College/Technical institute graduate Civil engineering 10 yrs (3) High school graduate Civil engineering 12 yrs	Pumping and sewage treatment facilities

1.4 Staff Positioning(continued)	
1. Sewerage engineer (continued)	
O&M	Facility in charge
1)Academic background and practical experience: (1)University graduate Sewerage engineering 2 yrs (2) College/Technical institute graduate Civil engineering 5 yrs (3) High school graduate Civil engineering 7 yrs 2)Class 1 & Class 2 Qualified person through national examination and experience 2 yrs 3) Persons qualified by ordinance of the MEPP	Design work of and supervision for construction of sewerage facilities

1.4 Staff Positioning(continued)	
Qualification - title	
Job	
Qualification	
1. Sewerage engineer (continued)	
Planning & designing1	Facility in charge
2) Qualified person through national examination and experience 5 yrs 3) Persons qualified by ordinance of the MEPP	Pumping and sewage treatment facilities

1.4 Staff Positioning(continued)	
3. Safety management personnel	
	Facility in charge
1)Academic background and practical experience: (1)University, technical institute and vocational training college graduate Technical course 3 yrs (3) High school graduate Technical course 5 yrs 2) Consultant on labor safety 3) Other than technical courses as specified by the Ministry of Labor: (1) University/Technical college 5 yrs (2) High school graduate 5 yrs (3) Vocational school Unspecified	Inspection of work places and implementation of safety measures

1.4 Staff Positioning(continued)

5. Fire prevention manager

	D&M		Facility in charge
		Those who are in a management or supervisory position, and have either one of the following items of qualification: (1) Those who are finished with a training course of nominated organization (2) Graduate of university, college or technical institute (disaster prevention course) (3) Manager of a fire department of a municipality	Management and supervision of fire prevention

1.4 Staff Positioning(continued)

6. Dangerous object handler

		Facility in charge
	Those who passed exam for dangerous object handler; Qualification needed for the exam; (1) Academic career University, college and technical institute graduate (chemical engineering course) (2) Licensing by prefectural governor	Handling of dangerous object, or attending the job

2. Public Relations

1) Public Announcement

- The commencement of sewer service and wastewater treatment → publicly announced :
- (1) Date of service commencement
- (2) Service area and the locations of the sewers
- (3) Obligation of residents to connect to the public sewer

2) Treatment of complaints

Complaints on flooding at the occasions of heavy rain; broken lids of manholes or catch basins; collapsed services (connections); etc.

1.4 Staff Positioning(continued)

8. Chief electric engineer

		Facility in charge
	1) Class 1 Chief Electric Engineer (1) Those who passed Class 1 exam (2) University, and licensed school (electric engineering course) graduate having more than 5 years experience with electrical equipment on 50kV power supply (3) Class 2 licensee : >8 years 2) Class 2 licensee (1) Those who passed Class 2 exam (2) University, and licensed school (electric engineering course) graduate having more than 3 years experience with electrical	Security and supervision of All the electrical facilities Security and supervision of All the electrical facilities with less than 170kV electric tension

3. Preparedness against Disasters (continued)

(1) Earthquake

To prevent such situation clogged sewers and damaged swage treatment function, the facilities must be maintained or improved at the normal times so that the suspension of sewerage services be contained to a minimum scale.

(2)Flooding

With a heavy rain, the incoming flow to pumping stations and the WWTP may largely increase, and the water level in the river may become very high. Pumping facilities should be so designed that their functions are not impaired by flooding due to incoming sewage even at the times of heavy rain.

Figure 1.1 An Example of Organization for Emergency Management

3. Preparedness against Disasters

If the function of the sewerage system fails due to a disaster, its socio-economic consequences are grave → preparation for such emergency situation including the establishment of a disaster preparedness system as to the following items:

(1) Training of personnel to cope with predicted type and magnitude of disasters

(2) Emergency communications channels

(3)Anti-disaster equipment and tools and indication of location of store of such tools and equipment

3. Preparedness against Disasters (continued)

(3) Abnormal Sewage Quality

Influent of abnormal quality of sewage to the WWTP may cause disruption to the function of the WWTP → prolonged adverse effect to the receiving water body.

(4) Fire etc.

Fire and explosion may cause failure of the function of the sewerage system to transfer and treat the sewage, resulting in the limitation to receive incoming sewage.

(5) Organization for Emergency Management

Organization and staffing for emergency management may differ depending on the scale and location of the sewerage system and its method of O&M. Figure 1.2 illustrates the general form of organization for emergency management.

II. O&M of Pumping Stations and WWTP

1. O&M Activities

- Maintenance activities are normally performed during daytime. The nighttime activities shall be limited to inspection of running condition of facilities.
- In case the failure of the facility, certain measure shall be taken such as switching to a standby unit so that the restoration or repair work shall be carried out in the daytime of the following day.
- Regular yearly, monthly and weekly maintenance work shall be undertaken based on a work plan. Table 2.1 shows principal items of maintenance jobs.

1. O&M Activities (continued)

Table 2.1 Principal O&M Activities (continued)

Category	Principal Maintenance Activities
2. Mechanical and electrical facilities	(1) Inspection, upkeep and testing of machinery (2) Examination of the function of instruments (3) Refilling and replacement of lubricants (4) Replacement of consumables such as gland packing and electric bulbs (5) Cleaning of drain pipes (6) Repainting (7) Inspection and upkeep of electrical facilities (8) Repair of machinery

1. O&M Activities (continued)

Table 2.1 Principal O&M Activities

Category	Principal Maintenance Activities
1. Land, buildings and structures	(1)Maintenance of buildings, gates, and fences (2)Cleaning of inside and outside of buildings (3)Cleaning of outlet troughs and overflow weirs (4)Horticultural work of the plant premises (planting, pruning and watering) (5)Prevention of odor (6)Leveling survey of water levels in basins and channels
2. Mechanical and electrical facilities	(Next page)

2. Basic Considerations

1) The staff shall have good knowledge of the basic design concept of the facilities he is attending.

(1)The purposes of building the pumping station or WWTP

(2)The locations of the drainage area and the lowest point and their elevation

(3)Ordinary operating water levels of sanitary and storm sewage pumps, ordinary sewage flows, and (in case of the WWTP) ordinary volume of sludge

(4)Characteristics of sewers: allowable time for the pumps to stop in a sunny day and the timing for storm sewer pumps to start

(5)The treatment processes and the roles of each facility

2. Basic Considerations (continued)

2) The staff shall understand the handling and characteristics of principal facilities.

3) The staff shall have general knowledge of mechanical and electrical equipment.

4) Diverse aspects need to be attended in the operation of pumping stations and the WWTP, so the operation must be carried out through mutual coordination of related components.

5) The staff shall understand the basic items of water quality:

(1)Meanings of technical terms of water quality

(2)Water quality items in water analysis performed at the laboratory of the WWTP.

(3)Basic knowledge of water quality control

2. Basic Considerations (continued)

6) The staff shall be prepared how to communicate with offices and personnel concerned in the occasions of major accidents or emergency.

7) The staff shall understand the following measures for work place safety and hygienic protection:

(1) The staff shall have full knowledge of correct procedures of ordinary and hazardous jobs.

(2) How to deal with the case of injury or death, and the method of first aid names of nearby hospitals and their locations

8) The staff shall acquire the following skills and knowledge required for day to day operation:

(1)Methods of operation, inspection and upkeep of facilities and equipment

2. Basic Considerations (continued)

8) The staff shall acquire the following skills and knowledge required for day to day operation

(2)Preparation and management of the job diary, recording of events etc.

(3)Method of reading drawings of buildings, piping, mechanical installations, sequential diagrams and so forth and their maintenance

(4)Logistic control of materials, supplies and consumables

9) The staff shall learn the following common knowledge:

(1)The mechanism of the sewerage system in general and the present status of the system he is attending

2. Basic Considerations (continued)

9) The staff shall learn the following common knowledge:

(2)General knowledge on environmental protection, prevention of pollution etc.

(3)Coordination with other people

(4)How to attend and manage meetings

(5)How to set up and handle jobs

3. Actions against failure of facilities and accidents

1) Failure of facilities

- A grave failure➔ shall be reported to the supervisor in charge of the facility. ➔A standby unit be provided or spare parts be stored if the potential failure of the facility is predicted.

-A contractor or supplier, who can quickly attend the failure, be nominated beforehand.

2) Response to accidents

Many cases of accidents occur due to operator's carelessness. ➔the incumbent staff members should arrange beforehand the method and procedures of the job, and proceed on the job while giving clear signs to each other.

-"When the staff become familiar with the job, they tend to omit confirmation of safety, which may lead to an accident.

3. Actions against failure of facilities and accidents

4) Management of buildings and structures

(1)Cleaning

Various garbage, soil, dirt etc. may be brought in the building from workplaces in the plant. ➔ efforts must be practiced to remove dirt from shoes, clothes etc. when the staff leaves the workplace.

(2)General upkeep of structures

The premises must be kept clean so as to protect staff's health and so as not to give a sense of displeasure to the public or visitors. It is also recommended to plant trees, grow lawns and make a flower garden to provide pleasant environment.

(i)Upkeep of structures and machinery

(ii)Cleaning of structures

3. Actions against failure of facilities and accidents

2) Response to accidents (continued)

The following are cases of accidents in a pumping station or a WWTP:

(1)Electrical accidents

(2)While welding was being done, sparks put oily scum on flame causing fire

(3)Bodily injury

(4)Foreign objects transported to the pumping station and WWTP

(5)Explosion of the sludge digester tank

3) Transfer of facilities (omitted)

4. Management of Pumping Stations

Classification of the procedures for O&M of pumping stations:

(1) ordinary day-to-day operation,

(2) operation at the time of heavy rain, and

(3) measures to be taken in case of pump failure.

The important points of the management of the pumping station are as follows:

(1) Maintenance of the grit chamber

(2) Operation of the influent gates

(3) Operation of the screens

(4) Operation of the grit-removing units

(5) Operation of pump units

(6) Inspection and maintenance of mechanical and electrical facilities

5. Management of the WWTP

The treatment process is largely divided into water treatment and sludge treatment.

1)Outline of Operation and Maintenance (O&M)

The WWTP should be operated while overseeing the conditions of the sewer network, pumping stations, pretreatment installations of factories, and the entire sewerage system.

The both sewage treatment and sludge treatment processes are closely interconnected since inefficient performance of the sewage treatment causes low efficiency in the sludge treatment process; and vice versa.

1) Outline of Operation and Maintenance (O&M)

(1) Management of Sewage Treatment Facilities (continued)

- The quantity and quality of incoming sewage largely change: ←season, weather, hours of the day, weekday or holiday, or the rate of return sewage
- Accordingly→ retention time of the sewage and the loading of BOD etc. change.
- The capacity of the plant is sufficient→ the quality of treated sewage can be safely maintained only by augmenting or reducing the number of pump units in operation.
- It is crucially important not to have too large a change in loading in order to obtain good performance of the plant. →the change in the rate of return water from the sludge treatment facility gives the heaviest impact to the treated sewage quality.

1) Outline of Operation and Maintenance (O&M)

(1) Management of Sewage Treatment Facilities

The representative methods of sewage treatment are the standard activated sludge process and the oxidation ditch.

A tendency of deterioration in treated water quality→ Examine whether the cause of such deterioration is caused by the malfunction of the sewage treatment process or the sludge treatment process.

Inflow of unusual sewage is the cause→ source of such sewage should be identified so that such incidence should not recur.

The sewage treatment plant consists of: pumping stations, preliminary aeration tanks, primary sedimentation basins, aeration tanks, final sedimentation basins, chlorination station, and ancillary facilities.

1) Outline of Operation and Maintenance (O&M)

(2) Management of Sludge Treatment Facilities

- There are various combinations of sludge treatment processes as illustrated in Figure 2.1

Figure 2.1 Combination of Major Treatment processes

1) Outline of Operation and Maintenance (O&M)

(2) Management of Sludge Treatment Facilities (continued)

- The purpose of sludge treatment → to alter the nature of the sludge into one that is easy to handle for final disposal. → the most important to reduce the moisture of sludge
- The sludge thickener condenses the sludge. → The performance of the thickener largely affects the efficiency of the following processes, namely, the sludge digestion and dewatering or drying.
- The deterioration in the quality of supernatant from the thickener will give bad influence to the sewage treatment process in that the sludge component circulates through every step of the treatment train.
- In the sludge digester, the organic components of the sludge are decomposed by methane fermentation so as to reduce the volume of sludge and stabilize its nature.

1) Outline of Operation and Maintenance (O&M)

(2) Management of Sludge Treatment Facilities (continued)

- Quality deterioration in supernatant from the thickener → bad influence to the sewage treatment process → the sludge component circulates through every step of the treatment train. → it is essential to make the strength of the sludge to be introduced to the digester, and keep the quality of thickener supernatant as good as possible.
- The organic components of the sludge are decomposed by methane fermentation → to reduce the volume of sludge;
- Prescribed quantity of methane gas is produced if the concentration of the sludge is high enough, and if the temperature in the tank is controlled within the regular range.
- Once the digester becomes defective, its restoration may take much longer period of time than in the case of sewage treatment.

1) Outline of Operation and Maintenance (O&M)

(2) Management of Sludge Treatment Facilities (continued)

- To make the dewatering of digested sludge easier, the sludge rinsing tank is used for removing alkali and colloidal substances from the sludge. This process also makes sedimentation and separation of sludge easy.
- Since even the rinsed sludge may not still be suitable for dewatering → such coagulants as ferric chloride or slaked lime to lower its resistance to filtration.
- Sludge is then dewatered by vacuum filter, belt-press, centrifuge, filter press or drying bed. → It is very important to make the concentration of the sludge for obtaining high efficiency of the filters and reducing the quantity of coagulants.

1) Outline of Operation and Maintenance (O&M)

(2) Management of Sludge Treatment Facilities (continued)

- The volume of sludge to be generated at the WWTP:

$$\text{Sludge volume} = \text{Sewage flow} \left(\frac{m^3}{day}\right) \times \frac{\left(\frac{SS \text{ of incoming sewage}}{10^6} - \frac{SS \text{ of sewage discharged}}{10^6}\right)\left(\frac{kg}{m^3}\right)}{\left(\frac{100 - \text{moisture}(\%)}{100}\right)}$$

Assume: Incoming sewage flow =100,000 m3/day; SS =200mg/l; and SS of sewage discharged= 20mg/l, the sludge volume(moisture 98%):

$$10^5 \times \left[\frac{200-20}{10^6} \times \frac{100}{100-98}\right] = 900 m^3$$

The quantity of the cake with moisture of 78% (daily average) and quantity of lime at 30% :

$$\frac{900 \times (100-98)}{100-78} \times (1+0.3) = 110\ t$$

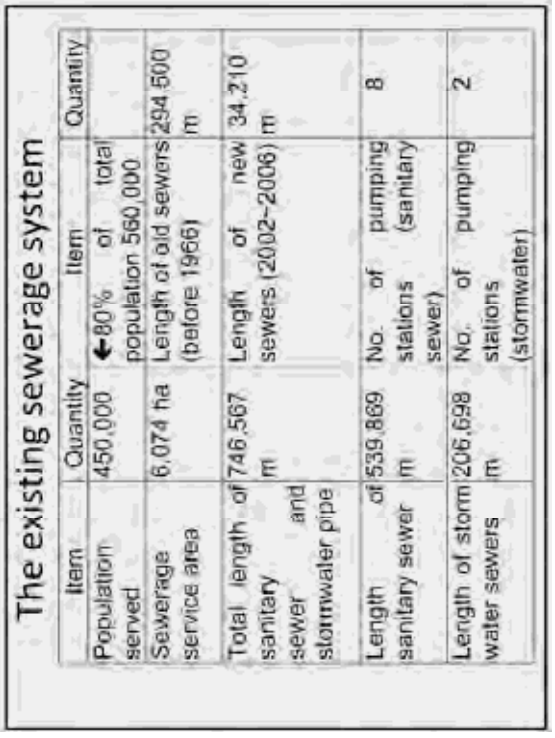
If the sludge is digested → estimate the sludge cake quantity taking into account of the quantity of gases generated in the digester.

1) Outline of Operation and Maintenance (O&M)

(3) Impact of return sewage to the sewage treatment process

The quality as well as quantity of return sewage from the sludge treatment facility➔ significant impact to the sewage treatment process. The return sewage➔ varies depending on the season, nature of the sludge, method of sludge treatment and allowance in capacity the sludge treatment facility has. An example of the circulation of solid and its balances (Figure 2.2):

3.3 Implementation in Financial Operation under the Project



Proposed sewerage system

1. Main collectors:
   Diameter 1,000 – 1,800 mm
   Length 9.3 km
2. Wastewater treatment plant:
   Capacity: 166,000 m3/day
   1) Wastewater treatment facility
   2) Sludge treatment facility
3. Project cost (provisional):
   1) Local cost component: ('000 Euro) 63,778
   2) Foreign exchange component: 34,399
   3) Total: ('000 Euro) 98,177
   4) Total: ('000 MKD) 5,994,000

1. Financial Evaluation

1.1 Aim of financial evaluation

-Financial evaluation of a project = a process to find the profit to be obtained from an investment.

-The newly added facilities, i.e., the main collectors and WWTP can function together with other existing facilities, i.e., sewers and pumping stations.

-Therefore, the operation of the new assets is financially viability insofar as the entire system is financially viable.

Proposed sewerage system

- The new Project assets compared with the existing assets of Vodovod:

1. Financial Evaluation

1.2 Present financial status of Vodovod

-In Skopje about 170,000 homes and numerous businesses are provided with drinking water and sewer services.

-Customers pay the following rates as per the volume of water consumed:

	Household (MKD/m^3)	Business (MKD/m^3)
Water supply	17.25	46.63
Sewerage	12.12	19.17
Total	29.39	65.8

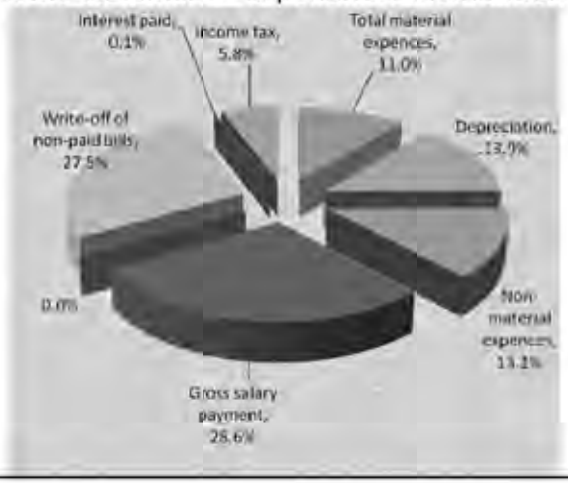
1. Financial Evaluation

2.1 Income statement (2005-2007) ['000MKD]

No	Description	2005	2006	2007
1	Total revenue	**748,943**	**698,718**	**1,219,396**
1.1	Revenue from selling services	681,876	663,448	1,179,577
1.2	Revenue from financing - interest	58,841	29,785	5,781
1.3	Other income	8,226	5,484	34,037
2	Total expences	**887,165**	**871,970**	**986,465**
2.1	Total material expences	108,798	115,394	133,476
2.2	Depreciation	169,805	168,046	168,485
2.3	Non-material expences	161,244	129,955	159,384
2.4	Gross payment of salaries	329,962	339,127	346,955
2.5	Procured value of goods	0	0	0
2.6	Write-off of non-payed bills	116,975	118,699	334,332
2.7	Expences from interest rates	379	784	1,000
3.2	Gross income	-138,222	-173,252	252,931
4	Income tax	0	0	0
3.2	Income after tax (Retained earnings)	**-138,222**	**-173,252**	**252,931**

1. Financial Evaluation

2.1 Income statement – Expenditure distribution



2.1 Balance Sheet – Financial Position (2006)

ASETTS ('000MKD)	2006	EQUITY AND LIABILITIES ('000MKD)	2006
Fixed Assets in Operation	5,886,040		
Minus Accumulated Depreciation	3,417,626	Equity	2,275,074
		Contributions	969,768
Net Fixed Assets	2,468,414	Revaluation surplus	241,430
		Operational Surplus	-121,282
Work in Progress	8,685		
Cash and Bank Deposits	10,410	Total Equity	3,365,990
Accounts Receivables	1,259,400		
Inventories	106,144	Long Term Debt (Net)	0
		Accounts Payables	1,442
Total Current Assets	1,383,718	Prepayment	11,671
		Current Maturities	546,200
Total	**3,862,132**	Total Current Liabilities	559,603
		Short Term Debt	0
		Total Liabilities	559,603
		Total Equity-Liabilities	**3,862,132**

2.1Assets Components – Skopje and Akita City

Asset Item Distribution- Compared (%)		
	Skopje	Akita
Fixed Assets in Operation		
Minus Accumulated Depreciation	38.6	49.2
Work in Progress	0.2	0.2
Net Fixed Assets	64.0	95.2
Cash and Bank Deposits	0.5	3.8
Accounts Receivables	32.7	1.0
Inventories	2.8	0.1
	0.0	0.0
Total Current Assets	36.0	4.8
	0.0	0.0
Total	100.0	100.0

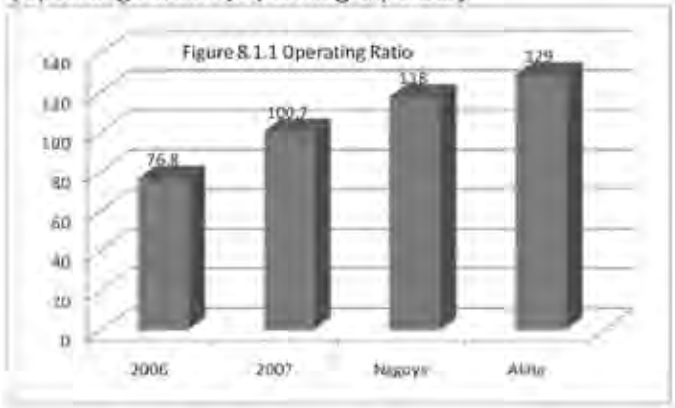
2.1 Equity and Liabilities - Skopje and Akita City

EQUITY AND LIABILITIES (%)		
	Skopje	Akita
Equity	59	57
Contributions	25	0
Revaluation Surplus	6	39
Operational Surplus	-4	1
	0	0
Total Equity	86	97
	0	0
Long Term Debt (Net)	0	2
Accounts Payables	0	1
Prepayment	0	0
Current Maturities	14	0
Total Current Liabilities	14	1
Short Term Debt	0	0
Total Liabilities	14	3
Total Equity-Liabilities	100	100

2.2 Evaluation of Financial Performance

1)Operating ratio (for '06 & '07 compared with Nagoya and Akita)

[Operating revenue/Operating expenses]



2.2 Evaluation of Financial Performance

2) Current ratio ('06 & '07 compared with Nagoya and Akita)

[Operating revenue +Non-operating revenue/Operating expenses +Non-operating expenses]

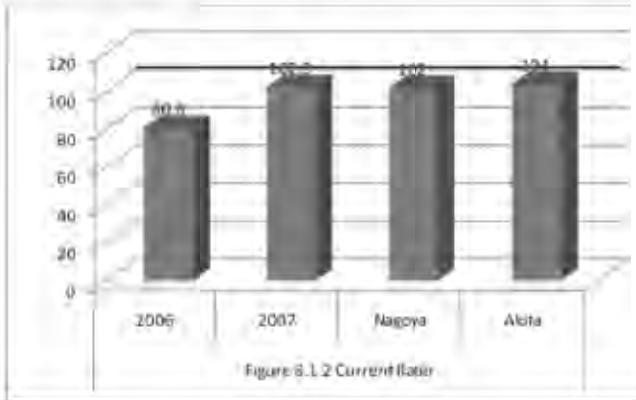


Figure 8.1.2 Current Ratio

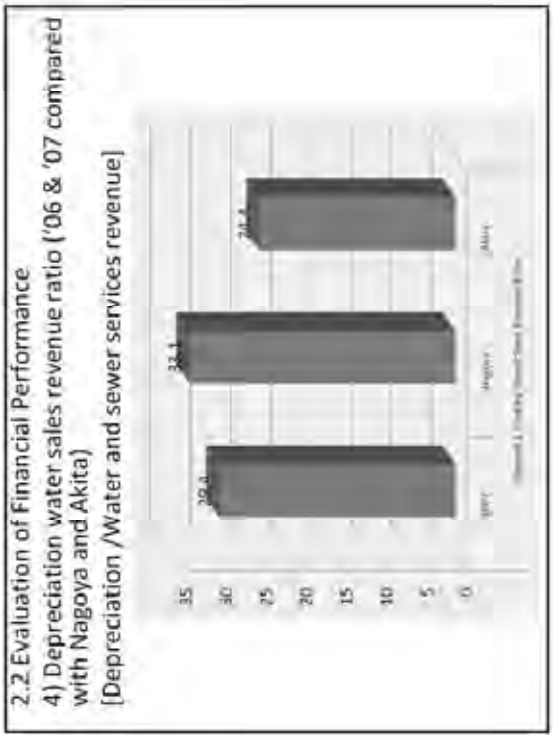
2.2 Evaluation of Financial Performance

3) Salary-water sales revenue ratio ('06 & '07 compared with Nagoya and Akita)

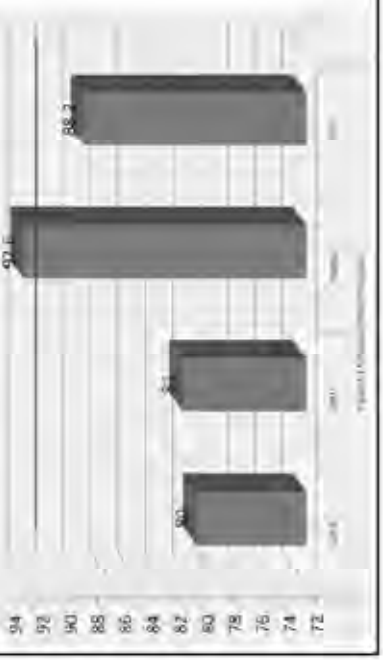
[Salaries and wages/Water and sewer services revenue]

Figure 8.1.3 Salary-Water Sales Revenue Ratio

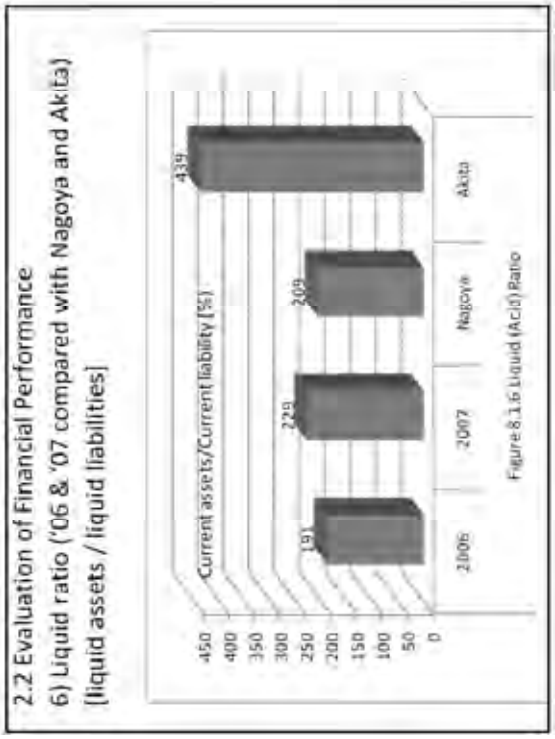
2.2 Evaluation of Financial Performance
4) Depreciation water sales revenue ratio ('06 & '07 compared with Nagoya and Akita)
[Depreciation /Water and sewer services revenue]



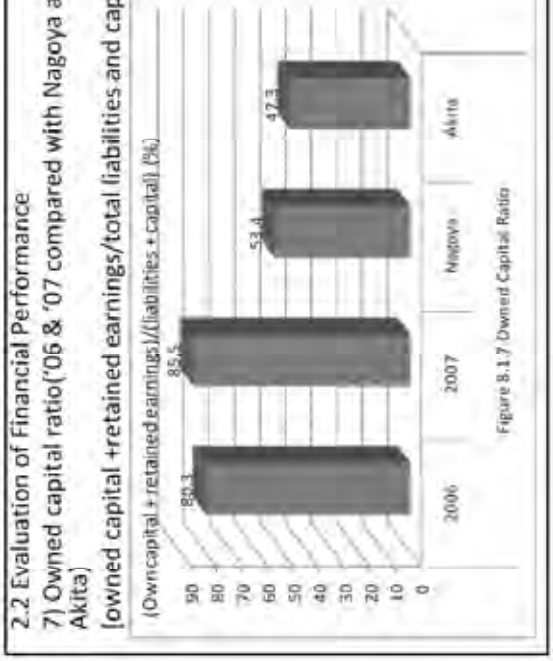
2.2 Evaluation of Financial Performance
5) Revenue water ratio ('06 & '07 compared with Nagoya and Akita)
[Revenue water volume/Total water production volume]



2.2 Evaluation of Financial Performance
6) Liquid ratio ('06 & '07 compared with Nagoya and Akita)
[liquid assets / liquid liabilities]



2.2 Evaluation of Financial Performance
7) Owned capital ratio('06 & '07 compared with Nagoya and Akita)
[owned capital +retained earnings/total liabilities and capital]



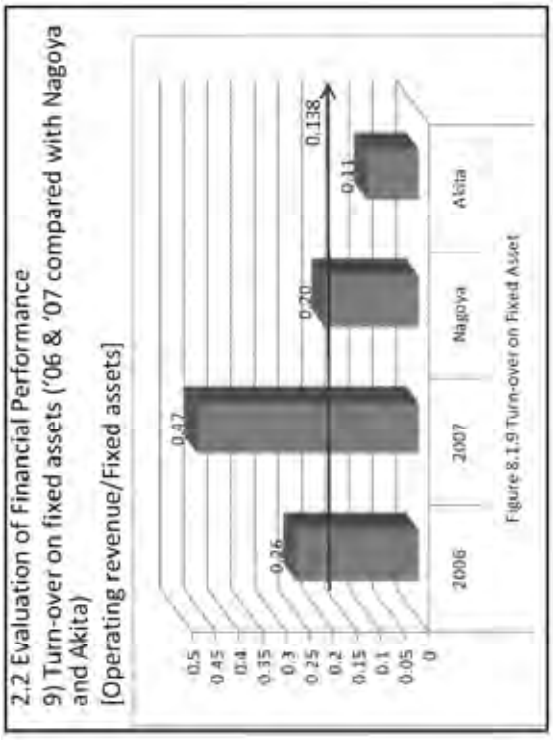
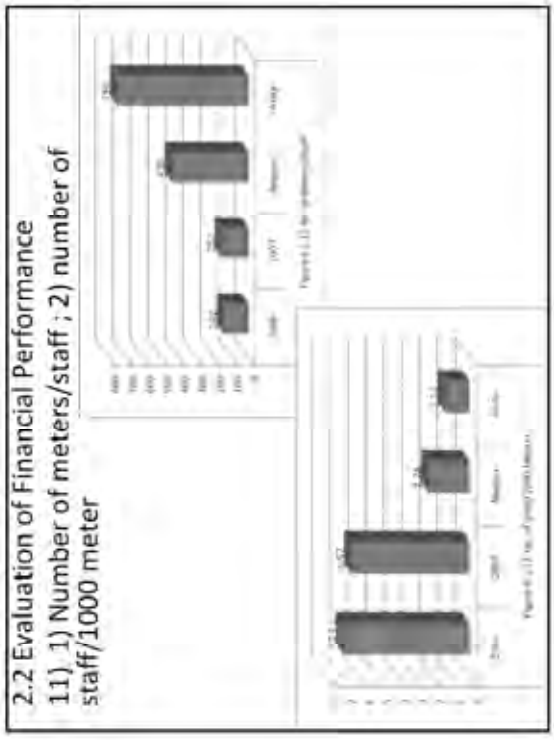


Figure 8.1.9 Turn-over on Fixed Asset



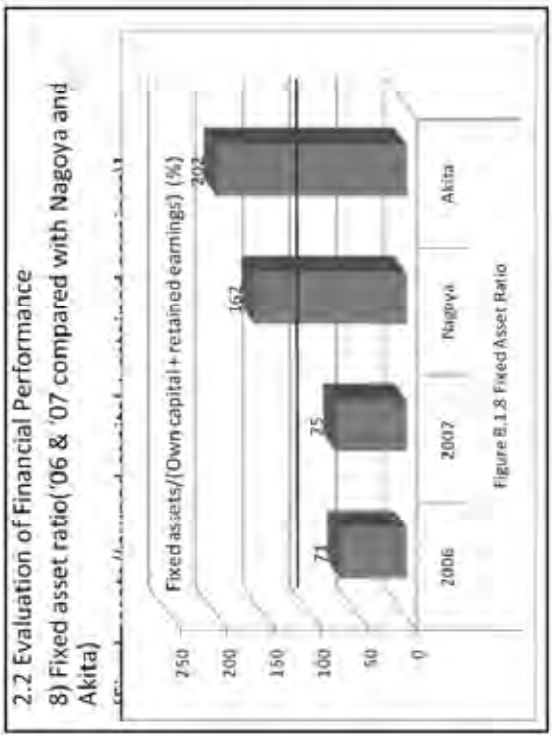


Figure 8.1.8 Fixed Asset Ratio

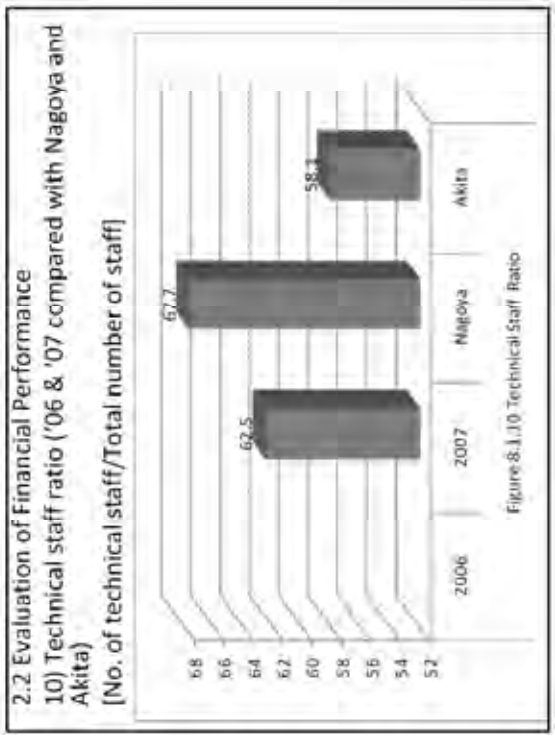


Figure 8.1.10 Technical Staff Ratio

2.3 Improvement in Financial Operation

1) Increase in water and sewer service revenue
   (1) Increase in the number of customers:
      (i) Water supply: now almost 100%; (ii) Sewer: will increase
   (2) Increase in unit consumption per customer: Appliances
   (3) Reduction in uncollectible water bills: ('06: 80%)
   (4) A hike in water and sewer service rates: An issue
2) Reduction in expenses:
   (1) Reduction in energy cost: ('06: 8.4%) → e.g., Increase the pump efficiency.
   (2) Rational procurement of spare parts, etc. (1.3%)
   (3) Outsourcing of security services (0.9%)
   (4) Outsourcing of PR costs (2.8%)
   (5) Reduction in personnel costs : Not easy?
   (6) Partial or entire omission of depreciation

3. Project Financing

2) Fund source
   (a) External fund 1: EU fund (European Investment Bank: EIB)
      Condition: Term: 20 yrs; interest: 4% p.a.; Grace: nil (0yrs)
   (b) External fund 2: Japan Bank for International Cooperation (JBIC)
      Condition: Term: 40 yrs; interest: 0.75% p.a.; Grace: 10yrs
   (c) Instrument for Pre-Accession Assistance (IPA) fund
      Condition: grant
   (d) Government grant

3. Project Financing

1) General
-The new Project will cost about 6,000 million MKD. The Project is expected to be financed by external borrowing/ grant in part and, possibly a government grant in another.
-To meet the additional expenses after the commission of the Project, certain increase in water and sewer service rates may be necessary. Such rate may or may not be sufficient to recover the operating and capital costs of the Project.
-The Project will form an important part of the Vodovod's entire sewerage system. Insofar as the whole system together with the Project is financially viable, the Project is also considered viable.
-Given this, financial evaluation is made for the whole system.

4. Affordability consideration

-It is crucially important to set a new rate which makes the Project financially viable. At the same time, it is mandate for the rate to be affordable to the consumers.

1) Existing water and sewer services rates*

	Household (MKD/m³)	Business (MKD/m³)
Water	17.25	46.63
Sewerage	12.12	19.17
Total	29.39	65.8

*Excluding VAT

4. Affordability consideration

3) Household Income

The above survey shows that the 25-percentile disposable income level was at 8,000 MKD/month and that of the 50-percentile income level was at 16,000/month in Skopje City.

★Unofficial economy and affordability

Official statistics of Macedonia:

-Disposable household income: 267,500 MKD/cap/yr

-Household expenditure: 379,400 MKD (142% of the above)

★ Apparently wealthy life of the Macedonian

★ Poor Japanese in terms of leisure time

4. Affordability consideration

2) Water consumption and charges

According to a social survey under this Study, the water consumption by an average household is approximately 17.5 m3/month; and the by a low income household (HH) (25-percentile income level) is about 8.0 m3/month.

Household Category	Water consumption m^3	Water supply MKD/m^3		Sewerage MKD/m^3		Total MKD
		Rate	Charge	Rate	Charge	
Low income	8	17.25	138	12.12	97	235
Average income	17.5	17.25	302	12.12	212	514

4. Affordability consideration

4) Affordability

-The water and sewerage charges combined of the average income HH is 514 MKD/month, which constitutes 3.2 % of their disposable HH income 16,000 MKD/month. On the other hand the ratio (235MKD/8,000*100) is 2.9% for the low-income HH.

-The maximum affordability to pay for water and sewerage services is considered to be 4% of HH disposable income according to WHO and other international development bank guidelines. According to this:

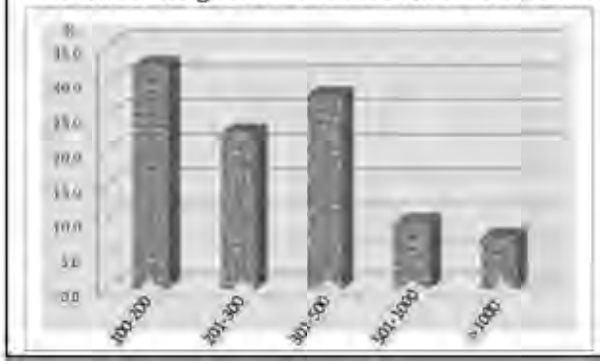
-Affordable rate for the average income group = 640 MKD/mon.; and

-that for the low income group is 320 MKD/mon.

4. Affordability consideration

5) Willingness-to-pay Assessment

-According to the social survey, the willingness-to-pay of consumers in excess of their present payment of sewer services charges for better service is illustrated as follows:



4. Affordability consideration

5) Willingness-to-pay Assessment (continued)

-The average willingness-to-pay (WTP) in excess of their present payment is estimated at 432 MKD per HH. The WTP of low income group (25-percentile) in excess of their present payment is estimated at 220 MKD per household. Accordingly the total WTP is computed as shown below:

Household category	Current payment for water (MKD)	Current payment for sewer services (MKD)	Willingness-to-pay for extra payment for improved sewer services (MKD)	Total (MKD)
Low income	138	97	220	455
Average incon	302	212	432	946

5. Financial Viability of the Project

1) Financial tables: Evaluation tools

-Forecast Income Statement and Cash Flow Statement are used for financial evaluation.

(1) Forecast Income Statement

5. Financial Viability of the Project

1) Financial tables: Evaluation tools (continued)

(2) Forecast Cash Flow

5. Financial Viability of the Project

2) Scenarios for financial analyses

(1) Factor of money source

(a) External fund 1: EU fund (European Investment Bank; EIB)
Condition: Term: 20 yrs; Interest: 4% p.a.; Grace: nil (0yrs)

(b) External fund 2: Japan Bank for International Cooperation (JBIC)
Condition: Term: 40 yrs; Interest: 0.75% p.a.; Grace: 10yrs

(c) Instrument for Pre-Accession Assistance (IPA) fund
Condition: grant

(d) Government grant

(2) Factor of fund combination

(5) Scenarios - 1

Scenario	EIB %	JBIC %	IPA %	Govern-Ment %	Capital Recovery	Rate Hike %
4-1-1	90	0	0	10	100	40
4-1-2	90	0	0	10	100	20
5-1-1	50	50	0	0	100	25
5-1-2	50	50	0	0	50	20
5-2-1	20	80	0	0	100	40
5-2-2	20	80	0	0	100	20
5-3-2	0	80	10	10	100	20
5-3-3	0	80	10	10	50	25

3) Financial analyses

Scenario 4-1-1:
JBIC: 0%
EU: 90%
Gov.:10%
Tariff: +40%
Depreciation: 100%

5. Financial Viability of the Project

2) Scenarios for financial analyses (continued)

(2) Factor of fund combination

(a) EIB fund: 90%, 50% or 0% of the total Project cost
(b) JBIC fund: 80%, 50% or 0%
(c) IPA fund: 10% or 0%
(d) Government fund: 100%, 20%, 10% or 0%

(3) Factor of cost recovery

(a) Operation and maintenance (O&M) costs: 100%
- The Vodovod's present financial position is considered to be not as bad as recovery of less than 100% of O&M is required.
(b) Capital cost (as depreciation): 100% or 50%

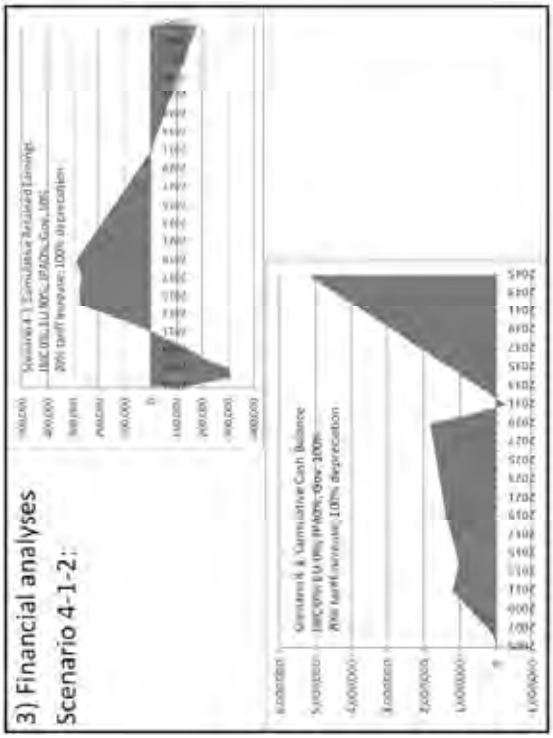
(4) Factor of rate increase

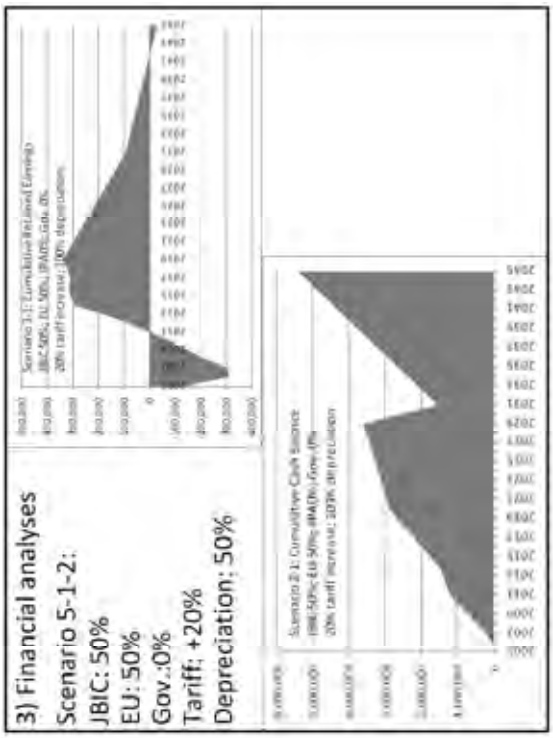
0%, 10%, 20% or 40%

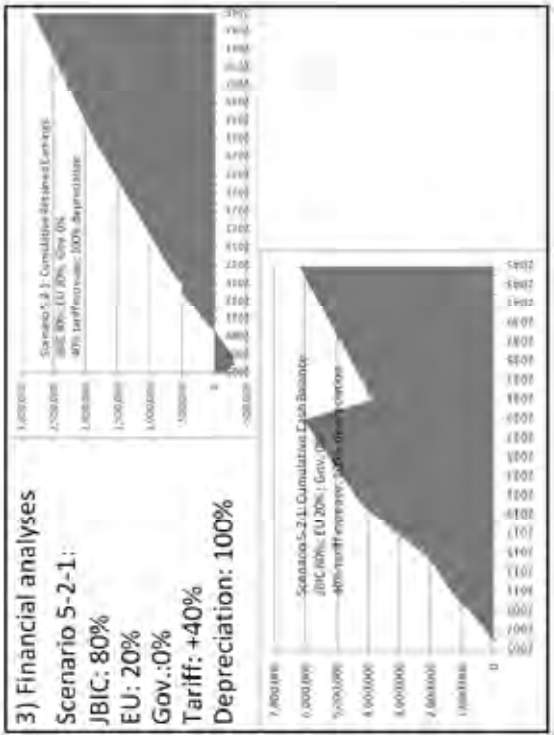
(5) Scenarios - 2

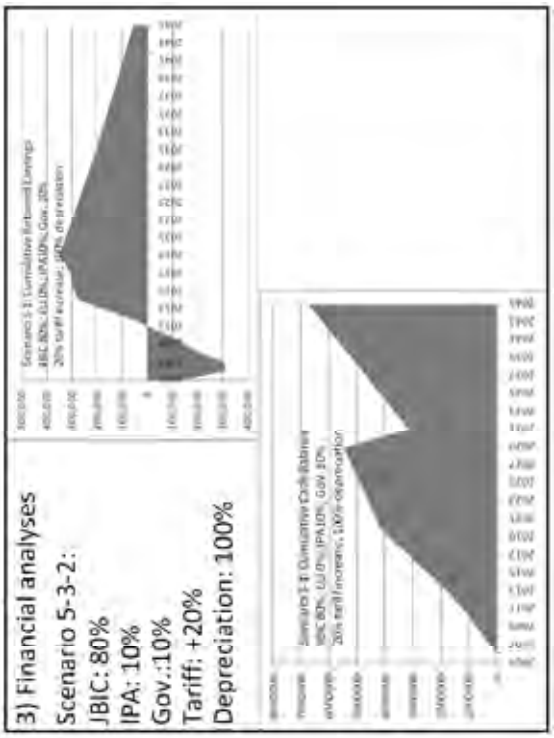
Scenario	EIB %	JBIC %	IPA %	Govern-Ment %	Capital Recovery	Rate Hike %
5-4-1	0	70	10	20	100	20
5-4-2*	0	70	10	20	100	20

*For financial evaluation, a gov. grant assumed for all investments


3) Financial analyses
Scenario 4-1-2:


3) Financial analyses
Scenario 5-1-2:
JBIC: 50%
EU: 50%
Gov.:0%
Tariff: +20%
Depreciation: 50%


3) Financial analyses
Scenario 5-2-1:
JBIC: 80%
EU: 20%
Gov.:0%
Tariff: +40%
Depreciation: 100%


3) Financial analyses
Scenario 5-3-2:
JBIC: 80%
IPA: 10%
Gov.:10%
Tariff: +20%
Depreciation: 100%

3) Financial analyses
Scenario 5-4-1:
JBIC:70%
IPA fund: 10%
Government: 20%
(grant)
Tariff: +20%
Depreciation: 100%

4) Recommended Financing Scenario
JBIC fund: 80% or 70%
IPA fund: 10% or 0%
Government fund: 20% or 10%
Net Present value of total repayment by funding source:

3) Financial analyses
Scenario 5-3-3a:
JBIC: 80%
IPA: 10%
Gov.:10%
Tariff: +25%
Depreciation: 50%

3) Financial analyses
Scenario 5-4-2:
Fund: All Government
grant