Part II/Tulcea: Appendix-4 Design Calculation of Tulcea WWTP

2.3.3 RETURN SLUDGE

Return sludge volume is calculated by the following equation.

Sludge return ratio 50 % Return sludge volume = $43,000 \times 0.5 = 21,500 \text{ m}^3/\text{day}$ = $15 \text{ m}^3/\text{min.}$

2.3.4 GRAVITY SLUDGE THICKENERS

Gravity thickened sludge production volume is calculated by the following equation.

Solids inflow = 2.75 + 2.73 = 5.48 t/dayPrimary sludge Excess sludge Sludge inflow = $137.6 + 304 = 441 \text{ m}^3/day$ Thickened sludge solids = $5.48 \times 0.8 = 4.39 t/day$ Assume solids content to be 3.5 %Thickened sludge volume = $4.39 \times 100 / 3.5 = 125 \text{ m}^3/day$

2.3.5 ANAEROBIC SLUDGE DIGESTERS

Anaerobic digested sludge production volume is calculated by the following equation.

Input solids = 4.39 t/dayInput sludge volume = $125 \text{ m}^3/\text{day}$ Volatile solids content of sludge 70 % Solids destruction rate 50 % Digested sludge collide $7 + 4.39 \times (1 - 0.7 \times 0)$

Digested sludge solids: $\pm 4.39 \times (1 - 0.7 \times 0.5) = 2.85 t/day$ Assume solids concentration is 3.0% and 4.30%Digested sludge volume $= 2.85 \times 100/3.0 = 95 \text{ m}^3/day$

2.3.6 SLUDGE DEWATERING

Dewatered sludge production volume is calculated by the following equation.

Input solids = 2.85 t/dayRecovered solids (90%) = $2.85 \times 0.9 = 2.57 \text{ t/day}$ Assuming solids concentration as 20.0 % Sludge cake volume = $2.57 \times 100 / 20.0 = 13 \text{ m}^3/\text{day}$

2.4 COMPONENT FACILITIES

2.4.1 DESIGN BASIS

Design wastewater inflow rate is determined as follows.

Average daily flow	Qin =	37,000 m ³ /d	an a		;
(Maximum daily flow in v	vinter season)		$\{1,2,1,2\}$		
Maximum daily flow	Qin max	= 43,000	m³/d	and an Attack	

Design wastewater quality :

Influent wastewater quality to reactor tank is calculated as Follows.

BOD	101.5	mg/L	(S-BOD is	69.02 mg/l)	68 %
SS	96	mg/L		t en transformer	(SBOD/BOD)
T-N	21.6	mg/L	1 • • •		

Design discharge wastewater quality :

Design effluent wastewater quality from final sedimentation tank (average quality) Is determined as follows.

		 A subset of a set of the set of	and the second second	
1	BOD	9 mg/L	91.1 %	92.5
	SS	8 mg/L	91.7 %	88
er A B	T-N	10 mg/L	53.7 %	11.6

Removal efficie	ncy

T-N condition of Treated water is	NOT-N	8.3 mg/L	Removal efficiency
	K-N	1.7	(T-N) 60~70%
Design water temperature	10 °c		

2.4.2 DESIGN CALCULATION

(1) Resircuration Ratio(R)

Recircuration ratio (R) is calculated by the following equation.

Influent cond	centration of T-N to	reactor ta	nk CTN i	U
				(effluent water quality from final sedimentation tank)
				Assuming that nitrogen ratio which
concerned at	out nitrification in	CTN in i	is α = 0.7	, recircuration ratio R is
R	$= \alpha \times CTN \cdot in /$	CNOX eff	-1	

 $R = 0.7 \times 21.6 / 8.3 - 1 = 1.82 - 1 = 0.82 - 1$

(2) MLSS Concentration

MLSS concentration is calculated by the following equation.

Assuming that MLSS concentration at reactor tank 3,000 mg/L (2,000~3,000MLSS) and return sludge concentration 9,000 mg/l, so that return sludge ratio R r is

5 - 1 - T.

 $9000 \text{ R r} = 3000 \times (1 + \text{ R r})$

R r = (3,000) / (9,000 - 3,000) = 0.5Recircuration flow Qc and return sludge flow Qr are respectively

(3) A -SRT

Retention time at aerobic tank is calculated by the following equation.

Assuming that complete nitrification, and to consider daily and seasonally change of water quantity and quality, A-SRT(d) is

 $\delta = 1.5$ (Assuming)

Part IVTulcea: Appendix-4 Design Calculation of Tulcea WWTP

T = 10 °c (Assuming) $\theta XA = \delta \times 20.6 \times \exp(-0.0627 \times T) - 0.627$ $= 1.5 \times 20.6 \times 0.534192 = 16.5 \text{ day}$

(4) Aerobic Tank Capacity VA(m³)

Aerobic tank capacity is calculated by the following equation.

VA = $(Q \text{ in} \times \theta XA \times (a \times C_s \cdot BOD \cdot in + b \times SS \cdot in)) / (1 + C \times \theta XA) \times X$ $\theta XA = Aerobic solids retention time$ 16.5 day Gross yield coefficient of dissolved BOD(0.5~0.6) a = 0.55 gMLSS/gS-BOD Dissolved BOD concentration of influent flow Cs-BOD =69.02 mg/L h = Gross yield coefficient of SS (0.9~1.0) 0.95 gMLSS/gSS Autolysis coefficient of sludge (0.025~0.035) с == 0.03 L / day MLSS concentration Х = 3,000 mg/L 37,000 × 16.51 VA ⇒ х 129/4486 = 17.586 m³ $A \times C_s$ -BOD in $b \times SS$ in = 0.55 x 69.02 + 0.95 x 96 = 129 $(1 + c \times 0XA) \times X = (1 + 0.03 \times 16.5) \times$ 3,000 = 4,486

(5) Biological Reaction Tank Capacity V(m³)

Biological reaction tank capacity is calculated by the following equation.

Assuming BOD-SS load(LBOD/x) is 0.06 kgBOD/kgMLSS/day (0.05~0.1) $V = (BOD \cdot in \times Qin) / (LBOD/x \times X)$ $= (101.5 \times 37,000) / (0.06 \times 3,000) = 20,864 \text{ m}^3$

(6) Anoxic Tank Capacity VDN m³

Anoxic tank capacity VDN m3 is calculated by the following equation.

 $VDN = V - VA = 20,864 - 17,586 = 3,278 \text{ m}^3$

(7) Capacity Ratio of Anoxic Tank and Aerobic Tank

VDN: VA = 3,278 : 20,864 = 1 : 6.4

(8) Speed Constant of Denitrification KDN (mgN/g MLSS/h)

Speed constant of denitrification KDN is calculated by the following equation.

 $KDN = (LNOX.DN \times 10^3) / (24 VDN \times X)$ Here COX.A $\alpha \times CTN \cdot in \times 1/(1 + R)$ $(0.7 \times 21.6 \times 1)/(1+1)$ 7.6 mg/L LNOX.DN CNOX.A × (Qr + Qc) $\times 10^{-3}$ \times (18,500 + 18,500) \times 10⁻³ 7.6 👘 280 kg/day KDN $(280 \times 10^3) / (24 \times 3,278 \times 3)$ 1.185 (mgN/gMLSS/h) 0.872 OK Check of denitrification speed Less than(y') is NO $y' = 6.2 \times 0.06 + 0.5 = 0.872$ More than (y') is OK

AII-4-38

Calculate	Vdn =	280	×	10 ³	······································	
back		24 ×	0.872	x x	3	
. <u>L</u>					=	4,455 m
	VD:VA	= 1:3.	.95			
	V	= 4,455	+ 17,58	6 = 22,0	41 m ³	
(0) Dieles	signal Departies	n Tank Ca	anthu and	Detention	Times	
	gical Reaction		•			
Biological rea	ction tank capa	city and rete	ention time is	s calculated b	by the follow	ving equation.
Retentio	n time at biolog	vical reaction	ı tank in win	fer season -t	(h) is	
Kotonno	t = (24)		1)/37,000	= 14.3		
Retentio	n time at aerob			tA(h) is		
	t = (24		6)/37,000			
	n time for daily	maximum f	flow at biolo	gical reaction	n tank in wi	nter season, t(h
IS	1 = (24)	v 22.04	1)/43,000	= 12.31		
	(24	~ 22,01	11)7 40,000	12,51		
(10) Neces	sary Oxygen	Demand	ΣD (kg/d)		 	an e e e e e
	/gen demands i	e calculated	hy consideri	na of avidati	ion of carbo	nie organie
	ary oxygen for					
	activated sludge					
		an a				
OD = Here	OD1 + OD2 +	+ OD3 + OD	4			
OD	Necessary	oxygen der	ands (koO	/day) (AOI	R) .	
OD1				carbonic org	2 L	(kgO2/day)
OD2			endogenous			(kgO ₂ /day)
OD3	Necessary	oxygen for	nitrification	reaction		(kgO₂/day)
OD4	Necessary	oxygen for	maintain a d	issolved oxy	gen	(kgO₂/day)
001-4	(kgO ₃ /kgBOD) v fDama			Donitrifia	ation volume
and the second	(kgN/day) × K			BOD/uay/	- Demunic	ation volume
and the second		- · ·	-	BOD (0.5~	0.7)	
			or denitrifica			
en de la constante. Notas en de la constante						
	3(kgO ₂ /kgMLV					
Here	B: Oxygen	consumption	h by endogen	ious respirati		
ν	A: Reaction	ı tank canac	ity at aerobio	nart	(0.05~	0.137
	rt. iteletio	i tank capao	ny ai acroon	, purt		
OD3 = 0	(kgO ₂ /kgN)	× Nitrificate	d Kj-N volu	me(kgN/đay)	
Here	C: Nitrificat	ed oxygen a	t nitrification	n reaction (4.57)	
Nitrifica	ted Kj-N			ow Kj – N v		
		- (Removal	volume of I	Kj -N by exc	ess sludge)	
OD4 = 0	$0 \times DO$ concent	ration of rea	ction tank			
	DO : Dissolve			at end point of	of aerobic ta	nk 1.5me/L
						· · · · · · · · · · · · · · · · · · ·
				7,000 m³/day		



All-4-39

Part II/Tulcea: Appendix-4 Design Calculation of Tulcea WWTP

BODout = 9 mg/L, VA = $17,586 \text{ m}^3$

The results of calculation is shown in table below.

		unit	note
Necessary oxygen	(I) Q	m³/day 37,0	00
demands for oxidation	(2) BODin	mg/L 101	1.5
of BOD	(3) BODout	mg/L	9 Sector 1
(OD1) 	(4) {(2)-(3)}×(1)×10 ⁻³	kg/day 3,4	23
	(5) ADN (denitrification	kg/day 2	80
	volume)		
	(6) k × (5)	kg/day 8	00 k = 2.86
	$OD1 = A \times [(4) - (6)]$	kg/day	57 A = 0.06
Necessary oxygen			
demands for endogenous	(1) MLSS	mg/1. 3,0	00
respiration (OD2)	(2) VA	m ³	86
	(3) (1) × (2) × 10^{-3}	kg/day 52,7	58
and a state of the second state	$OD2 = B \times (3)$	kg/day 5,2	76 B = 0.1
Necessary oxygen	(1) α (nitrification ratio)		2.7
demands for nitrification	(2) T-N·in	mg/L 21	.6
reaction	(3) Q = 1 (4)	m³/day 37,0	00
(OD3)			
	OD3=4.57×(1)×(2)×(3)	kg/day 2,5	57 C= 4.57
	×10 ⁻³		
Noossa			
Necessary oxygen demands for maintain	(1) DO concentration at reaction tank	mg/L	.5
dissolved oxygen (OD4)		m³/day 37,0	00
		m ³ /day 55,5	
	(3) Qr + Qc		
	OD4 = (1)×(4)×10 ⁻³	kg/day 1	39
		annaiche Annaiche an Airtean àirtean àirtean an Airtean Airtean àirtean àirtean àirtean àirtean àirtean àirtean	t Alexandro de la
Necessary oxygen (OD)	OD= OD1+OD2+OD3+OD4	kg/day 8,1	29
demands		0.2	20 Q

Design of air diffuser (Assuming that diffused air aeration, fine bubble, spiral flow) EA = 7.5, $\rho = 1.293$ Qw = 0.233 (Assuming)

Supplied air $(N m^3/day) =$

 $\{0\} \in \mathbb{N}\}$

(Necessary oxygen demands(kgO₂)) / EA(%) × 10^{-2} × ρ (Air/Nm³) × Ow(kgO₂/kgAir) = (0.220 × Q) / (7.5 × 0.01 × 1.293 × 0.233) = 9.72 Q = 359,748 (N m³/day) = 250 (Nm³/min)

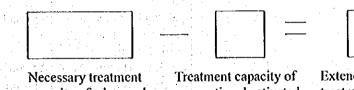
2.4.3 MEASURE FOR ADVANCED TREATMENT

Way of thinking

Changing from conventional activated sludge process to advanced treatment process (T-N,T-P removal).

Calculate a necessary treatment capacity of advanced treatment process and evaluate a capacity of conventional activated sludge process.

Extend a necessary ponds and equipment in the future.



capacity of advanced treatment process Treatment capacity of conventional activated sludge process

مايا أو موجد مايا أو مايا الأم مايات أو الحر

AII-4-41

÷1.

Extend or remodeling of treatment about shortage of capacity

1.744

Explanation of measures for advanced treatment

Here showing a treatment capacity of two processes in table below.

* Conventional activated sludge process

North Contracts

ing in and

and failed at

* Advanced treatment process(Recircuration process)



. . . .

na tanà amin'ny kaodim-positra dia mampiasa dia mampiasa dia mampiasa dia mampiasa dia mampiasa dia mampiasa di	unit	Necessary	Facility and equipment f	
		advanced	Conventional activated	
		capacity	sludge process	shortage of capacity
• Primary sedimentation				
tank surface load	m³/m²/day	35	35	_
Facility shape	entrale de la composition de la composition de		¢25m × 4 tanks	
•Reaction tank				e el el el el el trade de la
	hour	12.3	12.3	12.3 A A
Distribution ratio of	%	5 A. 185	6.3/12.3×100= 51	100 - 51 = 49
water	· · ·			Build an extend tank
			reaction	
			tank, and divided an	for reaction tank
		1 . · · · ·	anoxic zone and	
D			aerobic zone	
Facility shape	1.1		W5.5m × H5.5m	W5.5m × H5.5m
			× L49m × 8 tanks	× L46m × 8 tanks
Final sedimentation		a state est	and a start of the start s	
tank surface load	m³/m²/day	15	9.0	12.3
	· · ·		a the second	
				New ponds
Facility shape		an taite a set	¢30m × 4 tanks	¢25m × 4 tanks
•Return studge flow	%	Usually	Same to the left	Same to the left
		50%	an an an an an Arra Ar	
		(Sludge		(New pumps are
	a gara	pump		N
	}	capacity 100%)		Necessary)
•Recircuration flow of	%		Provide a recircuration	Same to the left
•Recircuration flow of nitrificated water	70	30%	1	Same to the left
murnicateo water			pumps at the outflow	
			point of reaction tank(aerobic tank)	
+ Supplied al- Asu	m ³ /min	250	-	203
•Supplied air flow		230	227	A set of the set of
				Extend capacity
- Warda ala J	t/day	5.48	8.04	Not no coord
• Waste sludge volume	Julay	5.48		Not necessary a
(Inflow sludge solids			(Sludge products from	extend of capacity
of thickener)			Conventional activated	
(exclude T-P removal)		- 787	studge process)	
(include T-P removal)		6.26		Not necessary a
				extend of capacity
• T-P removal by		New	Same to the left	Same to the left
addition		equipment		
of coagulant	1 1 1	is necessary	L Contraction of the second	I set a s

Explanation of Measures for Advanced Treatment

Waste sludge volume produced from T-P removal

Waste sludge production volume by addition of coagulant

Influent T-P concentration of reaction tank 4.14 mg/L

Additional concentration of aluminum sulfate CA(mg/L) is calculated by following

equation

CAL	=	Csp•in × 1	n×AL/P	
	Her	-		
		Csp∙in	Influent dissolved T-N concent	ration(mg/l) 4.14
		P	Valence of phosphorus	31
		AL	Valence of aluminum	27
		m	Additional molality ratio	1 (assuming)
CAL	=	(4.14 × 2	27×1 / (31) = 3.6 mg/L	

Assuming that waste sludge production volume by addition of coagulant is 5 times as additional aluminum volume.

Waste sludge production volume by addition of coagulant

 $QD \times 5 \times CAL \times 10^{-6}$ =

 $= 43,000 \times 5 \times 3.6 \times 10^{-6} = 0.78 \text{ t/day}$ Waste sludge production volume in case of removal of T-N and T-P simultaneously

5.48 + 0.78 = 6.26 t/day=

APPENDIX-5CONSTRUCTION PLAN AND COST ESTIMATE

1. CONSTRUCTION PLAN

1.1 GENERAL

Construction works for the project includes earthwork, concrete work, pipe work, mechanical/electrical work, architectural work and miscellaneous work. These works, in general, will be executed by ordinary construction methods using construction equipment readily available in Tulcea. Major works are planned to be carried out with mechanical equipment for smooth and economical performance.

Construction site for the proposed facilities are located in the eastern part of Tulcca City. There would be no difficulty to transport materials and equipment because the area has adequately provided road networks. There is neither difficulty in obtaining water nor electricity for construction.

1.2 CONSTRUCTION METHOD

Major construction works are construction of WWTP, installation of wastewater pumps and installation of sewer pipes and manholes.

1.2.1 CONSTRUCTION OF WWTP

The major construction works of WWTP are construction of primary and final sedimentation tank, aeration tank, influent and discharge pumping station, sludge treatment facilities and administration building.

No special construction method will be applied for the construction of WWTP except placing of Pre-stressed concrete for sludge digester tank. Since there are many experiences to construct pre-stressed concrete structure by Romanian contractors, there would not be any difficulty to construct this kind of structures.

1.2.2 INSTALLATION OF WASTEWATER PUMPS

Wastewater pumps will be installed at the former stormwater pumping station, which is not used for the original purpose and their pumps have already be removed. The work is only installation of new wastewater pumps. Therefore no special construction works/methods would be required.

1.2.3 INSTALLATION OF SEWER PIPES

Open trench method would be adopted for installation of scwcr pipes, because earth covering depth for sewer pipes are less than three meters.

1.3 CONSTRUCTION SCHEDULE

1.3.1 WORKING DAYS

Annual working days are estimated to be 225 days based on the following assumptions:

에는 것 같은 것 같은 것은 것은 것이 있는 것이 있는 것이 가지 않는 것이 있다. 것 같은 것 같은 것 같은 것이 있는 것이 없는 것이 있는 것이 없는 것이 있는 것이 없는 것이 없이 없는 것이 없는 것이 없는 것이 없는 것 것이 없는 것이 없이 없이 없이 없이 없이 없이 없이 없다. 것이 없는 것이 있는 것이 없는 것이 없이 않이	영상회사 동안에 가지 않는 것은 것을 위해 가는 것이 같아요. 것은 것이 있는 것이 없다.
Winter season idle period:	3 month (from Dec.15 to Mar. 15)
Workable period:	275 days

Sundays in workable period:	9 month x 4 days = 36 days
National holidays in workable period:	1 day
Rainy days in workable period:	10 days
	(more than 10 mm/day, ave. last 5 years)
Total work suspension days in workable period:	47 days

275 days - 47 days = 228 days : 225 days

Working days:

1.3.2 WORK TIME

All construction works will be done during day time in principle. The working time is eight (8) hours per day

1.3.3 REQUIRED CONSTRUCTION PERIOD AND SEQUENCE OF WORKS

Required construction periods are estimated based on the construction volume and the above mentioned working days and work time assumptions by each construction works/structures by ordinary scale of inputs. The sequence of works is decided as follows by relationship between construction period and provision of project efficiency. Construction plan for the Tulcea project is presented in the Figure All.5.1.

Figure All.5.1 Construction plan and sequence of works for the Tulcea project

	1 - E - E - E - E - E - E - E - E - E -		· · · · ·	and the state of the second
	Period (Year)	1 2001	2 2002	3 2003 ,
Wastowator Troatmont Plant Wastowater Troatmont Process	2.5	TREESALS	NYENDERFER	NJAN
Sludge Treatment Process	1.5	na na Chiao Chail Anns Chiao Chia	ana an	ALE M
Discharge Pumping Station	1.5		EXEC	NAMESON
Power Receiving Facility		an an an Arran		A ABELLITE
Administration Building	$\mathcal{O}_{i_1}(1) = 0$		*	BROBIES
Interceptor	1 1 1			ines inst

COST ESTIMATE 2.

2.1 BASIS OF COST ESTIMATE

The project cost consists of I) construction cost, II) equipment cost, III) engineering service cost, IV) government administration cost and V) physical contingency as shown in Table All.5.1. The project cost is estimated under the following conditions. 化物理 化成合合物 化自动自动相比多余分子

- All base costs are expressed under the economic conditions that prevailed in June 1999.
- The exchange rates of currencies are US\$1 = ROL15,756 = ¥122.

Only equipment cost is classified into foreign and local currency portions and their rate is FC : LC = 70% : 30%, because all construction works are done by local products and equipment.

Engineering service cost is including all services for detailed design, tendering assistance and construction supervision. The cost is assumed at 10% of the construction cost.

Government administration cost is costs that should be prepared by government and/or executing agency (e.g. cost for personnel and organization for the project management, cost for commission for external loan, etc.). The cost is assumed at 2 % of the construction

cost.

Physical contingency allowance is assumed to be 10% of the total of construction, equipment, engineering service and government administration cost.

Price escalation is not counted.

	Item	Remarks
I	Construction Cost	
Î H	Engineering Service Cost	10% of (1)
Ш	Government Administration Cost	2% of (l)
ÍV	Contingency	10% of (I+1I+1II)
v	Project Cost	1+11+111+1V

Table All.5.1 Structure of Project Cost

2.2 CONSTRUCTION COST

The construction cost consists of 1) mobilization and demobilization cost, 2) cost for preparatory works, 3) cost for main works, and 4) cost for miscellaneous works as shown in *Table AII.5.2.*

2.2.1 MOBILIZATION AND DEMOBILIZATION COST

Mobilization and demobilization cost is assumed at five (8) percent of the cost for main works.

2.2.2 PREPARATORY WORKS

Cost for preparatory works is assumed at five (5) percent of the cost for main works.

2.2.3 COST FOR MAIN WORKS

The direct cost for main works (cost for civil work, mechanical/electrical equipment cost, mechanical/electrical equipment installation cost, and construction cost for administration building) will be estimated based on the results of preliminary engineering design. Indirect costs such as site expenses and overhead and profit are estimated by percentage.

The site expense is estimated to be ten (10) percent of the direct cost of main works.

The overhead and profit are estimated to be ten (10) percent of the direct cost of main works.

The cost for the miscellaneous works is estimated to be ten (10) percent of the cost for main works.

Table All.5.2 Structure of Construction Cost

	Item	Remarks
1	Construction Cost	Total of I-1 to I-6
1-1	Mobilization and demobilization	5 % of 1-3
1-2	Preparatory works	5 % of I-3
1-3	Direct Cost for Main works	Total of 1-3-1 to 1-3-4
1-3-1	Civil work	
1-3-2	Mechanical/electrical equipment	
I-3-3	Mechanical/electrical equipment installation	
1-3-4	Administration building	
1-4	Miscellaneous works	10 % of I-3
I-5	Site expenses	10 % of I-3
1-6	Overhead and profit	10 % of 1-3



(1) Cost for Civil and Architectural Work

enter de la sec

 $(n_{1},p_{2}) \in \mathcal{A}$

The cost for civil and architectural work is estimated by multiplying the quantity of works by unit construction costs. The unit construction costs are estimated by unit prices of labor, construction materials and equipment.

The unit prices of personnel, material and equipment operation are estimated based on prevailing market prices referring the data collected from MPWTP and other organizations concerned. The Unit prices that are used in the study, are shown in *Tables All.5.3* to *All.5.5*.

Table All.5.3	Unit Costs of Personnel					
n an	lei/month	lei/day				
Engineer	3,500,000	140,000				
Foreman	2,600,000	104,000				
Skilled Labor	2,200,000	88,000				
Common Labor	1,600,000	64,000				
Technician	2,200,000	88,000				
Equipment Operater	2,000,000	80,000				
Driver	1,800,000	72,000				
Administrator/Clark	3,000,000	120,000				

server all the construction of the construction of the many section of the construction of

在我们也可能到了这时,我们就是这些人的问题,我们还是这些人的。

all and and all a grant and an a share all

أحكف والمحاور أبوا يراطع والمحروفية

et als supervised and the second second

8.43

lahayaa tala dheta

1.14

이는 것 같은 것

la este da Nationales

动脉的 的复数动物动物 多叉的

化合物性化合物性化合物性的

ina aku National

que que la

So Cr As tao	ushed stone sphalt ck coat		Unit m3 m3 m3 ton	Price (Lei) 100,000 100,000 200,000 800,000	
So Cr As tao	il ushed stone sphalt ck coat		m3 m3	100,000 200,000	
As tao	ushed stone sphalt ck coat		m3	200,000	
tao	ck coat		ton	800,000	and the second second
p۷			. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	15,000	
	einforcing bar		ton	5,000,000	e se dat i tal
W	ooden material		m3	700,000	1997 - 1997 - 1997 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -
Re	ady mix concrete	B50 B200	m3	500,000 700,000	
		B250		900,000	an An tailteach an an tailteachda
R	Сріре	Dia200 mm		100,000	and the second
· · · ·	an a	Dia300 mm Dia400 mm		150,000 175,000	
		Dia500 mm Dia600 mm		215,000 250,000	
· . · · ·		Diacou min		350,000	244-4
- galanda		Dia800 mm		450,000	
i i i i i i i i i i i i i i i i i i i		Dia1000 mi Dia1500 mi		2,000,000	
		Dia1650 mi		2,350,000	
Č1		Dia2000 m		3,500,000	
an a		Dia2200 m Dia2800 m		4,500,000 7,000,000	
1. 2.3		Dia3400 m		12,000,000	
St	eel Pipe	Dia400 mm	ı	500,000	

11.51 0.4 Hatanal

Table All.5.5 Unit Price of Equipment Operation

and provide a strand state of

	One i nee of Equipment Operation						
 Item	Price	(Lei/day)					
Dunp Truck Truck	10t (1997) 10t (1997)	800,000 800,000					
 Concrete Transporter Concrete Pumping Car		1,200,000 1,200,000					
Bulldozer Backhoe	11t 0.6m3	1,200,000 1,000,000					
Crawler Crane Truck Crane	20t 20t	1,800,000 1,800,000					
Pile Dirving Machine		2,500,000					
Tire Roller Vibration Roller Compactor		800,000 400,000 200,000					

Υ.

1.

1.1.1

N,

and an an and had the set of the bar had the

a state and the second second second

(2) Cost for Mechanical/Electrical Equipment and Installation

Since there are no published standard market price list for mechanical/electrical equipment for wastewater treatment, the cost for mechanical/electrical equipment will be obtained from manufacturer that have experience in Romania and/or neighboring countries based on the specifications resulting from preliminary engineering design.

The appropriate cost decided based on the obtained quotation would be used for the mechanical/electrical equipment cost for the project.

(3) Direct Cost for Main Works

The direct cost for main works are estimated for WWTP and interceptor separately as shown in *Table AII.5.6* and *AII.5.7*

2.3 PROJECT COST

Estimated total project cost is about ROL 321,054 million, and its breakdown is shown in *Table All.5.8.* Of the total project cost, ROL 107,265 million or 33% is foreign currency portion, and remaining ROL 213,789 million or 67% is local currency portion.

Iten	• • • • • • • • • • • • • • • • • • •	Cost	FC	LC
nen	1.4 Mar (* 1	(million Lei)	(million Lei)	(million Lei)
I ·	Construction Cost	260,596	94,235	166,361
	Mobilization and Demobilization	9,307	0	9,307
	Preparatory Works	9,307	0	9,307
	Main Works	186,140	94,235	91,905
	Wastewater Treatment Plant		93,238	88,135
	Wastewater Treatment Process	92,805	46,392	46,413
	Sludge Treatment Process	62,486	35,045	27,441
	Discharge Pumping Station	20,015	11,426	8,589
	Power Receiving Facility	2,565	0	2,565
	Administration Building	3,502	375	3,127
	Interceptor	4,768	998	3,770
	Miscellaneous Works	18,614	0	18,614
	Site Expenses	18,614	0	18,614
	Overhead and Profit	18,614	0	18,614
П	Engineering Service Cost	26,060	13,030	13,030
ĦI	Government Administration Cost	5,212	0	5,212
IV	Contingency	29,187	0	29,187
V -	Project Cost	321,054	107,265	213,789

Table All.5.8 Project Cost (Tulcea Project)

(unit: million lei)

2.4 OPERATION AND MAINTENANCE (O/M) COST

Major portions of O/M cost of the WWTP are electric power charge for the equipment and cost for personnel. The O/M cost for the Tulcea project is estimated at ROL 3,820 million as

All-5-6

Item	unit	unit price	Q'ty	Total
Personnel	lei/month/person (average)	2,000,000	40	960
Electricity	lei/kwh	500	449	1,938
Chemical	lei/kg	5,000	342,000	171
Excess Sludge D	Disposal m ³	20,000	7,000	140
Repairing	0.5% of Mechan	ical cost	52,660	263
ohters	10% of above			347
Total	n an	· · ·		3,820
	······································			(unit: million lei

following Table All.5.9.

3 IMPLEMENTATION SCHEDULE

3.1 IMPLEMENTATION SCHEDULE

The project will be completed within four (4) years from 2000. Pre-construction stage of one (1) year is assumed for the detailed design period and tender process followed by three (3) years' construction works.

Proposed implementation schedule is presented in Figure All.5.2.

Figure All.5.2 Implementation Schedule (Tulcea Project)

an an an tha an	et al set a tra	t i k	1 A		1999 - T. F. S.
	Period Year	2000	2 2001	3 2002	4 2003
Detailed Design	1	<u>Zajadiri</u> y			
Construction Wastewater Treatment Plant			BRANKS	ikai seri karak	STATE AND A
Wastewater Treatment Process	2.5	-	MANDEN)	<u>INARAS</u>	1070U
Studge Treatment Process	1.5			STATES AND	desia
Discharge Pumping Station	1.5			FOSI Z	DKASIMSKAJ
Power Receiving Facility	1,11				M 10 M 10
Administration Building	1				NNEL
Inte <i>r</i> ceptor	1				adsead

3.2 DISBURSEMENT SCHEDULE

Proposed annual cost disbursement schedule of the Tulcea project for entire project life is shown in *Table AII.5.10*.

AII-5-7

	Item		Unit	Quantity	Unit Price (Lei)	Amount (million Lei)	FC (million Lei)	LC (miltion Lei
	stewater Treatment Pro				n la se Sector de la sector		$\frac{1}{2} \left(\frac{1}{2} + \frac{1}{2} \right) = \frac{1}{2} \left(\frac{1}{2} + \frac{1}{2} \right)$	
	Preliminary Treatment	Process	· .			· ·	. :	
(1)) Civil Work		. yan				e egite de la constante	
	1) Earth Work		· · ·					
	Excavation		m3	4,889	5,000	24	0	2
	Backfill	 Model and the second sec	m 3	683	22,000	15		1
	Removal of Soil		m3 .	4,206	28,000	118	0	- 11
	2) RC Concrete		11.1			·		
	RC Concrete 1	Floorborad	_ m3	941	1,543,000	1,452	0	1,45
	RC Concrete II	Wall	m3	504	1,771,000	893	0	- 89
	3) Pile Work (ave.L=1	Om, incl. driving work)	pcs	144	4,810,000	693	0	69
(2)) Mechanical				the second			· · · · ·
	1) Equipment		ls	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	12,658,400,000	12,658	8,861	3,79
	2) Installation		.: %	15		1,899	0	1.89
(4)) Electorical	유지 문제 이 가지 않는 것이 있는 것이 없다.	ls	i	61,528,200	62	0	6
1-2	2 Secondary Treatment	Process				1. A. A.		
(1)	Civil Work			1	and the state	1997 - Alexandria († 1967) 1997 - Alexandria († 1967) 1997 - Alexandria († 1967)	di se	
	1) Earth Work		1 A.		e de la composición d			
	Excavation		m3	50,351	5.000	252	0	25
	Backfill		: m3	16,976	22,000	373		
	Removal of Soil	 March 1997 March 1997	m3	27,375	28,000	767		76
	2) RC Concreta			21,010	20,000		v	10
	RC Concrete I	Floorborad		3,004	1,543,000	4,635	0	4,63
•	RC Concrete II	Wall	m3	2,899	1,771,000	5,134	0	5,13
		Orn, incl. driving work)		2,099	4.810.000	48		
10) Architectural Work	orn, arec. orreang worky	pcs			1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A 1 A	the second s	
) Mechanical		m2	234	4,000,000	. 936	U	93
્રાઝ	• • • • • • • • • • • • • • • • • • • •					64 400		45.45
	1) Equipment		ls	1	51,180,000,000	51,180		15,35
	2) Installaiton	the second second second	* X *	15		7,677	0	
) Electorical		ls	1	304,328,400	304	0	30
	3 Final Treatment Proce	355						
(1)) Civil Work		· · · ·	e da la la la com	ej talo jak	te transference		
	1) Earth Work		1	a and the street.				
	Excavation		m3	6,526	5,000	33	0	. 3
	Backfill	and the second second	3	3,235	22,000	71	0	7
	Removal of Soil			1,130	28,000	32	Ó	3
	2) RC Concrete	シング 手 つきくさい いたい	$(\sigma_{i}, \sigma_{i}, \sigma_{i}) \in [0, \infty)$		1. N. A.	an a		
	RC Concrete I	Floorborad	m3	95	1,543,000	147	0	14
	RC Concrete II	Wall	m3	134	1,771,000	237	0	23
(2) Architectural Work		m2	90		360		36
(3) Mechanical							
	1) Equipment		ls	1	2,436,000,000	2,436	1.705	73
	2) Installation		× 1	15		365		
(4) Electorical		İs	1	4,474,800	4		
	, 2.000001000	우리 소리는 말을 들어.	13		-,		strati d	
12.	udge Treatment Process							e produktione
	·					in an		and the second
2-	1 Civil Work 1) Earth Work							
	Excavation		ويس	10 10	E 444			
	Backfill		m3 .	13,195				
			m3 	9,985				
	Removal of Soil		m3	3,210	28,000	OÈ	0	Ş
	2) RC Concrete	D . 1	~				يحذوب وركرون	1. 1. <u>1. 1.</u>
	RC Concrete 1	Floorborad	m3	476				
	RC Concrete II	Wall	. m3 .	112				
	3) PC Concrete	Sludge digestion tank	m3	592				
		10m, incl. driving work)	pcs	22				
	2 Architectural Work		m2	240	4,000,000	960	• 0	96
	A 14 1 1 1 1		an an Articla An Articla Antonia	and share they				1.11.11
	3 Mechanical		ls	1	50,064,000,000	50,064	35,045	15,01
	1) Equipment	a dhuais faithertair				7,510		
2-	1) Equipment 2) Installaiton	n de la Sasa de Carlos Nacional de Carlos de	5 X	15				
2-	1) Equipment			15 1		756	: Ó	75
2-	1) Equipment 2) Installaiton		5 % ;			756	Ċ	75
2	1) Equipment 2) Installaiton		5 % ;			756	i Ó	75
2- 2- 3 Dis	1) Equipment 2) Installaiton 4 Electorical		5 % ;			756	i O	75
2- 2- 3 Dis	1) Equipment 2) Installaiton 4 Electorical scharge Pumping Station 1 Civil Work		5 % ;			756	i C	75
2- 2- 3 Dis	1) Equipment 2) Installaiton 4 Electorical scharge Pumping Station 1 Civil Work 1) Earth Work		* Is	1	755,647,200			
2- 2- 3 Dis	1) Equipment 2) Installaiton 4 Electorical scharge Pumping Station 1 Givil Work 1) Earth Work Excavation		% Is m3	1 1,079	755,647,200	រ	; 0	
2- 2- 3 Dis	1) Equipment 2) Installaiton 4 Electorical scharge Pumping Station 1 Civil Work 1) Earth Work Excavation Backfill		% Is m3 m3	1 1,079 781	755,647,200 5,000 22,000	5 17	0 0	
2- 2- Di:	 Equipment Installaiton Installaiton Electorical scharge Pumping Station Givil Work Earth Work Excavation Backfill Embankment 		% Is m3	1 1,079	755,647,200 5,000 22,000	5 17	0 0	
2- 2- 3 Dis	1) Equipment 2) Installaiton 4 Electorical scharge Pumping Station 1 Civil Work 1) Earth Work Excavation Backfill	Floorborad	% Is m3 m3	1 1,079 781	755,647,200 5,000 22,000 22,000	5 17 7		

Table All.5.6 Direct Construction Cost of WWTP (Tulcea)



	ltem	Unit	· .	Quantity	Unit Price (Lei)	Amount (million Lei)	FC (million Lei) (r	LC million Lei)
	RC Concrete II Wall	m3		201	1,771,000	356		0	356
	Pile Work (ave L=10m, incl. driving work)	pcs		18	4,810,000	87		0	87
	3-2 Architectural Work	m2		116	4,000,000	464	. 4	0	464
	3-3 Mechanical			2 × 4	at the second	÷	a ta a	-	
	1) Equipment	ls		1	16,322,400,000	16,322	11,42	6	4,897
	2) Installaiton	5		15		2,448	an ar t	0	2,448
	3-4 Electorical	ls		· 1	174,808	0	19 T. I.	0	0
	3-5 Discharge Sewer dia 800 mm, EC=4m	m		150	1,703,000	255	1 - 1 - I	0	255
4	Power Receiving Facility	ts		1	2,565,334,200	2,565		Ó	2,565
5	Administration Building							· .	·
	5-1 Architectural Work	an the second			÷.			1.11	
	1) Architectural Work	m2		600	4,000,000	2,400		0	2,400
	Pile Work (ave L=10m, incl. driving work)	pcs	1	25	4,810,000	120		0 1	- 120
	5-2 Labo, and Office Equipment							•	1.
	1) Labo. and Office Equipment	ls		1	750,000,000	750	37	5	375
	2) Installaiton	5	÷	0	1.5.5	0	· · · ·	0.	. (
	5-3 Electorical	ls		1	231,600,000	232	· · · ·	0	232
	TOTAL		1			181,372	93,23	8	88,135

6

Table All.5.6 Direct Construction Cost of WWTP (Tulcea)

140,438

	item		Unit		Quantity	Unit Price (Lei)	Amount (million Lei)	FC (million Lei)	LC (million Lei
ł	Pipe, Manhole and CSO	· · · · · · · · · · · · · · · · · · ·		·				·	
-1	Installation of interceptor pipe (F	(C nine)							
	1) RC pipe 200 mm	earth coverage 1 to 3 m	m		20	805,000	16.1	0	- ² 1
	2) RC pipe 200 mm (replace)	earth coverage 1 to 3 m	m		10	1,207,500	12.1	ŏ	
	3) RC pipe 400 mm	earth coverage 1 to 3 m	. m	. *	193	989,000	190.9	õ	19
	4) RC pipe 600 mm	earth coverage 1 to 3 m	ភា	· · .	12	1,225,000	14.7	0	- 1
	5) RC pipe 600 mm (replace)	earth coverage 1 to 3 m	m	÷.	75	1,837,500	137.8	. 0	14 T (C 18
	6) RC pipe 1000 mm	earth coverage 1 to 3 m	m		600	2,087,000	1,252.2	0	1,2
-2	Installation of interceptor pipe (S	iteel pipe, pressured)					· · · ·		The second
÷.	1) Steel pipe 400 mm	earth coverage 1 to 2 m	m		285	1,398,000	398.4	0	3
•	Installation of Manhole and recei								i an se
••	1) Manhole dia 500	ARIS COLOR	place			6,211,000	e 9		
	2) Manhote dia 600		place	Ξ.		6,873,000	6.2 6.9		
	3) Receiving Tank	· · · · · · · · · · · · · · · · · · ·	place			22,416,000	22.4		
			piace		•	22,110,000	22.7	· · · · · ·	14.4
-4	Installation of Valve	en ante de la companya de la company La companya de la comp	•		and the second sec			· · · · · · · · · · · · · · · · · · ·	
	1) Installation of Valve	dia 1000 mm	· place		5	200,000,000	1,000.0	0	1.0
						÷		· · · · ·	
									1.1
2	Pumping Station					11 J. A. 19			
÷	1		1. J. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.				1910 - A		
- 1	Installation of wastewater pump 1) Pump	Q=0.15m/s, H=30m			· · ·	110 000 000	1 1000		· · · · ·
	2) Installation	Q-0.19m/5, N-30m	pcs		3	475,000,000	1,425.0		. 4
	er matallation	e de la companya de l	7		. 20		285.0	0	2
	Total						4,767.7	997.5	3,770
							- 7,777.7	431.3	⇒, //Ų

Table All.5.7 Direct Construction Cost of Interceptor (Tulcea)

3 692

6

6

•				
			. ¹ .	
		1		
			4	
_				
ß	9		÷	
100	I			÷



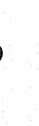


Table All.5.10 Disbursement Schedule of Tulcea Project

		Total	ج	2 S	6	4	S		7 8	6 8	10	11 0	12	. 23	- 14	31	16	n.	18	9	R	21 2	ី ភ	23 24	33	38	22	58	29	8	
Develor Owelon Construction	20 20 20 20 20 20 20 20 20 20 20 20 20 2		13.000 6.515 6.515	2242 10	0 15 0 42242 100,453 114,001										· · ·																
Mobilization and Demobilization Wartoweter Treatment Plent Construction		6.307			•	192							•			•				1				1. 							
Record and the second s	<u>.</u> 	200728	-	27.041 J 9.278 J 18.565 J		282 282 282					•									• •					. •		•				
Sludge Treatment Process	ទីខ្លួន;	82.48 35.045		000	23,976	32,510 22,363 8,147									· · · ·											•					
Discriming Fundant Station	ទីទីត	20,015 11,426 8,589		000		0.480 7.617 2.860			÷ .	<i>n</i> .		• •		•																÷	
Power Reserving Facility	ទ្ធីតីក	2,565	÷	00 0	000	ន្លឹន			•			•	•					<i>.</i>													
Administration Building	ទីទួក	3,502		000	 00c	375		•																							
Interceptor Construction	a de c	105 1996 177	•	000	000	28		•					•								-										
Other Costs	រទ្ធិតខ	85, 149 86, 149		9,745 2	26,621 26 0 26,621 26	26,583	te. At		· · ·						•															ан 1917 - Ал	
Construction Supervision	រិ្ទនទ	13,030 8,515 8,515		4.340 2,172 2,172	4.345.4 2,172 2,172 2,172 2,172	2,172	-					÷.,	÷.,					1													
Government Administration Contingency		5,212 29,187	1,303	845 2.069 4.740 10,987	2,069 2	2,206				•		. '								-											
O/M Cont	30 G	374,316 279,000 95,316					3,666 3, 3,666 3,	3,066 3, 3,666 3,	3,660 3,6 3,666 3,6	3,566 3,666 3,666 3,666	06 3,066 3,666	66 3,666 06 3,666	00 90,666 91,000 93,666		3,665 - 3,665 3,665 - 3,666	5 3,606 5 3,606	3,066	3,666 3,666	3,666	3,006 f	96,866 93,000 3,655	1,066 1,066 1,066 1,066	3,666 3, 3,666 3,	3,646 3,6 3,646 3,6	3,666 3,666 3,666 3,666	xe 3,666 X6 3,666	6 2,666 5 3,666	96,606 93,000 3,666	3,666	3,666	
Total Distrument FC LC		695,370 386,265 309,105	14,333 5 6,515 1 7,818 4	52,173,12 11,450 3 40,723 8	52,173 120,852 133,696 11,450 36,219 53,081 40,723 84,633 80,615		ย์ 9991ย 0.091ย	3,666 2, 0 3,665 2,	3,606 3,6 0 3,666 3,6	3,666 3,666 0 0 3,666 3,666	999'C 999 0 0'C 999	66 2,966 2,666 2,666	66 96,846 0 93,000 66 3,566	800 1.000 1.000 1.000	8 2,000 2,000 2,000	2000 1,000 1,000 1,000	3,966 3,666 3,666	3,606 3,606	3,666	3,066 5 3,066 5 3,666 5	96,666 93,000 3,666	3,666 3,666 3,666 3,666 3,	3,866 3, 3,666 3,	3,666 3,6 0 3,666 3,6	3,666 3,666 0 0 0 3,666 3,666	56 2,666 56 3,666 56 3,666	6 3,666 5 3,666	96,904 93,000 3,866	3,666 666 633,1	3,666	

APPENDIX-6 FINANCIAL AND ECONOMIC ANALYSIS

1 FINANCIAL ANALYSIS

1.1 MAJOR PRECONDITIONS AND ASSUMPTIONS

Following preconditions and assumptions were applied in the financial plan.

- The financial plan deals with only the cost and the revenue accrued by the project.
- Currency unit is ROL and the value of ROL is expressed as the June 1999 prices.
- Projection period is 30 years since the start of project implementation.
- Target year is 2010. From 2010 on the values of variables related to revenues and O & M cost are assumed to keep the 2010 level.
- Implementation period is 4 years from 2000 to 2003.
- 38 % of profit before tax is levied as a corporate tax.

Depreciation period is assumed as follows.

Depreciation Period

Item	Mechanical equipment	Civil works and sewer pipes
Depreciation period	8 years	40 years

1.2 TERMS AND CONDITIONS OF EXTERNAL FINANCIAL SOURCES

Conditions of possible external financial sources are assumed as shown in the table below.

Financial Organs	Financing Ratio (%)	Loan/Grant	Interest Rate (%)	Repayment Period (Years)	Grace Period (Years)
JBIC	70	Loan	2.7	30	10
EBRD	70	Loan	6.5	15	3
ISPA	75	Grant	-		

Assumed Financing Terms for Possible External Financial Sources

It should be noted that they are nothing other than an example or assumption. In the case of EBRD, financing ratio depends on the circumstances and interest rate fluctuates in parallel with LIBOR (London Inter-bank Offered Rate).

1.3 BACKGROUND DATA FOR FINANCIAL PLAN

1.3.1 SERVED POPULATION

Based on the planning basis for WWTP facility plan, the numbers of served population and served household were estimated as follows.

Part All/Tulcea: Appendix-6 Financial and Economic Analysis

					· · · · · · · · · · · ·			
Year	2004	2005	2006	2007	2008	2009	2010	from 2011
Served population	71,000	71,333	71,667	72,000	72,333	72,667	73,000	73,000
Served household	22,188	22,292	22,396	22,500	22,604	22,708	22,813	22,813

Number of Served Population and Household

1.3.2 QUANTITY OF WASTEWATER

Based on the planning basis for WWTP facility plan, the estimated quantities of domestic and non-domestic wastewater are as follows.

wart in a first and		da a a	end in a	ak si i			nit : 1,000 r	n ³ /year)
Year	2001	2005	2006	2007	2008	2009	2010	from 2011
Domestic	5,682	5,895	6,111	6,328	6,547	6,767	6,990	6,990
Non-domestic	4,711	4,832	4,953	5,075	5,198	5,322	5,446	5,446

Quantity of Domestic and Non-domestic Wastewater

112 - 111

The coefficient b, the ratio of non-domestic sewerage charge to domestic one, was estimated 2.20 based on the values in 1998 and 1999.

1.3.3 HOUSEHOLD INCOME

The average monthly household income was estimated at ROL 2,088,267 in 1999 based on the result of the people's awareness survey conducted in this study. It was assumed to grow 3 % per year until 2010, and to remain the level of 2010 whereafter. The annual household income was calculated by multiplying the monthly value with 12.

The estimated average annual household income is as follows.

Average Annual Household Income

		,	the states			(Unit : 1,	000 ROL/y	ear)
Year	2004	2005	2006	2007	2008	2009	2010	from 2011
Annual Household Income	29,050	29,922	30,820	31,744	32,697	33,677	34,688	34,688

1.3.4 COLLECTION RATE

The charge collection rate was assumed to linearly increase from 81.4 % in 1999 to 95% in 2010, then remain 95% ever since.

table is the interacting of the second state is a left state of the second state is the interaction is the second state is the collection rate of sewerage charge was estimated as follows. The collection rate of sewerage charge was estimated as follows.

	1.1.1	-	- A - A - A - A - A - A - A - A - A - A		
Sew	erade	Chara	e Col	lection	Rate

5 () () ()

Year	2004	2005	2006	2007	2008	2009	2010	from 2011
Collection Rate	87.6 %	88.8 %	90.1 %	91.3 %	92.5 %	93.8 %	95.0 %	95.0 %

1.4 FINANCIAL STATEMENTS FOR PROPOSED FINANCIAL PLANS

The financial statements for the proposed financial plans are shown in *Tables All.6.1 to All.6.4*. The structure of applied financial statements is as follows.

S.C. ACET S.A. account	
Revenue	Α
Operation and maintenance cost	В
Lease fee	C all the design of the second the
Profit before tax	$\mathbf{D} = \mathbf{A} - \mathbf{B} - \mathbf{C}$
Corporate tax	$\mathbf{E} = \mathbf{D} \times 0.38$
Profit after tax	$\mathbf{F} = \mathbf{D} - \mathbf{E}$
Working capital	G = F
Cumulative working capital	$\mathbf{H} = \boldsymbol{\Sigma} \mathbf{G}$
City's sewerage service account	
Revenue from lease fee	I=C
Depreciation	J
Payment of interest	K and a sub-
Profit	$\mathbf{L} = \mathbf{I} - \mathbf{J} - \mathbf{K}$
Loan	M
Subsidy from general budget	\mathbf{N} , where \mathbf{N} is the second
Depreciation	$\mathbf{O} = \mathbf{I}$
Sources	$\mathbf{P} = \mathbf{L} + \mathbf{M} + \mathbf{N} + \mathbf{O}$
Investment cost	Q
Payment of principal	\mathbf{R} and \mathbf{R} is the set of
Applications	S = Q + R
Working capital	$\mathbf{T} = \mathbf{P} - \mathbf{S}$
Cumulative working capital	$U = \Sigma T$
City's general account	<u></u>
City general revenue	V
Corporate tax from S.C. ACET S.A.	W = E
Revenue from lease fee	X = 1
Total current revenue	Y = V + W + X
Subsidy	Z = N
Subsidy ratio	AA = Z/Y
Repayment ratio	AB = (K + R)/Y

Structure of Applied Financial Statements

It is noted that leveled allocation of lease fee was applied for EBRD cases, taking into consideration of quite intense repayment schedule for relative short period under EBRD conditions.

2 ECONOMIC ANALYSIS

Based on the economic benefit of the project estimated by the people's awareness survey conducted in this study and the project cost, an economic analysis was conducted.

Applied preconditions and assumptions are as follows:

- Currency unit is ROL and the value of ROL is a constant one expressed at the June 1999 prices.
- Project Life: 30 years since the start of project implementation.
 - Target Year: 2010. From 2010 on the values of O & M cost variables are assumed to keep the 2010 level.

Part All/Tulcea: Appendix-6 Financial and Economic Analysis

- Implementation Period: 4 years 2000 to 2003.
- OCC (Opportunity Cost of Capital): 10%.
- Conversion factor: 98.4% to capital cost (initial and replacement cost) taking account of customs duty for foreign components.

The cost benefit stream of the project, which calculates the EIRR (Economic Internal Rate of Return), NPV (Net Present Value), and B/C (Ratio of Benefit to Cost), is shown in *Table AII.6.5*.

Obtained EIRR, NPV, and B/C are as below:

NPV (ROL 1,000,000)	B/C	EIRR (%)
9,523	1.03	(et alle per 12.5

Results of the sensitivity analysis are as shown below:

Conditions	EIRR (%)	NPV (million Lei)	B/C
Cost: +20%	NA	- 57,906	0.86
Cost: +10%, Benefits: -10%	NA	- 58,859	0.84
Benefits: -20%	NA	- 59,811	0.82

a bi bad na shekirin tarihin yakat yakat ka sa kula na kula na kula sa bishili na kula na kula na kula na kula Makatika ya babiya ka sana anarkish a na babih ya kula na kata na kula
1

r sprove staat fan de restaan staan ster sjeren slie de seener slie de seener seener. Bereke skriver staat stere een stere staat staat de stere stere stere stere stere stere stere stere stere ster De stere s

Table All.6.1 Financial Statements of Tulcea Financial Plan (Case IB3)

1 Classical States	C U	A CET C A	A (million						•	-	-			•					1		-	:		•			
1. FINANCIAL OTATOMONTS OF					2000	1007	1000	2009	2010	2011	2012	16 6100	014 20	15 201	107 9	107 1	100	2020	2021	202	2023	\$602	2022	2026	12 1 200	11 2	2
Revenue (A)	Н		H	~		5 29.20	0 30,425	C1716 0					2,623 32		23 32.6	23 32.62	3 32,62				32.623				Ł		666
Operation and maintanance (B).		*. •	14 083	66 3.666 89 14 089		3,660 3,550 3,555 3,555	6 3,00 9 14,085	14 089	3,000	14,089		14,089 14	14 089 14	14,089 14,089	000 3,000 089 14,089	89 14 089	14,089	14 089	14,089	14 089	14,089	14 OR9	14,089	14 089	14,080 14	14.085	14,080
	and the A. T. M. Make Communication	And we had not been added as	States March		16 23.07	fet - 23.07.	10.62 14	28,026	2	23.076	23,076 2		30/61-22	333 -10.630	30 13.3	11-34	9 643		÷.		. 6430		11			1	
Profit before tax (D = A-B-C) Comments (C = 0.28 ± D)			00		49 10 270	70 11.445 01 4.349	5 12.674	13,960	15,298	14,808	14,868	14,868 14	14,868 14	14,868 14,868	50 14,868	68 14,868 50 5,550	14,868 50 5,650	5,650	14,868	14.868	14,868	14,868	14.868 5.650	14,868	14,868 14	14,868	14,868
Profit after tex (F = D - E)	· • • • • • • • • • • • • • • • • • • •		5.0						- I					- 1	- 1	- 1		-		9219	9.28	- I'	- F*	1	- 11	0 274 11	
÷			5.0	3,067 6,544 5,004 10,677										2 S	.628 70.278 .446 114.664	78 75.928 64 123.882		- 1	151.536	150,754	169,972	1 061.671	1.0,408	197,626 20	206,844 21	216,062 22	280
2. Tulcea City Sewerage	erage Accoun	Account (million ROL)	, ROL				1.			÷									- 7					ł			[
	2000 2001	2002 200	03 2004	к 2005	5 2006	1001 3	2008	2000	2010	1100	2012 2	2013 20	02 \$100	2015 2016	02 9.	1 2018	2019	2020	2021	2022	702.1	2024	2025	2026	/20/		100
Revenue from lease fee	0	0	0 14,089	080 14,089	89 14,089	39 14,089	9 14 089			14,089		-	4,039 14,							14.089	- 1				- 1		14,089
Depreciation (J)	0 C	00	0 12.878 768 3.010	12,878		78 12,878	8 12,678	3 12,878		12,878		7.639	5.972 4	4 198 2.4	12,878 12,8 2,404 B	2	78 12,878 0 0	-	12,878		₽ (0 R/8'71	2,878	12.8/8 1		0
Protic (L = I-J-K) Loan (M)	36,521	8			28 -15.56 0	56 -14,49.	4 -13.35	2 -12,136		1	- 266.1-		-4,761 -2		0 365 265	12	171 1	0 1,211	0	1.2.1	1121	121	121	121	10	121	0
Subsidy from oity/atate budget (N)	15.652	36.256 40.	40.109 5.6									22				45 -1,211	11211-11	1 -1 211		-1.211	-1211	-1.211	-1,211	-1.211	- 11211	-1.211 -	-1,211
Depresiation (0 = 1)	10		<u> </u>	. 1				_		12,878	12,878 1	12 878 12	12,878 12	12 878 12 878 40 480 34 955	12,878			-1-	12,878 12,878			12. R7A					12,878
Nourons (P = L+M=N+U) Investment cost (Q)	14,333 52,173 1	120,852 133,696	1.	1				1					1			0	0 93,000	0			0	0	0 (.	1000'25	0 (00
Payment of principal (R)	0					-		_	21 222		24,071 2	25 635 27	302	6	23,977 13,010	200	01000				_ L _		00	0	00016	<u>, o</u>	0
Montang capital of the year		20,852 1.14,094				1	1	+-		+		1	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,								L	1 :				a7a ¢1	
. ¹ .	•	۲ ۵	-1,485 12,878	878 12,878	578 12,878	78 12,879	70 12,678	8 12,878	12,878	-80.122	12,878	12.878		1.1		·	•		·	2					•		
C = F D	0	1	-1.485 51.303	303 24.271	27.1 37.140	40 50.027	27 62.905	5 75.784	88.062	A.540	21,115	34,266	47.175 60	50,053 72.1	72.001 85.800	909 98,687	11.565	1.44	44.22	57.200	70,078	62,956	95,834	108,713	102.82	41 469	1
3. Criteria for State Guarantee (million RO	s Guarantee (million 5	(TO)	:	1.		-	- - -	-			•			:		:			•							. [
; L	2000 2001	2002 20	ÌЦ	ч	н	11		L		1102				Ц	LL	1 2018		Ш.		2022	2002	1074	2022	2026	07/	HC07	2020
Concerts tax from S.C.	57,835 59,570	61,357 33.	93,198 65,094		47 69,058	58 71,130	13,264	4 75,462		77.725				·	<u>.</u>		`	<u> </u>	`	-	•	3				•	
ACET S.A (WHE)	0 7 7 7	•	02	3.067 3.477	77 3.903	03 4,349	19 4,816	5,305	5,813	5,650	5,650	5,650	5,650 5	5,650 5,6	5,650 5,6	5,650 5,650	50 5.650	0 5,650	5,650	5,650.	5,650	5,650	5,650				2.630
Kevenue mom lease teo (XHI)	0		0 14,089	080 14,080	89 14,089	89 14,089	14,089	14,069	14,089	14,089	14,089	14,089 14	14,089 14	14,089 14,0	14,089 14,089	14,089	89 14,089	9 14,089	14,089	14,089	14,089	14,083	14,089	14,089	14,089 1	14,089 1	14,089
Total ourrent revenue (Y=V+W+X)	57,835 59,570		~		·			_	5		÷ .		97,464 97	97,464 27,464	464 97,464	64 97,464	54 97,464	4 97,464	97,464	97,464	97,464	97.464	97,464	97,464	97,464 9	97,464 9	97,464
Subsidy (ZeleK+R-M) Content for subsidu level	0	0	1,485 5.0	5.682 18,207	07 32,063	631 32,063	32,063	3 32,063	32,063	32 063	32,063 3			122 776.05	_ L						ľ						
WZ)	000 000	100	2 4%	691 21	21.5% 36.8%	AV 35. N	14.84	V 33.RV	32.8 K	32.94	32.9%	32.9%	35.06 3	31.4N 25.	AV 13	7	7 7 X	ステス	7	K T	K T	K T	X T	2	K T	K T	K T
Criteria for State Guarantee ((K+R)/Y)	0.00	0.04	2.4%	*	22.9% 38.2%	37.1%	36,15	35.15	34.15	34.1%	34.15	34.1%	34.14 3	32.6N 27	27.1% 14.	14.24	0.0% 0.0%	00	0.0	00	60	00	800	00	х о	6	80
Parameter Input Section	ction					- Eno	ulative V	Cumulative Warking Ca	aoital									Criteria f	for the St	State Gua	Guarantee	-					
Hatto of Sewerage Charge to	NCY	250,000	Ļ								ſ	· · ·		50.U%	L												
Coverage to Interest (%)	50.0X	200 000	- 2								\			10.004													
Coverage to depreciation (%)	50.0%			-	-				ł	K.	L			, , , ,	 ?		L	ł		1							
A windiand or waterenor		150,000	8	· · · · · · · · · · · · · · · · · · ·				h				t l	(ACET)	30.0%	<u> </u> %												
Averaged profit. rate	27.3%	100.000	2							5				. 6			-		•	~	•				<u> </u>		
Averaged criteria values for	100 DC		·			1		t	X	1		N HOS	Cum. W.C.	70°0%	. 8										1		
guarantee	80.02	50,000			X		X		λ		\mathbf{x}	3	2	10.0%	 %						-		}				
Highest subsidy ratio	36.8%	: : :	: :	X	S	7		×														- 		-		-	

°. ò. ÷. 0 ting. 000 81.J. 10. 102 eros

0102 ъ. Đ, *а*. cost. (10) (10)

0.0%

÷0. 202

and the set of the set of the set

1.94. 1.14

10° 0° 10°

-50.000 ¢

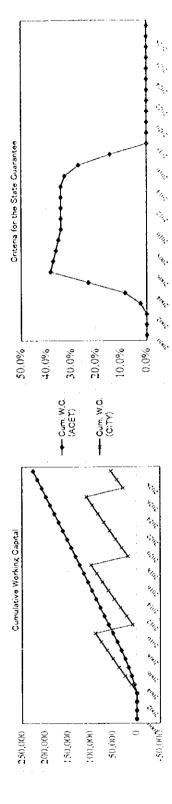
AII-6-5

Table	. ACET S.A. (millior	Year 2000 2001 2002 2004	12H GZ	Operation and maintenance (B) 3.000 3. 000 3	Date 0.685		* (E = D.38 * D) 3,067	5 004	Working capital (G = F) 3.067 5. Cumulative WC (H = 2 G) 10.	2 Tulcea City Sewerage Account (million ROI)	3	Kavenue from lease tee A 0 0 0 14 000 14	0 0 0 12,8/H	66627- 887- 10 10	Coan (M) 10.003 36.521 84.596 93.587 0	late 1,300 15,652 36,256 40,109 5,682	8/8/10 10 10 10 10 10 10 10 10 10 10 10 10 1		3 283	14 303 52 123 120 852 134 304 3 2830	*9r 0 0 0 -1,465 12,474	Силицатие могили, сарта! (U = Σ T) 0 0 −1 485 11 303 24	Criteria for State Guarantee (million ROL)	+U0+-	57.835 59,570 61.357 63.138 65,044	a SC.	/ C. N' C	0 0 0 14,080	57,805 59,570 61,357 63,198 82,250	Subsidy (7=1+X+R-M) 0 0 0 1 485 5.642 18
è All.6	01)	-1:	1	14 080 14 080 14 080 1	16,148 23,076	9149 10.970		ł	5,544 10,447 10,677 17,045		1002 2002	14 080 14 080		1.	0	18.207 32.063	17 H/H / 17 H/H		9.279 16497	16741 1678 6	12.874 12.678	24.271 37.149		2007 4007	67.047 69.058	000 L LL L		14,089 14,089		18 207 32 060
Table All.6.1 Financial			`1	0002 100	6 23,076	1		_	1/ 14,795 15 24,141		1001	14 040	_		0	32,063		1	17 569	1/24611 11	78 12.878	49 50.027		1066 1 1	021.11.30	076 1 04		39 14,089		10 32.063
ancia			. Ł.	3,000 0,000 0,000 14 0,491 14 0,49	23,0761 23,076	12 674 1		ł	31.998 4		2008	14 089	12.678	1	ö	32,063	17.8/H		18 711 1	18 / 11 1	12.878	62 905		2008	13.264	1016		14,089	92.169	32 043
	ł	2003 2010	+		076 23,076	13 960 15 298	-	-	24,917 30,730 40,653 50,138		2000 2010	14 049 14 080		- L-	0	32,063 32,063		Ł	19.927 21.222	222 12 226 51	12.87H 12.87B	75.784 88.t		2009 2007	75,462 77.725	5 305 5 112		14.089 14.089		37.063 32.063
emer		1102 0	1	10007 1000	76 23,076	48 14 868		- 1	30 35.3H0		1102 0	14 080	18, 12,878 10,679	F	0	53 32,063				22 115,602	78 -80,122	.b62 8.540		1102 6	C21.11 C2	5660		89 14,089	-	63 32 063
nts of		707	1	14 0.00	23,076	14.868		_	42.029 68.574		2012	14 089	.	11	0	32,063	26,040	1	24,071	_	12.878	21,418		2012	17.125	6640		14,089		32.063
Tulc	ł	2 1013 2	1		23.076	14.858	~	- 1	77,792 8		2013 2	14 0854	12,8/8 1	Ľ.	0	32.063 3			25.635	25,635	12,878	34.256		2013 2	11,725 7	650		14,089		37 063 3
ea Fi	ļ	79 6331 20 623	1		23.076 22,353	1868 14,868		_1	87.010 96.228		2014 2015	14 089 14 089	12.8/8 12.8/8 5 0 2 0 1 1 2.8/8	Ľ	0	32.063 30.577				27:02 27:491	12,878 121	47,175 601		410Z \$100	421.11 621.11	4.850 5.4		14,089; 14,0		32 053 30 577
Statements of Tulcea Financial Plan (Case iB3)	- 1	231 39 623			33 19,630	68 14,868			36.228 105.446		4107 9	84 14 089	12,878 12,878 A 194 2 404		0	25.170		4		911 23917	12.878 :2.878	60.050 72.911		2016	C21.11 d2	5 650 5 650		14,085 14,089		77 25.170
al Pi	1 2 2 2	32 623	1	~	13.367	14,868		1	114.664		2017	14 089	12.978	365		12,645			13.01	13 010	12,878	85.809		2017	11.125	9.650		:4,085		0 12 645
Ü u	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	1	I.		6,439	14,868 1			123.882 13		2018 2	1 040 1	12.8781	1	0	-1.211 -				* 	12.878 -1	98.6R7		2018 2	11.725 1	5 650		14,089		- 121-
ase li	100.000	37.673 37.623	Έ.	-	6.430 6.	14,868 14,1		1	133,100 142,318 151,536		0.00 6102	14 089 14 089	0 0		0	-1.211 -1.	1.	1	0	43.000	-50.122 12	18 945 31			11 125 11	5.650 5.	}	14,089 14.		-1 111
33)	100	4.	1-		6439 6439	14,868 14,868		KIZN HIZL	19,15,50		1202 0	380 14 0H9	12,878 12 B	112.1 [112]:	0	-1.211 -1.211		L	c	ē	12,878 12,878	444 44.922		- 1	11,125, 11 125	6,650 5,650		14.089 14.089		-12:21 -: 211
		3 32 623	1_	_	6 6433		0 5.650	L.	-		2022	9 :4 CHA	12 8/8 12.8/H	1171 1	5	1 -1.211		L.		0	12.878	2 57 200		1		5 050		14 085		11-1-11
	6.646	1	3.646		5,4,19	•	5.650	11.1			1702	14 089	U 12.8/H	171	>	-1.2.1	1			⇒†	12 878	70.07H		1023	11.725	5.650		14.085		-1211
	6	32 67.	3 5561	-	0.4391		5.650		179 190		2 1000		:2,878 T		Ş	-1.2:1 - 12 H78	1	0	c		12,674	82 956 9	ļ	_	CZ/ 11	5.650		14,080		- 111
	100 4000	32 6231 32 623	L	- I	0 6740		5 650 5.6	1-	188.40H 197.0		2023 2026		12,8/H 12,8/H	51 1.171	>	-1,211 -1,211 12,878 12,874	HINZE HINZ.	0	-	_	12,878 12.	95 R34 108.713		- 1	CZ	5.650 51		14.089 14.089		
	1606	221 32 423	3 666 3,666	-1	14-12 V-4		5,650 5,650				1007 94		0 12.878	1121 1121	>		HH :2 A/H	000.55 0			12.878 - 80 122	102 82 501	- 1	- I	CZ) // CZ/'//	5 650 5.550		580.51 0.80	164 97.454	
	100.00	32 23	3.000		22		5.650	130 495	215.062		8.07		51 12.3478 51 12.3478	1.21	<u> </u>			0 0	00		2 12,878	41465		1	1022 V 10	5 50		690 F! 6	07.454	
	heur	32.623	3,650	."	1040		5 650 ⁻	1040	225.2×0		10		0	1.2.1	5	-1.2.1 12.9.7H	12 8.14		C:	T	12.8.78	54 347		- 1	0.5	5 650		5.HO 11	37,464	-4-

3. Criteria

Ganeral Revenue (=V)	CE87C	010,06	1,357	63, 138	57.835 59,570 61.357 63.198 55,094 67,047 69,058 71,130 73,264	67.047 6	1.800.83	1.130 7.	_	5,462 77	.725 11.	725 77.	125 71.	1.11 627	20 1 20 1 20 1 20 1 20 1 20 1 20 1 20 1	51.17	5/11/C	11.725	\$21 II .	11.125	CZ1 11	C2177	677.77	627/37	C71.1		-	
Corporate tax from S.C. ACET S.A. (W=E)	U	0		0	3,057 3,477 3,903	3,477	3.903	4.349 4.816		1.305 5	.B13 5.	650. 5	650 5.4	550 5.6	5.305 5.813 5.850 5.650 5.650 5.650 5.650 5.650 5.650 5.650 5.650 5.650 5.650 5.650 5.650 5.650 5.650 5.650	0 5.65	0 5.650	5,650	5 650	5,650	5.650	5 650	5.650	5.650	5.650	5 650	5.550.	5 650
Revenue from lease fee (X=I)	0	0	ō	0	0 14,089, 14,089 14,089 14,089 14,089	14.089	14,085	4.089 14		1 680'1	089 14,	069 14,	080 14.I	389 : 4,G	14.085 14	5 14.08	9 :4,085	14,089	14,089	14.085	14,089	14 085	14.085	080.41	680,51	14.080	580.5	1 080 1
Total current revenue (Y=V+W+X)	57,835	59.570	61.357	63,198	52,835 59,570 51,357 63,198 82,250 84,612 87,050 89,568 92,169	84.612 6	17.050 81	9.568 92		1,855 97	628 97.	464 97	464 97.4	464 97.4	94.855 97.628 97.464 97.	4 07.46	4 57.464	27.464	97.464	97,464	97.464	17.464	97,464	97,464	27.464	97,464	17.454 5	7,454
Subsidy (Z=I+X+R-M)	0	c	c	1 485	0 0 1 485 5.647 18 202 32 063 32 063 32 063	19 207 :	12 063 3.	2,063 3;		7,063, 32	063 32	06.0 32	06.3 371	06.0 32.0	20 063 22 063 22 063 22 063 27 063 22 063 20 053 20 577 25170 12 845 -1211 -12	7 25.17	0 12.645	121-	-1211	1.2	-: 211	-1211	-1211	-1211	-1217			
Criteria for subsidy level (7/Y)	100	00	N U 0	241	0.01 0.01 0.01 2.41 8.41 2.51 36.84 35.84 34.84	21.5	26.8%	35 85		0 NI 02	2 81 3	5 e 1 3.	33 33	191 32	30.04 32.84 32.94 32.94 32.94 31.44 25.84 13.04 -1.24	25.8	13.0	×	× -	N/ 1-	21-	NC	۰۱ ۲۵	- S	€	-12	21-	K
Criteria *or State Guarantee		60		245	001 001 001 241 841 2291 3821 3711 3611	22 94	38.25	37 1.5		111	4 1 1	4 IN 34	11.34	11 34	3514 3414 3414 3414 3414 3414 3414 3714 1424 004 004 004 004 004 000 004 004 004	27	142	60 0	00	00	ę.	00	60	100	100	- N O	ξ	00

100 <





Parameter Input Section Rate of Sewerage Charge to Income (N)

All-6-5

 \mathbb{O}

Table All.6.2 Financial Statements of Tulcea Financial Plan (Case IIA3)

32.623 3.666 73.807	5,150 1,957 3,193 42,906 67,790	2020 20.607 12.816 10.022 0 10.022 0 10.022 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	702/9 1.957 1.957 103.489 103.489 0.0%
32.673 3.666 73.807 17.807		2020 - 20	<u>7,202</u> 7,1,725 1,957 106.489 105.489 1058 - 1058 - 1058
32 623 3 606 73 807 73 878		2027 2 23.607 2 12.818 1 12.818 1 12.81	2027
3,807 3,605 2,805		2026 - 2026 - 2026 - 2026 - 2026 - 2025 - 20	100 10 10 10 10 10 10 10 10 10 10 10 10
32 673 3.660 2.960 2.907	5,150 1,957 3,193 35,018	2075 2015 2015 2015 2015 2015 2015 2015 201	7275 77 17.725 77 1.957 1. 23.807 23.807 23. 103.489 103. 103.489 103. 100.929 -10. 0.056 -10.
32.623 32.625 23.865 23.807		22.878 22.867 12.878 12.878 10.929 12.878 12.878 12.878 0 0 0 0 0 0 0 0	2000 2000 2000 2000 2000 2000 2000 200
32 623 3.666 23 807		7227 729 729 729 729 729 729 729	
32.623 32.623 23.807		2072 23 807 12,878 12,9788 12,9788 12,9788 12,9788 12,9788 12,9788 12,9788 12,9	2000 1.122 1.1357 1.1357 1.1357 0.004
32,623 3,666 23,807 23,807		2027 23.007 12.878 10.929 0.0229 1.2.8788 1.2.878 1.2.9788 1.2.9788 1.2.9788 1.2.9788 1.2.9788 1.2.9788 1.2.9788 1.2.9788 1.2.9788 1.2.9788 1.2.9778 1.2.9788 1.2.9778 1.2.9778 1.2.9778 1.2.9778 1.2.9778 1.2.9777775	2027 23 1,957 1 1,957 1 1,957 23 23,807 23 103,489 103 103,489 103 103,489 103 103,489 103 103,497 103 103,497 103 103,497 103 103,103
32.623 3.056 23.407		2020 23,407 12,876 10,929 10,929 12,878 12,878 12,878 12,878 12,878 12,878 12,878 12,878 12,878 12,878 12,878	23 777,723 31 1,957 32 777,723 31 1,957 32 100,489 33 100,489 33 100,489 33 100,489 33 100,489 33 100,489 33 100,489 33 100,489 33 100,489 33 100,489 34 100,489 35 40,09
32,623 3,666 23,867 23,807	<u> </u>	9107 23,007 10,920 10,920 93,000 93,000 93,000 93,000 93,000 93,000 93,000 93,000 93,000 93,000 93,000 93,000 94,0000 94,0000 94,0000000000	11.1257 11.1257 10.057 0 10.057 0 10.05
23 807 23 807		2018 23,007 12,007 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	777125 777125 1 13657 1 13657 23.867 23.867 2 23.867 2 24.867 2 24.977 2 24.8677 2 24.8677 2 24.8677 2 24.8677 2 24.8677 2 24.86777 2 24.86777777777777777777777777777777777777
32.623 3,666 23,907	a 1	2017 255.807 10.325 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.355 10.3555 10.3555 10.3555 10.3555 10.35555 10.35555 10.35555 10.3555	2017 11725 1357 1357 1357 1358 1358 1358 1358 1358 1358 1358 1358
32.670 3.660 23.800		2016 23807 12818 12818 12818 201 201 201 201 201 201 201 201 201 201	20.0% 20.0% 20.0% 20.0% 20.0% 20.0% 20.0% 10.0% 0.0% 0.0%
32 620 3,660 73 AO7	5,150 5,150 3,193 15,507 23,087	2015 23,807 12,876 7,988 7,988 7,998 7,970 11,1,777 11,1,1,777 11,1,7777 11,1,7777 11,1,7777 11,1,77777 11,1,77777 11,1,7777777 11,1,77777777	
32,623 3,666 7,23,867	5,150 1,957 1,957 1,9550 19,894	2014 23 807 12.878 6.065 6.065 19.501 19.501 19.501 19.501 19.501 19.501 19.501	2 2014 25 77.725 55 1.957 86 103.489 10.12.4% 24 23.0% 25.0% 25.0% 25.0% 25.0% 25.0% 25.0% 25.0% 26.0% 26.0% 26.0% 27.0%
3 32,623 6 3,666 7 23,807	0 5,150 7 1,957 3 3,193 6 11,593 8 16,701	2013 2010 2010 2010 2010 2010 2010 2010	
3 32 623 8 3,666 7 23 607 6 36 645		2012 2012 2012 2012 2012 2012 2012 2012	2017 2017
03 32,623 06 3,668 07 23,607 07 23,607	€	2011 2011 12,87 12,87 2005 53,000 53,000 53,000 14,14 10,14 10,14 14,14 10,14 14,14 10,14 14,14 10,14 14,14 10,14 14 14 14 14 14 14 14 14 14 14 14 14 1	23 1 1 2 3 3 4 1 1 1 2 3 3 4 1 1 1 2 3 3 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
212 33,053 215 33,053 606 3,666 807 23,807 23,807	2 5.581 2 2.121 0 3.460 22 5.722 5.722 5.722	2010 23.8 12.8 12.8 23.0 15.1 15.1 15.1 15.1 15.1 15.1 15.1 15	2 27725 2 77 23.807 7 23.807 7 23.807 1 12.805 8 1 12.805 8 1 12.805 8 1 12.805 8 22.806 8 1 22.806 8 20.00 8 20.
30 429 31 713 33 053 30 429 31 713 33 055 3.0 5 3.6 5 3.6 5 3.6 5 2 2.3 8 7 2.3 8 7 2 3.8 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	2,956 ,4,242 1,123 1,612 1,833 2,630 1,990 3,602 1,032 3,662	2000 2000 2000 2000 2000 2000 2000 200	7000 2000 2000 200 71130 22000 200 20 656 1,123 1,512 2, 23.807 23.807 23.807 23.8 55.553 28,194 100.860 103,0 12.838 12.838 17,912 13.45 17,12 24.95 24.55 23.60 22 24.95 23.60 22 25.50 23.60 22 25.50 23.60 22 23.60 23.50 23.50 23 24.95 23.60 22 24.95 23.50 22 24.95 25 24.95 25 2
		700/ 2004 2.878 7.2.867 2.878 7.2.867 -2.898 7.2.878 2.878 7.2.878 2.878 7.2.878 2.878 7.2.878 2.878 1.2.878 2.878 1.2.8788 2.878 1.2.8788 2.878 1.2.8788 2.878 1.2.8788 2.878	207 2014 130 73264 666 1,123 607 23.807 368 13194 368 13194 2595 24 X
20 20 20 20 20 20 20 20 20 20 20 20 20 2	2210 2322 2720 272 210 272 210 272		
20104 28.075 29.200 2.666 2.669 2.676 2.666 2.669 3.666 2.3.807 23.807 3.645	-568 552 0 210 -568 343 -7214 -1.872	22.005 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 25.007 25.007 25.007 25.007 25	
23.827 26 3,666 3, 23.607 23	-1,646 -1,646 -1,646 -2,-2		2 0 2 2 2 2 2
		(million ROL 2007 2007 200 0 201 200 0 201 200 0 200 200 0 200 200 0 201 200 0 200	CODE
		Int (millio 2002 20 2002 20 2005 00 60.426 66 60.426 66 1320.452 133 120.452 133 120.452 133 120.452 133 120.452 133 120.452 133 130.456 130 130.456 130 100.456 100.4	(million ROL) 2000 0 2000 0 1.257 63.199 0 2000 1.75 0 0.000 1.75 0.000 1.75 0.000 1.75 0.000 1.75 0.000 1.75 0.000 0 2.0000 0 0 0 0 0 0 0 0 0 0 0 0
		Account 2001 20 2001 20 2007 50 20087 50 2007 50 2007 50 2007 50 2007 50 2007 50 2007 50 2007 50 2000 50 2007 50 2007 50 2007 50 2007 50 2007 50 2007 50 2007 50 2000 br>200	antee (m) 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300 300
		7326 AC	Occurran Occurran 2000 20 2000 20 2000 20 2000 0 10 0 13 8 13 8
		Tulcea City Sewerage Construction 2000 Construction 2000 <td>2-+</td>	2-+
Revenue (A) Operation and maintanance (B) Laveled lance fan (C) Laveled lance fan (C)	Profit before tax: ($C = A - B - C$) ($C = A - B - C$) ($C = A - B - C$) ($C = A - B - E$) Profit, who tax ($C = F$) Cumulative W.C. ($H = \Sigma$ C)	2. Tuicea City Se New Your Hamas from Hamas from Year New Your Hamas from Hamas from Power (1) Power (1)	3. Criteria for Stat General Revenue (24) Corpores tax from S.C. Corpores tax from S.C. Corpores tax from S.C. Revenue from lease fee Crait Revenue Crait Revenue C
wanua (A) mation and whited lense	off, before = A-B-C) mporate ta off, after to off, after to off, after to	2. Tuices Crt ven Revenue from lease (a C) beoreaution (u) Perpendicular (a C) Perpendicular (u) Perpendicular (u) Subdent (u) Subdent (u) Suprement (a C) Perpendicular (u) Perpendicular (u)	3. Criteria for Conserts to for Conserts to from 5 Conserts to from 5 Conserts to from 1 Revorue for near Total cummer and Conserts for Conserts for

All-6-6

Table All.6.2 Financial Statements of Tulcea Financial Plan (Case IIA3)

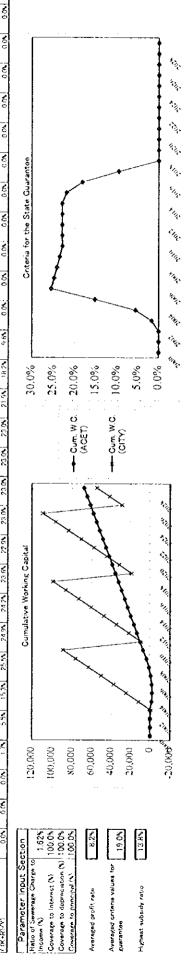
1. Financial Statements of S.C. ACET S.A. (million ROL)

Year	2000	2002 1002 0002	2002	L'HIL	2 1 1000	(<i>H</i> /)	2801 2004 2006 2006 2000 2000 1008	11 1 11	1012 2003	-	1102 0	101 1	2013	2014		2018	1102	2018	610.	201.00	2021	2622	2023 I	`	2020 20	126 1 20	101 201	2024 1 202	N 10
HAVARUM (A)					12462	26 404 24 025	N 025 24	90 20 00 00d 8d 14	15 562	040100 [517	<u> </u>	2 623 32 62	23 32 623	23 32 5233	10 32 623	32.523	32.623	1.7 . 21	32,523	32 5231	16.69.75	ENGINER	11.44 46	32.6231 33	32 623 33	32 523 32	32 623 32	12 67 34 32	12 12
Operation and maintanence [B.					3.566	3 0 0 0	3 5 5 5 5 3 5 5 5 3 5 5 5 5 5 5 5 5 5 5	6.660 3	999 3.666	566 3,665		555 3,500	3,666	3.660	3.600	01 3,065	3,665	3.505	3,566	3 546	3,666	3.659	1.000.5	3,655	3 695	3.655 3.	3,665 3	3.006 3	3.656
Lavalad base fee (C)		-	-		23.807 7:	3.H07 2.	23.807 23.407 23.807	807 23	23.807 23.807		TON EG - 20 NOV	101 23 H07	708 57 27 807	_	17 23,407	7 23 807	23.807	23,407	23.407	70H E2	70HD7	23 ×07	23.807' 3	23 HOV 20	23.407 23	23.807 23	23,807 23	23.807 23	208 EC
Leave the geloulation besy	ŀ.				17/101 2	9,749 3	6,440 36	64- 76	645 30 54	Sec 39.4	545 36 045	45 36,54	15 30,04	15 35 04	35,59	1 31 122	22.775	12.878	12,874	12.078	12,878	12,878	12,878	2.070.1	12,876 12	2878. 12	878 12		2.878
Profit before tax	-	-	-	_	-				-	_		-								-		-	-		_			_	
(D = A-B-C)					-1,646	-564	552	728 2.956		4,242 5,5		5.150 5.15								5.150	5,150	5 150	5,150						6,150
Corporate tax (E = 0.38 = D)					0	0	210	656	123 1.6	1:2 2:1	2.121 1.5	57 1.957	57 1.957	52 1.957	7 1.957	1 1 957	1.957	1,957	1,957	1,957	1,957	1 9 9 7	1.957	1,967	1.957	1,957 1,	1.957	1.957 1	1,957
Profit after tay (E = D - F)					-1 646	-558	3.42	071	HCC D H	330 0.4	60 3.1	93 3.143	2, 93					1		3, 193	3, 16.0	501 6	3 192		_				3 193
Working capital (C = F)		-			0	0	2:0	866 1.	9.001 3.6	3.602 5.7	271 1.6	19: 0,636						21,379		25,230	27.250	-	3.164			37.035 38	38,992 40		905.2
Cumulative WC (H = 2 D)	 				-1 646 -2.214 -1 872	2.214 -		-801	1.032 3.6	3 662 7.1	22: 10.315	15 13.509	08 16.70T	01 19 H9					35,860	39-053	42 246	45 439		51.825 St	55 018 55				1790

2. Tulcea City Sewerage Account (million ROL)

Year	0002	_	1001 S002 S002 S002 S002 S002 S002 S002	2002	1002	1007	2002	2007	00.	-	010	2 1100	1 1 11	36 1 810	1 000 1 0200 1 2000 1 1200 1 0400 1 6000 1 8000 1 2000 1 9000 1 900 1 900 1 2000 1 2000 1 2000 1 2000 1 2000 1	5 2010	107 3	4102	6102 1	0.02	1202	1000	Bill!	1004	Sinc	9602 1 1202 4202 4202	1000		6:02
Revenue from leaso fee (i = C)		C	0	0	0 23,807 23,807	23 407	23.407 23,407 23,407 23,407	20 kg7	23 807		3,407	1,407 2.	1 202	1,407 23	23.401 23.401 23.401 23.401 23.401 23.401 23.401 23.401 23.401 23.401 23.401 23.401 23.401 23.401 23.401 23.401	07 20.00	17 23.80	17 23.HC	17 22.80	7 73.40	1 23.807	23 407	23.807	20,407	23.807	23.807	20 × 07	23 H07 23 H07	23 807
Depreciation (J)	0	0	0	5	12.478	8/8.21	12.8/8 12.8/H	1	H/ 973	12.878	1 8/8/21	2,878.1	2,878,15	2,878 12	12,474 12,614 12,614 12,614 12,614 12,614 12,818 12,816 12,816 12,816 12,816 12,816 12,816 12,817 12,818 12,818	12, H	B. 12.8	17.H	18.1.81	4 12,87L	1 12.878	12,878	17.478	12.878	12.878	12.874	12,878	H/H/21	12.87H
Payment of interest (X)	Ċ	0	0	4634	2.579	7171	H 984	11 234	10 402	9.533	8.50H	7,623.	6.574 5	5 456 4	4,265 29	2 99H 1 717	7 604	P	с 0	°	0		ç	c	c	e	ç	c	C
Profit (L = IU-K)	3	0	0	1606-	8,350	1947 2	1000.1-	-289	02C	1,395	2.3201	3,305	4,355 5	9 B/ 9'S	0,6631 1,9	100 9.211	2,01	10,3251 10,929		10,925	10.929 10.9291	10.929	10,929	1.27.0	10,529	62601 162601	10.926	10,929 10,029	10.125
Loan (M)	2,166	26.087 60.426	_	66.848	õ	0	0	0	0	0	0	0	0		0	0	6	0	0	0	0	0	0	0 0 0	0	0	0	c	0
Subsidy from city/state										-,					~														
budget (N)	7,166	26.087	7.166 26.087 60.426 66.848 -6.005 2.941	66,848	-6,005	2,941	12,838 12,839 12,838 12,838	12, A33	12,838		12,838 1	12,833 1;	1,838 14	2.838 12	12.836 12.836 12.837 11.777 7.515 -1.031 -10.929 -10.929 -10.929 -10.929 -10.929 -10.329 -10.926 -10.929 -10.929 -10.929 -10.929	16.7 7.7	5	31 - 10,92	29 -10.92	9 - 10,025	01-10,923	-10.929	-10,929	- 10.929	-10.925	-10,929	-10.929	-10,929	10.925
Depresention ($O = I$)	c l	0	0	¢	12,478	12 878	12 878	12, 878	12 878 12 12 87A		17.8.78	12 R7H 13	12 878 12	12 878 12	12,478 12,478 12,434	78 12.83	8 1 2 8	7A 12 H)	TH 12 HT	9 12 875	31 12 H 7B	12.878	12 H 7 H	HL0 C.	12 878	12.67.6 12.47.4 12.47.6 12.47.6 12.47.6 12.47.6 12.47.6 12.47.6 12.47.6 12.47.6 12.47.6 12.47.6 12.47.6	12,879	12,878	12 878
(O+N+W+I = (D = I -W+N+O)	2622.91		52 1 /3 1 /20 852 1 /0/ 1 /0	1351-1331	15,223	1746.	74.611	25.427.	26,2431	21112 2	21 037 2	00 220 62	10.77	1,1841 37	30 077 31,184 32,379 37,546 30,005	46 30.00	1.75 2	11 12 1	17 H 12 H 1	11211	17 8/14	H/H (1	HIHZL	H/ 9 C	12.HZH	22 1.1 12 424 12 424 12 424 12 424 12 424 12 424 12 424 12 424 12 424 12 424 12 424 12 424 12 424	14/H (:	H/H/L	12 4/H
Investment cost (U)	14,333	52.173	22.173 120,8521 133,696	133,696	Ŷ	0	0	5	0	0	50	93,000	6	0	0	0	0	5	01 93,000	0			0			0	01 93,000	3	3
Payment of principal (R)	10	0	c	498	2.145	6.69.6	11 783	12 545	IT 783 12 549 13,365 14 234	1	15159 16144	6144 1	7,103 16	3,311 19	17,103 18,011 19 501 19 70H 17 776	OH 17 12	062 8 99	2	0	0	0	С	с 	0	0	ē	0	¢	C.
Applications (S = Q + H)	14 333	52.173	120,452 134,144	134,144	2145	11 11 11 11 11 11 11 11 11 11 11 11 11		12 544	CHC ET	14 234 1	01 1461 6	1 144 1	10.11.15	81 1184	192121 NOL61 10661 11311 1831 17361 1 16100 1601 1601 1	01 17:2	1266 1 94		000 84 0	6	0	0	0	c	C	Ċ	000.58 000	i ¢	¢
Working capital of the year				-					-		_			_	_	_		_		_									
(T =P-S)	0	0	¢	-1,06.1	~1.061 12.878 12.878 12.878 12.878 12.878	12,878	12.876	12.87B	12.8.7K		12.878	80.122	2.8/8 5	2,978 1;	12.878 - 80.122 : 2.878 : 2.878 : 12.878 : 12.878 : 12.878 : 12.878 : 2.878 : 2.878 : 2.878 : 2.878 : 2.878 : 2.878 : 2.878 : 2.878	12,85	78 12.8.	78 12.83	78 -80.52	2 12.82	12,878	12,478	17.871	12,478	12,874	12.478	-A0.127	12,878	12.878
Cumulative working capital						_	-			•••																		_	
(U = E T)	0	0	0	-1.051	0 -1.061 11.81.2 24.695 37.574 50.452 63.330 26.208	24.695	37.574	50.452	63.330		319 046	8.964 2	1.843 3.	4 721 45	1221 x 304 x 312 x 251 (23.25) x 252 x 2521 99 112 (19.80) 31 99 14 24 24 2 2 20 20 x 31 x 28 1 29 129 129 127 2 20 (21 4 1 8 3 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2	177 23.35	5 262.	11.00 11	19.94	oi 31.86	44 746	57.624	20 503	IRC CH	662.98	109.137	29 015	41,693	54 772

	100000	1000	1000	COMPA-	11111	TORE TORE FINE CORE CORE TORE	. 2010	1111		10000	1.00 0.000									1.1.1				2 1 1 1 V		in the second se			Contraction of the second s
	1000	1000	1000	1000	1000	1000		000 000		-	110		1000	2 010		1 010	0.0	2	1		1 10/0		200		1 1 1 1		0.0		
General Revenue (=V)	CE8.14	10/0.00	01.357	63.1985	P60.00	57.835 59.5701 61.3577 53.1987 55.0947 67.0471 69.0581 71.1301 73.2641 75.4621	860.60	71,130	13.264		C21'1	1.125	1.1251	1.125.1	1.1251.1	1.7251 /	1.1251.1	1.1251.1	1 25.1	1251 14	1.1251.1	2771 15771 [5771] 15771 [5771] [5771] [5771] [5771] [5771] [5771] [5771] [5771] [5771] [5771] [5771] [5771] [5771]	1 1621.1	1.125.1	1 621.1	1.725.	/ 162/ /	1 1221 1	1.7251 11.725
Corporate tax from S.C.	_		-	• • -																									-
ACET S.A. (W=E)	0	0	Ö	0	0	ō	210	656	210 656 1.123 1.612		2,121	1,957	1,957 1,957	1,357	1.957	1.957	1 957	1.957 1.957	1.957	100	1 957	[760.] [760.] [760.] [760.]		1.557	1,957 1,057	1 957	1,957	1 1953	1.957 1.957
Revenue from hase fae						_													-										
(I=X	2	ò	0	o	23.807	0 23.807 23.807 23.807 23.807 23.807 23.807	23.807	23,807	23.807		3,807, 2	3.807 2	13.607 2	3,807 2.	3.807 2.	3.807 2.	3.807 2,	1.807 2.	3,807 25	807: 25	3.807 2.	23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007 23.007	1,807 25	1.807 2.	1.807 2:	3.807	3.807 2.	3,807 25	23.807 23.807
Total current revenue																											_	·~ -	
(X+M+A=X)	57.635	59.570	61.357	63.198	106 88	57.635] 59.570] 61.357? 53.198 88.901 90,853[93,075] 95,593 98,194 100,880]	93.075	95.593	98.194 h		3,653 10	03.4K9 10	33,489 10	01,489 10.	13,489 10	3,489 10.	3,489,10,	3,489 10.	3,489 100	103 103	3 489 100	103.055 103.440 103.480 103.489 103.489 103.489 103.489 103.489 103.489 103.489 103.489 103.489 103.489 103.480 103.489 103.489 103.489 103.480	1,485 102	3,489 100	3,489 100	3,489 10	3.485 10	3,489 103	3,489 10
Subsey (Z=I+K+R-W)	c	ó	С	1961	-6 005	0 0 1.061 -6.005 2.941 :2,8384 12.838 :22.838	P NON	12 A3A	2 H3H		1 NGH 1	7 H3H 1	1 1958 2	2.838' 1.	2,838 1	111	79151 -	11-1120	3 9 2 4 1 - 1 C	01-10001	7 424 - 16	12 M3M 12 M3M 12 M3M 12 M3M 12 M3M 11 2015 - 10 001 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000 - 10 000	21-16920	3 9291-16	3.9251 - 1C	2 4 2 4 6	0.9241-10	0.929 - 10	1- 000
Criteria for subsidy level								-				-	┞			╞	-	-	-			-	_	L		-	-		-
2//)	00	00	60	2	γ Η 9-	771 1341 1341 1341 371 1341 1341 1341 13	13 81	13.45	1.00		12 41	12 4%	12 4	12 41	12 44	141	10	6	10.64	0.6 - 1	10.0	12 45 12 45 12 45 12 45 12 45 12 45 12 45 12 45 12 10 50 10 10 10 10 10 10 10 10 10 10 10 10 10	100	10.61 -1	10 61 -1	10.6%	10.6%	0.6%	0.65 -10.65
Critoria for State Guaruntee				-		-		-			-	-		_				-	-	_		_				-	-		-
S+8/2	80	Ę	000 000 000 170 550 1530 2550 2400 2400 2400 2360	-	с С	15.31	25.54	0 10	20.24		29 QA	23.04	5.0	2000	5.0	21 64	11, 7.	0.64	. 100	200	200		0.01	200	100	200	0.04	20	200



Ć

Table All.6.3 Financial Statements of Tulcea Financial Plan (Case IIIB2)

1. Financial Statem	Statements of S.C. A	ACET S.A.	A. (mill	(million ROL.)	ĵ			-				· ·		2			•		1	• .	·			•				
Parasi = (A)	2000 2001 20	2007 2003	\square	1	2002 2008	06 200	107 10	1 200	102 0	1102 -	202	2013	\$102	2015	2016	2017	8102	2019	2020	11	11	2023	2026	\$202	LT		1 10	620
Operation and maintenance (B)				3,666 2,666	1	966	200 200 200	366 3.666	56 3,666	36 3,666	6 3,666	3,666	3,666	3,666	3,666	3002	1,666	3,666	1,666	3,666	3,666	3,666	3,666	000	3,666	3,666	3,006	199
Leese fee celculation base	AND ADDRESS CONTRACTORS IN STREET	and as a super-	<u>67</u>		00 13.0	508 11,500	995 CI - 895			- 1 A.		10.560	13.569		1	9.408	9 71 H	9 / B	9.439	- E	15	- 15	9	- E	1	- 2	12	971R
Profit before tax ($D = A - B - C$) Corporate tax ($E = 0.38 = D$) Dondo $a = a = 0.45 = D$			51	1.921 2.5 730 9	2.560 3.2 973 1.2	3,224 3.9 1,225 1.4	3,920 4,6					5,948	5,948			5,948 2,260	5.948 2.260			· ·	ł	f -	1	J ·	I		1	2260
Working capital ($G = F$) Cumulative W.C. ($H = \Sigma G$)			12			1				1	1-11			20	200	26,420 42,106	28,680 28,680 46,794	30,941 50,482	33.201 54.170			1.0		44.503 4 72.610 7	46,763 45 76,298 75	49,024 51 79,986 83	51.284 50 51.284 50 83.674 87	50 544 51 544
2. Tulcea City Sewerage Account (million ROL	rage Account	(million	, ROL)		1												1					F	1		1]
Part Ann Ann Ann	1007 0002	202 200	200	C002 PC	200	107 201	1007 10	50 70	0100 0	1107	2012	2017	2014	2015	2018	2017	8102	6102	2020	2021	2017	1 6202	2024	202	20.6	207 7	2024 20	2079
() = ()			6		- 1	- 1	- 1	- 1	ł		- 1		- 1				9.718		9,718	9.71R							718 5	9.718
Perment of interest (K)	00	8 0 0			02 7,190				-		-			12,878	12,878		12,878	12,878 0	12,878	12,878	328	91.0		928	12,878 1		12,878 12	8/87
Profit (L. = I-J-K) Loan (M) Subsidy from oftw/state	4,300 15,652 36	36,256 40,109	109 -4.708		0 -10,351	0 0	591 -9,402 0 0	02 =8,88	- 0	0 -7,734	0 0 0	• •	-5,720			-3,523	-3,161	-3,161	-3,161	-3.161	- 3,161		-3,161	-3,161			2 51 0	-2.561
budget (N) Depreciation (O = I)	36,521	i		ļ							22	22			14,467	9,099 12,878	3,161 12,878	3,161	3,161 12,878				231	3,161			3,161 3 12,878 12	3,161 12,878
Sources (* = (*******************************	14,333 52,173 120	120,852 133,050 120,852 133,696	-		-	<u> </u>	1	~ 0		3 22.565 0 93.000				24,703	23 ²² 24	18,454 0	12,878	12,878 93,000	12,878	12,878	0	12,H781		12,476	1 978.51	12.878 12 93.000	6/8 12	P24
Applications (S = Q + R)		0 2 133,9	11	407 4,020		C 0/0/	7.529 8.01 7.529 8.01	8,019 8,540 8,019 8,540	10 9,095 10 9,095		6 10,316 6 10,315	10,987	10/11	77	10276	5,576	0 0	000106	00		.	.	00	00		00010	00	00
Working capital of the year (7 ≣P-S)	• •	۴ د	-637 12,878	12,076		12,878 12,878	278 12,878	12.878							12,870	12,876	12,878	-60.122	12.678	12,878	12,078	1	12,678	12.678			12,478	12,676
	0	9	-637 12.242	242 25,120	120 37,998	008 50.876	876 63.754	76.632	32 89.511	1 9.389	9 22,267	35,145	48,023	60,902	73,780	86,656	90.536	10,414	32.292	45,171	56,040	70,927	83,805)1. CB0'90	106.561	20,440	42,318 5	55.196
3. Criteria for State	Guarantee (m	ilion R	С) ОС																									
	2007 2007 2007 2002	107 200	(L. F	1.1.	H	L	Ш	Ц	2010	11	2012	2013	н	2015	2016	2017	2018	2019	2020	1600	2022	2023	2024 2			н	LJ	5020
Corporate tex from S.C.		('50 / 67'	8	õ -		· .	-						<u> </u>	~	71,725	71,725	77,725	177,725	17,125	1,125	1.725.17	1,725,17	71,725	<u>[</u>	<u> </u>		11.252.11	2
ACET S.A. (WEE) Revenue from lause fee	。	0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	130	973 1,225		1.490 1.7	1,766 2,056	56 2.357	7 2,260	0 2,260	2,260	2.260	2.260	2,260	2,260	2,260	2260	2,260	2,260	2,260	2,260	2,260	2,260	2.260	2.260 2	2.260 2	2,260
(X¤l) Total current revenue	0	0	0 9,718	18 9,718	18 9.718		9.718 9.718	18 9.718	8 9.718	8 9.718	9 2.718	9,718	9.718	9,718	9.7.6	9,718	9.718	9,718	9.718	9,718	9,718	9,718	9,718	9,718	9.718	9,718 2	9.718 9	9.718
(Y=V+W+X) Subsidy (Z=I+K+R-M)	57,835 59,570 61, 0 0	61,357 63,198 0 607	198 75,541 607 6,115	41 77,737	37 80.001 82 17.421	01 82,337	07 84,748 21 17,421	48 87,205 21 17,421	15 89,800	0 89.703	0 89.703 17.421	89,703	89,703	89,703 16,784	89,703 14.467	89.703 9.009	3 161	89,703	3 161	89,703 8	39,703 8	89.703 8	89,703 81	89,703 8	89,703 85	89,703 89	89,703 89	89,703
Criteria for subsidy level (Z/Y).	000 000	0.0% 1.4		1 1	R 2184		1				•			1	10.11	10	S.	1			1	L			1	Ł	1	
Criteria for State Guarantae ((K+R)/Y)	0.0%	0.0%	1.0%	3.94 10.74		17 8% 17 3N	31 16.8%	8% 16.3%	N 15.94			15			12.6%	80	i S O	80	80	Š	80	×0	800	00	X 00			00
Paramotor Input Section Rato of Semenge Charge to	Log	120,000				50	Julative	Cumulative Working Ca	Capital						20.0%			ЧÖ С	Criteria for	the State	e Guarantee	ntee						
	0.96% 50.0%	100,000		1 1			1	*		\mathbf{x}			1	í	2			I										
Coverage to deprediation (%) Coverage to principal (%)	50.0%	80,000	0			~		$\frac{1}{\sqrt{2}}$		X	X	l − 0 :	Cum. W.C.		5.0%				Į	ł	Ż			•		· ····		
Averaged profit, rate	17.9%	60,000	<u>.</u>		\times	+	×	+	Xor	X.	×	>			0.0%						•							
\$	13.2K	40,000	c		X		×		XX		X	1	Cum. W.C. (CITY)			•			۰.									
Highest subsidy ratio	21.8%	20,000			X	F		¥				j		• • 	5.0%		-											
		0 200005	4	300 - 1900	. 9	10° 010	410° 410°	0111 9101	Q	107 4.50	1	e set s E se			0.0%	1						-		ţ				

÷1; ÷д. °ђ. CD, 202 . Q. \$102 *10z ·1₀,

0102 °Ф. £03. 4002 100 CON.

-20.006

A11-6-7

1. Financial Statements of S.C.	ACET S.A.	Table All.6.3 Financial St (million ROL)	N (IO)	6.3	Fina	Incia		tem	atements		of Tulcea		Financial Plan (Case ili82)	ial p	lan	Cas	E E E E	3								
Year Yaar 1 2	1000 2002 1002 000	1 400 51	1000	2006 S	1007	2008 Z	7000	4 ÷	2011 20	LI-		10/ 10/	25	100 911	8102	2019	202	1707	2022	70/07	1.07	202	4/07	1407	1/2/	NUM.
Operation and maintenence (B) I avalad Inexe fee (C)				L.,	ļ		1	3,666		3,666 3,7	3,666 3.6 3,646 3.6 9 7 1 1 4 9 7		3,666 3.666 9,666 3.666 9,718 9,718		100	566 3,609 218 9,718		3000	1		3.066	3,666	3.505	3.666	3,005 8105 8178	3.050
Lease fee calculation base		7,518 1	10,600 1		L.I	Ł 1		r	Ľ	1.1	r				Ê					I i	1		6.4.9	6,430	6.4.9	0 434
Profit before tax (D = A-B-C) Corporate tax (E = 0.38 + D) Profit after tax (E = 0 - E)		730	2.560 973	3.224 1.225 1.999	3.920 1.490 2.431	4,648 1,766 2,842	5.410 2.056 3.354		5,548 5,548 2.260 2. 3.688	948 260 288	- 10 C C		5,948 5,948 2,260 2,260 3,688 3,688	5025	ഗ്രില	6 5,948 0 2,260	5.948 2.260 2.260				[5.948 2.260 3.604	5.94H 2.250 2.250	5.348 2.260 2.860	5.948 2.260
Working capital (G ≈ E) (Cumulative WC (H ≈ 2 G)	· · · · · · · · · · · · · · · · · · ·	1 1	1 1	1 1				230	2° 2'	118 666	12 2			1.1.4		1.5 41	<u> </u>	3.9	37.	39.952	140	44,503	A6,763 76,298	49.024 79.986		53.544 87.362
2. Tulcea City Sewerage	Account (mill	-	5 NUM		' -				L.				-	-		ŀ										
Kevenue from lease fee		1_	1	1	0110	N007	9110	1		1	1107 1102	+	2/0/ 0	+			0702	1202	2002			4/07		/20/	2024	6/07
Depreciation (J) Payment of interest (K)	000 000 000	12.878		1				12 878 12 5 165 4	12,8/8 12, 4574 3	12,8/H 12,8 3 544 3	ł	5/8, 12,8/8 5601 1,799	~	161 12.878 761 12.878 362		8 2 3 8	12.478	-	12	B/9'21	12.878	12.878	8/ 9/ 71	12 878	2.878 2.878	12.878
	4,300 15.652 36,256 40,109	-4,708 0		- 10.351 -		1	- 198'8-			1	-6,434 -5.7	-5.720 -4.9				11				1	1	141/8-	ł	-3,16	-3.151	19:0-
Subardy from urty/state [budget {N} [Derrepution {D = 1]	10.033 36.521 84.526 93.587	6.1.5	11,482 1	17.421	17.421	17.421	17.421	17,421 17	12,421 17.	17,421 17,4	421 17,421	16,784 16,784	14,467 14,467			3.16	3.161	;	3.16			3,161			3,161	3,161
4+())	52 1732 120 852 133 35	14 285		1 3						282			ł	154 18 454					17 H/H	12 8781	12 × /H	12 87H	2 H 78	12 87H	12 R / H	H/ R / I
Investment cost (U) i 14 Payment of principal (R) i	268.021 0	1 407	4 020	0.7070	7 529	8019 1	0 V V	6 005 0	93.000 9.686 10		0 0 0					0 93.000			00	03		57		000'86	00	0.
ŀ	14,333 52 131 20 852 133 595	1.01		11				15	÷		_	4.	.I	1.	2			50	0	5 5	00	515	00	1000 EE	50	ēļ6
Working capital of the year (T =P-S) Cumulative working control	-637	12.674	1 2,878	12.878	12.87H	12.478	1 828.93	12,878 -80.	12		12.878 12.878	878 12,878	378 12.878		8 12.976	L	12.87H	12.878	12.876	12 H78	12.474	12,8,14	12.878	-40,122	12.678	12 878
(0 ± 2.7)	0, 0 -637	12.242	25.120 3	37 998	50.876	63.754 7	76.632 A	R9.511 9	9.349 22.	22.267 35.	145 4K.023	023 60.902	302 73.780	80 B6.658	8 99 536	6 19.414	32 292	45.171	58,049	10 327	A3 805	96.GH3	109.551	29 440	42.218	54, 196
3. Criteria for State G	Guarantee (million ROL)	(•									
- -	2000 2001 2002 2001 57.835 59.570 01.357 03.196	10 460.C0	2005	2 900.69	11.130	3.2.54 1	2009 20	11 22111	11.125 11.	725 11.125	125. 11.125	4 2015 25 11.125	25: 71.725	1102 1 8	5111725	2010	0.0.	1202	*00* (1.125,	2023	C/1 11	2075	27.11	2027	127111	2075
ACET S.A. (WEE)	0	730	973	1.225	1.450	1.766	2.056 2	2.357 2	2.260 2.3	2,260 2,2	2,260 2,260	2.260	60 2,260	50 2,260	0, 2.260	0 2,260	2.260	2.260	2.260	2.250	2,260	2,260	2,260	2,260:	2 260	2.260
(X-1)	0 0	9.718	9.718	9.718	9718	9,718	9 718 9	9.718	9.718 9.	9.718 9.7	9.718 9.718	18 9,718	18 9.718	9.718	8 9.718	8 9.718	9,718	3718	9.7.6	9.718	9.718	9.71K	9,718	9.718	9.7:B	9,718
	57.N35 59.570 61.357 63.108	_								89.703 89.703	703 89.703	03 89.703	83	33 89.703	3 89,703	au	89.703		89.703	85 703	H9.703	H9.703	89,703	207,68		89,703
	é	01.0	447	1 1/0/1	1 40 10	30.64	1/4/1	1/421	17,421 17.4 10,421 17.4		1		14.6	_		1 3 161	<u> </u>	Ĩ	3 161	3161	3 161	9161	3 151	- 1	3 161	3161
Critera for State Guarantee ((K+R)/V)	000 000									9 15	12		° 2				00	00		00	6	000	6	00		00
Parameter input Section				Ċ	umulativ	Cumulative Workios Caoital	ve Caoit	-											Ę]
Katio of Sewerage Charge to Income (N)	0.96%			'					,	-ر			20.0%				ntena 1		orace Cua	uuarantee						
o Interest (V) o deprocetion (V) o principal (V)	50.0% 1.00.000 50.0% 80.000 50.0%			5		\searrow	¥				- Cum. W.	V	15.0%			1	ţ	Ŧ	F							
Averaged profit rate	000'09		\rightarrow	<u> </u>		×	Y	A A			500		10.0%	·					•							
Averaged criteria values for 13 guarantee	13.2%		~		A	A	~		\geq	ŧ	- Cum. W.	O	2002			-				-						
Highest subsidy ratio	21.8%			T.			× [•	-			•	200													

÷., ÷., *****}, $\hat{\phi}_{i}$ ЧЪ. 4. A 14. ÷., ·14. ÷. 4 (A)

4

0.0%

ł.;

\$ -20,000%

 \cdot

Table All.6.4 Financial Statements of Tulcea Financial Plan (Case IVB2)

1. Financial Statements of	onts of S.C. ACET		S.A. (million ROL)	yn RO	с С			-																1000		1000	0406	г
Year Revenue (A)	2000 2001 2002	2003	2004	2002	2006	2007	2008	2009	2010	2011	19,332	2013	19,332	1 2000	9,332	9,32 1	9,332 19	T	1			15	11	1	11	11		ज
Operation and maintenance (B) Leanse fee (C)			3,666 6,439		ŧ I	6 3,666 9 6,439	5 3,666 6,439	0,666	3,665	3,666 9,425	3,066	3,666	3,666	3,866	0,026 0,026	3,566	3,606 3	3,006 3,	3,686 3,	3,666 3,6	3.666 3.666 16.026 16.026	۳ ۳	.066 3.666 076 15.026	66 3.666 26 19.026	56 2,666 26 15,026	6 15.076		<u>.</u>
Profit before tax (D-# A-B-C) Corporate tax (E # 0.38 # D)			5,200	5,838 5,838 7,219 7,830		2 7.199	7.927	8,689 3,302 * 787	9,054 3,441 5,614	7.241 2.752 4.449	3,602 1,380	-360	000 90 90 90 90 90 90 90 90 90 90 90 90	- 1360 - 1360 - 1360		360				-140 -3				-360 -360 0 -360 -360 -360	60 -360 0 -360 60 -360			000
Working capital (G = F) Cumulative W.C. (H = 12 C)			3.224					۲° ۱	~ ~	21,907 35.743				N A	19 P.	8 M	287 2 833 3		23,287 23, 35,112 34,	23,267 23,297 34,752 34,391	287 23.287 34,031	87 23,287 31 33,670	87 23,287	10 23,287		7 23.267 9 32.229	31,869	NA ¹
2. Tuicea City Sewerage Account (million ROL)	rage Account (million	ROL)		-										· .											1.000	0401	r
Year	2000 2001 200	2 2003	2004	200	2006	2007	2001	2006	0100	1102	2015	2013	2014	2015 2	6 9100	2017 2	16 110	010 202	20 20	21 202	202 202	202	202	20/6	1202 5	7078	NU1	
Revenue from lease tee $(1 \pm C)$				- 1						8.25					16.025 14 17.878 14	16,026 10		16,026 16 12 878 12	16.026 16/ 12 878 12	16,026 16,0 12,878 12,8	16,026 16,026 12,878 12,878	- I''		78 18076 78 12878	-17			(n)
Depreciation (J) Payment of interest (K)	00	00	0 12,8/8	1						12,8/0	4,545	7 664	1,35.7	7.034	Ł		9009	- 1		_			3 744 3,328		\sim	1 2,003	1546	
	10,033 36,521 84,596	0 0 96 93,587	0 -6,139	9 6,439 0 0,439	9 -6,439	60 40 0	9°	-6,439	-6,365	080.5					1 200 200			7- 17C7-	1 0 0 1 2	n'l- 18/1-				20	000 000 000	:		
Subady from city/state budget (N)	4,300 15,652 36,256	40,10	9 6 439 0 1 2 878	6.400 6.400	0 6,439	0 6.439	6,439	6,439	6,667	8,425	12,034	16.026 12.878	16,026 1 12,878 1	16,026 10 12,878 1	16.026 11	16.026 10	16,026 16 12,878 12	16,026 16 12,878 12	16,026 16, 12,878 12,	16,026 16,0 12,878 12,8	16.026 16.026 12,878 12,878	26 10,026 78 12,878	26 16,026 78 12,878	26 15,026 (78 12,878		6 16,026 8 12,878	10.5	
Sources (P = L+M+N+O)	52,173	133,65								1 1	19.523	11	1.1	Ľł	1.1		Εŧ								1.1.	30,04	30,507	<u> </u>
(investment oost (Q) Perment of noncinel (R)	14,333 52,173 120,852	52 133,696 0		00	00	00	00	00	°ŝ	93.000 2.345	6,645		11,821	12,141 13			17.151 13	33,000 13,506 13	13,870 14	° ې	14,630 15,025	- 21	430 15,847	47 18.275		17.16		مە
Applications (S = Q + K)	14,333 52,173 120,852	52 133,695			ŀ				Ш	95,3451	6,045	11511	ш	Ц	12,468	2,805 13	r~1		13	4	630 15.0	25 15.4	430 15,8	47 16.2	11,001 67	4 17 165	17,629	م ۲
Working capital of the year (T =P-S)	o o	o u	0 12,678	A 12.878	8 12.878	12.878	12,878	12,576	12,878	-60.122	12,878	12,878	12.678	12,678	12,878	12,078	12,8786(-00.122 12	12,878 12	12,878 12,0	12,678 12,875		12,876 12,878	978 12,878	78 -60,122	2 12,878	12,878	
Cumulative working capital (U = 1 T)	0		0 12,878	8 25.756	6 38,635	5 51,513	64.301	77.269	90,147	10.025	22,904	35,782	48,660	61,538	74,410 8	87,294 10	100.173 24	20.051 32	32,929 45	45,807 58.4	58.665 71.5	564 84 442	42 97.320	10.101	98 30.076	6 42.054	1 55.833	
3. Oriteria for State Guarantee (million ROL	Guarantee (mìl	tion RO	Ľ.																			•			·			
Year	2000 2001 200	2 2003	2004	2002	2006	2007	2008	· 2009	2010	2011	2012	2013		Н	2016 2	2 / 10.	Ц	Ц	11	L1			1				2029	_
()=)	57,835 59,570 61,357	57 53,198	9 62,094	4 67,047	1 69,058	901,11, 8	73.264	75,462	17,725	11,725	11,725	27, 17	71.725 7	11.725	1 321.11	1,725	17,725 77	77.725 77.		621,11 c21,11	CZ//// CZ/	CZ1'11 CZ	G/11 G		C2/11	7.11		
ACET S.A. (WEE)	0	0 0	0 1.976	6 2,219	9 2.471	1 2,736	3.012	3,302	3,441	2,752	1,380	•	0	•	•	•	0	0	0	0	0	0	0	0	:	0	0	:
•	0	0	0 6.439	6,439	0,439	9 6,439	6,439	6.439	6,867	8,425	12,034	16,026	16,026	16.026 16	16.026 16	16,026 11	16,026 16	16,026 16	16.026 16.	16,026 16,026	026 16,026	26 16.026	26 16,026	26 16.026	26 16.026	5 16.026	16,026	
a 54	57,835 59,570 61,357	60,19	6 73.509	9 75,704	4 77,968	8 80,304	62,715	85.202	88.033	88,902	91,140	93,752	93,752 9	93.752 97 16.076 11	90,752 90	93,752 90 16 006 11	93,752 93 15,025 15	93,752 93. 16.026 16	93,752 93, 16,026 16	93,752 93,752 16.026 16.026	752 93.752	52 93,752 26 16,026	52 93,752 26 16,026	52 93,752 26 16,026	52 93.752 26 16.026	2 93.752	93,752	
Conterna for subsidy lavel (7.21)	200	8	1		1			1 ·		1.54						•								1 1			X1.71	r
na for State Guarantee'	0.05									454	12.3K	20.5%	20.54	20.5%	20.5%	20.54	20.5%	20.5% 2(20.5% 20	20.54 20	54 20	54 20.54	Ś	54 20	54 20.54	20.5%	20.51	
1 I U L	Б	000 061			i i U	Oumu	ativo W	Cumulative Working Ce	apital									- Critería	ia for the	State	Guarantee	2				r		
Hatto of Sewarage Charge to Income (%)	0.96%	000001							1. 1. 1.	×				Z5.0%	۱ ۴							14 14 14						
2		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	<u> </u>			*		X		\sim	. L			20.0%	<u>]%</u>										1 .	÷.		
"	2000 2000	000.08			$\sum_{i=1}^{n}$		×		×	 			Cum W.C.	15.0	5.0%													
- L I	0.5%	60,000					K	<u> </u>	X	1	<u> </u>	Š,	ET)		2000	•		· · ·		~								÷
d ortenia values for	18.3%	40,000		$\left \right $		A	1	ł		Ī	1	5	Cum. W.C.	5	\$													
Highest subsidy ratio	17.18	20,000		×		X		X				ō	2		5.0%													
. 		•				< <	1 1			9 	 										•							

a Die ٩. ٩ 102 ites. 202 \$100 510 ·102

ener 0102 а. 133 410). in, 000 0.0%

> **02 to. 202 Ċ. otor \$10 9102 100 ¢102

0102 \$002

900 100

. 00-Gan 0

AII-6-8

Table All.6.5 Cost Benefit Stream for Tulcea WWTP Project

(Unit: million ROL)

	Projec	t cost	Economic	Benefit - Cost	Discounted of	ash flow**
Year	Investment	O&M cost	benefit	(C-A-B)		
	cost* (A)	(B)	(C)	(С-Л-Б)	Cost	Benefit
2000	14,103	0		-14,103	14,103	0
2001	51,339	0		-51,339	46,671	0
2002	118,918	0		-118,918	98,280	0
2003	131,557	0		-131,557	98,841	0
2004	0	3,666	121,720	118,054	2,504	83,136
2005	0	3,666	121,720	118,054	2,276	75,579
2006	0	3,666	121,720	118,054	2,069	68,708
2007	0	3,666	121,720	118,054	1,881	62,462
2008	0	3,666	121,720	118,054	1,710	56,783
2009	. 0	3,666		-3,666	1,555	0
2010	0	3,666		-3,666	1,413	0
2011	91,512	3,666		-95,178	33,359	0
2012	0	3,666		-3,666	1,168	0
2013	0	3,666		-3,666	1,062	0
2014	0	3,666		-3,666	965	. 0
2015	• 0	3,666		-3,666	878	0
2016	0	3,666		-3,666	798	0
2017	0	3,666		-3,666	725	0
2018	0	3,666		-3,666	659	0
2019	91,512	3,666		-95,178	15,562	0
2020	0	3,666		-3,666	545	0
2021	0	3,666		-3,666	495	0
2022	0	3,666		-3,666	450	0
2023	0	3,666		-3,666	409	0
2024	. 0	3,666		-3,666	372	0
2025	0	3,666		-3,666	338	0
2026	0	3,666		-3,666	308	0
2027	91,512	3,666		-95,178	7,260	0
2028	0	3,666		-3,666	254	. 0
2029	0	3,666		-3,666	231	0
Total	590,453	95,316	608,600	-77,169	337,145	346,668

* Conversion factor = 0.984 ** Discount rate = 10.0 %

EIRR=	12.5%
NPV =	9,523 million ROL
B/C =	1.03

All-6-9



APPENDIX-7 ENVIRONMENTAL IMPACT ASSESSMENT SURVEY

1. INTRODUCTION

1.1 THE OBJECTIVE AND SCOPE OF THE STUDY

According to "Scope of Work for the Feasibility Study on Wastewater Treatment Along the Danube River Downstream Reach in Romanian" agreed upon between Ministry of Public Works and Territorial Planning (hereafter called as MPWTP) and Japan International Cooperation Agency (hereafter called as JICA), Environmental Impact Assessment (hereafter called as EIA) would be carried out based on the Romanian regulations as a part of the Feasibility Study on Wastewater Treatment along the Danube River Downstream Reach in Romanian. The objectives of the EIA are as follows:

- (1) To review the existing environmental conditions in EIA study area;
- (2) To assess environmental impacts of the proposed projects, and
- (3) To propose countermeasures for mitigating impacts and environmental monitoring plan.

The Environmental Impact Assessment areas cover three cities, which are Braila, Galati and Tulcea.

1.2 EIA SITUATION IN ROMANIA

The methodology for EIA is outlined in "Official Order of Romania, No. 125/1996," issued by MWFEP. The application procedures for EIA are prescribed under "Permitting Procedures for Economic and Social Activities Having an Environmental Impact According to the Environmental Protection Law No.137/1995, April 11th, 1996," by MWFEP.

The Order No.125 sets out the typical contents of an environmental assessment as follows:

- (1) Introduction, methodology and goals;
- (2) Engineering baseline including function of the project;
- (3) Environmental baseline, including;
 - geology
 - soils
 - water resources
 - climatic data
 - aquatic and terrestrial ecology, including flora, fauna, aquatic habitats and deltas socio-economic and cultural issues including the protection of historic buildings health, pollution and microclimatic issues, and
 - noise, transport and affected population
- (4) Pollution issues, including water pollution/water quality, air pollution, noise and vibration, radiation, waste management, and toxic/dangerous substance management;
- (5) Environmental impact. This comprises two categories, initial study and monitoring study, which address, water impact, air impact, flora and fauna, soil and subsoil

Part All/Tulcea: Appendix-7 Environmental Impact Assessment Survey

impact, socioeconomic impact, health and cultural impacts, public health and safety;

(6) Mitigation/reduction or elimination of impact, and

(7) Evaluation of final impact and conclusion.

According to the Law, the wastewater treatment plant development and improvement program is required to submit the EIA to the local regulatory agencies for review and public debate. The comments made thereon are then incorporated in the EIA report, which is submitted to MWFEP for final approval.

Two steps are generally taken for the assessment; Initial Environmental Examination (IEE) and EIA. Although there are no IEE national guidelines at present, the IEE is basically designed as a means of reviewing the environmental integrity of projects to determine whether EIA-level studies must be performed. In this sense the IEE is used for project screening to determine which environmental impact items require a full-scale EIA.

In accordance with Law 137/1995 and other relevant regulations, EIA shall be carried out only be certified Natural or Legal Persons. The analysis of samples for EIA shall be completed only by specialized laboratories using adequate equipment and methodologies in conformity with the existing norms and regulations.

1.3 THE REGULATIONS USED IN EIA STUDY

The regulations used in EIA study are showed as follows:

- (1) Environmental Protection Law, No. 137/1995;
- (2) The Order of Ministry of Water, Forests and Environmental Protection (MWFEP), No. 125/1996 – EIA;
- (3) The Water Law, No. 107/1996;
- (4) NTPA 001 Load Limits of Pollutants in Waste Water Discharged in Water Resources;
- (5) NTPA 002 Quality Indicators of Waste Water Discharged into Sewage Systems;
- (6) STAS 4706/1988 Surface Waters (Categories and Quality Condition);
- (7) STAS 1342/1991 Standard for Drinking Water Quality; Therapolity and the standard for Drinking Water Quality;
- (8) The Order of MWFEP, No. 756/1997 Environmental Protection for Soil Pollution;
- (9) The Order of MWFEP, No. 462/1993 Maximum Concentrations of Effluents Pollutants Emitted into the Atmosphere Given for Emissions Levels;
- (10)STAS 12574/1987 Maximum Allowable Concentrations for Air Pollutants in Human Settlements;
- (11) The Governmental Decree, No. 71/1996 Fire Precaution;
 - (12) The Order of Health Ministry, No. 1935/1996 Hygiene at Working Places;
 - (13) The Work Protection Law, No. 90/1996; And Andrew Strength
 - (14) The Order of Health Ministry, No. 536/1997 Noise Admissible Level at the Limit of the Developed Location;
 - (15) STAS 12025/2-81 Vibration Standard, and
 - (16) STAS 10009/1988 Urban Noise Standard. 6: 1945-04

1.4 EIA IMPLEMENTING ORGANIZATION AND SPECIALISTS

Research and Development National Institute for Environmental Protection (hereafter called as

ICIM Bucharest) which is selected as the implementing organization for EIA is certified by MWFEP for performing EIA with the certificate R-EIM-1-764 (be valid from Jan. 28, 1999 to Jan. 28, 2001) for transportation, power supply, civil and hydrotechnics constructions, waste management, tourism, industrial activities, water and wastewater treatment.

Address: Spl. Independentei nr. 194, sector 6, cod 77703, Bucharest 78, Romania

Tel: 40-(0) 1-637-3060 Fax: 40-(0) 1- 312-1393

The EIA survey works is performed by the following specialists:

Team Leader for all the three projects – Dr. Alexei Atudorei Team Leader for each city

> Tulcea – Mr. Gabriela Pietrareanu Galati – Mr. Mihaela Chiarescu Braila – Dr. Vasile Calin

Five experts for each city (sewerage, hydrologist, geologist, ccologist and sociologist)

2. EIA FOR TULCEA WWTP PROJECT

The present environmental situations and the potential impacts on the environment after the construction of WWTP are defined and the results and possibilities to reduce or remove the environment impacts are shown in following paragraphs.

2.1 DESCRIPTION OF PROPOSED PROJECTS IN THE FEASIBILITY STUDY (F/S)

The details of proposed WWTP in F/S Study are summarized in Table All.7.1





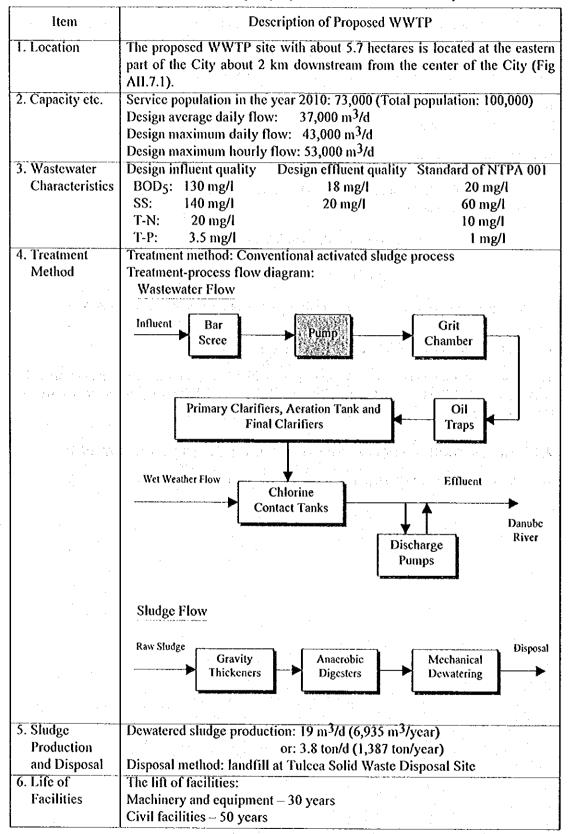


Table All.7.1 Summary of proposed WWTP in Tulcea City

All-7-4

2.2 DESCRIPTION OF THE ENVIRONMENT

2.2.1 CLIMATE, AIR QUALITY (ODOR), NOISE AND VIBRATIONS

(1) Climate

The climate characteristics are summarized in Table AII.7.2.

Item	Description	
1. Climate	The climate of Tulcea County belongs to the continental clir	nate sector.
2. Sun Radiation	The total sun radiation: 125	Kcal/cm•per year
3. Temperature	The average annual temperature in Tulcea City:	11°C
	The average monthly temperature in July (the hottest month): 22.9°C
	The average monthly temperature in Jan. (the coldest month): 1.5°C
4. Freezing Day	The average number of freezing day in Sulina town: days	84.2
	The average number of freezing day in continental side o days	f the county: 100
5. Precipitation	The average annual precipitation:	439 mm
	The average monthly precipitation in June (the max. month	i): 52.5
	mm	ij. 52.5
6. Wind	mm The average monthly precipitation in Feb. (the min. month	
6. Wind	mm The average monthly precipitation in Feb. (the min. month mm	
6. Wind	mm The average monthly precipitation in Feb. (the min. month mm The average annual frequency: NW - 19.9%	
6. Wind	mm The average monthly precipitation in Feb. (the min. month mm The average annual frequency: NW - 19.9% W - 14.4%	

Table All.7.2 Summary of climate characteristics in Tulcea

Source: Tulcea City and ICIM

(2) Air Pollution (Odor)

Regarding air pollution, the estimation has been made based on the measurements of APA (EPA) and of ICIM Bucharest.

Out of 364 samples taken in the Eastern zone of the city, where WWTP site might be influenced, only 3 samples, that is 0.82 percent, were proved to exceed the Maximum Allowable Values (MAV) with ammonia, ^[1]. MAVs are defined by STAS 12547/1987.

The pollution sources are stationary and they are the economic units, located in the eastern industrial platform of the city. These economic units use refrigeration facilities in their production process and heavy oil is used as fuel for production and heating. SO₂ and particulate are considered the most important pollutants emitted by combustion processes.

Regarding odor, the results of measurements in/around proposed WWTP site are presented in Table All.7.3. The locations of sampling points are shown in Fig. All.7.1, and the samples are taken at 2.5 m above the ground level.

AII-7-5

Parameter	Boundary fence	50m from boundary fence	150 m from boundary fence	Limits for 30 minutes sampling period according to RS 12574/1987
H ₂ S (mg/m ³)	0	0		0.015
NH3 (mg/m ³)	0.115	0.105	0.95	0.3
Odor Level	1	1	1	5 All and a state of the second
Odor Level	1	1	<u> 1</u>	5

Table All.7.3 Some results of air pollution measurements in the WWTP site (July 1999).
--

The results of survey show that hydrogen sulfide and ammonia concentrations as well as the odor level in/around proposed WWTP site are keeping at a relatively low level.

(3) Noise

Equivalent Continuous Sound Level (L Aeq, T) is used to assess noise level. L Aeq, T is the Aweighted energy mean of the noise level averaged over the measurement period. It can be considered as the continuous steady noise level which would have the same total A-weighted acoustic energy as the real fluctuating noise measured over the same period of time, and defined as:

ale graden an

e service d'anteres

$$L_{Aeq,T} = 10^* \lg(\frac{1}{T} \int_{0}^{T} (\frac{p_A(t)}{p_0})^2 dt)$$

Where: T = the total measurement time

 $P_A(t)$ = the A-weighted instantaneous acoustic pressure, and

 P_0 = the reference acoustic pressure (20*10⁻⁶ Pa)

Noise must be analyzed at two observation levels:

- at the working place, where there are imposed noise limits in order to not affect the workers' hearing capacity;

- at the open place, where noise limits are imposed for the population's comfort.

Indoor noise level (noise dose) at working places must be under 90 dB (A). Maximum admissible limits (external noise) based on which the environmental state assesses in an objective area are specified in STAS 10009-88 and provide at the yard boundary fence of an industrial area, a max. value of 65 dB (A). Concerning the location of dwellings, this will be made in such a way so that to ensure a max. value of 50 dB(A) for the noise level on the outside of the most exposed building.

The location map of measuring points is showed in Fig. All.7.1, and the points are situated at 1.5 m height and 30 m distance, from the axes of the road. The results of noise measurements around WWTP site are presented in Table All.7.4, which indicated that the present noise level in/around WWTP site is under Romania Standard (STAS 10009-88)

The Experimental States	Noise-dB (A) (LAeq,T)			
Sampling Point		Hourly Interval		
	6:00-22:00	22:00-6:00	Over 24 h	
Point 1 (see Fig. All.7.1)	55.7	45	54.5	
Point 2 (see Fig. All.7.1)	53.5	51 .	53.2	
Point 3 (see Fig. All.7.1)	51.8	45	51	
Maximum Allowable Values (MAV)	65	65	65	
Source: ICIM				

(4) Vibration

The Romanian Standard for vibration is set in STAS 12025, in which the level of "vibration" is established as following:

$$S = 10 \log (A/A_0)$$
 (vibration)

Where:

$$A = a^2 / f (m^2/s^2)$$

Where:

$$A = a^2 / f (m^2/s^2)$$

Where: a = vibration acceleration amplitude at the frequency "f"

F = frequency in Hz

 A_0 = reference level equal with 0.1 cm²/s²

The effects of vibration on the building structure, established also by the above mentioned STAS, are shown in Table AII.7.5.

Level of vibrations	Vibration Category	Effects on buildings structure	
10 - 20	Slight	No damage	
20 - 30	Medium	No damage	
30 - 40	Strong	Slight damages	
40 - 50	Hard	Fissure on the walls	
50 - 60	Heavy Hard	Destruction of the building	
Source: ICIM		ne alar y kan the second page the	

Table All.7.5 Summary of the effects of vibration on the building structure

The results of the measurement performed by ICIM Bucharest using a Bruel & Kjaer instrument, at the points presented on the Fig. AII.7.1, are shown in Table AII.7.6, which indicates the present vibration levels in/around WWTP site show relatively low values.





Location	Acceleration (m/s ²)	Frequency (Hz)	Level of Vibrations	Vibrations Category
Point 1	2-5	15 - 25	12.2	Slight
Point 2	2-5	15 - 25	12.2	Slight
Point 3	1-4	15 - 25	10.3	Slight

Table All.7.6 Results of vibration survey

Source: ICIM

2.2.2 GEOLOGY AND TOPOGRAPHY

(1) Geology

Tulcea town is located in the South-east part of Romania. The County of Tulcea covers a area of 8,430 km², that is 3.5 percent of the whole area of Romania. The county is on the fourth place in Romania as for the size of the area. The county is situated in the area between the Danube River, Chilia Branch and the Black Sea. The Danube River Delta that is the youngest and lowest form of relief in Romania, is situated in the Eastern part of the county. The Danube River Delta is continuously formed going into the Black Sea by the sediments carried by the Danube River and settled between the three branches following in the Delta zone: Sf.Gheorghe, Chilia and Sulina. The geological features of the zone are: cutted crystal foundation on which Triassic, Jurassic, Sarmatian and Pliocene deposites are disposed, and then the plain or deltaic formation-clay, clay sands and sands-are deposited.

In the Tulcea City zone there are sedimentary and greenstone formations over the crystal rock foundation.

(2) Seismology

The origin of most earthquakes in Romania comes from the Carpatian Curve Zone (Vrancea region) at the 100-200 km depth. The condition of propagation does not significantly affect Tulcea zone. In the Romania the constructions are designed taking into consideration the earthquake regime by means of the methodology indicated by the norms P100-92 of the Ministry of Public Works and Territorial Planning. The relations that are used for dimensioning are based on the two coefficients:

 $\mathbf{x} =$ coefficient of construction importance, and

 k_s = coefficient which is defined for each zone of the country;

k_s= Earthquake peak acceleration / Gravity acceleration

Besides the earthquake loads evaluation of the Corner Period -" T_c " is also defined for each county ($T_c = 2 \pi x$ Effective peak velocity / Effective peak acceleration).

a and a second secon

of the dependence of the second

For Tulcea City these values are:

 $k_s = 0.16$ ("D"zone)

The corner period is $T_c=1.5s$.

(3) Soil and Topography

The existing soil in the Tulcea City zone is defined as alluvial soil. Tulcea City is located at 30

AII-7-8

m altitude (above the Black Sea level) on the right side of the Danube River at the distance of 71.3 km from the Black Sea.

The proposed WWTP is located in the Northeast part of the city. The City-owned WWTP site of about 5.7 hectares land is located at the left bank of the Danube River. The land is relatively flat and low-lying with the ground surface elevation ranging from 2.5 m to 3.5 m above the M.W.L. The WWTP site has been approved by the Decision of Tulcea City Council Nr.29 on the 27 May 1996 and the Urbanism Regulation updated (in accordance with GD 525/1996) by the Local Council Decision Nr.19, on the 19 February 1999. This land area can accommodate the activated sludge WWTP to treat the maximum daily wastewater flow of 43,000 m³/day.

In the vicinity of the plant site there are two factories, one is the fish factory named TULCO Tulcea and another one is the beer factory. There are few residences within a distance of 300 m from the western boundary of the site, but to the east, there is a wide Government-owned vacant land that could be used for plant expansion when it becomes necessary in future.

Access to the site can be made through the major road, running from west to east along the Danube River. From the major road, unpaved public road of about 300 m long and 6 m wide is available.

2.2.3 FLORA AND FAUNA

Romania's flora includes over 3,500 plant species of which the Danube River Delta includes about 1,150 plant species.

Out of 8,600 species of birds spread all over the world, about 300 species, that is 3.4 percent of the bird species living in the world, can be found in the Danube River Delta. The number of bird species in the Danube River Delta represents 78 percent of species living in Romania. Almost 300 bird species travel from Asia, Africa, Europe and Polar regions. [6]

The mammals- a few species out of approximately 100 species - living in Romania are mostly considered threatened.

The dominant species living in Tulcea County are specific to the steppe zones (about 7 percent of the Romanian territory) where the average annual rainfall is 450-500 mm and where higher temperature values are met.

The vegetation in the Tulcea zone consists in agricultural plants (cereals, etc) other plants which are mentioned below (dominant and rare species). The wood flora consists of willows (Salix alba, Salix fragilis, Salix purpurea, etc.) and poplars (Populus alba, Populus nigra).

There are small zones in which oak forestry (Quercus robur) can be met. The pastures comprise a good diversity of plants, the main species being Agrositis salonifera, Agrositis canina, Alopecurus pratensis (fox tail- coada vulpii). Along with these plants numerous species of Carex, Juncus, Scirpus, Phragmites communis (recds) are met in the wetland zones.

Fauna is also rich in the zone and the mentioned below. There are mink (*Mustela lutreola*), atters, wild boars, pelicans, small and big egret (*Egretta garzetta*), spoon bill (*Platalea leucorodia*), white vulture, vipers and lizards, etc.

The main fish with economic interest are: sturgeons, herrings, caros, breams, sheet fish (Silurus glanis), etc.

· .

o et la station de la station de la sec

San Start Start

and a state of the

a hara ya shara sh

The dominant species of plants are: [6]

- Poa bulbosa 👘 👘
- Festuca valesiaca (paiusul)
- Stipa capillata
- Stipa stenophylla ٠
- Stipa lessingiana •
- Biotriochloa ischaemum •
- Artemisia austriaca (wormwood-pelinita)
- Agropyron cristatum
- Bromus tectorum
- . Setaria viridis
- Euphorbia stepposa (dogmilk-laptele cainelui) ٠
- Echium rossicum (snake head capul sarpelui)
- Vicia tennifolia
- Inula germanica
- Centaurea orientalis
- Astragalus asper
- Medicago falcata
- Thymus marschallianus (sowory)
- Adonis vernalis •
- Muscari sp.(rook onion-ceapa ciorii)
- Iris pumila and Iris graminea (iris -stinjenel)
- Paeonia tenuifolia (steppe peony bujor)

Shrubs

- Prunus spinosa (porumbar)
- Prunus tenella (almond tree-migdalul)
- Rosa gallica (steppe cherry tree- ciresul de stepa)

elc.

- Prunus fructicosa
- Paliurus spina-christi
- Jasminum fructicans (sawage jasmin)
- Quercus penduculiflora (oak)
- Querucus pubescens (oak)
- Acertatoricum (tatar maple artar tataresc)
- Carpinus orientalis
- Prunus mahaleb (Turkish cherry tree-cires turcesc)
- Cornus mas (cornel tree-corn)
- Frakinus ornus
- Cornus sanguinea
- Cartaegus monogyna a contra da tracta da carta en el éta de la composition de la composition da la factoria que provide provide de la composition de la compo ER an monoRhume de la composition de la

Animals whether a structure can be whether a structure for the

- Citellus citellus (ground squirrel popandau)
- Mustella eversmani Leaa (steppe fitch dihorul de stepa)
- Lepus europaeus (hare iepure)

- Cricetus cricetus (hamster harciog)
- Vormela peregusna Gueld (variegated fitch- dihor pestrit)
- Vipera amodites montadoni (viper vipera)
- Reticuliterms lucifugus Rossi (termites)
- Testudo graeca ibera Pall (turtle broasca testoasa)
- Coluber jugularis caspius (snake-sarpe)
- Scolopendra cingulata latr. (circiioc)

Major birds that can be found in the zone are sparrows, swallows (Hirundo rustica), partriges, quails, woodpeckers, etc.

The Danube River delta has become a component of the list of the Programme "Man and Biosphere" in 1990 based on the "Convention on the Wetlands of International Importance, Especially as Waterfowl Habitat" (Ramsar 1971).

The total preserved area for the Danube River Delta is 5,912 km² of which 592.8 km² is strictly protected (comprising 16 zones), 3,332 km² - buffer zone and the rest of surface is considered transitional zone.

The species of rare plants and animals, or threatened to become extinct in the Danube River Delta are mentioned in the following list: [6]

A set of the set of the set of the set of the set of

Plants

- Convolvulus persious Plantage coronopus
- Petunia parviflora
- Nymphae alba
- Nymphae candida
- Ephedra distochia
- Merenderas sobolifera
- Convallaria majalis
- Periplóca gracca

Animals

- Acipenser nudriventis
- Acipenser sturio
- Acipenser ruthenus
- Acipenser guldenstaedti
- Huso huso
- Vipera ursini renardi
- Neliaetus albicilla
- Falco peregrinu
- Platalea leucorodia
- Plegadis faleinellus
- Tadorna tadorna
- Tadorna ferruginca
- Netta rufina
- Falco cherrug
- **Falco vespertinus**



and the first strate and the second strategies.

- Himantopus himantopus
- Recurvirostra avesetta
- Columba oenas
- Bubo bubo
- Caprimulgus europaeus
- Canis lupus
- Lutra lutra
- Mustela erminea
- Mustela nivalis
- Vormela peregusna

As a special terrestrial ecosystem the Forest of Niculitel (11 hectares) is considered to be an important area which has kept a "high degree of naturalness", though having an important landscape value.

2.2.4 WATER RESOURCES

North States

(1) Ground Water

Groundwater level in proposed WWTP site is 0.70 m to 2.20 m measured under the natural level of the land.^[2] The variation of the level might be + or - 1m, according to the season over the year and the precipitation-evaporation regime over the years.

and a state of

Generally speaking, the ground water quality corresponds to the quality required by the RS (STAS) 1342/91. In case of Tulcea City it must be mentioned that a centralized system of raw water is coming mainly from the Danube River. Water intaken from the groundwater and surface water resources in the county of Tulcea is presented in the Table AII.7.7.

				00 m ³ /year (1995)
Water Use	Surface Water	Ground water	Total Intake	Total Discharge
Drinking Water	20,509	2,820	23,329	8,762
Industrial Water	18,388	11,084	18,498	16,367
Irrigation	18,162	1,805	18,246	- · · · · · · · · · · · · · · · · · · ·
Fowls	130	• 14	1,935	842
Total	57,189	4,819	62,008	25,971

Table All.7.7 Water intaken and discharged in the County of Tulcea^[1]

Tulcea City is supplied mainly with surface water abstracted from the Danube River (19,575,000 m³), and only 240,000 m³ from the existing ground water resources (1995). [1]

The groundwater intake used for supplying a part of Tulcea City is located in the zone of village Bogza.

The quality of groundwater intaken corresponds to the standard requirements (STAS 1342/91) except Permanganate Value and Ammonia which exceed 12 mg/l and 0.5 mg/l, respectively. [3]

AII-7-12

(2) Surface Water

Rivers

99 percent of the inland rivers belong to the tributary area of the Danube River. Only one percent of the inland rivers-located in Tulcea County-discharge their waters directly to the Black Sea. The hydrographic network of the Tulcea county territory is divided in two groups: one group belonging to the tributary area of the Danube River, and another one belonging to the tributary area of the county.

The City's major urban and industrial districts are located at the right bank of the Bratul Tulcea (Tulcea Branch), an arm running between the stretches of land Chilia and Sf. Gheorghe. The Tulcea branch stretches about 19 km with the maximum width of about 300 m, the deepest portion being 39 m. The branch carries about 40 % of the total river water flow.

Among the rivers in the tributary area of the Danube River are following ones: Rosti, Alorman, Cerna, Plopi, Jijila, Luncavita which have the tributary areas less than 100 km² and the most important river-Topologul with the surface area of its basin 345 km² and the length of 38 km. The surface area of Topologul River basin and length belonging to Tulcea County are 165 km² and 20 km, respectively.

The Danube River is the most important surface water resource in the zone. Water abstracted from the Danube River for different purposes was presented in Table AII.7.7.

The multi-annual average flow (MAF) of the Danube River at the entrance of the county of Tulcea is $6,000 \text{ m}^3/\text{s}$. Out of the average flow value only about 13 percent is transported through Macin Branch which is a boundary between the county of Tulcea and the county of Braila.

The average flow (AF) of the Danube River into the Black Sea is 6,340 m³/s, the additional flow being issued on the left side by the Siret River -230 m³/s and Prut River - 110 m³/s. The annual average flow values have variation of 1.5 times AF in the rainy years to 0.63 times AF in the droughty years.

The MAF of suspended matter is 1,800 kg/s at the entrance of Tulcea County and about 2,200-2,400 kg/s at the Ceatal Ismail point. The scoured sediments are not significant while comparing with the flow values of suspended matter (one percent of values of the suspended matter carried).

The Danube River water quality in Tulcea reach belongs to the second category whereas downstream the river become on the first category on two branches (Sulina and Sf.Gheorghe) and remain in the second category on Chilia branch. This could be explained by the self-purification process in those two branches - Sulina and Sf.Gheorghe.

A dam is built to defend the site of WWTP from flood events. Anyhow according to the existing data, [1] no event has been occurred up to now.

Lakes

All-7-13

Tulcea County is unique in Romania with respect of the huge area covered by lakes and wetlands. Out of the whole surface area of the county (849,875 ha)-353,386 ha are covered by waters. A lagoon system is formed by the lakes Razelm, Golovita, Babadag.

The lake Ciuperca is situated in the outskirt of Tulcea City in the Western part of the city. It has a volume of 0.31 million m³ having as the main function-recreational area (bathing) for the population living in Tulcea City. Regarding the water quality of this lake it is mentioned that it is classified in the first category (STAS 4706/88) ^[5]. It has to be mentioned that in some periods of time the organic substances in the lake water exceeds the values indicated for the first category and the quality category goes to the second one. This situation appears due to the wastewater discharges from SC CONPREF SA, SC CIMEX SA and SC DONARIS SA ^[5].

2.3 IMPACTS ON ENVIRONMENT

2.3.1 IMPACTS ON SOCIOECONOMIC CONDITIONS

(1) Resettlement

Illegal inhabitants have encroached in the proposed land for the proposed WWTP. This impact should be minimized to the extent possible, since involuntary resettlement is usually a traumatic experience for affected people, apart from legal, institutional and social consequences to the project implementation. The resettlement could be threatened with delays or additional costs.

At present the number of illegal inhabitants is limited (7 small houses, under 35 inhabitants), and the problem resettlement will be solved by Tulcea City Hall before starting the construction. Based on the results of unit costs survey, the costs relating to resettlement are roughly estimated as shown on Table AII.7.8, which indicates total resettlement costs will be about 767 millions Lei (or 48,000 US \$).

一般,这一个人们是这种地位,不可能在了这些

I all the second se

化氯化物 医无关的 化乙烯酸磷酸盐医酸 化分配分离

e shaking fan yn eis geenn eis sefna ffrank ferfen ferfen syn dêr.

the end of the first second and 的复数形式 化试验 网络有关的时间 建汽油 法律师 11.1

ar mengense for der for het der der eine sonste verste het der einen einen einen der einen einen einen einen ei Der sterigte der begigte forste sterigte geste sterigte sektieder einen einen einen einen einen einen einen eine

AII-7-14 /

Description	Quantity :	Unit Cost 🐇	Total Amount	
	n an an taon a Taon an taon an	(Lei)	(Lei)	(US \$)
. Existing Constructions	·	1	108,000,000	6,750
1.1 Houses (one-storied houses)	7	10,000,000	70,000,000	4,375
1.2 Huts	6	3,000,000	18,000,000	1,125
1.3 Pigsties and hen coops	20	1,000,000	20,000,000	1,250
2. Animals	· · · · · · · · · · · · · · · · · · ·	•	166,808,000	10,426
2.1 Pigs (90 kg/capita)	46	25,600	105,984,000	6,624
2.2 Cows (400 kg/capita)	4	21,200	33,920,000	2,120
2.3 Asses	5	1,600,000	8,000,000	500
2.4 Hens (3 kg/capita)	80	13,600	3,264,000	204
2.5 Geese (5 kg/capita)	230	13,600	15,640,000	978
3. Movement Transport	11			
10 km/time×1 time/house×7 houses	70	25,000	1,750,000	109
1. New Dwelling Costs	1.1.5.	a states		
3 rooms/apartment, 7 apartment	7	70,000,000	490,000,000	30,625
Total Costs	•		766,558,000	47,910

Table All.7.8 Estimated costs of resettlement

(2) Noise, Vibration and Traffic

Noise and Vibration An and a star of a second

The noise sources of the WWTP are: te senten en la servera de la 이 가슴을 만나 감독을 가 봐.

- 1) Pumping stations (during operation period)
- 2) Aeration equipment (during operation period)

3) Mobile sources, most of them consisting in vehicles and machinery used during WWTP construction period.

tti e sessi t

All States and States and

Neither densely residential areas nor facilities as hospitals and schools, which require a quiet atmosphere, are located in the vicinity of WWTP site. Therefore, the effect of noise from WWTP on environment during the operation period will be not expected so seriously.

During the construction, however, several different types of heavy construction equipment will be simultaneously put in operation. Although at this stage precise construction schedules and methods can hardly be determined yet, the possible noise levels from construction equipment may be reasonably estimated assuming appropriate construction procedures.

The possible noise power levels at the different distances have been calculated as a reference for a condition that two bulldozers, one power shovel and two dump trucks are simultaneously put in operation. The estimated compound noise levels at the locations of 10 m, 20 m, 30 m, 50 m, 80 m, 100 m are shown as Table All.7.9, which indicate that the countermeasures for noise should be considered during construction period.

Concerning the vibration, so significant vibration sources exist. 医血液试验 化连接合理机 网络拉马马拉马马拉马马拉马马

Distance from	Noise Power Level dB(A)				
Source (m)	Bulldozer	Power Shovel	Dump Truck	Compound Noise Level	
10	85.69	79.03	80.77	89.15	
20	79.66	73.01	74.75	84.23	
30	76.14	69.49	71.22	80.70	
50	71.70	65.05	66.78	76.26	
80	67.16	60.96	62.70	72.18	
100	65.67	59.02	60.75	70.23	
150	62.14	55.49	57.22	66.70	

Table All.7.9 Estimation of the noise generated from vehicles and machinery

Traffic

The results of traffic-flow survey at present access road indicate that the traffic-flow is around 175 to 220 vehicles/day among which the traffic-flow during the period of 7 a.m. to 4 p.m. represents 80% of the daily flow. This means in the day-time the traffic-flow is ranged from 16 to 20 vehicles/hr, therefore, traffic congestion problem could be negligible.

(3) Water Rights and Rights of Common

As mentioned in previous section, at present all the wastewater used to be discharged directly into the Danube River through seven wastewater outfalls without any treatment. According to the F/S Study after WWTP being put into operation the existing outfalls will be closed and all of the wastewater will be collected and treated at WWTP, and the pollution load discharged to the Danube River will be reduced obviously. Therefore, the project implementation will not create the impact on the fishing rights.

Consequences and participants of the

建立性态度 医磷酸铁 医原子之的

计表相关 医加利斯 通知 法制备 化合合合金 经

gen (4 - 14

Before and after the project implementation, there are no changes about the volume of wastewater discharged to the Danube River. Besides this, the intake for water supply system of Tulcea City is located in the upstream of 9 km from the center of the City, and the nearest intake in the downstream of Tulcea City is located at about 15 km as far as WWTP outfall. Therefore, it could be considered that the effect of wastewater on water rights is negligible.

In Tulcea there is only one authorized swimming area on the left side of the Danube River bank opposite to the Hotel Delta. In addition, the inhabitants usually swim along the Danubé River bank where are unauthorized areas by the local health authorities. However, as mentioned above in the future the existing outfalls will be closed and all of the wastewater will be collected and treated at WWTP, then discharged at the downstream of the City. It is estimated that the rights of common will be improved by the project implementation.

(4) Public Health Condition

Treated Wastewater

The results of wastewater characteristics survey at existing outfalls along the Danube River reach of Tulcea City revealed that the number of total Coliform Group in raw wastewater, which now is discharged directly into The Danube River, is about 1×10^7 no./100ml to 1×10^8

化合成可能成准确 医同胞的 法法律应该权利 化合同的 化合合物 静脉

no./100ml. While the number of total Coliform Group in The Danube River (1 km downstream from the outfall of proposed WWTP, Aug. 1999) is 2.4×10^3 no./100ml to 3.5×10^3 no./100ml. which has exceeded the standard (1×10^2 no./100ml, STAS 12585/1987) of water for swimming purposes.

According to the F/S Study after WWTP being put into operation all of the existing outfalls will be closed and all of the wastewater will be collected and treated at WWTP. The number of total Coliform Group in WWTP effluent will be meet the standard $(1 \times 10^6 \text{ no.}/100 \text{ m})$, NTPA 001) of wastewater discharged in water resources. Hence, during WWTP operation stage the public health condition will be improved certainly.

Sludge

The excess sludge generated from WWTP will be transported and disposed at the Solid Waste Disposal Site (SWDS) located in the southwest of the City about 8 km from the center of the City. The impacts of excess sludge will be discussed in following paragraph.

(5) Waste

At present the capacity of SWDS in Tulcea is enough for disposing excess sludge (19 m³/d or 3.8 t/d) generated from WWTP. However, the results of wastewater characteristics of leachate from SWDS in Tulcea indicated that the concentrations of the organic substances (BOD5: 2,988 mg/l, COD_{Mn}: 6,770 mg/l), NH₄-N (548 mg/l) and oil (278 mg/l) etc. in the leachate have exceeded the standard (NTPA 002/1997) of wastewater discharged into municipal sewage system substantially. In addition, the number of total Coliform Group is also relative high (5.4 $\times 10^8$ no./100ml). All of these may contribute a negative impact on groundwater. Therefore, countermeasures are considered to be necessary.

(6) Hazards

The results of geological survey indicated that the surface (0 to 2m) at WWTP site is unhomogeneous filling and the bottom (2 to 15 m) is gray fine-medium sand, and N-value of WWTP site ranges from 10 to 50. Taking into consideration the WWTP site locates in the seismic region, a careful aseismatic structure design will be considered in the planning and design of the wastewater treatment facilities.

Biogas resulting from sludge digester is a potential explosive fuel. So in some conditions there exists the possibility of producing accidents with major effects both on facility operation and maintenance staff (such as burning, different physical or mental injuries sometimes even lethal) and on technological objectives. Receiver water and/or soil and subsoil in the area might be affected by spillage of liquids following the breaking or destruction of technological objectives.

These events may appear in case of the incorrect operation and maintenance of sludge fermentation tanks and/or of biogas tanks.

In addition, the chlorination process is to be carefully controlled, avoiding overdosing of chlorine and by respecting the operation and maintenance instructions.

> Section 2 18

and the second second second