Table XI.1.1 Implementation Schedule of The Integrated Water Pollution Control Plan for Puno Interior Bay

Proposed Plan			Priority	Year
Measures	Component			2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025
External Pollution Load Reduction	Sewerage Systems	Sewer Expansion	1	
		WWTS Improvement	1	
	Sanitary Toilet		2	
	Urban Drainage		3	
Solid Waste Management	Removal of Illegally Dumped Wastes		2	
	Increase of Collection Rate		1	
	Expansion/Upgrade of Final Disposal Site		1	
In-Lake Management	Removal of *Lemna*		2	
	Cover of Bottom Sediment		4	
	Replanting of Totora		3	
Non-Structural Measures	Environmental Education & Campaign		1	
	Citizen's Participation		1	
	Institutional Strengthening		1	
	Land Use Management		3	
	Livestock Farming Management		4	
	Regulation of Effluents		2	
Environmental Monitoring			1	

Construction

Operation

The removal of littered wastes should be started early to stop further dumping and to enhance the citizen's awareness. As an essential control measure, the waste collection rate should be increased as a first priority, while it should be realized stepwise due to the severe financial conditions. Although a large amount of investment cost is necessary to adopt a sanitary landfill, it will be required soon to follow the DIGESA's guideline.

The removal of *Lemna* should be continued at least until the year 2008 when the lake water quality is expected to be improved by the sewerage systems improvement. Even if *Lemna* is significantly reduced, it should be continued by the citizen's participation in order to keep on enhancing the citizen's awareness. The sediment cover should be implemented when the measures against the external pollution load does not produce the expected effects. Replanting "Totora" does not require a special equipment or a large amount of investment, and so it can be started soon.

Besides the structural measures, no-structural measures should be started as early as possible in order to formulate citizen's awareness and understanding for the Integrated Plan. Citizen's awareness and understanding are indispensable to promote the structural measures.

First of all, the environmental monitoring should be practiced as the top priority. It will assure the quality of the Integrated Plan.

1.3 ORGANIZATION FOR IMPLEMENTATION OF THE INTEGRATED PLAN

It is recommended to assign the following organizations in order to implement the Integrated Plan rationally and effectively.

(1) Overall Management and Coordination

Competent organizations : INADE, PELT

Duties : policy/strategy making, decision making, fund raising, and coordination of component projects

(2) Execution and Management of Component Projects

1) Expansion of sewer system

EMSAPUNO

2) Improvement of wastewater treatment system

EMSAPUNO

3) Sanitary toilet

- guidance for installation of pit latrine : Ministry of Health, Puno Provincial Municipality
- pit emptying : EMSAPUNO

4) Urban Drainage

Puno Provincial Municipality

5) Removal of illegally dumped Wastes

- execution : the citizen of Puno City
- coordination : Puno Provincial Municipality, Multisectorial Committee, NGOs (nongovernmental organizations)

6) Increase of Collection Rate

Puno Provincial Municipality

7) Expansion and Upgrading of Final Disposal Site

Puno Provincial Municipality

8) Removal of *Lemna*

(until 2008)

- execution : PELT, Puno Provincial Municipality

(from 2009)

- execution : the citizen of Puno City
- coordination : Puno Provincial Municipality, Multisectorial Committee, NGOs

9) Bottom Sediment Cover

PELT

10) Replanting of Reed (Totora)

PELT

11) Environmental Education and Campaign

Puno Provincial Municipality, Multisectorial Committee, NGOs

12) Citizen's Participation

Puno Provincial Municipality, Multisectorial Committee, NGOs

13) Institutional Strengthening

- execution : each executing organizations
- coordination for consolidation/collaboration : Multisectorial Committee

14) Land Use Management

Puno Provincial Municipality

15) Livestock Farming Management

Puno Provincial Municipality, Ministry of Agriculture

16) Regulation of Effluents

Ministry of Health / DIGESA

17) Environmental Monitoring

PELT, DIGESA, UNA

1.4 PROJECT COSTS

Annual costs for each component project until 2025 are summarized in *Table XI.1.2* (sol (S/.)) and *Table XI.1.3* (US dollar (US$)). All the costs are based on the prices in the year 1998 and price escalation is not taken into account. IGV (general sales tax) is not included.

Table XI.1.2 Project Costs of The Integrated Water Pollution Control Plan for Puno Interior Bay (sol (S/.))

(thousand Peruvian Nuevo Soles (S/.1000))

Proposed Plan		Year	1999		2000		2001		2002		2003		2004		2005	
Measures	Component	Priority	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M
External	Sewerage	1	1,616.7	0.0	2,991.0	22.2	22,076.1	22.2	3,243.2	572.7	199.0	596.5	433.6	621.0	0.0	645.7
Pollution Load	Sanitary Toilet	2			0.0	0.0	350.0	302.1	0.0	301.4	0.0	300.8	0.0	261.5	88.0	260.7
Reduction	Urban Drainage	3			770.6	0.0	963.2	8.4	963.2	8.4	963.2	8.4	963.2	8.4	963.2	8.4
Solid Waste Management		1			14.0	0.0	2,961.0	0.0	2,870.0	1,289.4	216.2	1,290.8	2,348.0	1,432.8	216.2	1,338.1
In-Lake	Removal of *Lemna*	2			378.0	36.8	0.0	36.8	0.0	36.8	0.0	36.8	0.0	36.8	0.0	36.8
Management	Replanting of Totora	3			0.0	14.5	0.0	15.2	0.0	18.5	0.0	18.5	0.0	18.5	0.0	18.5
	Cover of Nutrient-rich Sediment	4														
Non-Structural Measures		1			289.8	516.3	0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3
Environmental Monitoring		1			15.0	184.2	0.0	184.2	0.0	184.2	0.0	184.2	0.0	184.2	27.0	184.2
Total			1,616.7	0.0	4,458.3	774.1	26,350.3	1,085.2	7,076.4	2,927.7	1,378.4	2,952.2	3,744.8	3,079.3	1,294.4	3,008.5

2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M
0.0	681.4	0.0	718.4	0.0	756.9	3,764.5	807.0	1,681.0	941.7	2,177.7	974.0	11,634.3	1,006.8	1,862.7	1,040.3	2,097.3	1,074.4	1,663.8	1,109.1	2,889.3	1,134.3
0.0	259.8	0.0	237.6	0.0	236.5	246.0	235.5	0.0	195.7	0.0	195.6	0.0	195.5	66.0	195.4	0.0	195.3	0.0	195.2	0.0	194.9
963.2	8.4	963.2	8.4	963.2	8.4																
4,006.2	1,558.4	2.0	1,373.4	216.2	1,400.7	2,962.1	1,637.7	0.0	1,486.1	3,336.2	1,718.4	2,640.1	1,753.3	432.4	1,707.6	3,963.2	1,948.0	216.2	1,717.0	467.3	1,782.9
0.0	36.8	0.0	36.8	0.0	36.8	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0
0.0	18.5	0.0	18.5	0.0	17.9																
						1,534.8	0.0	10,944.1	42.3	2,621.8	23.8	2,621.8	23.8	2,621.8	23.8	2,827.1	25.7				
0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	289.8	516.3	0.0	516.3	0.0	516.3	0.0	516.3
0.0	184.2	0.0	184.2	0.0	184.2	0.0	184.2	0.0	184.2	0.0	184.2	27.0	184.2	135.0	184.2	0.0	184.2	15.0	184.2	0.0	184.2
4,969.4	3,263.6	965.2	3,093.5	1,179.4	3,157.6	8,507.3	3,385.6	12,625.1	3,371.3	8,135.6	3,617.2	16,923.2	3,684.9	5,407.7	3,672.6	8,887.7	3,948.8	1,895.0	3,726.8	3,356.6	3,817.6

2017		2018		2019		2020		2021		2022		2023		2024		2025		Total	
Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Investment	O/M
7,556.2	1,168.6	2,671.4	1,201.5	2,521.3	1,239.3	1,599.0	1,275.7	1,581.8	1,308.8	11,552.3	1,342.4	1,780.7	1,376.6	2,015.3	1,411.5	1,581.8	1,446.9	91,189.8	24,495.7
246.0	194.7	0.0	194.5	0.0	194.3	0.0	194.0	66.0	193.6	0.0	193.3	0.0	193.0	0.0	171.4	186.0	171.0	1,248.0	5,463.5
																		8,476.2	67.0
4,171.2	2,072.2	683.5	1,991.0	4,141.3	2,302.5	0.0	2,029.5	5,667.0	2,338.0	1,740.0	2,000.0	432.4	2,013.8	2,391.4	2,375.1	467.0	2,115.0	46,561.4	42,671.3
0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	0.0	5.0	378.0	415.8
																		0.0	158.3
																		23,171.2	139.5
0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	0.0	516.3	579.6	13,424.2
0.0	184.2	0.0	184.2	27.0	184.2	0.0	184.2	0.0	184.2	0.0	184.2	0.0	184.2	0.0	184.2	0.0	184.2	246.0	4,788.3
11,973.5	4,141.0	3,354.9	4,092.4	6,689.6	4,441.6	1,599.0	4,204.7	7,314.8	4,545.8	13,292.3	4,241.1	2,213.2	4,288.9	4,406.8	4,663.4	2,234.8	4,438.4	171,850.2	91,623.7

not including IGV

Table XI.1.3 Project Costs of The Integrated Water Pollution Control Plan for Puno Interior Bay (US dollar (US$))

(thousand US Dollars (1000 US$))

Proposed Plan		Year	1999		2000		2001		2002		2003		2004		2005	
Measures	Component	Priority	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M
External	Sewerage	1	513.3	0.0	949.5	7.1	7,008.3	7.1	1,029.6	181.8	63.2	189.4	137.6	197.1	0.0	205.0
Pollution Load	Sanitary Toilet	2	0.0	0.0	0.0	0.0	111.1	95.9	0.0	95.7	0.0	95.5	0.0	83.0	27.9	82.7
Reduction	Urban Drainage	3	0.0	0.0	244.6	0.0	305.8	2.7	305.8	2.7	305.8	2.7	305.8	2.7	305.8	2.7
Solid Waste Management		1	0.0	0.0	4.4	0.0	940.0	0.0	911.1	409.3	68.6	409.8	745.4	454.8	68.6	424.8
In-Lake	Removal of *Lemna*	2	0.0	0.0	120.0	11.7	0.0	11.7	0.0	11.7	0.0	11.7	0.0	11.7	0.0	11.7
Management	Replanting of Totora	3	0.0	0.0	0.0	4.6	0.0	4.8	0.0	5.9	0.0	5.9	0.0	5.9	0.0	5.9
	Cover of Nutrient-rich Sediment	4														
Non-Structural Measures		1	0.0	0.0	92.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9
Environmental Monitoring		1	0.0	0.0	4.8	58.5	0.0	58.5	0.0	58.5	0.0	58.5	0.0	58.5	8.6	58.5
Total			513.3	0.0	1,415.3	245.7	8,365.2	344.5	2,246.5	929.4	437.6	937.2	1,188.8	977.6	410.9	955.1

2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016	
Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M
0.0	216.3	0.0	228.1	0.0	240.3	1,195.1	256.2	533.7	299.0	691.3	309.2	3,693.4	319.6	591.3	330.2	665.8	341.1	528.2	352.1	917.2	360.1
0.0	82.5	0.0	75.4	0.0	75.1	78.1	74.8	0.0	62.1	0.0	62.1	0.0	62.1	21.0	62.0	0.0	62.0	0.0	62.0	0.0	61.9
305.8	2.7	305.8	2.7	305.8	2.7																
1,271.8	494.7	0.6	436.0	68.6	444.7	940.3	519.9	0.0	471.8	1,059.1	545.5	838.1	556.6	137.3	542.1	1,258.2	618.4	68.6	545.1	148.3	566.0
0.0	11.7	0.0	11.7	0.0	11.7	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6
0.0	5.9	0.0	5.9	0.0	5.7																
						487.2	0.0	3,474.3	13.4	832.3	7.6	832.3	7.6	832.3	7.6	897.5	8.2				
0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	92.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9
0.0	58.5	0.0	58.5	0.0	58.5	0.0	58.5	0.0	58.5	0.0	58.5	8.6	58.5	42.9	58.5	0.0	58.5	4.8	58.5	0.0	58.5
1,577.6	1,036.1	306.4	982.1	374.4	1,002.4	2,700.7	1,074.8	4,008.0	1,070.2	2,582.7	1,148.3	5,372.4	1,169.8	1,716.7	1,165.9	2,821.5	1,253.6	601.6	1,183.1	1,065.6	1,211.9

2017		2018		2019		2020		2021		2022		2023		2024		2025		Total	
Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Invest.	O/M	Investment	O/M
2,398.8	371.0	848.1	381.4	800.4	393.4	507.6	405.0	502.1	415.5	3,667.4	426.2	565.3	437.0	639.8	448.1	502.1	459.3	28,949.1	7,776.4
78.1	61.8	0.0	61.8	0.0	61.7	0.0	61.6	21.0	61.5	0.0	61.4	0.0	61.3	0.0	54.4	59.0	54.3	396.2	1,734.5
																		2,690.8	21.3
1,324.2	657.9	217.0	632.0	1,314.7	731.0	0.0	644.3	1,799.0	742.2	552.4	634.9	137.3	639.3	759.2	754.0	148.3	671.4	14,781.4	13,546.5
0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6	0.0	1.6	120.0	132.0
																		0.0	50.3
																		7,355.9	44.3
0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	0.0	163.9	184.0	4,261.6
0.0	58.5	0.0	58.5	8.6	58.5	0.0	58.5	0.0	58.5	0.0	58.5	0.0	58.5	0.0	58.5	0.0	58.5	78.1	1,520.1
3,801.1	1,314.6	1,065.0	1,299.2	2,123.7	1,410.0	507.6	1,334.8	2,322.1	1,443.1	4,219.8	1,346.4	702.6	1,361.5	1,399.0	1,480.5	709.5	1,409.0	54,555.6	29,086.9

not including IGV

1.5 EVALUATION OF THE INTEGRATED PLAN

(1) Technical Aspect

It must be a great challenge to tackle the water quality improvement in Puno Interior Bay. The important thing is to start with acceptable one which is easy to operate/maintain, cheap to invest, effective in the environment improvement and harmless to the environment. The measures proposed in the Integrated Plan meet these requirements. The Plan does not propose the advanced technology if it is too expensive. The Plan does not propose the technology which improves only Puno Interior Bay's environment but affects the whole Lake Titicaca, either.

The Plan provides the conceptual designs of necessary facilities and equipment, the cost estimation, priorities of implementation, and the financial plan.

(2) Financial Aspect

The great challenge requires a large amount of investment even if reasonable techniques are applied to each component projects. However, as discussed in the previous chapters, the financial status of the local government in Puno is too serious to realize the Plan. Even if the local government of Puno succeed in increasing the revenue with a maximum effort, strong financial support by the state government will still be indispensable.

(3) Economic Aspect

The Plan was evaluated as follows from the economic point of view.

1) Basic Conditions and Assumptions

In estimating economic cost and benefit (revenue), economic values are converted or quantified applying the following conditions and assumptions into the financial costs of the proposed plan estimated in the previous chapters.

- Opportunity cost of capital represents the permissible economic rate of return for development plan. In this case, 5 % of this opportunity cost of capital will be suitable as a discount rate for assessing economic viability

of the proposed plan because this environment plan is not profit oriented one and the 5 % is the intra bank rate in late August in 1999.

- In the economic analysis, all goods and services related to the costs and the benefits of the Plan have to be estimated on the basis or real economic value. But many local portion (S/.202,269 thousand) of purchased goods and service will affect the Puno's economy affirmatively (for instance, the solution of unemployment). Even so, the economic value of these local portion is estimated to be same as the financial value. On the other hand, the imported goods and services is estimated based on international market price.

- The economic life of the plan is taken as until 2025FY(fiscal year). The benefits accruing from the Plan are assumed to continue in proportion to increasing service population during the economic life of the plan.

2) Economic Costs

The construction and O/M (operation and maintenance) costs of the proposed Integrated Plan are summarized in *Table XI.1.2* and *Table XI.1.3* in financial terms which is described before.

3) Economic Benefits

There will be various benefits accruing from this plan and some of them will be quantified taking account of data availability

- Decrease of environment-borne diseases
- Reduction of future purification cost for water supply
- Opportunity expense

If this plan can not start, the environment of Puno will become worse and worse. As the result, Lake Titicaca will be dirty and fishery activities will be damaged and the sightseeing business will be also diminished. The effects were estimated from current business volume.

a. **Fishery activity**

According to the 1998FY statistic report by Puno fishery office, the volume in Puno province was 586,127 Kg (S/. 2,079 thousand). Also in Chucuito 638,028Kg (S/. 2,271 thousand). The fishery will be diminished until 2025FY steadily.

Although there is no clear projection, it is assumed that the sales amount of Puno and Chucuito will be zero by 2025FY if no measures are implemented (the case of "without project").

b. **Sightseeing business**

According to the 1998FY statistic report by Puno tourism office, the number of sightseeing guests and average stay of the guest by each category of hotel were reported. So it is possible to estimate the total sales amount of hotels which is the major income of the sightseeing business in Puno. The amount is at least S/. 9,317,629 (see Chapter II for detailed explanation). Although there is no clear projection, it is assumed that the total sales amount of S/. 9,318 thousand will be zero until 2025FY if there is no measure. On the other hand, it is assumed that the total sales amount will be sustained until 2025FY if the Integrated Plan is accepted and implemented. To prevent the decrease of the tourism sales amount or to sustain the current sales amount is, so to speak, to produce the hidden sales amount which should be an economic benefit of the Plan.

4) Economic evaluation

The parameters, the Profit and the EIRR (economic internal rate of return), were estimated as shown in *Table XI.1.4(1)*. The Integrated Plan was evaluated in terms of economic efficiency by using these parameters. The results of the evaluation are shown in the following table.

The cost and revenue of solid waste management of the proposed Integrated Plan is based on case1 (The existing waste handling charge (32 soles/household/yr) is not raised and environment fee is not applied. See *Table VI.2.11*).

Table XI.1.4(1) Results of EIRR

Total cost	S/. 282,604 thousand
Total revenue	S/. 428,693 thousand
Profit	S/. 146,089 thousand
EIRR	15.2%

The value of EIRR is higher than 10% assumed as an opportunity cost in Peru and the cumulative profit is plus. So it can be said that the proposed Integrated Plan is viable from the economic point of view.

In order to analyze the sensitivity of EIRR of the proposed Integrated Plan, the amount of cost and revenue are changed as the following table. The combinations enclosed by a black thick line are considered as feasible, because the EIRRs of each combination exceed 10% assumed as an opportunity cost in Peru. For example, even if cost expands by 10% and revenue is same (this case is that cost is 110% and revenue is 100%), the proposed Integrated Plan is still feasible, because the EIRR of this case is 10.3%.

Table XI.1.4(2) Sensitivity analysis of EIRR of the proposed Integrated Plan

(Unit: %)

Revenue \ Cost	80%	90%	100%	110%	120%	130%	140%	150%	160%	170%	180%	190%
80%	15.2	9.4	5.6	2.7	—	—	—	—	—	—	—	—
90%	26.9	15.2	9.9	6.4	3.6	—	—	—	—	—	—	—
100%	—	24.9	15.2	10.3	7.0	4.4	2.2	—	—	—	—	—
110%	—	—	23.5	15.2	11.0	8.0	5.6	3.0	—	—	—	—
120%	—	—	—	22.5	15.2	11.0	8.0	5.6	3.6	—	—	—
130%	—	—	—	43.2	21.7	15.2	11.3	8.4	6.1	4.2	2.5	—
140%	—	—	—	—	36.1	21.1	15.2	11.5	8.8	6.6	4.7	3.1

*1 100% is the basic condition of the proposed Integrated Plan shown in the *Table XI.1.4(1)*. Cost "90%" means that the cost of the basic condition is cut by 10%.

Table XI.1.5 Economic Evaluation for the proposed Integrated Plan (tourism will drop down by 100% by the year 2025)

Cost & Expense	Total(99-25)	1999FY	2000FY	2001FY	2002FY	2003FY	2004FY	2005FY	2006FY	2007FY	2008FY	2009FY	2010FY	2011FY
Sewerage	133,100	2225	3887	26425	4399	831	1133	645	681	718	757	5250	2925	3544
Sanitary Toilet	7,092			724	310	309	269	372	267	244	243	532	202	201
Urban Drainage	10,069		909	1,145	1,145	1,145	1,145	1,145	1,145	1,145	1,145			
Solid Waste Management	89,233	0	14	2,961	4,159	1,507	3,781	1,554	5,565	1,375	1,617	4,600	1,486	5,055
Removal of Lemna	427		48	48	48	48	47	47	47	47	47			
Replanting of Totora	1,659		181	182	182	186	186	186	186	185	185			
Cover of Nutrient-rich Sediment	26,807												12,831	3,427
Non-Structural Measures	9,075		527	208	214	221	227	234	241	248	256	263	271	279
Environmental Monitoring	5,139		204	187	186	187	186	219	186	187	186	187	186	187
Total	282,601	2,225	5,770	31,880	10,643	4,434	6,974	4,402	8,318	4,149	4,436	10,832	17,901	12,693

Revenues	Total(99-25)	1999FY	2000FY	2001FY	2002FY	2003FY	2004FY	2005FY	2006FY	2007FY	2008FY	2009FY	2010FY	2011FY
Sewerage	166,671	1,572	1,783	1,903	2,025	2,259	2,399	2,542	2,875	3,095	3,322	3,740	4006	4,181
KfW Donation	21,180	1,617	2,974	16,589										
Solid Waste Management	49,577			167	1,451	1,481	1,645	1,546	1,790	1,609	1,642	1,842	1,779	1,999
sub-total 1	237,428	3,189	4,757	18,659	3,476	3,740	4,044	4,088	4,665	4,704	4,964	5,582	5,785	6,180
Sightseeing Business(100%down	130,410	345	690	1035	1380	1725	2070	2415	2760	3105	3450	3795	4140	4485
Fishery Business	60,858	161	322	483	644	805	966	1127	1288	1449	1610	1771	1932	2093
sub-total 2	191,268	506	1012	1518	2024	2530	3036	3542	4048	4554	5060	5566	6072	6578
Grand total	428,696	3,695	5,769	20,177	5,500	6,270	7,080	7,630	8,713	9,258	10,024	11,148	11,857	12,758
Profit & Loss	146,095	1,470	-1	-11,703	-5,144	1,836	106	3,228	396	5,108	5,588	316	-6,044	65

Cost & Expense	2012FY	2013FY	2014FY	2015FY	2016FY	2017FY	2018FY	2019FY	2020FY	2021FY	2022FY	2023FY	2024FY	2025FY
Sewerage	14736	3240	3551	3074	4543	10084	4352	4214	3162	3175	14973	3478	3789	3313
Sanitary Toilet	201	279	201	201	201	491	200	200	200	277	199	198	176	395
Urban Drainage														
Solid Waste Management	4,393	2,140	5,911	1,933	2,250	6,243	2,674	6,444	2,029	8,005	3,740	2,446	4,767	2,582
Removal of Lemna														
Replanting of Totora														
Cover of Nutrient-rich Sediment	3,427	3,427	3,695											
Non-Structural Measures	803	325	335	345	356	366	377	389	400	412	425	437	451	464
Environmental Monitoring	218	346	187	204	186	187	186	218	187	186	187	186	187	186
Total	23,778	9,757	13,880	5,757	7,536	17,371	7,789	11,465	5,978	12,055	19,524	6,745	9,370	6,940

Revenues	2012FY	2013FY	2014FY	2015FY	2016FY	2017FY	2018FY	2019FY	2020FY	2021FY	2022FY	2023FY	2024FY	2025FY
Sewerage	4,584	4,781	4,983	5,456	5,674	5,900	6,426	6,689	6,948	7,548	7,809	8,077	8,771	47,320
KfW Donation														
Solid Waste Management	1,871	1,920	2,182	2,025	2,081	2,292	2,239	2,519	2,369	2,716	2,483	2,543	2,716	2,671
sub-total 1	6,455	6,701	7,165	7,481	7,755	8,192	8,665	9,208	9,317	10,264	10,292	10,620	11,487	49,991
Sightseeing Business(100%down	4830	5175	5520	5865	6210	6555	6900	7245	7590	7935	8280	8625	8970	9315
Fishery Business	2254	2415	2576	2737	2898	3059	3220	3381	3542	3703	3864	4025	4186	4347
sub-total 2	7084	7590	8096	8602	9108	9614	10120	10626	11132	11638	12144	12650	13156	13662
Grand total	13,539	14,291	15,261	16,083	16,863	17,806	18,785	19,834	20,449	21,902	22,436	23,270	24,643	63,653
Profit & Loss	-10,240	4,534	1,381	10,325	9,327	435	10,996	8,369	14,470	9,847	2,912	16,525	15,274	56,713

EIRR = 15.208

(4) Environmental Aspect

The Plan will essentially contribute to the environmental improvement of Puno Interior Bay. The extent of the water quality improvement was evaluated by the reduction rates of external pollution loads. According to *Figure XI.1.1*, *Figure XI.1.2* and *Figure XI.1.3*, the followings effects are expected through the implementation of the Plan.

- BOD load will be reduced to the targeted level which used to be in/before the 1970's. Consequently, the target of the plan against the organic pollution in Puno Interior Bay will be achieved by the year 2008, and the favorable condition will last for a long period.

- Nitrogen load will be reduced to the targeted level by 2008. But the total load will increase after that. It will exceed the level of the 1970's in 2025, though it will be significantly reduced to half of the load in the case of "without project".

- Phosphrous load will be reduced to the target level by 2008 and the favorable level will last for a long period as same as the BOD load. Its effest depends on the phosphorous reduction by the livestock wastewater control as well as by the sewage control.

However the Plan will produce not only positive effects on the environment, but also negative effects through the phases of planning, construction and operation. Possible impacts and their mitigation measures are summarized in *Table XI.1.6*, *XI.1.7* and *XI.1.8*. As shown in the table, all impacts will be minor or temporary and able to be mitigated within an acceptable level.

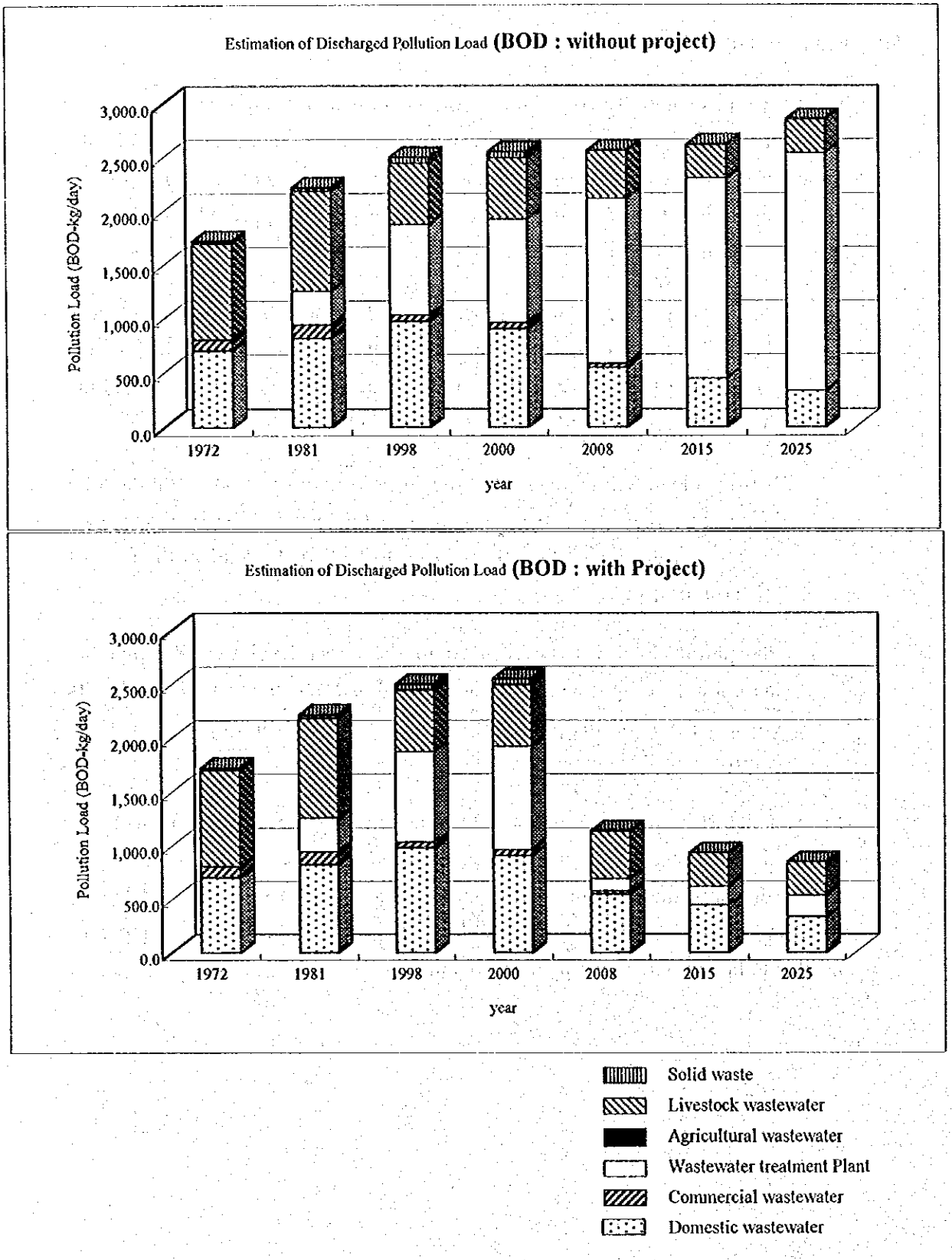

Figure XI.1.1 Projection of the External Pollution Load Reduction by the Integrated Plan (BOD)

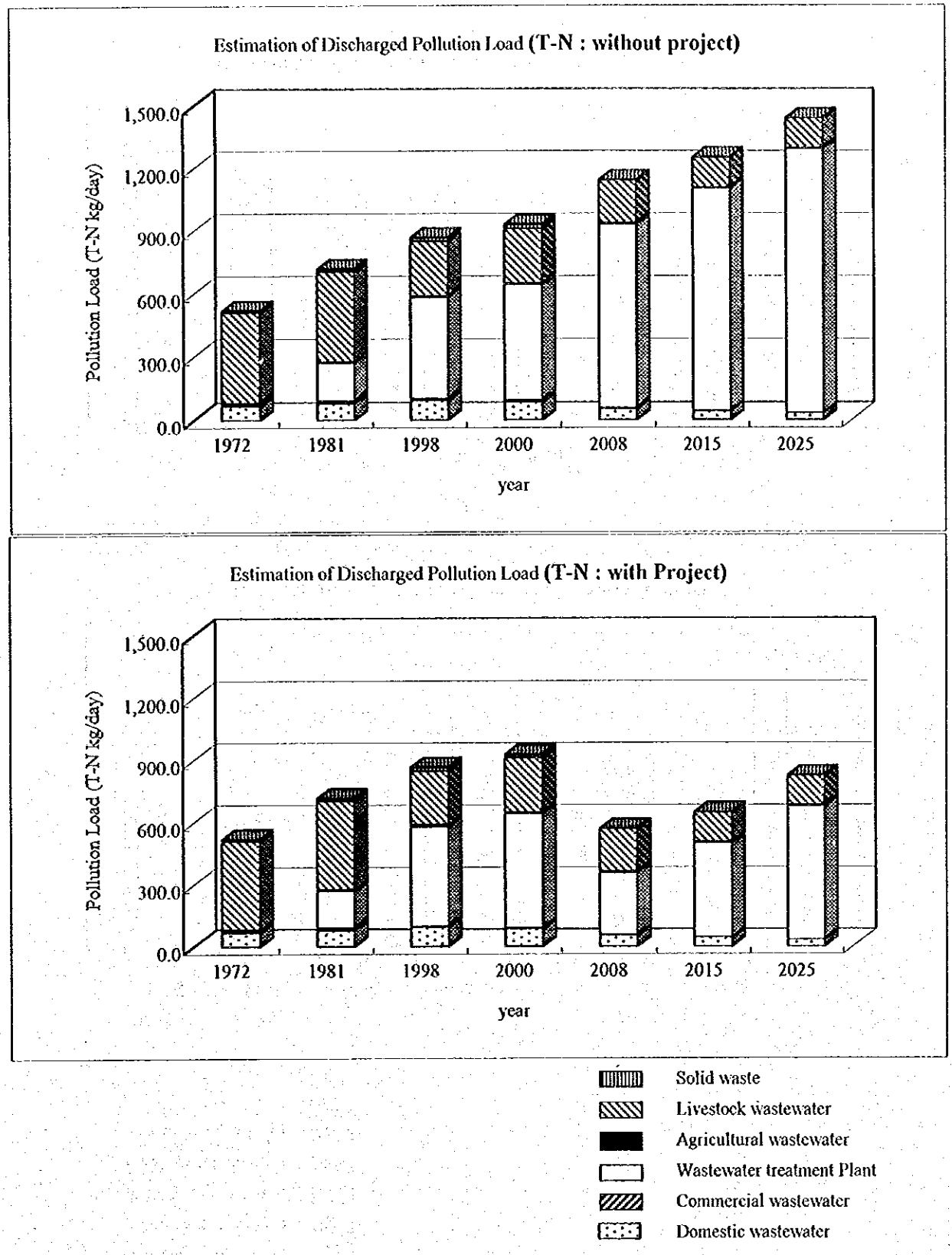

Figure XI.1.2 Projection of the External Pollution Load Reduction by the Integrated Plan (T-N)

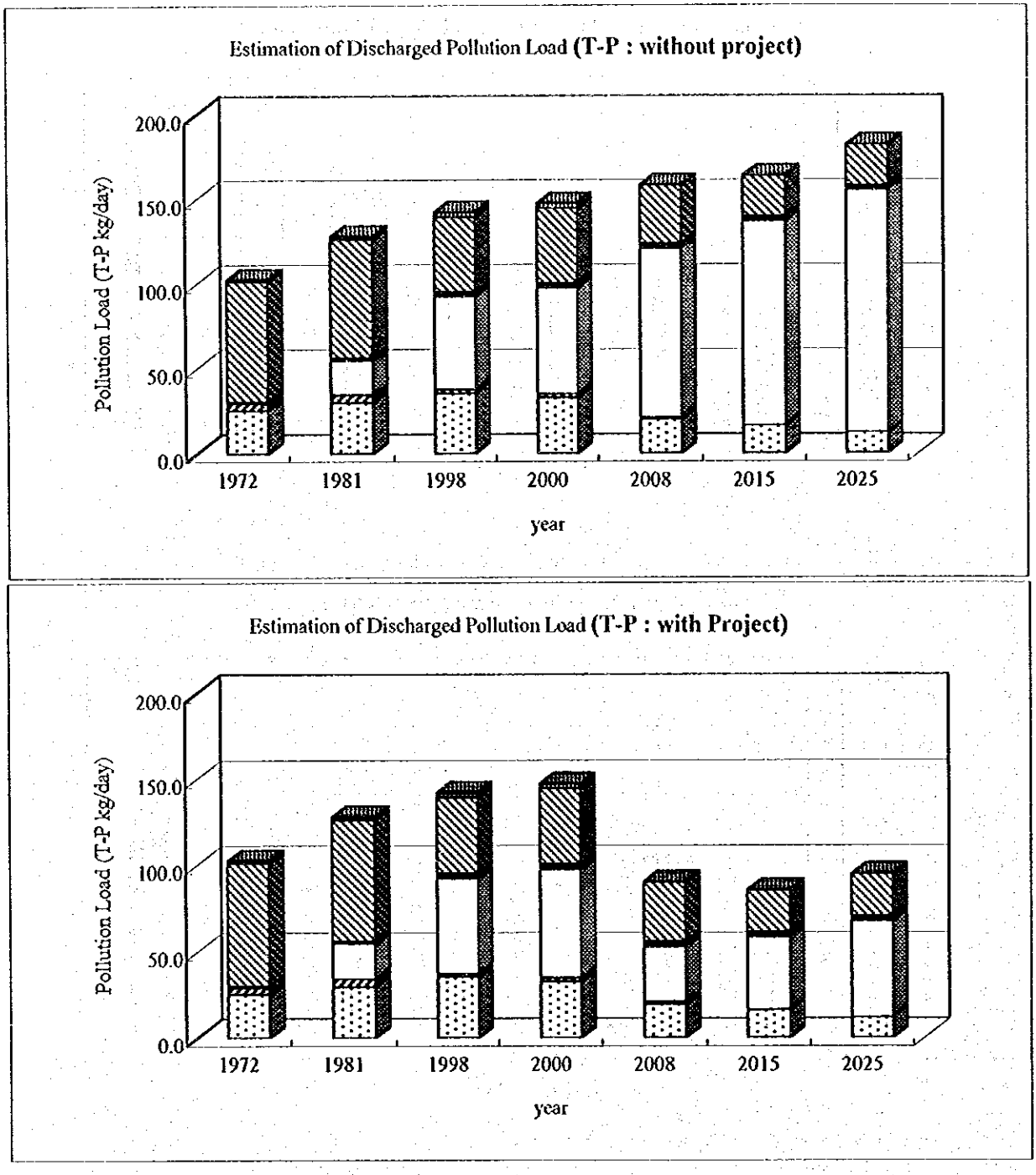

Figure XI.1.3 Projection of the External Pollution Load Reduction by the Integrated Plan (T-P)

Table XI.1.6 Environmental Impact Assessment (phase : Planning & Design)

(1/3)

Environmental Factor			Environmental Element	Impact	Affected Area(s)	Extent of Impact	Mitigation Measures or Evaluation
Measures	Component	Activity					
External Pollution Load Reduction	Sewerage Systems	Expansion of sewer system	resettlement	no		–	
			fauna and flora	no		–	
			aesthetic condition	no		–	
		Improvement of WWTS	resettlement	no		–	
			economic activities	impact on waterfront development	Espinar WWTP and the surroundings	xx	The northern shore of the bay should be developed, or advanced compact treatment system should be adopted.
			fauna and flora	loss of Totora (about 30ha) for artificial wetland	inundation area adjacent to Espinar WWTP	x	Totora is to be replanted in the artificial wetland.
			aesthetic condition	degradation of the scenery	Puno Interior Bay and the lakeshore	x	no tall facility, a slight change of facilities
	Sanitary Toilet		resettlement	no		–	
			fauna and flora	no		–	
			aesthetic condition	no		–	
	Urban drainage		resettlement	no		–	
			fauna and flora	no		–	
			aesthetic condition	no		–	
Solid Waste Management	Removal of Illegally Dumped Waste		resettlement	no		–	
			fauna and flora	no		–	
			aesthetic condition	positive		O	The scenic view will be improved.
	Increase of Collection Rate		resettlement	no		–	
			traffic and public facility	increase in traffic volume, congestion and accidents	Puno City	x	control of routes and time
			waste	increase in waste to transfer	final disposal site	x	expansion of the final disposal site

Environmental Factor			Environmental Element	Impact	Affected Area(s)	Extent of Impact	Mitigation Measures or Evaluation
Measures	Component	Activity					
Solid Waste Management	Expansion & Upgrade of Final Disposal Site		resettlement	no		–	
			economic activities	degradation of land use potential	the back hillside of the Cancharani mountain	x	The area is sparsely inhabited and the land use potential is low.
			groundwater	infiltration of leachate	catchment area of the upstream of Ilave river	x	the design for impermeable layer
			fauna and flora	no		–	poor habitat
			aesthetic condition	littered wastes, change of topography and vegetation	catchment area of the upstream of Ilave river	x	sparsely inhabited area
			water pollution	discharge of leachate into water bodies	ditto	x	the designs for impermeable layer and leachate treatment system
In-Lake Management	Removal of Lemna		fauna and flora	change of ecological balance	Puno Interior Bay	x	minor change due to a gradual removal method
	Cover of Bottom Sediment		economic activities	no	Puno Interior Bay	–	Fishing is prohibited in Puno Interior Bay.
			traffic and public facility	shallowing the channel and the berth	port facilities	x	The water depth of/around navigation channel and port facilities will be kept.
			waste	no		–	
			topography	shallowing the lake by 30cm	the western part of Puno Interior Bay	x	The total basin volume of Puno Interior Bay will not be changed.

(3/3)

Environmental Factor			Environmental Element	Impact	Affected Area(s)	Extent of Impact	Mitigation Measures or Evaluation
Measures	Component	Activity					
In-Lake Management			fauna and flora	impact on the benthos	the western part and along the navigation channel of Puno Interior Bay	x	The existing ecological condition is poor.
	Replanting of Totora		economic activities	an obstacle to the planned waterfront development	the western shore of Puno Interior Bay	x	Coordination among the projects is necessary.
			traffic and public facility	obstruction to the boat navigation	the western part of Puno Interior Bay	x	only at the shallow areas, never planting near the ordinary navigation routes
			fauna and flora	rather positive	the western part of Puno Interior Bay	O	Totora will provide habitat or nursery for almost all fauna and flora.

Legend	major negative impact	xxx	minor negative impact	x
(Extent of Impact)	certain negative impact	xx	no negative impact	-
			positive impact	O

Table XI.1.7 Environmental Impact Assessment (phase : Construction)

(1/4)

Environmental Factor			Environmental Element	Impact	Affected Area(s)	Extent of Impact	Mitigation Measures or Evaluation
Measures	Component	Activity					
External Pollution Load Reduction	Sewerage Systems	Expansion of Sewer System	traffic and public facility	increase in traffic volume, congestion and accidents	Puno City	x	temporary or minor impact, control of routes and time
			waste	generation of construction waste and debris	Puno City	x	careful construction plan and management
			aesthetic condition	degradation of the scenery	Puno City	x	temporary or minor impact
			air quality	increase in dust and exhaust gas by construction vehicles and equipment	Puno City	x	temporary or minor impact, control of routes and time
			water quality	increase in SS and turbidity	Puno Interior Bay	x	temporary or minor impact
			noise & vibration	increase in noise	Puno City	x	temporary or minor impact, control of routes and time
		Improvement of WWTP	traffic and public facility	increase in traffic volume, congestion and accidents	near Espinar WWTP and Puno City	x	temporary impact, a watch at the way in/out on the main road
			waste	generation of construction waste and debris	Espinar WWTP and the surroundings	x	careful construction plan and management
			fauna and flora	disturbance of the wildbirds' habitat	innundation area along the lakeshore	x	temporary impact. Birds will return back after finishing work.

Environmental Factor			Environmental Element	Impact	Affected Area(s)	Extent of Impact	Mitigation Measures or Evaluation
Measures	Component	Activity					
External Pollution Load Reduction	Sewerage Systems	Improvement of WWTP	aesthetic condition	degradation of the scenery	Espinar WWTP and the surroundings	x	temporary or minor impact
			air quality	increase in dust and exhaust gas by construction vehicles and equipment	ditto	–	The site is far from the residential area. a small-scale construction
			water quality	increase in SS and turbidity	Puno Interior Bay	x	temporary or minor impact
			noise & vibration	increase in noise	Espinar WWTP and the surroundings	–	The site is far from the residential area. a small-scale construction
	Sanitary Toilet			no		–	manual work
	Urban drainage		traffic and public facility	increase in traffic volume, congestion and accidents	Puno City	x	temporary or minor impact, control of routes and time
			waste	generation of construction waste and debris	Puno City	x	careful construction plan and management
			aesthetic condition	degradation of the scenery	Puno City	x	temporary or minor impact
			air quality	increase in dust and exhaust gas by construction vehicles and equipment	Puno City	x	temporary or minor impact, control of routes and time

Environmental Factor			Environmental Element	Impact	Affected Area(s)	Extent of Impact	Mitigation Measures or Evaluation
Measures	Component	Activity					
External Pollution Load Reduction	Urban drainage		water quality	increase in SS and turbidity	drainage channel and Puno Interior Bay	x	temporary or minor impact
			noise & vibration	increase in noise	Puno City	x	temporary or minor impact, control of routes and time
Solid Waste Management	Removal of Illegally Dumped Waste		waste	generation of waste	Puno City	x	transfer to the existing final disposal site
	Increase of Collection Rate			no		–	no construction work
	Expansion & Upgrade of Final Disposal Site		traffic and public facility	increase in traffic volume, congestion and accidents	the back hillside of the Cancharani mountain	–	The area is sparsely inhabited.
			waste	generation of construction waste and debris	construction site	–	reuse for covering soil
			fauna and flora	no		–	poor habitat
			aesthetic condition	degradation of the scenery	the back hillside of the Cancharani mountain	–	The area is sparsely inhabited.
			air quality	increase in dust and exhaust gas by construction vehicles and equipment	ditto	–	ditto
			water quality	increase in SS and turbidity	catchment area of the upstream of Ilave river	x	temporary or minor impact
			noise & vibration	increase in noise	Puno City	–	The area is sparsely inhabited.

(4/4)

Environmental Factor			Environmental Element	Impact	Affected Area(s)	Extent of Impact	Mitigation Measures or Evaluation
Measures	Component	Activity					
In-Lake Management	Removal of Lemna			no		–	no construction work
	Cover of Bottom Sediment		traffic and public facility	obstruction to the boat navigation	the western part and along the navigation channel of Puno Interior Bay	x	careful watch and operation
			fauna and flora	turbidity of the water column or disturbance of the bottom sediment	Puno Interior Bay	x	poor ecological condition, but careful operation
			air quality	increase in dust and exhaust gas by construction equipment	Puno City	–	The equipment will work on the lake, far from the residential area.
			water quality	turbidity of the water column	Puno Interior Bay	x	Relatively coarse sediment will be dredged and used for covering material. The lake water will soon settle.
			noise & vibration	increase in noise	Puno City	–	The equipment will work far from the residential area.
	Replanting of Totora		traffic and public facility	obstruction to the boat navigation	the western part of Puno Interior Bay	x	only at the shallow areas, where there is no ordinary navigation route.
			fauna and flora	no		–	small-scall work
			water quality	no		–	small-scall work

Legend (Extent of Impact)				
	major negative impact	xxx	minor negative impact	x
	certain negative impact	xx	no negative impact	–
			possitive impact	O

Table XI.1.8 Environmental Impact Assessment (phase : Operation)

(1/3)

Environmental Factor			Environmental Element	Impact	Affected Area(s)	Extent of Impact	Mitigation Measures or Evaluation
Measures	Component	Activity					
External Pollution Load Reduction	Sewerage Systems	Expansion of Sewer System	public health condition	possitive	Puno City	O	decrease of water-borne disease
		Improvement of WWTP	waste	disposal of dried sludge	Puno City	x	temporary storage and use for manure
			fauna and flora	the artificial wetland will affect the ecological condition	inundation area adjacent to Espinar WWTP	–	The site area is natural wetland, so there will be no change.
			aesthetics	alteration of visual profile of Espinar WWTP	Puno City and Puno Interior Bay	x	only a slight change
			water pollution	the artificial wetland will be turned to a source of nutrients	Puno Interior Bay	x	careful maintenance (harvest, soil renewal)
			noise & vibration	generating from aerator	Espinar WWTP and the surroundings	–	The site is far from the residential area.
			offensive odor	generating from sludge pond	ditto	–	ditto
	Sanitary Toilet		public health condition	possitive	Puno City	O	decrease of water-borne disease
			waste	disposal of pit sludge	Puno City	x	temporary storage and use for manure
			water quality	Non-toilet wastewater flows into the stream.	Puno City and Puno Interior Bay	–	better than the present situation (open-air latrine)
	Urban drainage			possitive		O	possitive effect on sewerage systems

(2/3)

Environmental Factor			Environmental Element	Impact	Affected Area(s)	Extent of Impact	Mitigation Measures or Evaluation
Measures	Component	Activity					
Solid Waste Management	Removal of Illegally Dumped Waste		waste	repetition of dumping	Puno City	x	regular watch, signboard
	Increase of Collection Rate		traffic and public facility	increase in traffic volume, congestion and accidents	Puno City	x	a slight increase, if necessary, control of routes and time
			air quality	increase in dust and exhaust gas by collection vehicles	Puno City	x	ditto
			noise & vibration	increase in noise by collection vehicles	Puno City	x	ditto
	Expansion & Upgrade of Final Disposal Site		public health condition	dangerous scavenging	final disposal site	–	everyday soil-covering
			waste	rapid increase of disposal volume	ditto	x	volume reduction (sorting, recycle)
			fauna and flora	vermin	ditto	–	everyday soil-covering
			aesthetic condition	littered wastes, change of topography and vegetation	final disposal site and the surroundings	–	sparsely inhabited area, everyday soil-covering
			air quality	dispersion of waste or dust	ditto	–	soil-covering and compaction of the surface
			water quality	discharge of leachate into water bodies	catchment area of the upstream of Ilave river	–	impermiable layer at the bottom, leachate treatment system and monitoring wells
			soil contamination	contamination by leachate or littered wastes	final disposal site and the surroundings	x	impermiable layer at the bottom, leachate treatment system, monitoring wells and soil-covering
			offensive odor	dispersion of wastes	ditto	x	everyday soil-covering

Environmental Factor			Environmental Element	Impact	Affected Area(s)	Extent of Impact	Mitigation Measures or Evaluation
Measures	Component	Activity					
In-Lake Management	Removal of Lemna		traffic and public facility	obstruction to the boat navigation	the western part and along the navigation channel of Puno Interior Bay	x	careful watch and operation
			waste	a lot of Lemna as wastes	the western lakeshore	x	transfer to the experimental farmland of UNA or LINIA and dispose of them, use for compost
			offensive odor	gerenated from a rotting Lemna	the western lakeshore	x	transfer the Lemna on the same day of removal
	Cover of Bottom Sediment		-				operation is construction
	Replanting of Totora		water quality	Rotting Totora will be turned to a source of nutrients.	Puno Interior Bay	x	regular maintenance (removal of dead Totora, regular harvesting)
			offensive odor	gerenated from a rotting Totora	the western lakeshore	x	ditto

Legend (Extent of Impact)				
	major negative impact	xxx	minor negative impact	x
	certain negative impact	xx	no negative impact	-
			possitive impact	O

2. RECOMMENDATIONS

The Study has proposed the Integrated Water Pollution Control Plan which should be realized by the year 2025 in order to recover the acceptable environmental conditions in Puno Interior Bay as it used to be in the 1970's. Although each component project must be acceptable from technical, financial, socio-economical, or environmental viewpoints, the Plan as a whole still requires a large amount of investment, all possible efforts and much time. The Plan needs involvement of all parties concerned; the state government, local governments, private sectors, citizens and tourists.

- Puno Interior Bay is a part of Lake Titicaca which is not only the property of the people who live there but also the property of the Peruvian nation and foreign tourists. They have enjoyed the outstanding environment of the lake. Therefore they have to return the profits, in other word, provide the labor or the funds required for the environmental improvement of the lake. As discussed in the economic evaluation, the economic benefit will surpass the total costs of the Plan. It means that the Plan is worthy to implement. However it is too hard for the local governments or residents to bear all costs when their financial difficulties are taken into account. The state government's financial assistance such as subsidies or low-interest funds are indispensable to realize the Plan. Furthermore, it is recommended to establish the system to raise the funds widely from the users or polluters of the lake environment.

- A special fund for environmental improvement in Lake Titicaca (provisionally called "Save Lake Titicaca Fund") should be established in order to ensure the finances necessary for component projects. Subsidies, low-interest loans or environmental fee should be pooled, managed and effectively utilized by this fund.

- The environmental monitoring will not produce a direct effect, but it should be urgently practiced as the highest priority. It will provide a lot of information to identify the problems, to select an appropriate measures against the problems, or to check the expected effects or the adverse effects. The reason why the previous monitoring was given up must have been a budgetary cutback. In order to keep on monitoring with the limited budgets, relevant organizations such

as PELT, DIGESA or UNA should collaborate with others sharing a laboratory equipment, technique and manpower.

- Although it will take a time to improve the lake environment, the relevant organizations should persevere in their efforts. It should not be adopted absolutely to spread the problems of Puno Interior Bay over the Exterior Bay or main part of Lake Titicaca. Dilution by the water of the Exterior Bay or diversion of effluents into the Exterior Bay should not be adopted. It is recommended that the water pollution of the Coata river should also be controlled at the same time in order to protect the Exterior Bay.

- With regard to the wastewater treatment system, the Study could not necessarily selected the best alternative from the viewpoint of the environmental improvement in Puno Interior Bay. The financial difficulties which are facing the local governmental organizations, made a financial advantage for the most important criterion to select the system. Therefore it is recommended to reuse the treated wastewater for irrigation of afforestation in the surrounding area in order to reduce the nutrients more. If the financial condition can afford further investment in future, an advanced and intensive wastewater treatment system such as Alternative III or a diversion of the treated wastewater to the outside of the basin should be reconsidered.

- Reuse of nutrient-rich wastes should be encouraged in order to minimize the outflow of pollution loads into the lake. Removed Lemna can be utilized as a compost for agriculture. Dung of livestock and sludge of wastewater treatment plant or pit latrine can be used as a manure for agriculture or afforestation. Treated wastewater can be also used for irrigation of afforestation.

- The internal loading control measures such as the sediment cover should be taken when any possible measures against the external loading do not produce the expected effect on the lake water quality. Because the costs of the measures are high, the projects should be implemented effectively. Nutrients loading from the bottom sediment should be examined by sufficient monitoring data in order to predict the effect of the measures more precisely. It is recommended that a nutrients release test should be included in the environmental monitoring program when the laboratory's capacity progresses well.

- Puno City has gained experiences of the environmental education/campaign and the citizen's participation organized by the public sectors or NGOs. The non-structural measures will favorably be accepted in Puno City. It is expected to develop and utilize such experiences to implement the proposed non-structural measures.

REFERENCES

LIST OF REFERENCES

No	Title	Style	Date	Publication
1	ESTUDIOS DE FACTIBILIDAD DE LOS PLANES DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO VOLUMEN 1 TOMO1	Copy	97/1	PRONAP
2	ESTUDIOS DE FACTIBILIDAD DE LOS PLANES DE EXPANSION DE NIMIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO VOLUMEN 1 TOMO2	Copy	97/1	PRONAP
3	ESTUDIOS DE FACTIVILIDAD DE LOS PLANES DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO VOLUMEN 1 TOMO3	Copy	97/1	PRONAP
4	ESTUDIOS DE FACTIBILIDAD DE LOS PLANES DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLAO VOLUMEN 2	Copy	97/1	PRONAP
5	ESTUDIOS DE FACTIBILIDAD DE LOS PLANES DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLAO VOLUMEN 3	Copy	97/1	PRONAP
6	ESTUDIOS DE FACTIBILIDAD DE LOS PLANES DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLAO VOLUMEN 4 TOMO1	Copy	97/1	PRONAP
7	ESTUDIOS DE FACTIBILIDAD DE LOS PLANES DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLAO VOLUMEN 4 TOMO2	Copy	97/1	PRONAP
8	ESTUDIOS DE FACTIBILIDAD DE LOS PLANES DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLAO VOLUMEN 4 TOMO3	Copy	97/1	PRONAP
9	ESTUDIOS DE FACTIBILIDAD DE LOS PLANES DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLAO VOLUMEN 5	Copy	97/1	PRONAP
10	ESTUDIOS DE FACTIVILIDAD DE LOS PLANES DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO VOLUMEN 6	Copy	97/1	PRONAP
11	ESTUDIOS DE FACTIVILIDAD DE LOS PLANES DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO VOLUMEN 7	Copy	97/1	PRONAP
12	(RESUMEN EJECUTIVO) VOLUMEN 8	Copy	97/2	PRONAP
13	ESTUDIO DE FACTIBILIDAD DESCONTAMINACION Y DESARROLLO DE LA BAHIA INTERIOR DE PUNO VOLUMEN 1 PLANEAMIENTO Y DISENO	Copy		INADE / PELT

No	Title	Style	Date	Publication
14	ESTUDIO DE FACTIBILIDAD DESCONTAMINACION Y DESARROLLO DE LA BAHIA INTERIOR DE PUNO	Copy	97/10	INADE / PELT
15	ESTUDIO DE FACTIBILIDAD DESCONTAMINACION Y DESARROLLO DE LA BAHIA INTERIOR DE PUNO VOLUMEN 3 ESTUDIO DE IMPACTO AMBIENTAL	Copy	97/10	INADE / PELT
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19	CONDUCCION, TRATAMIENTO Y MANEJO INTEGRAL DE LAS AGUAS SERVIDAS DE LA CIUDAD DE PUNO	Copy		Regional Development Division, Ministry of Policy Planning and
20	LA CONTAMINACION Y EL IMPACTO AMBIENTAL EN LA BAHIA INTERIOR DE PUNO	Copy		INADE / PELT
21	INFORME TECNICO FINAL LEVANTAMIENTO HIDROGRAFICO Y TAQUIMETRICO DE LA BAHIA INTERIOR DEL PUERTO DE PUNO (Draft) PLANO# 1 TRAZO DE CANAL ALTERNATIVA2 PLANO# 2 GEOLOGIA DE SUPERFICIE-TRAZO CANAL ALTERNATIVA2 PLANO# 3 LINEA DE	Copy	95/10	MINISTERIO DE DEFENSA(MARINA DE GUERRA) PIRECCION DE HIDROGRAFIA Y NAVEGACION
22	INFORME TECNICO - BATIMETRIA (Draft)	Copy		MINISTERIO DE DEFENSA(MARINA DE GUERRA) PIRECCION DE HIDROGRAFIA
23	ESTUDIO INTEGRAL DE FACTIBILIDAD DESCONTAMINACION Y DESARROLLO SOCIO-ECONOMICO Y ECOTURISTICO DE LA BAHIA INTERIOR DE PUNO ESTUDIO BASICO TOMO II	Copy	97/8	INADE / PELT
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No	Title	Style	Date	Publication
25	BASES Y TERMINOS DE RERERENCIA DEL CONCURSO PUBLICO DE MENTOS ESTUDIO DEFINITIVO PARA LA CONDUCCION, TRATAMIENTO Y MANEJO INTEGRAL DE LAS AGUAS SERVIDAS DE LA CIUDAD DE PUNO	Copy	98/8	INADE / PELT
26	BASES ADQUISICION DE EQUIPO MECANICO PESADO			INADE / PELT
27	ESTUDIOS DE FINITIVOS DE LA PRIMERA ETAPA DE INVERSION DEL PLAN DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO SANITARIO GRUPO 2 INFORME I - REVISION 3 VOLUMEN 1/2	Copy	98/6	PRONAP (Figuerredo Ferraz)
28	ESTUDIOS DEFINITIVOS DE LA PRIMERA ETAPA DE INVERSION DEL PLAN DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO SANITARIO GRUPO 2 INFORME I - REVISION 3 VOLUMEN 2/2	Copy	98/6	UNICEF, Colombo
29	ESTUDIOS DEFINITIVOS DE LA PRIMERA ETAPA DE INVERSION DEL PLAN DE EXPANSION DE MINIMO COSTO DE LOS SISTEMAS DE AGUA POTABLE Y ALCANTARILLADO SANITARIO GRUPO 2 INFORME I - REVISION 3 VOLUMEN 2/2	Copy	98/6	PRONAP (Figuerredo Ferraz)
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33	MEJORAMIENTO INSTITUCIONAL Y OPERATIVO DE EMPRESAS PRESTADORAS DE SERVICIOS DE AGUA POTABLE Y ALCANTARILLADO PROYECTO PLAN DE ATENCION A LAS EMERGENCIAS Y DESASTRES EMSAPUNO	Copy		PRONAP
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37	PROGRAMA MIO EMSAPUNO (VERSION 3)	Copy		PRONAP

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38	EVALUACION DE INFORMES ANUALES DE OPERACIÓN Y MANTENIMIENTO DE LAS EPS. 1997	Copy		PRONAP
39	DISEÑO E IMPLANTACION DE MODELOS EMPRESARIALES INFORME TECNICO DE AVANCE RESUMEN 1998	Copy		PRONAP
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41	PROYECTO ESPECIAL PROGRAMA NACIONAL DE AGUA POTABLE	Copy		PRONAP
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45	LA BASURA EN LIMA, PROBLEMA Y	Copy		IPES
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49	ENFOQUE AGROECOLOGICO PARA EL DESARROLLO DE SISTEMAS DE PRODUCCION SOSTENIBLE EN LOS ANDES	Book	96	MIGUEL ATTIERI CIED
50	COMPRENDER LA AGRICULTURA CAMPESINA EN LOS ANDES CENTRALES PERU-BOLIVIA	Book	96/11	CENTRO DE ESTUDIOS REGIONALES ANDINOS BARTOLOME DE LAS CASAS
51	AGUA POTABLE PARA POBLACIONES RURALES SISTEMAS DE ABASTECIMIENTO POR GRAVEDAD SIN TRATAMIENTO	Book	97/9	ROGER AGÜERO PITTMAN
52	MENSAJES IMPORTANTES SOBRE EL ENFOQUE BASADO EN LA DEMANDA	Book	98/5	BM PNUD
53	PERU, LINEAMIENTOS PARA UN PROGRAMA NACIONAL DE AGUA Y SANEAMIENTO RURAL DOCUMENTO DE TRABAJO	Book	98/6	BM PNUD

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54	EL SANEAMIENTO BASICO EN LOS BARRIOS MARGINALES DE LIMA METROPOLITANA DIAGNOSTICO	Copy		BM PNUD
55	PERU, MODELOS DE POLITICA FINANCIERA EN LA DOTACION DE SERVICIOS DE AGUA Y SANEAMIENTO SOSTENIBLES A COMUNIDADES RURALES	Copy	98/6	BM PNUD
56	POBLACION, MUJER Y SALUD PUN0 1996	Book	96/9	INEI
57	PERU, ESTADISTICAS DEL MEDIO AMBIENTE	Book	98/5	INEI
58	ESTADISTICAS ECONOMICAS IMPLICANCIAS SOCIO-ECONOMICAS DEL CRECIMIENTO DE LA POBLACION 1995-2015	Copy		INEI 1/2
59	ESTADISTICAS ECONOMICAS IMPLICANCIAS SOCIO-ECONOMICAS DEL CRECIMIENTO DE LA POBLACION 1995-2015	Copy		INEI 2/2
60	ESTADISTICAS ECONOMICAS METODOLOGIA N°6	Copy		INEI 1/1
61	PERU, ESTADISTICAS DEL MEDIO AMBIENTE 1998 BANCO DE CUADROS ESTADISTICOS	Copy		INEI
62	ESTADISTICAS REGIONALES Y DEPARTAMENTALES RESULTADOS DEFINITIVOS PROVINCIA, DISTRITO, DEPARTAMENTO DE PUNO	Copy		INEI 1/4
63	ESTADISTICAS REGIONALES Y DEPARTAMENTALES RESULTADOS DEFINITIVOS PROVINCIA, DISTRITO,	Copy		INEI 2/4
64	ESTADISTICAS REGIONALES Y DEPARTAMENTALES RESULTADOS DEFINITIVOS PROVINCIA, DISTRITO, DEPARTAMENTO DE PUNO	Copy		INEI 3/4
65	ESTADISTICAS REGIONALES Y DEPARTAMENTALES RESULTADOS DEFINITIVOS PROVINCIA, DISTRITO, DEPARTAMENTO DE PUNO	Copy		INEI 4/4
66	PLAN DIRECTOR CIUDAD DE PUNO VOLUMEN I MEMORIA DESCRIPTIVA	Copy	96/1	INADUR (INSTITUTO NACIONAL DE DESARROLLO)
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69	LIMA, LIMPIEZA PUBLICA, EXPECTATIVAS	Copy	98/6	SUPERVISION MUNICIPAL DE SERVICIOS DE LIMPIEZA (SUMSEL)

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70	PLAN ESTRATEGICO PARA EL MEJORAMIENTO AMBIENTAL DE LA CIUDAD DE PUNO 95/12 COMISION DE MEJORAMIENTO AMBIENTAL DE LA CIUDAD DE PUNO	Copy	95/12	OPS/CEPIS
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72	GUIA PARA EL MANEJO DE RESIDUOS SOLIDOS EN CIUDADES PEQUEÑAS Y ZONAS RURALES	Book		CEPIS
73	EL MANEJO DE RESIDUOS SOLIDOS MUNICIPALES EN AMERICA LATINA Y EL	Book	95	CEPIS
74	RESIDUOS SOLIDOS MUNICIPALES GUIA PARA EL DISEÑO, CONSTRUCCION Y OPERACIÓN DE RELLENOS SANITARIOS MANUALES PROGRAMA DE SALUD AMBIENTAL	Book	91/9	CEPIS
75	RAPINDEX, RESIDUOS SOLIDOS MUNICIPALES	Book		CEPIS
76	RAPINDEX, EVALUACION DEL IMPACTO AMBIENTAL 2a EDICION	Book	94/9	CEPIS
77	GROUNDWATER POLLUTION, AN EXECUTIVE OVERVIEW OF THE LATIN AMERICAN-CARIBBEAN SITUATION IN RELATION TO POTABLE WATER-SUPPLY	Book		CEPIS
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80	PROGRAMA DE COSTOS SEGÚN SERVICIOS PRESTADOS (COSEPRE) PARA EL SISTEMA DE LIMPIEZA PUBLICA MANUAL DEL USUARIO COSEPRE 1.0	Book	95	CEPIS
81	COSEPRE VOLUMEN 1.0	Book		CEPIS
82	LEGISLACION EN MATERIA DE PRESTACION DE SERVICIOS DE SANEAMIENTO	Book	98	SUNASS
83	DIRECTIVA PARA LA FORMULACION DE LOS PLANES MAESTROS DE LAS ENTIDADES PRESTADORAS DE SERVICIOS DE SANEAMIENTO	Book		SUNASS
84	PROYECTO DE NORMAS	Copy	97/1	SUNASS
85	PROBLEMÁTICA DE LA CONTAMINACION DE AGUAS EN EL LAGO TITICACA (BAHIA INTERIOR DE PUNO)	Copy	97	MINISTERIO DE AGRICULTURA INRENA 1997
86	GUIA PARA LA FORMULACION DE TERMINOS DE REFERENCIA DE ESTUDIOS DE IMPACTO AMBIENTAL EN EL SECTOR AGRARIO	Copy		MINISTERIO DE AGRICULTURA INRENA 1997
87	PLAN DIRECTOR CIUDAD DE PUNO VOLUMEN II ANEXOS	Copy		INADUR ENERO 96
88	COMITÉ MULTISECTORIAL DE ECOLOGIA Y MEDIO AMBIENTE	Copy		98-PUNO
89	SUB-REGION DE SALUD 1997, FORTALECIENDO LA SALUD	Copy		MINISTERIO DE SALUD 1997
90	DATOS DEL MINISTERIO DE SALUD (PUNO)	Copy		MINISTERIO DE SALUD

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91	PROYECTO ESPECIAL BINACIONAL LAGO TITICACA MANUAL DE ORGANIZACIÓN Y	Copy		INADE / PELT
92	PELT PLAN OPERATIVO 1997	Copy		INADE / PELT
93	PELT RESULTADOS 1997	Copy		INADE / PELT
94	EVALUACION DE PLANTAS DE TRATAMIENTO DE AGUAS RESIDUALES PARA LA DETERMINACION DE PARAMETROS DE DISEÑO-	Copy		SENCICO 1997
95	CENSOS NACIONALES 1993 DEPARTAMENTO DE PUNO PERFIL SOCIO-DEMOGRAFICO	Copy		INEI
96	PUNO GEOLOGIA DE LA CORDILLERA OCCIDENTAL Y ALTIPLANO AL OESTE DEL LAGO TITICACA-SUR DEL PERU, 15 PLANOS	Copy		INGEMET
97	RESERVA NACIONAL DE TITICACA Y EL FENOMENO DEL NIÑO	Copy		INRENA Blgo. Gilmar Goyzueta
98	DIA MUNDIAL DEL MEDIO AMBIENTE 05 DE JUNIO, REVISTA DE INVESTIGACION	Copy		INRENA (PUNO)
99	PUNO A NGO (CIRNMA)	Copy		CIRNMA
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102	PROGRAMA DE REHABILITACION Y GESTION URBANA EN LA REPUBLICA DEL PERU INFORME DE APOYO, OPINION Y MERCADO CIUDAD DE PUNO	Copy		BANCO MUNDIAL MTCVC
103	PROGRAMA DE REHABILITACION Y GESTION URBANA EN LA REPUBLICA DEL PERU DIAGNOSTICO DE LA SITUACION EXISTENTE Y ACCIONES PRIORITARIAS DE LA CIUDAD DE	Copy		BANCO MUNDIAL MTCVC
104	PROGRAMA DE REHABILITACION Y GESTION URBANA EN LA REPUBLICA DEL PERU DIAGNOSTICO Y FORTALECIMIENTO DE LAS FINANZAS MUNICIPALES DE LA MUNICIPALIDAD DE PUNO	Copy		BANCO MUNDIAL MTCVC
105	PROGRAMA DE REHABILITACION Y GESTION URBANA EN LA REPUBLICA DEL PERU DIAGNOSTICO DE LA ORGANIZACIÓN Y DE LOS RECURSOS HUMANOS DE LA MUNICIPALIDAD DE PUNO	Copy		BANCO MUNDIAL MTCVC
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107	PROGRAMA DE REHABILITACION Y GESTION URBANA EN LA REPUBLICA DEL PERU PROYECTOS Y ESTUDIOS A FINANCIAR POR EL PROGRAMA DE REHABILITACION Y GESTION URBANA CIUDAD DE PUNO	Copy		BANCO MUNDIAL MTCVC
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109	PROGRAMA DE REHABILITACION Y GESTION URBANA EN LA REPUBLICA DEL PERU RESUMEN EJECUTIVO DE LA CIUDAD DE PUNO	Copy		BANCO MUNDIAL
110	PUNO	Copy		INEI
111	* LEY DE AREAS NATURALES PROTEGIDAS * PROYECTO DE REGLAMENTO DE LA LEY DE AREAS NATURALES PROTEGIDAS * PROYECTO DE REGLAMENTO DE ORGANIZACIÓN Y FUNCIONES DEL CENTRO DE FORMACION DE ECOGUARDAS DEL INRENA	Copy		MINISTERIO DE AGRICULTURA INRENA
112	INFORMACIONES DEL MINISTERIO DE TURISMO (PUNO)	Copy		MINISTERIO DE TURISMO EN PUNO
113	INFORMACIONES DEL MUNICIPIO DE PUNO (TAX Y LA POBLACION POR BARRIO)	Copy		MUNICIPIO DE PUNO
114	CONOCIENDO PUNO 1998	Copy		INEI
115	CENSO NACIONAL AGROPECUARIO, DEPARTAMENTO DE PUNO 1/2	Copy		INEI
116	CENSO NACIONAL AGROPECUARIO, DEPARTAMENTO DE PUNO 2/2	Copy		INEI
117	ENCUESTA SOCIO-ECONOMICO 1991 DEPARTAMENTO DE PUNO	Copy		INEI
118	PROYECTO, FOCALIZACION DE LA INVERSION SOCIAL CIUDAD DE PUNO VOLUMEN III MEMORIA DESCRIPTIVA 1996	Copy	96/12	INADUR
119	PROYECTO, FOCALIZACION DE LA INVERSION SOCIAL CIUDAD DE PUNO VOLUMEN III A, PERFILES DE LOS PROYECTOS DE INVERSION SOCIAL DE LAS AREAS DE POBREZA URBANA DE LA CIUDAD DE PUNO	Copy		INADUR
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