

Table 5.2 (2/2)

List of Additional Meteorological Observation Instruments

Items Name of Station	Pyranometer	Items Name of Station	Pyranometer
BASCO	○	SAN JOSE MINDORO	○
CASIGURAN	○	CATBALOGAN	○
IBA	○	SURIGAO	○
INFANTA	○	HINATUAN	○
DAET	○	TUGUEGARAO	○
MORONG	○	ILOILO	○
SAN FRANCISCO	○	PTO. PRINCESA	○
ROMBLON	○	Total	15

Table 5.3

List of Improved Meteorological Observation Instruments

Name of Instrument	Specification	Accuracy
Propeller and Vane Type Wind Sensor & Recorder	FF3R-13 LRT-100	Speed < 0.5 m/s Direction $\pm 5^\circ$
Tilting Bucket Type Rain Gauge & Recorder	LRT-100 1 Pulse; 0.5 mm	$\pm 3 \%$
Fortin Barometer	PM-2M 10-A	< 0.2 mm
Psychrometer	HP-2 SY H-5B	0.1°C
Pyranometer	MS-42	0.01 KW/m ²

Table 6.1

Training Course

Name of course	Place	Duration	Number of people	Remarks
Mini computer (Soft)	Outside In PAGASA	1 year 6 months	} 4	
Mini computer (Hard)	Outside In PAGASA	6 months 3 months	} 5	
Tele-communication (Operation)	In PAGASA	1 month	70	Weather station 62 persons PFC 8 persons
Tele-communication (OH multiplex)	Outside In PAGASA	1 month 6 months	10 30	
	Outside In PAGASA	1 month 2 months	10 30	
Tele-communication (VHF)	Outside In PAGASA	10 days 1 month	} 10	two times
Tele-communication (HF)	Outside In PAGASA	10 days 1 month	} 10	
Meteorological Observations	Outside In PAGASA	1 month 2 month	5 10	

Table 6.2

Personnel Necessary for Operation and Maintenance

	Station	Number of personnel	Remarks
Operation	PFC	13	3 men x 4 group & chief 1
	DCC TUGUEGARAO	9	2 men x 4 group & chief 1
	DCC MACTAN Radar	9	"
	DCC CAGAYAN DE ORO	9	"
	SCIENCE GARDEN	9	
	Other station	5	(Hold the additional of observation)
Maintenance	PFC	3	Day time work
	DCC (3 stations)	each 1	
	DRS GARMEN ROSALES	1	
	DRS TANAY	0	
	DRS LEGASPI	1	
	SCIENCE GARDEN	1	
Repairs	DILIMAN	5	Day time work

Table 8.3 Derivation of Benefit Less Cost of Alternative Plan 1
(at Discount Rate of 10%)

(Unit: P10⁶)

No.	Year	Costs		Total Cost	Total Benefits
		Capital Cost & Replacement Cost	O&M Cost		
1.	1986	130.0	0	130.0	0
2.	1987	112.0	0	112.0	0
3.	1988	64.0	3.9	67.9	46.0
4.	1989	0	6.2	6.2	137.0
5.	1990	0	6.2	6.2	202.0
6.	1991	0	6.2	6.2	266.0
7.	1992	0	6.2	6.2	331.0
8.	1993	0	6.2	6.2	395.0
9.	1994	0	6.2	6.2	459.0
10.	1995	0	6.2	6.2	524.0
11.	1996	0	6.2	6.2	588.0
12.	1997	0	6.2	6.2	653.0
13.	1998	199.0	6.2	205.2	717.0
14.	1999	0	6.2	6.2	781.0
15.	2000	0	6.2	6.2	847.0
16.	2001	0	6.2	6.2	856.0
17.	2002	0	6.2	6.2	865.0
18.	2003	0	6.2	6.2	874.0
19.	2004	0	6.2	6.2	883.0
20.	2005	0	6.2	6.2	893.0
21.	2006	0	6.2	6.2	902.0
22.	2007	0	6.2	6.2	911.0
23.	2008	199.0	6.2	205.2	920.0
24.	2009	0	6.2	6.2	930.0
25.	2010	0	6.2	6.2	939.0
26.	2011	0	6.2	6.2	948.0
27.	2012	0	6.2	6.2	958.0
28.	2013	0	6.2	6.2	967.0
29.	2014	0	6.2	6.2	976.0
30.	2015	0	6.2	6.2	986.0
31.	2016	0	6.2	6.2	995.0
32.	2017	0	6.2	6.2	1,005.0
33.	2018	0	6.2	6.2	1,014.0
		704.0	189.9	893.9	22,905.0

$$B-C (10\%) = \text{P}4,042 \times 10^6$$

Table 8.4 Derivation of Benefit Less Cost of Alternative Plan 2
(at Discount Rate of 10%)

(Unit: $\text{P}10^6$)

No.	Year	Costs		Total Cost	Total Benefits
		Capital Cost & Replacement Cost	O&M Cost		
1.	1986	121.0		121.0	0
2.	1987	139.0		139.0	0
3.	1988	46.0	0.8	46.8	9.0
4.	1989	0	6.2	6.2	137.0
5.	1990	0	6.2	6.2	202.0
6.	1991	0	6.2	6.2	266.0
7.	1992	0	6.2	6.2	331.0
8.	1993	0	6.2	6.2	395.0
9.	1994	0	6.2	6.2	459.0
10.	1995	0	6.2	6.2	524.0
11.	1996	0	6.2	6.2	588.0
12.	1997	0	6.2	6.2	653.0
13.	1998	199.0	6.2	205.2	717.0
14.	1999	0	6.2	6.2	781.0
15.	2000	0	6.2	6.2	847.0
16.	2001	0	6.2	6.2	856.0
17.	2002	0	6.2	6.2	865.0
18.	2003	0	6.2	6.2	874.0
19.	2004	0	6.2	6.2	883.0
20.	2005	0	6.2	6.2	893.0
21.	2006	0	6.2	6.2	902.0
22.	2007	0	6.2	6.2	911.0
23.	2008	199.0	6.2	205.2	920.0
24.	2009	0	6.2	6.2	930.0
25.	2010	0	6.2	6.2	939.0
26.	2011	0	6.2	6.2	948.0
27.	2012	0	6.2	6.2	958.0
28.	2013	0	6.2	6.2	967.0
29.	2014	0	6.2	6.2	976.0
30.	2015	0	6.2	6.2	986.0
31.	2016	0	6.2	6.2	995.0
32.	2017	0	6.2	6.2	1,005.0
33.	2018	0	6.2	6.2	1,014.0
		704.0	186.8	890.8	22,868.0

$$B-C (10\%) = \text{P}4,013 \times 10^6$$

Table 9.1 Historical Typhoon Damages, per Capita GDP and Population Density from 1970 to 1983

Year	Typhoon Damages (Current price P10 ⁶)	Consumer Price Index	Typhoon Damages (const price June, 1984)	GDP (current price P10 ⁶)	GDP Deflator	GDP (const price P10 ⁶)	Per Capita GDP (const price, June 1984, Peso)	National Population (10 ³)	Population Density (person/km ²)
1970	500.6	13.6	3,680	42,448	21.1	201,175	5,484	36,684	122
1971	40.3	15.6	258	50,120	23.6	212,372	5,609	37,862	126
1972	178.3	17.2	1,037	56,075	25.2	222,520	5,718	38,914	129
1973	250.4	19.6	1,278	71,786	29.6	242,520	6,064	39,995	133
1974	365.1	26.1	1,399	99,638	38.9	256,139	6,231	41,106	137
1975	18.9	28.2	67	114,603	42.0	272,864	6,486	42,070	140
1976	724.8	30.0	2,416	133,928	46.0	291,148	6,708	43,406	144
1977	335.1	32.4	1,034	155,631	49.5	314,406	7,052	44,584	148
1978	1,575.2	34.8	4,526	178,603	54.2	329,526	7,196	45,794	152
1979	417.2	41.4	1,008	220,477	62.7	351,638	7,476	47,037	156
1980	1,417.7	48.8	2,905	266,008	72.1	368,043	7,652	48,098	160
1981	1,419.0	55.3	2,566	305,270	79.7	383,024	7,733	49,530	165
1982	1,650.5	61.3	2,692	340,360	85.8	396,690	7,818	50,740	169
1983	522.1	68.0	768	380,820	95.0	400,863	7,715	51,960	173
1984		100.0			100.0				

Source: International Financial Statistics, 1983 Philippine Statistical Yearbook

Table 9.2 Projection of Future Typhoon Damage under "Without Project"
Condition and Derivation of Mitigatable Typhoon Damage

No.	Year	Population (10 ³)	Population Density (persons/km ²)	GDP (Const. price June, 1984) (P10 ⁶)	Per Capita GDP (Peso)	Typhoon Damage (Const. price June, 1984) (P10 ⁶)	Mitigat- able Typhoon Damage (P10 ⁶)
1.	1986	55,576	185.3	461,909	8,311	4,074	0
2.	1987	56,761	189.2	478,630	8,431	4,136	0
3.	1988	57,927	193.1	495,350	8,551	4,199	420
4.	1989	59,070	196.9	512,140	8,670	4,260	790
5.	1990	60,185	200.6	528,862	8,787	4,320	1,160
6.	91	61,275	204.3	545,582	8,904	4,380	1,530
7.	92	62,344	207.8	562,302	9,019	4,347	1,900
8.	93	63,390	211.3	579,024	9,134	4,494	2,270
9.	94	64,408	214.7	595,744	9,250	4,550	2,640
10.	95	65,397	218.0	612,466	9,365	4,605	3,010
11.	96	66,358	221.2	629,186	9,482	4,659	3,380
12.	97	67,288	224.3	645,908	9,599	4,712	3,750
13.	98	68,187	227.3	662,628	9,718	4,764	4,120
14.	99	69,054	230.2	679,348	9,838	4,815	4,490
15.	2000	69,885	233.0	696,070	9,960	4,865	4,865
16.	01	70,933	236.4	712,790	10,049	4,918	4,918
17.	02	71,997	240.1	729,512	10,133	4,973	4,973
18.	03	73,077	243.6	746,232	10,212	5,025	5,025
19.	04	74,173	247.2	762,952	10,286	5,077	5,077
20.	05	75,285	251.0	779,674	10,356	5,131	5,131
21.	06	76,415	254.7	796,394	10,422	5,183	5,183
22.	07	77,562	258.5	813,144	10,483	5,236	5,236
23.	08	78,725	262.4	829,838	10,541	5,289	5,289
24.	09	79,906	266.4	846,558	10,594	5,343	5,343
25.	10	81,104	270.3	863,278	10,644	5,395	5,395
26.	11	82,321	274.4	879,998	10,690	5,449	5,449
27.	12	83,556	278.5	896,718	10,732	5,503	5,503
28.	13	84,809	282.7	913,442	10,771	5,557	5,557
29.	14	86,081	286.9	930,162	10,806	5,610	5,610
30.	15	87,372	291.2	946,882	10,837	5,664	5,664
31.	16	88,683	295.6	963,602	10,866	5,719	5,719
32.	17	90,013	300.0	980,322	10,891	5,774	5,774
33.	18	91,364	304.5	997,046	10,913	5,829	5,829

Table 9.3 Derivation of Typhoon Damage Mitigation Ratio to Equalize the Benefit of the Project to the Cost of the Project (For Plan 1)

(Unit: ₱10⁶)

No.	Year	Costs			Total Benefit
		Capital Cost & Replacement Cost	O&M Cost	Total Cost	
1.	1986	130.0	--	130.0	--
2.	87	112.0	--	112.0	--
3.	88	64.0	3.9	67.9	420.0
4.	89	0	6.2	6.2	790.0
5.	90	0	6.2	6.2	1,160.0
6.	91	0	6.2	6.2	1,530.0
7.	92	0	6.2	6.2	1,900.0
8.	93	0	6.2	6.2	2,270.0
9.	94	0	6.2	6.2	2,640.0
10.	95	0	6.2	6.2	3,010.0
11.	96	0	6.2	6.2	3,380.0
12.	97	0	6.2	6.2	3,750.0
13.	98	199.0	6.2	205.2	4,120.0
14.	99	0	6.2	6.2	4,490.0
15.	2000	0	6.2	6.2	4,865.0
16.	01	0	6.2	6.2	4,918.0
17.	02	0	6.2	6.2	4,973.0
18.	03	0	6.2	6.2	5,025.0
19.	04	0	6.2	6.2	5,077.0
20.	05	0	6.2	6.2	5,131.0
21.	06	0	6.2	6.2	5,183.0
22.	07	0	6.2	6.2	5,236.0
23.	08	199.0	6.2	205.2	5,289.0
24.	09	0	6.2	6.2	5,343.0
25.	10	0	6.2	6.2	5,395.0
26.	11	0	6.2	6.2	5,449.0
27.	12	0	6.2	6.2	5,503.0
28.	13	0	6.2	6.2	5,557.0
29.	14	0	6.2	6.2	5,610.0
30.	15	0	6.2	6.2	5,664.0
31.	16	0	6.2	6.2	5,719.0
32.	17	0	6.2	6.2	5,774.0
33.	18	0	6.2	6.2	5,829.0
		704.0	189.9	893.9	131,000.0

Present Worth of Cost = Present Worth of Benefit x X%

$$X = \frac{424.1}{25,257.6} = 1.68\% \text{ (Discount Rate = 10\%)}$$

Table 9.4 Derivation of EIRR based on Mitigation Ratio of 5%
(For Plan 1)

(Unit: P10⁶)

NO	Year	Costs		Total Cost	Total Benefits	Benefit Less Cost
		Capital Cost & Replacement Cost	O&M Cost			
1	1986	130.0	0	130.0	0	-130.0
2	1987	112.0	0	112.0	0	-112.0
3	1988	64.0	3.9	67.9	132.0	64.1
4	1989	0	6.2	6.2	213.0	206.8
5	1990	0	6.2	6.2	216.0	209.8
6	1991	0	6.2	6.2	219.0	212.8
7	1992	0	6.2	6.2	222.0	215.8
8	1993	0	6.2	6.2	225.0	218.8
9	1994	0	6.2	6.2	228.0	221.8
10	1995	0	6.2	6.2	230.0	223.8
11	1996	0	6.2	6.2	233.0	226.8
12	1997	0	6.2	6.2	236.0	229.8
13	1998	199.0	6.2	205.2	238.0	32.8
14	1999	0	6.2	6.2	241.0	234.8
15	2000	0	6.2	6.2	243.0	236.8
16	2001	0	6.2	6.2	246.0	239.8
17	2002	0	6.2	6.2	249.0	242.8
18	2003	0	6.2	6.2	251.0	244.8
19	2004	0	6.2	6.2	254.0	247.8
20	2005	0	6.2	6.2	257.0	250.8
21	2006	0	6.2	6.2	259.0	252.8
22	2007	0	6.2	6.2	262.0	255.8
23	2008	199.0	6.2	205.2	264.0	58.8
24	2009	0	6.2	6.2	267.0	260.8
25	2010	0	6.2	6.2	270.0	263.8
26	2011	0	6.2	6.2	272.0	265.8
27	2012	0	6.2	6.2	275.0	268.8
28	2013	0	6.2	6.2	278.0	271.8
29	2014	0	6.2	6.2	281.0	274.8
30	2015	0	6.2	6.2	283.0	276.8
31	2016	0	6.2	6.2	286.0	279.8
32	2017	0	6.2	6.2	289.0	282.8
33	2018	0	6.2	6.2	291.0	284.8
		704.0	189.9	893.9	7,710.0	6,816.1

EIRR = 51.9%

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