7. Environmental Issues

Current Status around Proposed Location of Intake Facility and Open Channel of Parañaque Spillway

Land Use and Existing Facilities:

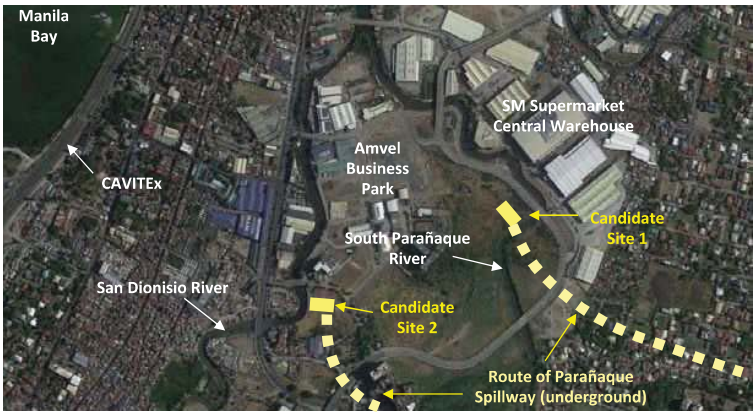
- Residential area along Laguna Lake (ISFs are included)
- Police Facilities (Camp Bagong Diwa)
- University (Polytechnic University)

Land Use and Existing Facilities:

- Residential area along Laguna Lake (ISFs are included)
- PNR (Philippine National Railways)
- Open space (property of a developer: Vista Land and Lifescapes Inc.)

7. Environmental Issues

Current Status around Proposed Location of Drainage Facility (Outlet) of Parañaque Spillway



Land Use and Existing Facilities:

- Located along South Parañaque River (Site 1) and San Dionisio River (Site 2)
- Candidate sites are currently open space (covered by bush and grasses)
- There are ISFs along downstream stretches of the South Parañaque River and San Dionisio River

Land Use and Existing Facilities:

- Located along Zapote River (Site 3), in the property of Las Piñas City (motor pool),
- Left bank side of Zapote River is occupied by ISFs (area of municipality of Bacoor, Cavite)

7. Environmental Issues

Major Potential Impacts of Construction of Parañaque Spillway

Construction of Parañaque Spillway

Pre-Construction Stage

- Land acquisition for (1) Intake facility – Open channel, and (2) Drainage facility and Resettlement of FS and IFS
- Land acquisition:
  Route-1: approx. 10.4 ha.
  Route-3: approx. 5.5 ha.
- Number of affected buildings:
  Route-1: approx. 280.
  Route-3: approx. 290.
- Compensation cost (preliminary calculation):
  Route-1: PhP. 1.20 billion.
  Route-3: PhP. 1.17 billion.

※ No need of compensation for underground channel because of its depth (deeper than 50m from ground surface).

Construction Stage

- Traffic disturbance due to transportation of construction equipment (segment for tunnel lining) and excavated materials: 700 no./day of trailers/dump trucks.
- Disposal of excavated materials from tunneling (1.9 to 2.0 million m3) and development of backfill site.
- Potential impact on groundwater use at deepwells due to tunneling works.

Operation Stage

- Impact on economic activities in Laguna Lake (fishery, etc.) due to construction of intake facility.
- Potential impact on downstream areas of outlet river (effluent stream) including LPPCHEA (Ramsar site)

7. Environmental Issues

Considerations necessary for Major Potential Impacts

Potential Impacts	Measures for Mitigation and Compensation
Land acquisition and resettlement	• Just compensation for affected lands and structures based on RA No. 10752 and other relevant laws and regulations. • IEC (information, education and communication) with PAPs and coordination with relevant GAs (such as NHA and concerned LGUs) for proper resettlement.
Traffic disturbance by project-related traffic	• Development of Traffic Management Plan based on the detailed traffic survey. • The Plan should include: - Consideration in the transportation route and time of construction materials, - Deployment of traffic control person, - Public relation by means of mass media on schedule of construction works, etc.
Generation of excavated materials and disposal	• Development of disposal/reclamation site and/or utilization of existing disposal/reclamation site through coordination with relevant GA (including PRA, LLDA) and LGUs.
Impact on groundwater use	• IEC (information, education and communication) with users of groundwater (owners of deepwells) and compensation when necessary (in case of actual impact generation) through coordination with relevant GAs (such as NWRB: national water resources board and concerned LGUs) for proper compensation.
Impacts on economic activities in Laguna Lake	• Conduct of detailed investigation on existing economic activities in Laguna Lake, • Formulation of impact mitigation measures including: - coordination with local fisher folks for proper compensation for the impacts, - establishment of alternative and/or temporary facilities for existing water transportation, navigation route, mooring facilities, etc., when necessary.

7. Environmental Issues

Necessary Survey in the Stage of Feasibility Study

◆ Implementation of EIA (Environmental Impact Assessment) based on PEISS and JICA Guidelines:

Considering the impact magnitude of the Project, for example, spatial extent and significance of potential impacts (physical modification of land, economic activity, etc.), the Project is to be required to conduct EIA in accordance with both Philippine Environmental Impact Statement System and JICA Guidelines for Environmental and Social Considerations.

◆ Preparation of RAP (Resettlement Action Plan)

Since the Project requires land acquisition and resettlement of FS and IFS (PAPs), RAP shall be prepared in accordance with both Philippine legislation and JICA Guidelines for Environmental and Social Considerations.

8. Water Quality

Water Quality Comparison

- The observed water quality of Laguna de Bay is better than that of Manila Bay.
- pH and Phosphate of Manila Bay failed Class SC standard.

Water quality comparison between Laguna de Bay vs Manila Bay (offshore)

Item	Manila Bay Offshore Evaluation	Laguna de Bay Evaluation	Comparison
DO	SA 7.19 mg/L	AA 8.54 mg/L	Both Manila Bay and Laguna de Bay are rich in oxygen. It is appropriate for fishes.
pH	SD 8.84	AA 8.13	pH is higher in Manila Bay. It is attributed to photosynthesis by phytoplankton and photosynthetic micro organs. Laguna de Bay is better in terms of pH.
Phosphate	SD 1.3 mg/L	A 0.123 mg/L	Laguna de Bay satisfies Class A. Manila Bay (offshore) failed Class SC.
Salinity	— 2.31%	AA 0.02%	The salinity of Laguna de Bay is normally almost zero. When salt water intrusion occurs it increases up to about 0.18%. The salinity of Manila Bay is lower than the average salinity of open sea of 3.5 – 4 %. The reason is expected that the Manila Bay is an inner bay and the tidal current speed is relatively slow.

The values are annual average of 2014.

8. Water Quality

Water Quality Comparison

- The observed water quality of Laguna de Bay is better than that of Manila Bay near LPPCHEA.

Water quality comparison between Laguna de Bay vs Manila Bay near LPPCHEA

Item	Manila Bay Coast Evaluation	Laguna de Bay Evaluation	Comparison
BOD	N/A 16.9 mg/L	A 3.61 mg/L	BOD of salt water cannot be evaluated because the standard is not defined. However, compared with the standard for fresh water, the BOD of Manila Bay fails Class D, while that of Laguna de bay passes Class A.
DO	Fails D 1.71 mg/L	A 8.01 mg/L	The dissolved oxygen of Laguna de Bay is enough for fishes, while that the coast of Manila bay is too small for fishes to survive.
Fecal coliform	Fails SD 180 Million MPN/100mL	–	Fecal coliform is not monitored in Laguna de Bay. The fecal coliform of the coast of Manila Bay is 100 thousand to 1 million times larger than the standard. It has been getting worse.
Total coliform	–	OK 262 MPN/100mL	This item is not monitored in the coast of Manila Bay. The total coliform of Laguna de Bay passes Class A (<1000 MPN/100mL). The evaluation was done with DAO No.34, because the DAO2016-08 doesn't include the standard for total coliform.
pH	SD 6.3	AA 8.42	The pH of the coast of Manila Bay is lower than Class C range. The pH of Laguna de Bay is within Class AA range.
Nitrogen	SA 0.55 mg/L	AA 0.17 mg/L	Both the coast of Manila Bay and Laguna de Bay are top rating.
Phosphorus	SD 0.8 mg/L	A 0.105 mg/L	Phosphorus of Laguna de Bay passes Class A. Phosphorus of the coast of Manila Bay is Class SD, but now it is on the improvement.
Ammonia	–	D 0.07 mg/L	Ammonia is not monitored in the coast of Manila Bay, but it is assumed to be high, because a lot of fecal coliform implies the inflow of human waste. Ammonia of Laguna de Bay fails Class C of 0.05 mg/L.
TSS	SA 13.1 mg/L	–	TSS of the coast of Manila Bay passes top rating of SA. TSS is not measured in Laguna de Bay since 2015 and in 2015 monitoring was carried out in October to December only. The data of the objective period is only available in 2013, and it is about 24 mg/L.

The values are average of Jul to Dec 2016, but BOD and pH are those of 2015 due to data availability.

8. Water Quality

Impact on Water Quality of Manila Bay

Based on the survey, it looks like that the environmental impact of Parañaque Spillway on Manila Bay is small. There are three reasons.

1. Amount of fresh water
   Pampanga River contributes approximately 50% of all fresh water that enters Manila Bay. Compared to the water from Pampanga River, the increase in flow rate by the Parañaque Spillway is smaller, and the total amount of fresh water doesn't change. Therefore, it is not likely to decrease the density of chloride of Manila Bay.
2. Water Quality
   Owning to the control by LLDA, the water quality of Laguna de Bay is better than that of Manila Bay.
3. Sediment
   Sediment concentration of the water discharged through the spillway is expected to be small because Laguna de Bay works as a settling basin. In addition, the tributaries which are main sediment source enter the central and eastern part of the lake and the intake of the spillway will be constructed in western part of the lake. Considering the low current velocity in the lake, sediment is not likely to transported to the intake.

8. Water Quality

Impact on Water Quality around LPPCHEA

Based on the survey , it looks like that the environmental impact of Parañaque Spillway on Manila Bay near LPPCHEA is small. There are three reasons.

1. Water Quality
   According to the water quality data provided by LLDA and DENR, the water quality of Laguna de Bay is better than that around LPPCHEA. Although the TSS of Laguna de Bay is a little bit higher than that of the coast of Manila Bay, it will be washed away with the momentum of drainage and not likely to dwell in that area, because it is expected to consist of relatively fine sediments.
2. Fresh Water
   If the Parañaque Spillway increases the amount of fresh water enter the area near LPPCHEA, it will not devastate mangroves, because they don't need salt water to survive. If mangroves survive, the ecosystem fishes, birds etc. will be preserved.
3. Temporary Event
   The drainage through is a temporary event that lasts 1 to 3 months. After drainage finishes, the environment restores to its normal state. The salinity also rises to its normal level and it maintains the environment that is suitable for mangroves.

8. Water Quality

Water Quality Simulation

It looks like that the environmental impact of Parañaque Spillway on water quality of Manila Bay and the area around LPPCHEA is small. However it is necessary to confirm it quantitatively by conducting water quality simulation of Manila Bay.

Proposition of Analysis Method and Study Items

1. Modeling Area	• **Whole Manila Bay (to set boundary conditions at the mouth of the bay)** • **Major 15 rivers that enter Manila Bay (water quality and flow regime)** • **Sewage plant that discharge to Manila Bay(amount of effluent)**
2. Simulation period and Computation time steps	• Computation period is before draining to the period when the salinity of the coast of Manila Bay becomes normal level (JULY to January or February seem to be enough). • Computation time step is a minute to consider tide. • Input data hydrological data, weather data are hourly
3. Mesh size	• Mesh sizes are 100 m near the outfall. • Mesh sizes become larger with the distance from the outfall.
4. Water quality item to be modeled	• Select items which pose big impact from the existing data. (ex. water temperature, salinity, DO, coliform, phosphate, nitrate, zooplankton, phytoplankton, TSS etc.)
5. Input data	• Seabed topography • The water quality of Manila Bay (offshore) • Th water quality and discharge of the major 15 rivers that enter Manila Bay • Water quality of Laguna de Bay. • Tide level at mouth of the bay and near LPPCHEA • Bottom sediment data (sediment diameter distribution and amount of organic materials) • Effluent from large sewage plants and factories and their water quality.
6. Flora and Fauna	• Only include planktons and exclude and exclude other animals. • The impact on the other animals will be considered based on the simulation result
7. Flushing by Drainage	• Modeling the movement of bottom sediment is costly and takes long time. Therefore, it will be considered based on the simulation result current velocity, tractive force and diameter of sediment. • The impact on the roots of mangroves will be considered in the same manner above. • Raising up of heavy metals in the bottom sediment will also be considered with the simulation result.

9. Implementation Plan
a. Planning Condition

【F/S,E/N,L/A】 2018 to Dec.2019

【D/D, Tender】 Jan.2020 to Dec.2021

【Construction of Parañaque Spillway】

（Route-1: Tunnel 6.0km, Open Channel 1.2km, Route-3: Tunnel 8.8km, Open Channel 0.6km)

Option1: Route-1, Shield Tunneling Method : **Jan. 2022 to Feb. 2030**

Option2: Route-1, NATM : **Jan. 2022 to Jan. 2031**

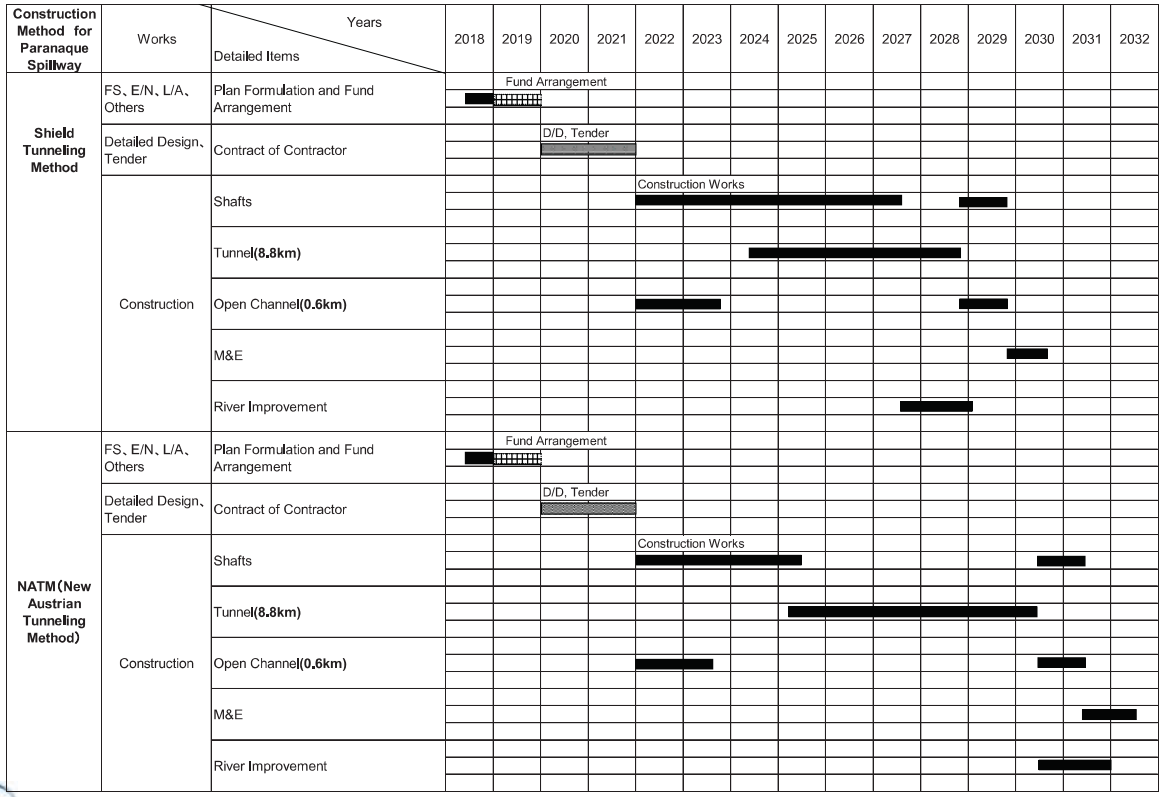
Option3: Route-3, Shield Tunneling Method : **Jan. 2022 to Sep. 2030**

Option4: Route-3, NATM : **Jan. 2022 to Jun. 2032**

9. Implementation Plan
b-1. Implementation Schedule (Parañaque Spillway : Route-1)

Construction Method for Paranaque Spillway	Works	Years / Detailed Items	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Shield Tunneling Method	FS、E/N、L/A、Others	Plan Formulation and Fund Arrangement		Fund Arrangement													
	Detailed Design、Tender	Contract of Contractor			D/D, Tender												
	Construction	Shafts					Construction Works										
		Tunnel(6.0km)															
		Open Channel(1.2km)															
		M&E															
		River Improvement															
NATM(New Austrian Tunneling Method)	FS、E/N、L/A、Others	Plan Formulation and Fund Arrangement		Fund Arrangement													
	Detailed Design、Tender	Contract of Contractor			D/D, Tender												
	Construction	Shafts					Construction Works										
		Tunnel(6.0km)															
		Open Channel(1.2km)															
		M&E															
		River Improvement															

9. Implementation Plan
b-2. Implementation Schedule (Parañaque Spillway : Route-3)



10. Preliminary Cost Estimate
a. Items on Project Cost

a. Construction Cost

b. Engineering Cost (the cost for consulting service) ; 10% of Construction Cost

c. Price Escalation; FC 0.8% , LC 1.8%

d. Contingency; 10% of total amount for Construction Cost , Engineering Cost and Price Escalation

e. Land Acquisition and Compensation

f. Project Administration Cost; 2% of total amount for Construction Cost, Engineering Cost and the cost for Land Acquisition and Compensation

g. VAT; 12%

Base Year of Cost Estimate : September 2017, PHP 1 = JPY 2.183

10. Preliminary Cost Estimate
b. Project Cost

Cost Item	Work Item	Project Cost (million PHP)			
		Option 1 (1-S)	Option 2 (1-N)	Option 3 (3-S)	Option 4 (3-N)
Construction Cost	Tunnel	17,879	11,707	24,258	16,839
	Vertical Shafts	11,940	9,899	11,940	9,899
	Open Channel	4,544	4,544	3,412	3,412
	River Improvement	2,382	2,382	596	596
	Surplus Soil Disposal	1,828	1,828	1,937	1,937
	Sub-total	38,573	30,360	42,143	32,683
Engineering Cost		3,857	3,036	4,214	3,268
Price Escalation		4,022	3,645	4,359	4,218
Contingency		4,645	3,704	5,090	4,017
Land Acquisition, Compensation		1,352	1,352	1,316	1,316
Project Administration Cost		1,049	842	1,146	910
VAT		6,294	5,052	6,876	5,460
Total (million PHP)		59,792	47,991	65,324	51,873

11. Economic Evaluation and Verification of the Project

Outline of Economic Analysis

Quantified Economic Cost and Economic Benefits

Project Cost	Economic Benefits
(1) Initial Construction Cost (2) O&M Cost	(1) Reduced Economic Damage caused by Inundation (Case1) (household assets, commercial/industrial assets, infrastructure, agricultural crops, suspension of economic activities) (2) Increase of Land Price (Case2)

Annual average value of "(1)Reduced economic damage caused by inundation" is calculated by multiplying the "avoided damage of assets under different return period cases (2, 3, 5, 10, 20, 30, 50, 100, 200 years)" and "occurrence rate of each cases per year".

Economic Analysis is further elaborated for the project of Parañaque Spillway under 4 Options.

11. Economic Evaluation and Verification of the Project

Economic Initial Construction Cost under 4 Options (PHP million)

Year	Financial Cost (inc. Price Escalation and TAX)				Economic Cost			
	1: 1-Shield	2: 1-NATM	3: 3-Shield	4: 3-NATM	1: 1-Shield	2: 1-NATM	3: 3-Shield	4: 3-NATM
2020	1,246	1,112	1,242	1,076	965	856	931	828
2021	1,266	1,130	1,261	1,093	976	867	945	838
2022	4,397	4,330	4,576	4,642	3,421	3,345	3,337	3,570
2023	4,458	4,392	4,068	4,136	3,426	3,350	2,991	3,171
2024	7,242	4,456	7,350	3,025	5,410	3,355	5,446	2,365
2025	10,099	5,195	10,633	4,823	7,664	3,869	7,846	3,617
2026	9,740	5,008	10,780	5,172	7,342	3,660	7,950	3,771
2027	9,870	5,081	10,268	5,249	7,236	3,667	7,529	3,778
2028	7,603	5,156	8,504	5,326	5,328	3,673	6,173	3,784
2029	3,384	7,347	4,539	5,405	2,519	5,048	3,323	3,791
2030	488	4,536	2,102	5,654	368	3,186	1,603	3,899
2031	0	247	0	4,759	0	181	0	3,292
2032	0	0	0	1,513	0	0	0	1,098
Total	59,792	47,991	65,324	51,873	44,653	35,057	48,074	37,802

Economic O&M Cost (PHP million)

Facility	Items	Financial Cost		Economic Cost	
		Route-1	Route-3	Route-1	Route-3
O&M Cost of Parañaque Spillway	O&M cost	162.1	221.3	136.0	185.7
	Cleaning of Tunnel	13.6	16.6	11.4	13.9
	Total	175.7	237.9	147.4	199.6
O&M of EFCOS	O&M of Machines	1.1	1.1	0.9	0.9

11. Economic Evaluation and Verification of the Project

Methodology of Calculation of Economic Damage caused by Inundation

Economic Damage	Formula	Economic Benefit (PHP million /year)
Damage of House and House Assets	"Number of Affected Household" x "Value of House and House Assets" x "Damage Rate" x 1.2 (including indirect damage) (Value of House Assets = 30% of House Value)	859 (23%)
Damage of Commercial and Industrial Assets	"Number of Affected Enterprises" x "Value of Commercial Assets" x "Damage Rate" x 1.2 (including indirect damage)	1,127 (30%)
Damage of Infrastructure	"Direct Damage of Household and Commercial/Industrial Assets" x 65%	1,076 (29%)
Damage of Agricultural Crops (Paddy, Maize, commercial crops)	"Affected Area of Crops" x "Economic Value of Agricultural Crops per m2" x "Damage Rate"	28 (1%)
Avoided Economic Cost of Suspended Business Activities	"Number of Affected Enterprises" x "Reduced Period of Suspension" x "Average Daily Added Value per Enterprise"	665 (18%)
Total	-	**3,755**

Methodology of Calculation of Other Economic Benefits

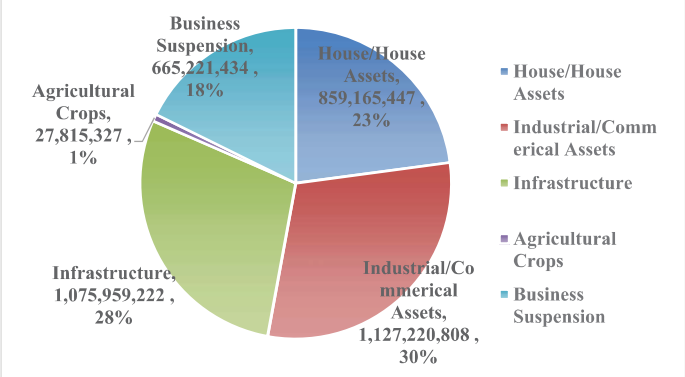
Economic Benefit	Formula	Economic Benefit (PHP million)
Increase of Land Price (Case2)	"Influenced Area" x "Current Market Value of Land" x "Increase Rate of Land Value"	1,520 X 10 years

11. Economic Evaluation and Verification of the Project

Calculation of Annual Average Benefit (31 LGUs)

Return Period	Water Level (m)			Damage Value			Suspention of Business (b)	Total Economic Loss (c)=(a)+(b)	Probability (d)	Probability between two cases (e)	Average Damage of two cases(f)	Annual Economic Loss (e) x (f)
	Without	With	Difference	Without	With	Difference (a)						
200	14.7	14.3	0.4	171,900,856,031	109,151,662,797	62,749,193,234	11,139,603,814	73,888,797,048	0.005	0.00500	63,782,454,775	318,912,274
100	14.3	13.9	0.4	118,748,667,980	73,389,780,852	45,358,887,128	8,317,225,375	53,676,112,502	0.010	0.01000	49,105,402,872	491,054,029
50	14.0	13.7	0.3	84,024,543,627	46,380,838,792	37,643,704,835	6,890,988,407	44,534,693,242	0.020	0.01333	36,333,566,423	484,447,552
30	13.7	13.4	0.3	52,754,246,724	29,281,697,620	23,472,549,104	4,659,890,500	28,132,439,604	0.033	0.01667	25,111,316,517	418,521,942
20	13.6	13.4	0.2	42,533,334,981	24,731,047,902	17,802,287,079	4,287,906,351	22,090,193,430	0.050	0.05000	16,573,312,168	828,665,608
10	13.2	13.0	0.2	18,139,247,230	9,166,508,290	8,972,738,939	2,083,691,967	11,056,430,906	0.100	0.10000	7,585,214,628	758,521,463
5	12.9	12.8	0.1	6,721,906,318	3,683,561,418	3,038,344,900	1,075,653,450	4,113,998,350	0.200	0.13333	2,660,308,555	354,707,807
3	12.6	12.5	0.1	1,206,618,760	0	1,206,618,760	0	1,206,618,760	0.333	0.16667	603,309,380	100,551,563
2	12.3	12.3	0.0	0	0	0	0	0	0.500	0.50000	0	0
												3,755,382,239

Composition of Annual Average Benefit in 31 LGUs around Laguna Lake



11. Economic Evaluation and Verification of the Project (Lagna de Bay Basin (Paranaque Spillway))

Result of Economic Analysis

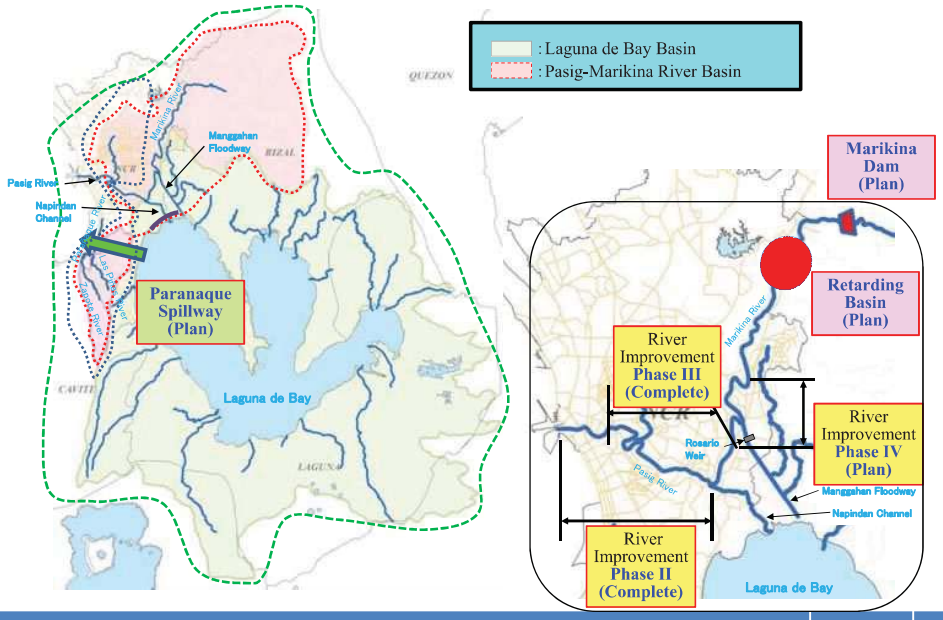
(Case 1, Annual Average Benefit Only)

Option	EIRR	B/C	NPV (PHP million)
Option 1（Route-1, Shield）	9.1%	0.87	-3,199
Option 2（Route-1, NATM）	**10.4%**	**1.06**	**1,094**
Option 3（Route-3, Shield）	8.3%	0.76	-6,297
Option 4（Route-3, NATM）	9.6%	0.95	-1,077

(Case 2, Case 1 + Land Price Increase) EIRR +1.0%~+1.1%

Option	EIRR	B/C	NPV (PHP million)
Option 1（Route-1, Shield）	**10.1%**	**1.02**	**402**
Option 2（Route-1, NATM）	**11.5%**	**1.23**	**4,368**
Option 3（Route-3, Shield）	9.2%	0.89	-3,024
Option 4（Route-3, NATM）	**10.6%**	**1.10**	**1,899**

11. Economic Evaluation and Verification of the Project (Pasig- Marikina River Basin + Laguna de Bay Basin (Paranaque Spillway))



Projects	EIRR	B/C	NPV (PHP million)
River Improvement	28.6%	4.5	27,391
River Improvement + Paranaque Spillway	26.9%	3.1	27,958
River Improvement + Marikina Dam + Retarding Basin + Paranaque Spillway	26.1%	2.8	28,535

12. Study on Downstream River Channel

☐ Evaluated the downstream river water level due to drainage of Parañaque Spillway on Route 1 (Lower Bicutan - South Parañaque River) and Route 3 (Sucat - Zapote River).

1) Route 1 (Lower Bicutan - South Parañaque River)

- The river water level will raise up 0.3m at 5-year return period and 0.7m up at 2-year return period. The design scale of South Parañaque is 25-year for flood control measures and High Water Level (HWL) of 25-year is 14.3m. The river water level is less than 25-year HWL even if Parañaque Spillway is draining during flooding time at this area.

Figure 7.3.1 Drain Facility Location of Route 1 in South Parañaque River

[Calculation Condition]
Laguna Lake Water Level :14.0m
Tide Level : 11.87m

SP. 1+800

Return Period	without Parañaque Spillway		with Parañaque Spillway				Difference WL ①- WL ②
	WL①	River Q	WL②	River Q	Outlet Q* Max	Outlet Q* Min	
	(m)	(m³/S)	(m)	(m³/S)	(m³/S)	(m³/S)	(m)
100	15.0	364.8	-	-	-	-	-
50	14.7	315.3	-	-	-	-	-
25	14.3	268.5	-	-	-	-	-
15	14.1	235.7	-	-	-	-	-
10	13.9	210.6	14.0	220.8	124.1	7.9	0.1
5	13.5	168.3	13.8	203.9	124.4	33.1	0.3
2	12.9	110.9	13.6	180.8	124.8	66.8	0.7

* Drainage discharge of Parañaque Spillway (Outlet Q) was estimated at the level of water level in the case without Parañaque Spillway (present condition). The calculation method of drainage discharge is calculated based on the calculation of (6) in the crossing (section) plan as shown in 4.3.3.

12. Study on Downstream River Channel

1) Route 1 (Lower Bicutan - South Parañaque River)

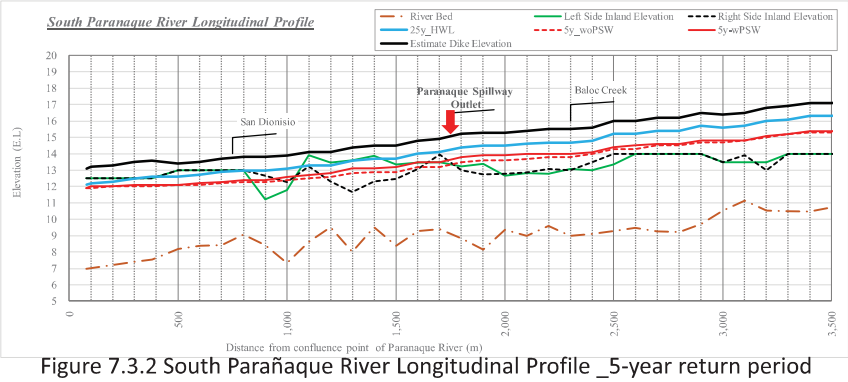


Figure 7.3.2 South Parañaque River Longitudinal Profile _5-year return period

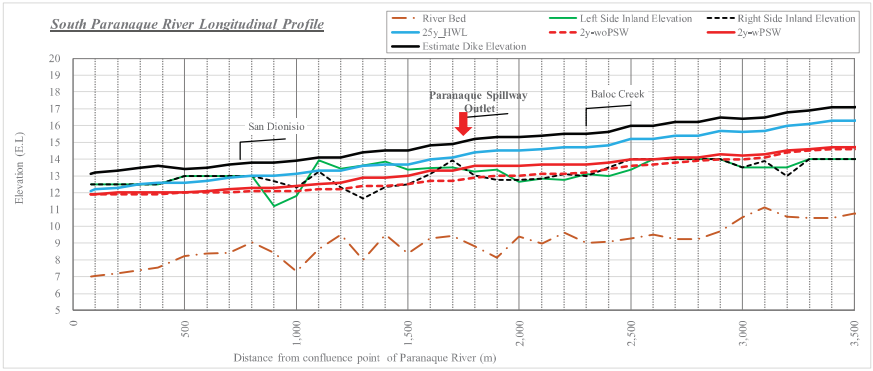
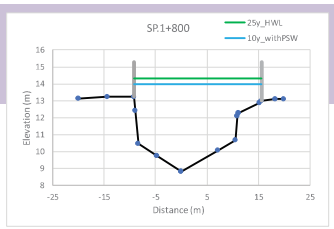


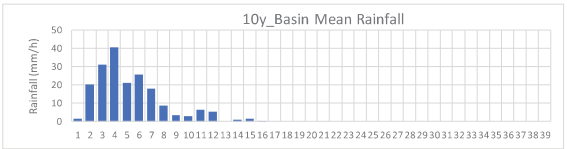
Figure 7.3.3 South Parañaque River Longitudinal Profile _2-year return period

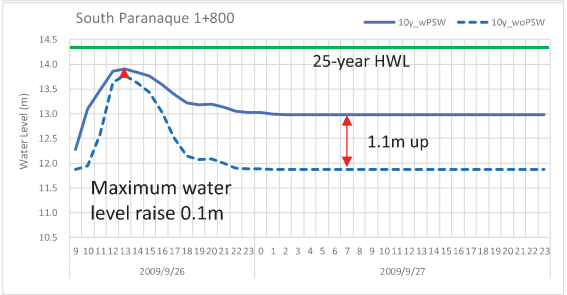
12. Study on Downstream River Channel

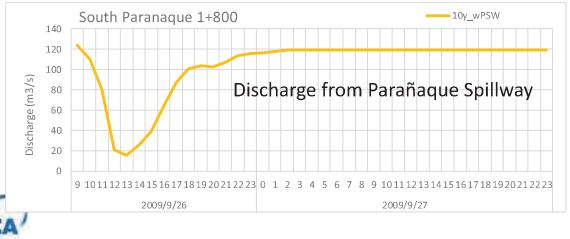


1) Route 1 (Lower Bicutan - South Parañaque River)

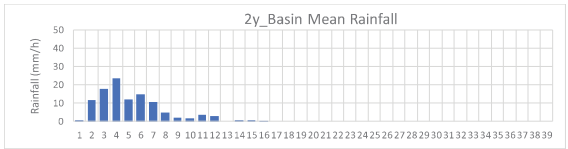
10-year Return Period

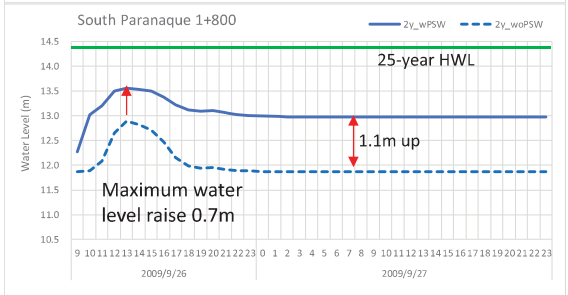


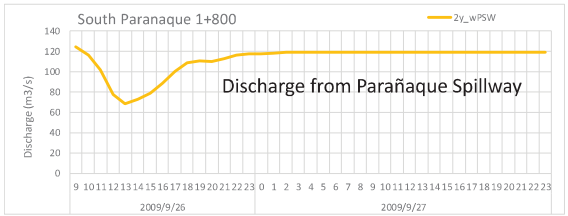




2-year Return Period







12. Study on Downstream River Channel

2) Route 3 (Sucat - Zapote River)

- The river water level will raise up 0.1 – 0.2 m in each return period. The design scale of Zapote River Basin is 50-year for flood control measures and High Water Level (HWL) of 50-year is 12.1m. The river water level is higher than 50-year HWL more than 25-year return period.
- In more than 25-year return period, there is a section that is over 50-year HWL (maximum 20 cm) due to drainage of Parañaque Spillway but lower than the assumed dike top height (HWL + free-board).

Figure 7.3.4 Drain Facility Location of Route 3 in Zapote River

[Calculation Condition]
Laguna Lake Water Level :14.0m
Tide Level : 11.87m

ZA. 0+100

Return Period	without Parañaque Spillway		with Parañaque Spillway				Difference WL ①- WL ②
	WL①	River Q	WL②	River Q	Outlet Q* Max	Outlet Q* Min	
	(m)	(m^3/S)	(m)	(m^3/S)	(m^3/S)	(m^3/S)	(m)
100	12.2	677.6	12.3	827.8	176.1	155.1	0.1
50	12.1	586.0	12.3	739.8	176.1	159.0	0.2
25	12.0	501.8	12.2	659.2	176.2	162.8	0.2
15	12.0	442.5	12.1	602.5	176.2	165.3	0.1
10	12.0	396.4	12.1	558.4	176.2	167.1	0.1
5	11.9	319.0	12.0	483.8	176.2	169.9	0.1
2	11.9	216.1	12.0	383.7	176.2	172.8	0.1

* Drainage discharge of Parañaque Spillway (Outlet Q) was estimated at the level of water level in the case without Parañaque Spillway (present condition). The calculation method of drainage discharge is calculated based on the calculation of (6) in the crossing (section) plan as shown in 4.3.3.

12. Study on Downstream River Channel

2) Route 3 (Sucat - Zapote River)

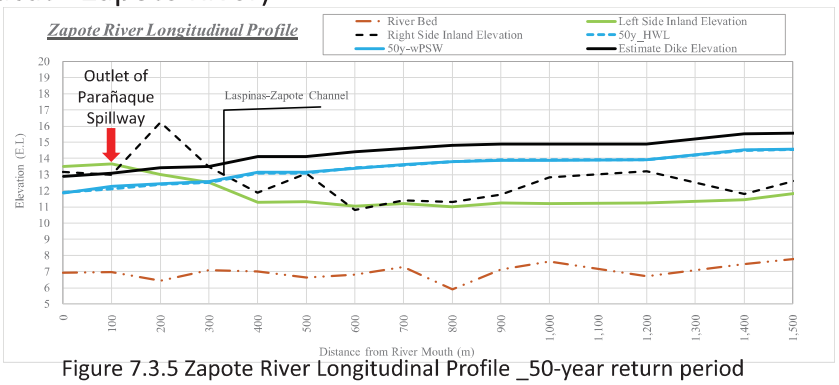


Figure 7.3.5 Zapote River Longitudinal Profile _50-year return period

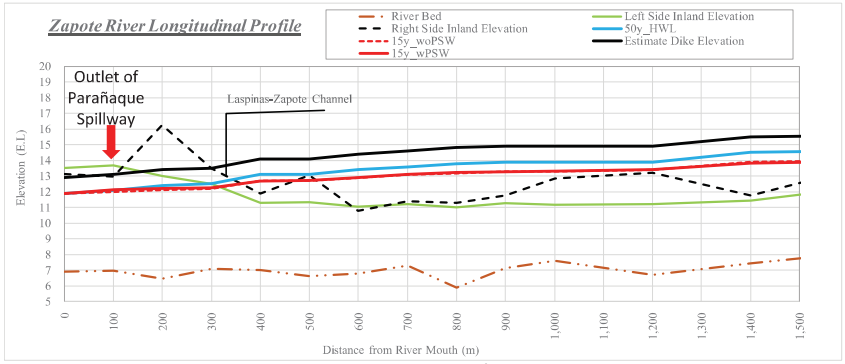
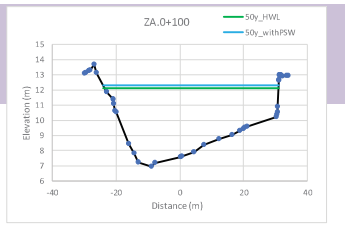


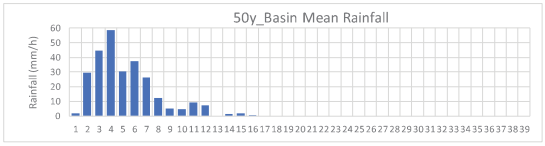
Figure 7.3.6 Zapote River Longitudinal Profile _15-year return period

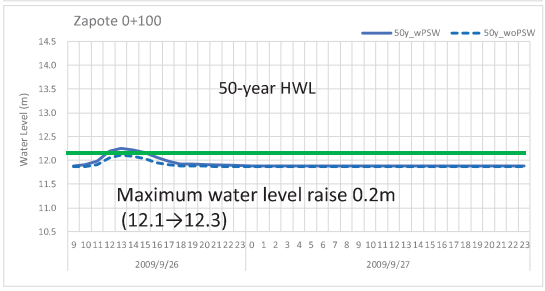
12. Study on Downstream River Channel

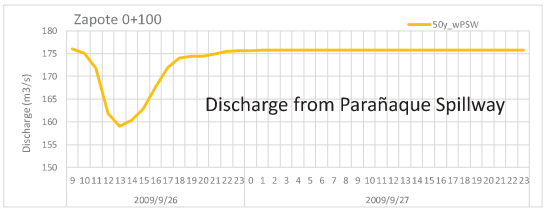


2) Route 3 (Sucat - Zapote River)

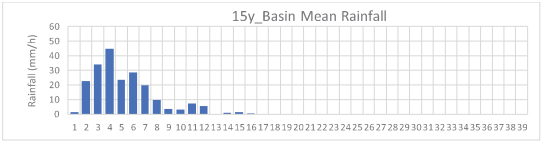
50-year Return Period

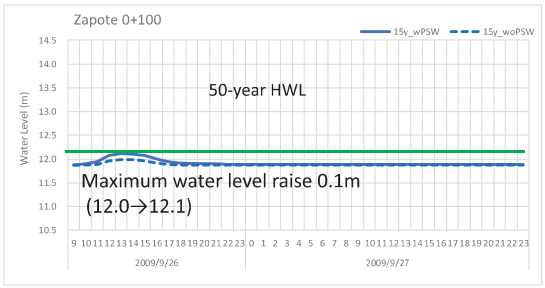


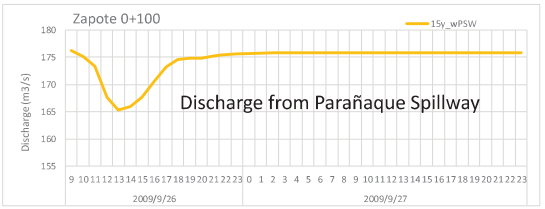




15-year Return Period







12. Study on Downstream River Channel

3) Evaluation on the influence on downstream river channel (summary)

Route	Location of Drainage facilities	Influence of Downstream River Channel
1 (Lower Bicutan - South Parañaque River)	South Parañaque River (SP. 1+800)	● If probable scale exceeds 10 year, the water level at South Parañaque River, which is the drainage destination, exceeds design lake level (14.0 m), so there is a time when it can not drain from Parañaque Spillway. ● Design scale of South Parañaque is 25 years based on basin area. If river improvement (embankment) becomes possible, influence due to drainage of Parañaque Spillway is little in the cross section after river improvement. ● However, since the section where river water level rises greatly affects the upstream and downstream of outlet point due to Parañaque Spillway, river improvement including not only South Parañaque river but also the upstream tributaries is essential.
3 (Sucat - Zapote River)	Zapote River (ZA. 0+100)	● At the time of flood, river water level of Zapote River will not exceed design lake level (14.0 m), there is no time when drainage from Parañaque Spillway can not be done. ● In more than 25-year return period, there is a section that is over 50-year HWL (maximum 20 cm) due to drainage of Parañaque Spillway but lower than the assumed dike top height (HWL + free-board). ● Influence of Parañaque Spillway drainage is not limited to Zapote River. It also affects surrounding rivers / channel because Zapote River is connected to Las Piñas River near estuary via channel and Las Piñas River is also connected to South Parañaque River by San Dionisio River.

Thank you so much for your Attention !!

Republic of the Philippines
Department of Public Works and Highways
Manila

Title/Description: FOURTH STEERING COMMITTEE MEETING FOR THE DATA COLLECTION SURVEY ON PARAÑAQUE SPILLWAY IN METRO MANILA

Minutes of Meeting

Date:	**Started**	**Adjourned**	**Venue**
April 4, 2018	1:30 P.M.	4:00 P.M.	Operations Room, 2nd floor, DPWH Central Office, Port Area, Manila

Attendees:	**Topics:**
Please see attached marked "**ANNEX 1**"	1. Schedule 2. Results of Pre-Feasibility Study

Topic	Session Highlights and Discussion	Person Responsible
	The Meeting was chaired by Director Patrick B. Gatan, CESO III of the Flood Control Management Cluster (FCMC), UPMO, DPWH. The results of the study were explained by Mr. Takahiro Mishina, Leader of the JICA Survey and discussions were made. The principal items discussed and/or concluded in the Meeting are summarized below:	
1. Call to Order	• Director Gatan called the meeting into order at 1:50 P.M and acknowledged the presence of the members/representatives of the Steering Committee. • After the acknowledgement, Director Gatan requested the JICA Consultant to present the updates/status of the Survey. • Mr. Mishina presented the results of the Pre-Feasibility Study for the Parañaque Spillway.	
2. Results of the Pre-Feasibility Study	• Dir. Gatan opened the floor for any clarification on the results of the Pre-Feasibility Study, started by asking Mr. Mishina on the duration for a 14m water level at Laguna de Bay to lower with the installation of the Parañaque Spillway.	JICA Study Team

	➢ Mr. Mishina replied that in the brochure prepared for the meeting, the number of days for the water level to reach to its normal elevation will be reduced by half based on the recorded level on the 2009 data, as reference. ➢ He stated that during typhoon Ondoy, it took 105 days for flood water to subside, however, with the Parañaque Spillway, their calculation is it will take 45 days for flood water to recede.	
3. Operation and Maintenance	• Ms. Adelina 'Lennie' Santos-Borja, Department Manager III, Laguna Lake Development Authority (LLDA) and Dir. Gatan inquired about the rule curve of the inlet and outlet. Her concern is that complaints from the residents are triggered by a water level of 12.5m and the operation of the spillway if it reaches 13m and 12 m. ➢ Mr. Mishina replied that rule curve of the spillway is 12m but it can operate even before the water level reaches 12m depending on the conditions observed by the spillway operators. • Ms. Santos suggested that the Study Team should recommend the agency with specific mandates to be responsible for the operation of the spillway.	JICA Study Team, Ms. Lennie Santos
4. Environmental Issues	• Project Manager Dolores M. Hipolito, UPMO-FCMC has three clarifications: o The water quality parameters used in the simulation for the Pre-Feasibility Study. As the existing water quality data are for period of non-disasters. She noted that during typhoons and flooding, the water quality is worst given the run-offs of flood water contains different kinds of pollutants. ➢ She recommended that further study should be done to determine the water quality during typhoons and flooding. o For the sediments to be removed after every operation of the spillway, PM Hipolito further asked if the study team used the Japanese standard as there are more wastes than sediments in flood water in Metro Manila including the cost of managing solid wastes in the O&M costs and design of the spillway pump station.	PM Dolores M. Hipolito, Ms. Lennie Santos and Engr. Alexander Mohammad

	➢ Mr. Mishina confirmed that they did consider all parameters since there are more solid wastes in flood water and this is the reason why the cost of the project is quite high. o Third question of PM Hipolito is the opinion of Mr. Mishina's on the recommendation of pursuing the project given the EIRR of the Parañaque Spillway is not less than the minimum of 10. ➢ Mr. Mishina explained that Parañaque Spillway should not be considered as a stand-alone project but as the third and last component of improving the flood management system for the whole Metro Manila as was the objective of the 1975 Comprehensive Master Plan. The River Improvement Project of DPWH which includes the Pasig-Marikina and Marikina Dam needs the Parañaque Spillway to complete the system of managing flood waters. • Ms. Santos recommended that water quality monitoring equipment should be included in the outlet station so as to ensure that pollutants will not affect the protected area in the Las Piñas-Parañaque Critical Habitat (LLPCHEA). • Engr. Alexander Mohammad, Metropolitan Manila Development Authority (MMDA) representative inquired if the spillway will be different from the drainage pipes as this might cause possible leaks. ➢ PM Hipolito clarified that it is separate and will not be in anyway be contaminated by drainage and septic wastes.	

Review and Confirmation:		
Prepared by:	Approved by:	Noted:
TAKAHIRO MISHINA	**PATRICK B. GATAN, CESO III**	**EMIL K. SADAIN, CESO I**
Project Team Leader JICA Survey Team	Project Director UPMO – FCMC	Undersecretary for UPMO Operations and Technical Services
Position	Position	Position

ANNEX 1 ATTENDANCE SHEET

Date:	Started:	Adjourned:	Venue:
April 4,2018	1:30 PM	4:00 PM	2nd Floor Operations Room, Office of the Secretary, DPWH Head Office, Bonifacio Drive ,Port Area Manila

ATTENDANCE SHEET

Name	Office	Contact Number	Signature
1.Dir. Patrick B. Gatan	Chairperson – UPMO -FCMC		
2.Joseph I Acebuche	LGU – Las Piñas		
3.Michael Aguilar	LGU- Las Piñas		
4.Donna Marie A. Manansala	LGU- Parañaque		
5.Bernardo Amurao	LGU- Parañaque		
6.Shello B. De Leon	LGU- Parañaque		
7. Detherina M. Basilio	DILG-NCR		
8.Maria Lourdes L. Agustin	DILG-NCR		
9. Jocelyn G. Sta. Ana	LLDA		
10.Joceilyn F. Siapao	LLDA		
11.Lennie Santos Borjz	LLDA		
12.Yolando D. Fiel	MMDA		
13.Alexander Mohammad	MMDA-FCSMO		
14.Jonathan T. Gomez	MMDA-EFCOS		
15.Jan Edmond Sabater	MMDA-EFCOS		
16.Angeline Agunno	NEDA		
17.Lara Hidalgo	NEDA		
18.Rhommel Grutas	PHILVOCS		

19.Cathy Palanca	JICA		
20.Kimiko Hayashi	JICA		
21.Ayummi Oshima	JICA		
22.Jonathan Bacor	DPWH-R IV-A		
23.Tiburcio L. Canlas	DPWH-NCR		
24.Arie Peñaranda	DPWH-PPD		
25.Yvette Kirsten Rivera	DPWH-PPD		
26.Dolores M.Hipolito	DPWH-FCMC		
27.Leonila R. Mercado	DPWH-FCMC-UPMO		
28.Jesse C. Felizardo	DPWH-FCMC-UPMO		
29.Michael T. Alpasan	DPWH-FCMC-UPMO		
30.Mark Zaplan	DPWH-FCMC-UPMO		
31.Cathirine Kay Roque	DPWH-BOD		
32.Mark Gerson P. Baril	DPWH-BOD		
33.Takahiro Mishina	JICA Survey Team/Team Leader		
34.Geraldine Santos	JICA Survey Team		
35.Riza S. Nanas	JICA Survey Team		
36.Eliazar Rupido	JICA Survey Team		
37.Leonida Prudente	JICA Survey Team		
38.			
39.			
40.			
41.			

添付資料　2

用地取得費及び建物補償費

表 2-1 湖岸堤建設に伴う用地取得費および被影響建物補償費の算定結果

Location		a. Phase / Priority	b. Length of Lakeshore Dike (m)	c. Areas by land use within lakeside of Lakeshore Dike (ha)					d. Zonal Value (Php./m2)		e. Cost for Land Acquisition (million Php.)			f. No. of Buildings/ Unit Area (No./ha)					g. No. of Buildings (Nos.)	h. Unit Cost of Residential Building (Php.)	i. Replacement Cost for Residential Buildings (million Php.)	j. Total (e4+i) (million Php.)	k. Project Affected People (PAPs)	
Province	City / Municipality			c1. Built-up	c2. Agricultural	c3. Fishpond	c4. Others	c5. Total	d1. RR	d2. A	e1. Residential Area	e2. Agricultural Area	e4. Total	f1. (No./ 2,500 m2)	f2. (No./ 2,500 m2)	f3. (No./ 2,500 m2)	f4. Ave. (No./ 2,500m2)	f5. Ave. (No./ha)					k1. Average Family Size	k2. PAPs (Nos.)
Rizal	Angono	I	3,310	0.8	3.8	0.0	320.6	325.2	901	358	7	14	21	35	19	36	30.0	120	92	156,344	14	35	4.5	415
Rizal	Taytay	I	1,350	0.0	31.9	0.0	51.9	83.9	1,011	150	0	48	48	35	19	36	30.0	120	0	156,344	0	48	4.3	0
NCR	Taguig	I	2,490	0.0	0.0	0.0	27.0	27.0	6,790	3,500	0	0	0	9	49	47	35.0	140	0	436,735	0	0	4.1	0
NCR	Muntinlupa	I	9,870	0.5	0.0	0.0	27.0	27.5	11,221		60	0	60	9	49	47	35.0	140	75	436,735	33	93	4.1	309
Sub-total			17,020	1.3	35.7	0.0	426.5	463.6			67	61	129						168		47	176		725
Laguna	San Pedro	II	4,080	0.2	0.0	0.0	26.6	26.8	1,792	600	3	0	3	25	51	37	37.7	151	25	216,573	5	8	4.5	112
Laguna	Binan	II	4,660	1.6	1.2	0.0	37.9	40.8	1,459	270	24	3	27	25	51	37	37.7	151	249	216,573	54	81	3.8	944
Laguna	Santa Rosa	II	5,780	1.7	0.0	0.0	26.4	28.0	2,793	545	47	0	47	25	51	37	37.7	151	254	216,573	55	102	3.5	889
Laguna	Cabuyao	II	8,390	1.1	0.0	0.0	84.0	85.1	1838	159	19	0	19	43	29	25	32.3	129	137	216,573	30	49	3.8	520
Laguna	Calamba	II	9,920	1.4	10.8	0.0	36.6	48.8	2,285	416	32	45	77	43	29	25	32.3	129	180	216,573	39	116	3.7	667
Sub-total			32,830	6.0	12.0	0.0	211.5	229.5			125	48	174						845		183	357		3,134
Laguna	Los Banos	III	8,240	3.3	2.8	0.0	11.1	17.2	1,809	340	60	10	69	43	29	25	32.3	129	426	216,573	92	162	3.9	1,661
Laguna	Bay	III	3,780	1.9	17.8	0.0	9.0	28.6	808	223	15	40	55	28	17	13	19.3	77	144	216,573	31	86	4.1	592
Laguna	Calauan	III	840	0.0	15.0	0.0	1.8	16.8	535	35	0	5	5	28	17	13	19.3	77	0	216,573	0	5	4.6	0
Laguna	Victoria	III	6,470	0.4	33.2	0.0	28.4	61.9	839	304	3	101	104	28	17	13	19.3	77	29	216,573	6	110	3.6	104
Laguna	Pila	III	4,750	0.7	24.7	0.0	31.6	56.9	682	213	5	52	57	28	17	13	19.3	77	53	216,573	11	68	4.4	232
Laguna	Santa Cruz	III	8,820	2.2	124.5	0.0	96.8	223.5	2,169	383	47	477	524	28	17	13	19.3	77	167	216,573	36	561	4.2	703
Sub-total			32,900	8.4	217.9	0.0	178.6	405.0			129	685	815						819		177	992		3,293
Total for Priority Area (I+II+III)			82,750	15.6	265.7	0.0	816.7	1,098.0			322	795	1,117						1,832		408	1,525		7,151
Laguna	Pagsanjan		1,160	0.0	13.8	0.0	0.0	13.8	382	251	0	35	35	18	18	21	19.0	76	0	216,573	0	35	4.3	0
Laguna	Lumban		8,900	0.1	523.9	0.0	402.4	926.4	699	35	1	185	185	18	18	21	19.0	76	8	216,573	2	187	4.2	33
Laguna	Kalayaan		3,840	0.4	56.3	0.0	9.1	65.8	647	33	3	19	21	18	18	21	19.0	76	33	216,573	7	29	4.5	150
Laguna	Paete		2,730	0.0	49.9	0.0	11.2	61.0	375	68	0	34	34	18	18	21	19.0	76	0	216,573	0	34	4.5	0
Laguna	Pakil		6,300	0.5	91.0	0.0	21.1	112.6	245	18	1	17	18	18	18	21	19.0	76	35	216,573	8	25	4.5	158
Laguna	Pangil		4,260	0.5	135.0	0.0	14.2	149.7	252	48	1	65	67	18	18	21	19.0	76	42	216,573	9	76	4.4	183
Laguna	Siniloan		1,590	0.0	55.2	0.0	7.2	62.3	495	0	0	0	0	18	18	21	19.0	76	0	216,573	0	0	4.5	0
Laguna	Famy		600	0.0	20.6	0.0	6.6	27.3	240	10	0	2	2	18	18	21	19.0	76	0	216,573	0	2	4.0	0
Laguna	Mabitac		4,960	0.1	163.4	0.0	7.8	171.3	217	26	0	42	43	18	18	21	19.0	76	6	216,573	1	44	4.5	28
Rizal	Jala-jala		23,310	2.8	29.1	0.2	91.0	123.1	505	123	14	36	50	18	18	21	19.0	76	215	216,573	46	97	4.7	1,009
Rizal	Pililla		17,320	4.2	131.3	0.0	15.0	150.5	852	132	36	173	209	18	18	21	19.0	76	321	156,344	50	259	4.4	1,412
Rizal	Tanay		4,530	1.2	41.3	0.0	28.5	71.1	1,644	125	20	52	72	18	18	21	19.0	76	94	156,344	15	87	4.6	433
Rizal	Baras		3,290	0.2	115.6	0.0	13.1	129.0	866	163	2	188	190	18	18	21	19.0	76	19	156,344	3	193	4.1	76
Rizal	Morong		5,670	0.2	245.1	0.0	35.0	280.4	1,394	135	3	331	334	18	18	21	19.0	76	16	156,344	3	337	4.4	73
Rizal	Cardona		13,110	1.4	1.9	0.0	112.0	115.2	649	113	9	2	11	18	18	21	19.0	76	103	156,344	16	27	4.0	413
Rizal	Binangonan		19,110	16.9	49.8	0.0	361.4	428.1	1,386	226	234	112	346	35	19	36	30.0	120	2,024	156,344	316	663	4.0	8,096
Sub-total			120,680	28.6	1723.2	0.2	1135.5	2,887.5			325	1,292	1,617						2,916		476	2,093		12,064
Grand Total			**203,430**	**44.3**	**1988.9**	**0.2**	**1952.2**	**3,985.5**			**647**	**2,087**	**2,734**						**4,748**		**884**	**3,618**		**19,216**

Note)

a. Development Phase proposed by JICA Survey Team.

b. Length of the Proposed Lakeshore Dike delineated on Google Earth.

c. Area calculated on GIS. Classification of land use compiled by Department of Agriculture is used with adjustment. c4. others (non-productive land use) includes grass land, bush, forests, etc.

d. Calculation of land price by land use in each LGU based on the Zonal Value provided by BIR (Bureau of Internal Revenue)

e. Calculation is done as follows: e1=c1 x d1, e2=(c2+c3) x d2, e4=e1+e2

f. Estimation is done as follows: 1) Set a square with a size of 50m by 50m (unit area) on representative location (3 sites in each area). 2) Calculate the no. of buildings in each square. 3) Average the three sets of data and convert it to no./ha as an average value.

g. Number of affected buildings located within the lakeside area of the proposed Lakeshore Dike. g=c1 x f4

h. Use the data of average cost (median) for construction of residential building (house) listed in a statistical book.

i. Replacement cost for affected buildings. i=g x h

j. j=e4+i

k. Calculation of Project Affected Persons (PAPs), k1 is average family size based on a statistical book. K2=g x k1.

表 2-2 河川改修に伴う用地取得費および被影響建物補償費の算定結果

Location		River Name	a. Phase / Priority	b. Improvement Length	c. Width of River Improvement (m)			d. Area of Land Acquisition (ha)	e. Average Zonal Value (Php./m2)	f. Cost for Land Acquisition (million Php.)	g. Household Density by LGU			h. No. of Buildings in Land Acquisition Area (No.)	i. Unit Cost of Residential Building (Php.)	j. Replacement Cost for Residential Buildings (million Php.)	k. Total (f +j) (million Php.)	l. Project Affected People (PAPs)	
Province	City / Municipality			upto 15.0m	c1. average improvement width	c2. existing river width	c3. c1 - c2				g1. No. of Households (No.)	g2. Area of LGUs (ha)	g3. Household Density (No./ha)					l1. Average Family Size	l2. PAPs (No.)
Rizal	Angono	Angono River	I	1,170	36	13	23	2.69	1,146	31	25,325	2,622	9.7	26	156,344	4	35	4.5	117
Rizal	Taytay		I	0													0		0
NCR	Taguig	Magdaong River	I	390	23	10	13	0.51	73,731	374	198,256	4,521	43.9	22	436,735	10	384	4.1	91
NCR	Muntinlupa	Alabang River	I	1,630	32	17	15	2.45	32,206	787	122,286	3,975	30.8	75	436,735	33	820	4.1	308
		Bayanan Creek	I	690	30	10	20	1.38	32,206	444	122,286	3,975	30.8	42	436,735	19	463	4.1	174
		Poblacion River	I	400	30	10	20	0.80	32,206	258	122,286	3,975	30.8	25	436,735	11	268	4.1	101
		Magdaong River	I	630	27	12	15	0.95	32,206	304	122,286	3,975	30.8	29	436,735	13	317	4.1	119
		SB-23-5	I	850	30	20	10	0.85	32,206	274	122,286	3,975	30.8	26	436,735	11	285	4.1	107
		SB-23-6	I	520	25	15	10	0.52	32,206	167	122,286	3,975	30.8	16	436,735	7	174	4.1	66
Sub-total				6,280				10.14		2,640				262		107	2,747		1,083
Laguna	San Pedro	San Isidro River	II	1,340	41	16	25	3.35	1,706	57	73,030	2,405	30.4	102	216,573	22	79	4.5	458
		Tunasan River	II	790	32	10	22	1.74	1,706	30	73,030	2,405	30.4	53	216,573	11	41	4.5	237
Laguna	Binan	SB-20-4	II	770	39	15	24	1.85	2,452	45	86,752	4,350	19.9	37	216,573	8	53	3.8	140
		Binan River	II	2,890	52	30	22	6.36	2,452	156	86,752	4,350	19.9	127	216,573	27	183	3.8	482
Laguna	Santa Rosa	Sta. Rosa River	II	810	50	18	32	2.59	3,153	82	101,385	5,484	18.5	48	216,573	10	92	3.5	168
		SB-20-2	II	1,240	41	26	15	1.86	3,153	59	101,385	5,484	18.5	34	216,573	7	66	3.5	120
		SB-20-3	II	1,010	51	30	21	2.12	3,153	67	101,385	5,484	18.5	39	216,573	8	75	3.5	137
Laguna	Cabuyao		II	0													0		0
Laguna	Calamba	San Juan River	II	1,500	82	60	22	3.30	3,165	104	123,071	14,950	8.2	27	216,573	6	110	3.7	101
		San Cristobal River	II	1,450	71	50	21	3.05	3,165	96	123,071	14,950	8.2	25	216,573	5	102	3.7	93
		SB-17-6	II	710	27	13	14	0.99	3,165	31	123,071	14,950	8.2	8	216,573	2	33	3.7	30
		SB-17-7	II	750	37	15	22	1.65	3,165	52	123,071	14,950	8.2	14	216,573	3	55	3.7	50
		SB-17-8	II	1,410	47	15	32	4.51	3,165	143	123,071	14,950	8.2	37	216,573	8	151	3.7	137
Sub-total				14,670				33.37		923				551		119	1,042		2,154
Laguna	Los Banos	Los Banos River	III	2,100	51	20	31	6.51	2,171	141	29,020	5,422	5.4	35	216,573	8	149	3.9	136
		SB-17-3	III	450	24	10	14	0.63	2,171	14	29,020	5,422	5.4	3	216,573	1	14	3.9	13
		SB-17-4	III	430	33	10	23	0.99	2,171	21	29,020	5,422	5.4	5	216,573	1	23	3.9	21
		SB-17-5	III	1,550	33	20	13	2.02	2,171	44	29,020	5,422	5.4	11	216,573	2	46	3.9	42
Laguna	Bay	Colo River	III	1,070	32	25	7	0.75	859	6	15,149	4,266	3.6	3	216,573	1	7	4.1	11
Laguna	Calauan	Calauan	III	1,970	61	23	38	7.49	373	28	17,669	6,540	2.7	20	216,573	4	32	4.6	93
		SB-16-2	III	5,270	65	10	55	28.99	373	108	17,669	6,540	2.7	78	216,573	17	125	4.6	360
Laguna	Victoria	Pila	III	2,410	51	14	37	8.92	858	77	10,822	2,235	4.8	43	216,573	9	86	3.6	155
Laguna	Pila	SB-15-2	III	4,790	50	20	30	14.37	769	111	11,447	3,120	3.7	53	216,573	11	122	4.4	232
Laguna	Santa Cruz	Sta. Cruz River	III	2,650	69	60	9	2.39	3,178	76	27,982	3,859	7.3	17	216,573	4	80	4.2	73
Sub-total				22,690				73.04		626				269		58	684		1,136
Grand Total				**43,640**				**116.54**		**4,188**				**1,081**		**284**	**4,472**		**4,373**

Note)
a. Development Phase proposed by JICA Survey Team.
b. Longitudinal length of river improvement section measured on AutoCAD
c. Width of river improvement section given by JICA Survey Team.
d. Calculation by d=b x c3
e. Average Zonal Value calculated by city/municipality.
f. Calculation by f=d x e
g. Household density is estimated from number of households listed in statistical book in each LGU.
h. Approximation by h=d x g3.
i. Use the data of average cost (median) for construction of residential building (house) listed in a statistical book.
j. Calculation by j=h x i
k. Calculation by k=f+j

表 2-3 放水路建設に伴う用地取得費および被影響建物補償費の算定結果

Case (Route)	Facility	Location		a. Area			b. Zonal Value	c. Market Value	d. Cost for land acquisition		e. Number of buildings	f. Unit cost of residential building	g. Replacement cost for residential buildings	h. Total cost for compensation	
		City	Barangay	a1. Length	a2. Width	a3. Area			in case of ZV	in case of MV				in case of ZV	in case of MV
				(m)	(m)	(m2)	(PhP./m2)	(PhP./m2)	(million PhP.)	(million PhP.)	No.	(PhP.)	(million PhP.)	(million PhP.)	(million PhP.)
1. Lower Bicutan - Parañaque River	Open Channel	Taguig	Lower Bicutan	1,200	83	99,346	7,829	9,395	778	933	280	776,862	218	1,027	1,188
	Shaft (Departing)	Taguig	Lower Bicutan	80	50	4,000	7,829	9,395	31	38					
	Drainage Facility (Arrival Shaft)	Parañaque	San Dionisio	-	-	1,000	7,110	8,532	7	9	0	776,862	0	7	9
	Total	-	-	-	-	104,346	-	-	**816**	**979**	280	-	**218**	**1,034**	**1,197**
2. Sucat - Zapote River	Open Channel	Muntinlupa	Sucat	600	83	49,673	14,524	17,429	721	866	290	776,862	225	1,005	1,161
	Shaft (Departing)	Muntinlupa	Sucat	80	50	4,000	14,524	17,429	58	70					
	Drainage Facility (Arrival Shaft)	Las Piñas	Pulang Lupa Uno	-	-	1,000	3,270	3,924	3	4	0	776,862	0	3	4
	Total	-	-	-	-	54,673	-	-	**783**	**939**	290	-	**225**	**1,008**	**1,165**

Note)

a1. Width of land acquisition is the width of channel plus additional 12m necessary for acquisition of marginal areas of residential lot.

b. Zonal Value (ZV) provided by BIR (Bureau of Internal Revenue) , specifically average value of ZV at residential area in the barangay in question.

c. Market Value (MV) is calculated as 1.2 times as large as ZV for consistency with the case of Master Plan of this Project.

d. Cost for land acquisition = a3 x b, or a3 x c

f. Average cost of residential buildings (houses) in respective LGUs listed in a statistical book.

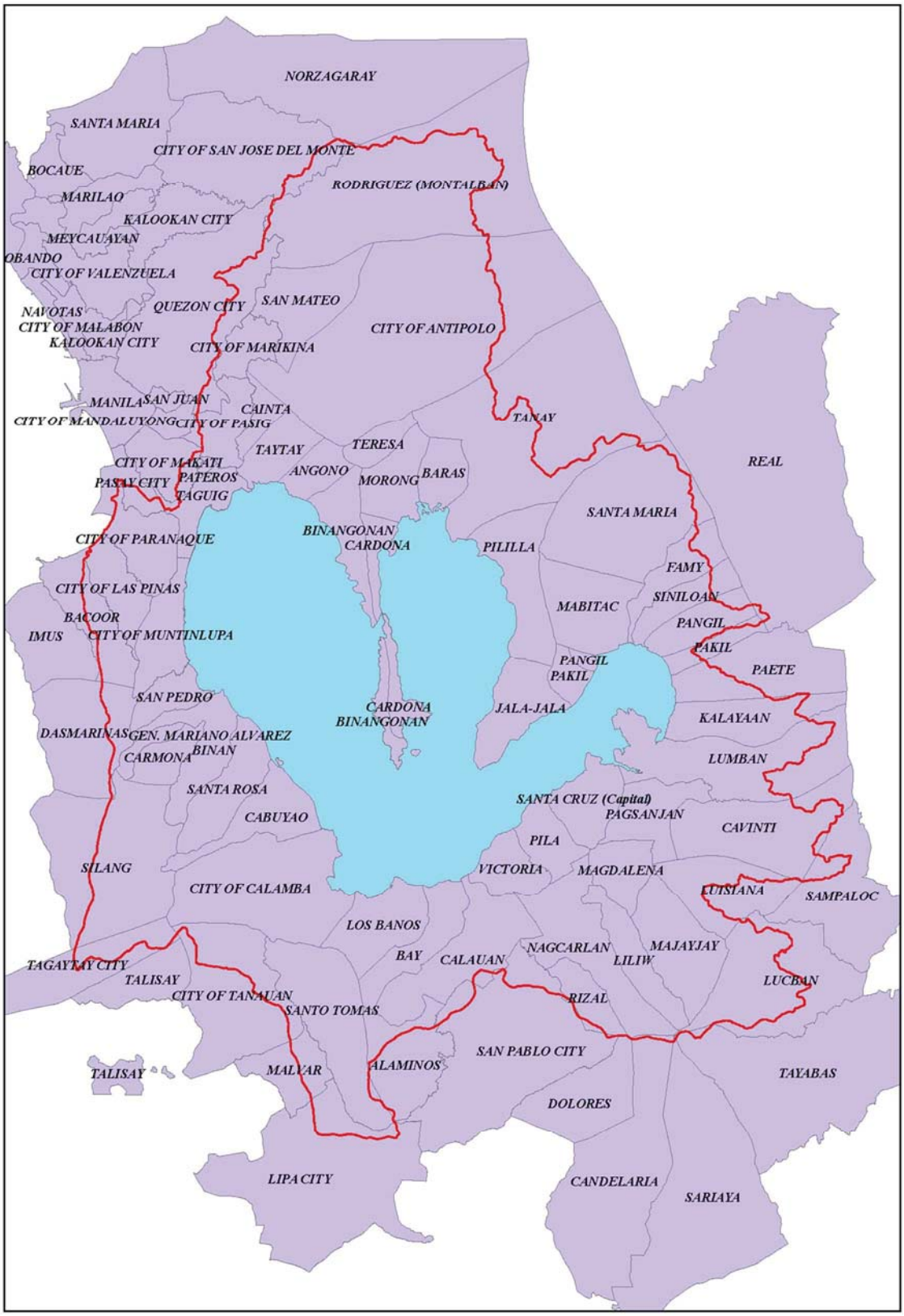
h. Total cost for compensation = d + g

添付資料　3

経済分析に係る資料

添付資料 3-1 洪水被害分析の対象 LGU リスト

ID	Province	Name of LGU	Population (2015 census)	Increase Rate (2015-20)	Population in 2017
1	NCR	CITY OF MUNTINLUPA	504,509	0.98%	514,446
2	NCR	TAGUIG	804,915	0.98%	820,769
3	LAGUNA	BAY	62,143	1.85%	64,464
4	LAGUNA	BINAN	333,028	1.85%	345,464
5	LAGUNA	CABUYAO	308,745	1.85%	320,274
6	LAGUNA	CALAUAN	80,453	1.85%	83,457
7	LAGUNA	CITY OF CALAMBA	454,486	1.85%	471,458
8	LAGUNA	FAMY	16,587	1.85%	17,206
9	LAGUNA	KALAYAAN	23,269	1.85%	24,138
10	LAGUNA	LOS BANOS	112,008	1.85%	116,191
11	LAGUNA	LUMBAN	30,652	1.85%	31,797
12	LAGUNA	MABITAC	20,530	1.85%	21,297
13	LAGUNA	PAETE	25,096	1.85%	26,033
14	LAGUNA	PAGSANJAN	42,164	1.85%	43,738
15	LAGUNA	PAKIL	20,659	1.85%	21,430
16	LAGUNA	PANGIL	24,274	1.85%	25,180
17	LAGUNA	PILA	50,289	1.85%	52,167
18	LAGUNA	SAN PEDRO	325,809	1.85%	337,975
19	LAGUNA	SANTA CRUZ (Capital)	117,605	1.85%	121,997
20	LAGUNA	SANTA ROSA	353,767	1.85%	366,977
21	LAGUNA	SINILOAN	38,067	1.85%	39,489
22	LAGUNA	VICTORIA	39,321	1.85%	40,789
23	RIZAL	ANGONO	113,283	2.08%	118,045
24	RIZAL	BARAS	69,300	2.08%	72,213
25	RIZAL	JALA-JALA	32,254	2.08%	33,610
26	RIZAL	MORONG	58,118	2.08%	60,561
27	RIZAL	PILILLA	64,812	2.08%	67,536
28	RIZAL	TANAY	117,830	2.08%	122,783
29	RIZAL	TAYTAY	319,104	2.08%	332,517
30	RIZAL	CARDONA	49,034	2.08%	51,095
31	RIZAL	BINANGONAN	282,474	2.08%	294,347
		Total	**4,894,585**		**5,059,443**


NORZAGARAY
SANTA MARIA
CITY OF SAN JOSE DEL MONTE
BOCAUE
RODRIGUEZ (MONTALBAN)
MARILAO
KALOOKAN CITY
MEYCAUAYAN
OBANDO
CITY OF VALENZUELA
QUEZON CITY
SAN MATEO
NAVOTAS
CITY OF MALABON
KALOOKAN CITY
CITY OF MARIKINA
CITY OF ANTIPOLO
MANILA
SAN JUAN
CAINTA
CITY OF MANDALUYONG
CITY OF PASIG
TAYTAY
TERESA
TANAY
REAL
CITY OF MAKATI
PASAY CITY
PATEROS
TAGUIG
ANGONO
MORONG
BARAS
SANTA MARIA
BINANGONAN
CARDONA
CITY OF PARANAQUE
PILILLA
FAMY
CITY OF LAS PINAS
SINILOAN
MABITAC
BACOOR
IMUS
CITY OF MUNTINLUPA
PANGIL
PAKIL
PANGIL
PAKIL
PAETE
SAN PEDRO
CARDONA
BINANGONAN
JALA-JALA
KALAYAAN
DASMARINAS
GEN. MARIANO ALVAREZ
CARMONA
BINAN
LUMBAN
SANTA ROSA
SANTA CRUZ (Capital)
PAGSANJAN
CABUYAO
CAVINTI
PILA
SILANG
VICTORIA
MAGDALENA
CITY OF CALAMBA
LUISIANA
SAMPALOC
LOS BANOS
NAGCARLAN
MAJAYJAY
BAY
CALAUAN
LILIW
TAGAYTAY CITY
TALISAY
LUCBAN
CITY OF TANAUAN
RIZAL
SANTO TOMAS
SAN PABLO CITY
TALISAY
MALVAR
ALAMINOS
TAYABAS
DOLORES
LIPA CITY
CANDELARIA
SARIAYA

添付資料　3-2 LGU の高さ毎の家屋・家庭用品被害額 (PHP)

Economic Damage of Household Building and Assets (inc. indirect)

Elevation Range	Total	Metro Manila	Laguna	Rizal	1	2	3	4	5	6	7	8	9	10	11	12	13
					Metro Manila	Metro Manila	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna
					Taguig City	Municipalities	San Pedro	Binan	Santa Rosa	Calauyao	City of Calamba	Los Banos	Bay	Calauan	Victoria	Pila	Santa Cruz
<= 12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<= 12.6	160,728,133	16,362,179	103,505,689	40,860,264	8,919,819	7,442,360	2,565,733	36,699,990	5,297,391	9,053,007	3,471,232	5,078,484	6,642,266	0	6,144,998	1,481,839	19,827,393
<= 12.7	351,179,417	74,175,367	202,119,546	74,884,504	48,487,219	25,688,147	8,001,383	64,646,461	15,766,516	21,445,509	9,078,097	5,554,592	14,356,292	0	14,651,422	4,419,056	29,390,572
<= 12.8	948,714,527	139,481,290	593,272,125	215,961,112	90,450,735	49,030,555	19,842,697	196,284,158	40,929,618	55,775,046	21,305,931	22,000,653	36,757,470	205,641	38,686,837	8,596,522	102,612,388
<= 12.9	1,637,105,848	322,340,426	971,664,042	343,101,380	208,420,964	113,919,462	38,630,209	306,043,839	81,909,537	102,468,113	44,765,536	28,980,368	62,818,067	238,809	64,329,713	16,802,752	143,105,401
<= 13.0	2,375,537,370	437,793,591	1,441,351,851	496,391,928	285,600,058	152,193,533	63,299,029	432,519,986	122,239,056	166,966,680	60,336,973	39,888,383	83,682,496	939,804	92,179,374	25,324,731	214,099,146
<= 13.1	3,482,934,395	601,230,882	2,136,024,366	745,679,147	366,008,010	235,222,872	99,276,798	641,087,644	182,258,226	241,538,344	105,689,618	70,341,660	120,309,618	1,176,551	122,141,764	39,251,622	317,589,598
<= 13.2	4,845,460,735	956,262,135	2,861,610,995	1,027,587,604	587,662,397	368,599,738	163,295,560	811,996,017	236,782,137	382,532,849	142,802,372	79,685,605	156,395,299	1,631,099	160,543,775	62,456,676	386,430,730
<= 13.3	6,120,532,507	1,139,714,805	3,662,996,315	1,317,821,387	685,590,803	454,124,003	241,548,195	1,003,789,433	301,070,381	469,833,493	207,088,323	109,522,891	185,442,577	2,454,823	201,326,450	77,919,814	498,849,496
<= 13.4	7,610,502,638	1,508,118,468	4,468,242,084	1,634,142,106	923,112,548	585,005,920	340,528,698	1,198,067,068	354,533,547	590,481,881	260,561,519	136,262,782	206,466,822	2,525,229	226,076,972	97,860,511	587,830,843
<= 13.5	9,065,074,193	1,805,690,769	5,287,299,921	1,972,083,503	1,062,148,138	743,542,631	432,733,053	1,364,623,919	409,030,624	739,689,645	340,098,810	170,992,777	229,342,316	2,905,422	256,847,487	128,285,472	655,045,113
<= 13.6	11,428,438,810	2,178,186,243	6,691,883,424	2,558,369,144	1,242,957,496	935,228,747	571,081,747	1,694,978,328	504,173,320	918,797,418	444,005,209	224,962,927	281,882,587	3,229,290	322,499,938	169,357,784	851,669,162
<= 13.7	14,042,960,015	2,951,447,356	8,016,064,676	3,075,447,983	1,729,132,696	1,222,314,660	702,303,680	2,037,879,295	616,597,777	1,101,735,850	540,079,097	254,027,815	338,464,456	3,229,290	385,335,987	215,570,036	963,886,534
<= 13.8	16,590,727,945	3,374,195,281	9,602,468,171	3,614,064,493	1,931,916,594	1,442,278,686	848,663,184	2,405,034,972	756,953,100	1,292,859,900	657,260,508	309,198,060	380,920,689	4,311,724	454,533,486	264,303,065	1,160,994,857
<= 13.9	19,270,701,073	3,932,236,967	11,124,025,459	4,214,438,647	2,191,013,080	1,741,223,887	993,878,792	2,743,608,860	926,371,504	1,487,932,224	795,221,765	360,751,051	425,788,545	4,796,088	507,374,957	321,322,111	1,305,406,665
<= 14.0	22,285,099,848	4,615,355,115	12,807,158,220	4,862,586,512	2,540,688,542	2,074,666,574	1,170,851,480	3,040,339,988	1,078,294,963	1,784,894,736	908,279,562	412,006,838	484,850,236	6,317,975	552,708,054	400,745,959	1,444,861,911
<= 14.1	25,364,992,025	5,195,732,091	14,593,043,858	5,576,216,075	2,765,941,431	2,429,790,660	1,376,527,278	3,364,683,978	1,280,203,920	1,994,083,378	1,103,776,431	456,579,262	539,032,780	8,283,801	614,338,080	468,887,089	1,618,635,212
<= 14.2	28,610,155,144	6,088,221,762	16,307,503,186	6,214,430,197	3,278,726,200	2,809,495,562	1,616,623,473	3,723,978,866	1,465,761,923	2,216,383,821	1,264,440,658	498,576,222	575,123,176	10,564,385	662,379,085	523,262,514	1,757,467,196
<= 14.3	31,607,569,250	6,627,877,947	18,052,360,929	6,927,330,374	3,502,000,241	3,125,877,706	1,859,987,367	3,962,647,679	1,648,851,495	2,402,813,692	1,492,582,383	580,977,572	612,593,495	12,110,806	706,188,345	597,783,004	1,899,205,339
<= 14.4	34,738,296,094	7,316,605,686	19,730,977,208	7,690,713,201	3,836,472,240	3,480,133,445	2,094,794,841	4,150,802,380	1,833,846,404	2,622,443,089	1,712,256,397	627,116,561	690,790,843	16,647,673	764,402,680	661,394,689	2,034,319,736
<= 14.5	38,037,274,750	8,246,601,640	21,430,362,442	8,360,310,668	4,313,153,152	3,933,448,488	2,291,191,933	4,426,763,069	2,052,381,628	2,809,546,139	1,937,777,366	684,346,230	713,248,876	22,442,912	796,487,764	725,830,064	2,134,329,169
<= 14.6	42,912,264,062	9,139,079,323	24,283,459,986	9,489,724,753	4,657,373,234	4,481,706,089	2,505,152,925	5,070,353,454	2,369,388,490	3,115,094,976	2,183,213,689	783,175,253	831,783,438	30,497,205	899,835,737	813,498,128	2,501,679,612
<= 14.7	48,000,887,696	10,588,089,671	26,869,953,396	10,542,853,628	5,489,307,852	5,098,772,819	2,748,312,913	5,636,935,767	2,696,756,382	3,384,331,712	2,434,239,200	814,325,755	967,884,943	43,229,922	1,039,703,848	908,661,717	2,704,978,571

Elevation Range	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Rizal	Rizal	Rizal	Rizal	Rizal	Rizal	Rizal	Rizal
	Pagsanjan	Lumban	Kalayaan	Paete	Pakil	Pangil	Siniloan	Famy	Mabitac	Jalajala	Pilila	Tanay	Baras	Morong	Cardona	Binangonan	Angono	Taytay
<= 12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<= 12.6	397,129	882,530	0	3,916,133	147,574	1,655,317	0	0	244,673	311,185	289,981	7,264,371	1,457,259	276,688	1,965,573	11,639,573	4,017,895	13,637,739
<= 12.7	564,342	2,426,956	0	6,814,515	694,465	1,655,317	75,063	0	2,578,989	4,621,677	2,734,107	13,421,879	2,073,570	2,570,896	2,386,355	14,718,093	7,078,874	25,279,053
<= 12.8	1,573,201	5,791,917	0	23,788,874	2,674,936	7,647,837	4,228,533	1,099,805	3,471,060	6,903,957	5,476,234	37,726,994	6,290,279	4,742,999	7,858,890	53,020,516	22,342,771	71,598,472
<= 12.9	3,201,885	12,006,031	0	32,693,310	4,392,397	8,635,578	4,585,838	1,147,036	12,701,622	19,958,284	12,117,012	56,897,704	8,505,259	11,833,530	10,765,539	81,005,166	33,517,957	108,500,930
<= 13.0	3,201,885	17,575,472	198,656	57,319,354	8,668,071	14,374,400	16,646,368	4,518,452	15,373,536	24,575,959	19,575,645	91,502,424	12,683,544	17,172,198	12,426,650	107,077,726	59,699,289	151,678,492
<= 13.1	7,493,579	28,206,554	437,044	75,160,345	13,545,779	20,394,915	21,012,989	4,827,241	24,284,076	32,113,677	21,959,495	119,776,407	17,999,938	22,603,472	23,161,923	191,049,439	89,487,097	227,528,700
<= 13.2	8,371,463	48,094,652	1,272,299	103,937,522	15,323,010	23,917,576	34,958,649	6,711,457	34,472,250	44,683,501	34,818,232	191,768,658	28,259,919	35,958,893	26,478,022	216,416,710	141,242,166	307,961,503
<= 13.3	10,559,995	61,563,385	1,877,293	137,105,220	27,287,318	30,438,533	49,324,265	10,159,735	35,834,693	57,411,566	42,406,876	222,934,251	31,884,591	46,876,375	32,998,788	270,605,176	194,649,059	418,054,765
<= 13.4	14,744,271	97,977,559	2,717,562	158,608,629	30,366,173	38,116,055	66,968,076	11,810,580	45,737,308	66,918,093	49,107,328	264,050,830	42,243,565	62,900,792	42,370,442	346,563,568	241,818,763	516,168,725
<= 13.5	18,398,641	117,378,384	3,139,253	187,867,704	31,335,522	49,006,009	82,644,404	15,097,259	52,038,108	83,890,958	59,790,612	333,032,618	51,353,270	77,743,128	46,927,983	408,155,392	308,730,745	609,458,796
<= 13.6	22,189,007	152,961,448	3,645,282	234,678,931	39,966,105	71,475,569	103,621,571	17,059,200	59,658,602	94,306,710	68,457,271	416,662,827	74,014,055	90,525,110	68,091,706	530,029,483	394,137,154	822,144,827
<= 13.7	26,549,518	200,173,114	4,348,100	277,694,933	44,153,088	78,842,940	132,186,519	20,027,894	72,978,753	122,873,294	91,543,871	487,417,899	83,374,730	120,768,110	80,144,785	614,716,193	469,120,207	1,005,488,895
<= 13.8	31,333,973	243,449,223	4,500,403	334,723,773	54,984,992	101,478,632	191,349,618	28,607,534	77,006,479	151,656,978	113,531,920	570,332,242	96,386,078	144,342,550	89,766,134	734,353,186	551,602,977	1,162,092,427
<= 13.9	40,961,420	298,961,405	4,500,403	363,283,628	60,459,183	122,059,196	225,203,166	33,559,785	102,582,710	172,553,422	133,535,437	638,543,984	116,433,305	165,688,853	111,601,567	920,589,767	627,947,474	1,327,544,837
<= 14.0	49,272,834	362,247,739	6,111,386	417,645,562	64,930,230	141,351,242	327,743,242	39,982,800	113,721,485	194,844,783	159,429,138	780,799,304	141,678,278	186,882,876	123,526,300	1,004,254,338	747,471,172	1,523,700,324
<= 14.1	54,027,055	426,859,557	8,789,891	459,509,328	88,128,004	163,387,530	402,033,233	44,756,768	120,521,284	217,356,977	193,005,413	846,706,783	158,595,299	205,127,558	144,859,801	1,125,039,803	894,709,424	1,790,815,018
<= 14.2	63,848,892	528,747,551	12,125,380	497,410,574	95,182,034	175,896,329	445,261,869	51,812,142	122,657,096	235,640,365	215,824,992	925,085,069	177,069,604	246,919,212	160,619,601	1,257,155,939	979,432,755	2,016,682,660
<= 14.3	77,551,633	598,852,404	18,386,113	540,943,077	105,549,254	220,087,093	525,852,054	58,875,761	130,522,452	290,864,321	258,073,999	1,027,369,263	203,005,134	281,042,621	178,409,283	1,406,261,887	1,066,856,427	2,215,447,439
<= 14.4	82,218,918	680,420,445	23,395,639	566,286,828	120,431,991	269,693,188	599,296,016	69,296,966	151,121,562	310,907,496	289,829,668	1,106,481,168	242,509,326	304,978,755	201,035,803	1,551,381,060	1,184,120,012	2,499,469,913
<= 14.5	94,523,129	754,282,328	32,117,323	594,891,452	128,310,131	317,228,700	677,260,422	77,663,566	159,740,242	323,941,074	320,236,006	1,163,606,184	252,016,540	346,130,176	221,545,363	1,706,695,465	1,277,421,394	2,740,718,466
<= 14.6	109,641,991	835,228,776	42,377,911	676,983,349	142,065,383	383,618,013	728,295,690	84,217,791	177,358,174	347,676,342	365,523,548	1,322,494,203	298,100,043	375,038,256	260,929,272	1,986,260,685	1,390,649,384	3,143,053,019
<= 14.7	125,049,017	918,376,805	53,082,682	743,203,269	165,681,014	411,342,789	758,773,637	95,578,753	219,504,700	414,423,901	447,806,861	1,449,717,487	322,220,254	438,116,644	284,773,621	2,212,777,859	1,481,993,827	3,491,013,173

添付資料　3-3 LGU の高さ毎の事業所被害額（PHP）

Economic Damage of Industorial (inc. indirect)

Elevation Range	Total	Metro Manila	Laguna	Rizal	1	2	3	4	5	6	7	8	9	10	11	12	13
					Metro Manila	Metro Manila	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna
					Taguig City	Muntinlupa City	San Pedro	Binan	Santa Rosa	Cabuyao	City of Calamba	Los Banos	Bay	Calauan	Victoria	Pila	Santa Cruz
<= 12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<= 12.6	364,008,779	20,909,264	231,454,586	111,644,929	5,059,255	15,850,009	7,758,287	56,676,841	10,123,307	25,991,696	10,011,918	12,302,990	20,214,615	0	12,810,390	5,212,508	34,323,668
<= 12.7	756,445,117	80,607,143	461,509,142	214,328,833	27,505,434	53,101,709	22,677,730	101,109,378	26,548,230	59,050,873	22,079,992	14,271,468	45,142,676	0	30,252,123	15,980,288	55,121,083
<= 12.8	1,462,321,017	123,723,804	953,932,670	384,664,542	50,743,871	72,979,933	37,927,534	213,898,589	55,550,064	113,648,932	38,812,022	34,663,178	75,969,306	531,578	57,564,676	20,205,861	135,317,408
<= 12.9	2,180,828,829	258,242,952	1,380,039,949	542,545,929	115,157,475	143,085,477	59,757,577	314,723,615	93,704,755	177,397,067	67,627,631	48,299,147	110,785,097	620,679	78,793,474	34,131,286	181,665,818
<= 13.0	3,095,747,065	359,480,500	1,958,312,480	777,954,085	157,712,253	201,768,247	94,619,494	418,327,869	130,506,274	305,078,209	88,594,194	57,010,230	142,241,562	1,389,351	104,898,854	52,144,293	247,244,667
<= 13.1	4,492,784,215	497,788,146	2,809,569,990	1,185,426,079	201,959,837	295,828,309	153,598,235	607,360,537	186,206,080	419,387,607	141,643,393	93,268,652	197,811,760	1,824,623	141,784,667	74,173,691	351,907,113
<= 13.2	6,045,071,805	762,472,883	3,682,645,456	1,599,953,466	324,802,466	437,670,417	241,957,995	772,759,796	234,440,557	591,552,888	184,925,644	108,510,219	247,508,273	2,092,496	182,331,485	105,699,782	432,566,632
<= 13.3	7,613,505,056	900,418,320	4,696,594,780	2,016,491,956	378,738,106	521,680,214	326,336,962	951,208,083	296,318,887	743,288,826	263,662,998	156,936,422	288,723,377	2,986,493	229,513,800	130,745,937	555,057,803
<= 13.4	9,384,401,966	1,171,015,345	5,723,109,865	2,490,276,756	508,806,573	662,208,772	439,302,600	1,116,418,392	353,731,707	938,171,752	341,960,912	195,517,291	323,621,393	3,097,391	260,345,761	170,782,495	655,129,844
<= 13.5	11,266,744,790	1,441,033,611	6,829,310,926	2,996,400,253	586,001,530	855,032,081	541,056,876	1,284,991,261	412,299,712	1,183,059,457	431,038,648	228,533,827	367,910,463	3,675,610	290,854,609	227,106,253	729,443,753
<= 13.6	14,266,244,286	1,773,345,165	8,649,682,005	3,843,217,116	685,348,298	1,087,996,867	697,499,854	1,626,694,076	514,875,210	1,459,200,749	567,767,541	295,039,146	456,813,026	4,160,759	364,601,163	311,233,508	932,604,571
<= 13.7	17,330,140,974	2,344,507,947	10,361,353,838	4,624,279,189	953,347,861	1,391,160,086	869,954,230	1,963,221,697	631,100,383	1,734,391,476	675,054,641	335,636,703	544,178,613	4,160,759	441,409,712	402,134,413	1,071,309,511
<= 13.8	20,609,656,998	2,662,713,982	12,505,450,552	5,441,492,464	1,065,403,934	1,597,310,048	1,041,583,969	2,307,240,618	768,273,510	2,039,300,185	812,894,743	424,679,680	623,034,510	5,640,088	521,435,024	501,517,820	1,315,455,996
<= 13.9	24,093,085,595	3,137,359,698	14,582,582,196	6,373,143,700	1,208,483,368	1,928,876,331	1,227,199,646	2,638,194,562	939,496,110	2,380,834,167	988,642,792	493,753,468	709,303,045	6,809,433	587,882,119	608,203,704	1,513,667,044
<= 14.0	28,032,611,787	3,736,998,661	16,943,580,988	7,352,032,139	1,401,500,716	2,335,497,945	1,444,990,450	2,958,143,450	1,099,766,428	2,870,261,260	1,135,085,062	551,076,118	810,392,637	9,573,605	646,305,697	738,704,202	1,699,481,176
<= 14.1	31,963,321,120	4,251,314,188	19,273,934,378	8,438,072,554	1,525,364,377	2,725,949,812	1,700,735,365	3,292,165,755	1,290,929,037	3,219,143,314	1,356,329,170	610,906,842	896,701,544	12,081,550	713,520,794	866,917,688	1,908,465,793
<= 14.2	35,816,666,836	4,921,237,561	21,445,030,320	9,450,398,954	1,808,129,705	3,113,107,856	1,985,247,873	3,659,744,837	1,458,150,189	3,562,469,106	1,525,199,579	675,280,719	955,989,838	15,252,178	772,979,814	973,207,107	2,089,459,764
<= 14.3	39,726,285,656	5,385,297,598	23,796,028,132	10,544,959,926	1,931,774,603	3,453,522,995	2,260,640,966	3,907,908,880	1,627,246,372	3,896,719,411	1,780,116,718	788,257,674	1,027,056,975	17,598,228	829,490,682	1,117,560,296	2,279,435,943
<= 14.4	43,920,536,630	5,954,258,912	26,166,767,651	11,799,510,067	2,116,545,649	3,837,713,263	2,548,190,692	4,103,560,164	1,814,049,286	4,300,335,567	2,022,678,559	856,520,588	1,086,968,320	25,321,888	900,371,320	1,237,297,479	2,486,116,783
<= 14.5	48,129,774,512	6,742,008,213	28,540,342,196	12,847,424,103	2,379,706,604	4,362,301,609	2,804,613,318	4,417,294,270	2,016,020,663	4,641,473,010	2,257,682,681	929,214,556	1,180,468,178	36,854,953	936,832,704	1,360,586,584	2,636,204,122
<= 14.6	53,637,460,731	7,488,068,688	31,883,326,103	14,266,065,940	2,568,889,167	4,919,179,521	3,069,896,469	4,970,836,226	2,303,118,293	5,088,037,870	2,546,514,976	1,033,771,713	1,322,303,426	48,078,307	1,032,478,020	1,534,092,316	3,010,423,872
<= 14.7	59,074,950,527	8,534,091,009	34,898,652,049	15,642,207,469	3,024,583,118	5,509,507,891	3,356,749,126	5,481,521,225	2,603,634,334	5,457,720,138	2,795,576,276	1,099,053,801	1,478,883,399	64,817,778	1,167,786,136	1,704,754,679	3,252,112,917

Elevation Range	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Laguna	Rizal	Rizal	Rizal	Rizal	Rizal	Rizal	Rizal	Rizal	Rizal
	Pagsanjan	Lumban	Kalayaan	Paete	Pakil	Pangil	Siniloan	Famy	Mabitac	Jalajala	Pililla	Tanay	Baras	Morong	Cardona	Binangonan	Angono	Taytay
<= 12.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<= 12.6	1,521,013	1,486,536	0	28,051,649	1,506,105	2,630,414	0	0	832,648	969,306	1,803,422	14,470,438	2,247,776	2,141,998	7,778,083	20,797,751	13,647,636	47,788,517
<= 12.7	1,975,145	4,264,808	0	49,115,219	3,597,228	2,630,414	3,110,491	0	4,381,996	8,884,243	15,012,059	25,887,400	3,129,632	13,296,845	8,722,322	27,394,582	23,431,416	88,570,335
<= 12.8	2,605,064	7,432,139	0	105,410,830	14,885,239	8,724,236	23,482,052	1,411,513	5,892,450	11,711,998	30,858,611	47,935,269	5,962,224	21,509,325	13,914,588	58,373,143	46,119,473	148,279,911
<= 12.9	7,646,015	15,834,189	0	121,949,588	16,866,307	10,237,193	25,120,603	1,474,444	13,405,464	23,076,905	41,330,795	62,553,674	8,210,723	35,368,300	20,521,129	96,168,743	60,855,216	194,460,443
<= 13.0	7,650,229	22,711,579	675,382	181,319,978	19,739,017	15,271,029	49,093,689	3,773,141	16,023,438	27,784,446	60,765,981	110,323,537	13,318,705	49,881,479	21,976,660	118,684,485	106,682,416	268,536,377
<= 13.1	14,134,350	35,861,395	1,423,893	252,133,686	34,680,493	20,356,341	56,207,395	4,081,619	21,724,459	37,075,336	66,416,110	143,853,531	18,607,619	65,812,514	45,258,161	196,626,679	164,218,831	447,557,296
<= 13.2	16,457,364	54,060,013	2,860,569	318,964,961	39,233,902	23,562,347	87,768,905	5,440,358	29,951,270	51,895,650	92,986,103	206,079,928	27,180,512	97,857,758	52,660,537	233,695,964	231,186,967	606,410,048
<= 13.3	20,650,749	71,097,934	3,226,711	406,222,468	57,326,276	31,650,592	121,370,488	8,625,386	31,644,589	68,353,414	123,540,907	247,531,444	30,574,756	124,634,531	60,559,584	298,365,822	304,215,834	758,715,664
<= 13.4	29,059,478	110,112,235	3,740,750	458,944,546	63,142,395	42,414,596	167,559,079	9,950,779	40,106,469	78,691,987	142,627,518	291,275,742	42,511,947	154,400,096	74,333,619	391,516,007	369,147,623	945,772,219
<= 13.5	33,305,438	135,889,548	4,547,333	547,093,206	63,708,830	55,416,840	232,056,960	12,536,046	44,786,258	92,214,523	171,656,400	367,482,127	50,848,857	182,384,702	82,089,779	457,869,172	468,892,357	1,122,962,338
<= 13.6	41,181,135	184,117,614	5,452,151	680,024,895	82,544,063	74,430,789	286,056,425	13,967,840	51,417,487	106,085,426	189,096,828	457,700,478	68,996,593	212,418,230	120,670,348	599,118,540	598,030,233	1,491,100,439
<= 13.7	50,081,411	234,580,381	6,799,224	798,802,331	90,334,310	81,167,938	345,332,216	16,639,815	65,064,074	138,227,968	244,359,950	546,228,977	80,339,744	272,124,850	137,801,959	697,135,141	701,549,655	1,806,510,945
<= 13.8	59,609,587	292,291,351	7,323,852	966,784,096	121,529,526	105,747,789	497,401,124	24,115,893	69,591,190	170,422,402	307,369,994	647,010,798	93,386,769	319,742,692	155,727,447	829,730,625	828,510,432	2,089,591,304
<= 13.9	77,519,601	366,490,303	7,323,852	1,034,673,034	132,918,103	128,774,891	622,308,604	28,196,119	90,391,597	195,026,680	351,855,354	720,967,843	114,366,748	369,667,634	187,151,044	1,030,031,238	980,544,238	2,423,532,922
<= 14.0	91,987,417	454,829,608	9,929,875	1,182,840,904	136,947,878	152,959,692	817,977,446	33,386,765	98,941,319	217,714,947	414,014,372	882,467,612	136,230,753	427,939,113	204,413,940	1,131,472,116	1,155,467,726	2,782,291,560
<= 14.1	102,155,917	546,619,425	15,507,123	1,322,268,913	174,824,504	178,141,507	924,372,348	36,677,106	105,470,681	248,290,673	455,971,716	968,463,052	153,768,795	472,392,719	248,021,835	1,286,824,411	1,338,468,970	3,265,870,383
<= 14.2	115,627,708	653,979,133	21,344,627	1,426,927,103	185,373,878	193,201,824	1,023,733,362	43,070,344	108,791,336	270,419,044	500,810,556	1,075,242,618	173,537,418	543,016,705	278,372,562	1,443,826,961	1,471,400,926	3,693,772,165
<= 14.3	137,235,903	763,601,863	27,699,440	1,519,124,089	198,556,055	244,646,088	1,206,589,466	49,763,916	116,779,166	323,914,467	568,010,556	1,207,314,676	196,950,717	619,438,066	308,662,967	1,617,320,126	1,622,407,445	4,080,940,906
<= 14.4	148,005,034	877,603,667	32,671,969	1,603,072,081	226,099,648	300,068,729	1,404,102,723	58,363,644	135,369,508	343,845,991	625,201,936	1,306,740,446	235,502,277	671,279,175	334,468,080	1,808,816,246	1,821,087,236	4,652,568,680
<= 14.5	178,574,711	987,147,644	40,531,005	1,691,195,314	237,838,622	352,442,345	1,624,727,523	64,626,850	146,013,144	362,825,906	689,998,972	1,387,904,016	243,773,049	745,900,732	363,659,391	1,989,683,199	1,970,861,271	5,092,817,568
<= 14.6	204,506,048	1,109,364,699	52,801,806	1,867,307,396	251,343,665	413,778,901	1,788,222,420	69,471,500	166,978,181	390,265,706	755,254,759	1,552,510,157	281,416,139	803,164,374	415,450,596	2,276,028,829	2,130,320,502	5,661,654,879
<= 14.7	231,334,084	1,224,481,491	62,903,078	2,005,914,119	283,110,378	447,465,881	1,899,477,871	79,471,296	201,944,041	451,710,208	858,277,813	1,701,927,165	305,855,033	896,201,086	445,577,456	2,518,980,610	2,249,548,067	6,214,130,032

添付資料　3-4 LGU の分野別事業所数

Procince	LGU	C	F	G	H	I	J	K	L	P	Q	R	S	Total
		C - Manufacturing	F - Construction	G - Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	H - Transport and Storage	I - Accommodation and Food Service Activities	J - Infomation and Communication	K - Financial and Insurance Activities	L - Real Estate Activities	P - Education	Q - Human Health and Social Work Activities	R - Arts, Entertainment, and Recreation	S - Other Service Activities	
Total		9,224	607	32,645	793	10,431	4,138	4,130	1,898	2,009	2,939	916	6,217	76,037
Share		12%	1%	43%	1%	14%	5%	5%	2%	3%	4%	1%	8%	100%
NCR	Makati City	1,018	186	4,952	255	2,214	798	1,410	882	324	666	121	1,156	13,982
NCR	Muntinlupa City	444	62	2,617	62	632	216	286	82	146	222	55	362	5,186
NCR	Pasig City	1,051	146	4,467	126	1,189	511	649	374	270	424	139	752	10,098
NCR	Pateros	114	5	211	7	75	41	47	2	19	44	19	60	644
NCR	Taguig City	747	25	3,099	61	984	335	322	100	184	248	73	670	6,848
Rizal	Angono	179	4	700	4	202	78	46	22	33	76	23	136	1,503
Rizal	Baras	51	1	168	0	50	23	6	3	6	7	4	27	346
Rizal	Canta	595	26	2,056	22	660	228	135	31	120	193	87	574	4,727
Rizal	Jalajala	26	0	88	0	31	16	3	1	8	2	3	14	192
Rizal	Morong	98	1	238	1	77	39	30	6	17	30	13	53	603
Rizal	Pililla	79	2	224	1	80	29	5	15	13	5	8	33	494
Rizal	Tanay	184	3	849	6	220	68	70	78	32	60	23	119	1,712
Rizal	Taytay	1,136	39	2,009	21	560	263	106	47	95	157	60	384	4,877
Rizal	Cardona	65	0	164	0	39	18	5	8	7	6	7	26	345
Rizal	Binangonan	239	9	1,232	7	317	129	73	2	60	62	20	168	2,318
Laguna	Bay	100	5	342	0	106	49	10	3	20	13	6	38	692
Laguna	Binan	456	8	938	51	202	114	89	28	68	64	24	164	2,206
Laguna	Calauan	394	15	1,502	41	308	202	76	59	103	81	27	239	3,047
Laguna	Calauan	39	0	154	1	32	13	15	0	8	10	2	16	290
Laguna	City of Calamba	736	24	1,854	51	1,095	233	215	51	139	146	74	364	4,982
Laguna	Famy	5	0	32	0	7	0	1	0	1	0	0	3	49
Laguna	Kalayaan	25	0	65	0	23	10	1	0	2	1	5	5	137
Laguna	Los Banos	100	2	485	7	241	61	65	23	36	37	10	80	1,147
Laguna	Lumban	144	2	117	0	29	42	8	1	5	2	2	17	369
Laguna	Mabitac	20	0	19	3	13	1	3	1	1	0	2	1	64
Laguna	Paete	80	0	164	0	43	25	14	0	6	7	5	22	366
Laguna	Pagsanjan	58	0	146	4	58	17	16	1	9	10	3	22	344
Laguna	Pakil	28	0	48	0	29	12	4	0	3	8	3	9	144
Laguna	Pangil	22	0	44	0	15	19	2	0	3	0	0	4	109
Laguna	Pila	70	2	181	0	45	27	8	3	10	21	3	28	398
Laguna	San Pedro	455	18	1,180	24	297	281	138	32	117	136	40	278	2,996
Laguna	Santa Cruz	128	2	719	6	150	60	94	5	33	50	12	84	1,343
Laguna	Santa Rosa	340	19	1,061	31	347	130	143	28	100	123	37	260	2,619
Laguna	Siniloan	61	1	377	1	41	24	28	0	5	27	5	31	601
Laguna	Victoria	37	0	143	0	20	26	7	0	6	1	1	18	259

添付資料　3-5 各作物の農地面積、収穫量、価格

Crop	Country		Laguna		Rizal		Farmgate Price (2017)
	Production (ton)	Area (ha)	Production (ton)	Area (ha)	Production (ton)	Area (ha)	(PHP/kg)
Palay	**18,967,826**	**4,739,672**	**130,904**	**30,619**	**27,243**	**8,073**	**10.46**
- Irrigated Palay	14,405,716	3,253,080	130,383	30,370	22,107	6,428	
- Raifed Palay	4,562,110	1,486,592	521	249	5,136	1,645	
Corn	**7,770,603**	**2,611,432**	**2,249**	**1,007**	**1,660**	**551**	**9.32**
- White Corn	2,262,234	1,290,213	1,455	797	759	363	
- Yellow Corn	5,508,369	1,321,219	794	210	901	188	
Major Cereal 'Total		**7,351,104**		**31,626**		**8,624**	
Coconut	14,696,298	3,502,011	96,110	62,200	720	270	7.84
Coffee	75,454	117,451	81	620	82	60	30.01
Sugarcane	25,029,880	432,026	11,250	146	0	0	**3.28**
Banana	8,884,857	442,751	15,867	6,642	3,347	2,042	9.99
Calamansi	160,740	20,065	360	420	719	72	19.94
Mango	885,038	188,092	557	187	1,241	813	25.16
Pinapple	2,507,098	61,643	12,670	1,020	513	42	12.03
Sweet Potato	519,855	88,968	1,125	157	751	96	14.99
Cassava	2,540,254	216,775	1,970	150	938	110	6.29
Eggplant	225,579	21,159	1,759	159	592	70	24.23
Peanut	29,196	25,048	19	9	38	56	31.33
Tomato	214,573	16,742	6,573	520	159	23	16.48
Other Crops Total		**5,186,574**		**72,284**		**3,661**	
Total		**12,537,678**		**103,910**		**12,285**	

Note: Price of Sugarcane is converted from the price of sugar price

Source : MAJOR CROPS STATISTICS OF THE PHILIPPINES, 2010-2014, PSA

添付資料　3-6 米ととうもろこしの経済価格計算

米の経済価値計算

		Import Parity		
		Operation	US$/ton	PHP/Kg
1.	Price Forecast of rice, Bangkok, Thailand, f.o.b.		344.0	
2.	Quality Adjustment 95 (10% broken)		326.8	
3.	Insurance, freight, etc.		30.0	
4.	Forecast 2017 c.i.f. price of rice, Manila		356.8	
				18.36
5.	Port handling, storage and losses	5% +		0.92
6.	Transportation (port to wholesaler)	+		1.00
7.	Ex-wholesaler price			20.28
8.	Merketing Margin	10% -		2.03
9.	Local transportation (village to wholesaler)	-		1.00
10.	Value of Milled Rice			17.25
11.	Conversion of Paddy	65%		11.21
12.	Milling Cost	-		0.50
13.	Revenue of Rice Bran	+		0.75
14.	Transportation and Stabilization of Rice Bran	-		0.50
15.	Local transportation (farm to village)	-		0.50
16.	Economic farm gate price			**10.46**
15.	Average economic farm gate price of import and export parity			

1.Thai 5% broken rice, price forecast in nominal US$ in 2030, converted to 2017 constant price (Source: Commodity Market Outlook, April 2017, World Bank)

- Projection in 2030　440 USD/ton
- MUV index 2017-2030　1.280 USD/ton
- Projection in 2030 by constant price in 2017　344 USD/ton

4.1US$=51,45PHP (Oct./2017)

11.Milling recovery is assumed at 65% for paddy

とうもろこしの経済価値計算

		Import Parity		
		Operation	US$/ton	IDR/Kg
1.	Price Forecast of maize, Gulf Ports, USA, f.o.b.		164.0	
2.	Insurance, freight, etc.		40.0	
3.	Forecast 2017 c.i.f. price of maize, Jakarta		204.0	
				10.50
4.	Port handling, storage and losses	5% +		0.52
5.	Transportation (port to wholesaler)	+		1.00
6.	Ex-wholesaler price			12.02
7.	Merketing Margin	10% -		1.20
8.	Local transportation (village to wholesaler)	-		1.00
9.	Local transportation (farm to village)	-		0.50
10.	Economic farm gate price			**9.32**
11.	Average economic farm gate price of import and export parity			

1.USA maize, forecast in nominal US$ in 2030, converted to 2017 constant price　(Source: Commodity Market Outlook, April 2017, World Bank)

- Projection in 2030210　USD/ton
- MUV index 2017-2030　1.280　USD/ton
- Projection in 2030 by constant price in 2017　164　USD/ton

4.1US$=51,45PHP (Oct./2017)

添付資料　3-7 年平均被害軽減の便益額

No.	Province	LGU	Annual Benefit (PHP/year)	2017	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Metro Manila			0.98%	0.70%	0.70%	0.70%	0.70%	0.70%	0.52%	0.52%	0.52%	0.52%	0.52%	0.35%
	Laguna			2.35%	2.18%	2.18%	2.18%	2.18%	2.18%	2.06%	2.06%	2.06%	2.06%	2.06%	1.91%
	Rizal			2.50%	2.32%	2.32%	2.32%	2.32%	2.32%	2.14%	2.14%	2.14%	2.14%	2.14%	1.99%
1	Metro Manila	Taguig City	156,995,316		161,656,359	162,787,954	163,927,470	165,074,962	166,230,487	167,394,100	168,264,549	169,139,525	170,019,051	170,903,150	171,791,846
2	Metro Manila	Muntinlupa City	312,939,788		322,230,676	324,486,291	326,757,695	329,044,999	331,348,314	333,667,752	335,402,824	337,146,919	338,900,083	340,662,363	342,433,807
3	Laguna	San Pedro	177,685,731		190,509,262	194,662,364	198,906,004	203,242,155	207,672,834	212,200,102	216,571,424	221,032,795	225,586,071	230,233,144	234,975,947
4	Laguna	Binan	387,328,958		415,282,383	424,335,539	433,586,054	443,038,230	452,696,463	462,565,246	472,094,090	481,819,228	491,744,704	501,874,645	512,213,263
5	Laguna	Santa Rosa	138,069,098		148,033,507	151,260,637	154,558,119	157,927,486	161,370,305	164,888,178	168,284,874	171,751,542	175,289,624	178,900,590	182,585,942
6	Laguna	Cabuyao	352,655,208		378,106,238	386,348,954	394,771,361	403,377,377	412,171,004	421,156,332	429,832,152	438,686,694	447,723,640	456,946,747	466,359,850
7	Laguna	City of Calamba	146,492,232		157,064,536	160,488,543	163,987,193	167,562,114	171,214,968	174,947,454	178,551,372	182,229,530	185,983,458	189,814,717	193,724,900
8	Laguna	Los Banos	85,852,344		92,048,284	94,054,937	96,105,335	98,200,431	100,341,200	102,528,638	104,640,728	106,796,327	108,996,331	111,241,655	113,533,233
9	Laguna	Bay	143,852,858		154,234,680	157,596,996	161,032,611	164,543,122	168,130,162	171,795,400	175,334,385	178,946,273	182,632,566	186,394,797	190,234,530
10	Laguna	Calauan	2,415,235		2,589,542	2,645,994	2,703,677	2,762,617	2,822,842	2,884,380	2,943,798	3,004,440	3,066,331	3,129,497	3,193,965
11	Laguna	Victoria	90,661,191		97,204,184	99,323,235	101,488,482	103,700,931	105,961,611	108,271,574	110,501,968	112,778,309	115,101,542	117,472,634	119,892,570
12	Laguna	Pila	88,319,880		94,693,902	96,758,229	98,867,558	101,022,871	103,225,170	105,475,479	107,648,274	109,865,828	112,129,064	114,438,923	116,796,365
13	Laguna	Santa Cruz	237,933,455		255,105,048	260,666,338	266,348,864	272,155,269	278,088,254	284,150,578	290,004,080	295,978,164	302,075,314	308,298,065	314,649,005
14	Laguna	Pagsanjan	13,746,828		14,738,933	15,060,242	15,388,555	15,724,025	16,066,809	16,417,065	16,755,257	17,100,415	17,452,684	17,812,209	18,179,141
15	Laguna	Lumban	56,679,219		60,769,743	62,094,523	63,448,184	64,831,354	66,244,678	67,688,812	69,083,202	70,506,316	71,958,746	73,441,096	74,953,983
16	Laguna	Kalayaan	2,380,627		2,552,436	2,608,079	2,664,935	2,723,031	2,782,393	2,843,049	2,901,616	2,961,389	3,022,394	3,084,655	3,148,199
17	Laguna	Paete	162,912,322		174,669,660	178,477,459	182,368,268	186,343,896	190,406,193	194,557,048	198,564,923	202,655,360	206,830,060	211,090,759	215,439,229
18	Laguna	Pakil	21,309,804		22,847,726	23,345,806	23,854,745	24,374,778	24,906,148	25,449,102	25,973,354	26,508,405	27,054,478	27,611,800	28,180,603
19	Laguna	Pangil	20,172,048		21,627,860	22,099,347	22,581,113	23,073,381	23,576,381	24,090,346	24,586,607	25,093,091	25,610,009	26,137,575	26,676,009
20	Laguna	Siniloan	85,749,929		91,938,478	93,942,737	95,990,689	98,083,286	100,221,502	102,406,331	104,515,901	106,668,929	108,866,309	111,108,955	113,397,799
21	Laguna	Famy	3,603,360		3,863,413	3,947,635	4,033,693	4,121,628	4,211,479	4,303,289	4,391,937	4,482,411	4,574,749	4,668,989	4,765,170
22	Laguna	Mabitac	15,977,445		17,130,533	17,503,979	17,885,566	18,275,471	18,673,876	19,080,966	19,474,034	19,875,199	20,284,628	20,702,491	21,128,962
23	Rizal	Jalajala	32,024,274		34,486,640	35,286,730	36,105,382	36,943,027	37,800,105	38,677,067	39,504,756	40,350,158	41,213,651	42,095,623	42,996,469
24	Rizal	Pililia	51,220,457		55,158,830	56,438,515	57,747,889	59,087,640	60,458,473	61,861,110	63,184,938	64,537,096	65,918,190	67,328,839	68,769,676
25	Rizal	Tanay	117,132,795		126,139,208	129,065,638	132,059,961	135,123,752	138,258,623	141,466,223	144,493,600	147,585,763	150,744,098	153,970,022	157,264,980
26	Rizal	Baras	16,651,887		17,932,261	18,348,289	18,773,969	19,209,525	19,655,186	20,111,186	20,541,565	20,981,154	21,430,151	21,888,756	22,357,175
27	Rizal	Morong	60,733,742		65,403,597	66,920,960	68,473,526	70,062,112	71,687,553	73,350,704	74,920,409	76,523,706	78,161,313	79,833,965	81,542,412
28	Rizal	Cardona	41,467,832		44,656,320	45,692,347	46,752,409	47,837,065	48,946,885	50,082,453	51,154,217	52,248,917	53,367,044	54,509,099	55,675,594
29	Rizal	Binangonan	188,878,976		203,401,999	208,120,925	212,949,330	217,889,754	222,944,796	228,117,115	232,998,821	237,984,996	243,077,875	248,279,742	253,592,928
30	Rizal	Angono	146,598,412		157,870,455	161,533,050	165,280,617	169,115,127	173,038,598	177,053,093	180,842,029	184,712,048	188,664,886	192,702,315	196,826,145
31	Rizal	Taytay	396,940,990		427,462,031	437,379,150	447,526,346	457,908,957	468,532,445	479,402,398	489,661,609	500,140,367	510,843,371	521,775,419	532,941,413
			3,755,382,239		**4,011,408,724**	**4,093,281,422**	**4,176,925,600**	**4,262,380,373**	**4,349,685,737**	**4,438,882,570**	**4,523,623,293**	**4,610,091,294**	**4,698,322,415**	**4,788,353,236**	**4,880,221,110**

No.	Province	LGU	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
	Metro Manila		0.35%	0.35%	0.35%	0.35%	0.20%	0.20%	0.20%	0.20%	0.20%	0%	0%	0%	0%	0%	0%	0%
	Laguna		1.91%	1.91%	1.91%	1.91%	1.81%	1.81%	1.81%	1.81%	1.81%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%
	Rizal		1.99%	1.99%	1.99%	1.99%	1.89%	1.89%	1.89%	1.89%	1.89%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%
1	Metro Manila	Taguig City	172,393,117	172,996,493	173,601,981	174,209,588	174,819,322	175,168,961	175,519,299	175,870,338	176,222,079	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523
2	Metro Manila	Muntinlupa City	343,632,325	344,835,038	346,041,961	347,253,108	348,468,494	349,165,431	349,863,762	350,563,490	351,264,617	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146
3	Laguna	San Pedro	239,463,988	244,037,750	248,698,871	253,449,019	258,289,895	262,964,942	267,724,607	272,570,422	277,503,947	282,526,768	287,301,470	292,156,865	297,094,316	302,115,210	307,220,957	312,412,991
4	Laguna	Binan	521,996,536	531,966,670	542,127,233	552,481,863	563,034,267	573,225,187	583,600,563	594,163,733	604,918,097	615,867,115	626,275,269	636,859,321	647,622,244	658,567,060	669,696,843	681,014,720
5	Laguna	Santa Rosa	186,073,333	189,627,334	193,249,216	196,940,276	200,701,835	204,334,538	208,032,993	211,798,390	215,631,941	219,534,879	223,245,018	227,017,859	230,854,461	234,755,901	238,723,276	242,757,699
6	Laguna	Cabuyao	475,267,323	484,344,929	493,595,917	503,023,599	512,631,350	521,909,977	531,356,548	540,974,102	550,765,733	560,734,593	570,211,008	579,847,574	589,646,998	599,612,032	609,745,475	620,050,174
7	Laguna	City of Calamba	197,425,046	201,195,864	205,038,705	208,954,944	212,945,983	216,800,305	220,724,391	224,719,502	228,786,925	232,927,968	236,864,451	240,867,460	244,938,120	249,077,574	253,286,985	257,567,535
8	Laguna	Los Banos	115,701,718	117,911,621	120,163,733	122,458,860	124,797,824	127,056,665	129,356,391	131,697,742	134,081,471	136,508,346	138,815,337	141,161,316	143,546,942	145,972,885	148,439,827	150,948,460
9	Laguna	Bay	193,868,010	197,570,889	201,344,493	205,190,173	209,109,305	212,894,183	216,747,568	220,670,699	224,664,839	228,731,273	232,596,832	236,527,718	240,525,036	244,589,909	248,723,478	252,926,905
10	Laguna	Calauan	3,254,970	3,317,140	3,380,497	3,445,064	3,510,865	3,574,412	3,639,109	3,704,977	3,772,037	3,840,311	3,905,212	3,971,210	4,038,323	4,106,571	4,175,972	4,246,546
11	Laguna	Victoria	122,182,518	124,516,204	126,894,463	129,318,147	131,788,124	134,173,489	136,602,029	139,074,526	141,591,775	144,154,586	146,590,799	149,068,184	151,587,436	154,149,264	156,754,387	159,403,536
12	Laguna	Pila	119,027,176	121,300,595	123,617,436	125,978,529	128,384,719	130,708,482	133,074,306	135,482,951	137,935,192	140,431,819	142,805,117	145,218,523	147,672,716	150,168,385	152,706,231	155,286,966
13	Laguna	Santa Cruz	320,658,801	326,783,384	333,024,947	339,385,723	345,867,990	352,128,201	358,501,721	364,990,602	371,596,932	378,322,836	384,716,492	391,218,201	397,829,789	404,553,112	411,390,060	418,342,552
14	Laguna	Pagsanjan	18,526,363	18,880,217	19,240,829	19,608,329	19,982,848	20,344,538	20,712,774	21,087,675	21,469,362	21,857,957	22,227,356	22,602,998	22,984,989	23,373,435	23,768,446	24,170,133
15	Laguna	Lumban	76,385,604	77,844,569	79,331,400	80,846,630	82,390,801	83,882,074	85,400,340	86,946,086	88,519,810	90,122,019	91,645,081	93,193,883	94,768,860	96,370,454	97,999,115	99,655,300
16	Laguna	Kalayaan	3,208,330	3,269,609	3,332,059	3,395,701	3,460,559	3,523,195	3,586,965	3,651,889	3,717,988	3,785,284	3,849,255	3,914,307	3,980,459	4,047,729	4,116,136	4,185,699
17	Laguna	Paete	219,554,118	223,747,602	228,021,181	232,376,386	236,814,775	241,101,122	245,465,052	249,907,969	254,431,303	259,036,510	263,414,227	267,865,927	272,392,861	276,996,300	281,677,537	286,437,887
18	Laguna	Pakil	28,718,853	29,267,383	29,826,390	30,396,074	30,976,639	31,537,316	32,108,141	32,689,298	33,280,974	33,883,360	34,455,989	35,038,295	35,630,442	36,232,596	36,844,927	37,467,606
19	Laguna	Pangil	27,185,521	27,704,764	28,233,925	28,773,193	29,322,761	29,853,503	30,393,851	30,943,980	31,504,066	32,074,290	32,616,346	33,167,562	33,728,094	34,298,099	34,877,737	35,467,171
20	Laguna	Siniloan	115,563,697	117,770,964	120,020,389	122,312,778	124,648,952	126,905,098	129,202,080	131,540,638	133,921,524	136,345,504	138,649,743	140,992,924	143,375,704	145,798,753	148,262,752	150,768,393
21	Laguna	Famy	4,856,185	4,948,938	5,043,463	5,139,793	5,237,963	5,332,770	5,429,293	5,527,563	5,627,612	5,729,472	5,826,300	5,924,764	6,024,893	6,126,714	6,230,255	6,335,546
22	Laguna	Mabitac	21,532,525	21,943,796	22,362,923	22,790,055	23,225,345	23,645,724	24,073,712	24,509,446	24,953,067	25,404,718	25,834,058	26,270,654	26,714,628	27,166,105	27,625,212	28,092,078
23	Rizal	Jalajala	43,852,099	44,724,756	45,614,779	46,522,513	47,448,311	48,345,084	49,258,806	50,189,797	51,138,384	52,104,899	53,027,156	53,965,737	54,920,931	55,893,031	56,882,338	57,889,155
24	Rizal	Pililia	70,138,193	71,533,943	72,957,468	74,409,322	75,890,068	77,324,390	78,785,821	80,274,873	81,792,068	83,337,938	84,813,020	86,314,210	87,841,972	89,396,775	90,979,098	92,589,428
25	Rizal	Tanay	160,394,553	163,586,405	166,841,774	170,161,925	173,548,147	176,828,207	180,170,260	183,575,478	187,045,055	190,580,207	193,953,477	197,386,454	200,880,194	204,435,773	208,054,286	211,736,847
26	Rizal	Baras	22,802,083	23,255,844	23,718,635	24,190,636	24,672,030	25,138,331	25,613,445	26,097,539	26,590,782	27,093,348	27,572,900	28,060,940	28,557,619	29,063,089	29,577,506	30,101,028
27	Rizal	Morong	83,165,106	84,820,092	86,508,012	88,229,521	89,985,288	91,686,010	93,418,876	95,184,493	96,983,480	98,816,468	100,565,519	102,345,529	104,157,045	106,000,625	107,876,836	109,786,256
28	Rizal	Cardona	56,783,538	57,913,530	59,066,009	60,241,423	61,440,227	62,601,447	63,784,614	64,990,143	66,218,457	67,469,986	68,664,205	69,879,561	71,116,429	72,375,190	73,656,231	74,959,946
29	Rizal	Binangonan	258,639,427	263,786,352	269,035,700	274,389,510	279,849,861	285,139,023	290,528,151	296,019,133	301,613,895	307,314,398	312,753,863	318,289,606	323,923,332	329,656,775	335,491,700	341,429,903
30	Rizal	Angono	200,742,985	204,737,770	208,812,052	212,967,412	217,205,463	221,310,646	225,493,417	229,755,243	234,097,617	238,522,062	242,743,902	247,040,469	251,413,085	255,863,097	260,391,874	265,000,810
31	Rizal	Taytay	543,546,947	554,363,531	565,395,365	576,646,733	588,122,003	599,237,509	610,563,098	622,102,741	633,860,483	645,840,446	657,271,822	668,905,533	680,745,161	692,794,350	705,056,810	717,536,316
			4,966,540,988	**5,054,503,976**	**5,144,141,806**	**5,235,486,827**	**5,328,572,014**	**5,417,840,760**	**5,508,731,983**	**5,601,275,458**	**5,695,501,512**	**5,791,441,029**	**5,881,752,893**	**5,973,615,253**	**6,067,054,748**	**6,162,098,462**	**6,258,773,956**	**6,357,109,255**

2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%
1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%
176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523
351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146
317,692,771	323,061,779	328,521,523	334,073,537	339,719,380	345,460,638	351,298,923	357,235,875	363,273,161	369,412,477	375,655,548	382,004,127	388,459,997	395,024,971	401,700,893	408,489,638	415,393,113
692,523,869	704,227,522	716,128,967	728,231,547	740,538,660	753,053,763	765,780,372	778,722,060	791,882,463	805,265,277	818,874,260	832,713,235	846,786,089	861,096,774	875,649,309	890,447,782	905,496,350
246,860,304	251,032,243	255,274,688	259,588,830	263,975,881	268,437,073	272,973,660	277,586,915	282,278,134	287,048,634	291,899,756	296,832,862	301,849,337	306,950,591	312,138,056	317,413,189	322,777,472
630,529,022	641,184,962	652,020,988	663,040,143	674,245,521	685,640,270	697,227,591	709,010,737	720,993,018	733,177,800	745,568,505	758,168,613	770,981,663	784,011,253	797,261,043	810,734,755	824,436,172
261,920,426	266,346,881	270,848,143	275,425,477	280,080,168	284,813,523	289,626,872	294,521,566	299,498,980	304,560,513	309,707,586	314,941,644	320,264,158	325,676,622	331,180,557	336,777,508	342,469,048
153,499,489	156,093,630	158,731,612	161,414,176	164,142,076	166,916,077	169,736,959	172,605,514	175,522,547	178,488,878	181,505,340	184,572,780	187,692,060	190,864,056	194,089,659	197,369,774	200,705,323
257,201,370	261,548,073	265,968,235	270,463,098	275,033,924	279,681,997	284,408,623	289,215,129	294,102,865	299,073,203	304,127,540	309,267,295	314,493,912	319,808,859	325,213,629	330,709,739	336,298,734
4,318,313	4,391,292	4,465,505	4,540,972	4,617,714	4,695,753	4,775,111	4,855,810	4,937,873	5,021,323	5,106,183	5,192,477	5,280,230	5,369,466	5,460,210	5,552,488	5,646,325
162,097,456	164,836,903	167,622,647	170,455,470	173,336,167	176,265,548	179,244,436	182,273,667	185,354,092	188,486,576	191,671,999	194,911,256	198,205,256	201,554,925	204,961,203	208,425,047	211,947,430
157,911,316	160,580,017	163,293,819	166,053,485	168,859,789	171,713,519	174,615,477	177,566,479	180,567,352	183,618,940	186,722,100	189,877,703	193,086,636	196,349,800	199,668,112	203,042,503	206,473,921
425,412,541	432,602,013	439,912,987	447,347,516	454,907,689	462,595,629	470,413,495	478,363,483	486,447,826	494,668,794	503,028,697	511,529,882	520,174,737	528,965,690	537,905,210	546,995,808	556,240,037
24,578,608	24,993,986	25,416,384	25,845,921	26,282,717	26,726,895	27,178,580	27,637,898	28,104,978	28,579,952	29,062,953	29,554,117	30,053,582	30,561,488	31,077,977	31,603,195	32,137,289
101,339,475	103,052,112	104,793,693	106,564,706	108,365,650	110,197,029	112,059,359	113,953,162	115,878,970	117,837,325	119,828,776	121,853,882	123,913,213	126,007,346	128,136,870	130,302,383	132,504,493
4,256,437	4,328,371	4,401,520	4,475,906	4,551,549	4,628,470	4,706,691	4,786,234	4,867,121	4,949,375	5,033,019	5,118,077	5,204,573	5,292,530	5,381,974	5,472,929	5,565,422
291,278,687	296,201,297	301,207,099	306,297,499	311,473,927	316,737,836	322,090,705	327,534,038	333,069,363	338,698,235	344,422,235	350,242,971	356,162,077	362,181,216	368,302,079	374,526,384	380,855,880
38,100,809	38,744,713	39,399,499	40,065,351	40,742,455	41,431,002	42,131,186	42,843,203	43,567,253	44,303,540	45,052,270	45,813,653	46,587,904	47,375,240	48,175,882	48,990,054	49,817,986
36,066,566	36,676,091	37,295,917	37,926,218	38,567,171	39,218,956	39,881,756	40,555,758	41,241,150	41,938,125	42,646,879	43,367,611	44,100,524	44,845,823	45,603,717	46,374,420	47,158,148
153,316,379	155,907,426	158,542,261	161,221,625	163,946,270	166,716,962	169,534,479	172,399,612	175,313,165	178,275,957	181,288,821	184,352,602	187,468,161	190,636,373	193,858,128	197,134,330	200,465,900
6,442,617	6,551,497	6,662,217	6,774,808	6,889,302	7,005,731	7,124,128	7,244,526	7,366,958	7,491,460	7,618,066	7,746,811	7,877,732	8,010,866	8,146,250	8,283,922	8,423,920
28,566,834	29,049,613	29,540,551	30,039,786	30,547,458	31,063,710	31,588,687	32,122,536	32,665,407	33,217,452	33,778,827	34,349,689	34,930,199	35,520,519	36,120,816	36,731,258	37,352,016
58,913,793	59,956,567	61,017,798	62,097,813	63,196,944	64,315,530	65,453,915	66,612,449	67,791,489	68,991,398	70,212,546	71,455,308	72,720,067	74,007,212	75,317,140	76,650,253	78,006,962
94,228,261	95,896,101	97,593,462	99,320,866	101,078,845	102,867,941	104,688,704	106,541,694	108,427,482	110,346,648	112,299,784	114,287,490	116,310,379	118,369,073	120,464,206	122,596,422	124,766,379
215,484,589	219,298,666	223,180,252	227,130,542	231,150,753	235,242,121	239,405,907	243,643,392	247,955,880	252,344,699	256,811,200	261,356,758	265,982,773	270,690,668	275,481,893	280,357,923	285,320,258
30,633,816	31,176,035	31,727,851	32,289,434	32,860,957	33,442,596	34,034,530	34,636,941	35,250,015	35,873,940	36,508,909	37,155,117	37,812,763	38,482,049	39,163,181	39,856,369	40,561,827
111,729,473	113,707,085	115,719,700	117,767,939	119,852,432	121,973,820	124,132,757	126,329,907	128,565,946	130,841,563	133,157,459	135,514,346	137,912,950	140,354,009	142,838,275	145,366,512	147,939,499
76,286,737	77,637,012	79,011,187	80,409,685	81,832,936	83,281,379	84,755,459	86,255,631	87,782,356	89,336,104	90,917,353	92,526,590	94,164,311	95,831,019	97,527,228	99,253,460	101,010,246
347,473,212	353,623,488	359,882,624	366,252,546	372,735,216	379,332,629	386,046,817	392,879,846	399,833,819	406,910,878	414,113,201	421,443,005	428,902,546	436,494,121	444,220,067	452,082,762	460,084,627
269,691,324	274,464,860	279,322,888	284,266,903	289,298,427	294,419,009	299,630,225	304,933,680	310,331,006	315,823,865	321,413,947	327,102,974	332,892,697	338,784,898	344,781,391	350,884,022	357,094,669
730,236,709	743,161,899	756,315,865	769,702,656	783,326,393	797,191,270	811,301,555	825,661,593	840,275,803	855,148,685	870,284,817	885,688,858	901,365,551	917,319,721	933,556,280	950,080,226	966,896,646
6,457,132,872	**6,558,873,803**	**6,662,361,551**	**6,767,626,124**	**6,874,698,040**	**6,983,608,345**	**7,094,388,628**	**7,207,071,004**	**7,321,688,141**	**7,438,273,285**	**7,556,860,245**	**7,677,483,402**	**7,800,177,746**	**7,924,978,847**	**8,051,922,904**	**8,181,046,724**	**8,312,387,761**

2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%
1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%	1.77%
176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523	176,574,523
351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146	351,967,146
422,413,257	429,552,041	436,811,470	444,193,584	451,700,456	459,334,194	467,096,942	474,990,880	483,018,226	491,181,234	499,482,197	507,923,446	516,507,352	525,236,326	534,112,820	543,139,327
920,799,238	936,360,745	952,185,242	968,277,173	984,641,057	1,001,281,491	1,018,203,148	1,035,410,781	1,052,909,223	1,070,703,389	1,088,798,276	1,107,198,967	1,125,910,630	1,144,938,520	1,164,287,981	1,183,964,448
328,232,411	333,779,539	339,420,413	345,156,618	350,989,765	356,921,492	362,953,465	369,087,379	375,324,956	381,667,948	388,118,136	394,677,332	401,347,379	408,130,150	415,027,550	422,041,516
838,369,143	852,537,582	866,945,467	881,596,845	896,495,832	911,646,612	927,053,440	942,720,643	958,652,622	974,853,851	991,328,881	1,008,082,339	1,025,118,931	1,042,443,441	1,060,060,735	1,077,975,761
348,256,775	354,142,314	360,127,319	366,213,471	372,402,479	378,696,081	385,096,045	391,604,168	398,222,278	404,952,234	411,795,927	418,755,278	425,832,242	433,028,807	440,346,994	447,788,858
204,097,243	207,546,486	211,054,022	214,620,835	218,247,927	221,936,317	225,687,041	229,501,152	233,379,721	237,323,838	241,334,611	245,413,166	249,560,649	253,778,224	258,067,076	262,428,410
341,982,183	347,761,682	353,638,854	359,615,351	365,692,850	371,873,059	378,157,714	384,548,579	391,047,450	397,656,152	404,376,541	411,210,505	418,159,963	425,226,866	432,413,200	439,720,983
5,741,748	5,838,784	5,937,459	6,037,802	6,139,841	6,243,604	6,349,121	6,456,421	6,565,535	6,676,493	6,789,326	6,904,066	7,020,745	7,139,396	7,260,052	7,382,747
215,529,342	219,171,788	222,875,791	226,642,392	230,472,648	234,367,636	238,328,449	242,356,200	246,452,020	250,617,059	254,852,487	259,159,494	263,539,289	267,993,103	272,522,186	277,127,811
209,963,330	213,511,710	217,120,058	220,789,387	224,520,728	228,315,128	232,173,654	236,097,389	240,087,435	244,144,913	248,270,962	252,466,741	256,733,429	261,072,224	265,484,345	269,971,030
565,640,494	575,199,818	584,920,695	594,805,855	604,858,074	615,080,175	625,475,030	636,045,558	646,794,728	657,725,559	668,841,121	680,144,536	691,638,979	703,327,678	715,213,916	727,301,031
32,680,409	33,232,708	33,794,341	34,365,465	34,946,241	35,536,832	36,137,404	36,748,126	37,369,169	38,000,708	38,642,920	39,295,985	39,960,087	40,635,412	41,322,150	42,020,494
134,743,819	137,020,990	139,336,645	141,691,434	144,086,019	146,521,073	148,997,279	151,515,333	154,075,942	156,679,825	159,327,714	162,020,352	164,758,496	167,542,915	170,374,390	173,253,717
5,659,478	5,755,123	5,852,385	5,951,290	6,051,867	6,154,144	6,258,149	6,363,912	6,471,462	6,580,830	6,692,046	6,805,142	6,920,149	7,037,100	7,156,027	7,276,964
387,292,344	393,837,585	400,493,440	407,261,779	414,144,503	421,143,545	428,260,871	435,498,480	442,858,404	450,342,711	457,953,503	465,692,917	473,563,127	481,566,344	489,704,815	497,980,826
50,659,910	51,516,062	52,386,683	53,272,018	54,172,315	55,087,827	56,018,811	56,965,529	57,928,246	58,907,233	59,902,765	60,915,122	61,944,588	62,991,452	64,056,008	65,138,555
47,955,121	48,765,563	49,589,701	50,427,767	51,279,996	52,146,628	53,027,906	53,924,078	54,835,395	55,762,113	56,704,493	57,662,799	58,637,300	59,628,270	60,635,988	61,660,736
203,853,774	207,298,903	210,802,254	214,364,812	217,987,577	221,671,567	225,417,816	229,227,377	233,101,320	237,040,732	241,046,720	245,120,410	249,262,945	253,475,489	257,759,225	262,115,356
8,566,284	8,711,054	8,858,271	9,007,976	9,160,211	9,315,019	9,472,443	9,632,527	9,795,317	9,960,858	10,129,197	10,300,380	10,474,456	10,651,474	10,831,484	11,014,536
37,983,265	38,625,182	39,277,948	39,941,745	40,616,760	41,303,183	42,001,207	42,711,027	43,432,843	44,166,858	44,913,278	45,672,312	46,444,174	47,229,081	48,027,252	48,838,913
79,387,685	80,792,847	82,222,880	83,678,225	85,159,330	86,666,650	88,200,650	89,761,802	91,350,586	92,967,491	94,613,016	96,287,666	97,991,958	99,726,416	101,491,574	103,287,975
126,974,744	129,222,197	131,509,430	133,837,147	136,206,065	138,616,912	141,070,431	143,567,378	146,108,521	148,694,642	151,326,537	154,005,017	156,730,906	159,505,043	162,328,282	165,201,493
290,370,427	295,509,984	300,740,511	306,063,618	311,480,944	316,994,157	322,604,954	328,315,062	334,126,239	340,040,273	346,058,986	352,184,230	358,417,891	364,761,888	371,218,173	377,788,735
41,279,771	42,010,423	42,754,007	43,510,753	44,280,893	45,064,665	45,862,310	46,674,073	47,500,204	48,340,958	49,196,593	50,067,373	50,953,566	51,855,444	52,773,285	53,707,372
150,558,028	153,222,905	155,934,950	158,694,999	161,503,900	164,362,519	167,271,736	170,232,446	173,245,560	176,312,006	179,432,729	182,608,688	185,840,862	189,130,245	192,477,850	195,884,708
102,798,127	104,617,654	106,469,386	108,353,894	110,271,758	112,223,568	114,209,925	116,231,441	118,288,738	120,382,449	122,513,218	124,681,702	126,888,568	129,134,496	131,420,177	133,746,314
468,228,125	476,515,763	484,950,092	493,533,709	502,269,256	511,159,422	520,206,944	529,414,607	538,785,246	548,321,745	558,027,040	567,904,119	577,956,022	588,185,844	598,596,733	609,191,895
363,415,245	369,847,695	376,393,999	383,056,173	389,836,267	396,736,369	403,758,603	410,905,130	418,178,151	425,579,904	433,112,668	440,778,762	448,580,546	456,520,422	464,600,833	472,824,268
984,010,717	1,001,427,707	1,019,152,977	1,037,191,985	1,055,550,283	1,074,233,523	1,093,247,456	1,112,597,936	1,132,290,919	1,152,332,468	1,172,728,753	1,193,486,052	1,214,610,755	1,236,109,365	1,257,988,501	1,280,254,897
8,445,984,106	**8,581,874,503**	**8,720,098,359**	**8,860,695,771**	**9,003,707,511**	**9,149,175,061**	**9,297,140,613**	**9,447,647,083**	**9,600,738,125**	**9,756,458,143**	**9,914,852,310**	**10,075,966,567**	**10,239,847,653**	**10,406,543,104**	**10,576,101,271**	**10,748,571,345**

添付資料　3-8 (1) 経済分析の計算表 (Option1：ルート 1、Shield)

Economic Analysis of Pre F/S Project (Option1: Route1, Shield)

(million PHP)

Items	Total	NPV (D.R. 10%)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
			3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Construction								Spillway		Phase I								Phase II							Phase III		
Economic Cost	**-52,029**	**-25,331**	**-964**	**-975**	**-3,418**	**-3,424**	**-5,406**	**-7,660**	**-7,338**	**-7,231**	**-5,323**	**-2,518**	**-516**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**
- Project Cost	-44,624	-24,765	-964	-975	-3,418	-3,424	-5,406	-7,660	-7,338	-7,231	-5,323	-2,518	-367	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- O&M Cost	-6,790	-519	0	0	0	0	0	0	0	0	0	0	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136
- Cleaning Cost	-570	-44	0	0	0	0	0	0	0	0	0	0	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
- Cleaning of Spillway	-45	-3	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
- Rehabilitation Cost																											
Economic Benefit	**373,021**	**22,150**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4,880**	**4,967**	**5,055**	**5,144**	**5,235**	**5,329**	**5,418**	**5,509**	**5,601**	**5,696**	**5,791**	**5,882**	**5,974**	**6,067**	**6,162**
- Benefit of Spillway	373,021	22,150	0	0	0	0	0	0	0	0	0	0	4,880	4,967	5,055	5,144	5,235	5,329	5,418	5,509	5,601	5,696	5,791	5,882	5,974	6,067	6,162
Economic Cost	**-52,029**	**-25,331**	**-964**	**-975**	**-3,418**	**-3,424**	**-5,406**	**-7,660**	**-7,338**	**-7,231**	**-5,323**	**-2,518**	**-516**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**
Economic Benefit	**373,021**	**22,150**	0	0	0	0	0	0	0	0	0	0	4,880	4,967	5,055	5,144	5,235	5,329	5,418	5,509	5,601	5,696	5,791	5,882	5,974	6,067	6,162
Balance	**320,992**	**-3,181**	**-964**	**-975**	**-3,418**	**-3,424**	**-5,406**	**-7,660**	**-7,338**	**-7,231**	**-5,323**	**-2,518**	**4,365**	**4,818**	**4,906**	**4,996**	**5,087**	**5,180**	**5,270**	**5,361**	**5,453**	**5,547**	**5,643**	**5,734**	**5,826**	**5,919**	**6,014**
	B/C	**0.87**																									
	EIRR	**9.1%**																									
Other Benefits																											
Case2) Land Price Increase																											
- Land Price Increase	15,202	3,601	0	0	0	0	0	0	0	0	0	0	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	0	0	0	0	0
Cost-Benefit Flow	336,194	420	-964	-975	-3,418	-3,424	-5,406	-7,660	-7,338	-7,231	-5,323	-2,518	6,385	6,339	6,427	6,516	6,608	6,701	6,790	6,881	6,973	7,068	5,643	5,734	5,826	5,919	6,014
	1.02	**10.1%**																									
Case3) Case2) + Landfill	**-1,930**	**-1,064**	0	0	-241	-241	-241	-241	-241	-241	-241	-241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
landfill Benefit	**9,000**	**3,154**	0	0	0	0	0	0	0	0	0	0	9,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost-Benefit Flow	**343,264**	**2,511**	-964	-975	-3,660	-3,665	-5,647	-7,901	-7,579	-7,472	-5,565	-2,759	14,885	6,339	6,427	6,516	6,608	6,701	6,790	6,881	6,973	7,068	5,643	5,734	5,826	5,919	6,014
	1.11	**10.7%**																									
Sensitivity Analsys (Case1)																											
S1) Cost +10%	**-57,231**	**-27,864**	-1,060	-1,072	-3,760	-3,766	-5,946	-8,426	-8,072	-7,954	-5,856	-2,769	-567	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163
Cost-Benefit Flow	**315,789**	**-5,714**	-1,060	-1,072	-3,760	-3,766	-5,946	-8,426	-8,072	-7,954	-5,856	-2,769	4,313	4,804	4,892	4,981	5,073	5,166	5,255	5,346	5,438	5,533	5,629	5,719	5,811	5,904	5,999
	0.79	**8.5%**																									
S2) Benefit -10%	**335,719**	**19,935**	0	0	0	0	0	0	0	0	0	0	4,392	4,470	4,549	4,630	4,712	4,796	4,876	4,958	5,041	5,126	5,212	5,294	5,376	5,460	5,546
Cost-Benefit Flow	**283,690**	**-5,306**	-964	-975	-3,418	-3,424	-5,406	-7,660	-7,338	-7,231	-5,323	-2,518	3,877	4,322	4,401	4,482	4,564	4,648	4,728	4,810	4,893	4,978	5,064	5,145	5,228	5,312	5,398
	0.79	**8.4%**																									
S3) Cost +10%, Benefit -10%	**278,487**	**-7,929**	-1,060	-1,072	-3,760	-3,766	-5,946	-8,426	-8,072	-7,954	-5,856	-2,769	3,825	4,307	4,386	4,467	4,549	4,633	4,713	4,795	4,878	4,963	5,049	5,131	5,213	5,297	5,383
Cost-Benefit Flow	**0.72**	**7.8%**																									

2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079
28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
		Phase III																																
-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-165	-165	-165	-136	-136	-136	-165	-165
-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
6,259	6,357	6,457	6,559	6,662	6,768	6,875	6,984	7,094	7,207	7,322	7,438	7,557	7,677	7,800	7,925	8,052	8,181	8,312	8,446	8,582	8,720	8,861	9,004	9,149	9,297	9,448	9,601	9,756	9,915	10,076	10,240	10,407	10,576	10,749
6,259	6,357	6,457	6,559	6,662	6,768	6,875	6,984	7,094	7,207	7,322	7,438	7,557	7,677	7,800	7,925	8,052	8,181	8,312	8,446	8,582	8,720	8,861	9,004	9,149	9,297	9,448	9,601	9,756	9,915	10,076	10,240	10,407	10,576	10,749
-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148
6,259	6,357	6,457	6,559	6,662	6,768	6,875	6,984	7,094	7,207	7,322	7,438	7,557	7,677	7,800	7,925	8,052	8,181	8,312	8,446	8,582	8,720	8,861	9,004	9,149	9,297	9,448	9,601	9,756	9,915	10,076	10,240	10,407	10,576	10,749
6,111	6,209	6,309	6,411	6,514	6,620	6,727	6,836	6,946	7,059	7,174	7,290	7,409	7,529	7,652	7,777	7,904	8,033	8,164	8,298	8,434	8,572	8,713	8,856	9,001	9,149	9,300	9,453	9,608	9,767	9,928	10,092	10,258	10,428	10,600
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,111	6,209	6,309	6,411	6,514	6,620	6,727	6,836	6,946	7,059	7,174	7,290	7,409	7,529	7,652	7,777	7,904	8,033	8,164	8,298	8,434	8,572	8,713	8,856	9,001	9,149	9,300	9,453	9,608	9,767	9,928	10,092	10,258	10,428	10,600
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,111	6,209	6,309	6,411	6,514	6,620	6,727	6,836	6,946	7,059	7,174	7,290	7,409	7,529	7,652	7,777	7,904	8,033	8,164	8,298	8,434	8,572	8,713	8,856	9,001	9,149	9,300	9,453	9,608	9,767	9,928	10,092	10,258	10,428	10,600
-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163
6,096	6,194	6,294	6,396	6,499	6,605	6,712	6,821	6,931	7,044	7,159	7,275	7,394	7,515	7,637	7,762	7,889	8,018	8,149	8,283	8,419	8,557	8,698	8,841	8,986	9,134	9,285	9,438	9,594	9,752	9,913	10,077	10,244	10,413	10,586
5,633	5,721	5,811	5,903	5,996	6,091	6,187	6,285	6,385	6,486	6,590	6,694	6,801	6,910	7,020	7,132	7,247	7,363	7,481	7,601	7,724	7,848	7,975	8,103	8,234	8,367	8,503	8,641	8,781	8,923	9,068	9,216	9,366	9,518	9,674
5,485	5,573	5,663	5,755	5,848	5,943	6,039	6,137	6,237	6,338	6,441	6,546	6,653	6,762	6,872	6,984	7,099	7,215	7,333	7,453	7,576	7,700	7,827	7,955	8,086	8,219	8,355	8,493	8,633	8,775	8,920	9,068	9,218	9,370	9,526
5,470	5,558	5,649	5,740	5,833	5,928	6,024	6,122	6,222	6,323	6,427	6,532	6,638	6,747	6,857	6,970	7,084	7,200	7,318	7,438	7,561	7,685	7,812	7,940	8,071	8,205	8,340	8,478	8,618	8,760	8,905	9,053	9,203	9,356	9,511

添付資料　3-8 (2) 経済分析の計算表 (Option2：ルート 1、NATM)

Economic Analysis of Pre F/S Project (Option2: Route1, NATM)

Items	Total	NPV (D.R 10%)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
			3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Construction								Spillway		Phase I					Phase II										Phase III		
Economic Cost	**-42,288**	**-19,330**	**-855**	**-866**	**-3,342**	**-3,348**	**-3,353**	**-3,866**	**-3,658**	**-3,664**	**-3,670**	**-5,044**	**-3,184**	**-329**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**	**-148**
- Project Cost	-35,031	-18,816	-855	-866	-3,342	-3,348	-3,353	-3,866	-3,658	-3,664	-3,670	-5,044	-3,184	-181	0	0	0	0	0	0	0	0	0	0	0	0	0
- O&M Cost	-6,654	-472	0	0	0	0	0	0	0	0	0	0	0	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136
- O&M of Machines	-559	-40	0	0	0	0	0	0	0	0	0	0	0	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
- Cleaning of Spillway	-44	-3	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
- Rehabilitation Cost																											
Economic Benefit	**368,140**	**20,439**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4,967**	**5,055**	**5,144**	**5,235**	**5,329**	**5,418**	**5,509**	**5,601**	**5,696**	**5,791**	**5,882**	**5,974**	**6,067**	**6,162**
- Benefit of Spillway	368,140	20,439	0	0	0	0	0	0	0	0	0	0	0	4,967	5,055	5,144	5,235	5,329	5,418	5,509	5,601	5,696	5,791	5,882	5,974	6,067	6,162
Economic Cost	**-42,288**	**-19,330**	-855	-866	-3,342	-3,348	-3,353	-3,866	-3,658	-3,664	-3,670	-5,044	-3,184	-329	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148
Economic Benefit	**368,140**	**20,439**	0	0	0	0	0	0	0	0	0	0	0	4,967	5,055	5,144	5,235	5,329	5,418	5,509	5,601	5,696	5,791	5,882	5,974	6,067	6,162
Balance	**325,853**	**1,109**	**-855**	**-866**	**-3,342**	**-3,348**	**-3,353**	**-3,866**	**-3,658**	**-3,664**	**-3,670**	**-5,044**	**-3,184**	**4,637**	**4,906**	**4,996**	**5,087**	**5,180**	**5,270**	**5,361**	**5,453**	**5,547**	**5,643**	**5,734**	**5,826**	**5,919**	**6,014**
B/C		**1.06**																									
EIRR		**10.4%**																									
Other Benefits																											
Case2) Land Price Increase																											
- Land Price Increase	15,202	3,274	0	0	0	0	0	0	0	0	0	0	0	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	0	0	0	0
Cost-Benefit Flow	341,054	4,383	-855	-866	-3,342	-3,348	-3,353	-3,866	-3,658	-3,664	-3,670	-5,044	-3,184	6,157	6,427	6,516	6,608	6,701	6,790	6,881	6,973	7,068	7,164	5,734	5,826	5,919	6,014
1.23		**11.5%**																									
Case3) Case2) + Landfill	**-1,930**	**-1,004**	0	0	-241	-241	-241	-241	-241	-241	-241	-241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
landfill Benefit	**9,000**	**3,154**	0	0	0	0	0	0	0	0	0	0	9,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost-Benefit Flow	**348,124**	**6,474**	-855	-866	-3,584	-3,589	-3,594	-4,107	-3,899	-3,905	-3,911	-5,285	5,816	6,157	6,427	6,516	6,608	6,701	6,790	6,881	6,973	7,068	7,164	5,734	5,826	5,919	6,014
1.38		**12.3%**																									
Sensitivity Analsys (Case1)																											
S1) Cost +10%	**-46,516**	**-21,263**	-941	-952	-3,677	-3,682	-3,688	-4,253	-4,024	-4,030	-4,037	-5,548	-3,502	-362	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163
Cost-Benefit Flow	**321,624**	**-824**	-941	-952	-3,677	-3,682	-3,688	-4,253	-4,024	-4,030	-4,037	-5,548	-3,502	4,604	4,892	4,981	5,073	5,166	5,255	5,346	5,438	5,533	5,629	5,719	5,811	5,904	5,999
0.96		**9.7%**																									
S2) Benefit -10%	**331,326**	**18,395**	0	0	0	0	0	0	0	0	0	0	0	4,470	4,549	4,630	4,712	4,796	4,876	4,958	5,041	5,126	5,212	5,294	5,376	5,460	5,546
Cost-Benefit Flow	**289,039**	**-935**	-855	-866	-3,342	-3,348	-3,353	-3,866	-3,658	-3,664	-3,670	-5,044	-3,184	4,140	4,401	4,482	4,564	4,648	4,728	4,810	4,893	4,978	5,064	5,145	5,229	5,312	5,398
0.95		**9.7%**																									
S3) Cost +10% Benefit -10%	**284,810**	**-2,868**	-941	-952	-3,677	-3,682	-3,688	-4,253	-4,024	-4,030	-4,037	-5,548	-3,502	4,108	4,386	4,467	4,549	4,633	4,713	4,795	4,878	4,963	5,049	5,131	5,213	5,297	5,383
Cost-Benefit Flow	**0.87**	**9.1%**																									

(million PHP)

2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079
28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
		Phase III																																
-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136
-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
6,259	**6,357**	**6,457**	**6,559**	**6,662**	**6,768**	**6,875**	**6,984**	**7,094**	**7,207**	**7,322**	**7,438**	**7,557**	**7,677**	**7,800**	**7,925**	**8,052**	**8,181**	**8,312**	**8,446**	**8,582**	**8,720**	**8,861**	**9,004**	**9,149**	**9,297**	**9,448**	**9,601**	**9,756**	**9,915**	**10,076**	**10,240**	**10,407**	**10,576**	**10,749**
6,259	6,357	6,457	6,559	6,662	6,768	6,875	6,984	7,094	7,207	7,322	7,438	7,557	7,677	7,800	7,925	8,052	8,181	8,312	8,446	8,582	8,720	8,861	9,004	9,149	9,297	9,448	9,601	9,756	9,915	10,076	10,240	10,407	10,576	10,749
-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136
-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
6,259	**6,357**	**6,457**	**6,559**	**6,662**	**6,768**	**6,875**	**6,984**	**7,094**	**7,207**	**7,322**	**7,438**	**7,557**	**7,677**	**7,800**	**7,925**	**8,052**	**8,181**	**8,312**	**8,446**	**8,582**	**8,720**	**8,861**	**9,004**	**9,149**	**9,297**	**9,448**	**9,601**	**9,756**	**9,915**	**10,076**	**10,240**	**10,407**	**10,576**	**10,749**
6,259	6,357	6,457	6,559	6,662	6,768	6,875	6,984	7,094	7,207	7,322	7,438	7,557	7,677	7,800	7,925	8,052	8,181	8,312	8,446	8,582	8,720	8,861	9,004	9,149	9,297	9,448	9,601	9,756	9,915	10,076	10,240	10,407	10,576	10,749
-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148	-148
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136	-136
-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
6,111	**6,209**	**6,309**	**6,411**	**6,514**	**6,620**	**6,727**	**6,836**	**6,946**	**7,059**	**7,174**	**7,290**	**7,409**	**7,529**	**7,652**	**7,777**	**7,904**	**8,033**	**8,164**	**8,298**	**8,434**	**8,572**	**8,713**	**8,856**	**9,001**	**9,149**	**9,300**	**9,453**	**9,608**	**9,767**	**9,928**	**10,092**	**10,258**	**10,428**	**10,600**
6,111	6,209	6,309	6,411	6,514	6,620	6,727	6,836	6,946	7,059	7,174	7,290	7,409	7,529	7,652	7,777	7,904	8,033	8,164	8,298	8,434	8,572	8,713	8,856	9,001	9,149	9,300	9,453	9,608	9,767	9,928	10,092	10,258	10,428	10,600
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6,111	6,209	6,309	6,411	6,514	6,620	6,727	6,836	6,946	7,059	7,174	7,290	7,409	7,529	7,652	7,777	7,904	8,033	8,164	8,298	8,434	8,572	8,713	8,856	9,001	9,149	9,300	9,453	9,608	9,767	9,928	10,092	10,258	10,428	10,600
-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163	-163
6,096	6,194	6,294	6,396	6,499	6,605	6,712	6,821	6,931	7,044	7,159	7,275	7,394	7,515	7,637	7,762	7,889	8,018	8,149	8,283	8,419	8,557	8,698	8,841	8,986	9,134	9,285	9,438	9,594	9,752	9,913	10,077	10,244	10,413	10,586
5,633	5,721	5,811	5,903	5,996	6,091	6,187	6,285	6,385	6,486	6,590	6,694	6,801	6,910	7,020	7,132	7,247	7,363	7,481	7,601	7,724	7,848	7,975	8,103	8,234	8,367	8,503	8,641	8,781	8,923	9,068	9,216	9,366	9,518	9,674
5,485	5,573	5,663	5,755	5,848	5,943	6,039	6,137	6,237	6,338	6,441	6,546	6,653	6,762	6,872	6,984	7,099	7,215	7,333	7,453	7,576	7,700	7,827	7,955	8,086	8,219	8,355	8,493	8,633	8,775	8,920	9,068	9,218	9,370	9,526
5,470	5,558	5,649	5,740	5,833	5,928	6,024	6,122	6,222	6,323	6,427	6,532	6,638	6,747	6,857	6,970	7,084	7,200	7,318	7,438	7,561	7,685	7,812	7,940	8,071	8,205	8,340	8,478	8,618	8,760	8,905	9,053	9,203	9,356	9,511

添付資料　3-8 (3) 経済分析の計算表 (Option3：ルート 3、Shield)

Economic Analysis of Pre F/S Project (Option3: Route3, Shield)

(million PHP)

Items	Total	NPV (D.R. 10%)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079
			3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
Construction							Spillway			Phase I					Phase II										Phase III																																											
Economic Cost	**-57,856**	**-26,718**	**-930**	**-944**	**-3,334**	**-2,989**	**-5,443**	**-7,840**	**-7,945**	**-7,524**	**-6,168**	**-3,321**	**-1,603**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**
- Project Cost	-40,041	-26,022	-930	-944	-3,334	-2,989	-5,443	-7,840	-7,945	-7,524	-6,168	-3,321	-1,603	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- O&M Cost	-9,090	-644	0	0	0	0	0	0	0	0	0	0	0	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186
- O&M of Machines	-691	-48	0	0	0	0	0	0	0	0	0	0	0	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14
- Cleaning of Spillway	-44	-3	0	0	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
- Rehabilitation Cost																																																																																						
Economic Benefit	**368,140**	**20,439**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4,967**	**5,055**	**5,144**	**5,235**	**5,329**	**5,418**	**5,509**	**5,601**	**5,696**	**5,791**	**5,882**	**5,974**	**6,067**	**6,162**	**6,259**	**6,357**	**6,457**	**6,559**	**6,662**	**6,768**	**6,875**	**6,984**	**7,094**	**7,207**	**7,322**	**7,438**	**7,557**	**7,677**	**7,800**	**7,925**	**8,052**	**8,181**	**8,312**	**8,446**	**8,582**	**8,720**	**8,861**	**9,004**	**9,149**	**9,297**	**9,448**	**9,601**	**9,756**	**9,915**	**10,076**	**10,240**	**10,407**	**10,576**	**10,749**
- Benefit of Spillway	368,140	20,439	0	0	0	0	0	0	0	0	0	0	0	4,967	5,055	5,144	5,235	5,329	5,418	5,509	5,601	5,696	5,791	5,882	5,974	6,067	6,162	6,259	6,357	6,457	6,559	6,662	6,768	6,875	6,984	7,094	7,207	7,322	7,438	7,557	7,677	7,800	7,925	8,052	8,181	8,312	8,446	8,582	8,720	8,861	9,004	9,149	9,297	9,448	9,601	9,756	9,915	10,076	10,240	10,407	10,576	10,749
Other Benefits																																																																																			
Case2) Land Price Increase																																																																																	
- Land Price Increase	15,202	3,274	0	0	0	0	0	0	0	0	0	0	0	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost-Benefit Flow	325,486	-3,005	-930	-944	-3,334	-2,989	-5,443	-7,840	-7,945	-7,524	-6,168	-3,321	-1,603	6,286	6,374	6,464	6,555	6,648	6,738	6,829	6,921	7,015	7,111	5,681	5,773	5,867	5,962	6,058	6,157	6,257	6,359	6,462	6,567	6,674	6,783	6,894	7,007	7,121	7,238	7,357	7,477	7,600	7,725	7,852	7,981	8,112	8,246	8,382	8,520	8,660	8,803	8,949	9,097	9,247	9,400	9,556	9,715	9,876	10,040	10,206	10,376	10,548
	0.89	**9.2%**																																																																														
Case3) Case2) + Landfill	**-1,930**	**-1,064**	0	-241	-241	-241	-241	-241	-241	-241	-241	-241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
landfill Benefit	9,000	3,154	0	0	0	0	0	0	0	0	0	0	9,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost-Benefit Flow	332,556	-914	-930	-944	-3,576	-3,230	-5,684	-8,082	-8,186	-7,765	-6,409	-3,562	7,397	6,286	6,374	6,464	6,555	6,648	6,738	6,829	6,921	7,015	7,111	5,681	5,773	5,867	5,962	6,058	6,157	6,257	6,359	6,462	6,567	6,674	6,783	6,894	7,007	7,121	7,238	7,357	7,477	7,600	7,725	7,852	7,981	8,112	8,246	8,382	8,520	8,660	8,803	8,949	9,097	9,247	9,400	9,556	9,715	9,876	10,040	10,206	10,376	10,548
	0.96	**9.7%**																																																																														
Sensitivity Analsys (Case1)																																																																																
S1) Cost +10%	**-63,641**	**-29,390**	-1,023	-1,039	-3,668	-3,288	-5,987	-8,624	-8,740	-8,276	-6,785	-3,653	-1,763	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220
Cost-Benefit Flow	**304,499**	**-8,951**	-1,023	-1,039	-3,668	-3,288	-5,987	-8,624	-8,740	-8,276	-6,785	-3,653	-1,763	6,066	6,154	6,244	6,335	6,428	6,518	6,609	6,701	6,795	6,891	5,461	5,553	5,647	5,742	5,838	5,937	6,037	6,139	6,242	6,347	6,454	6,563	6,674	6,787	6,901	7,018	7,137	7,257	7,380	7,505	7,632	7,761	7,892	8,026	8,162	8,300	8,440	8,583	8,729	8,877	9,027	9,180	9,336	9,495	9,656	9,820	9,986	10,156	10,328
	0.70	**7.7%**																																																																														
S2) Benefit -10%	**331,326**	**10,395**	0	0	0	0	0	0	0	0	0	0	0	4,470	4,549	4,630	4,712	4,796	4,876	4,958	5,041	5,126	5,212	5,294	5,376	5,460	5,546	5,633	5,721	5,811	5,903	5,996	6,091	6,187	6,285	6,385	6,486	6,590	6,694	6,801	6,910	7,020	7,132	7,247	7,363	7,481	7,601	7,724	7,848	7,975	8,103	8,234	8,367	8,503	8,641	8,781	8,923	9,068	9,216	9,366	9,518	9,674
Cost-Benefit Flow	**273,470**	**-8,323**	-930	-944	-3,334	-2,989	-5,443	-7,840	-7,945	-7,524	-6,168	-3,321	-1,603	4,270	4,349	4,429	4,512	4,595	4,676	4,758	4,841	4,926	5,012	5,093	5,176	5,260	5,346	5,433	5,521	5,611	5,703	5,796	5,891	5,987	6,085	6,185	6,286	6,389	6,494	6,601	6,709	6,820	6,932	7,046	7,163	7,281	7,401	7,523	7,648	7,774	7,903	8,034	8,167	8,303	8,440	8,581	8,723	8,868	9,016	9,166	9,318	9,473
	0.69	**7.7%**																																																																														
S3) Cost +10%, Benefit -10%	**267,685**	**-10,995**	-1,023	-1,039	-3,668	-3,288	-5,987	-8,624	-8,740	-8,276	-6,785	-3,653	-1,763	4,250	4,329	4,409	4,492	4,575	4,656	4,738	4,821	4,906	4,992	5,073	5,156	5,240	5,326	5,413	5,501	5,591	5,683	5,776	5,871	5,967	6,065	6,165	6,266	6,369	6,474	6,581	6,689	6,800	6,912	7,026	7,143	7,261	7,381	7,503	7,628	7,754	7,883	8,014	8,147	8,283	8,420	8,560	8,703	8,848	8,996	9,146	9,298	9,453
Cost-Benefit Flow		**7.2%**																																																																														

添付資料　3-8 (4) 経済分析の計算表 (Option4：ルート 3、NATM)

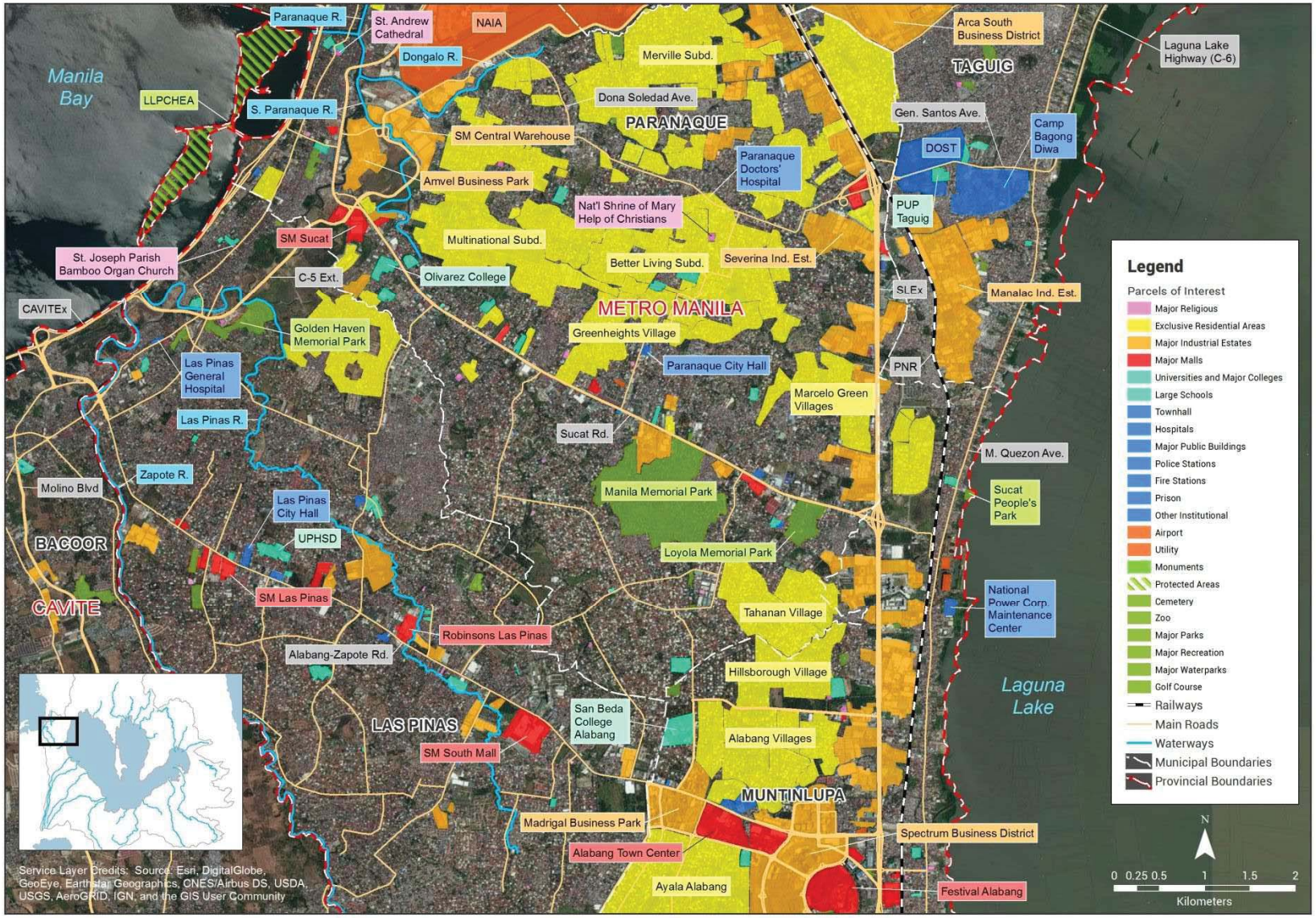
Economic Analysis of Pre F/S Project (Option4: Route3, NATM)

(million PHP)

Items	Total	NPV (D.R. 10%)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079
			3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
Construction							Phase I		Spillway								Phase II									Phase III																																										
Economic Cost	**-47,390**	**-19,919**	**-827**	**-837**	**-3,568**	**-3,169**	**-2,364**	**-3,614**	**-3,769**	**-3,775**	**-3,781**	**-3,788**	**-3,896**	**-3,290**	**-1,297**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**
Project Cost	37,775	-19,207	-827	-837	-3,568	-3,169	-2,364	-3,614	-3,769	-3,775	-3,781	-3,788	-3,896	-3,290	-1,297	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200	-200
- O&M Cost	-9,504	-585	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- O&M of Machines	-667	-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186	-186
- Cleaning of Spillway	-43	-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14
- Rehabilitation Cost																	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
Economic Benefit	**363,174**	**18,857**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5,055**	**5,144**	**5,235**	**5,329**	**5,418**	**5,509**	**5,601**	**5,696**	**5,791**	**5,882**	**5,974**	**6,067**	**6,162**	**6,259**	**6,357**	**6,457**	**6,559**	**6,662**	**6,768**	**6,875**	**6,984**	**7,094**	**7,207**	**7,322**	**7,438**	**7,557**	**7,677**	**7,800**	**7,925**	**8,052**	**8,181**	**8,312**	**8,446**	**8,582**	**8,720**	**8,861**	**9,004**	**9,149**	**9,297**	**9,448**	**9,601**	**9,756**	**9,915**	**10,076**	**10,240**	**10,407**	**10,576**	**10,749**
- Benefit of Spillway	363,174	18,857	0	0	0	0	0	0	0	0	0	0	0	0	5,055	5,144	5,235	5,329	5,418	5,509	5,601	5,696	5,791	5,882	5,974	6,067	6,162	6,259	6,357	6,457	6,559	6,662	6,768	6,875	6,984	7,094	7,207	7,322	7,438	7,557	7,677	7,800	7,925	8,052	8,181	8,312	8,446	8,582	8,720	8,861	9,004	9,149	9,297	9,448	9,601	9,756	9,915	10,076	10,240	10,407	10,576	10,749
Economic Cost	**-47,390**	**-19,919**	**-827**	**-837**	**-3,568**	**-3,169**	**-2,364**	**-3,614**	**-3,769**	**-3,775**	**-3,781**	**-3,788**	**-3,896**	**-3,290**	**-1,297**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**	**-200**
Economic Benefit	**363,174**	**18,857**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5,055**	**5,144**	**5,235**	**5,329**	**5,418**	**5,509**	**5,601**	**5,696**	**5,791**	**5,882**	**5,974**	**6,067**	**6,162**	**6,259**	**6,357**	**6,457**	**6,559**	**6,662**	**6,768**	**6,875**	**6,984**	**7,094**	**7,207**	**7,322**	**7,438**	**7,557**	**7,677**	**7,800**	**7,925**	**8,052**	**8,181**	**8,312**	**8,446**	**8,582**	**8,720**	**8,861**	**9,004**	**9,149**	**9,297**	**9,448**	**9,601**	**9,756**	**9,915**	**10,076**	**10,240**	**10,407**	**10,576**	**10,749**
Balance	**315,784**	**-1,062**	**-827**	**-837**	**-3,568**	**-3,169**	**-2,364**	**-3,614**	**-3,769**	**-3,775**	**-3,781**	**-3,788**	**-3,896**	**-3,290**	**3,757**	**4,944**	**5,035**	**5,128**	**5,218**	**5,308**	**5,401**	**5,495**	**5,591**	**5,681**	**5,773**	**5,867**	**5,962**	**6,059**	**6,157**	**6,257**	**6,359**	**6,462**	**6,567**	**6,674**	**6,783**	**6,894**	**7,007**	**7,121**	**7,238**	**7,357**	**7,477**	**7,600**	**7,725**	**7,852**	**7,981**	**8,112**	**8,246**	**8,382**	**8,520**	**8,660**	**8,803**	**8,949**	**9,097**	**9,247**	**9,400**	**9,556**	**9,715**	**9,876**	**10,040**	**10,206**	**10,376**	**10,548**
	B/C	**0.95**																																																																		
	EIRR	**9.6%**																																																																
Other Benefits																																																																		
Case2) Land Price Increase																																																																		
- Land Price Increase	15,202	2,976	0	0	0	0	0	0	0	0	0	0	0	0	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost-Benefit Flow	330,986	1,914	-827	-837	-3,568	-3,169	-2,364	-3,614	-3,769	-3,775	-3,781	-3,788	-3,896	-3,290	5,277	6,464	6,555	6,648	6,738	6,829	6,921	7,015	7,111	7,202	5,773	5,867	5,962	6,059	6,157	6,257	6,359	6,462	6,567	6,674	6,783	6,894	7,007	7,121	7,238	7,357	7,477	7,600	7,725	7,852	7,981	8,112	8,246	8,382	8,520	8,660	8,803	8,949	9,097	9,247	9,400	9,556	9,715	9,876	10,040	10,206	10,376	10,548
	1.10	**10.6%**																																																																		
Case3) Case2) + Landfill	**-1,930**	**-1,064**	0	0	-241	-241	-241	-241	-241	-241	-241	-241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
landfill Benefit	**9,000**	**3,154**	0	0	0	0	0	0	0	0	0	0	9,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost-Benefit Flow	**338,056**	**4,005**	-827	-837	-3,809	-3,410	-2,605	-3,855	-4,010	-4,016	-4,023	-4,029	5,104	-3,290	5,277	6,464	6,555	6,648	6,738	6,829	6,921	7,015	7,111	7,202	5,773	5,867	5,962	6,059	6,157	6,257	6,359	6,462	6,567	6,674	6,783	6,894	7,007	7,121	7,238	7,357	7,477	7,600	7,725	7,852	7,981	8,112	8,246	8,382	8,520	8,660	8,803	8,949	9,097	9,247	9,400	9,556	9,715	9,876	10,040	10,206	10,376	10,548
	1.22	**11.4%**																																																																	
Sensitivity Analsys (Case1)																																																																		
S1) Cost + 10%	**-52,129**	**-21,911**	-910	-921	-3,924	-3,486	-2,600	-3,975	-4,145	-4,152	-4,160	-4,167	-4,286	-3,619	-1,427	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220	-220
Cost-Benefit Flow	**311,045**	-3,054	-910	-921	-3,924	-3,486	-2,600	-3,975	-4,145	-4,152	-4,160	-4,167	-4,286	-3,619	3,627	4,924	5,015	5,108	5,198	5,288	5,381	5,475	5,571	5,661	5,753	5,847	5,942	6,037	6,134	6,234	6,336	6,439	6,545	6,652	6,761	6,872	6,985	7,100	7,216	7,335	7,455	7,577	7,701	7,827	7,955	8,085	8,217	8,352	8,488	8,627	8,768	8,911	9,057	9,204	9,354	9,506	9,660	9,816	9,975	10,135	10,298	10,463
	0.86	**9.1%**																																																																	
S2) Benefit -10%	**326,856**	**16,971**	0	0	0	0	0	0	0	0	0	0	0	0	4,549	4,630	4,712	4,796	4,876	4,958	5,041	5,126	5,212	5,294	5,376	5,460	5,546	5,633	5,721	5,811	5,903	5,996	6,091	6,187	6,285	6,385	6,486	6,590	6,694	6,801	6,910	7,020	7,132	7,247	7,363	7,481	7,601	7,724	7,848	7,975	8,103	8,234	8,367	8,503	8,641	8,781	8,923	9,068	9,216	9,366	9,518	9,674
Cost-Benefit Flow	**279,467**	-2,948	-827	-837	-3,568	-3,169	-2,364	-3,614	-3,769	-3,775	-3,781	-3,788	-3,896	-3,290	3,252	4,429	4,512	4,595	4,676	4,758	4,841	4,926	5,012	5,093	5,176	5,260	5,346	5,433	5,521	5,611	5,703	5,796	5,891	5,987	6,085	6,185	6,286	6,389	6,494	6,601	6,709	6,820	6,932	7,046	7,163	7,281	7,401	7,523	7,648	7,774	7,903	8,034	8,167	8,303	8,440	8,581	8,723	8,868	9,016	9,166	9,318	9,473
	0.85	**9.0%**																																																																
S3) Cost + 10%, Benefit -10%																																																																
Cost-Benefit Flow	**274,728**	**-4,940**	-910	-921	-3,924	-3,486	-2,600	-3,975	-4,145	-4,152	-4,160	-4,167	-4,286	-3,619	3,122	4,409	4,492	4,575	4,656	4,738	4,821	4,906	4,992	5,073	5,156	5,240	5,326	5,413	5,501	5,591	5,683	5,776	5,871	5,967	6,065	6,165	6,266	6,369	6,474	6,581	6,689	6,800	6,912	7,026	7,143	7,261	7,381	7,503	7,628	7,754	7,883	8,014	8,147	8,283	8,420	8,560	8,703	8,848	8,996	9,146	9,298	9,453
	0.77	**8.4%**																																																																

添付資料　4

土地利用及び施設・構造物の立地状況

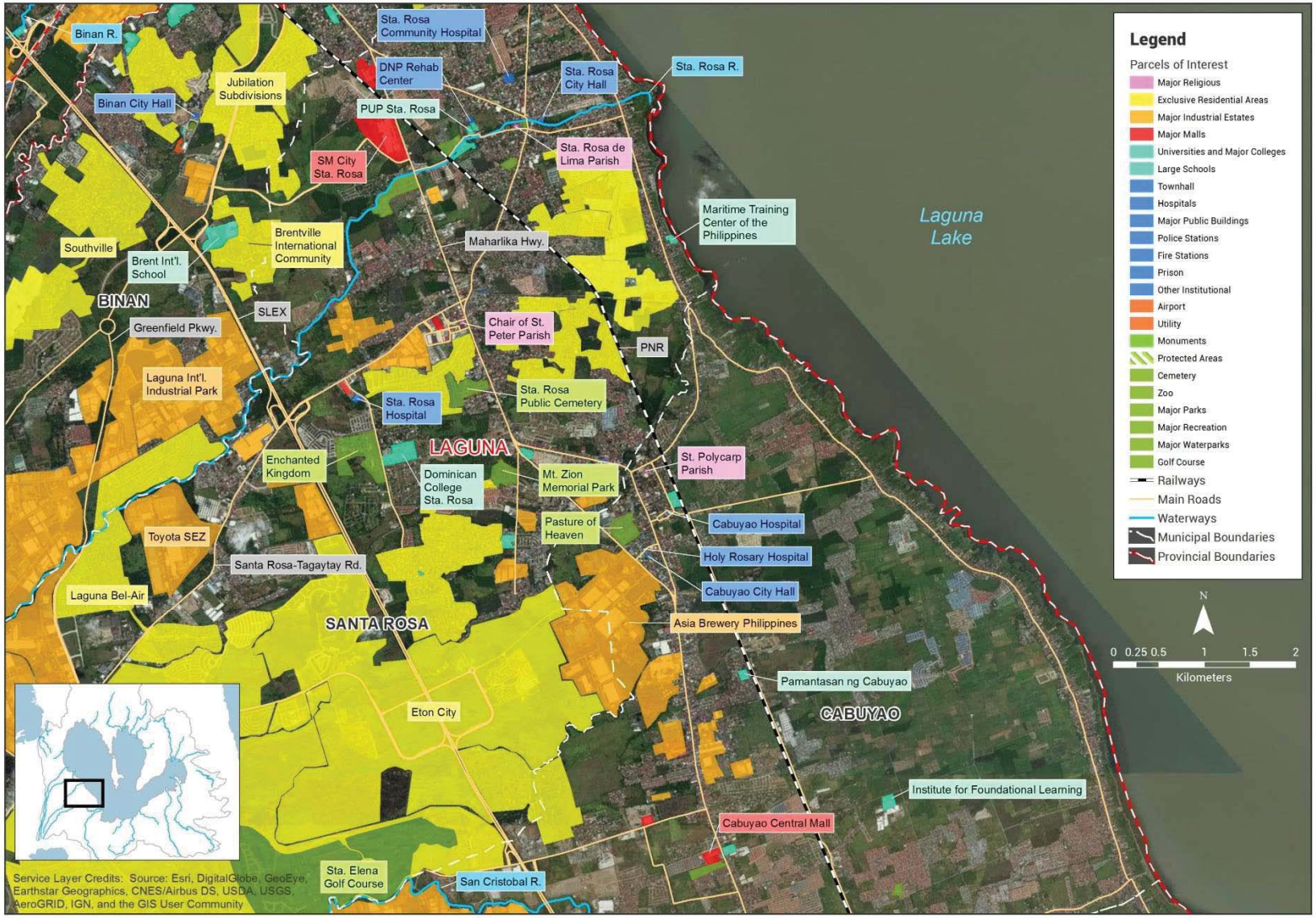


出典: JICA 調査チーム

図 巻 1-1　土地利用及び施設・構造物の立地状況（エリア 1）

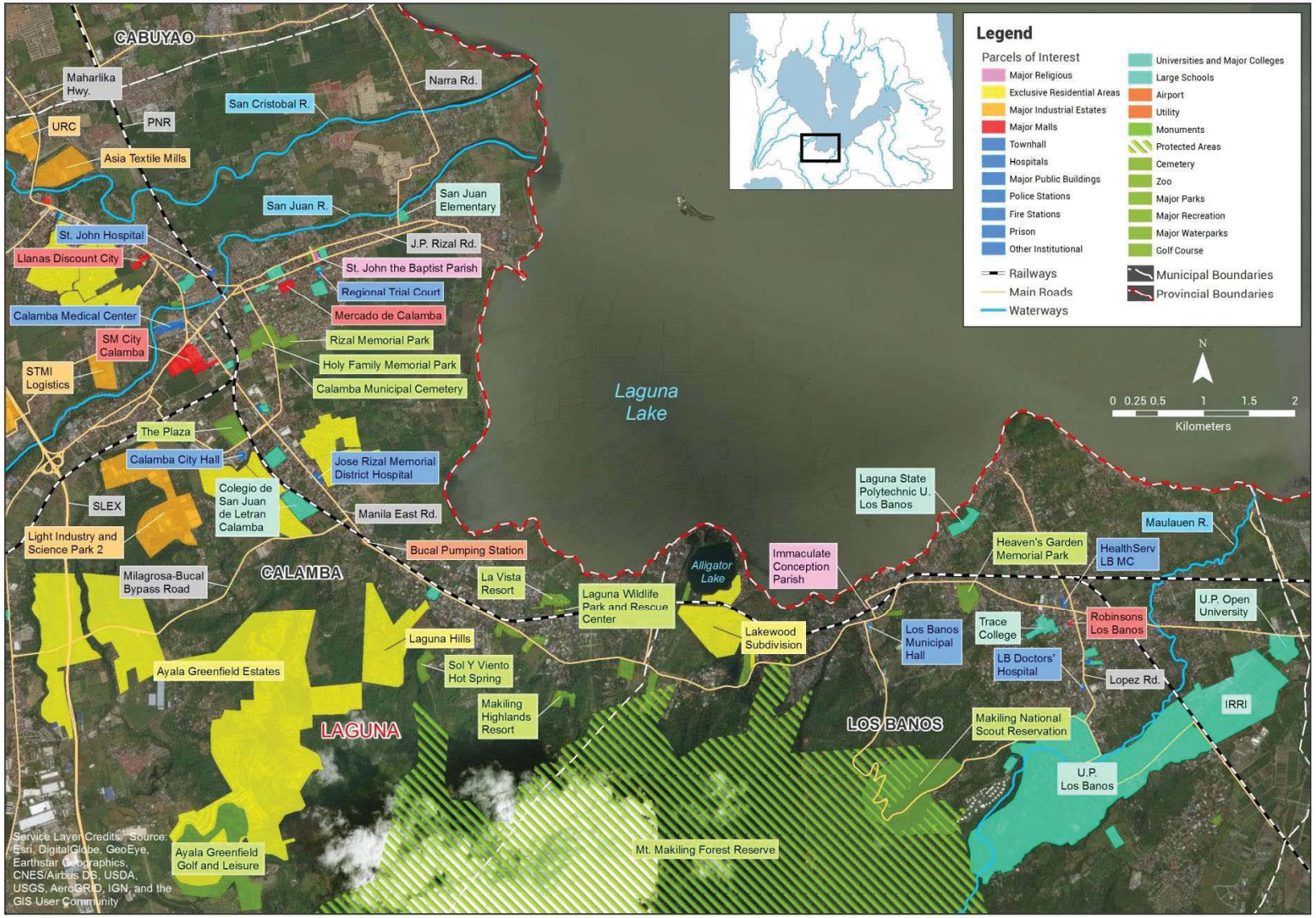
出典: JICA 調査チーム

図 巻 1-2　土地利用及び施設・構造物の立地状況（エリア 2）



出典: JICA 調査チーム

図 巻 1-3　土地利用及び施設・構造物の立地状況（エリア 3）

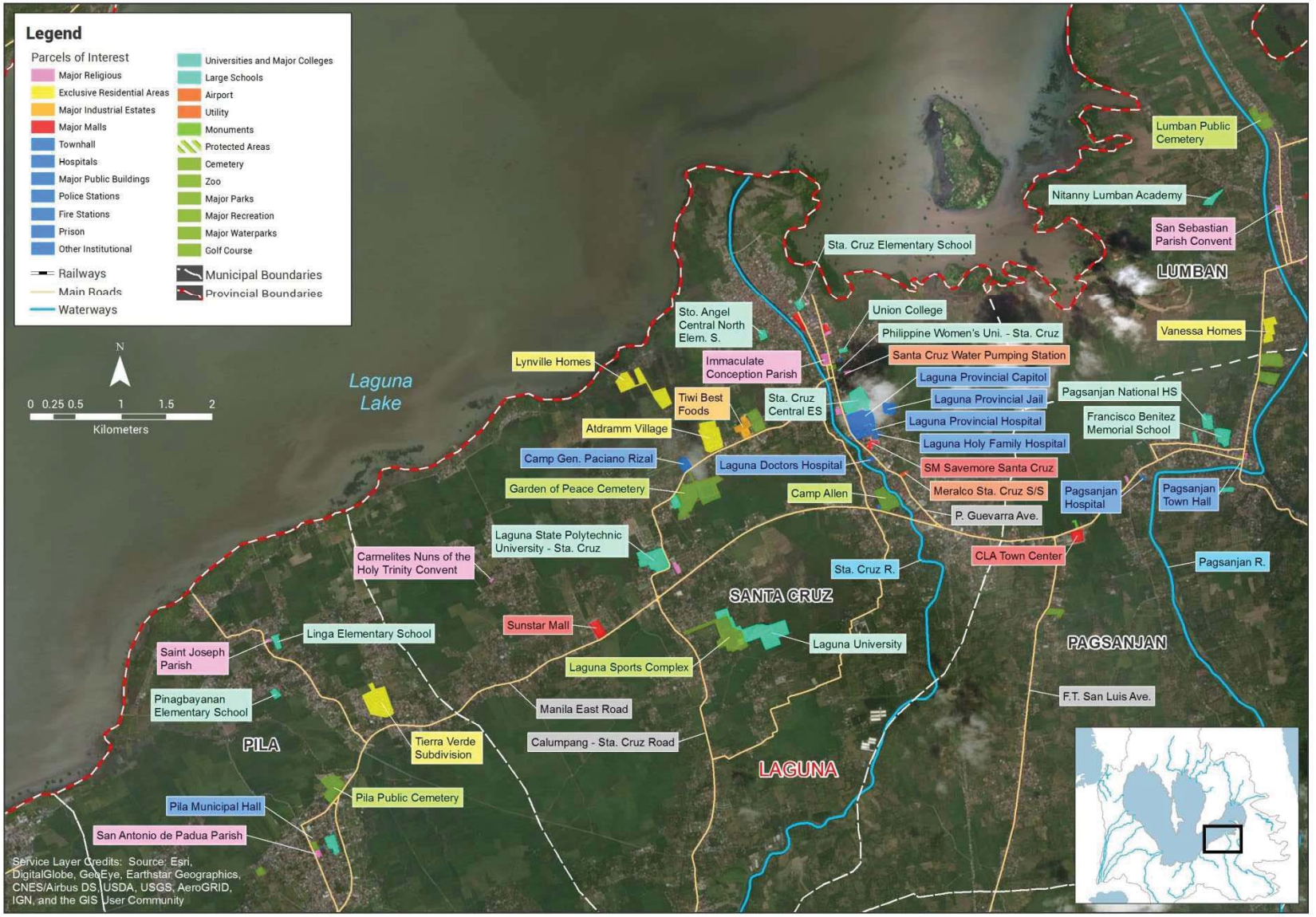


出典: JICA 調査チーム

図 巻 1-4　土地利用及び施設・構造物の立地状況（エリア 4）

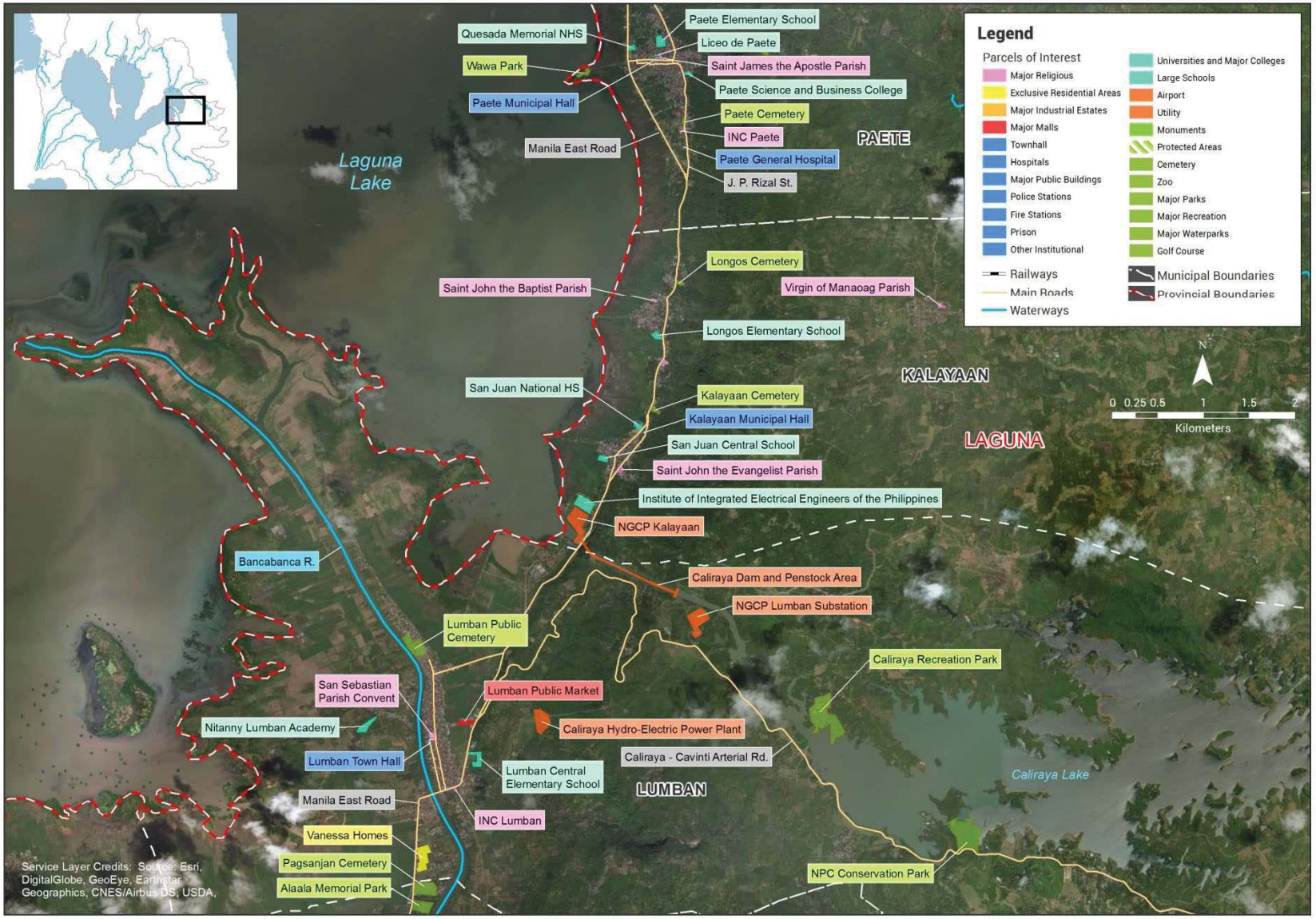
出典: JICA 調査チーム

図 巻 1-5　土地利用及び施設・構造物の立地状況（エリア 5）



出典: JICA 調査チーム

図 巻 1-6　土地利用及び施設・構造物の立地状況（エリア 6）



出典: JICA 調査チーム

図 巻 1-7　土地利用及び施設・構造物の立地状況（エリア 7）