

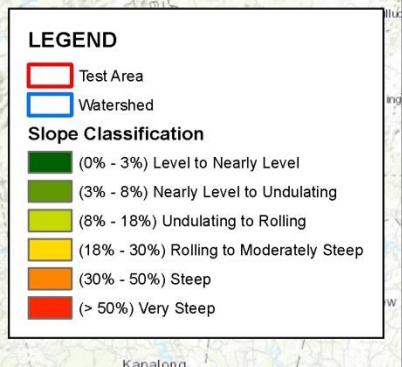
## Annex 2

### Instruction paper of GIS Mapping for Environmental Sensitivity

## Instruction paper of GIS Mapping for Environmental Sensitivity

### 1. Thematic map

#### Natural Environment

	Title	Data Source	Remark
T-1	Designated Land Protection	Protected area: DENR  Land use: DCPDO (2019-2028)  KBA: DENR/CIP <sup>1</sup> Data from ESRI WEB site <sup>2</sup> Protected area in Kitaotao, Quezon and San Fernando	Protected area (Apo Natural Park, Malagos WFR and Samal Island Protected Landscape/ Seascape) Protection Forest Production Forest Terrestrial KBA  Protect forest Forest production
T-2	Vegetation and coast condition	Land cover: DENR Land use: DCPDO (mangroves only) Coral reef: NAMRIA	
T-3	Elevation	Data source?	
T-4	Slope	NAMRIA	Change legend & hatching based on:  
T-5	Erosion	DCPDO San Fernando	
T-6	Land slide	Landslide (1:50,000): MGB San Fernando	
T-7	Soil condition	<b>Data source</b>	Legend and hatching Class A: hard rock Class B: rock Class C: very dense and soft rock Class D: stiff soil Class E: soft soil Class F: soils requiring site-specific evaluation
T-8	Liquefaction	PHIVOLCS	
T-9	Water area	River & stream: NAMRIA Water body: DCPDO (Landuse 2017)	
T-10	Earthquake (Seismicity)	Active Faults: PHIVOLCS	Legend: Active fault (certainly located) Active fault (approximately located)

<sup>1</sup> Conservation International Philippines

<sup>2</sup> <https://www.arcgis.com/home/item.html?id=0781ae5276884b65bc0c9120326a8d31#overview>

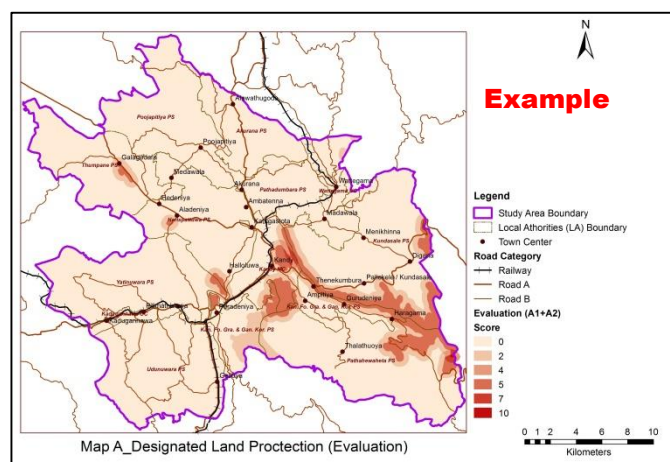
## Social Environment

	Title	Data Source	Remark
T-11	Indigenous peoples	Ancestral domains: NCIP	
T-12	Informal Settler	Informal Settlements: JPT	
T-13	Density of Building (Number of building per 1km <sup>2</sup> )	Building points/footprints: NAMRIA Building footprints: JPT	1. Use polygon of JPT for the urban area, point of NAMRIA for out of urban area. 2. Make a layer with 2km-mesh. 3. Overlay the layers. 4. Count number of point in each grid (1km <sup>2</sup> ). 5. Make a chloropleth/ graduation map (or color map or heat map?)
T-14	Land use	Land use: DCPDO, (2019-2028) Rice field, cropland: NAMRIA Tree category: NAMRIA Land use: Kitaotao, Quezon and San Fernando	T-14-1: Land use T-14-2: Rice field, cropland and tree category
T-15	Tourism and social site	Landuse: DCPDO, (2019-2028) Park area: NAMRIA Land use: Kitaotao, Quezon and San Fernando Conservation DPCDO  Land use of Kitaotao and Quezon Tourism (Kitaotao) Tourism (Quezon)  Tourism site: Tourism map <ul style="list-style-type: none"> <li>• Eden nature park</li> <li>• Malagos garden (same as Maragos WFR) and Philippine</li> <li>• Deca wakeboard park</li> <li>• Organic vegetable gardens &amp; mountain resorts</li> <li>• Little Tokyo of prewar phil.</li> <li>• Crocodile park</li> <li>• Philippine eagle center</li> </ul>	Parks & recreational, tourism development Park area, cemetary/ memorial park Tourism in Quezon and Kitaotao Secondary conservation (Eco-tourism)

## 2. Scoring map

Put a score on each indicator based on the thematic maps. Score varies from 0 to 10, score 10 means most environmentally sensitive.

Scoring map will be made in the form of chloropleth map.



Natural Environment

Title		Score	
S-1	Designated Land Protection		Score
		Protected area, Forest protection	10
		Protection Forest (Davao)	9
		Forest Production, Production Forest (Davao)	8
		KBA	8
		Others	0
S-2	Vegetation		Score
		Mangrove	9
		Coral reef	9
		Closed forest	8
		Open forest	7
		Glass land	4
		Bush/ shrub	2
		Others	0
S-3	Elevation		Score
		Over 1,000m	8
		500m to 1,000m	5
		Below 500m	0
S-4	Slope		Score
		Over 50%	8
		Over 30% to 50%	7
		Over 18% to 30%	5
		Over 3% to 18%	2
		Below 3%	0
S-5	Erosion		Score
		DCPDO/ SanFernando Very high risk	8
		High risk/ severe erosion	6
		Moderate risk/ moderate erosion	4
		Low risk/ no apparent or slight erosion	0
S-6	Landslide		Score
		DCPDO/ SanFernando Very high susceptibility	7
		High susceptibility/ High landslide	5
		Moderate susceptibility/ Moderate landslide	4
		Low susceptibility/ Low landslide	1
S-7	Soil condition		Score
		Class F	4
		Class E	2
		Class C, D	1
		Class A, Class B	0

	Title	Score	
S-8	Liquefaction		Score
		High risk	5
		Moderate risk	3
		Low risk	1
S-9	Water area		Score
		Water bodies (pond, lake, etc. except river)	7
		Others	0
S-10	Earthquake (Seismicity)		Score
		0.5km from both active fault (certain)	3
		0.5km from both active faults (approximate)	2
		Others	0

### Social Environment

	Title	Score	
S-11	Indigenous peoples		Score
		Ancestral domains area	8
		Other	0
S-12	Informal Settler		Score
		Informal settlement	5
		Others	0
S-13	Density of Building		Score
		Over 4,000	5
		Over 2,000 to 4,000	4
		Over 1,000 to 2,000	2
		Over 50 to 1,000	1
S-14	Landuse		Score
		Mangroves	7
		Rice field, Agriculture protection Protection Agriculture (Davao)	7
		Agriculture production, Production Agriculture (Davao), Buffer/ Greenbelt	6
		Commercial tree (Nipa, palm, coconuts, etc.), Urban ecological enhancement	5
		Cropland	3
		Industrial area	3

S-15	Tourism		Score
		Cemetery/ memorial park	8
		Park & recreational, Tourism development, Park area Conservation forest (eco-tourism)	5
		Tourism site (If point data, circle with 0.5km radius)	5
		Others	0

### 3. Environmental Sensitivity Map

Calculate total score of each “natural environment” and “social environment” based on the following formula:

	Title	Score
NE-1	Natural Environmental Sensitivity	Total score = (N-1 x 2)+N-2+N-3+N-4+N-5+N-6+N-7+N-8+N-9+N-10
SE-1	Social Environmental Sensitivity	Total score = S-11+S-12+S-13+S-14+S-15

Natural/ Social Sensitivity map will be made in the form of chloropleth map with range of 0 to 110 for natural environmental sensitivity and 0 to 50 for social environmental sensitivity

Calculate variation of total area of each score for both natural/ social sensitivity:

#### Classification of Sensitiveness (tentative)

Class	Natural Sensitivity	Social Sensitivity
Negligible Sensitive (white)	Total score: 0 – 5, and Natural park, Forest protection in Kitaotao	Total score: 0 – 5
Slight Sensitive (green)	Total score: 6 – 21	Total score: 6 – 8
Negligible Sensitive (orange)	Total score: 22 – 41	Total score: 9 – 12
Negligible Sensitive (red)	Total score: 42 – 59	Total score: 13 – 19

End

## Annex 3

### Records for Stakeholder Meetings



### Program and Discussion Record

Date		Location of participants	Topics
First Round			
1 -1	January 29, 2019	Davao/ Matina/ Talomo River	<ul style="list-style-type: none"> <li>• Outline of the Project, schedule</li> <li>• Regarding river flood:                             <ul style="list-style-type: none"> <li>• Record of floods</li> <li>• Finding issues</li> </ul> </li> </ul>
1 -2	February 20, 2019	Nine (9) drainage areas in Davao city	<ul style="list-style-type: none"> <li>• Outline of the Project, schedule</li> <li>• Regarding inland flood:                             <ul style="list-style-type: none"> <li>• Record of floods</li> <li>• Finding issues</li> </ul> </li> </ul>
1 -3	April 24, 2019	Coastal area in Davao city	<ul style="list-style-type: none"> <li>• Outline of the Project, schedule</li> <li>• Regarding Coastal flood:                             <ul style="list-style-type: none"> <li>• Record of floods</li> <li>• Finding issues</li> </ul> </li> </ul>
Second round			
2-1	July 23, 2019	Davao/ Matina/ Talomo River	<ul style="list-style-type: none"> <li>• Finding environmental and social issues</li> <li>• Introduction of river flood control measures in Japan, etc.</li> <li>• Group discussion</li> </ul>
2-2	July 24, 2019	Nine (9) drainage areas in Davao city	<ul style="list-style-type: none"> <li>• Finding environmental and social issues</li> <li>• Introduction of inland flood control measures in Japan, etc.</li> <li>• Group discussion</li> </ul>
2-3	July 25, 2019	Coastal area in Davao city	<ul style="list-style-type: none"> <li>• Finding environmental and social issues</li> <li>• Introduction of coastal flood control measures in Japan, etc.</li> <li>• Group discussion</li> </ul>
Third round			
3-1	January 23, 2020	Davao/ Matina/ Talomo River and coastal area near river mouths	<ul style="list-style-type: none"> <li>• Results of basic study</li> <li>• Outline of the MP (control measures of river flood and coastal flood)</li> <li>• Initial environmental and social impact evaluation, and scoping</li> <li>• Group discussion</li> </ul>
3-2	January 24, 2020	Nine (9) drainage areas in Davao city	<ul style="list-style-type: none"> <li>• Results of basic study</li> <li>• Outline of the MP (control measures of inland flood and coastal flood)</li> <li>• Initial environmental and social impact evaluation, and scoping</li> <li>• Group discussion</li> </ul>

## First Round



Davao City

## Agenda for the 1st Stakeholders Coordination Meeting in Davao on the Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City

Date: January 29, 2019

Time: 8:00~12:00

Place: Grand menseng hotel, Davao

No.	Time	Agenda	Presenter
1	8:00 – 8:15	Registration	-
2	8:15 – 8:30	Preliminaries - Prayer - Philippine National Anthem - Japan National Anthem - Tayo'y Dabawenyo	<i>Ms. Eleanor Deliguer Administrative Officer V Regional Training Officer, DPWH RO XI</i>
3	8:30 – 8:45	Opening Remarks	<i>Mr. Ivan C. Cortez Coordinator, CPDO City government of Davao</i>
4	8:45 – 9:15	Explanation of the Project, and purpose of today's meeting	<i>Mr. Kenji Morita Team Leader, JICA Project Team</i>
5	9:15 – 10:15	Identification of current problems on flood	<i>All participants Facilitated by DPWH RO XI</i>
6	10:15 – 10:30	Coffee break	-
7	10:30 – 11:30	Discussion and recommendation for the future countermeasures	<i>All participants Facilitated by DPWH RO XI</i>
8	11:30 – 11:50	Wrap up the meeting	<i>All participants Presented by Group Leader</i>
9	11:50 – 12:00	Closing Remarks	<i>Mr. Rogelio O. Ang Project Manager III, UPMO – FCMC, DPWH</i>
10	12:00 – 13:00	Lunch	-

## **DISCUSSION POINTS:**

### **I. Group 1A: Davao River (Upstream)**

#### **DISCUSSION POINTS:**

- Improper dumping of solid waste in the river caused flooding and the number of HH along the riverbanks is an issue on flooding.
- Expected measures against flood are as follows:
  - Desilting of rivers
  - Strict implementation of watershed policies
  - Construction of riverbank protection against scouring gabion
  - Penalize violators of illegal quarrying and improper waste disposal
  - Resettlement of the existing HH along riverbanks
  - Prohibit living along the rivers/riverbanks.

### **II. Group 1B: Davao River (Downstream)**

#### **DISCUSSION POINTS:**

- Most barangays located in Davao river experienced flooding once or twice a year. Water depth is from (leg to waist), which usually lasts 2 to 3 hours.
- Causes of flooding in the areas (19-B,5-A,76-A, Mandug, Waan, Maa, 8-A and Tigatto) includes heavy rainfall, river condition, development of housing projects and cutting of trees.
- Flooding results to damages on agriculture, household goods and housing (infrastructure), diseases, soil erosion and siltation.
- They would like to recommend to the City Government of Davao to put-up additional gabion particularly in barangay Ma-a. However, gabion or dike is not applicable in all barangays, especially in Brgy. Tigatto. According to its barangay Captain, putting-up a gabion in the area, might put the community at stake, since water may not have any exit point, they prefer the installation of pump instead of a gabion in order to remove (excess) water in the areas.
- **Opinions on Flood Issues:**
  - Improper construction of dikes/gabions (Brgy. Mandug); as observed almost 100 meters of gabions constructed in the area are already damage despite of the moderate amount water (flood).
  - Resettlement for the residents living along riversides.
  - Elevate low lying areas (Brgy. Tigatoo)
  - Dredging (Brgy. Mandug) desilting Davao river using the amphibious backhoe especially in the Mandug area is very useful. It was observed that from the

beginning up to the present after the activity was being conducted the rise of the water level is just bearable.

- Barangay officials should give high importance on prohibiting the people to live along the flood prone areas. However, there are people who are uncontrollable.
- They are expecting that the following will be considered in the plan that will be drafted by the JICA Project Team:
  - Additional gabions
  - Resettlement of buffer zones
  - Construction of well-implemented river protections
  - Evacuation drills; Facilities in the evacuation areas
  - Forecasting and Establish Early warning Systems (Currently the barangays are connected to the apo base which that gives them updates from time to time)
  - Grant of Amphibious backhoe in the barangays along Davao River or to DPWH or the City (with the positive result of the dredging along Davao River in Mandug area, they are thinking that it would be great to do this in the areas of Davao River)

### **III. Group 2 : Matina River**

#### **DISCUSSION POINTS:**

- Matina River tagged as the smallest but the “most deadly” by the group presenter. It killed 25 people and partially/ totally damaged more than 400 houses in the flashflood last 2011.
- Matina River experienced flooding twice or thrice a year. But recently, they experienced ground level flood frequently.
- Matina River, in its channel has some narrow portions considered to be its choke points.
- DPWH needs to reevaluate the Matina bridge, if it can accommodate the volume of water coming from the upstream.
- Brgy. Captains noticed that after putting-up a dike in the part of NHA bangkal, flooding incidents in Matina river decreased.
- Before Matina River flooding incident is high because of the simultaneous flooding in Talomo and Matina river. The flood happened 2-3 years ago erode the sand bar portion of the river in the shamrock, reason why today Talomo river directly discharge its water in the Davao Gulf.
- RD of EMB XI said that high coliform was found during the water analysis of the water along Matina River.
- Discharge of waste water in Matina River.
- **Cause of flooding**

- Development of subdivision especially along the riverbank, reevaluate to see if the easement is still present.
- Cutting of trees, blockage of debris and presence of garbage in the river.
- **Opinions for Flood Issues:**
  - No person should live in the riverbanks.
  - **River easement**  
In the land title, easement allocated is not being shown, however if a person will secure a copy of the approved survey from DENR it will show the allocated easement in a certain area. Supposed these areas (easement) no one should be allowed to put-up any infrastructure or live in the area; however, it was practiced that whenever there is an empty space in a land one will just simply occupy it. Given he own the lot, any advise coming from the CPDO GIS will be disregarded. This character should be addressed.
  - If only people will observe the easement there will be no (less) damage caused by flood.
- **Expected Measure**
  - Proper urban planning
  - Construction of cut-off channels since Matina River is has a meandering channel.
  - Planting deep rooted trees, however this should be put into proper places, because if it will be planted just in the riverbanks it will narrow the river channel.
- During the conduct of the study (Master Plan and FS) the width of channel of the Matina River should be identified to have proper measures to increase the capacity of the river.

#### **IV. Group 3 : Talomo River**

##### **DISCUSSION POINTS**

- Mr. Camilote, highlighted the experience of Barangay Calinan. Wherein they usually experienced flooding twice a year, 0.25 cm. depth which lasts to 2 hours.
- Due to flooding they encountered problems such as soil erosion in river side and in the big canal situated in the area, silted materials in the main drain, scouring in the riverbanks and bridge foundations. Huge volume of water coming from the upstream caused damage in the protection in abutment A in the 3 RCDG bridges in Calinan, other than that Calinan also encountered agricultural problems during flooding.
- In the case of Gumalang primary cause of flooding in the area is the overflowing lateral canal of a private company due to the silted materials. Canal in brgy. Gumalang are narrow so it cannot cater the water coming the lateral canal causing flood in the area.
- **OPINION ON FLOOD ISSUE**

- Keep the natural channel of the river; Do not change (divert) its alignment
- Brgy. Dalagdag exert efforts in prohibiting its residents to occupy the areas near the rivers.
- **EXPECTED MEASURES AGAINST FLOOD**
  - Removal of silted materials
  - Construction of flood control projects in riverbanks-like dike, stockpiles, riprap
  - Installation of Early warning devices
  - Putting up of marking limits (easement) in riverbanks.
  - Additional equipment for maintenance and dredging (backhoe, dump truck)

**JICA PROJECT FOR MASTER PLAN AND FEASIBILITY STUDY  
ON FLOOD CONTROL AND DRAINAGE IN DAVAO CITY**

<b>DAVAO RIVER UPSTREAM</b>					
(Composed of Brgy. Lacson, Lamanan and Bantol together with NEDA XI and CENRO)					
<b>ACTUAL CONDITION OF RIVERINE FLOOD</b>	<b>PROBLEM BY FLOOD</b>	<b>CAUSE OF FLOOD</b>	<b>OPINION ON FLOOD ISSUE</b>	<b>EXPECTED MEASURES AGAINST FLOOD</b>	
<b>Barangay Lacson</b> Frequency: Once a year Depth 5 ft. Duration of Flooding: 1 day	Damage to Households and crops due to soil erosion along the river.	- Heavy Rainfall - Siltation	- No improper dumping of solid waste along the river - No households along riverbanks	- Desilting of river beds - Strict implementation of watershed policies	
<b>Barangay Bantol</b> (During typhoon Vinta, December 22, 2017) Depth: 20 ft. Duration of Flooding: 8 hours	In the flooding on Dec 22, 2017, 15 houses were totally damaged in 5 sitios. Crops damages are coconut, cacao, banana and others.	- Enhancement of boundaries of banana plantations - Illegal cutting of trees - Open dumping of wastes - Illegal quarrying - Burning activities - Illegal logging			
<b>Lamanan</b> Flood happened last December 15, 2017 Depth 30 ft.	11 houses were totally damaged in Sitio Macatuno Purok 1-a Darila by Dec. 15, 2017 flood	- Heavy rainfall			
<b>Discussed summary or participated organizations ?</b>				- Riverbank protection (planting of bamboo/ malibago/ other appropriate	



				<p>trees and plants)</p> <ul style="list-style-type: none"> <li>- Abutment protection of Lacson-Lamanan bridge</li> <li>- Riverbank protection against scouring (gabions, concrete revetment, etc.)</li> <li>- Penalize violators (illegal quarrying, dumping of waste, etc.)</li> <li>- Resettlement of existing households along river banks to safe areas</li> <li>- No build zone along river banks</li> </ul>
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<b>DAVAO RIVER (DOWNSTREAM)</b>				
(Composed of CDRMO, MinDA, Barangays Maa, Waan, 5-A, Mandug, 8-A, 40-D, 76-A, Tigatto, 19-B and Callawa)				
<b>ACTUAL CONDITION OF RIVERINE FLOOD</b>	<b>PROBLEM BY FLOOD</b>	<b>CAUSE OF FLOOD</b>	<b>OPINION ON FLOOD ISSUE</b>	<b>EXPECTED MEASURES AGAINST FLOOD</b>
<b>Brgy. 5-a</b> Frequency: twice a year Water depth: knee to waistline Duration of flooding: 2 to 3 hours	- Damage of household goods - Household goods - Housing damage - Disease - Hygiene issue - livestock	- Heavy rainfall	- Nobody should live in flood prone area (Resettlement)	- Resettlement, - Enforcement of water code (Easement) - Construction of Dike
<b>19-b</b> Every 2 years 3 ft-10 ft 12 hrs to 24 hours	- Agricultural crops - Household goods - Housing - Disease	- Heavy rainfall - River condition change - No implemented measures	- Construction works	- Forecasting & early warning - Deepen the level of river basin
<b>76-A Bucana</b> Once or twice a year Waistline level	- Heavy rainfall  <i>(Note by Morita: Cause?)</i>	- Heavy rainfall, - Blockage by debris	- Relocation of informal settlers - Dredging, deepening, widening	- Construction of dikes - Stop dumping waster along the rivers in Marilog & Bukidnon areas (Stop making our rivers as dumping area of wastes especially those from Marilog and Bukidnon Areas)
<b>Tigatto</b> Twice a year	- Damage on agricultural land, housing/household	- Heavy rainfall - Lower portion of Bbrgy.	- To elevate the flooding area	- Amphibious backhoe for desilting of Davao River

1.5 meters	<ul style="list-style-type: none"> <li>- Pump station</li> <li>- Elevation of the flooded area</li> </ul>	<p>Flood, San Vicente, Lourdes, Jade Valley, Juliville Phase III, San Isidro, Uyanguren, Lote Lote, Sta. Marina at Km10 &amp; Deca</p> <ul style="list-style-type: none"> <li>- Blockage of sand and hard soil “palana” along river lines</li> <li>- Heavy rainfall</li> <li>- River conditions change during time.</li> <li>- Damaged dikes and gabions</li> </ul>	<ul style="list-style-type: none"> <li>- Relocation</li> </ul>	<ul style="list-style-type: none"> <li>- Enforcement of Easement Area (Water code)</li> </ul>
<p><b>Mandug</b> Flooding occurs twice a year, depth and duration depends on the rainfall</p>	<ul style="list-style-type: none"> <li>- Soil erosion along river lines which affects: houses, livestock, agricultural and river itself</li> </ul>	<ul style="list-style-type: none"> <li>- Well-planned river line protections such as dikes, gabions must be well implemented</li> <li>- Signages/ warnings along riverside</li> <li>- Relocation of those living along riverside</li> </ul>	<ul style="list-style-type: none"> <li>- Constructions of well implemented planned river protections</li> <li>- Evacuation drills</li> <li>- Evacuation centers/facilities</li> <li>- Desiltation of rivers</li> </ul>	
<p><b>Waan</b> 1-2 in a year 2-3 hours 5 ft</p>		<ul style="list-style-type: none"> <li>- Drainage problem</li> <li>- Heavy Rainfall</li> <li>- River condition change</li> </ul>	<ul style="list-style-type: none"> <li>- Construction of Dike and drainage</li> </ul>	<ul style="list-style-type: none"> <li>- Early Warning System</li> <li>- Resettlement</li> </ul>
<p><b>Maa</b> 1-2 years From knee to waistline 2-3 hr.</p>	<ul style="list-style-type: none"> <li>- Livestock-evacuation</li> <li>- Agricultural damage</li> <li>- Household damage</li> </ul>	<ul style="list-style-type: none"> <li>- Erosion</li> <li>- Siltation</li> <li>- development/ housing</li> <li>- cutting of trees</li> <li>- heavy rainfall</li> </ul>	<ul style="list-style-type: none"> <li>- Resettlement of People living in flood prone areas</li> </ul>	<ul style="list-style-type: none"> <li>- Additional gabion (1-2 layer)</li> <li>- Resettlement</li> <li>- Construction of dam or closing culvert from creek</li> <li>- Buffer zone</li> <li>- Construction of Flood Gate for every creek going to</li> </ul>

<p><b>8-A</b> Heavy rainfall River condition change</p>	<ul style="list-style-type: none"> <li>- Damage of house/ household goods, livestock</li> <li>- Health, hygiene and sanitation</li> <li>- Appearance of disease</li> </ul>	<ul style="list-style-type: none"> <li>- River Clean-up Drive</li> <li>- Blocked debris must be removed</li> </ul> <p><i>(Note by Morita: Expected measures?)</i></p>	<ul style="list-style-type: none"> <li>- Nobody should live in flood prone areas</li> <li>- Resettlement</li> </ul>	<p>the river</p> <ul style="list-style-type: none"> <li>- Construction of Dike</li> <li>- Resettlement of houses living in a flood prone area</li> <li>- Flood forecasting &amp; Early warning Devices</li> <li>- Enforcement of Water Code</li> </ul>
<p><b>40-d</b></p>			<ul style="list-style-type: none"> <li>- Resettlement</li> </ul>	<ul style="list-style-type: none"> <li>- Construction of Slope Flood Protection</li> </ul>
<p><b>Participated Organization?</b></p>				<ul style="list-style-type: none"> <li>- Establishment of Early warning system for all barangay (Siren, Signages, Operation Center, Rescue Equipment)</li> </ul>

<b>MATINA RIVER</b> (Composed of CEO, EMB, Ms. Mildred Martinez, 74-A, Matina Aplaya)				
<b>ACTUAL CONDITION OF RIVERINE FLOOD</b>	<b>PROBLEM BY FLOOD</b>	<b>CAUSE OF FLOOD</b>	<b>OPINION ON FLOOD ISSUE</b>	<b>EXPECTED MEASURES AGAINST FLOOD</b>
<ul style="list-style-type: none"> <li>- Every year (3x4year) (3times per 4years?)</li> <li>- Ground level</li> <li>- 3 hours</li> </ul>	<ul style="list-style-type: none"> <li>- Housing damages, damage of household goods</li> <li>- Physical Damages</li> </ul>	<ul style="list-style-type: none"> <li>- Heavy rainfall</li> <li>- Subdivision development activity</li> </ul>		
<ul style="list-style-type: none"> <li>- Every Year</li> <li>- Ground level flood</li> <li>- 1hour flood time,</li> </ul>	<ul style="list-style-type: none"> <li>- Physical damage to properties</li> <li>- Housing damage</li> <li>- Damage of HH goods</li> <li>- Loss of lives in 2011</li> </ul>	<ul style="list-style-type: none"> <li>- Heavy Rainfall</li> <li>- Land Use Change</li> <li>- Subdivision/ Housing development</li> <li>- Blockage of debris</li> <li>- Cutting of permanent trees</li> </ul>	<ul style="list-style-type: none"> <li>- Small scale damage can be accepted</li> <li>- Nobody should live in flood prone areas</li> </ul>	<ul style="list-style-type: none"> <li>- Development Regulation</li> <li>- Planting of deep-rooted trees/ vegetables along riverbank</li> <li>- Construction of Dike</li> </ul>
<ul style="list-style-type: none"> <li>- Illegal settlers along the easement of the rivers</li> <li>- Coliforms on the chemical analysis of water along the river</li> </ul>	<ul style="list-style-type: none"> <li>- Damage property</li> <li>- Cause of death</li> </ul>	<ul style="list-style-type: none"> <li>- Climate change</li> <li>- Heavy rain</li> <li>- Land use change</li> <li>- Capacity of river</li> </ul>		<ul style="list-style-type: none"> <li>- Proper assessment channel near Matina Bridge</li> <li>- Proper Urban Planning</li> <li>- Construction of Cut-off channel</li> </ul>

<ul style="list-style-type: none"> <li>- Discharge of mistreated wastewater from different firm</li> </ul>				<ul style="list-style-type: none"> <li>- Improve housing high rise building</li> <li>- Conduct disaster awareness</li> <li>- Organize disaster volunteers</li> </ul>
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<b>TALOMO RIVER</b>					
(Composed of Barangays Tugbok, Sto Niño, Wangan, Calinan, Riverside, Los Amigos, Dalagdag and Lampianao)					
<b>ACTUAL CONDITION OF RIVERINE FLOOD</b>	<b>PROBLEM BY FLOOD</b>	<b>CAUSE OF FLOOD</b>	<b>OPINION ON FLOOD ISSUE</b>	<b>EXPECTED MEASURES AGAINST FLOOD</b>	
Calinan Poblacion Twice a year, Water depth 25 cm Length of time: 2 hours	<ul style="list-style-type: none"> <li>- Silts materials of canal &amp; drainage</li> <li>- Soil Erosion of riverbank and Main channel</li> <li>- Agricultural damage rice field and corn field</li> <li>- Scouring of bridge foundation</li> <li>- Damage on infrastructure slope protection/ bridge school building</li> </ul>	<ul style="list-style-type: none"> <li>- Bad weather condition</li> </ul>	<ul style="list-style-type: none"> <li>- Do not reverse the alignment of water way</li> </ul>	<ul style="list-style-type: none"> <li>- Rehabilitate all drainage system of Calinan Poblacion</li> <li>- Removal of silted materials of river bed</li> <li>- Construction of flood control project of the river bank, dike and sheet pile and rip-rap</li> <li>- Early warning water level</li> <li>- Add equipment like Backhoe</li> </ul>	
Heavy rainfall twice to thrice a year	<ul style="list-style-type: none"> <li>- Agricultural damages</li> <li>- Increase garbage</li> <li>- Soil erosion</li> <li>- Open canal not yet develop</li> </ul>	<ul style="list-style-type: none"> <li>- Heavy rainfall</li> <li>- Land Use change</li> <li>- Heavy rainfall</li> <li>- Improper waste Disposal</li> </ul>	<ul style="list-style-type: none"> <li>- To improve the drainage canal to avoid the housing damage, physical damage</li> </ul>	<b>(Tugbok)</b> <ul style="list-style-type: none"> <li>- To put-up the construction of dikes</li> </ul>	
<b>Gumalang (Davao river upstream, mistake of sitting</b>	(Cause of Flood) <ul style="list-style-type: none"> <li>- Lateral canal</li> </ul>	<ul style="list-style-type: none"> <li>- Lateral canal</li> <li>- Heavy rainfall</li> </ul>		-	

<p><b>table)</b> Twice a year in the month of January to March 1 ½ hours</p>	<ul style="list-style-type: none"> <li>- Heavy rainfall</li> <li>- River condition</li> </ul>	<ul style="list-style-type: none"> <li>- River condition</li> </ul>		
<p>Twice Sept. and December</p>				
<p>Twice a year January to March <b>Dalagdag (Davao river upstream, mistake of sitting table)</b> Frequency: 3 times a year Depth: 10 ft. Flooding time: 6 hours Sediments- boulders w/ debris</p>	<ul style="list-style-type: none"> <li>- Damage to property</li> <li>- Damage to crops (Agri) (rice field)</li> </ul>	<ul style="list-style-type: none"> <li>- Change of river course</li> <li>- Main drain easily filled with sediments</li> </ul>	<ul style="list-style-type: none"> <li>- No resident household stay near the river</li> </ul>	<ul style="list-style-type: none"> <li>- Deepening/ widening if river channel</li> <li>- Construction of dikes/ revetment</li> <li>- Desilting rivers</li> <li>- Address right of way problem</li> <li>- Acquire right of way</li> <li>- Install monuments to mark limit of right of way for flood control</li> </ul>
<p><b>Sto Niño</b></p>		<ul style="list-style-type: none"> <li>- Spill over water is the cause of floods in our area</li> </ul>	<ul style="list-style-type: none"> <li>- Implementation of projects to flood control program</li> </ul>	
<p><b>Riverside</b></p>	<ul style="list-style-type: none"> <li>- Dike</li> </ul>			



# **“The Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City”**

## 2<sup>nd</sup> Stakeholders Coordination Meeting in Davao

### Concept paper

#### 1. Objective

- The coordination meetings aim to widely recognize and share issues related to flood/drainage/tidal flood and coastal erosion in Davao among stakeholders, to facilitate understanding of M/P, smooth implementation of flood control measures and appropriate maintenance and management activities in near future.
- Discussed results are used to understand the local conditions and the local awareness of related organizations and local residents so as to contribute to appropriate M/P formulation activities.
- The meetings will be held three times in Stage 1. The meetings are designed to link with the public consultation for SEA in Stage 2.
- 1<sup>st</sup> meeting was held on January 29<sup>th</sup> focused on riverine flood. 2<sup>nd</sup> meeting will focus on drainage problems.

#### 2. Date and Time

February 20 (Wed.), 2019 from 8 am to 12 am

#### 3. Venue

Grand menseng hotel (tentative)

#### 4. Participants to be invited

80 participants in total

##### Government agencies

- Department of Public Works and Highways Regional Office XI
- DPWH Davao city I District Engineering Office
- DPWH Davao city II District Engineering Office
- Environment Management Bureau
- Department of Environment and Natural Resources XI
- Davao City Disaster Risk Reduction Management Office
- City Engineers Office
- City Planning and Development Office
- City Environment and Natural Resources Office
- City Social Services Development Office
- Davao City Water District
- City Council

## “The Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City”

- Office of the President (Nathaniel D. Dalumpines, Assistant Secretary for Mindanao Concerns)
- Davao River Basin Management Alliance
- National Economic and Development Authority Region XI
- Mindanao Development Authority
- Regional Development Council Region XI
- University of Southeastern Philippine
- Mines and Geosciences Bureau Region XI

### Barangay captains

- 58 Barangay captains **in inland flood prone area**

### 5. Role allocation

Item	DPWH	JICA Project Team
Preparation	<ul style="list-style-type: none"> <li>- Send invitation letter</li> <li>- Confirm participation</li> </ul>	<ul style="list-style-type: none"> <li>- Arrange venue</li> <li>- Arrange necessary equipment (projector, banner, etc.)</li> </ul>
Meeting	<ul style="list-style-type: none"> <li>- Assign staff (4 officials) who will act as program facilitator for the smooth conduct of the stakeholders coordination meeting</li> </ul>	<ul style="list-style-type: none"> <li>- Reception</li> <li>- Time management</li> </ul>
Necessary expenses		<ul style="list-style-type: none"> <li>- Necessary expenses (venue, equipment, etc.) will be covered by JICA Project Team.</li> </ul>

## “The Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City”

### 6. Agenda

Time		Agenda	Presenter
<b>8:00 – 8:15</b>	15min	Registration	-
<b>8:15 – 8:30</b>	15min	Preliminaries - Prayer - Philippine National Anthem - Japan National Anthem - Tayo'y Dabawenyo	-
<b>8:30 – 8:40</b>	10min	Opening Remarks	<i>City government of Davao</i>
<b>8:40 – 9:10</b>	30min	Explanation of the Project, and purpose of today's meeting	<i>Mr. Tadanori Kitamura Storm Drainage Improvement, JICA Project Team</i>
<b>9:10 – 10:10</b>	60min	1 <sup>st</sup> topic: Identification of current problems on drainage	<i>All participants</i>
<b>10:10 – 10:30</b>	20min	Presentation of discussion result of 1 <sup>st</sup> topic	<i>All participants Presented by group leader</i>
<b>10:30 – 10:45</b>	15min	Coffee break	-
<b>10:45 – 11:30</b>	45min	2 <sup>nd</sup> topic: Discussion and recommendation for the future countermeasures	<i>All participants</i>
<b>11:30 – 11:50</b>	20min	Presentation of discussion result of 2 <sup>nd</sup> topic	<i>All participants Presented by group leader</i>
<b>11:50 – 12:00</b>	10min	Closing Remarks	<i>DPWH</i>
<b>12:00 – 13:00</b>	60min	Lunch	

## DISCUSSION POINTS:

### I. IDENTIFICATION OF CURRENT PROBLEMS ON FLOOD

#### GROUP 1

##### *MS. MILDRED MARTINEZ, CONSULTANT*

- Agdao area experienced severe flooding. Sometimes despite of the moderate pour of rain flooding is inevitable. It is because Agdao lacks outfall going to Davao gulf.
- The big canal which caters the water from the whole Agdao district is only the Jerome canal (created by the RCDP projects based on the 1982 masterplan). The Jerome canal and other small canals can no longer cater the water volume after the whole golf course area was being developed (construction of malls and other establishment) and the increase of the population in Agdao area. This is the main reason why Agdao area experienced severe flooding despite of the moderate rainfall.
- Water from the Belisario area passing through the drainage located under the Toyota establishment goes straight to Jerome canal. Due to the development in the natural catch basin which is turned into a gulf course and now was being developed, Jerome canal needs to cater huge volume of water causing flooding in Agdao area. With this, things should be considered before tapping in the Jerome canal in the future.
- Going to the North eastern part, we will find the Sasa creek which is also problematic. Head water in Sasa creek originally comes from the Cabantian. Which passes through [La Verna](#) where the problem is, and then went to the airport. Airport bought hectares made into a catch basin so that water from the airport will not go straight to the areas such as Doña Luisa and Doña Asuncion. Because the catch basin made by the CAAP caters the huge volume of water, Doña Luisa and Doña Asuncion became safe from flooding/ huge amount of water.
- In the case of [La Verna](#), it experiences flooding because some of its drainage are no longer fuctional.
- There was a consultant in the airport before who suggested to create a catch basin before the diversion road to lessen the water that will go to [La Verna](#).
- Sasa Creek, although this creek was developed by the City, due to improper disposal of waste/ garbage and silted materials Sasa Creek is already insufficient to cater the huge volume of water.
- There is a need to check on the Pagamikan creek.
- Agdao district and [La Verna](#) area in Cabantian should be prioritized since these are the areas that experienced severe flooding.
- Common problems caused by flood includes damage to household; inconvenience to commuters who were stranded due to blockage in diversion road caused by the flood in [La Verna](#).
- Damages due to flooding were experienced in Agdao and Sasa areas.
- Some subdivisions were constructed without easement which narrowed the natural waterways.
- In the case of Lanang creek, informal settlers and housing development contribute to the incidence of flooding.

- To be able to clean the creek informal settlers should be relocated from the creek.
- In the junction of R. Castillo and Jerome canal there are construction materials that were just irresponsibly thrown/ left by the workers. These materials caused clogging in the waterways.
- Failure to construct the actual form/design of a drainage upon constructions can also contribute to flooding since it may have an insufficient capacity.
- [La Verna](#) is a perennial problem we need to focus on.

## GROUP 2

### **EDWIN LIWAG, BRGY. ADMINISTRATOR (LEON GARCIA)**

- Unfinished construction works/ rehabilitation of the drainage system is one of the reasons of flooding particularly in Agdao Area. Unfinished works may cause blockage of water in a certain area which causes to overflow.
- **LEON GARCIA**
  - The most affected by flood in the barangay was the fly-over located in Carpenter, Leon Garcia st. This was due to the unfinished construction in the interior area of the barangay that blocked the water flow which causes it to overflow.
  - In the barangay roads the perennial problem is the irresponsible residents throwing their garbage anywhere.
  - Higher sea level is one of the reasons why flooding is difficult to resolve in the area. So, no matter how deep the digging is, no matter what will be the improvement of the drainage, if there is a 'leverage' on the high tide and the occurrence of rain, flooding is inevitable.
  - Flooding caused skin diseases such as scabies and leptospirosis. Leon Garcia has a recorded case of leptospirosis.
- It was observed by the presenter that drainage system in Davao City was implemented by various contractors. With this, there are different plans and designs being implemented. So he suggested having only one contractor and one plan for the whole drainage in Davao City.
- Development Regulation;
  - It was observed that in the area where development is fast, building contractors let the water with mixed cement flow freely to the nearby drainage/canals. This will later on hardened and may cause clogging. It is the responsibility of the government officials to monitor the development in the City. Create rules and regulations to address such problem; regulate the developers for them to avoid throwing their construction waste to the sewers/ drainage in the city.

### **FRANCISCO LABRO, BRGY. COUNCILOR (15-B)**

- Brgy 15-B caters the wastes coming from Brgy.16,17,18 and 20. In Cervantes corner Lapu-lapu, the drainage needs to be rehabilitated. However, there was no action from the City Engineer's Office. The barangay already made a request but it was not yet granted by the CEO. *(This concern was answered by the CEO officer present in the meeting. Engr. Allen A. Tibos before presenting the output of the group 3 said that, CEO made an initial action on this concern. They already sent an official to check on the area. After checking the official said that it needs to be cleaned first before CEO can proceed with the rehabilitation of the drainage. She emphasized that Ancillary Service Unit (ASU) needs to clean-up the drainage first. The current barangay chairperson of Barangay 15-B, Ms. Fradilyn Labro elaborated that ASU already check the area and after the inspection ASU officers said to forward the concern to CEO since rehabilitation is highly needed. She (the brgy. Chairperson) checked with CEO and was informed that they are just waiting for the materials to rehabilitate the drainage. Further she said that she proposed to CEO to use their Annual Development Plan to rehabilitate the drainage but*

*CEO insisted to just wait for the materials, which until now she's waiting for an update. She added that right now Lapu-lapu changed its culvert that does not match with the old culvert.)*

- There is a need to deepen the open canal located in the entrance of Barangay Agdao, so that waters from Sobrecarey and Sales will flow smoothly to the sea. However, dissilting, cleaning and digging is not being done regularly which unables the canal to cater huge volume of water.

### **GROUP 3**

#### ***ENGR. ALLEN A. TIBOS, CEO***

- On the actual condition of flooding in the area, presenter said that if high tide causes the flood they cannot do anything since it was a natural phenomenon.
- Importance of proper waste disposal was being stressed.
- Solid Waste Management is considered to be the major problem in the City. With the improper waste disposal, garbage will go to water outlet/ canal that will soon cause flooding.

### **GROUP 4**

#### ***FIDELO G. ALMIRANTE, Barangay Chairperson (30-C)***

- The importance of properly coordinating with barangay adjacent to where **the national project** will be **implemented**. *(As stated by Barangay Chairperson Mr. Fidelo G. Almirante, what happened in their area, 2 years ago there was a national project implemented in Sta. Ana Avenue. In this project, they put-up a big culvert in the area going to huge creek in barangay 15-B. In order to do so, they need to tapped in the drainage of brgy. 30-C. After that, Villa Abrille St. which is not flooding before the construction, is now experiencing flooding up to knee level, since flood water needs to fill-in first their area before going to the creek located in Buyayang. If the CPDO or CEO will allow him he will put sack of sand in the Sta. Ana culvert to stop the flooding in their barangay. He added that he tried to stop them in tapping in their drainage, but he was informed by the contractor that it was part of their design to tap in the barangay drainage for constructing the said project.)*
- He emphasized on the importance of proper coordination between the barangays and the agency that will implement the project.
- A barangay proposed a drainage project worth 3 million pesos, however they were stopped by the DPWH because they will implement the same project, which until now the barangay is not aware of the status.

### **Group 5**

#### ***CHERYLYN M. RULIDA, Brgy. Councilor (39-D)***

- In the incidence of high tide and heavy downpour of rain, flooding occurs especially in the area of Almendras Gym located in Barangay 39-D. This flood lasts less than 10 minutes.
- Resident in Brgy. 39-D were advised to wear rubber boots whenever it is flooding to avoid leptospirosis and other diseases.
- Whenever flood water level reaches the houses of the residents, it caused damage to their properties such as appliances. This also became a threat to the safety of the individuals, especially if water reaches the areas where sockets are attached (current sources)
- Improper waste disposal is also the reason of flooding. Everytime the barangay will conduct a clean-up drive they were able to get sacks of garbages.
- Silted materials (small rocks, sand) occupied the canals. Desiltation was being conducted by the barangay through City Engineers Office is only good within the week after desilting. They understand that they cannot easily request CEO because of their schedules.

#### ***NOEL LOMANTA, BRGY. COUNCILOR (32-D)***

- Canal/Drainage and garbage is the main problem of the City
- *(Requested the City Engineers' Office to check on the drainage after a commercial/private building construction. As he observed in their area, constructor after constructing a new establishment/ building they will just leave the drainage unclean and upon closing the manhole, they are unable to return it properly. Then the barangay will be the one to cater the complaint from the residents when flooding occurs. Engr. Ildefonso Coronica Jr from CEO, thank the barangay councilor for raising that concern. He reminded the barangay officials, that CEO lacks manpower to monitor all establishments/building being constructed in the city, in this case the barangay officials has the right to reprove the constructors. They can look for the drainage clearance, if they cannot present such document the barangay officials have the right to suspend the operation. It is undeniable that securing a drainage permit is often neglected by some constructors, they eventually proceed with the construction, CEO might not be aware so the barangay can intervene then inform the CEO.)*

***ANITA BONJOC, Barangay Chairperson (36-D)***

- Expressed her appreciation to the act of the CEO official who paid a visit in her office before putting up a drainage project in their area. It is important to coordinate with the barangay so that they can also give their suggestions. Since the barangay played vital role in maintaining/ cleaning/disilting their drainage/canals.
- Requested the CEO to strictly implement the issuance of drainage clearance to the commercial/private establishments.

**GROUP 6**

***EDGARDO INZON, BRGY. COUNCILOR (26-C)***

- Encountered a problem with the box canal located in their area, which is already full of soil reason why flood water level increased.

***LORETO R. LACIDA JR., BRGY. COUNCILOR (28-C)***

- Raised a concern regarding the rehabilitation of their canal system.
- In December 2018, DPWH already concreted the road in Governor Sales st., however its canal both side are not yet fixed until this time. Requested the DPWH to check the area to give recommendation on the next step to fix the drainage system in the area.

**II. DISCUSSIONS AND RECOMMENDATIONS FOR THE FUTURE COOUNTERMEASURES**

**GROUP 1**

***LITO ONGCAY, BRGY. COUNCILOR (CABANTIAN)***

- Cabantian is more on housing development with 46 subdivisions. But unfortunately, it was not properly regulated, causing flooding in the Sta. Teresita going to Angliongto then it traverses to Barangay Hizon and Buhangin. Too much volume of water caused flooding in Diversion road. Due to soil erosion the volume of water is getting bigger as time passed by.
- Expressed his desire to know from the MGB, DENR and other concerned agencies if how they regulated these subdivisions; how they foresee its environmental and social impact.
- Laverna is the most problematic area, which flooding caused damage to property and worst loss of lives. With this, Mr. Ongcay encouraged the MGB, DENR, HLURB to check on the area.
- Requested the above-mentioned agency to check on the new subdivisions (North Crest and North town) which is situated in the upper part Cabantian, to take for a consideration the safety of the residents residing in the lower area, if they will put a catch basin to cater the volume of water from a hundred to 200 hectares subdivision there is a possibility that it will collapsed in the years to come.

## **GROUP 2**

*JOSE GAMOLO, Punong Barangay (17-B)*

- Davao City is at sea level; completion of the coastal road can minimize the flooding incidence in the City.
- Encouraged the concerned agencies such as DPWH, CEO and LGU in partnership with flooded barangays (adjacent barangays) to conduct a simultaneous clean-up drive in its drainage.

Leon Garcia,

- Observed that some of the drainage constructed by DPWH and CEO are not on the same level/depth. He observed it particularly in Laverna, Cabantian.
- Duplication of the plan being implemented to be kept by the concerned offices as a reference for the next contractor who will continue the project.
- Unfinished construction works by DPWH and CEO caused by lack of manpower and equipment also causes flood.

## **Group 3**

- Strict implementation of the ‘no build zone policy’ under the disaster law (RA 10121). The adaptation of this act should start in the barangay level through barangay resolution, since the barangay are more aware with the situation of their constituents.
- Barangay should formulate and strictly implement ordinance related to the ‘no build zone policies’ particularly in flood prone areas.
- Drainage measurement are not properly implemented; the barangay ‘committee on infrastructure should assist DPWH and CEO in checking the proper implementation of infrastructure project particularly drainage.
- Project implementation should be properly coordinated with the barangay to be able for the barangay level to allocated budget from their IRA and integrate the urgent infrastructure needs in their Barangay Development Plan (BDP)
- Intensive advocacy on policies on preparedness and mitigation
- Before granting a building permit to subdivision/commercial buildings make sure that the preparedness polices are being considered such as, the developers should implement the rainwater catchment law/ rain water harvesting law.
- Emphasize the importance of waste segregation that should start from the household.

## **GROUP 4**

- Solid waste management should be prioritized. The attitude (discipline) of every individual is highly needed particularly in the manner of properly segregating their wastes. No matter how huge the drainage that will be put-up in Davao City, flooding will still occur if wastes segregation is being neglected.
- Increase the penalty for the violators of the Solid waste management, and strictly monitor its implementation in the barangay level.

## **GROUP 5**

- Remove/change the old and small culverts with a big one that can accommodate the volume of water.
- Construction of lateral drainage and canal.
- Implement SWM in every barangay to lessen clogging in canals.
- Flood awareness symposium in every barangay to emphasis the importance of taking care our waterways (canals) to avoid back flow

## **GROUP 6**



- Constant monitoring of all construction works in the City. There should be inspector from CPDO, CEO, DPWH

## GROUP OUTPUTS

Group 1				
Actual Condition	Problem by Flood	Cause of Flood	Opinion for Flood Issue	Expected Measures against flood
<p>➤ <b>Brgy. Cabantian</b> La Verna 2 to 5 times a year; 1 to 4 meters-water depth; 1 to 5 hrs. length of flooding <u>Sta. Teresita/Villa park</u> 1-2 meters overflow; 1-5 times a year; 1 hr. flooding time.</p> <p>➤ <b>Brgy. Sasa</b> <u>Bolton relocation-F. Bangoy Bridge;</u> Frequency- twice a year; water depth-3 ft.; Length: 2 hours within the day</p> <p>➤ <b>Brgy. Hizon</b> Occurrence of heavy rainfall at <u>Amherstia street, Nova Tierra Village</u> and <u>Aquino St. Corner Sto. Domingo</u> <u>Academy at Sto. Domingo,</u> <u>Subdivision.</u> Knee depth high during rainfall. Flood subsides two (2) hours after the rain stops</p> <p>➤ <b>Brgy. Angilongto</b> <u>Roseville Subdivision Purok</u> 2-5 times a year; depth knee level; <u>Belisario Subdivision</u> 2 to 5 times a year depth reaches neck level.</p> <p>➤ <b>Brgy. Lapu-lapu</b> Flood every heavy rainfall; 4 inch to 8 inch at <u>Jerome big canal;</u> 4 to 10 inches at <u>Davao Farm Village</u></p> <p>➤ <b>Brgy. Pampanga</b> During heavy rain depending on the duration of the rain; 4-7 ft. <u>Sto Domingo I Subdivision</u> Flood depth reaches knee level</p>	<p>➤ <b>Brgy. Cabantian</b> La Verna Damage of household goods; hygiene issue; unpassable road; disruption of traffic; Vehicles are stocked-up. <u>Sta. Teresita/Villa park</u> Damage of Household; unpassable road <b>Brgy. Sasa</b> Appliance, personal belongings, furniture, house damage; Disease such as leptospirosis, skin diseases.</p> <p>➤ <b>Brgy. Hizon</b> Damaged to households, housing damage, diseases, health issues</p> <p>➤ <b>Brgy. Angilongto</b> Damage of household Property; Health Household belongings such as TV, refrigerator, sofa, beds and etc.</p> <p>➤ <b>Brgy. Lapu-lapu</b> Children can't go to school due to high level of water; Lot of garbage are in the coastal area outfall.</p> <p>➤ <b>Brgy. Pampanga</b> Household belongings TV, ref., sofa, bed etc.</p>	<p>➤ <b>Brgy. Cabantian</b> La Verna Heavy rainfall; silted canal <u>Sta. Teresita/Villa park</u> Heavy rainfall; massive housing development</p> <p>➤ <b>Brgy. Sasa</b> Heavy rainfall <u>Sasa Creek</u> Downstream of airport; insufficient capacity; silted canal; insufficient creek easement</p> <p>➤ <b>Brgy. Hizon</b> Clogged canals fronting residences who have closed canals upon construction of residential driveways.</p> <p>➤ <b>Brgy. Angilongto</b> Heavy rainfall; silted canal</p> <p>➤ <b>Brgy. Lapu-lapu</b> Every heavy rainfall and high tide; garbage outfall</p> <p>➤ <b>General</b> Agdao barangays lack outfall going to the sea. Poor construction of drainage structures not supervised. Some drainage is not connected properly to main drains Construction debris are thrown into drainage lines. Development are not controlled. Indiscriminate filling of lands, to save them from flooding</p>	<p>➤ <b>Brgy. Cabantian</b> La Verna Construction works by government organizations <u>Sta. Teresita/Villa park</u> To monitor housing/ subdivision construction by housing and environment agencies.</p> <p>➤ <b>Brgy. Sasa</b> Houses affected are located in the middle of the creek "danger zone" Flood can have devastating consequences which can affect the economy, environment and people.</p> <p>➤ <b>Brgy. Hizon</b> The clogged canals must be opened therefore, residential driveways/ excess of their owned lot which blocked these open canals must be removed for canals to be examined for recommendation from City Engineer's Office</p> <p>➤ <b>Brgy. Lapu-lapu</b> Allocate budget for construction of canals.</p> <p>➤ <b>Brgy. Pampanga</b> It can be solved by construction works- flood prone areas</p>	<p>➤ <b>Brgy. Cabantian</b> La Verna Construction of Drainage <u>Sta. Teresita/Villa park</u> Strict implementation of housing policies and environmental awareness/ program</p> <p>➤ <b>Brgy. Sasa</b> Desilting the creek Construction of drainage Regular drainage clean-up Early warning The government should come-up with a comprehensive long-term plan on flood control</p> <p>➤ <b>Brgy. Hizon</b> Cleaning and clearing of drainage canals; rehabilitation of drainage system; No flood occurrence.</p> <p>➤ <b>Brgy. Lapu-lapu</b> extension of seawall; extension of line canal outfall Weekly coastal clean-up Bayanihan (Community working together) for Canal clean-up</p> <p>➤ <b>Brgy. Pampanga</b> Construction of Drainage; cleaning of drainage; flood forecasting; early warning</p>

		<ul style="list-style-type: none"> <li>- Construction materials (Sand, Gravel, Debris) at construction sites are not properly stock piled.</li> <li>- Washed away during rain.</li> <li>- Forms are not removed from construction manhole or similar structures causing obstruction</li> </ul>		
<b>GROUP 2</b>				
<p><b>Actual Condition</b></p> <ul style="list-style-type: none"> <li>➤ <b>Brgy. 15-B</b> Every time there's a heavy rainfall and high tide only; Water depth: 1 ft, flooding time: 1 hr.</li> <li>➤ <b>Brgy. Aquino</b> During heavy rainfall/ continuous rain</li> <li>➤ <b>Others</b> <ul style="list-style-type: none"> <li>- Garbage/ hightide/ Unclean small drainage</li> <li>- Installation of undersized cross drains along canals at driveways causing flow constriction</li> <li>- During heavy downpour of rain</li> <li>- During the heavy rain coupled with the high tide. There's about 1 foot of water that lasts for a couple of hours or so.</li> <li>- Disposing of garbage and other solid wastes into drainage/canals causing clogging</li> </ul> </li> </ul>	<p><b>Problem by Flood</b></p> <ul style="list-style-type: none"> <li>➤ <b>Brgy. 15-B</b> Damage of household goods; hygiene issue</li> <li>➤ <b>Brgy. Aquino</b> Household goods</li> <li>➤ <b>Leon Garcia</b> Streets Flood</li> <li>➤ <b>JP Laurel</b> If heavy rain along JP Laurel high water level/ due to clogging/ drainage problem</li> <li>➤ <b>Others</b> <ul style="list-style-type: none"> <li>- Rain garbage</li> <li>- Clogged drainage</li> <li>- Skin/foot diseases</li> <li>- Sanitation</li> <li>- Hygiene issue</li> <li>- Disruption of Traffic</li> <li>- Disrupt livelihood/ business activities</li> <li>- Damage to appliances and houses. Diseases like leptospirosis, scabbies.</li> <li>- Slow down and obstructs traffic both for vehicles and pedestrians.</li> </ul> </li> </ul>	<p><b>Cause of Flood</b></p> <ul style="list-style-type: none"> <li>➤ <b>Brgy. Aquino</b> <ol style="list-style-type: none"> <li>1. High water level at drainage</li> <li>2. Clogging drainage such plastics, bottles, etc.</li> </ol> </li> <li>➤ <b>Brgy. 15-B</b> Clogged drainage in the ff. areas: <ul style="list-style-type: none"> <li>1. Sobrecarey</li> <li>2. Cervantes corner Lapu-lapu</li> </ul> </li> <li>- Obstacle and siltation of drainage in Agdao Creek</li> <li>➤ <b>Others</b> <ul style="list-style-type: none"> <li>- Solid waste thrown into canal</li> <li>- Some drainage/canal are condemned or not serviceable</li> <li>- Back flow of sea water during high tide</li> <li>- Small drainage canal</li> <li>- Some area has small drainage that caused overflowing</li> <li>- Clogged canals and drainage due to improper garbage disposal, heavy rainfall and high tide.</li> </ul> </li> </ul>	<p><b>Opinion for Flood Issue</b></p> <ul style="list-style-type: none"> <li>➤ <b>Brgy. Aquino</b> <ol style="list-style-type: none"> <li>1. Drainage improvement</li> <li>2. Proper disposal of garbage</li> </ol> </li> <li>➤ <b>Brgy. 15-B</b> <ol style="list-style-type: none"> <li>1. Governmental organizations construction works.</li> <li>2. Minimize siltation and clean the drainage</li> </ol> </li> <li>➤ <b>Others</b> <ul style="list-style-type: none"> <li>- There should be proper waste disposal, government should closely monitor the construction of buildings wherein the waste cement goes directly to the main drainage.</li> </ul> </li> </ul>	<p><b>Expected Measures against flood</b></p> <ul style="list-style-type: none"> <li>➤ <b>Brgy. Aquino</b> Proper monitoring of the new drainage system.</li> <li>➤ <b>Brgy. 15-B</b> <ol style="list-style-type: none"> <li>1. Rehabilitation of the drainage in Cervantes corner Lapu-lapu St.</li> <li>2. Clean-up drive in clogged drainage.</li> </ol> </li> <li>➤ <b>Others</b> <ul style="list-style-type: none"> <li>- There should be a rehabilitation of the City's drainage system</li> <li>- The barangays should do its part by cleaning the interior canals.</li> <li>- There should be a strict development regulation</li> <li>- Early warning and forced evacuation should be non-negotiable.</li> </ul> </li> </ul>

**GROUP 3**

Actual Condition	Problem by Flood	Cause of Flood	Opinion for Flood Issue	Expected Measures against flood
<ul style="list-style-type: none"> <li>- Every high tide or twice a month (1-2 hours)</li> <li>- 0.2 to 0.5 meter during high tide and heavy downpour</li> </ul>	<ul style="list-style-type: none"> <li>- Disruption of school classes</li> <li>- Economic issues</li> <li>- Damage of properties, life, livestock/agriculture</li> <li>- Disruption of traffic</li> <li>- Traffic issues</li> <li>- Health issues</li> <li>- Opportunity for looting</li> </ul>	<ul style="list-style-type: none"> <li>- Poor maintenance</li> <li>- Construction of building without proper drainage</li> <li>- Improper disposal of garbage</li> <li>- Lack discipline on proper waste disposal</li> <li>- Lack of drainage system at subdivisions</li> <li>- Heavy rainfall</li> <li>- High tide level</li> <li>- Mono cropping</li> <li>- Gutters along roads full of sediments, silt, gravel</li> <li>- Informal settler along waterway reduced drainage capacity</li> <li>- Damages Riverbank Protection</li> <li>- Insufficient drainage capacity</li> <li>- Erection of houses over canals.</li> <li>- Encroachment of main drains.</li> <li>- Maintenance of drainage is being neglected</li> <li>- Some commercial establishments have no grease traps.</li> <li>- Land use change</li> <li>- Increasing frequency and magnitude of rainfall</li> </ul>	<ul style="list-style-type: none"> <li>- Relocation of residents from flood prone areas.</li> <li>- Proper implementation of existing law regarding proper drainage measures.</li> <li>- Intensive advocacy on policies on preparedness and mitigation.</li> </ul>	<ul style="list-style-type: none"> <li>- Construction of flood control and drainage facilities.</li> <li>- Rain water catchment or rain water harvesting facility.</li> <li>- Sustainable Urban Drainage (SUD's) application</li> <li>- Non-structural measures; flood forecasting and early warning; drills and evacuation</li> <li>- Enforcement by Government agencies of appropriate regulation to preserve water ways (nat)</li> </ul>

GROUP 4			
Actual Condition	Problem by Flood	Cause of Flood	Opinion for Flood Issue
<ul style="list-style-type: none"> <li>➤ <b>Brgy. 6-A</b></li> <li>- During heavy rains, we have flood that lasts for 30 minutes then subsides.</li> <li>➤ <b>USEP Obrero</b></li> <li>- Flooding occurs in the campus during continuous heavy rains.</li> <li>➤ <b>F. Torres St. and JP Laurel venue</b></li> <li>- Flood will occur during heavy rains but will take only 30 mins to 1 hr., 1ft</li> <li>➤ <b>Others</b></li> <li>- Natural retarding basins are reclaimed for urban settlements</li> <li>- Invert elevation at outfalls are below sea level. Back flow occurs during heavy rain and high tide.</li> <li>- Some inlet is inadequately sized and spaced that's why there is water ponding.</li> <li>- Poor inlet design. Examples use of PVC pipe (small size) easily clogged.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. 6-A</b></li> <li>- Heavy rains</li> <li>➤ <b>USEP Obrero</b></li> <li>- Students and faculty/ staff are stranded, school records and files were damaged.</li> <li>➤ <b>F. Torres</b></li> <li>- Heavy Traffic</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. 6-A</b></li> <li>- Drainage System.</li> <li>➤ <b>USEP Obrero</b></li> <li>- Lowered elevation compared to road elevation.</li> <li>➤ <b>Others</b></li> <li>- Heavy rainfall</li> <li>- Garbage/ clogging</li> <li>- Constriction of natural waterways along the stretch of Cabanian creek.</li> <li>- Unproper tapping of culverts/ elevation</li> <li>- LGU and National Government do not have enough modern drainage cleaning equipment (Ex. Vactor)</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. 6-A</b></li> <li>- Drainage cleaning; proper disposal of solid waste</li> <li>➤ <b>Others</b></li> <li>- Strict adherence to Solid waste Management ordinance;</li> <li>- More punitive legislation for violation on environmental laws.</li> <li>- Flood problem should be solved asap because it causes much inconvenience and discomfort.</li> </ul>
			<ul style="list-style-type: none"> <li>- Cleaning of Drainage</li> <li>- Solid waste management</li> <li>- Construction of Drainage.</li> </ul>
GROUP 5			
Actual Condition	Problem by Flood	Cause of Flood	Opinion for Flood Issue
<ul style="list-style-type: none"> <li>- Overflowing of some canals happened only during heavy downpour of rain and occurred during high tide but subsided later on at low tide.</li> <li>- Closure of natural waterways by land owners because the waterway is part of their property as stated in their land title</li> <li>- No clean-up after construction. Lines are full just after construction</li> <li>- Use of poor-quality pipes joints; not properly made.</li> <li>- Natural creeks not segregated for title (Land)</li> </ul>	<ul style="list-style-type: none"> <li>- Health issues</li> <li>- Leptospirosis</li> <li>- Skin Diseases</li> <li>- Damage to property</li> <li>- Threat to one's life</li> <li>- Traffic congestion</li> <li>- Loss of man's hours of work</li> <li>- Negative effect on transportation cost</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. 37-D</b></li> <li>- Some areas have no canals (Interior canals)</li> <li>➤ <b>Others</b></li> <li>- No catch basin</li> <li>- Clogging</li> <li>- Silt</li> <li>- High tide</li> <li>- Improper waste disposal</li> <li>- Heavy rainfall</li> <li>- Non-rehab/ clean-up of Roxas Avenue open canal</li> <li>- Waste from construction materials.</li> </ul>	<ul style="list-style-type: none"> <li>- The actual situation in our barangay, after the complete construction along boulevard area we notice the increase volume of water in our barangays during heavy rains</li> <li>- Construction debris are thrown into drainage lines.</li> </ul>
			<ul style="list-style-type: none"> <li>- Rehabilitate all existing old-line canal and drainage based on actual flow of water volume</li> <li>- De-clogging desilting activities</li> <li>- Construction of more drainage system</li> <li>- Good solid waste management (Strict implementation of City ordinance 0631-10)</li> <li>- Flood awareness to residents</li> <li>- More drainage equipment like vactors</li> </ul>

**GROUP 6**

Actual Condition	Problem by Flood	Cause of Flood	Opinion for Flood Issue	Expected Measures against flood
<p>➤ <b>Brgy. 28-C</b> During heavy rain water depth is 2 feet and will last for almost 1 hour along <a href="#">D. Suazo st., Juan Luna St. and R. Magsaysay Avenue</a></p> <p>➤ <b>Brgy. 25-C</b> Simultaneous Occurrence of Heavy Rains &amp; High tide: It only occurs in 2-5 minutes.</p> <p>➤ <b>Brgy. 26-C</b> Full of soil R. Magsaysay exit to Lizada Brgy. 1 ½ meters wide deep 6 ft. below the ground box canal</p> <p>- During heavy rain length of flooding time is 2 hours in <a href="#">Damaso Suazo St. between Monteverde and Uyanquien</a></p> <p>- <a href="#">Gempesaw corner boulevard</a> clogging drainage manhole; road damage at <a href="#">Ponce Corner Boulevard</a></p> <p>➤ <b>Brgy. 21-C</b> Flood along <a href="#">Fatima extension in front of GKK Sta Cruz</a></p> <p>➤ <b>Brgy. 24-C</b> Overflow of canal along <a href="#">Fatima St. corner Jacinto St.</a></p>	<p>➤ <b>Brgy. 28-C</b> 1. Students community were stranded</p> <p>2. Disposal of pile in the area</p> <p>➤ <b>Brgy. 25-C</b> It will disrupt the traffic condition. Muddy flood will enter into houses.</p> <p>➤ <b>Brgy. 27-C</b> Disease; damage of structures; traffic</p> <p>➤ <b>Brgy. 21-C</b> Damage of household goods</p> <p>➤ <b>Others</b> Disrupt traffic</p> <p>- Stranded Commuters</p> <p>- Replacement of culverts and enlargement of canal along Jacinto St.</p> <p>- Physical Damage</p> <p>- Damage of Household goods</p> <p>- Disrupting of traffic</p> <p>- Hygiene issue</p>	<p>➤ <b>Brgy. 28-C</b> 1. Reoccurring clogging</p> <p>2. Needs repair/ rehabilitation</p> <p>3. No output of Waste to main outlet</p> <p>4. Solid Waste Disposal (Piled scattered in the area)</p> <p>➤ <b>Brgy. 25-C</b> - Poor drainage system; simultaneous occurrence of high tide and heavy rainfall</p> <p>- People abusive of their garbage of not properly throwing it.</p> <p>➤ <b>Brgy. 27-C</b> - Heavy rain. Clogged drainage system, no proper garbage disposal (in some purok)</p> <p>➤ <b>Brgy. 22-C</b> 1. High water level during high tide</p> <p>2. Obstacle and siltation in drainage</p> <p>➤ <b>Brgy. 21-C</b> - Canal clogging and High tide</p> <p>➤ <b>Others</b> - Inadequate drainage system</p> <p>- Drainage slopes are either flat or reversed</p> <p>- Heavy rainfall: high water level at drainage outlet</p> <p>- During rainy season and high tide, the sea water flows to Roxas Avenue canal it causes flood</p> <p>- Obstructed silted drainage</p>	<p>- Flood issues comes only if it is taken for granted.</p> <p>- The community should help each other in conducting a clean-up drive headed by the brgy. Council.</p> <p>- Construction of drainage in the interior area and elevate the drainage by taking out the cause of the problem then improve the drainage system.</p> <p>- Check issuance of building permit and monitor there are encroachment of canal.</p> <p>- Proper drainage system proper garbage disposal operation clean-up</p> <p>- Nobody should live in flood-prone area.</p> <p>- Concrete drainage both sides will be implemented.</p> <p>- Brgy. Budget for monthly de-clogging of canal and purok re-orientation on solid waste management program</p> <p>- Constant monitoring of all construction in the city by DPWH and City Planning: Inspectors!</p>	<p>➤ <b>Brgy. 28-C</b> Campaign in school regarding proper garbage disposal</p> <p>- No drainage outflow at Sales street</p> <p>- Improvements/repair/ rehab</p> <p>- Reclogging of drainage system.</p> <p>➤ <b>Brgy. 25-C</b> 1. Clean-up drive monthly</p> <p>2. Construction of drainage in the interior and educate constituent to be concerned</p> <p>➤ <b>Brgy. 22-C</b> 1. Improvement of drainage along Suazo St. Extension</p> <p>2. Clean-up drainage</p> <p>➤ <b>Others</b> - Construction of drainage; clean all possible flood prone areas.</p> <p>- Construction of big culvert</p> <p>- Elevate roads</p> <p>- City must have drainage maintenance laborer for de-clogging of canal</p>

			<ul style="list-style-type: none"> <li>- Solid waste laws not strictly implemented</li> <li>- Maintenance of drainage not given importance</li> <li>- No advance acquisition of ROW for drainage purpose</li> </ul>		
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# **“The Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City”**

## 3<sup>rd</sup> Stakeholders Coordination Meeting in Davao

### Concept paper

#### 1. Objective

- The coordination meetings aim to widely recognize and share issues related to flood/drainage/tidal flood and coastal erosion in Davao among stakeholders, to facilitate understanding of M/P, smooth implementation of flood control measures and appropriate maintenance and management activities in near future.
- Discussed results are used to understand the local conditions and the local awareness of related organizations and local residents so as to contribute to appropriate M/P formulation activities.
- The meetings will be held three times in Stage 1 of November 2018 to August 2019. The meetings are designed to link with the public consultation for Strategic Environmental Assessment (SEA) in Stage 2 and 3 of September 2019 to August 2020.
- The 1<sup>st</sup> meeting was held on January 29<sup>th</sup> focused on riverine flood and the 2<sup>nd</sup> meeting was held on February 20<sup>th</sup> focused on drainage problem. This 3<sup>rd</sup> meeting will focus on tidal flood and coastal erosion.

#### 2. Date and Time

April 24 (Wed.), 2019 from 8 am to 12 am

#### 3. Venue

The Pinnacle Hotel and Suites, Sta. Ana Avenue, Davao City 8000

#### 4. Participants to be invited

80 participants in total

##### Government agencies

- Department of Public Works and Highways Regional Office XI
- DPWH Davao city I District Engineering Office
- DPWH Davao city II District Engineering Office
- Environment Management Bureau
- Department of Environment and Natural Resources XI
- Davao City Disaster Risk Reduction Management Office
- City Engineers Office
- City Planning and Development Office
- City Environment and Natural Resources Office



## “The Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City”

- City Social Services Development Office
- Davao City Water District
- City Council
- Office of the President (Nathaniel D. Dalumpines, Assistant Secretary for Mindanao Concerns)
- Davao River Basin Management Alliance
- National Economic and Development Authority Region XI
- Mindanao Development Authority
- Regional Development Council Region XI
- University of Southeastern Philippine
- Mines and Geosciences Bureau Region XI

### Barangay captains

- 53 Barangay captains along coastal area

### 5. Role allocation

Item	DPWH	JICA Project Team
Preparation	<ul style="list-style-type: none"> <li>- Send invitation letter</li> <li>- Confirm participation</li> </ul>	<ul style="list-style-type: none"> <li>- Arrange venue</li> <li>- Arrange necessary equipment (projector, banner, etc.)</li> </ul>
Meeting	<ul style="list-style-type: none"> <li>- Assign staff (4 officials) who will act as program facilitator for the smooth conduct of the stakeholders coordination meeting</li> </ul>	<ul style="list-style-type: none"> <li>- Reception</li> <li>- Time management</li> </ul>
Necessary expenses		<ul style="list-style-type: none"> <li>- Necessary expenses (venue, equipment, etc.) will be covered by JICA Project Team.</li> </ul>

## “The Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City”

### 6. Agenda

Time		Agenda	Presenter
<b>8:00 – 8:15</b>	15min	Registration	-
<b>8:15 – 8:30</b>	15min	Preliminaries - Prayer - Philippine National Anthem - Japan National Anthem - Tayo'y Dabawenyo	-
<b>8:30 – 8:40</b>	10min	Opening Remarks	<i>City government of Davao</i>
<b>8:40 – 9:10</b>	30min	Explanation of the Project, and purpose of today's meeting	<i>Dr. Daiki Tsujio Storm Surge Control and Sediment Management, JICA Project Team</i>
<b>9:10 – 10:10</b>	60min	1 <sup>st</sup> topic: Identification of current problems on tidal flood and coastal erosion	<i>All participants</i>
<b>10:10 – 10:30</b>	20min	Presentation of discussion result of 1 <sup>st</sup> topic	<i>All participants Presented by group leader</i>
<b>10:30 – 10:45</b>	15min	Coffee break	-
<b>10:45 – 11:30</b>	45min	2 <sup>nd</sup> topic: Discussion and recommendation for the future countermeasures	<i>All participants</i>
<b>11:30 – 11:50</b>	20min	Presentation of discussion result of 2 <sup>nd</sup> topic	<i>All participants Presented by group leader</i>
<b>11:50 – 12:00</b>	10min	Closing Remarks	<i>DPWH</i>
<b>12:00 – 13:00</b>	60min	Lunch	

## DISCUSSION POINTS

### Group 1 (RODOLFO B. TE, Barangay Daliao, Chairperson)

#### Identification of the Current Problems on Coastal Flood

- Abnormal rise of sea water during hightide. It reaches almost at the doorsteps of the houses residing along coastal areas.
- Coastal flood resulting to damages of properties. Last January 22, alone it brought down 8 houses and leave tens of houses destroyed.
- Binugao has eroded shorelines during hightides.
- In Daliao, there was a 50m sea wall which was destroyed due to typhoon, sea swell, hightide and monsoon. Houses and fishing boats were also damaged.
- In Daliao, hygiene is one of its primary problem. Because of its very poor community, they lack comfort room. Human dirt was thrown directly to the sea. The barangay tried to solve the problem by putting public comfort rooms but due to number of residents it was already full.
- Barangay Binugao, encountered a problem with their farm goods such as coconut and corn during the flooding.
- One of the causes of the rise in water level in Daliao is the presence of the Davao Fish Port Building.
- In Barangay Sirawan, there was a school wall which collapsed due to big waves.

#### Opinion on Coastal Flood

- Nobody should live in flood prone areas; Relocate the constituents living in flood prone areas.
- Sea wall is a good measure to lessen the impact of the big waves in the barangays in coastal areas.
- The barangay officials being more knowledgeable on their areas, should not just rely on other government agencies to solve the problems related to flooding particularly coastal flooding. Since the barangay officials are well aware of their situation, they should be helping the concerned agencies particularly the CEO, in identifying the proper areas to put the drainages and canals, so that flooding will be minimized.
- In Barangay Daliao, there is a need to improve its sea wall, because it was heavily damaged.
- Strict implementation of the RA 9003; the city mayor already gave an order to **bantay-dagat** in apprehending the violators of the law.

#### Expected Measures

- Construction of dikes, sea wall, and installation of early warning including signages for the evacuation areas.
- Should conduct evacuation drills among the members of the community.
- Dumping/ improper disposal of garbage in waterways, is one cause of flooding.

### Group 2 (Engr. Newton Apao, DEO)

#### Identification of the Current Problems on Coastal Flood

- According to the barangay chairperson of Brgy. 76-A Bucana, they experienced flooding 7 times a year it has a depth of 0.5m inland flooding which subsides after 2 hours.
- Every month during hightides, coastal barangays experienced flooding.
- During the flooding fishing equipment were destroyed.
- There were debris coming from the sea, this debris takes almost 10 trucks before it will be completely removed in the area.

- There is a need to relocate the people residing in the sea areas, which makes them totally affected during high waves.
- There were lots of garbage found in the barangay 76-A, because it is located near Davao River, during flooding garbage coming from different areas were accumulated in the barangay.
- There is a need to construct a slope, coastal protection and a sea wall in the Poblacion area.
- Drainage should be improved, since it was observed that even light rain can cause flooding.

#### **Expected Measures**

- Early warning devices should be installed in the areas and the constituents must be fully aware about it.
- Construction of higher sea wall.
- Evacuation for affected families. It is a common situation especially in the Poblacion area that houses were built above the sea water. For these families to be removed there should be an identified relocation site for them.
- Poor government funding to solve the issue on coastal flooding. It's a good thing for the Poblacion area and the other barangays that will be covered by the coastal road, since it can serve as their protection on coastal flooding.
- No more people should be living in coastal area, since it will cause a them a problem on hygiene.

#### **Group 3 (FRADILYN M. LABRO, Chairperson 15-B)**

##### **Opinion on Coastal Flood**

- LGU should take action on the problem regarding the coastal flood and highways.
- Improvement of sea wall, drainage and road.
- Observe proper waste disposal.
- Construction of coastal road and resettlement to affected families.
- Construction of seawall dikes and drainage rehabilitation.
- 15-B, there was no action taken by the CEO in the problem experienced by the barangay due to the uneven drainage located in Lapu-lapu street corner Cervantes St. This uneven drainage caused the water from barangays 16,17,18 and 20 to be stocked-up in the area. This problem was raised during the conduct of the 2nd stakeholders meeting.

##### **Expected Measures**

- There is a need to implement the proper waste management and apply the 3Rs.
- There should be an Early warning for flood and high wave forecast, especially in water levelling. Currently, due to the absence of proper activity venue such as covered court, barangay 15-B relies on Google weather forecast to check weather condition every time they have an activity.
- Since manpower and budget is lacking in the barangays, Brgy. 15-B in conducting a monthly drainage clean-up drive is coordinating with the 4ps and UCT's (Unconditional Cash Transfer) beneficiaries. They find it effective because the beneficiaries are willing to help. There was even a private company who connected with the barangay which offered to provide cleaning materials and foods for the conduct of the clean-up drive on the April 27<sup>th</sup>.
- In terms with the relocation, the chairperson of Brgy. 15 encourages the other barangay officials to coordinate with the City Housing Division in City Planning.

- The ordinance regarding the residential collection on garbage fee should be implemented. Through this, the barangay can easily track who are the people irresponsibly throwing their garbage. The current practice is the residents are paying children to throw their garbage, in implementing the ordinance the barangay personnel will be the one to collect the garbage to assure that it will be thrown properly.

#### **Group IV (NERIO PASAJE, Councilor Barangay Vicente Duterte)**

##### **Identification of the Current Problems on Coastal Flood**

- Flooding affects the economy, since flooding refrain the workers to go to their workplace the barangays needs to subsidize.
- The National Government should look for a place to relocate the residents in the coastal area to minimize the effect of the flooding due to heavy rain and high tide.

##### **Expected Measures**

- Rehabilitate the drainage; current situation is the water coming from barangay Aquino to San Antonio clogged in Barangay Duterte because of the narrow drainage.
- Plant and maintain mangroves along coastal area.
- Install pumping station to prevent flooding in some area.

#### **Group V (Doce Apostol, Chairperson Barangay Panacan)**

##### **Expected Measures**

- Monitor informal settlers, because as time passed by the numbers of the settler is increasing.
- Continuous road widening in Panacan affects some HH leading them to put-up their houses in coastal areas. Currently, HH which are affected by the government projects are encouraged to create an association. This association will look for a lot then the government will purchase the lot for their relocation.
- Coastal cleaning helps reduce the garbage in the coastlines.
- Construction of sea walls is highly recommended since it can highly protect the barangays during high waves.
- Proposal to put up a gate valve in drainage, since putting up he culvert in the coastal became useless, the water just come back in the land which caused flooding.
- Declogging of drainage, although the people are aware of the law, they still kept on improperly throwing their garbage.
- Resettlement for the HH/families in high risk areas, however the government is having a problem with the area to relocate them. The area for relocation is far from the workplace/ source of income of the affected residents.

**GROUP 1 (West Area)**

Actual Condition of Coastal Flood and High Wave	Problem by Coastal Flood and High Wave	Cause of Coastal Flood and High Wave	Opinion for Coastal Flood and High Wave	Expected Measure against Coastal flood and High Wave
<ul style="list-style-type: none"> <li>➤ <b>Brgy. Daliiao</b></li> <li>• There is an abnormal rise of sea water during high tide. It reaches almost at the doorstep of the houses residing along coastal areas.</li> <li>• Coastal flood resulted to damage of properties last January 22 alone, it brought down 8 houses and leave ten houses destroyed.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. Daliiao</b></li> <li>• The 150 m of seawall was destroyed. Houses and fishing boats were damaged.</li> <li>• Hygiene issues</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. Daliiao</b></li> <li>• Typhoon</li> <li>• Monsoon</li> <li>• Sea swell</li> <li>• Land use change</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. Dumoy</b></li> <li>• People must be educated to be a responsible care taker of the environment.</li> <li>• Government and community must solve by construction works.</li> <li>• Nobody must live in flood prone areas.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. Dumoy</b></li> <li>• Construction of dikes</li> <li>• Construction of seawall</li> <li>• Early warning</li> <li>• Evacuation drill</li> <li>• Resettlement</li> </ul>
<ul style="list-style-type: none"> <li>• Coastal flood resulted to damage of properties last January 22 alone, it brought down 8 houses and leave ten houses destroyed.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. Binugao</b></li> <li>• Damage of crops</li> <li>• Damage of properties</li> <li>• Damage of household goods</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. Dumoy</b></li> <li>• Monsoon wave</li> <li>• Typhoon</li> <li>• High Tide</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. Bago Aplaya</b></li> <li>• Nobody should live in coastal area</li> <li>• Need revetment of seawall/gabion</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. Sirawan</b></li> <li>• Construction of dike</li> <li>• Seawall</li> <li>• Development regulations</li> </ul>
<ul style="list-style-type: none"> <li>➤ <b>Brgy. Bago Aplaya</b></li> <li>• Every month during high tide/ full moon</li> <li>• 5-6 hours length of flooding time</li> <li>• Every 5 years for monsoon</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Others</b></li> <li>• Damage to household</li> <li>• Damage to houses</li> <li>• Injury/death</li> <li>• Damage to property located along the coast (houses, buildings, fences, walls, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Others</b></li> <li>• Monsoon</li> <li>• High tide</li> <li>• Sea swell</li> <li>• Typhoon</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. Sirawan</b></li> <li>• No apparent subdivision regulation</li> <li>• No seawall</li> <li>• Lack of canal planning</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Others</b></li> <li>• Relocation of residents from flood prone areas.</li> <li>• Dumping of garbage in a waterway.</li> <li>• Construction of drainage</li> <li>• Construction of seawall</li> </ul>
<ul style="list-style-type: none"> <li>➤ <b>Brgy. Dumoy</b></li> <li>• Coastal flood every July, August, September</li> <li>• Flood depth: 5 ft.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Others</b></li> <li>• Address current and future health/ sanitation problems</li> <li>• The issue on coastal flood and high wave must be addressed ASAP before a major disaster will occur.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. Daliiao</b></li> <li>• Improve the seawall</li> <li>• Relocate residents on flood prone area</li> <li>• Strict implementation of RA 9003 Solid waste management</li> <li>• Improve and de-clog drainages.</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Others</b></li> <li>• Address current and future health/ sanitation problems</li> <li>• The issue on coastal flood and high wave must be addressed ASAP before a major disaster will occur.</li> </ul>	<ul style="list-style-type: none"> <li>• Relocation of residents from flood prone areas.</li> <li>• Dumping of garbage in a waterway.</li> <li>• Construction of drainage</li> <li>• Construction of seawall</li> </ul>

GROUP 2 (Poblacion 1)				
Actual Condition of Coastal Flood and High Wave	Problem by Coastal Flood and High Wave	Cause of Coastal Flood and High Wave	Opinion for Coastal Flood and High Wave	Expected Measure against Coastal flood and High Wave
<ul style="list-style-type: none"> <li>• 7 times/ year</li> <li>• Minor damage</li> <li>• 0.5 m flood subsidence in approximately 2 hours</li> </ul>	<ul style="list-style-type: none"> <li>• Fisherman livelihood damage (boat, fishing nets, bongsood)</li> <li>• Hygiene issue</li> <li>• Garbage problem from debris coming from the sea</li> <li>• Relocation of Residents</li> <li>• Debris from sea (gapnod)</li> <li>• Flooding due to high tide</li> </ul>	<ul style="list-style-type: none"> <li>• Monsoon, typhoon</li> <li>• Construction of slope (flood) protection under the Bolton Bridge</li> <li>• Coastal protection, breakwater</li> <li>• Improvement of drainage system</li> <li>• Proper garbage disposal</li> <li>• Climate Change</li> </ul>	<ul style="list-style-type: none"> <li>• We are saved by the coastal road.</li> <li>• No one should be allowed to construct houses along the coastal area.</li> <li>• Coastal floods and high waves are always a threat to one's life and properties.</li> </ul>	<ul style="list-style-type: none"> <li>• Early warning advice</li> <li>• Construction of higher seawall</li> <li>• Relocation for affected families</li> <li>• More government funding to solve the issue on coastal flooding.</li> </ul>

**GROUP 3 (Poblacion 2)**

Actual Condition of Coastal Flood and High Wave	Problem by Coastal Flood and High Wave	Cause of Coastal Flood and High Wave	Opinion for Coastal Flood and High Wave	Expected Measure against Coastal flood and High Wave
<ul style="list-style-type: none"> <li>➤ <b>Brgy. 21-C</b></li> <li>• Coastal Road</li> <li>• Construction of Sea wall</li> <li>• Construction of dike</li> <li>➤ <b>Brgy. 14-B</b></li> <li>• Clogging of canal due to improper waste disposal</li> <li>➤ <b>Brgy. 25-C</b></li> <li>• Narrow canal</li> <li>➤ <b>Brgy. 23-C</b></li> <li>• Drainage and garbage during the high tide</li> <li>➤ <b>Brgy. 24-C</b></li> <li>• Drainage problem along Jacinto St., corner Fatima St., overflow even without rain</li> <li>➤ <b>Others</b></li> <li>• Clogged drainage along Suazo St.</li> <li>• Drainage problem</li> <li>• Output from Suazo Ext., Brgy. 28 to 25-C</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. 21-C</b></li> <li>• House destruction</li> <li>• Flooding 5 hours</li> <li>• Canal clogging</li> <li>➤ <b>Others</b></li> <li>• Traffic</li> <li>• Housing damage</li> <li>• Hygiene issue</li> <li>• Physical Diseases</li> <li>• Damage of property and disturbance on day to day activity</li> <li>• Mostly no septic tank/ CR</li> <li>• Overflowing of drainage and canal when high tide and coastal flood comes.</li> <li>• Leptospirosis</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. 21-C</b></li> <li>• Monsoon wave</li> <li>➤ <b>Others</b></li> <li>• Typhoon</li> <li>• Heavy Rain</li> <li>• Clogging drainage</li> <li>• Throwing garbage anywhere</li> <li>• Heavy rain</li> <li>• Improper waste disposal</li> <li>• Drainage of Gempesaw brgy. 26 going to brgy. 23 water outlet needs big culvert.</li> <li>• Need de-clogging of 130x canal from brgy. 23 to 26-C and Ramon Magsaysay</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Brgy. 23-C</b></li> <li>• Improvement of seawall, drainage and road</li> <li>➤ <b>Brgy. 15-B</b></li> <li>• No actions taken with regards to our concern in Lapu-lapu st. corner Cervantes St. new and old culvert caused clogging.</li> <li>➤ <b>Others</b></li> <li>• Suspension of work/ school establishment.</li> <li>• Relocate and educate the people along the coastal area.</li> <li>• Proper waste disposal</li> <li>• Construction of coastal road and resettlement for the affected family.</li> <li>• Construction of seawalls and dikes; and drainage rehabilitation</li> <li>• We the LGU should take action on the matter.</li> </ul>	<p><b>Brgy. 15-B</b></p> <ul style="list-style-type: none"> <li>• Implement city ordinance no. 0291-17 sec. 293, collection of 50 pesos per household for the garbage fee so that the barangay personnel will be the one to throw the garbage instead of paying kids who irresponsibly dispose the collected garbage anywhere.</li> <li>• Deepen the Agdao creek near Banggoy St.</li> <li>• Construction works in our problem in the clogged drainage in Lapu-lapu st. corner Cervantes St.</li> <li>➤ <b>Others</b></li> <li>• Proper waste management</li> <li>• Early warning forecast</li> <li>• Flood and high wave forecasting and early warnings.</li> <li>• Conduct clean-up drive</li> <li>• Coordinate with LGU on proper waste disposal</li> <li>• Coordinating council for the maintenance of coastal flooding manpower budget.</li> <li>• Government agencies must construct seawalls and coastal roads.</li> </ul>



**GROUP 4 (Agdao Area)**

Actual Condition of Coastal Flood and High Wave	Problem by Coastal Flood and High Wave	Cause of Coastal Flood and High Wave	Opinion for Coastal Flood and High Wave	Expected Measure against Coastal flood and High Wave
<ul style="list-style-type: none"> <li>➤ <u><b>Brgy. Vicente Duterte</b></u> <ul style="list-style-type: none"> <li>• Affected by heavy rainfall &amp; high tide</li> </ul> </li> <li>➤ <u><b>Brgy. Agdao Proper</b></u> <ul style="list-style-type: none"> <li>• Heavy rain during high tide causes flood in our area.</li> </ul> </li> <li>➤ <u><b>Brgy. W. Aquino</b></u> <ul style="list-style-type: none"> <li>• High waves</li> <li>• Monsoon waves 3 days caused damage of houses and property.</li> </ul> </li> <li>➤ <u><b>Brgy. San Antonio</b></u> <ul style="list-style-type: none"> <li>• Heavy rains</li> <li>• Full implementation (RA 9003)</li> </ul> </li> <li>➤ <u><b>Others</b></u> <ul style="list-style-type: none"> <li>• High waves during monsoon</li> <li>• High waves: August to September</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>➤ <u><b>Brgy. Duterte</b></u> <ul style="list-style-type: none"> <li>• Housing damage</li> <li>• Damage household goods, appliances.</li> </ul> </li> <li>➤ <u><b>Brgy. San Antonio</b></u> <ul style="list-style-type: none"> <li>• Flash back of water or high wave</li> <li>• Rehabilitate all box culvert</li> </ul> </li> <li>➤ <u><b>Others</b></u> <ul style="list-style-type: none"> <li>• Coastal erosion</li> <li>• Accumulation of solid waste along coastal areas</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>➤ <u><b>Brgy. Duterte</b></u> <ul style="list-style-type: none"> <li>• Heavy rainfall</li> </ul> </li> <li>➤ <u><b>Brgy. San Antonio</b></u> <ul style="list-style-type: none"> <li>• Open canals convert into culvert</li> <li>• Clogging of box culvert</li> <li>• Diseases (skin irritation)</li> </ul> </li> <li>➤ <u><b>Others</b></u> <ul style="list-style-type: none"> <li>• Strong winds</li> <li>• Flash back of waters from monsoon wave cause overflow of drainage</li> <li>• Heavy rainfall, high water level at drainage outlet, obstacle and situation in drainage, land use change, subdivision development activity, no implemented measure.</li> <li>• Typhoon + LPA (Low Pressure Area) + High tide</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Affect the economy, environment and people</li> <li>• Coastal flooding affects us economically</li> <li>• Resettlement of houses along coastal.</li> <li>• Engaged in management of coastal flood; programs and creation of coastal flood management council.</li> </ul>	<p>Expected Measure against Coastal flood and High Wave</p> <ul style="list-style-type: none"> <li>➤ <u><b>Brgy. W. Aquino</b></u> <ul style="list-style-type: none"> <li>• Construction of dike/ sea walls</li> <li>• Proper drainage</li> <li>• Clean-up drive</li> </ul> </li> <li>➤ <u><b>Others</b></u> <ul style="list-style-type: none"> <li>• Rehabilitation and construction of drainage and dikes.</li> <li>• Construct infrastructure to mitigate wave causing damages in coastal areas.</li> <li>• Provide adequate drainage system</li> <li>• Plant and maintain mangroves along designated coastal areas.</li> <li>• Maintain cleanliness along coastal areas.</li> <li>• Construct sea wall and other appropriate infrastructures along coastal area</li> <li>• Construction of dikes</li> <li>• Pumping station</li> <li>• Rehabilitate all creeks</li> </ul> </li> </ul>

**GROUP 5 (North Area)**

Actual Condition of Coastal Flood and High Wave	Problem by Coastal Flood and High Wave	Cause of Coastal Flood and High Wave	Opinion for Coastal Flood and High Wave	Expected Measure against Coastal flood and High Wave
<ul style="list-style-type: none"> <li>➤ <b><u>Brgy. Ilang</u></b></li> <li>• High wave during monsoon</li> <li>➤ <b><u>Brgy. V. Hizon Sr.</u></b></li> <li>• High tide and big waves during monsoon months</li> <li>• Happens every year</li> <li>• Depth: 1 m at shoreline</li> <li>➤ <b><u>Bunawan Proper</u></b></li> <li>• Twice a year</li> <li>• 5 hours</li> <li>➤ <b><u>Brgy. Tibungco</u></b></li> <li>• A minimal disaster incidents every year because our barangay is surrounded by Mati and Samal Island.</li> <li>• Coastal flooding twice a year.</li> <li>• 4 hours</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b><u>Brgy. V. Hizon Sr.</u></b></li> <li>• Physical damage shoreline</li> <li>➤ <b><u>Others</u></b></li> <li>• Damage of household goods, disease, hygiene issue</li> <li>• Disruption of traffic</li> <li>• Damage of household goods</li> <li>• Cause traffic</li> <li>• Physical damages</li> <li>• Causes disease</li> </ul>	<ul style="list-style-type: none"> <li>➤ <b><u>Brgy. Ilang</u></b></li> <li>• High tide</li> <li>➤ <b><u>Brgy. Tibungco</u></b></li> <li>• Typhoon</li> <li>• LPA (Low Pressure Area)</li> <li>• High tide</li> <li>➤ <b><u>Brgy. Sasa</u></b></li> <li>• High tide level: 5 m</li> <li>• No dike</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor all illegal settlers</li> <li>• Flood and high wave forecasting and early warning.</li> <li>• Reconsider implementation of proper setbacks / easements along shorelines.</li> <li>• Continue coastal clean-up along shoreline</li> <li>• Constant monitoring &amp; control of informal settlers along coastlines by the brgy.</li> </ul>	<ul style="list-style-type: none"> <li>• Construction of seawall</li> <li>• De-clogging of drainage</li> <li>• Resettlement for families within high risk area.</li> <li>• Infrastructure projects to mitigate damage (seawalls, dikes, drainage systems, etc.)</li> </ul>

## Second Round

**2nd Round Stakeholders' Coordination Meeting in Davao  
on the Project for  
Master Plan and Feasibility Study on Flood Control and Drainage in Davao City**

**AGENDA**

DAY-1: River Flood

Date: July 23, 2019

Venue: Garnet Room, Pinnacle Hotel, Davao City

	<b>Time</b>	<b>Agenda</b>	<b>Presenter, Facilitator</b>
0	08:00 - 08:15	Registration	Secretariat
1	08:15 - 08:30	Preliminaries - Prayer - Philippine National Anthem - Japan National Anthem - Tayo'y Dabawenyo  Opening Remarks	JET Secretariat  <b>Engr. Alejandro A. Sosa</b> Project Manager III Unified Project Management Office-Flood Control Management Cluster
2	08:30 - 08:40	Introduction	<b>Mr. Kenichi Kuramoto</b> Environmental and Social Expert
3	08:40 - 09:05	Quick Environmental Evaluation of the Project site	<b>Ms. Ara Charise Salcedo, EnP; and, Mr. Ershad S. Ibba, Sociologist</b> DPWH-Environmental and Social Safeguard Division DPWH Central Office
4	09:05 - 09:30	Outline of Flood Control Methodology	<b>Mr. Kenichi Kuramoto</b> Environmental and Social Expert, and; DPWH
5	09:30 - 09:45	Orientation of the Group Work	<b>Mr. Kenichi Kuramoto</b> Environmental and Social Expert
6	09:45 - 10:00	- Coffee Break	
7	10:00 - 11:10	Group Work	Facilitated by JET and DPWH
8	11:10 - 12:00	Presentation and Discussion	
9	12:00 - 12:10	Conclusion	<b>Mr. Kenichi Kuramoto</b> Environmental and Social Expert
10	12:10 - 12:20	Closing Remarks	<b>Engr. Alejandro A. Sosa</b> Project Manager III Unified Project Management Office-Flood Control Management Cluster
11	12:20 -	Lunch	-

## Master Plan and Feasibility Study on Flood Control and Drainage in Davao City

Second Round of Stakeholders' Coordination Meeting  
Garnet Room, Pinnacle Hotel and Suites, Davao City  
July 23, 2019

### Group 1: Davao River Upstream

Flood Control Measures	Opportunities	Risks
Levees/Flood Wall	<ul style="list-style-type: none"> <li>▪ To houses/community near meandering of the river – Suawan</li> <li>▪ Protection of the community vulnerable to flooding - Suawan</li> <li>▪ Riverbanks will be protected from Soil Erosion/Landslides- Tamugan</li> <li>▪ Job Opportunities and Safety for Families - Gumalang</li> </ul>	<ul style="list-style-type: none"> <li>▪ Land owner may oppose the installation of flood wall- Gumalang</li> <li>▪ Shallow river beds causes flood water to spill immediately to nearest community</li> <li>▪ Bantol Security</li> <li>▪ Displacement of IP communities from the prospected area</li> <li>▪ Possible destruction of the traditional landmarks/burial sites/ritual grounds</li> <li>▪ Disturbance of flora and fauna</li> </ul>
Flood Way/Cut-Off Works	<ul style="list-style-type: none"> <li>▪ Less Property Damage - Bantol</li> </ul>	
Retarding Pond	<ul style="list-style-type: none"> <li>▪ To regulate the flow of heavy water downstream</li> </ul>	
Other		
<ul style="list-style-type: none"> <li>▪ Warning/Evacuation System in Barangay Malamba</li> <li>▪ Installation of Early Warning System such as Electric Siren and Radio Base Communication at Apo Base</li> </ul>		

### Support/Assistance from Barangays

For warning evacuation system, to inform the community of the incoming flood – Lacson	Temporary Evacuation during Heavy Calamities
Inform our constituents especially IPs on the benefits of the project- Gumalang	To inform the community for the implementation of the project - Lacson
Planting of Banyan Trees – Pangyan	To give a barangay regulation protecting the ongoing project activity, cooperation of the community is necessary.

**Master Plan and Feasibility Study on Flood Control and Drainage in Davao City**

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The project implementor shall undergo FPIC to promote equal rights for the IPs	
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Note: The groups were assisted by the Counterpart Agencies, National Government Agencies and Local Government Unit.

## Master Plan and Feasibility Study on Flood Control and Drainage in Davao City

Second Round of Stakeholders' Coordination Meeting

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July 23, 2019

### Group 2: Davao River Downstream

Flood Control Measures	Opportunities	Risks
Levees/Flood Wall	<ul style="list-style-type: none"> <li>▪ Erosion Control</li> <li>▪ Prevents water overflow</li> </ul>	
Flood Way/Cut-Off Works	<ul style="list-style-type: none"> <li>▪ Easy Access of Water Downstream</li> <li>▪ Prevent overflow of water</li> </ul>	
Retarding Pond		No available properties for the project
Evacuation/ Warning Signs	<ul style="list-style-type: none"> <li>▪ Beneficial Well Informed Communities</li> <li>▪ Availability of Evacuation Center</li> </ul>	
Other		
<ul style="list-style-type: none"> <li>▪ Plant Malibago Trees instead of Gabion for River Protection</li> <li>▪ Gabion project is ongoing</li> <li>▪ River Mixed Materials are used for road maintenance</li> </ul>		

### Support/Assistance from Barangays

Help Massive Information Campaign for the Proposed Projects to the Communities	Massive and Intensive IEC on affected areas and residents	Use spoils to maintain the dredging operation, example: fuel, maintenance operation
Intensify safety and security measures especially with Women, Children, PWDs, Senior Citizens, Pregnant Women	Inform the responsible agencies if there are problems that may arise during implementation	Barangay 8-A Urgent needs <ul style="list-style-type: none"> <li>- Dike</li> <li>- Information and Education Campaign</li> </ul>
Information Regarding the Proposed Plan/Project	Improve Vicinity of Warning/Evacuation Signages	Proper Disposal of Waste Put up Signages for Disaster Preparedness – e.g. water level, evacuation area
Barangay Officials are also monitoring the ongoing project/s	Comprehensive Resettlement Program Implementation	Purchase the necessary equipment for disaster and calamity

## Master Plan and Feasibility Study on Flood Control and Drainage in Davao City

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### Group 3: Matina River

Negative Impact	Positive Impact	Support/Assistance from Barangays
<p>Cut Off Work in Matina Pangi and Matina Crossing</p> <ul style="list-style-type: none"> <li>- Loss of Agricultural Land</li> <li>- Difficulty in acquiring right of way</li> <li>- Cost of Acquisition</li> </ul>	<p>Cut-off Work</p> <ul style="list-style-type: none"> <li>- Easy water flow (avoid blockage)</li> <li>- Reduced flooding</li> <li>- Avoid damage on property and loss of lives</li> <li>- Recreation and tourism areas</li> </ul>	<p>Brgy Captains will help in the negotiation on land acquisition</p>
<p>Desiltation and Widening of Matina River</p> <ul style="list-style-type: none"> <li>- Displacement of informal settlers along matina riverbanks</li> </ul>	<ul style="list-style-type: none"> <li>▪ Dam in Matina Biao and Biao Escuela</li> <li>▪ Flood Wall in Matina Aplaya</li> </ul>	<p>Brgy Officials will conduct information drive</p>



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### Group 4: Talomo River

Flood Control Measures	Opportunities	Risks
Levees/Flood Wall	<ul style="list-style-type: none"> <li>▪ Leveed Banks to Use As Promenade (Mintal)</li> <li>▪ Create New Access and Road Network</li> <li>▪ Protected Low Level Area</li> <li>▪ Residence are enjoy to use as alternative road-right-of-way</li> </ul>	<ul style="list-style-type: none"> <li>▪ Informal Settlers along Riverbanks – social concern</li> <li>▪ Rapid Urbanization/Tree Cutting</li> <li>▪</li> </ul>
Flood Way/Cut-Off Works	<ul style="list-style-type: none"> <li>▪ Old River Course Can Be Utilized as Relocation Site for Affected</li> </ul>	<ul style="list-style-type: none"> <li>▪ Cut-Off Work</li> <li>▪ Environmental Risk – Loss of Biodiversity Dependent on Water</li> <li>▪ Erosion</li> <li>▪ Disturbance of the Natural Flow of Nature Causing Long Term Environmental Impact</li> </ul>
Retarding Pond	<ul style="list-style-type: none"> <li>▪ A Livelihood Activity – Fishing/Boating</li> <li>▪ A Destination – Floating Restaurant</li> <li>▪ Besides Retarding Pond will rise medium tenement of ISF ( Mintal)</li> </ul>	<ul style="list-style-type: none"> <li>▪ ISF Resettlement to be Addressed</li> </ul>
Early Warning Evacuation System	<ul style="list-style-type: none"> <li>▪ Information Education Campaign</li> <li>▪ Barangay to identify those who need special assistance during emergencies</li> </ul>	<ul style="list-style-type: none"> <li>▪ Victims Can be Properly Accommodated</li> <li>▪ Reduce Casualties/Damage</li> </ul>

### Support/Assistance from Barangays

Before	During	After
<ul style="list-style-type: none"> <li>▪ Trees Tagging by Barangay Level and Limit Cutting</li> <li>▪ Request Funding from the Office of Congressman of the Third District</li> <li>▪ Social Preparation through</li> </ul>	<ul style="list-style-type: none"> <li>▪ Facilitate Right of Way For Equipment Use on the Project to Private Lot Owner</li> <li>▪ Organize ISF for CMP Program thru SHFC</li> </ul>	<ul style="list-style-type: none"> <li>▪ Encourage reforestation and landscaping and provide safe play areas</li> <li>▪ Increase areas for MRF Facilities (Barangay)</li> <li>▪ Barangay supports utilization</li> </ul>

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<p>Barangay Intervention prior to project execution</p> <ul style="list-style-type: none"><li>▪ Awareness to be executed by barangay official</li></ul>		<p>and increase deployment of trucks- JICA to provide ASAP</p> <ul style="list-style-type: none"><li>▪ Periodical (every 2 months) clean up drive at Talomo River</li><li>▪ Educate Barangay Constituents of Garbage Disposal</li><li>▪ Provide Composting and Recycling Facilities To Manage Garbage</li><li>▪ Strict Enforcement Garbage – Mintal</li></ul>
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**AGENDA**

DAY-2: Inland Flooding

Date: July 24, 2019

Venue: Garnet Room, Pinnacle Hotel, Davao City

	<b>Time</b>	<b>Agenda</b>	<b>Presenter, Facilitator</b>
0	08:00 - 08:15	Registration	Secretariat
1	08:15 - 08:30	Preliminaries - Prayer - Philippine National Anthem - Japan National Anthem - Tayo'y Dabawenyo  Opening Remarks	JET Secretariat  <b>Engr. Alejandro A. Sosa</b> Project Manager III Unified Project Management Office-Flood Control Management Cluster
2	08:30 - 08:40	Introduction	<b>Mr. Kenichi Kuramoto</b> Environmental and Social Expert
3	08:40 - 09:05	Quick Environmental Evaluation of the Project site	<b>Ms. Ara Charise Salcedo, EnP; and, Mr. Ershad S. Ibba, Sociologist</b> Environmental and Social Safeguard Division DPWH Central Office
4	09:05 - 09:30	Outline of Flood Control Methodology	<b>Mr. Kenichi Kuramoto</b> Environmental and Social Expert; and, DPWH
5	09:30 - 09:45	Orientation of the Group Work	<b>Mr. Kenichi Kuramoto</b> Environmental/Social Expert
6	09:45 - 10:00	- Coffee Break	
7	10:00 - 11:10	Group Work	Facilitated by JET and DPWH
8	11:10 - 12:00	Presentation and Discussion	
9	12:00 - 12:10	Conclusion	<b>Mr. Kenichi Kuramoto</b> Environmental and Social Expert
10	12:10 - 12:20	Closing Remarks	<b>Engr. Alejandro A. Sosa</b> Project Manager III Unified Project Management Office-Flood Control Management Cluster
11	12:20 -	Lunch	-

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### Group 1

	Flood control measures	Benefits	Risks
IMPROVEMENT CONSTRUCTION OF DRAINAGE	Open canal at/with road pathway. Drainage construction <ul style="list-style-type: none"> <li>▪ From Green Heights to Spring valley to Ladislawa Village</li> </ul>	<ul style="list-style-type: none"> <li>▪ Station improvement at outfall going up to source of storm water.</li> <li>▪ Costal clean up for outfall</li> <li>▪ Bayanihan</li> </ul>	<ul style="list-style-type: none"> <li>▪ Relocation for affected PLT. / public area residence</li> <li>▪ Illegal settlers</li> </ul>
UNDERRGROUND RESERVIOIRS	<ul style="list-style-type: none"> <li>▪ Proposed retarding pond and reservoir at Magsaysay Park at the same time pumping station</li> <li>▪ Construction city gate to St. Mary</li> </ul>	Re-open waterway at St. Mary avenue	
LAND-USE MANAGEMENT	<ul style="list-style-type: none"> <li>▪ Brgy. Angliongto Improvement of Culvert along Angliongto ave. from 48" diameter to 72" diameter culvert.</li> </ul>	Box culvert at Jerome to R. Castillo	Public land No acquisition of lot.
PUBLIC INVOLVEMENT	Brgy. Angliongto  The whole stretch of Mamay creek should be dissented and properly rehabilitated which should also have periodic management.	Proper installation of creeks <ul style="list-style-type: none"> <li>▪ Enlarging the area of canal at Jerome to Brgy. R. Castillo</li> </ul>	Illegal dumping of waters

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	<p>Brgy. Anglionto</p> <ul style="list-style-type: none"> <li>▪ Improvement of Mamay creek outfall of water at fortune homes (Brgy. Hizon)</li> </ul> <p>Pumping station at laverna hills should automatically turns on when water level rises ( Brgy. Cabantian)</p>	<p>Suggested solution</p> <p>Construct open channel storm drainage canal outfall at Davao Gulf</p>	<p>Illegal structures over the canal Mamay Creek</p>
	<p>Installation of retarding pond/ inform of Laverna Hills</p>	<p>Change the small culvert to big culvert across the R. Castillo High way and D. Zuno St. Brgy. Uberde</p>	

### Support/Assistance from Barangays

<p>Strict compliance of concern govt. agency DPWH, COA, city and Brgy. Officials of a completed and fully finish project. ( clean from const. debris/materials in constructed open or culvert canal)</p>	<p>More people involved means faster and bigger job completion</p>	<p>BRGY. GOV. DUTERTE</p> <ul style="list-style-type: none"> <li>▪ Flash flood occurred during heavy rain coming from Brgy. Aquino. Particular purok NHA 1 and NHA 2</li> </ul>
<p>Identify the area and do consultation and support Brgy. Residence or ordinance.</p>	<p>Accommodates existing and future problem that an area has and will have.</p>	<p>Maintenance of main canal at Jerome</p>
<p>Information dissemination whatever program/ project mandated by the government</p>	<p>Desilting all river bank and creek</p>	

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### Group 2

Flood control measures	Benefits	Risks
Brgy. Gov. P. Bangoy <ul style="list-style-type: none"> <li>▪ Installation of drainage at Amber St. to connect main drain of Dacudao main canal</li> <li>▪ Upgrade drainage at N.Tores to Davao Gulf.</li> <li>▪ Installation of drainage at garnet St. main drain at Dacudao main canal</li> </ul>	<ul style="list-style-type: none"> <li>▪ Clean cup main canal</li> <li>▪ Box culvert improvement every barangay</li> <li>▪ Increase in cross sectional area at Shanghai creek</li> </ul>	Flood walls
Matina Aplaya <ul style="list-style-type: none"> <li>▪ Drainage improvement</li> <li>▪ Pumping station in Huang Matina Aplaya</li> </ul>		Displacement of illegal settlers along the river bank
Brgy.20-B <ul style="list-style-type: none"> <li>▪ Drainage improvement</li> <li>▪ Establishment of required retarding pond to all community establishment</li> <li>▪ Installation of water reservoir or permeable pavement for all roads and parking areas of all commercial establishment</li> </ul>	<ul style="list-style-type: none"> <li>▪ Prevent or mitigate flooding</li> </ul>	<ul style="list-style-type: none"> <li>▪ Traffic congestion during construction</li> <li>▪ Access of roads and road right of ways</li> </ul>
Brgy. T. Monteverde <ul style="list-style-type: none"> <li>▪ Floods during high tide rain</li> </ul> Rehabilitation of drainage system		Lack of funds
Drainage improvement 18-B <ul style="list-style-type: none"> <li>▪ Underground reservoir in private areas</li> <li>▪ Water reservoir permeable pavement</li> <li>▪ Retarding pond at use area</li> <li>▪ Rainwater collector/ tank</li> </ul>		<ul style="list-style-type: none"> <li>▪ Illegal structures will be demolish</li> <li>▪ maintenance</li> </ul>
Brgy. 16-B <ul style="list-style-type: none"> <li>▪ Drainage improvement</li> <li>▪ Water reservoir under public/ private structure</li> <li>▪ Main drainage box all culvert</li> </ul>		
Pumping station in Shanghai creek		
Brgy. Aquino <ul style="list-style-type: none"> <li>▪ connect the pavement drainage from canal</li> </ul>		
Brgy. 13-B <ul style="list-style-type: none"> <li>▪ Drainage improvement box type drainage</li> </ul> Along J. P. Laurel corner Vinzon St.		
Brgy. 15-B <ul style="list-style-type: none"> <li>Improvement of drainage system to outfall</li> </ul>		

Support/Assistance from Barangays

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<b>IMPROVEMENT OF GOVERNMENT PROJECTS</b>
▪ public awareness
▪ monitoring of the existing laws and ordinance
▪ implement retarding ponds, water catchment facilities or all establishments
▪ Coordination of LGU's and regulating government agencies in the approval drainage plan.

### Group 3

Flood control measures	Benifits	Risks
Drainage improvement	<ul style="list-style-type: none"> <li>▪ Minimize flood level</li> <li>▪ Health prevention measures (dengue/ leptopyrosis )</li> <li>▪ Minimize disaster risk</li> <li>▪ Minimize diseases</li> <li>▪ Business opportunity</li> <li>▪ Proper drainage eliminates or minimize lost of lives</li> </ul>	<ul style="list-style-type: none"> <li>▪ Displacement of actual settlers</li> <li>▪ Disposing of excess excavated materials</li> </ul>
Retarding pond (rainwater harvesting) Households Implement city ordinance	<ul style="list-style-type: none"> <li>▪ Control siltation</li> <li>▪ Prevent damage of adjacent property</li> </ul>	<ul style="list-style-type: none"> <li>▪ Needs wide utilization of the affected area</li> </ul>
Land use management (provision of vegetation) ▪ Paving blocks (bricks or stones)	<ul style="list-style-type: none"> <li>▪ Control water run-off</li> <li>▪ Increase percolation movement of water</li> <li>▪ Prevent soil erosion</li> <li>▪ Increase water circulation</li> <li>▪ Quick absorption of water</li> <li>▪ Movement downward of water</li> <li>▪ Assist in the negotiation of the affected area</li> </ul>	<ul style="list-style-type: none"> <li>▪ Damage property by strong winds.</li> </ul>

### Support/Assistance from Barangays

1. Conduct dialogue and consultation with the constituents
2. Information dissemination campaign drive ➤ Capacity building ( technical expert as a resource person)
3. Intensity strengthen participation of every Barangay on MRF ( material recovery facilities) program (strict implementation of R. A. 9003)

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### Group 4

Flood control measures	benefits
Drainage improvement	Minimize flooding <ul style="list-style-type: none"> <li>▪ Implementation of policy such as solid waste management</li> <li>▪ Drainage maintenance through bayanihan</li> <li>▪ Implement of no build zone along water waste and drainage system</li> <li>▪ Implementation of social housing program by the government</li> <li>▪ Improve the health condition and environment</li> <li>▪ Less exposure of the people to flooding</li> <li>▪ Beautification along the drainage system, incorporating variety of plants.</li> </ul>
Permeable pavement	<ul style="list-style-type: none"> <li>▪ It helps minimize storm water run off</li> <li>▪ Minimize urban heat</li> </ul>

Support/Assistance from Barangays

Encourage all infra to use permeable construction materials such as bricks in:
<ul style="list-style-type: none"> <li>▪ Parking areas</li> <li>▪ Parks</li> <li>▪ Pathways</li> <li>▪ Roadways</li> </ul>

### Group 5

Flood control measures	Benefits	Risks
1. Drainage improvement constructions	<ul style="list-style-type: none"> <li>▪ Introduce: additional drainage construction</li> <li>▪ Drainage improvement along Quimpo Blvd., San Pedro Ext. area Brgy. 39-D</li> <li>▪ Ease traffic congestion on rainy weather</li> <li>▪ Drainage construction will provide access to the barangay</li> <li>▪ Prevent property damage and save lives</li> <li>▪ Promote healthy practices</li> </ul>	<ul style="list-style-type: none"> <li>▪ Brgy. 32-D Lesser damage to property</li> <li>▪ Damage construction</li> <li>▪ Possible relocation of informal settlers</li> </ul>



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2. Retarding pond- not applicable	Not applicable due to large displacement to informal settlers Land requirements	
3. Water reservoir (permeable pavement- N/A)	<p>Introduce:</p> <ul style="list-style-type: none"> <li>▪ Residential water harvesting tank (each houses)</li> <li>▪ Water reservoir (requirement)</li> </ul> <p>Under government budgets Almendras Gym parking Brgy. 39</p> <ul style="list-style-type: none"> <li>▪ Brgy. 35-D water reservoir under basketball court</li> </ul>	
4. Land use management	<p>Land use management:</p> <ul style="list-style-type: none"> <li>▪ Strict implementation and monitoring of zoning ordinance</li> <li>▪ Provision of waste collection point and community composting and recycling facility</li> </ul> <p>Public involvement</p> <ul style="list-style-type: none"> <li>▪ Identify possible route of the additional drainage project</li> <li>▪ Formulation of environmental policies on water management</li> <li>▪ Imposition/ implementation of policies and guidelines</li> <li>▪ Proper disposal of garbage</li> </ul>	Inadequate information/ education to appreciate the need for improvement and development to benefit the majority

### Support/Assistance from Barangays

Barangay leaders will assist in educating and convincing ISF participation and cooperation before, during and after project implementation
Participate in maintenance and proper waste management of the community and individual houses

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### Group 6

Flood control measures	Benefits	Risks
Brgy. 24-C ▪ Drainage management	▪ Proper flowing of water	▪ Displacement of informal settlers Brgy. 28
Brgy. 23-C ▪ Seawall	▪ No relogging of drainage	▪ Dislocation of resident in implementation of project Brgy. 26-C
Brgy. 22-C ▪ Existing drainage needs	▪ Healthy- clear environment Brgy. 28-C	▪ Relocation of costal area Brgy. 21-C
▪ Drainage improvement Brgy.2 4	▪ Drainage improvement Brgy. 25-C	▪ Relocation and financial assistance Brgy. 26-C
▪ Need to improve new canal at high level than sea level Brgy. 26-C	▪ Can prevent sickness Brgy. 26-C	
▪ Drainage improvement Brgy. 24-C	▪ Avoid back-flow from sea level to elevate lower area and avoid flooding Brgy. 26-C	
▪ Existing drainage Improve the size of our canals Brgy. 28-C		
▪ Flood gate		
▪ Need earth filling on lower areas Brgy. 26-C		

### Support/Assistance from Barangays

Cooperation to take place
▪ Clean up drive
▪ Intensive implementation of waste disposal
▪ Bgry. Orientation and assistance

Note: The groups were assisted by the Counterpart Agencies, National Government Agencies and Local Government Unit.

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**AGENDA**

DAY-3: Coastal Flood

Date: July 25, 2019

Venue: Garnet Room, Pinnacle Hotel, Davao City

	<b>Time</b>	<b>Agenda</b>	<b>Presenter, Facilitator</b>
0	08:00 - 08:15	Registration	Secretariat
1	08:15 - 08:30	Preliminaries - Prayer - Philippine National Anthem - Japan National Anthem - Tayo's Dabawenyo  Opening Remarks	JET Secretariat  <b>Engr. Alejandro A. Sosa</b> Project Manager III Unified Project Management Office-Flood Control Management Cluster
2	08:30 - 08:40	Introduction	<b>Mr. Kenichi Kuramoto</b> Environmental and Social Expert
3	08:40 - 09:05	Quick environmental evaluation in the Project site	<b>Ms. Ara Charise Salcedo, EnP; and, Mr. Ershad S. Ibba, Sociologist</b> Environmental and Social Safeguard Division, DPWH Central Office
4	08:55 - 09:10	Coastal Engineering	<b>Engr. Dolores M. Hipolito</b> Project Manager III Unified Project Management Office-Flood Control Management Cluster
4	09:10 - 09:30	Outline of Flood Control Methodology	<b>Mr. Kenichi Kuramoto</b> Environmental and Social Expert, and; DPWH
5	09:30 - 09:45	Orientation of the Group Work	<b>Mr. Kenichi Kuramoto</b> Environmental/Social Expert
6	09:45 - 10:00	- Coffee Break	
7	10:00 - 11:10	Group Work	Facilitated by JET and DPWH
8	11:10 - 12:00	Presentation and Discussion	
9	12:00 - 12:10	Conclusion	<b>Mr. Kenichi Kuramoto</b> Environmental and Social Expert
10	12:10 - 12:20	Closing Remarks	<b>Engr. Dolores M. Hipolito</b> Project Manager III Unified Project Management Office-Flood Control Management Cluster
11	12:20 -	Lunch	-

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### Group 1: WEST

Flood Control Measures	Benefits	Risks
Daliao ▪ Coastal road	▪ Accessibility	<ul style="list-style-type: none"> <li>▪ Boat landing area</li> <li>▪ Displacement of:                             <ul style="list-style-type: none"> <li>▪ -local settler</li> <li>▪ -commercial establishments</li> </ul> </li> <li>▪ Loss on the source of livelihood</li> </ul>
Binugao ▪ Seawall	▪ Protection from storm surge/ large waves	
Talomo ▪ River flood control ▪ Gabion	▪ Disaster prevention forest	
Daliao ▪ Artificial coral reefs	▪ Increase production on marine product breakwater	
Matina Aplaya ▪ River dikes	▪ Disaster prevention	▪ Destruction on marine resources
Matina Aplaya/Talomo ▪ dredging		

### Support/Assistance from Barangays

1. Relocation site for the displaced local settlers
2. Construction of tenement building for fisher folks
3. Public consultation with the local settlers
4. Sustainable livelihood program
5. Relocation of boat landing

### Group 2: Poblacion 1

Flood Control Measures	Benefits	Risks
Construction of seawalls (break water)	▪ Safety of community	▪ Dislocation of community affected
Dredging ( to ease siltation make the run off fast)	▪ Protect of high tide monsoon wind	▪ Displacement of the livelihood of fisher folk
Mangrove planting Reforestation	▪ Clean costal area	▪ No site for the relocation
River dikes contractions		
Coastal road ongoing	Brgy. 32	▪ Establishment of the

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	<ul style="list-style-type: none"> <li>▪ Warning for evacuation</li> </ul>	<ul style="list-style-type: none"> <li>▪ fish landing area (center)</li> </ul>
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Support/Assistance from Barangays

Consultation and dialogue (IEC)	Creation of early warning device Brgy. 38-D, 40-D Warning device: <ul style="list-style-type: none"> <li>▪ Siren</li> <li>▪ Warning sign for evacuation</li> </ul>	Request assistance to identify the area for a fisher folks relocation
Establish livelihood program		

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### Group 3: Poblacion 2

Flood Control Measures	Benefits	Risks
Brgy. 26-C <ul style="list-style-type: none"> <li>▪ Filling of borders (stone)</li> <li>▪ Concreting of seawall</li> </ul>	<ul style="list-style-type: none"> <li>▪ Protection of big waves and heavy water</li> </ul>	<ul style="list-style-type: none"> <li>▪ Dislocation of residence in implementation</li> <li>▪ Health and traffic condition</li> <li>▪ Lack of food and water supply</li> <li>▪ Hygiene</li> </ul>
Brgy. 25-C <ul style="list-style-type: none"> <li>▪ Seawall improvement Coastal area</li> <li>▪ Tidal dikes</li> <li>▪ Mangrove trees</li> <li>▪ Warning system</li> </ul>	<ul style="list-style-type: none"> <li>▪ Protection of the people belong to the coastal area</li> </ul>	
Radio control communication	<ul style="list-style-type: none"> <li>▪ Communication and warning</li> </ul>	
Early warning device		
Concrete overpass/flyover	<ul style="list-style-type: none"> <li>▪ Appropriate space for the motor boat</li> </ul>	

### Support/Assistance from Barangays

Brgy. 26-C	<ul style="list-style-type: none"> <li>▪ Relocation and food assistance</li> </ul>	<ul style="list-style-type: none"> <li>▪ First aid</li> <li>▪ Kit supply</li> <li>▪ Information and education campaign</li> </ul>
Brgy. 25-C	<ul style="list-style-type: none"> <li>▪ Relocation area</li> <li>▪ Awareness</li> <li>▪ Tree planting of mangroves at seaside</li> </ul>	
Brgy 23-C	<ul style="list-style-type: none"> <li>▪ Livelihood cash and food assistance</li> </ul>	
Brgy. 15-B	<ul style="list-style-type: none"> <li>▪ Information education on coastal disaster</li> <li>▪ Installation of early warning system</li> </ul>	
Brgy. 21-C	<ul style="list-style-type: none"> <li>▪ Cash for work assistance</li> <li>▪ Livelihood program</li> </ul>	

### Group 4: Agdao

Flood Control Measures	benefits	Risks
Coastal road <ul style="list-style-type: none"> <li>• Brgy. Monteverde Building breakway</li> </ul>	<ul style="list-style-type: none"> <li>• Eleven barangay of Agdao district reduce traffic</li> </ul>	

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Brgy. Leon Garcia Building high seawalls	<ul style="list-style-type: none"> <li>Flood mitigation</li> </ul>	
Brgy. 75-A Matina Aplaya Maintaining of drainage outfall		<ul style="list-style-type: none"> <li>Displacement of illegal settlers along the seawalls</li> </ul>
Brgy. Leon Garcia Planting mangrove trees	<ul style="list-style-type: none"> <li>Fish sanctuary and corals</li> </ul>	<ul style="list-style-type: none"> <li>Informal settlers</li> <li>Fish port livelihood</li> <li>Loss of economic opportunity</li> </ul>
Brgy. San Antonio Warning evacuation system	<ul style="list-style-type: none"> <li>Safety measures and concern</li> </ul>	

Support/Assistance from Barangays

Massive information IEC	Monitoring of flood project	Government agency concern
Adoption of city ordinance and national law's of BDRRMC		

### Group 5: North

Flood Control Measures	Benefits	Risks
Coastal road	<ul style="list-style-type: none"> <li>Reduce traffic congestion</li> <li>Recreational (bay walk)</li> <li>Business opportunity</li> </ul>	<ul style="list-style-type: none"> <li>Informal settlers</li> <li>Private company</li> <li>Water pollution (garbage)</li> <li>Peace and order</li> <li>Livelihood of fishermen</li> <li>Effect to the Marine sanctuary</li> </ul>
Disaster prevention forest	<ul style="list-style-type: none"> <li>Lessen negative impact of coastal hazard</li> <li>Minimize air pollution</li> <li>Serves as marine habitat</li> </ul>	

Support/Assistance from Barangays

IEC campaign	<ul style="list-style-type: none"> <li>Negotiation with the community</li> </ul>
Clean-up drive	<ul style="list-style-type: none"> <li>Bay walk management done by the barangay</li> <li>Bantay dagat</li> </ul>

**Master Plan and Feasibility Study on Flood Control and Drainage in Davao City**

Second Round of Stakeholders' Coordination Meeting  
Garnet Room, Pinnacle Hotel and Suites, Davao City  
July 23, 2019

	<ul style="list-style-type: none"><li>• Monitoring of the environment</li></ul>
Propose relocation area	<ul style="list-style-type: none"><li>• Construction of evacuation area/ center</li></ul>



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**I. Attendance**

About 241 attended the 3-day 2<sup>nd</sup> Round Stakeholders' Coordination Meeting held last July 23-25, 2019 at Garnet Room, Pinnacle Hotel and Suites, Davao City. The profile and number of participants are presented in Table 1, below.

**Table 1.** Profile and Number of Participants

Profile	Day 1(July 23)	Day 2 (July 24)	Day 3 (July 25)	Total
	River Flooding	Inland Flooding	Coastal Flooding	
Barangay Leaders	37	57	47	141
Counterpart Agencies	14	14	17	45
JPT	7	8	8	23
*Other	12	15	11	38
Total	70	94	83	<b>247</b>

\*Other includes the National Government Agencies, Local Government Units, Private Groups and Academe

**II. Objectives**

The Meeting was conducted to wit:

- i. JPT to refresh the participants on the findings during the previously conducted coordination meeting;
- ii. JPT to discuss quick natural and social environmental evaluation of the possible impacts of flood control measures;
- iii. JPT to present examples of flood control measures;
- iv. Barangay Leaders to identify possible flood control measures in their barangay/s, including its benefit/s and risk/s, if any; and,
- v. Barangay Leaders to discuss their support and/or assistance in implementing the identified flood control measures

**III. Process Flow and Methodology**

The barangay leaders were already divided into groups to encourage group participation. Prior to group discussions, Mr. Kenichi Kuramoto of JPT, emphasized the meeting process highlighting on the data and information by JPT and DPWH-Central Office and the discussion per group, with group outputs written on meta cards and posted on manila papers.

Mr. Kuramoto proceeded by presenting some of the findings during the previous Coordination Meetings, possible Flood Control Measures, and, guide questions for the groups. Ms. Ara Charise Salcedo, EnP, and, Mr. Irshad S. Ibba, Sociologist gave brief evaluation on natural environment, and,

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social environment, respectively. And with three different sectors for three days, their presentations also reflected the sectors: Day 1- River Flooding, Day 2- Inland Flooding, and, Day 3-Coastal Flooding.

For Coastal Flooding on Day 3, Engr. Dolores M. Hipolito, Project Manager III of Unified Project Management Office-Flood Control Management Cluster gave a presentation on Coastal Engineering. She emphasized coastal protection from storm surges and high waves, coastal erosion and tsunami.

In addition, the participants were given two questions for group discussions and presentations. And for ideas/comments/suggestions that were not raised within the groups, the participants can send to [MPFSdavaocity@gmail.com](mailto:MPFSdavaocity@gmail.com) and [mfcdp\\_2@yahoo.com](mailto:mfcdp_2@yahoo.com).

The meeting agenda are attached as **Documents 1, 2 and 3**.

The technical presentations with guide questions and list of group members are attached as **Documents 4, 5, 6 and** the presentation on Coastal Engineering is attached as **Document 7**.

#### **IV. Messages of Support and Encouragement from DPWH-CO**

The meeting was supported and attended by the following persons from DPWH-CO:

- a. *Engr. Alejandro A. Sosa, Project Manager III, Unified Project Management Office-Flood Control Management Cluster* gave Opening and Closing Remarks during River and Inland Flooding slated on July 23 and July 24, respectively. He was grateful for the presence of stakeholders and emphasized their key role in the project. As such, he encouraged active participation from them.
- b. *Engr. Dolores M. Hipolito, Project Manager III, Unified Project Management Office-Flood Control Management Cluster* delivered her Closing Remarks during Coastal Flooding held on July 25. She thanked the active participation of the stakeholders. She encouraged everyone to sustain and strengthen on non-infrastructure flood control measures such as clean-up drive, while infrastructure related flood control measures are yet to be finalized.
- c. *Engr. Maximo L. Carvajal, Assistant Secretary for Mindanao Operations of DPWH-CO* gave his Opening Remarks during Coastal Flooding. He informed that DPWH has been embarking on massive infrastructure development where Davao City is a massive recipient. The development is divided into two areas: (1) Connectivity and Mobility of Road Networks; and, (2) Protection of Lives and Properties through Flood Control and Drainage. He added the importance of this project study in view of giving back due and right service out of the taxes paid by the people. In the process of doing so, it is important that the stakeholders are consulted, he stressed.

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**V. Other Points Raised**

**VI. Discussions Points (Questions) and Summary of Outputs**

**A. River Flooding** was divided into four groups: Davao River Upstream, Davao River Downstream, Matina River and Talomo River.

*Comment/Suggestion Raised Prior to Discussion Proper*

The representative from Barangay Mandug was amazed with the possible intervention of underground tunnel. However, he highlighted the need for detailed survey to include among other scientific reaction when the tunnel is full of water and other possible impacts of the structure.

The summary of their outputs is presented in Table 2.

	1: Davao River Upstream	2: Davao River Downstream	3: Matina River	4. Talomo River
Barangay	Present: 1. Gumalang 2. Inayangan 3. Lacson 4. Bantol 5. Malamba 6. Tamugan 7. Suawan 8. Pangyan – not in the original list but present in the meeting  Absent: 9. Lamanan 10. Gumitan	Present: 1. Lampianao 2. Callawa 3. Mandug 4. Waan 5. Tigatto 6. Brgy 19-B 7. Brgy 8-A 8. Brgy 2-A 9. Brgy 40-D 10. Maa 11. Bucana – 76A  Absent 12. Dalagdal 13. 5-A 14. 9-A	All Present: 1. Matina Biao 2. Matina Pangi 3. Matina Crossing 4. Matina Aplaya	All Present: 1. Calinan 2. Wangan 3. Riverside 4. Los Amigos 5. Balingaeng 6. Tugbok 7. Mintal 8. Sto. Nino 9. Talomo Proper 10. Cawayan – not in the original list but present in the meeting

**Table 2.** Summary of Group Outputs for River Flooding

Group	Flood Control Measures	Support/Assistance from Barangay Leaders	Special Concerns
1: Davao River	<ul style="list-style-type: none"> <li>▪ Flood Wall, Flood Warning Facilities</li> </ul>	<ul style="list-style-type: none"> <li>▪ The barangay council shall provide a venue</li> </ul>	<ul style="list-style-type: none"> <li>▪ Since Indigenous Peoples (IPs) reside</li> </ul>

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Group	Flood Control Measures	Support/Assistance from Barangay Leaders	Special Concerns
Upstream	<p>and Evacuation Centers were the recommended control measures.</p> <p><i>During the Typhoon Vinta in 2017, Barangay Bantol for example experienced property and income losses. In a span of an hour, the water level rose so high that houses and newly-harvested bananas for sale were consumed by the flood. Also, the warning device disappeared.</i></p>	<p>for public consultations and dialogues.</p> <ul style="list-style-type: none"> <li>▪ Initiate and/or support capacity building activity for example in using the water level warning facility.</li> </ul>	<p>in most of the member barangays, a Free and Prior Informed Consent (FPIC) must be done to promote equal rights for the IPs.</p> <ul style="list-style-type: none"> <li>▪ Issue on security – This concern is gradually being addressed through a program called Peace 911, which includes continuing dialogue with the rebels.</li> </ul>
2. Davao River downstream	<p>Desilting the river and planting of malibago trees were the identified flood control measures.</p>	<ul style="list-style-type: none"> <li>▪ Engage in massive information campaign with the stakeholders in the barangay/s.</li> <li>▪ Engage in monitoring the identified projects, before, during and after project implementation and immediately address implementations issues, if any.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Presence of informal settlers</li> <li>▪ Improper waste disposal.</li> </ul>
3. Matina River	<p>Dam in Matina Biao and Biao Escuela, by pass water channel somewhere in Matina Pangi going to Matina Aplaya, and, early warning device especially in the lower portion of</p>	<ul style="list-style-type: none"> <li>▪ Initiate dialogue for stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>▪ No site for evacuation centers (Matina Crossing and Aplaya).</li> <li>▪ Informal settlers may avail of the government initiated 25-year</li> </ul>

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Group	Flood Control Measures	Support/Assistance from Barangay Leaders	Special Concerns
	Matina River among others were identified.		housing loan with a monthly payment of Php 1700-1900.
4. Talomo River	Assumed that all flood control measures are applicable depending on the location.  Levee/flood wall can be used as promenade, and alternative road right of way. It also protects low level areas.	<ul style="list-style-type: none"> <li>▪ Initiate and/or support public consultations/dialogue</li> </ul>	<ul style="list-style-type: none"> <li>▪ Consider natural environmental impact in the long-run, for example in implementing cut-off networks as flood control measure</li> </ul>

**B. Inland Flooding** was divided into six groups. The involved areas were Buhangin, Agdao, Poblacion, Talomo Proper, and, Bunawan.

*Comment/Suggestion Raised Prior to Discussion Proper*

A participant asked about the most appropriate flood control measure for areas below sea level to which JPT responded that the team has been exploring all possible measures including pumping station.

The summary of their outputs is presented in Table 3.

	1	2	3	4	5	6
Barangay	Present: 1. Cabantian 2. Buhangin 3. Angliongto 4. Hizon 5. R. Castillo 6. Lapu-Lapu 7. Sasa 8. Ubalde 9. Centro 10. San Antonio 11. Gov. Duterte  Absent	Present: 1. W. Aquino 2. P. Bangoy 3. Tomas Monteverde 4. 15-B 5. 16-B 6. 17-B 7. 18-B 8. 20-B 9. 13-B 10. 14-B  Absent:	Present: 1. Bucana 76-A 2. Matina Crossing 3. Communal 4. Indangan  Absent: 5. Maa 6. Matina Aplaya 7. Panacan	All Present: 1. 3-A 2. 4-A 3. 6-A 4. 7-A 5. 9-A 6. 10-A 7. 11-B 8. 12-B 9. 29-C 10. 30-C	Present: 1. 31-D 2. 32-D 3. 33-D 4. 34-D 5. 35-D 6. 36-D 7. 37-D 8. 38-D 9. 39-D  Absent: 10. 34-D	All Present 1. 21-C 2. 22-C 3. 23-C 4. 24-C 5. 25-C 6. 26-C 7. 27-C 8. 28-C

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	12. Pampanga	11. Agdao Proper 12. Leon Garcia				
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**Table 3.** Summary of Group Outputs for Inland Flooding

Group	Common Flood Control Measures	Support/Assistance from Barangay Leaders	Special Concerns
1	<p>The common flood control measure is Drainage Construction and/or Improvement in some parts of Buhangin, portions of Talomo Proper, most barangays of Poblacion and Agdao areas.</p> <p>The benefits of drainage construction and/or improvement are:</p> <ul style="list-style-type: none"> <li>- It eases traffic congestion on rainy weather</li> <li>- Prevents property damages and save lives</li> <li>- Minimizes disaster risk and diseases</li> </ul>	<p>Initiate and/or support in educating the public on barangay programs.</p>	<ul style="list-style-type: none"> <li>▪ Public involvement is important in project implementation. Public volunteerism is associated with public involvement and may not be achievable without incentives.</li> <li>▪ Recommended underground reservoir in Magsaysay Park</li> </ul>
2	<p style="text-align: center;">Retarding Pond</p>	<ul style="list-style-type: none"> <li>▪ Continue the implementation of clean-up drive in canals</li> <li>▪ Enhance monitoring of ordinances and laws</li> <li>▪ Ensure coordination between national government units and local government units in project implementation</li> </ul>	<ul style="list-style-type: none"> <li>▪ All establishments to have permeable pavement, retarding pond and water catchment facilities.</li> <li>▪ Box culvert is preferred for drainage design.</li> <li>▪ Displacement of informal settlers</li> <li>▪ Ensure access roads during project implementation.</li> <li>▪ Conduct project maintenance after project implementation.</li> <li>▪ Some projects might be implemented for compliance and without checking/assessing the viability of the project/s</li> </ul>

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Group	Common Flood Control Measures	Support/Assistance from Barangay Leaders	Special Concerns
3		<ul style="list-style-type: none"> <li>▪ Initiate and/or support continuing dialogue and consultations with the constituents</li> <li>▪ Support in the conduct of project capacity building (projects that may need thorough understanding of technical terms) by the public.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provide vegetation areas to prevent soil erosion.</li> <li>▪ Improper waste disposal. The following must be done, to wit:                             <ul style="list-style-type: none"> <li>- Strict implementation of RA 9003-Solid Waste Management. Conduct orientation programs for example to schools.</li> <li>- Intensify or strengthen Material Recovery Facility (MRF), this is a required facility in each barangay to recover recyclable materials from municipal waste.</li> </ul> </li> <li>▪ It is best to send the same person from barangay/s as representative/s in JICA meetings to ensure easier coordination among other during site visit, document request.</li> </ul>

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Group	Common Flood Control Measures	Support/Assistance from Barangay Leaders	Special Concerns
4		<ul style="list-style-type: none"> <li>▪ Support strict compliance to solid waste management ordinance</li> <li>▪ Support the conduct of drainage maintenance</li> <li>▪ Intensify no build zone along waterways</li> <li>▪ Implement socialized housing</li> <li>▪ Encourage the construction of permeable pavement</li> </ul>	<ul style="list-style-type: none"> <li>▪ Improper waste disposal resulting to clogged drainage</li> <li>▪ Presence of informal settlers on waterways</li> </ul>
5		<ul style="list-style-type: none"> <li>▪ Educate waste management for example at school level</li> <li>▪ Initiate or support public dialogues for example in identifying drainage location sites</li> <li>▪ Barangay Council to come up with policies on how to harvest the water</li> <li>▪ Assist in communicating with the informal settlers, proper waste management</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rainwater investment tank per house entails investment cost. A subsidy or a free system for them to apply may be done.</li> <li>▪ Include pumping station as flood control measure</li> <li>▪ Consider open areas for project location/s to reduce risks</li> <li>▪ Visit barangays with existing projects on flood control measures for first-hand assessment and/or appreciation of flood control measures.</li> <li>▪ Limited budget is a challenge especially for</li> </ul>



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Group	Common Flood Control Measures	Support/Assistance from Barangay Leaders	Special Concerns
			projects that may need barangay funds. Consultants must be able to consider for example the kind of approach and what can be done given limited budget.
6		<ul style="list-style-type: none"> <li>▪ Conduct of drainage de-clogging</li> <li>▪ Support for the reconstruction of Mini-Park in Barangays 22 and 23</li> </ul>	<ul style="list-style-type: none"> <li>▪ Clogged drainage</li> <li>▪ All establishments should have water catchment facilities</li> </ul>

**C. Coastal Flooding** was divided into five groups comprising Talomo, Toril, Poblacion, Agdao, Buhangin and Agdao.

*Comment/Suggestion Raised Prior to Discussion Proper*

- A representative from Barangay Bucana, 76-A, asked on the social preparation/s with respect to the Badjao\* as they are part of Indigenous Peoples group. Mr. Ibba replied that the coastal barangays of Davao City have no IP communities.

- *\*Badjao are sea gypsies of the Sulu and Celebes Seas and scattered along the coastal areas of Sulu, Tawi-Tawi and some coastal municipalities in Zamboanga del Sur and ARMM. In Davao City, they are spread in the coastal barangays of Matina Aplaya, Bucana-76-A, Brgy 23-C, etc.*

The summary of their outputs is presented in Table 4.

	<b>1: West</b>	<b>2: Poblacion 1</b>	<b>3: Poblacion 2</b>	<b>4. Agdao</b>	<b>5. North</b>
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Barangay	Present:	Present	Present:	Present:	Present
	1. Matina Aplaya 2. Talomo 3. Toril 4. Daliao 5. Binugao  Absent: 6. Bago Aplaya 7. Dumoy 8. Lizada 9. Sirawan	1. 1-A 2. 31-D 3. 32-D 4. 33-D 5. 34-D 6. 35-D 7. 36-D 8. 37-D 9. 38-D 10. 39-D 11. 40-D 12. 76-A Bucana	1. 15-B 2. 21-C 3. 22-C 4. 23-C 5. 25-C 6. 26-C 7. 27-C 8. 28-C 9. 29-C 10. 30-D  Absent: 11. 14-B 12. 24-C	1. San Antonio 2. Paciano Bangoy 3. Agdao Proper 4. Ubalde 5. Tomas Monteverde 6. Lapu-Lapu 7. Leon Garcia Sr. 8. Gov. Vicente Duterte  Absent: 9. Wilfredo Aquino 10. Centro 11. Rafael Castillo	1. Tibungco 2. Panacan 3. Mahayag 4. Ilang 5. Bunawan 6. Angliongto 7. Sasa 8. Pampanga  Absent: 9. V. Hizon

**Table 4.** Summary of Group Outputs for Coastal Flooding

Group	Common Flood Control Measure/s	Support/Assistance from Barangay Leaders	Special Concerns
1	<ul style="list-style-type: none"> <li>▪ Construction and Improvement of Seawalls in some parts of the districts of Toril District, Talomo Proper, Poblacion and Agdao.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Support public consultations</li> <li>▪ Identify sustainable livelihood program and relocation of boat landing points.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Displacement of settlers in the coastal road</li> <li>▪ Establishment of fish landing area/s</li> <li>▪ Displacement of livelihood programs</li> </ul>
2		<ul style="list-style-type: none"> <li>▪ Support for the consultations before project implementation.</li> <li>▪ Establish livelihood program where financing can be for example through loan.</li> </ul>	<ul style="list-style-type: none"> <li>▪ For projects that may displace fisher folks, it is best to identify area/s for them prior to project implementation.</li> <li>▪ Provision of areas is mandated by law.</li> <li>▪ Engage in planting mangroves and</li> </ul>

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Group	Common Flood Control Measure/s	Support/Assistance from Barangay Leaders	Special Concerns
			reforestation which are both mandated by law.
3		<ul style="list-style-type: none"> <li>▪ Assist in identifying relocation sites</li> <li>▪ Support Information and Education Campaign</li> <li>▪ Support loan livelihood assistance. Cooperative system is a better way to access capital from among others City, DTI, DOLE.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Evacuation center/s of coastal barangays should be 2-storey building or more. The higher the building the safer it is for the people to go to this place in case the water level is high.</li> <li>▪ For areas without evacuation centers yet, building/s that are privately-owned and with minimum of 2-storey can be an alternative evacuation areas during emergencies.</li> </ul>
4		<ul style="list-style-type: none"> <li>▪ Massive information/information and education campaign</li> <li>▪ Implement city ordinance/s and national laws</li> </ul>	<p>Coastal road reduces traffic especially in several areas of Agdao District.</p> <ul style="list-style-type: none"> <li>▪ Displacement of illegal settlers.</li> </ul>
5		Support the Information and Education Campaign	

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The outputs are attached as **Documents 8, 9 and 10**.

**VII. Takeaways**

- The participants have identified possible control measures. JPT to consider those measures and at the same time conduct thorough validation and assessment base on natural and social environment impacts, benefit-cost analysis, among others.
- The roles of various stakeholders must be clear within the project cycle, from identification to completion, to ensure accountability and better coordination.
- Continue to engage the stakeholders in future meetings, if possible suggest permanent representation from their offices to project meetings to ensure continuity, and, easier and faster coordination.

**VIII. Photo Documentation**

The photos are attached as **Document 11**.

## Third Round

**Report of the Third Round Stakeholders Coordination Meeting**

January 23-24, 2020

8:30 am – 12:30 noon

Garnet Room, Pinnacle Hotel, Davao City

**I. Overview of the Meeting**

The meeting was conducted in order to: (a) share and exchange the environmental issues related to flood control, water conservation, etc.; (b) inform the possible structural and non-structural measures; and, (c) brainstorm and build consensus among the stakeholders on the planning process of flood control and drainage.

**Table 1.1 Profile and Number of Participants**

Profile	Day 1 (January 23)	Day 2 (January 24)	Total
	River Flooding	Inland and Coastal Flooding	
Barangay Leaders	44	54	98
Counterpart Agencies	9	9	18
JPT	18	18	36
Other Offices	12	7	19
Total	<b>83</b>	<b>88</b>	171

The attendees of the two-day event totaled to 170 (Day 1-86 and Day 2-88) representing the officers and/members of the barangays, government organizations and non-government organizations.

Regional Director Allan S. Borrromeo, CESO V, DPWH XI gave his opening remarks on the first and second day. The highlights of his remarks are as follows:

- a. Day 1, January 23 - He started by welcoming the participants to the meeting. He cited the estimated 182 billion pesos cost of destruction brought by natural calamities such as typhoons, monsoons and floods. It is on this context that as planners and engineers, there is a need to make the necessary plan to mitigate the destruction in the future.
- b. He informed that the meeting was conducted in order to exchange ideas and plans that will finally result to identifying strategies for the masterplan. In doing so, the stakeholders can help in providing measures to address the flooding situation. Finally, he thanked the participants for attending the meeting.

The other parts of the two-day event included opening ceremonies, presentations by the experts, group discussions and presentations by the participants, presentation of conclusion by Mr. Kenji Morita, Team Leader of JICA Project Team (JPT) and closing remarks by Engr. Allan V. dela Peña, Engr IV, DPWH XI. The copies of the program are attached as **Annex A**.

## II. Highlights – Day 1

### Experts Presentations

Mr. Morita presented the purpose, outputs, timeline and implementation structures of the project. He also informed the present and future conditions (ex. 100-year flood) of Davao River, Talomo River and Matina River. He included the concept of framework plan and master plan, selection of design level, criteria of project evaluation, planning conditions using land use plan in 2017 and 2045 land use plan, and, areas to be protected by structural measures. He mentioned four possible alternative structural measures such as: (a) dike/flood wall for river improvement; (b) widening for river improvement; (c) retarding pond as storage facility; and, (d) dam as storage facility. He also identified non-structural measures.

Mr. Kenichi Kuramoto, Environmental and Social Expert, presented the findings from the last coordination meeting, environmental evaluation, problem analysis and solution on land acquisition and resettlement, and, process of stakeholder involvement through group discussion and presentation.

**Table 2.1 Questions and Responses during the Open Forum**

Questions/Statements	Responses
<p>Kagawad Edgar Yaranon Barangay Mandug</p> <p>His question was about the concept of type of river channel improvement, slide 29/30. There is 2-5 meters wall in the drawing but there is no indication if dredging is included in the implementation.</p>	<p>Mr. Morita emphasized that dredging is an effective undertaking and thus will be included in the design solutions, however JPT is still calculating the design and thickness of the dredge.</p>
<p>Mr. Romulo Nicdao Barangay 76-A</p> <p>The widening of Davao River is only possible in the upstream and not in the downstream due to the presence of informal settlers. There is a need to address the concerns of informal settlers. What should be done in case the widening in the downstream part of Davao River will not be possible due to presence of informal settlers?</p>	<p>Mr. Morita responded that JPT is considering several combinations of structural measures by carefully examining and comparing the location, including the cost and effectiveness. In case widening will take place and there will be affected settlers, the relocation of the settlers shall be considered.</p>

### Group Work

The groups were divided into four (4), to wit: (1) Davao River Upstream; (2) Davao River Downstream; (3) Matina River; and, (4) Talomo River. They were allotted with almost an hour to discuss and write their answers in the meta cards. Each group was given with a maximum of 10 minutes to present. Their outputs are attached in **Annex B**.

**Table 2.2. Summary of Outputs, Groups 1-4**

<b>Problem: Standing points on settler and owner</b>	<b>Solution: Standing point on implementers, LGUs</b>
<ul style="list-style-type: none"> <li>▪ Financial support does not cover livelihood assistance for the establishment of for example stores and land improvements.</li> <li>▪ Relocation areas have limited access to livelihood opportunities</li> <li>▪ Hard to negotiate landowner</li> <li>▪ The settlers do not move by their own because they do not have lands. Acquiring lot is also expensive.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Relocation program means that LGU/Barangay will provide land for the affected residents with allocation of micro financial assistance to be rendered before the relocation.</li> <li>▪ The potential relocation site should have security, wide pathway road, near to market, access to light and water, and far from risks/hazards.</li> <li>▪ Encourage People’s Organization/s to be organized</li> <li>▪ Available community mortgage program</li> <li>▪ Add compensation for voluntary resettlement</li> </ul>
<b>How do we address control improper settlement in danger area?</b>	
<ul style="list-style-type: none"> <li>▪ The barangay council will pass resolution of no illegal structures in the river segment, barriers and signages must be properly installed in the proposed project site/area to be affected.</li> <li>▪ Application of RA 7160, otherwise known as Local Government Code, to informal settlers</li> <li>▪ Budget support from local and national funds</li> <li>▪ Danger areas must be vacated.</li> <li>▪ Conduct of public awareness campaign and consultation especially if the identified government projects are scheduled to be built</li> </ul>	
<b>What can be done in Barangay level?</b>	<b>What kind of support is necessary?</b>
<b>Flood Early Warning</b>	
<ul style="list-style-type: none"> <li>▪ Evacuation Drill</li> <li>▪ Signage</li> <li>▪ Installation of early warning devices such as CCTVs and siren</li> <li>▪ Putting up of water level indicators that are visible for everyone</li> <li>▪ Warning Bells per Purok</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provide transportation</li> <li>▪ Install flood way/ warning devices</li> <li>▪ Provide P/A system communication</li> <li>▪ Utilize the Barangay Disaster Risk Reduction Management Committee (BDRRMC) funds</li> </ul>
<b>Flood fighting/evacuation drill</b>	
<ul style="list-style-type: none"> <li>▪ Training and seminar – purok level/sitios</li> <li>▪ Flood orientation and drill (quarterly for houses and schools)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provide proper training</li> <li>▪ With the help of BDRRMC and City Disaster Risk Reduction Management Office (CDRRMO)</li> </ul>
<b>Forest/mangroves conservation</b>	
<ul style="list-style-type: none"> <li>▪ Reforestation/tree planting</li> </ul>	Continuous tree growing activity (ex. tree



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<ul style="list-style-type: none"> <li>▪ Assign forest rangers</li> <li>▪ Establishment of Monitoring Team</li> </ul>	growing near the river)
<b>Rainwater catchment system</b>	
Install water tank, reservoir or drum	<p>The barangay may allocate funding support for the purchase of water container per household using the barangay calamity fund.</p> <p>Allocate purchase of water reservoir from</p>
<b>Cleaning river/drainage/ coat</b>	
<ul style="list-style-type: none"> <li>▪ Make a resolution for annual dredging of the river</li> <li>▪ Clean up Drive</li> <li>▪ Community Participation of Cleanliness</li> </ul>	

The table above shows the summary of the group outputs. It appears that with the identified issues the role of the LGU is key in addressing the issues, and, the cooperation of the concerned and affected sector is necessary.

**Table 2.3. Additional Inputs by the Spokespersons of the Groups**

<p>Group 1</p> <p>NCIP Representative, thanked JICA and appreciated that ancestral domain is being considered in the masterplan. Most of the settlers in Davao River upstream are farmers. The Indigenous People (IPs) are receptive to government programs and projects. He acknowledged that DPWH is compliant with Free Prior Informed Consent (FPIC) process which is a necessary process in the IP communities.</p> <p>The disaster-prone areas are already identified. And our 911 and CDRMO are very efficient in responding to disasters.</p> <p>DENR's National Greening Program is a product of Executive Number 26, designed as one of the mitigating measures of climate change. NGP is a good program to address flood control, however, its policies must be corrected because it is prone to graft and corruption.</p>	<p>Group 2</p> <p>There is an overwhelming influx of families in Davao River downstream located in for example Barangay 76-a, 21-c and others. The issue therefore is the relocation sites when in fact as far as Marilog District, there are already identified resettlement area. The cost of land today also doubled/tripled from previous years. It is therefore recommended to encourage the communities to organize into Peoples Organizations (P Os) because the government will not entertain application by individuals.</p> <p>In Barangay Mandug, there are river walls and gabion. It is better to install dikes rather than gabions because gabions washed out three times.</p>
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<p><b>Group 3</b></p> <p>More than 300 households are informal settlers in Barangay Langub which are currently being lobbied to be part of the City’s resettlement program. There are landslide prone areas in the barangay with informal settlers subject for relocation.</p> <p>During flooding, the liquid/hazardous waste from Carmen sanitary landfill flows to Matina Aplaya where waterways, spring and flowing water are affected.</p>	<p><b>Group 4</b></p> <p>The relocation sites should be near to working areas, schools and with livelihood package. The government process on land acquisition is by deed of donation, negotiated sale or expropriation (last option).</p> <p>Each barangay should make use of its calamity fund to install cctvs, sirens, among others.</p>
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**III. Highlights – Day 2**

**Experts Presentations**

Dr. Tadanori Kitamura, Storm Drainage Improvement Expert presented the Storm Water Drainage Planning specifically the typical drainage situation, cause of flooding, main target area- Poblacion and Agdao, simulated flood area, drainage inventory survey, simulated flood volume in drainage networks including laterals, and, issues for example the insufficient drainage capacity for large scale runoff. He also highlighted the structural measures such as retarding basin, dam, channel improvement, bypass channel and pump.

His presentation was followed by Mr. Daiki Tsujio, Coastal Expert, who discussed about the countermeasures for coastal disaster. He showed the inundation for 100-year probable tide, structural countermeasures which are dike/seawall, breakwater, artificial reef, concrete blocks, and, jetty.

Finally, Mr. Masato Fujimoto, shared about the non-structural measures. These are the following, to wit: (a) community-based flood early warning; (b) flood fighting drill/evacuation drill; (c) forest/mangrove conservation; (d) rainwater catchment system; and, (e) cleaning maintenance of drainage channels, river and coast.

Mr. Kenichi Kuramoto, Environmental and Social Expert, also presented. The initial part of his presentation which are the purpose, schedule and procedure of SHC Meeting was similar in Day 1. The remaining part emphasized on Davao Urban Area: findings from previous meetings, spatial analysis, and, evaluation matrix. Finally, he gave instructions for the group discussions.

**Table 3.1. Questions and Responses during the Open Forum**

<b>Recommendations</b>
<p>Mr. Danilo Gonzales, DENR Region XI</p> <p>a. Suggest barangay level to plant malibago trees along the creeks and rivers by providing</p>

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<p>seedlings and labor shall be provided by the barangay.</p> <p>b. For pavement construction, use porous blocks or bricks to allow easy sink in of runoff water. pavement using concrete, pure concrete.</p> <p>c. No structure along a natural water waste.</p> <p>d. Seriously implement easement of 3-5 meters in urban, 20 meters in rural, then 40 meters in upland.</p> <p>e. Need political will in project implementation</p> <p>f. Enhance mangrove reforestation in coastal as natural barricade. At present, the mangrove areas are in Barangay Lasang and Matina Aplaya.</p>	
Questions/Statements	Response
<p>Kagawad Edgardo Inzon, Barangay 26-C</p> <p>There are no guidelines on mangrove planting in Davao City. Our group, Parole Provincial Office, plants everywhere with no specific guidelines from the city as to where to plant. This parole program is a continuing monthly activity as part of the requirement of those parolees.</p>	<p>Mr. Sammy Singco, City Planning and Development Office</p> <p>Mr. Singco informed that Kag Inzon and his group needs to coordinate with CENRO, the office responsible on mangrove planting in Davao City.</p>

**Group Work**

The participants were divided into four, with almost an hour to finish the group discussion, and, 10 minutes each group for the presentation. Their outputs are attached in **Annex C**.

**Table 3.2. Summary of Group Outputs, Land Acquisition**

How do we find/secure land for further retarding basin?
<ul style="list-style-type: none"> <li>▪ Complete drainage rehabilitation</li> <li>▪ Barangay will help to locate vacant lot for possible retarding basin</li> <li>▪ Approach directly the landowners</li> <li>▪ Utilizing of underground storage: under the road, parking area, basketball gym and open space</li> <li>▪ Select the areas suitable for the location of the ponds such as natural land. If there are adverse claimed on the lot implement expropriation proceeding</li> </ul>
What incentive could be effective to negotiate for land procure?
<ul style="list-style-type: none"> <li>▪ Provide incentives to landowners: tax holidays, scholarships</li> <li>▪ It is effective to negotiate based on the appraisal</li> <li>▪ To offer high price for land acquisition (36-D)</li> </ul>

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- To provide light and water facilities in the relocation site
- To give and secure possible relocation area
  - Expropriation party

**Table 3.3. Summary of Group Outputs, Non-structural Measures**

What can be done in Barangay level?	What kind of support is necessary?
<b>Rainwater catchment system</b>	
<ul style="list-style-type: none"> <li>▪ Encourage the houses to have catchment basins: water tanks</li> <li>▪ Close monitoring and implementation of the city ordinance</li> <li>▪ Improvement of existing design of drainage system</li> <li>▪ Roof gutter for rainwater harvesting</li> <li>▪ To find available area for possible reservoir and water will be treated for possible sanitary use distribution</li> <li>▪ Construct a retarding pond</li> <li>▪ Construction of pavement with decorative blocks or bricks for the water to sip-in</li> <li>▪ Installation of concrete and aluminum basin with rainwater to minimize water flow and water conservation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provision of budget for IEC materials</li> <li>▪ Recommendation of budget proposal to DPWH/ city government to make an under-tank project</li> <li>▪ Allocation of funds from national/LGU/LGSF</li> <li>▪ Cooperation of the people in barangay is necessary to achieve the program</li> <li>▪ Make a barangay ordinance and require installing water tank in every house and commercial building</li> <li>▪ Equipment supports from LGU/DPWH</li> <li>▪ Contraction materials like hollow blocks of cement plastic pipes and even small among for labor cost BAYANIHAN</li> <li>▪ Available space for retarding ponds</li> </ul>
<b>Cleaning river/drainage/cost</b>	
<ul style="list-style-type: none"> <li>▪ Rehabilitate of canal/drainage</li> <li>▪ Inform/educate the concerned sectors</li> <li>▪ Regular drainage (ex. reclogging) and coastal clean-up drive</li> <li>▪ Remove informal settlers along the natural waterway</li> <li>▪ Remove obstacle materials along water channel</li> <li>▪ Desilt of drainage</li> <li>▪ Plant malibago tree along the river creek embankment</li> <li>▪ (Due to very limited resources) Organize a group as volunteer to maintain/clean the drainage</li> <li>▪ Repair damage dike in our coastal roads</li> <li>▪ Proper disposal of garbage</li> <li>▪ Allocate budget for the rehabilitation of the interior canal (drainage system)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Support from LGU, Barangay and national agency (ex. LGU equipment support, resolution and legislation, continuous fund allocation)</li> <li>▪ The community should be actively supporting the barangay for example in the clean-up drive activity.</li> <li>▪ Implement existing laws and ordinance</li> <li>▪ Allot funds for labor and others</li> <li>▪ BAYANIHAN in barangay – Bayanihan is Filipino custom which refers to community cooperation to achieve the desired goal.</li> <li>▪ Proper garbage disposal</li> </ul>

**Table 3.4. Summary of Group Outputs, Coastal Area**

COASTAL AREA (OPTIONAL)
What issues do you concern on seawall installation along coast? (accessibility, water pollutions sg.)
<ul style="list-style-type: none"> <li>▪ Issues on relocation of houses</li> <li>▪ Where do they park/place their fishing boat?</li> <li>▪ Secure proper outlines of waste materials</li> <li>▪ Sub-standard construction along coastal area</li> <li>▪ Accessibility of equipment</li> <li>▪ Livelihood and living</li> <li>▪ Wastewater discharge</li> <li>▪ It will lessen our reserve approved marine protection area (MPA)</li> <li>▪ Coastal cleaning</li> <li>▪ Enhance mangrove reforestation by tree nurturing</li> </ul>

**Table 3.5. Additional Inputs by the Spokespersons of the Groups**

Please make the table of presentation outputs same as table 2.3. Appendix is just written out from their meta cards not their presentation.

#### **IV. Conclusion/Next Steps**

For Day 1 and 2, Mr. Morita gave conclusions about the group discussions and Engr. Dela Pena delivered the closing remarks. The highlights of their messages are, as follows:

Mr. Morita expressed his gratitude for the participation of the stakeholders. He assured that JPT shall review the group outputs as it becomes key considerations in the formulation of the masterplan, framework plan and selection of priority projects. He informed that he cannot discuss yet the details of the project and hoped to provide in the forthcoming activity/ies.

Engr. Dela Pena acknowledged the participants. He cited the previous stakeholders' meetings where the stakeholders were able to understand the flood situation, exchanged ideas regarding flood control and its effects to the natural and social environment, and, came up with suggestions on what to consider in flood control planning. Again, the stakeholders provided its invaluable contribution in the 3<sup>rd</sup> Stakeholders' Meeting. He assured the participants that their ideas shall be considered by JICA Study Team in formulating the masterplan. He also hoped that the participants also gained knowledge that could be used in their respective barangays. Finally, he thanked everyone for their presence and looked forward to seeing them again in the future.

There will be 4<sup>th</sup> and 5<sup>th</sup> Stakeholders' Meeting.

The photo documentation is attached as **Annex D**.

**MASTER PLAN AND FEASIBILITY STUDY ON FLOOD CONTROL AND DRAINAGE IN DAVAO CITY**



**THIRD ROUND STAKEHOLDERS COORDINATION MEETING**

**Date: January 23, 2020**

**Time: 8:00 am-12:00 nn**

**Venue: Garnet Room, Pinnacle Hotel, Davao City**

<b>Time</b>	<b>Agenda</b>	<b>Presenter</b>
8:30 – 8:45	Registration	
8:45-9:00	Opening Remarks	<b>ALLAN S. BORROMEO, CESO V</b> Regional Director, DPWH XI
9:00-9:10	Introduction	<b>KENICHI KURAMOTO</b> Environmental and Social Expert
9:10-9:40	Outline of Flood Control Master Plan and Proposed Control Measures	<b>KENJI MORITA</b> Team Leader, JPT
9:40-10:00	Scoping on Environmental and Social Considerations	<b>KENICHI KURAMOTO</b> Environmental and Social Expert
10:00-10:15	Coffee Break	
10:15-10:30	Orientation of the Group Work	<b>KENICHI KURAMOTO</b> Environmental and Social Expert
10:30-11:20	Group Work	<b>JPT and DPWH</b>
11:20-12:10	Presentation and Discussion	
12:10-12:20	Conclusion	<b>KENJI MORITA</b> Team Leader, JPT
12:20-12:30	Closing Remarks	<b>ENGR. ALLAN V. DELA PEÑA</b> Engr IV, DPWH XI
12:30	LUNCH	

**MASTER PLAN AND FEASIBILITY STUDY ON FLOOD CONTROL AND DRAINAGE IN DAVAO CITY**



**THIRD ROUND STAKEHOLDERS COORDINATION MEETING**

**Date: January 24, 2020**

**Time: 8:00 am-12:00 nn**

**Venue: Garnet Room, Pinnacle Hotel, Davao City**

<b>Time</b>	<b>Agenda</b>	<b>Presenter</b>
8:30 – 8:45	Registration	
8:45-9:00	Opening Remarks	<b>ALLAN S. BORROMEO, CESO V</b> Regional Director, DPWH XI
9:00-9:10	Introduction	<b>KENICHI KURAMOTO</b> Environmental and Social Expert
9:10-9:40	Outline of Flood Control Master Plan and Proposed Control Measures	<b>TADANORI KITAMURA</b> Storm Drainage Improvement Expert  <b>DAIKI TSUJIO</b> Coastal Expert  <b>MASATO FUJIMOTO</b> Non-Structural Measures
9:40-10:00	Scoping on Environmental and Social Considerations	<b>KENICHI KURAMOTO</b> Environmental and Social Expert
10:00-10:15	Coffee Break	
10:15-10:30	Orientation of the Group Work	<b>KENICHI KURAMOTO</b> Environmental and Social Expert
10:30-11:20	Group Work	<b>JPT and DPWH</b>
11:20-12:10	Presentation and Discussion	
12:10-12:20	Conclusion	<b>KENJI MORITA</b> Team Leader, JPT
12:20-12:30	Closing Remarks	<b>ENGR. ALLAN V. DELA PEÑA</b> Engr IV, DPWH XI
12:30	LUNCH	

## GROUP OUTPUTS – DAY 1

### Group 1- Outputs

How do we encourage land acquisition and resettlement?

Problem: Standing points on settler and owner	Solution: Standing point on implementers, LGUs
○	<ul style="list-style-type: none"> <li>▪ The LGU/ Barangay will allocate proper livelihood and assistance</li> <li>▪ Provide land for the affected area</li> <li>▪ Proper compensation</li> <li>▪ Relocate including relatives</li> <li>▪ Relocation program</li> </ul>
<b>How do we address control improper settlement in danger area?</b>	
<ul style="list-style-type: none"> <li>▪ First the barangay will negotiate or the resident</li> <li>▪ Provide warning sign or danger zone</li> </ul>	
What can be done in Barangay level?	What kind of support is necessary?
Flood Early Warning	
<ul style="list-style-type: none"> <li>▪ Evacuation drill</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provide transportation</li> <li>▪ Install food way/ warning devices</li> <li>▪ Provide P/A system communication</li> </ul>
Flood fighting/evacuation drill	
<ul style="list-style-type: none"> <li>▪ Training and seminars</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provide proper training</li> </ul>
Forest/mangroves conservation	
<ul style="list-style-type: none"> <li>▪ Reforestation / tree planting</li> </ul>	<ul style="list-style-type: none"> <li>▪ Conduct tree planting</li> <li>▪ Tree planting near the river</li> </ul>
Rainwater catchment system	
<ul style="list-style-type: none"> <li>▪ Tank, reservoir and drum</li> </ul>	<ul style="list-style-type: none"> <li>▪ home owners and residence will provide at least 1 drum per household</li> </ul>
Cleaning river/drainage/ coat	
<ul style="list-style-type: none"> <li>▪ Make a resolution for annual dredging of the river</li> </ul>	

### Consolidated Individual Inputs (from the participants who answered the questionnaires)

How do we encourage land acquisition and resettlement?

Problem: Standing points on settler and owner	Solution: Standing point on implementers, LGUs
<ul style="list-style-type: none"> <li>▪ The barangay will negotiate the settlers for relocation</li> <li>▪ How to adjust the new environment of settlers (separated from family)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Provide land and financial assessment to the affected settlers</li> <li>▪ Relocate including relatives</li> </ul>



<ul style="list-style-type: none"> <li>▪ They will have a hard time finding new means of livelihood</li> <li>▪ Compensation for improvement made</li> <li>▪ They don't move because they don't have land that they own</li> </ul>	<ul style="list-style-type: none"> <li>▪ Government should provide new livelihood not far from home</li> <li>▪ Provide compensation in capital to start new livelihood</li> <li>▪ Provide land in the name of the affected and far from hazard</li> </ul>
<b>How do we address control improper settlement in danger area?</b>	
<ul style="list-style-type: none"> <li>▪ Create law/ordinance to discourage settlers in danger area</li> <li>▪ Impose danger hazard</li> <li>▪ livelihood</li> </ul>	<ul style="list-style-type: none"> <li>▪ Relocate danger zone and provide warning signs</li> <li>▪ Discourage constituent in occupying danger area</li> <li>▪ Provide warning sign</li> <li>▪ Craft laws/ordinance to discourage settlers in danger area</li> </ul>

**Group 2- Outputs**

How do we encourage land acquisition and resettlement?

<b>Problem: Standing points on settler and owner</b>	<b>Solution: Standing point on implementers, LGUs</b>
<ul style="list-style-type: none"> <li>▪ Financial assistant if needed</li> <li>▪ Good area for settlement</li> <li>▪ Easy and accessibly of livelihood</li> <li>▪ A land owner: Compensation/payment must include livelihood such as stores, agricultural etc.</li> <li>▪ Lot acquisition</li> <li>▪ Acquisition cost</li> <li>▪ No enough money to buy a safe lot</li> <li>▪ As landlord: Compensation/payment including the amount of money used in the development of the land.</li>   <li>▪ Problem: As settlers</li> <li>▪ -Is the relocation site acceptable?</li> <li>▪ -Is the availability of financial assistance ready?</li> <li>▪ Landowner: It's their own property</li> <li>▪ Their present home is near to their livelihood</li> </ul>	<ul style="list-style-type: none"> <li>▪ Security</li> <li>▪ Wide pathway road</li> <li>▪ Present possible livelihood suited to their situation</li> <li>▪ Dialogue with clear and vivid agenda</li> <li>▪ Near to market</li> <li>▪ Accessible to PCWD, DLPC</li> <li>▪ To encourage POs to organize</li> <li>▪ Available community mortgage program</li> <li>▪ Seek assistant to LGUs, and other National agency</li> <li>▪ Relocation program</li>   <li>▪ Solution:</li> <li>▪ -Prepared relocation site</li> <li>▪ -Financial assistance are ready before relocation</li> <li>▪ -Just compensation</li> <li>▪ -Prepared relocation base on the acceptable compensation for both parties</li> </ul>

<b>How do we address control improper settlement in danger area?</b>	
<ul style="list-style-type: none"> <li>▪ As much as possible all in danger area must vacate</li> <li>▪ Explain thoroughly the danger at stake may possible occur</li> <li>▪ Insufficient income</li> <li>▪ No proper job</li> <li>▪ Some ISF is less educated</li> <li>▪ Regular information discussion regarding the ongoing government project</li> <li>▪</li> </ul>	<ul style="list-style-type: none"> <li>▪ Conduct monitoring</li> <li>▪ Public awareness, coordination shall always be conducted</li> <li>▪ Strictly implementation of RA 7160 on control of informal settlers</li> <li>▪ Educational program</li> <li>▪ Livelihood program               <ul style="list-style-type: none"> <li>○ -To avoid illegal settlement, boundaries and signage must be properly installed in the proposed areas that will be affected.</li> </ul> </li> </ul>

**Consolidated Individual Inputs (from participants who answered the questionnaires)**

**How do we encourage land acquisition and resettlement?**

<b>Problem: Standing points on settler and owner</b>	<b>Solution: Standing point on implementers, LGUs</b>
<ul style="list-style-type: none"> <li>▪ Installation of early warning device system</li> <li>▪ Always mobilized the BDRMO</li> <li>▪ Conduct IEC/drill and exercises in regular basis</li> <li>▪ Train the barangay staff and functionary</li> <li>▪ Financial assistance if needed</li> <li>▪ Lot acquisition</li> <li>▪ Acquisition cost</li> <li>▪ No relocation, No demolition policy</li> <li>▪ Easy access to livelihood opportunities</li> <li>▪ Availability of micro financial assistance</li> <li>▪ For landowners' compensation including the amount spent in the development of the land</li> <li>▪ Titled properties</li> </ul>	<ul style="list-style-type: none"> <li>▪ Encourage POs to organize</li> <li>▪ Available community mortgage</li> <li>▪ Relocation program</li> <li>▪ Seek assistance to the local government unit and national agencies</li> <li>▪ Dialogue with preferred agencies</li> <li>▪ Assurance of details agreement               <ul style="list-style-type: none"> <li>○ -livelihood</li> <li>○ -financial</li> <li>○ -Accessibility to merchandise</li> </ul> </li> <li>▪ Prepare relocation site</li> <li>▪ Micro financial assistant to be rendered before relocation</li> <li>▪ Add compensation for voluntary resettlement</li> </ul>
<b>How do we address control improper settlement in danger area?</b>	
<ul style="list-style-type: none"> <li>▪ As much as possible in danger area must be vacated</li> <li>▪ Conduct monitoring of the informal settlers</li> <li>▪ Conduct public awareness and public consultation</li> <li>▪ For existing settlers' constant information dissemination that the upcoming government project are built in the area</li> </ul>	<ul style="list-style-type: none"> <li>▪ Overwhelming of the abundant family</li> </ul>

<ul style="list-style-type: none"> <li>▪ Application of RA 7160 for informal settlers</li> <li>▪ To avoid illegal settlement barrier and signage must be properly installed in the proposed area to be affected</li> </ul>	
<b>What can be done in Barangay level?</b>	<b>What kind of support is necessary?</b>
<b>Flood Early Warning</b>	
<ul style="list-style-type: none"> <li>▪ Installation of early warning device system</li> <li>▪ Always mobilize the BDRRMO</li> <li>▪ Water level indicators in rivers where it is visible to everyone</li> <li>▪ Warning bells per purok</li> </ul>	<ul style="list-style-type: none"> <li>▪ Funding</li> <li>▪ Procurement of flood rescue equipment</li> </ul>
<b>Flood fighting/evacuation drill</b>	
<ul style="list-style-type: none"> <li>▪ Conduct IEC/drill</li> <li>▪ Train the barangay</li> <li>▪ River walls construction</li> </ul>	<ul style="list-style-type: none"> <li>▪ Establish disaster activity team</li> <li>▪ Encourage the community to participate</li> </ul>
<b>Forest/mangroves conservation</b>	
<ul style="list-style-type: none"> <li>▪ Continue mangroves rehabilitation and reforestation</li> <li>▪ Conduct tree growing activity along riverbank</li> <li>▪ Forest ranger</li> <li>▪ Monitoring team</li> </ul>	<ul style="list-style-type: none"> <li>▪ Tree planting program</li> <li>▪ Tre growing along riverbank</li> </ul>
<b>Rainwater catchment system</b>	
<ul style="list-style-type: none"> <li>▪ Construct the water reservoir catch basic in the upper stream</li> <li>▪ Construct dumpsite on the upper stream</li> </ul>	<ul style="list-style-type: none"> <li>▪ Improve drainage system/infrastructure</li> </ul>
<b>Cleaning river/drainage/ coat</b>	
<ul style="list-style-type: none"> <li>▪ Some areas have no proper drainage</li> </ul>	<ul style="list-style-type: none"> <li>▪ River clean-up drive</li> <li>▪ Maintenance of clean-up drainage per purok</li> </ul>

### **Group 3-Outputs**

How do we encourage land acquisition and resettlement?

<b>Problem: Standing points on settler and owner</b>	<b>Solution: Standing point on implementers, LGUs</b>
<b>How do we address control improper settlement in danger area?</b>	
<b>What can be done in Barangay level?</b>	<b>What kind of support is necessary?</b>
Flood Early Warning	
<ul style="list-style-type: none"> <li>▪ Siren</li> <li>▪ Signage</li> </ul>	
Flood fighting/evacuation drill	
<ul style="list-style-type: none"> <li>▪ Flood orientation and drill               <ul style="list-style-type: none"> <li>○ (quarterly for houses and school)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ With the help of BORRMC and CDRMO</li> </ul>
Forest/mangroves conservation	
<ul style="list-style-type: none"> <li>▪ tree planting</li> </ul>	
Rainwater catchment system	

### **Consolidated Individual Inputs (from participants who answered the questionnaires)**

How do we encourage land acquisition and resettlement?

<b>Problem: Standing points on settler and owner</b>	<b>Solution: Standing point on implementers, LGUs</b>
<ul style="list-style-type: none"> <li>▪ By doing soft approach</li> <li>▪ The wright compensation to the owners of the property. We need the property negotiation to the land owners</li> <li>▪ Difficult to negotiate the land owners</li> </ul>	<ul style="list-style-type: none"> <li>▪ Add-on compensation for resettlement</li> <li>▪ Job training</li> <li>▪ Micro finance</li> <li>▪ Livelihood after the relocation</li> <li>▪ Facilities should be provided in the relocation site</li> <li>▪</li> </ul>
<b>How do we address control improper settlement in danger area?</b>	
<ul style="list-style-type: none"> <li>▪ Participating planning</li> <li>▪ Public awareness campaign</li> <li>▪ Implementation of law and ordinances constant information education campaign done by the barangay</li> <li>▪ Relocation of the site</li> <li>▪ Informal settler's relocation area</li> <li>▪ Hard to negotiate with the landowners</li> </ul>	<ul style="list-style-type: none"> <li>▪ Warning to resident through various tools</li> <li>▪ Evacuation center management</li> <li>▪ Develop the area</li> <li>▪ Directive ordinance</li> <li>▪ Letter to the LGU about the hazardous area cautiously resettled by the IS</li> <li>▪ Find the relocation site</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Negotiate landowners for the benefits of everyone</li> <li>▪ Look for enough budget intended for the settlement</li> <li>▪ Provide livelihood program as an additional source of income</li> </ul>
<b>What can be done in Barangay level?</b>	<b>What kind of support is necessary?</b>
<b>Flood Early Warning</b>	
<ul style="list-style-type: none"> <li>▪ Manual method for early warning</li> <li>▪ Signage</li> <li>▪ Siren every Tuesday according to water level coding</li> <li>▪ Installation of early warning device</li> <li>▪ Always mobilized by the BDRRMC</li> <li>▪ The barangay council will pass resolution to not make illegal structure of river segment</li> <li>▪ Barangay level will tie to the national level for budget requirement</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rainwater utilization for flood mitigation</li> <li>▪ Communication link between BDRRMC and CDRRMC</li> <li>▪ Provide the evacuation center</li> <li>▪ Provide early warning device or facility for disaster and calamity fund</li> </ul>
<b>Flood fighting/evacuation drill</b>	
<ul style="list-style-type: none"> <li>▪ Regular community drill</li> <li>▪ Flood orientation</li> <li>▪ Seminars of barangay officials</li> </ul>	<ul style="list-style-type: none"> <li>▪ With the help of BDRRMC</li> <li>▪ Conduct training orientation for the residence near the riverbank</li> <li>▪ IEC awareness program</li> </ul>
<b>Forest/mangroves conservation</b>	
<ul style="list-style-type: none"> <li>▪ They destroy the mangroves to build the house</li> <li>▪ Some existing dikes affect the area</li> <li>▪ reforestation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Support with other agencies</li> <li>▪ “Bantay dagat”</li> <li>▪ Continue tree planting</li> <li>▪ Tree growing activity</li> </ul>
<b>Rainwater Catchment System</b>	
<ul style="list-style-type: none"> <li>▪ Tanks, reservoir and drums</li> </ul>	<ul style="list-style-type: none"> <li>▪ Control the flow of water level</li> <li>▪ Purchase water catchment system like water tank</li> <li>▪ Funded 30% of calamity disaster fund</li> </ul>
<b>Cleaning river/drainage/ coat</b>	
<ul style="list-style-type: none"> <li>▪ Catches all liquid waste and some solid/plastic materials from landfill area</li> <li>▪ Can be dangerous to health for the residence near the streams and flowing water</li> <li>▪ Conduct IEC to the residence regularly</li> </ul>	<ul style="list-style-type: none"> <li>▪ Recommend the city government to reregulate the waste management that cause illness to people living near the area</li> <li>▪ Maintain the cleanliness of the drainage system with the help of the barangay functionaries and constituent</li> </ul>

<ul style="list-style-type: none"> <li>▪ Clean quarterly and the community should participate</li> </ul>	
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### **Group 4-Outputs**

#### **How do we encourage land acquisition and resettlement?**

<b>Problem: Standing points on settler and owner</b>	<b>Solution: Standing point on implementers, LGUs</b>
<ul style="list-style-type: none"> <li>▪ Informal settler</li> <li>▪ Relocation site or area</li> <li>▪ Hard to negotiate landowner</li> </ul>	<ul style="list-style-type: none"> <li>▪ Find area for the relocation for the informal settler</li> <li>▪ Near the working area and accessible to their basic needs, if possible, within the barangay</li> <li>▪ Expropriation</li> <li>▪ Offer livelihood program for settlers</li> </ul>
<b>How do we address control improper settlement in danger area?</b>	
<ul style="list-style-type: none"> <li>▪ Implement the barangay ordinance in prohibiting the illegal settlers to build houses near or within the danger area</li> <li>▪ Close monitoring/ strict implementation of the barangay ordinance</li> <li>▪ Strong political will from the barangay officials</li> </ul>	
<b>What can be done in Barangay level?</b>	<b>What kind of support is necessary?</b>
<b>Flood Early Warning</b>	
<ul style="list-style-type: none"> <li>▪ Installation of early warning devices such as CCTV and Siren</li> </ul>	<ul style="list-style-type: none"> <li>▪ Utilize the BORRMC funds</li> </ul>
<b>Flood fighting/evacuation drill</b>	
<ul style="list-style-type: none"> <li>▪ Training and seminars purok levels/ Sitios</li> </ul>	<ul style="list-style-type: none"> <li>▪ With the help of BORRMC and CDRRMO</li> </ul>
<b>Forest/mangroves conservation</b>	
<ul style="list-style-type: none"> <li>▪ Reforestation / tree planting</li> </ul>	<ul style="list-style-type: none"> <li>▪ Implementation of laws and ordinance regarding reforestation</li> <li>▪ Continuous tree growing activity along river bank</li> </ul>
<b>Rainwater Catchment System</b>	
<ul style="list-style-type: none"> <li>▪ Tank, reservoir and drum</li> </ul>	<ul style="list-style-type: none"> <li>▪ Homeowners and residence will provide at least 1 drum per household</li> </ul>
<b>Clean river/drainage/cost</b>	
<ul style="list-style-type: none"> <li>▪ Clean-up drive</li> </ul>	<ul style="list-style-type: none"> <li>▪ Community Participation of cleanliness</li> </ul>

## GROUP OUTPUTS-DAY 2

### Group Outputs – Group 1

#### LAND ACQUISITION

How Do we find/secure land for further retarding basin?
<ul style="list-style-type: none"> <li>• Complete damage rehabilitation Improve the drainage</li> <li>• Barangay will help to locate vacant lot for possible retarding basin</li> <li>• Identify vacant lot for the retarding pond</li> </ul>
What incentive could be effective to negotiate for land procure?
<ul style="list-style-type: none"> <li>• Recommendation for tax incentive provision for the landowner</li> <li>• Beneficial to flooding area</li> </ul>

#### NON-STRUCTURAL MEASURES

What can be done in Barangay level?	What kind of support is necessary?
Rain water catchment system	
<ul style="list-style-type: none"> <li>• Provision of water tanks -rainwater catchment basin in every household</li> <li>• Information/ education campaign for the constituents</li> <li>• Close monitoring and implementation of the city ordinance</li> </ul>	<ul style="list-style-type: none"> <li>• Provision of budget -LGU and private company</li> <li>• Provision of budget for IEC materials</li> <li>• Educate the community</li> </ul>
Cleaning river/drainage/cost	
<ul style="list-style-type: none"> <li>• Rehabilitation of canal/drainage</li> <li>• Information/education campaign</li> <li>• Program activities for drainage and coastal clean-up drive</li> </ul>	

COASTAL AREA (OPTIONAL)
What issues do you concern on seawall installation along coast? ( accessibility, water pollutions sg.)
Issues on relocation of houses

### Individual Outputs (from those who provided their answers in the questionnaire forms)

#### LAND ACQUISITION

How Do we find/secure land for further retarding basin?
<ul style="list-style-type: none"> <li>• As a coastal area assessment retrieval of available coastal area</li> </ul>
What incentive could be effective to negotiate for land procure?
<ul style="list-style-type: none"> <li>• To give and secure possible relocation area</li> <li>• Expropriation party</li> </ul>

## GROUP OUTPUTS-DAY 2

### NON-STRUCTURAL MEASURES

What can be done in Barangay level?	What kind of support is necessary?
Rain water catchment system	
<ul style="list-style-type: none"> <li>• To find available area for possible reservoir and water will be treated for possible sanitary use distribution</li> <li>• Require all household to install rain water catchment</li> <li>• Construct a retarding pond</li> </ul>	<ul style="list-style-type: none"> <li>• Contraction materials like hollow brocks of cement plastic pipes and even small among for labor cost BAYANIHAN</li> <li>• Help in regulating the procurement of lot for the retarding pond</li> </ul>
Cleaning river/drainage/cost	
<ul style="list-style-type: none"> <li>• Regular schedule of coastal or river clean-up</li> <li>• (Due to very limited resources) Organize a group as volunteer to maintain/clean the drainage</li> </ul>	

COASTAL AREA (OPTIONAL)	
What issues do you concern on seawall installation along coast? ( accessibility, water pollutions sg.)	
<ul style="list-style-type: none"> <li>• It will lessen our reserve approved marine protection area(MPA)</li> <li>• Coastal cleaning</li> <li>• Mangrove planting</li> </ul>	

### Group Outputs - Group 2

#### LAND ACQUISITION

How Do we find/secure land for further retarding basin?	
<ul style="list-style-type: none"> <li>• Approach directly the land owners</li> </ul>	
What incentive could be effective to negotiate for land procure?	
<ul style="list-style-type: none"> <li>• It is effective to negotiate based on the appraisal</li> </ul>	

### NON-STRUCTURAL MEASURES

What can be done in Barangay level?	What kind of support is necessary?
Rain water catchment system	



## GROUP OUTPUTS-DAY 2

<ul style="list-style-type: none"> <li>Encourage the house to have a catchment basin</li> </ul>	<ul style="list-style-type: none"> <li>Recommendation of budget proposal to DPWH/ city government to make an under tank project</li> <li>Inform the constituent</li> <li>Make barangay ordinance</li> </ul>
Cleaning river/drainage/cost	
<ul style="list-style-type: none"> <li>Allocate budget for the rehabilitation of the interior canal (drainage system)</li> <li>Outpour should go to the main catch basin of the major drainage</li> </ul>	<ul style="list-style-type: none"> <li>Subsidize the barangay instructure projects (LGU/NATIONAL LEVEL)</li> </ul>

COASTAL AREA (OPTIONAL)
What issues do you concern on seawall installation along coast? ( accessibility, water pollutions sg.)
Relocation issues

### Individual Outputs (from those who provided answers in the questionnaire forms)

#### LAND ACQUISITION

How Do we find/secure land for further retarding basin?
<ul style="list-style-type: none"> <li>Select the areas suitable for the location of the ponds such as natural land. If there are adverse claimed on the lot implement expropriation proceeding</li> <li>Political will is a must</li> </ul>
What incentive could be effective to negotiate for land procure?
<ul style="list-style-type: none"> <li>There are plenty or many kinds of incentives such as;             <ol style="list-style-type: none"> <li>Tax holidays</li> <li>Scholarship of children of the land owner</li> </ol> </li> </ul>

#### NON-STRUCTURAL MEASURES

What can be done in Barangay level?	What kind of support is necessary?
Rain water catchment system	
<ul style="list-style-type: none"> <li>Rain water catchment is good but if only a tablet for a cure. We suggest that in constructing a pavement use decorative blocks or bricks to be able the water to sip-in</li> </ul>	
Cleaning river/drainage/cost	
<ul style="list-style-type: none"> <li>Plant malibago tree along the river creek embankment</li> <li></li> </ul>	

## GROUP OUTPUTS-DAY 2

COASTAL AREA (OPTIONAL)
What issues do you concern on seawall installation along coast? ( accessibility, water pollutions sg.)
<ul style="list-style-type: none"> <li>Enhance mangrove reforestation by tree nurturing</li> </ul>

### Group Outputs - Group 3

#### LAND ACQUISITION

How Do we find/secure land for further retarding basin?
<ul style="list-style-type: none"> <li>Not applicable in our barangay. (barangay 38-D</li> <li>Alternative: SUMPPIT with pumps</li> <li>Security land in urban areas</li> </ul>
What incentive could be effective to negotiate for land procure?
<ul style="list-style-type: none"> <li>To offer high price for land acquisition (36-D)</li> <li>Relocation with light and water installation</li> <li>Training activity</li> </ul>

#### NON-STRUCTURAL MEASURES

What can be done in Barangay level?	What kind of support is necessary?
Rain water catchment system	
<ul style="list-style-type: none"> <li>Improvement of existing design of drainage system</li> <li>Each household must have water tank to catch rain water</li> <li>Required to install water tank in every house and commercial building</li> </ul>	<ul style="list-style-type: none"> <li>Allocation of funds from national? LGU/LGSF</li> <li>To allocate BOF to install water tank for water to conserve water</li> <li>Cooperation of the people in barangay is necessary to achieve the program</li> <li>Make a barangay ordinance and required to install water tank in every house and commercial building under AOR</li> </ul>
Cleaning river/drainage/cost	
<ul style="list-style-type: none"> <li>Desiltation of canal periodically</li> <li>Proper disposal of garbage</li> <li>Maintain cleanliness in canal/ drainage</li> <li>Proper throwing of garbage</li> <li>Monthly clean-up drive</li> </ul>	<ul style="list-style-type: none"> <li>Resolution and Legislation to congressman and city</li> <li>Continuous allocate funds</li> <li>Proper garbage disposal</li> </ul>

COASTAL AREA (OPTIONAL)
What issues do you concern on seawall installation along coast? ( accessibility, water pollutions sg.)
<ul style="list-style-type: none"> <li>Where do they park/place their fishing boat?</li> </ul>

## GROUP OUTPUTS-DAY 2

- |  |
|--|
| <ul style="list-style-type: none"> <li>• Secure proper outlines of waste materials.</li> </ul> |
|--|

### Individual Outputs (from those who provided answers in the questionnaire forms)

#### NON-STRUCTURAL MEASURES

What can be done in Barangay level?	What kind of support is necessary?
Rain water catchment system	
<ul style="list-style-type: none"> <li>• Installation of concrete and aluminum basin with rain water to minimized water flow and water conservation</li> </ul>	<ul style="list-style-type: none"> <li>• Allocate funds from BDF specially national and local funds(LGU)</li> </ul>
Cleaning river/drainage/cost	
<ul style="list-style-type: none"> <li>• Maintain relogging of canal</li> </ul>	<ul style="list-style-type: none"> <li>• Allot funds for labor and others</li> </ul>

COASTAL AREA (OPTIONAL)
What issues do you concern on seawall installation along coast? ( accessibility, water pollutions sg.)
<ul style="list-style-type: none"> <li>• Enhance mangrove reforestation by tree nurturing</li> </ul>

### Group Outputs - Group 4

#### LAND ACQUISITION

How Do we find/secure land for further retarding basin?
<ul style="list-style-type: none"> <li>• Underground storage</li> <li>• Unitizing               <ul style="list-style-type: none"> <li>-under the road</li> <li>-parking area</li> <li>-basketball gym</li> <li>-open space</li> </ul> </li> </ul>
What incentive could be effective to negotiate for land procure?
<ul style="list-style-type: none"> <li>• PRIVATE               <ul style="list-style-type: none"> <li>Set an appointment to the management for negotiation or possible discount of RPT</li> <li>If without water it can generate income by imposing parking fee</li> </ul> </li> <li>• PUBLIC               <ul style="list-style-type: none"> <li>Use stored water as secondary source of utility waters</li> </ul> </li> </ul>

#### NON-STRUCTURAL MEASURES

What can be done in Barangay level?	What kind of support is necessary?
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## GROUP OUTPUTS-DAY 2

Rain water catchment system	
<ul style="list-style-type: none"> <li>• Convince all household occupant to install a water tank or just conduct a seminar to open their minds</li> <li>• Requirement of household rainwater tank</li> <li>• Roof gutter for rain water harvesting</li> </ul>	<ul style="list-style-type: none"> <li>• Institutional support</li> <li>• Equipment supports from LGU/DPWH</li> <li>• Community involvement</li> </ul>
Cleaning river/drainage/cost	
<ul style="list-style-type: none"> <li>• Cleaning maintenance of drainage</li> <li>• Removal of IS along water channel</li> <li>• Repair damage dike in our coastal roads</li> <li>• Removal of obstacle along waterways</li> <li>• Desiltation and drainage</li> </ul>	<ul style="list-style-type: none"> <li>• LGU- Equipment support</li> <li>• BAYANIHAN in barangay</li> </ul>

<b>COASTAL AREA (OPTIONAL)</b>
What issues do you concern on seawall installation along coast? ( accessibility, water pollutions sg.)
<ul style="list-style-type: none"> <li>• Sub-standard construction is along coastal area</li> <li>• Accessibility of equipment</li> <li>• Livelihood and living</li> <li>• Waste water discharge</li> </ul>

### **Individual Outputs (from those who provided answers in the questionnaire forms)**

#### LAND ACQUISITION

How Do we find/secure land for further retarding basin?
<ul style="list-style-type: none"> <li>• Available space be acquired</li> </ul>
What incentive could be effective to negotiate for land procure?

#### NON-STRUCTURAL MEASURES

What can be done in Barangay level?	What kind of support is necessary?
Rain water catchment system	
<ul style="list-style-type: none"> <li>• Roof gutter rain harvesting</li> <li>• Mini retarding pond</li> </ul>	<ul style="list-style-type: none"> <li>• Financial support</li> <li>• Available space for retarding pons</li> <li>• Community involvement</li> </ul>
Cleaning river/drainage/cost	

## GROUP OUTPUTS-DAY 2

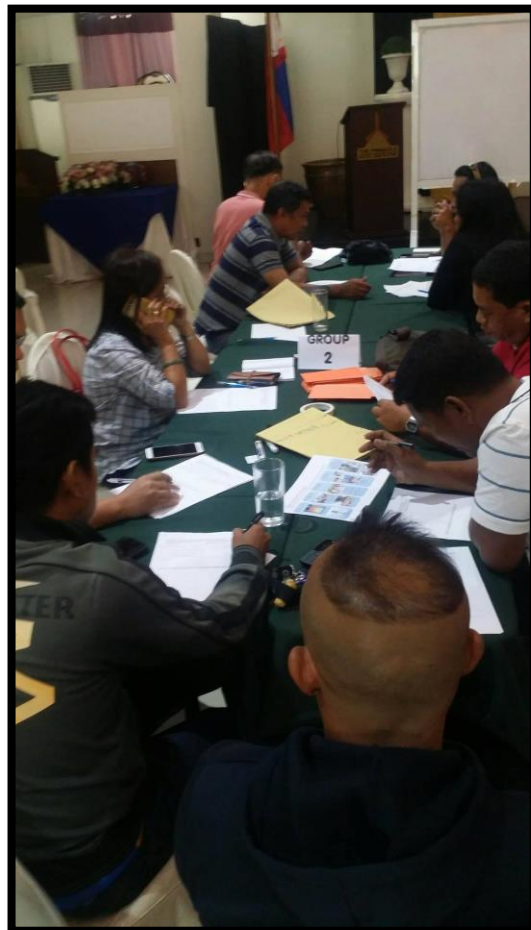
<ul style="list-style-type: none"><li>• Removal of informal settlers along the natural waterway</li><li>• Removal of the obstacle materials along water channel</li><li>• Desiltation drainage</li></ul>	<ul style="list-style-type: none"><li>• Support from LGU. Barangay and national agency</li><li>• Community involvement</li><li>• Implication of existing laws and ordinance</li></ul>
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COASTAL AREA (OPTIONAL)
What issues do you concern on seawall installation along coast? ( accessibility, water pollutions sg.)
<ul style="list-style-type: none"><li>• Sub-standard construction is along coastal area</li><li>• Accessibility of equipment</li><li>• Livelihood and living</li><li>• Waste water discharge</li></ul>

Day 1



Group 1



Group 2

PHOTO DOCUMENTATION



Group 3



Group 4

DAY 2



Group 1



Group 2



PHOTO DOCUMENTATION



Group 3



Group 4

## Annex 4

### Data on Cost Estimate

## 1. Quantity of Works

### (1) Dredging volume (Cross section area method)

No	station	Structures	Design Sectional Distance (m)	Cumulative Distance (m)	Dredging Area (m <sup>2</sup> )	Dredging Volume (m <sup>3</sup> )	No	station	Structures	Design Sectional Distance (m)	Cumulative Distance (m)	Dredging Area (m <sup>2</sup> )	Dredging Volume (m <sup>3</sup> )
1	STA 0+000		0	0	0.000		28	STA 12+675		237	8,386	161.950	112,555
2	STA 0+500		500	500	306.556	76.639	29	STA 12+975	Davao River Brd.	300	8,686	161.950	48,585
3	STA 1+000		500	1,000	92.820	99.844	30	STA 13+500		525	9,211	14.751	46,384
4	STA 1+522	Bolton Brd. D	522	1,522	38.066	34.161	31	STA 14+000		500	9,711	31.209	11,490
5	STA 1+561	Bolton Brd. U	39	1,561	46.896	1,657	32	STA 14+500		500	10,211	92.820	31,007
6	STA 2+000		439	2,000	59.645	23.386	33	STA 15+000		500	10,711	76.520	42,335
7	STA 2+500		500	2,500	168.292	56.984	34	STA 15+500		500	11,211	123.558	50,020
8	STA 2+664	Gov.Generoso Brd. D	164	2,664	58.721	18.615	35	STA 16+000		500	11,711	87.545	52,776
9	STA 2+710	Gov.Generoso Brd. U	46	2,710	57.046	2,663	36	STA 16+500		500	12,211	55.876	35,855
10	STA 3+000		290	3,000	143.321	29,053	37	STA 16+750		250	12,461	35.576	11,432
11	STA 3+500		500	3,500	161.201	76.131	38	STA 17+147	Waan Brd.	397	12,858	42.929	15,583
12	STA 4+000		500	4,000	137.450	74.663	39	STA 17+500		353	13,211	66.977	19,398
13	STA 4+500		500	4,500	79.255	54.176	40	STA 18+000		500	13,711	28.964	23,985
14	STA 5+000		500	5,000	73.928	38.296	41	STA 18+500		500	14,211	14.144	10,777
15	STA 5+500		500	5,500	54.380	32.077	42	STA 18+980		480	14,691	9.742	5,733
16	STA 5+929	F.Torres Brd.	429	5,929	14.828	14,845	43	STA 19+132	Sta.Lucia Brd.	152	14,843	33.379	3,277
17	STA 6+500		571	6,500	34.756	14,156	44	STA 19+500		368	15,211	8.056	7,624
18	(STA 7+030.2)		90	6,590	397.646	Short-Cut	45	STA 20+000		500	15,711	51.070	14,782
19	(STA 7+573.4)		90	6,681	449.969	Short-Cut	46	STA 20+500		500	16,211	20.523	17,898
20	(STA 8+116.6)		90	6,771	489.886	Short-Cut	47	STA 21+000		500	16,711	35.770	14,073
21	(STA 8+659.8)		90	6,862	563.485	Short-Cut	48	STA 21+500		500	17,211	125.708	40,370
22	(STA 9+260)		102	6,964	346.132	Short-Cut	49	STA 22+020		520	17,731	80.566	53,631
23	STA 9+480		220	7,184	346.132	Short-Cut	50	STA 22+500		480	18,211	16.788	23,365
24	(STA 9+873)		393	7,577	346.132	Short-Cut	51	STA 23+000		500	18,711	17.847	8,659
25	(STA 10+472.2)		172	7,749	628.423	Short-Cut							
26	(STA 11+188.4)		200	7,949	633.705	Short-Cut							
27	(STA 11+904.7)		200	8,149	787.617	Short-Cut							
									Average Area				79.1
									Sub-Total	17,062		7,911	1,349,000
									Diduction around Bridges		79.1x5x200=		79,000
									Total Dredging Volume				1,270,000

### (2) Quantity of Cut-off

#### Earthwork volume (Cross section area method)

No	station	Design Sectional Distance (m)	Cumulative Distance (m)	Excavation Area (m <sup>2</sup> )	Excavation Volume (m <sup>3</sup> )	Filling Area (m <sup>2</sup> )	Filling Volume (m <sup>3</sup> )
1	STA 6+500	571	571	34.756	0	0.000	0
2	(STA 7+030.2)	90	661	397.646	19,559	14.056	636
3	(STA 7+573.4)	90	752	449.969	38,340	11.151	1,140
4	(STA 8+116.6)	90	842	489.886	42,512	5.369	747
5	(STA 8+659.8)	90	933	563.485	47,647	0.637	272
6	(STA 9+260)	102	1,035	346.132	46,280	7.894	434
7	STA 9+480	220	1,255	346.132	76,149	7.894	1,737
8	(STA 9+873)	393	1,648	346.132	136,030	7.894	3,102
9	(STA 10+472.2)	172	1,820	628.423	83,841	0.000	679
10	(STA 11+188.4)	200	2,020	633.705	126,213	0.000	0
11	(STA 11+904.7)	200	2,220	787.617	142,132	0.000	0
					759,000		
							9,000

**Work volume by location of Cut-off (Downstream Cut-off portion, Center river widening portion, Downstream Cut-off portion)**

Item			1	2	3	4	5	Total
			D RW	D Cut-off	M RW	U Cut-off	U RW	
1	Channel Excavation (Excavation-Loading-Transportation)	m3	-	-	-	-	-	759,000
2	Embankment (for Dike)	m3	-	-	-	-	-	9,000
3	Embankment (at Disposal area)	m3	-	-	-	-	-	750,000
4	Concrete Revetment (t=30cm)	m3	-	2,830	6,209	5,248	-	14,287
5	Gabion (t=50cm) - Foot Protection	m3	-	1,488	2,638	2,558	-	6,684
6	Concrete Block - Slope Toe Protection	m3	-	372	989	640	-	2,001
7	RC Wall (Reinforced concrete)	m	-	0	-	7,514	-	7,514
8	RC Wall back-filling (crushed stone)	m	-	0	-	4,704	-	4,704
9	RC Wall base (crushed stone)	m3	-	0	-	729	-	729
10	Steel Sheet Piles , Furnished	m	-	-	8,125	0	-	8,125
11	Steel Sheet Piles, for temporary works, without materials	m	-	-	8,125	0	-	8,125

**( 3 ) Quantity of Retarding pond (Quantities of structures are listed in main document)**

**Earthwork volume (Calculating by CAD)**

	Cut(m3)	Fill(m3)	Net(m3)
RP08	5,893,720	31,107	5,862,613
RP09	1,931,483	38,243	1,893,240
RP11	4,345,682	11,930	4,333,752
Total	12,170,885	81,279	12,089,606

**( 4 ) Quantity of River widening (Quantities of structures are listed in main document)**

**Earthwork volume (Cross section area method)**

Station	Structures	Dredging Area from barge (m2)	Cut Area from ground (m2)	Dredging Volume (m3)	Cut Volume (m3)	Filling Area (m2)	Filling Volume (m3)
STA 1+561	Bolton Brd. U	0	0	0	0	0	0
STA 2+000		151	41	33,242	9,062	8	1,760
STA 2+500		44	7	48,964	12,037	7	3,827
STA 2+664	Gov.Generoso Brd. D	90	51	11,024	4,746	9	1,351
STA 2+710	Gov.Generoso Brd. U	150	103	5,520	3,547	8	398
STA 3+000		82	69	33,617	24,919	43	7,479
STA 3+500		82	39	40,921	26,861	12	13,988
STA 4+000		59	86	35,252	31,125	55	16,757
Total		-	-	209,000	112,000	-	46,000

2. Rate Analysis

1701(2)a Channel Excavation (Excavation-Loading-Transportation)

RATE ANALYSIS								
Item No.:		1701(2)a			Excavation(Bulldozer)- Loading(Payloader)- Transportation(DT)		Unit m <sup>3</sup>	
Description		Channel Excavation (Excavation-Loading-Transportation)						
Unit of Analysis		60 (Output per hour)						
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment		Remark
						(LC)	(FC)	
<b>A. Labour</b>								
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Unskilled Labor	hr	2.00	61.07	122.14			
<b>Sub-total (A)</b>					231.58	231.58	0.00	
<b>B. Equipment</b>								
a	Bulldozer D6H	hr	1.00	3642.00	3,642.00			Excavation
b	Payloader (1.5m <sup>3</sup> ), LX80-2C	hr	1.00	1733.00	1,733.00			Loading
c	Payloader (1.5m <sup>3</sup> ), LX80-2C	hr	0.00	1733.00	0.00			at Disposal
d	Dump Truck (12 yd <sup>3</sup> )	hr	12.00	1420.00	17,040.00			L=20km, 5.2m <sup>3</sup> /hr
Minor Tools		hr	0.1000	231.58	23.16			Labor Cost x 10%
<b>Sub-total (B)</b>					22,438.16	6,731.45	15,706.71	LC:FC=3:7
<b>C. Total (A+B)</b>					22,669.74	6,963.03	15,706.71	
<b>D. Output per hour</b>							60.00	
<b>E. Direct Unit Cost (C/D)</b>					377.83	116.05	261.78	
<b>F. Material</b>								
<b>Sub-total (C)</b>					0.00	0.00	0.00	
<b>G. Direct Unit Cost (E+F)</b>					378	116	262	

1701(2)a(2) Channel Excavation (Loading and Transportation)

RATE ANALYSIS									
Item No.:		1701(2)a(2)		Description		Channel Excavation (Loading and Transportation)		Loading(Payload)- Transportation(DT)	
Unit of Analysis		60		(Output per hour)				Unit m3	
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment (LC) (FC)		Remark	
<b>A. Labour</b>									
a	Construction Foreman	hr	0.50	109.44	54.72				
b	Unskilled Labor	hr	1.00	61.07	61.07				
<b>Sub-total (A)</b>					115.79	115.79	0.00		
<b>B. Equipments</b>									
a	Bulldozer D6H	hr	0.00	3642.00	0.00			Excavation	
b	Payloader (1.5m3), LX80-2C	hr	1.00	1733.00	1,733.00			Loading	
c	Payloader (1.5m3), LX80-2C	hr	0.00	1733.00	0.00			at Disposal	
d	Dump Truck (12 yd3)	hr	12.00	1420.00	17,040.00			L=20km, 5.2m3/hr	
	Minor Tools	hr	0.1000	115.79	11.58			Labor Cost x 10%	
<b>Sub-total (B)</b>					18,784.58	5,635.37	13,149.21	LC:FC=3:7	
<b>C. Total (A+B)</b>					18,900.37	5,751.16	13,149.21		
<b>D. Output per hour</b>							60.00		
<b>E. Direct Unit Cost (C/D)</b>					315.01	95.85	219.15		
<b>F. Material</b>									
<b>Sub-total (C)</b>					0.00	0.00	0.00		
<b>G. Direct Unit Cost (E+F)</b>					315	96	219		

### 1703-(1)a Dredging-soils (using Backhoe on Barge)

RATE ANALYSIS								
Item No.:		1703-(1)a			Dredging-Barge-Unloading (Temporary yard)		Unit m <sup>3</sup>	
Description		Dredging-soils (using Backhoe on Barge)						
Unit of Analysis		16 (Output per hour)						
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment (LC) (FC)		Remark
<b>A. Labour</b>								
a	Dredge Master	hr	1.00	109.44	109.44			
b	Dredgerman Foreman	hr	1.00	109.44	109.44			
c	Marine Engineman	hr	1.00	91.33	91.33			
d	Skilled Labor	hr	3.00	79.17	237.51			
<b>Sub-total (A)</b>					547.72	547.72	0.00	
<b>B. Equipments</b>								
a	Backhoe (0.8m3)	hr	1.00	2096.00	2,096.00			
b	Deck Barge (600mt DWT)	hr	1.00	546.00	546.00			
c	*Scow, 10 m3	hr	2.00	222.07	444.14			
d	Tugboat, 500hp	hr	1.00	160.00	160.00			
e	Backhoe (0.8m3) -for Loading	hr	0.00	2096.00	0.00			not included
f	Dump Truck (12 yd3)	hr	0.00	1420.00	0.00			not included
g	Payloader (1.5m3)- at Temporary	hr	0.50	1733.00	866.50			Temporary Yard
h	Crawler Crane (36-40m)190hp w	hr	1.00	2282.40	2,282.40			for Unloading
	Minor Tools	hr	0.1000	547.72	54.77			Labor Cost x 10%
<b>Sub-total (B)</b>					6,449.81	1,934.94	4,514.87	LC:FC=3:7
<b>C. Total (A+B)</b>					6,997.53	2,482.66	4,514.87	
<b>D. Output per hour</b>							16.00	
<b>E. Direct Unit Cost (C/D)</b>					437.35	155.17	282.18	
<b>F. Material/Fuel</b>								
included in Equipments								
<b>Sub-total (C)</b>					0.00	0.00	0.00	
<b>G. Direct Unit Cost (E+F)</b>					437	155	282	

1703-(1)d Dredging-soils (using Cutter Suction Dredger, 8"  $\phi$ )

RATE ANALYSIS								
Item No.:		1703-(1)d			Dredging-(Pipeline)- (Temporary yard)			Unit m <sup>3</sup>
Description		Dredging-soils (using Cutter Suction Dredger, 8" $\phi$ )						
Unit of Analysis		88 (Output per hour)						
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment		Remark
						(LC)	(FC)	
<b>A.</b>	<b>Labour</b>							
a	Dredge Master	hr	1.00	109.44	109.44			
b	Dredgerman Foreman	hr	1.00	109.44	109.44			
c	Marine Engineman	hr	1.00	91.33	91.33			
d	Skilled Labor	hr	1.00	79.17	79.17			
e	Unskilled Labor	hr	4.00	61.07	244.28			
<b>Sub-total (A)</b>					633.66	633.66	0.00	
<b>B.</b>	<b>Equipments</b>							
a	Dredger, 8" $\phi$ , 225hp, 1.5km	hr	1.00	8327.27	8,327.27			
b	Motorized Banca, 20 hp	hr	0.20	11.11	2.22			
c	Payloader (1.5m <sup>3</sup> )-	hr	0.50	1733.00	866.50			Temporary Yard
	Minor Tools	hr	0.1000	633.66	63.37			Labor Cost x 10%
<b>Sub-total (B)</b>					9,259.36	2,777.81	6,481.55	LC:FC=3:7
<b>C.</b>	Total (A+B)				9,893.02	3,411.47	6,481.55	
<b>D.</b>	Output per hour						88.00	
<b>E.</b>	Direct Unit Cost (C/D)				112.42	38.77	73.65	
<b>F.</b>	<b>Material/Fuel</b>							
a	Fuel for Motorized Banca (Diesel)	L	0.05	77.50	3.88	1.16	2.71	
b	Lubricants	L	0.01	194.38	1.94	0.58	1.36	
	Miscellaneous	LS	1.00	0.17	0.17	0.05	0.12	3% of MaterialCost
<b>Sub-total (C)</b>					5.99	1.80	4.20	
<b>G.</b>	Direct Unit Cost (E+F)				118	41	78	







1705(1)b Fill (Granular Materials)

RATE ANALYSIS								
Item No.:		1705(1)b						
Description		Fill (Granular Materials)			Spreading and Compaction			Unit m3
Unit of Analysis		1.25			(Output per hour)			
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment (LC) (FC)		Remark
<b>A.</b>	<b>Labour</b>							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Unskilled Labor	hr	4.00	61.07	244.28			
<b>Sub-total (A)</b>					353.72	353.72	0.00	
<b>B.</b>	<b>Equipments</b>							
a	Plate Compactor (5hp)	hr	1.00	123.00	123.00			
	Minor Tools	hr	0.1000	353.72	35.37			Labor Cost x 10%
<b>Sub-total (B)</b>					158.37	47.51	110.86	LC:FC=3:7
<b>C.</b>	Total (A+B)				512.09	401.23	110.86	
<b>D.</b>	Output per hour						1.25	
<b>E.</b>	Direct Unit Cost (C/D)				409.67	321	89	
<b>F.</b>	<b>Material/Fuel</b>							
	Granular Filter	m3	1.15	644.00	740.60	740.60	0.00	
<b>Sub-total (C)</b>					740.60	740.60	0.00	
<b>G.</b>	Direct Unit Cost (E+F)				1,150	1,062	89	

1710(1)c Riprap (Class C)

RATE ANALYSIS								
Item No.:		1710(1)c					Unit	
Description		Riprap (Class C)					m3	
Unit of Analysis		1 (Output per hour)						
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment (LC) (FC)		Remark
<b>A.</b>	<b>Labour</b>							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Skilled Labor	hr	2.00	79.17	158.34			
c	Unskilled Labor	hr	4.00	61.07	244.28			
<b>Sub-total (A)</b>					512.06	512.06	0.00	
<b>B.</b>	<b>Equipments</b>							
a	Backhoe (0.3m3)	hr	0.75	922.00	691.50			
<b>Sub-total (B)</b>					691.50	207.45	484.05	LC:FC=3:7
<b>C.</b>	Total (A+B)				1,203.56	719.51	484.05	
<b>D.</b>	Output per hour						1.00	
<b>E.</b>	Direct Unit Cost (C/D)				1,203.56	719.51	484.05	
<b>F.</b>	<b>Material/Fuel</b>							
a	Boulders	m3	1.05	760.00	798.00	798.00	0.00	
	1714(1)a							
	Hauling Cost	m3	1.25	295.35	369.19	369.19	0.00	
	Miscellaneous	hr	0.0100	1167.19	11.67	11.67	0.00	Materials Cost x 1%
<b>Sub-total (C)</b>					1,178.87	1,178.87	0.00	
<b>G.</b>	Direct Unit Cost (E+F)				2,382	1,898	484	

## 1712(2) Concrete (Slope Protection)

RATE ANALYSIS								
Item No.: 1712(2)		Description Concrete (Slope Protection)					Unit	
Unit of Analysis 1		(Output per hour)					m3	
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment (LC) (FC)		Remark
<b>A.</b>	<b>Labour</b>							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Skilled Labor	hr	4.00	79.17	316.68			
c	Unskilled Labor	hr	8.00	61.07	488.56			
	Installation of Formworks & Revars:							
a	Skilled Labor	hr	2.00	79.17	158.34			
b	Unskilled Labor	hr	4.00	61.07	244.28			
<b>Sub-total (A)</b>					1,317.30	1,317.30	0.00	
<b>B.</b>	<b>Equipments</b>							
a	One Bagger Mixer	hr	1.00	172.00	172.00			
b	Water Truck/Pump (16000L)	hr	0.05	2450.00	122.50			
c	Backhoe (0.3m3)	hr	0.10	922.00	92.20			
d	Concrete Vibrator	hr	0.50	57.17	28.59			
e	Bar Cutter	hr	0.05	105.47	5.27			
f	Bar Bender	hr	0.05	168.75	8.44			
	Minor Tools	hr	0.1000	1317.30	131.73			Labor Cost x 10%
<b>Sub-total (B)</b>					560.73	168.22	392.51	LC:FC=3:7
<b>C.</b>	Total (A+B)				1,878.03	1,485.52	392.51	
<b>D.</b>	Output per hour						1.00	
<b>E.</b>	Direct Unit Cost (C/D)				1,878.03	1,485.52	392.51	
<b>F.</b>	<b>Material/Fuel</b>							
a	Cement	bag	8.40	275.00	2,310.00	693.00	1,617.00	
b	Sand	m3	0.50	647.14	323.57	323.57	0.00	
c	Weep Holes (PVC)	m	0.21	291.00	61.11	61.11	0.00	
d	Filter Cloth	m2	0.015	175.00	2.63	2.63	0.00	
e	Gravel	m3	1.00	798.57	798.57	798.57	0.00	
f	Granular Filter	m3	0.016	644.00	10.30	10.30	0.00	
f	Reinforcing Steel Bar	kg	26.03	68.00	1,770.04	177.00	1,593.04	
g	Marine Plywood 1/2" x 4'x8'-4	pc	0.48	565.00	271.20	162.72	108.48	
h	Lumber -4 uses	bd-ft	18.76	11.25	211.05	126.63	84.42	
i	#16 GI Tie Wire (2% of RSB)	kg	0.521	75.38	39.27	39.27	0.00	
j	Assorted CWN (1kg/100bd-ft of	kg	0.188	66.88	12.57	12.57	0.00	
<b>Sub-total (C)</b>					5,810.32	2,407.38	3,402.94	
<b>G.</b>	Direct Unit Cost (E+F)				7,688	3,893	3,795	

# 1714(1) Gabion

RATE ANALYSIS								
Item No.:		1714(1)						
Description		Gabion						
Unit of Analysis		2.5 (Output per hour)						Unit m3
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment		Remark
						(LC)	(FC)	
<b>A.</b>	<b>Labour</b>							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Skilled Labor	hr	2.00	79.17	158.34			
c	Unskilled Labor	hr	8.00	79.17	633.36			
<b>Sub-total (A)</b>					901.14	901.14	0.00	
<b>B.</b>	<b>Equipments</b>							
<b>Sub-total (B)</b>					0.00	0.00	0.00	LC:FC=3:7
<b>C.</b>	Total (A+B)				901.14	901.14	0.00	
<b>D.</b>	Output per hour						2.50	
<b>E.</b>	Direct Unit Cost (C/D)				360.46	360.46	0.00	
<b>F.</b>	<b>Material/Fuel</b>							
a	Gabion Wire Mesh (1mx1mx2m)	pc	0.50	2,500.00	1,250.00	1,250.00	0.00	
b	Boulders	m3	1.05	760.00	798.00	798.00	0.00	
	1714(1)a							
	Hauling Cost	m3	1.25	295.35	369.19	369.19	0.00	
<b>Sub-total (C)</b>					2,417.19	2,417.19	0.00	
<b>G.</b>	Direct Unit Cost (E+F)				2,778	2,778	0	



### 1714(3) Filter Cloth (Impermeable Liner)

RATE ANALYSIS								
Item No.:		1714(3)						
Description		Filter Cloth (Impermeable Liner)						
Unit of Analysis		50 (Output per hour)					Unit m3	
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment (LC) (FC)		Remark
<b>A.</b>	<b>Labour</b>							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Skilled Labor	hr	2.00	79.17	158.34			
c	Unskilled Labor	hr	8.00	61.07	488.56			
<b>Sub-total (A)</b>					756.34	756.34	0.00	
<b>B.</b>	<b>Equipments</b>							
a	Cargo Truck (9-10mt)	hr	0.25	1212.00	303.00			
<b>Sub-total (B)</b>					303.00	90.90	212.10	LC:FC=3:7
<b>C.</b>	Total (A+B)				1,059.34	847.24	212.10	
<b>D.</b>	Output per hour						50.00	
<b>E.</b>	Direct Unit Cost (C/D)				21.19	16.94	4.24	
<b>F.</b>	<b>Material/Fuel</b>							
a	ImpermeableSheet	m2	1.05	610.00	640.50	640.50	0.00	
	Miscellaneous	hr	0.05	640.50	32.03	32.03	0.00	Materials Cost x 5%
<b>Sub-total (C)</b>					672.53	672.53	0.00	
<b>G.</b>	Direct Unit Cost (E+F)				694	689	4	



## 1716(6) Steel Sheet Piles, Furnished

RATE ANALYSIS								
Item No.: 1716(6)								
Description Steel Sheet Piles , Furnished								
Unit of Analysis 72 (Output per hour) <span style="float:right">Unit m</span>								
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment		Remark
						(LC)	(FC)	
<b>A.</b>	<b>Labour</b>							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Skilled Labor	hr	2.00	79.17	158.34			
c	Unskilled Labor	hr	2.00	61.07	122.14			
<b>Sub-total (A)</b>					389.92	389.92	0.00	
<b>B.</b>	<b>Equipments</b>							
a	Truck Mounted Crane (41-45m)	hr	1.00	2606.00	2,606.00			
	Minor Tools	hr	0.1000	389.92	38.99			Labor Cost x 10%
<b>Sub-total (B)</b>					2,644.99	793.50	1,851.49	LC:FC=3:7
<b>C.</b>	Total (A+B)				3,034.91	1,183.42	1,851.49	
<b>D.</b>	Output per hour						72.00	
<b>E.</b>	Direct Unit Cost (C/D)				42.15	16.44	25.72	
<b>F.</b>	<b>Material/Fuel</b>							
a	Steel Sheet Piles (48kg/m)	kg	48.00	63.50	3,048.00	304.80	2,743.20	
	Miscellaneous	LS	1.00	91.44	91.44	9.14	82.30	3% of MaterialCost
<b>Sub-total (C)</b>					3,139.44	313.94	2,825.50	
<b>G.</b>	Direct Unit Cost (E+F)				3,182	330	2,851	

## 1717(2)a1 Steel Sheet Piles (Slope Protection), Type2

RATE ANALYSIS								
Item No.:		1717(2)a1						
Description		Steel Sheet Piles (Slope Protection), Type2						
Unit of Analysis		10 (Output per hour)						Unit m
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment		Remark
						(LC)	(FC)	
<b>A.</b>	<b>Labour</b>							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Skilled Labor	hr	2.00	79.17	158.34			
c	Unskilled Labor	hr	4.00	61.07	244.28			
<b>Sub-total (A)</b>					512.06	512.06	0.00	
<b>B.</b>	<b>Equipments</b>							
a	Crawler Crane (36-40mt)	hr	1.00	1902.00	1,902.00			
b	Vibro Hammer (201 hp)	hr	1.00	2123.00	2,123.00			
c	Welding Machine (300A), Gas/D	hr	0.25	371.00	92.75			
d	Cutting Outfit	hr	0.25	45.45	11.36			
	Minor Tools	hr	0.1000	512.06	51.21			Labor Cost x 10%
<b>Sub-total (B)</b>					4,180.32	1,254.10	2,926.22	LC:FC=3:7
<b>C.</b>	Total (A+B)				4,692.38	1,766.16	2,926.22	
<b>D.</b>	Output per hour						10.00	
<b>E.</b>	Direct Unit Cost (C/D)				469.24	176.62	292.62	
<b>F.</b>	<b>Material/Fuel</b>							
a	Steel Sheet Piles (48kg/m)	kg	48.00	63.50	3,048.00	304.80	2,743.20	
	Miscellaneous	LS	1.00	91.44	91.44	9.14	82.30	3% of MaterialCost
<b>Sub-total (C)</b>					3,139.44	313.94	2,825.50	
<b>G.</b>	Direct Unit Cost (E+F)				3,609	491	3,118	

1717(2)a1(2) Steel Sheet Piles (Slope Protection), Type3

RATE ANALYSIS								
Item No.:		1717(2)a1(2)						
Description		Steel Sheet Piles (Slope Protection), Type3						
Unit of Analysis		10 (Output per hour)						Unit
								m
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment (LC) (FC)		Remark
<b>A.</b>	<b>Labour</b>							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Skilled Labor	hr	2.00	79.17	158.34			
c	Unskilled Labor	hr	4.00	61.07	244.28			
<b>Sub-total (A)</b>					512.06	512.06	0.00	
<b>B.</b>	<b>Equipments</b>							
a	Crawler Crane (36-40mt)	hr	1.00	1902.00	1,902.00			
b	Vibro Hammer (201 hp)	hr	1.00	2123.00	2,123.00			
c	Welding Machine (300A), Gas/D	hr	0.25	371.00	92.75			
d	Cutting Outfit	hr	0.25	45.45	11.36			
	Minor Tools	hr	0.1000	512.06	51.21			Labor Cost x 10%
<b>Sub-total (B)</b>					4,180.32	1,254.10	2,926.22	LC:FC=3:7
<b>C.</b>	Total (A+B)				4,692.38	1,766.16	2,926.22	
<b>D.</b>	Output per hour						10.00	
<b>E.</b>	Direct Unit Cost (C/D)				469.24	176.62	292.62	
<b>F.</b>	<b>Material/Fuel</b>							
a	Steel Sheet Piles (60kg/m)	kg	60.00	64.00	3,840.00	384.00	3,456.00	
	Miscellaneous	LS	1.00	115.20	115.20	11.52	103.68	3% of MaterialCost
<b>Sub-total (C)</b>					3,955.20	395.52	3,559.68	
<b>G.</b>	Direct Unit Cost (E+F)				4,424	572	3,852	

1717(2)a1(3) Steel Sheet Piles (Slope Protection), TypeVL

RATE ANALYSIS								
Item No.:		1717(2)a1(3)						
Description		Steel Sheet Piles (Slope Protection), TypeVL						
Unit of Analysis		8 (Output per hour)						Unit m
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment		Remark
						(LC)	(FC)	
<b>A.</b>	<b>Labour</b>							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Skilled Labor	hr	2.00	79.17	158.34			
c	Unskilled Labor	hr	4.00	61.07	244.28			
<b>Sub-total (A)</b>					512.06	512.06	0.00	
<b>B.</b>	<b>Equipments</b>							
a	Crawler Crane (36-40mt)	hr	1.00	1902.00	1,902.00			
b	Vibro Hammer (201 hp)	hr	1.00	2123.00	2,123.00			
c	Welding Machine (300A), Gas/D	hr	0.25	371.00	92.75			
d	Cutting Outfit	hr	0.25	45.45	11.36			
	Minor Tools	hr	0.1000	512.06	51.21			Labor Cost x 10%
<b>Sub-total (B)</b>					4,180.32	1,254.10	2,926.22	LC:FC=3:7
<b>C.</b>	Total (A+B)				4,692.38	1,766.16	2,926.22	
<b>D.</b>	Output per hour						8.00	
<b>E.</b>	Direct Unit Cost (C/D)				586.55	220.77	365.78	
<b>F.</b>	<b>Material/Fuel</b>							
a	Steel Sheet Piles (105kg/m)	kg	105.00	64.00	6,720.00	672.00	6,048.00	
	Miscellaneous	LS	1.00	201.60	201.60	20.16	181.44	3% of MaterialCost
<b>Sub-total (C)</b>					6,921.60	692.16	6,229.44	
<b>G.</b>	Direct Unit Cost (E+F)				7,508	913	6,595	

1717(2)a1(4) Steel Sheet Piles (Slope Protection), Type2, for temporary works, without materials

RATE ANALYSIS								
Item No.:		1717(2)a1(4)						
Description		Steel Sheet Piles (Slope Protection), Type2, for temporary works, without materials						
Unit of Analysis		10 (Output per hour)					Unit m	
Item No.	Description	Unit	Q'ty	Rate/unit	Amount (PhP)	Currency Adjustment		Remark
						(LC)	(FC)	
<b>A. Labour</b>								
	Installation							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Skilled Labor	hr	2.00	79.17	158.34			
c	Unskilled Labor	hr	4.00	61.07	244.28			
	Removing							
a	Construction Foreman	hr	1.00	109.44	109.44			
b	Skilled Labor	hr	2.00	79.17	158.34			
c	Unskilled Labor	hr	4.00	61.07	244.28			
<b>Sub-total (A)</b>					1,024.12	1,024.12	0.00	
<b>B. Equipments</b>								
a	Crawler Crane (36-40mt)	hr	2.00	1902.00	3,804.00			
b	Vibro Hammer (201 hp)	hr	2.00	2123.00	4,246.00			
c	Welding Machine (300A), Gas/D	hr	0.50	371.00	185.50			
d	Cutting Outfit	hr	0.50	45.45	22.73			
	Minor Tools	hr	0.1000	1024.12	102.41			Labor Cost x 10%
<b>Sub-total (B)</b>					8,360.64	2,508.19	5,852.45	LC:FC=3:7
<b>C. Total (A+B)</b>					9,384.76	3,532.31	5,852.45	
<b>D. Output per hour</b>							10.00	
<b>E. Direct Unit Cost (C/D)</b>					938.48	353.23	585.24	
<b>F. Material/Fuel</b>								
<b>Sub-total (C)</b>					0.00	0.00	0.00	
<b>G. Direct Unit Cost (E+F)</b>					938	353	585	

Annex 5

PDS (Project Description for Scoping)

## PROJECT DESCRIPTION FOR SCOPING (PDS)

### I. BASIC PROJECT INFORMATION

#### a. Project Information

Project Name	Priority Projects for Flood Control in Davao River in Davao City
Project Proponent	DPWH Flood Control Management Cluster (UPMO-FCMC)
Office Address	DPWH 2 <sup>nd</sup> St., Port Area, Manila
Type of Project	Environmental Enhancement
Project Location	Davao City, Davao River Basin
Total Project Area	+ River Dredging: Expected excavated volume - 2.0 MCM + Cut-Off Works: Expected excavated volume - 1.7MCM + Retarding Ponds: Expected excavated volume - 28.2MCM
Project Contact Person	Ramon A. Arriola III Project Director
Project Contact Number	+632-5304-3813/ +632-5304-3752 arriola.ramon@dpwh.gov.ph

#### b. Proponent Profile

The Department of Public Works and Highways (DPWH) is one of the three departments of the government undertaking major infrastructure projects. The DPWH is mandated to undertake (a) the planning of infrastructure, such as national roads and bridges, flood control, water resources projects and other public works, and (b) the design, construction, and maintenance of national roads and bridges, and major flood control systems.

The Department of Public Works and Highways functions as the engineering and construction arm of the Government tasked to continuously develop its technology for the purpose of ensuring the safety of all infrastructure facilities and securing for all public works and highways the highest efficiency and quality in construction. DPWH is currently responsible for the planning, design, construction and maintenance of infrastructure, especially the national highways, flood control and water resources development system, and other public works in accordance with national development objectives.

The office envisioned that by 2030, DPWH is an effective and efficient government agency, improving the life of every Filipino through quality infrastructure. The office mission is to provide and manage quality infrastructure facilities and services responsive to the needs of the Filipino people in the pursuit of national development objectives.

## II. PROJECT DESCRIPTION

### a. Project Location and Area

The project is composed of three (3) components such as River Dredging (Component A); Cut-Off Works (Component B); and Retarding Pond (Component C). The administrative boundaries of these components are located within the following barangays:

<b>Project Component</b>	<b>Project Location</b>
Component A: River Dredging	Barangay 8
	Barangay 1
	Barangay 2
	Barangay Bucana
	Barangay Tigatto
	Barangay 19
	Barangay Ma-a
	Barangay 5
	Barangay New Carmen
	Barangay Waan
	Barangay Mandug
Component B: Cut-Off Works	Barangay 8
	Barangay Tigatto
	Barangay Ma-a
	Barangay 19
Component C: Retarding Ponds	Barangay New Valencia
	Barangay Mandug
	Barangay New Carmen
	Barangay Callawa

Figure 1 shows the location of three components of the proposed flood control project in Davao City.



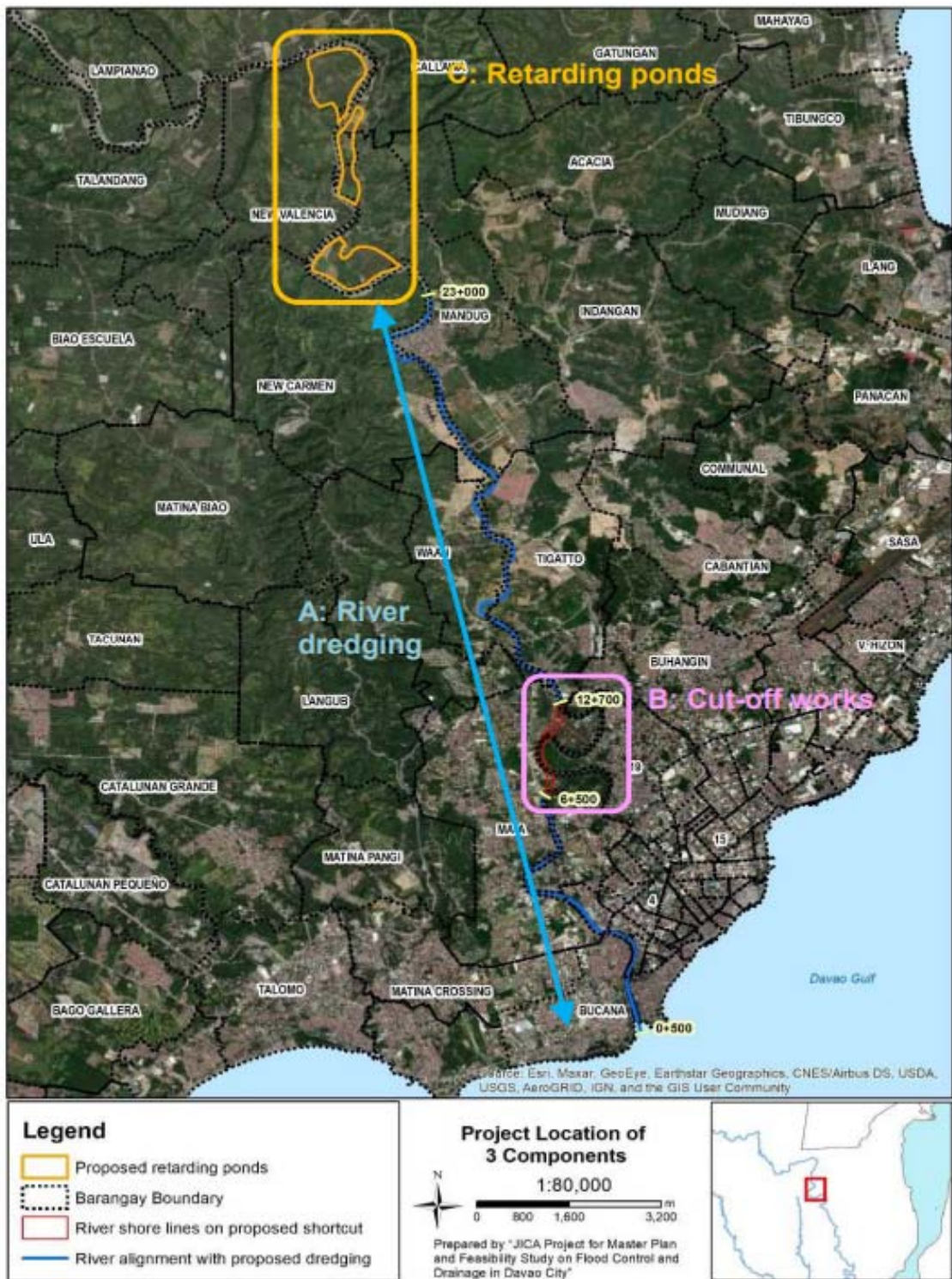


Figure 1. Proposed location of the three project components.

## **b. Project Rationale**

The Philippines has suffered devastating damage from natural disasters. During the 10 year-period from 2005 until 2015, a total of 20,000 people were dead and missing, 75 million people have been affected, and the economic loss has reached 182 billion pesos. The main cause of disaster is strong wind and flooding in which 70% of the affected people suffered damage by typhoons and monsoons, and 24% suffered damaged by storm surges and high waves.

The Project site, Davao City, located in the southern part of Mindanao Island, is the third largest city in the Philippines, and the largest city on Mindanao Island. Davao City had been less affected by flooding in the past, but flood damage has recently increased due to changes in typhoon tracks. In 2011, 30 people were killed by the flooding of the Davao and Matina Rivers, more than 2,500 people were affected by the flooding of Davao River in 2013, and 22,911 families were affected by flooding due to Typhoon Vinta in December, 2017. In addition, there are several problems such as inland flooding, insufficient drainage systems, and storm surges due to the geographical features of the 60 km coastline.

Even though flood disaster has occurred frequently in Davao City, a Master Plan for integrated flood control has not been developed. Although the budget for flood control in the Department of Public Works and Highways (hereinafter referred to as DPWH) has increased, the budget has not been fully used due to the lack of development of the Master Plan. Ten of 18 major river basins in the Philippines have developed Master Plans for flood control from the 1980s to the early 1990s. After that, 5 rivers (Cagayan, Agusan, Pasig-Marikina-Laguna Bay, Tagoloan, and Cagayan de Oro) have reviewed and updated their Master Plans. The preparation of the Master Plan and Feasibility Study for the 5 rivers was conducted by DPWH with the support of JICA through technical cooperation projects. For the improvement of drainage systems, although a Master Plan for the six districts inside Davao City had been developed by Davao City, a Master Plan for flood control in Davao River has not been developed. Further, it is highly expected to develop the Master Plans for flood control of major rivers/principal rivers including Davao River, and to enhance DPWH's capacity for development of the Master Plans for flood control by DPWH themselves.

Under the above circumstances, the Government of the Republic of the Philippines (GOP) requested assistance from the Japanese Government on the Master Plan and Feasibility Study on Flood Control and Drainage in Davao City. In response to the official request of the Government of the Republic of the Philippines, JICA conducted a detailed planning survey on the Project and confirmed and signed the minutes of meetings (M/M) on the 11th of August 2017, and signed the Record of Discussion (R/D) on the 23rd of April 2018.

Objective of the Project is to mitigate flood damage in Davao City by the implementation of flood control measures through development of the Master Plan for Davao River, Matina River and Talomo River basin and conducting the Feasibility Study on urgent and/or priority project(s).

The project is expected to i) develop a Master Plan of the flood control and drainage in Davao City which includes a flood control Master Plan for Davao River, Matina River and Talomo River basins; ii) analyze the Feasibility Study on urgent and/or priority project(s); and iii) enhance the capacity of concerned DPWH personnel/Officials in the development of Flood Control and Drainage Master Plan.

### c. Project Component List

Below are the brief descriptions of the three components of flood control project:

#### ***Component A: River dredging***

River dredging work aims to secure appropriate river flow in order to reduce risk of over flow. Dredging work will be taken from Davao River mouth (0+500) to 23km upstream. River soil in the existing river will be dredged; approximate volume is estimated two (2) million m<sup>3</sup>. Figure 2 illustrates image of dredging.

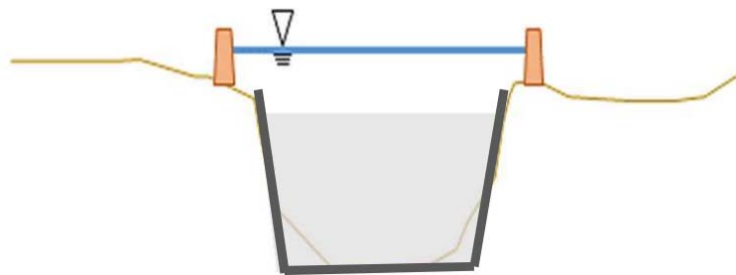


Figure 2. Brief image of dredging work.

#### ***Component B: Cut-Off Works***

Cut-off works, will be installed at downstream of near Crocodile Park to shorten the river line; it is expected to increase river flow. Actual design will be examined in the feasibility study. As of now, the standard revetment structure after widening of the river should preferably be a combination of concrete revetment (above mean water level, H=approx. 5 m) and steel sheet pile (below mean water level) (see Figure 3). It is also necessary to have a platform behind the crest of steel sheet pile in order to reduce the embankment load that affects the steel sheet pile.

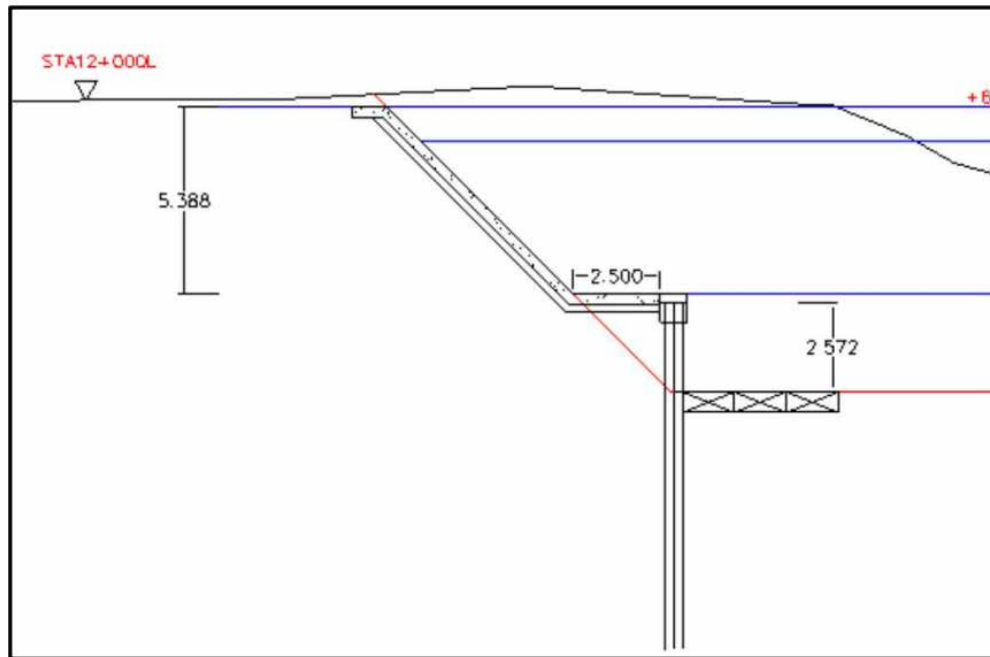


Figure 3. Type of standard revetment for cut-off works of river alignment.

### ***Component C: Retarding Ponds***

Three (3) retarding ponds are planned to install to aim at temporal water storage during heavy rain in which flood risk rises. Location of these ponds is upper stream of proposed dredging area at 24km, 27km and 29km from the river mouth, and four (4) barangays are located in the project area.

Retarding ponds are composed of various structures, such as overflow dike, surrounding levee and drainage date. In the facility planning of retarding pond, natural drainage is to be considered so that planned basin-bed elevation will be equal to the planned/ current riverbed elevation of the Davao River. The height of surrounding levees should be the same with Davao River's design levee height taken at the upstream end of the pond. Excavation of the ground down to the planned pond elevation is necessary, if the existing ground level of the candidate site is high, which the case here is seemingly. Figure 4 illustrates concept for the facility planning of the retarding pond.

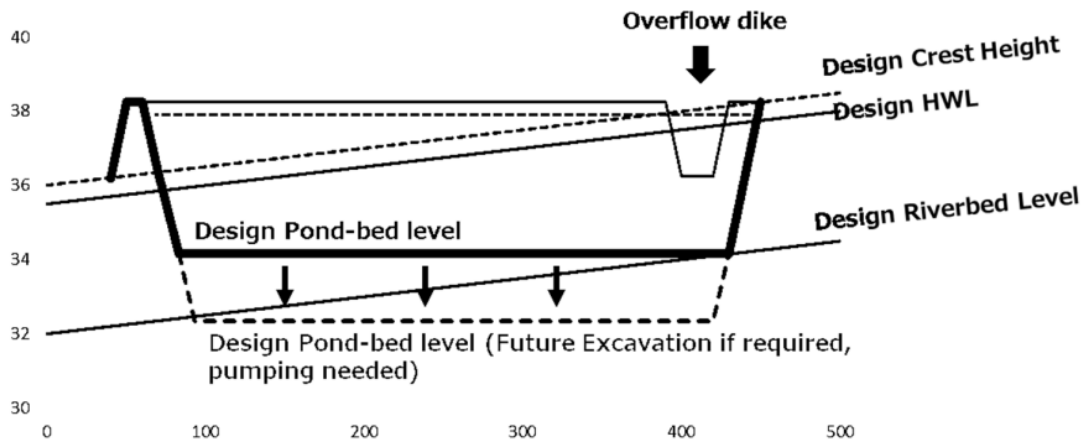


Figure 4. Concept for Facility Planning of the Retarding Pond

For the structure of overflow dike, gabion-type structure with gentle slope is the most commonly adopted one, which is considered to be suitable to Davao River since i) the structure is flexible and adapt to potential settlement; ii) easy procurement of materials and less costly; iii) Same structure with the existing revetment along Davao River (gabion pile-up revetment) and thus there will be a continuity of structure; and iv) requires regular unweeding but easy to monitor and maintain.

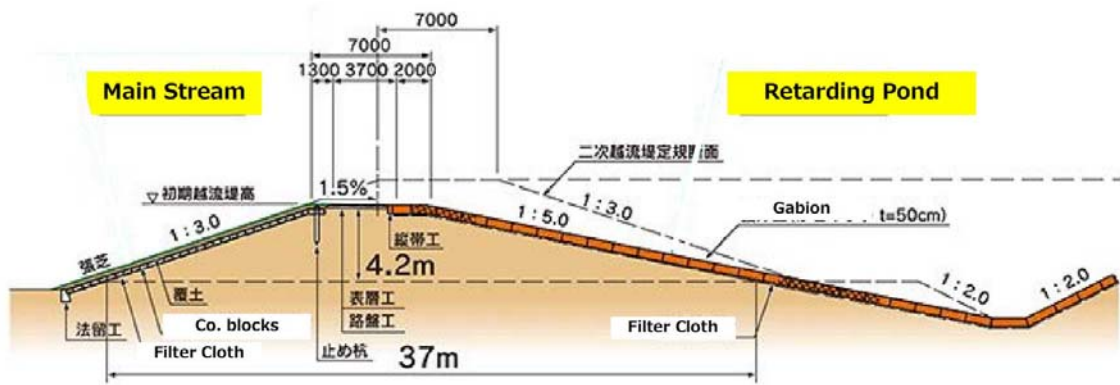


Figure 5. Example section of overflow dike.

**d. Project Phases, Key Environmental Aspects, Wastes, Issues, Built-in Measures**

<b>Project Phases</b>	<b>Key Environmental Aspect</b>	<b>Impacts/Wastes</b>	<b>Built-in Measures</b>
1. Dredging	<ul style="list-style-type: none"> <li>- Water Quality</li> <li>- Freshwater biota</li> <li>- Land</li> <li>- Air</li> </ul>	<ul style="list-style-type: none"> <li>- Degradation of water quality downstream, siltation</li> <li>- Disruption of freshwater biota</li> <li>- Soil pollution (production of dredged materials, oil and grease)</li> <li>- Emission from heavy equipment (Sox, NOx, CO)</li> <li>- Noise generation</li> </ul>	<ul style="list-style-type: none"> <li>- Installation of silt curtains</li> <li>- Dispose dredged materials in accordance with the dredging master plan</li> <li>- Use new models and less emission equipment</li> <li>- Provision of muffler to lessen noise</li> </ul>
2. Cut-off works	<ul style="list-style-type: none"> <li>- Land cover</li> <li>- Water quality</li> <li>- People</li> <li>- Air</li> </ul>	<ul style="list-style-type: none"> <li>- Removal of vegetation (solid waste-vegetal wastes)</li> <li>- Degradation of water quality downstream, siltation</li> <li>- Displacement of directly affected people</li> </ul>	<ul style="list-style-type: none"> <li>- Dispose vegetal wastes in accordance with City instituted system</li> <li>- Plant trees along the cut-off works bank</li> <li>- Installation of silt curtains</li> <li>- Formulate RAP</li> <li>- Resettle PAPs</li> <li>- Develop acceptable compensation package</li> <li>- Use of new model and less</li> </ul>

	- Land	<ul style="list-style-type: none"> <li>- Emission from heavy equipment (Sox, NOx, CO)</li> <li>- Noise generation</li> <li>- Generation of excavated materials</li> </ul>	<ul style="list-style-type: none"> <li>emission equipment</li> <li>- Provision of mufflers to lessen noise</li> <li>- Dispose in accordance with the plan of the City</li> </ul>
Retarding ponds	<ul style="list-style-type: none"> <li>- Land cover</li> <li>- Water quality</li> <li>- People</li> <li>- Air</li> <li>- Land</li> </ul>	<ul style="list-style-type: none"> <li>- Removal of vegetation (solid waste-vegetal wastes)</li> <li>- Degradation of water quality downstream, siltation</li> <li>- Displacement of directly affected people</li> <li>- Emission from heavy equipment (Sox, NOx, CO)</li> <li>- Noise generation</li> <li>- Generation of excavated materials</li> </ul>	<ul style="list-style-type: none"> <li>- Dispose vegetal wastes in accordance with City instituted system</li> <li>- Plant trees around the ponds</li> <li>- Installation of silt curtains</li> <li>- Formulate RAP</li> <li>- Resettle PAPs</li> <li>- Develop acceptable compensation package</li> <li>- Use of new model and less emission equipment</li> <li>- Provision of mufflers to lessen noise</li> <li>- Dispose in accordance with the plan of the City</li> </ul>





### III. ANNEXES

#### a. Proposed Project Site



Figure 6. Proposed sites of the three project components.

**b. Google Earth Topographic Map**



Figure 7. Google Earth topographic map of Cut-off works' location



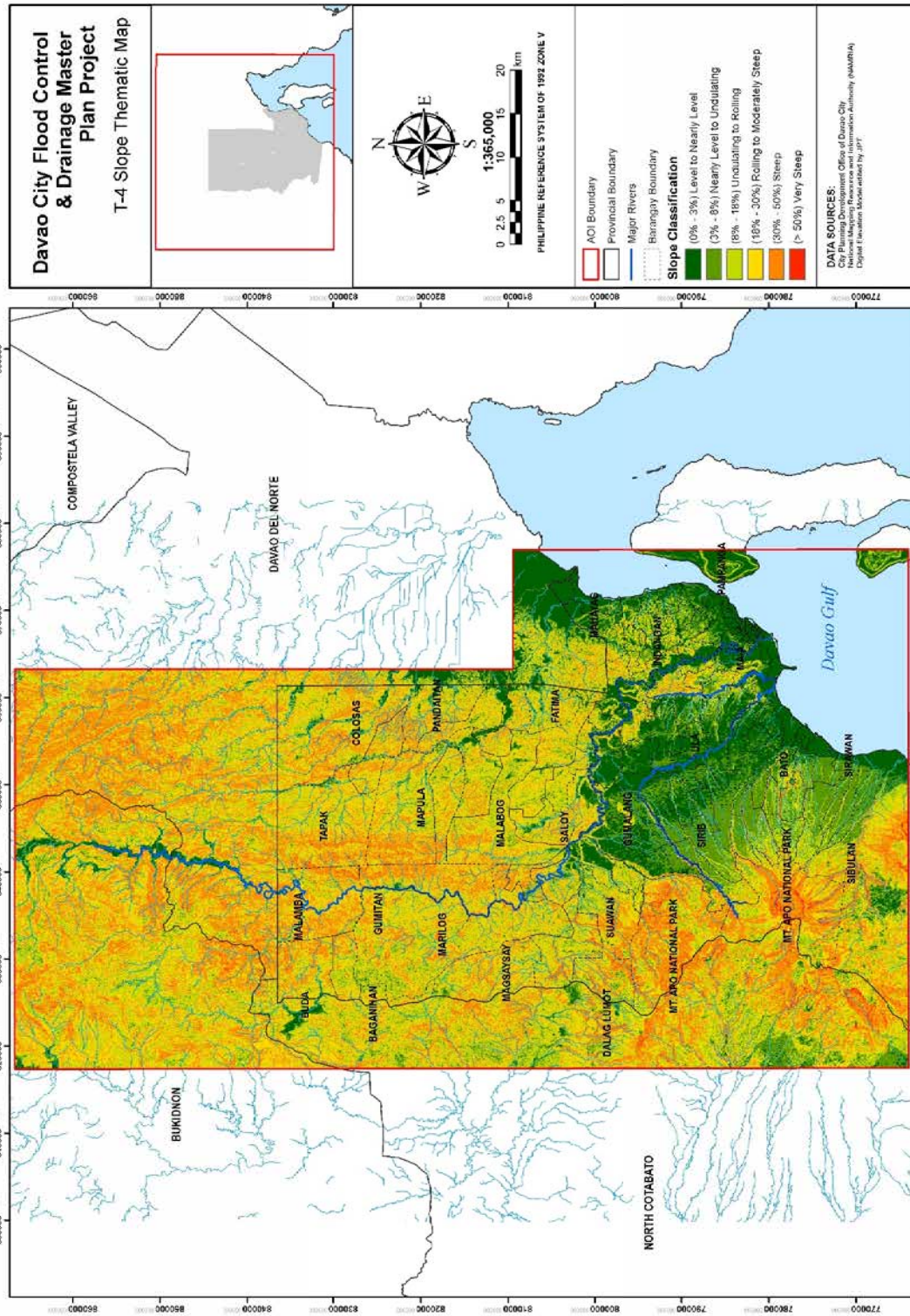


Figure 9. Slope Map of the Project Site

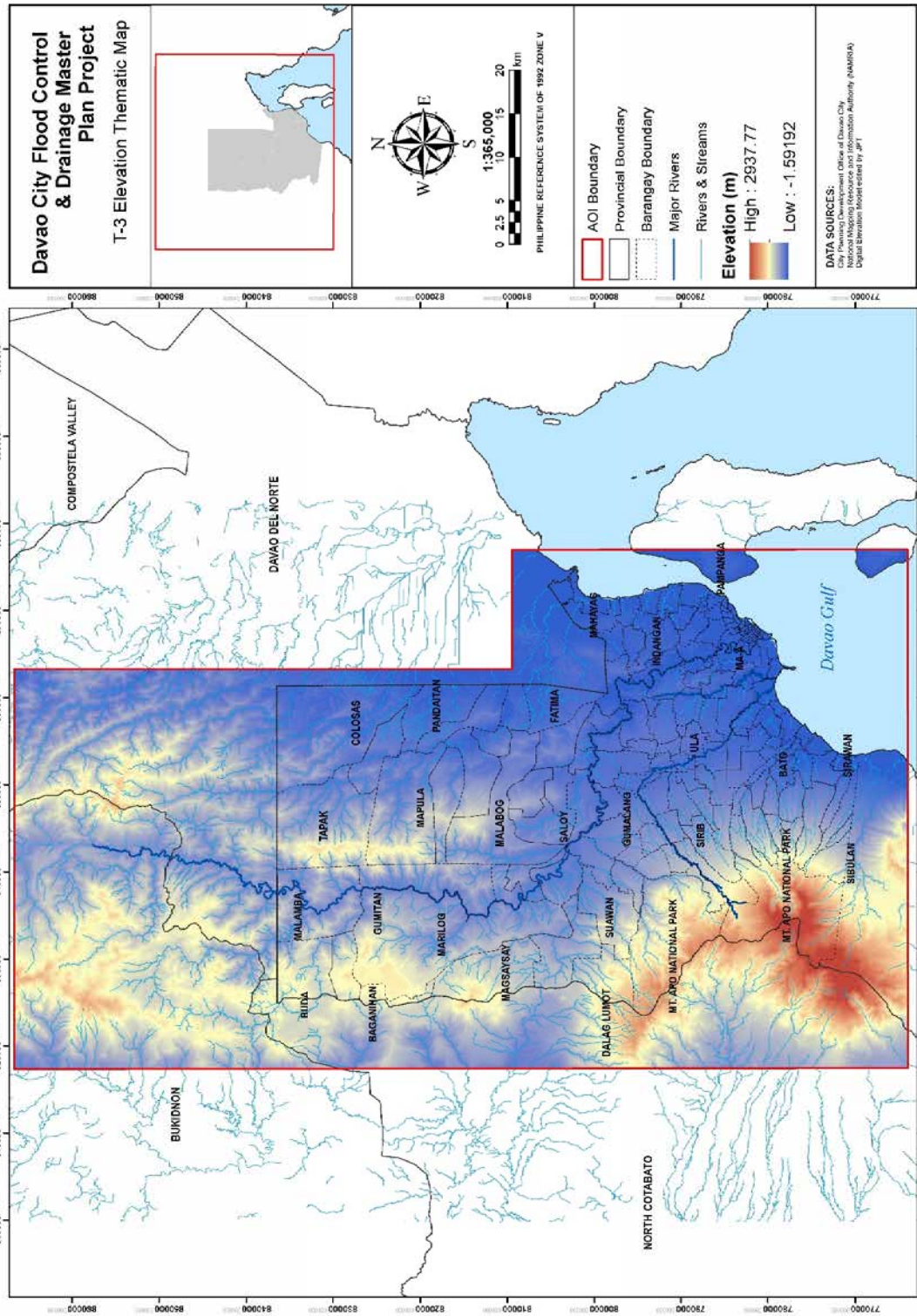


Figure 10. Elevation Map of the Project Site

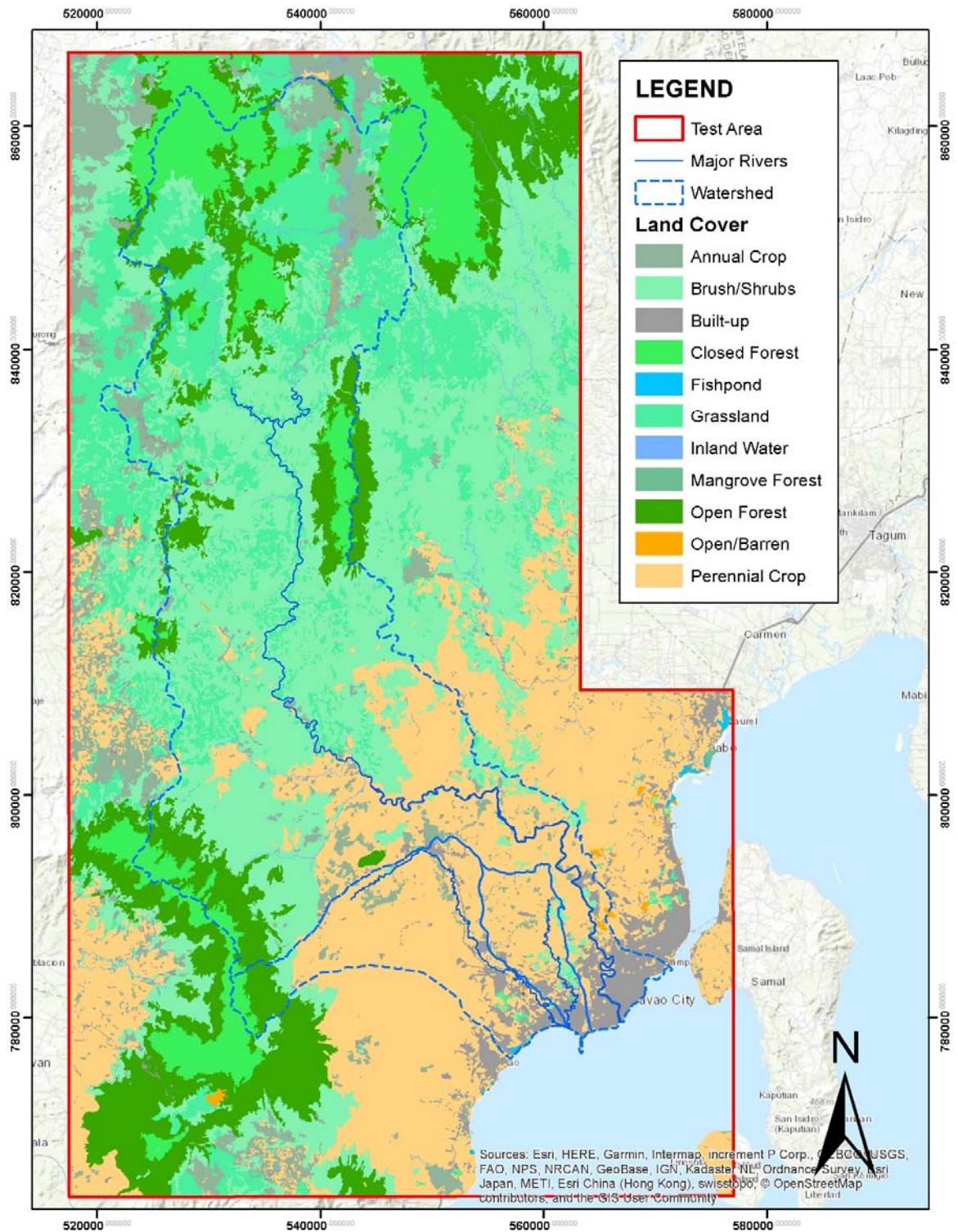


Figure 11. Land Cover Map of the Project Site

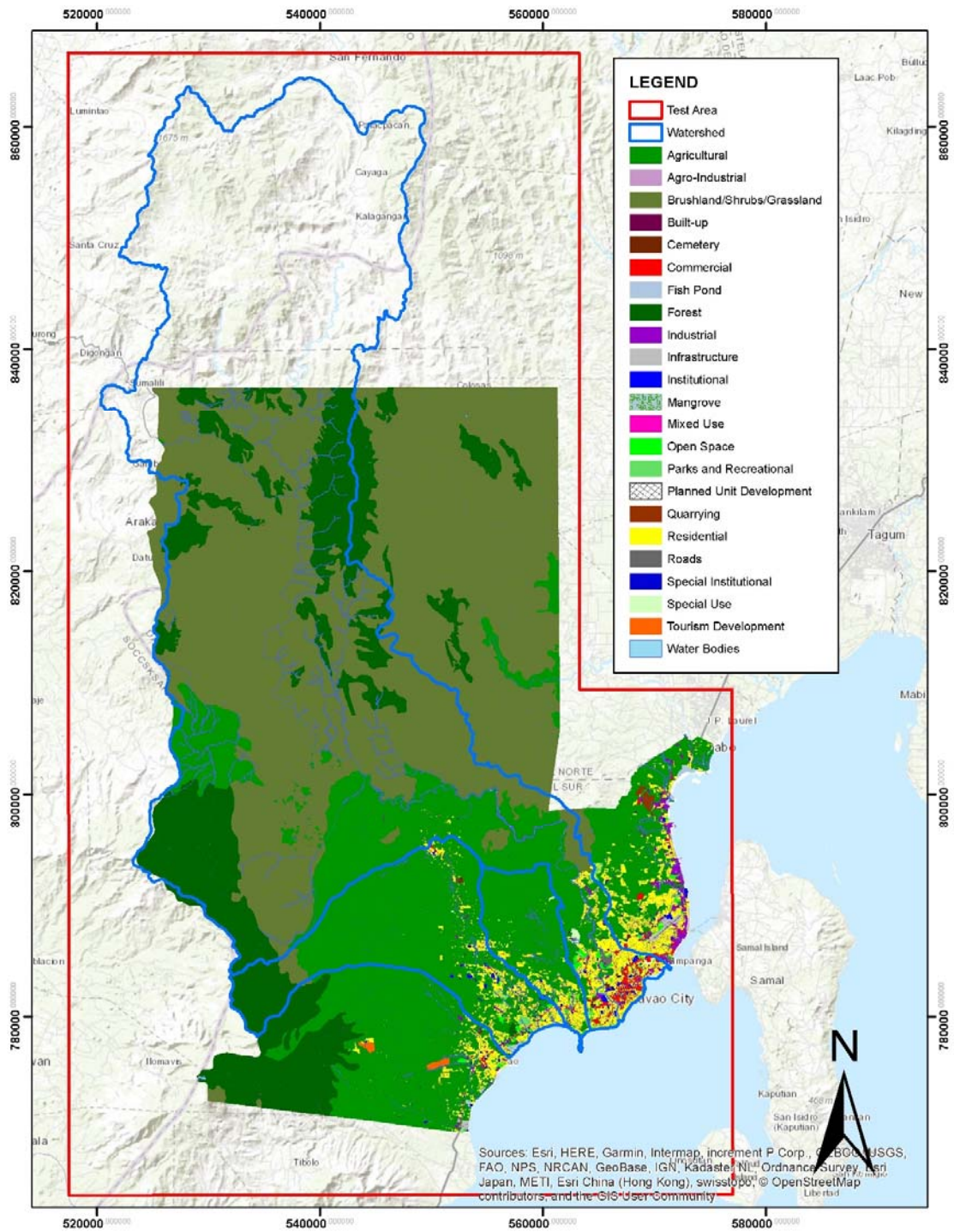


Figure 12. Land Use Map of the Project Site

Annex 6

Draft of Monitoring Form



**Environmental Monitoring Form (draft)**

(1) Flood control in the Davao River (M/P)

**Construction Phase**

1) Air Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
CO		9 ppm		
SO2		180 ug/m <sup>3</sup>		
NO2		150 ug/m <sup>3</sup>		
PM10		150 ug/m <sup>3</sup>		
PM2.5		35 ug/m <sup>3</sup>		
Dust	-	-		Direct observation

1) DENR NAAQGV, 24-hours average except CO: 8-hours average.

2) Water Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (location, method, etc.)
BOD		Class A: 3 mg/L Class B: 5 mg/L		
DO		Class A: 5 mg/L and over Class B: 5 mg/L and over		
Fecal coliform		Class A: 200 MPN/100mL Class B: 200 MPN/100mL		
pH		Class A: 6.5 – 8.5 Class B: 6.5 – 8.5		
Inorganic phosphate		Class A: 1.5 mg/L Class B: 1.5 mg/L		
TSS		Class A: 50 mg/L Class B: 65 mg/L		
Oil & Grease		Class A: 1 mg/L Class B: 1 mg/L		
Heavy metals	Pb Hg As Cd Cr <sup>6+</sup>	Pb: 0.01mg/L Hg: 0.001mg/L As: 0.01mg/L Cd: 0.03mg/L Cr <sup>6+</sup> : 0.01mg/L		
Turbidity	-	-		Direct observation

1) DAO 2016-008, except inorganic phosphate and fecal coliform: DAO 2021-19

3) Waste

Date:

Items	Description
Record of treatment or disposal of waste, manifest	
Observation of storage condition of the waste	

4) Soil Condition (dredged/ excavated soil)

Date:

Items	Value	Standard Value	Location	Remarks (method, etc.)
Arsenic (As)		8.2 mg/kg (NOAA <sup>2)</sup> )		
Cadmium (Cd)		1.2 mg/k (NOAA)		
Chrome (Cr)		373 mg/kg (Canada <sup>3)</sup> )		
Lead (Pb)		35 mg/kg (Canada		
Mercury (Hg)		0.17 mg/kg (Canada)		
Spillage of toxics	-	-		Direct observation

1) NOAA: NOAA Sediment Quality Guidelines developed for National Status and Trends Program.

2) Canadian Environmental Quality Guidelines (2001). Canadian Sediment Quality Guidelines for the Protection of Aquatic life. Canadian Council of Ministers of the Environment.

5) Noise, vibration

Date:

Items	Time of measurement	Value <sup>1)</sup>	Standard <sup>2)</sup>	Location	Remarks
Noise level	Morning ( )		50 dBA		
	Noon ( )		55 dBA		
	Evening ( )		50 dBA		
	Night ( )		45 dBA		
Noise, Vibration <sup>3)</sup>	During construction	-	-		Direct monitoring, hearing

1) Median of seven highest recorded noise levels

2) National Pollution Control Commission. (NPCC) memorandum circular no. 002, 1980

3) Since no standard is set in the Philippines, it is temporary monitored by hearing, etc.

6) Subsidence

Date:

Items	Description
Observation of subsidence	
Observation or measurement of underground water	
Hearing	

7) Ecosystem

Date:

Items	Description
Observation, sampling	
Hearing	
Condition of trees planted, eco-tourism	

8) Hydrology

Date:

Items	Description
Hydrological condition	
Hearing	
Records of flood	

9) Social Environment

Poor/Vulnerable, Local economies, Existing social infrastructures and services, Social institutions, Community severance, Local conflicts of interest, Utilization of land and local resources, Gender, Children's rights, Infectious diseases, Labor conditions Accidents

Date:

Items	Description
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	
Others	

10) Complainants

Number of complaints	Description	Counter action and results

**Operation Phase**

1) Social Environment

Community severance, Local conflicts of interest, Utilization of land and local resources, Land scape, Accidents

Date:

<b>Items</b>	<b>Description</b>
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	
Others	

2) Complainants

<b>Number of complaints</b>	<b>Description</b>	<b>Counter action and results</b>

(2) Flood control in the Matina River (M/P)

**Construction Phase**

1) Air Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
CO		9 ppm		
SO2		180 ug/m <sup>3</sup>		
NO2		150 ug/m <sup>3</sup>		
PM10		150 ug/m <sup>3</sup>		
PM2.5		35 ug/m <sup>3</sup>		
Dust	-	-		Direct observation

1) DENR NAAQGV, 24-hours average except CO: 8-hours average.

2) Water Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
BOD		Class B: 5 mg/L Class C: 7 mg/L		
DO		Class B: 5 mg/L and over Class C: 5 mg/L and over		
Fecal coliform		Class B: 200 MPN/100mL Class C: 200 MPN/100mL		
pH		Class B: 6.5 – 8.5 Class C: 6.5 – 9.0		
Inorganic phosphate		Class B: 1.5 mg/L Class C: 1.5 mg/L		
TSS		Class C: 80 mg/L		
Oil & Grease		Class B: 1 mg/L Class C: 2 mg/L		
Heavy metals	Pb Hg As Cd Cr <sup>6+</sup>	Pb: 0.01mg/L Hg: 0.001mg/L As: 0.01mg/L Cd: 0.03mg/L Cr <sup>6+</sup> : 0.01mg/L		
Turbidity	-	-		Direct observation

1) DAO 2016-008, except inorganic phosphate and fecal coliform: DAO 2021-19

3) Waste

Date:

Items	Description
Record of treatment or disposal of waste, manifest	
Observation of storage condition of the waste	

4) Soil Condition (dredged/ excavated soil)

Date:

Items	Value	Standard Value	Location	Remarks (method, etc.)
Arsenic (As)		8.2 mg/kg (NOAA <sup>2)</sup> )		
Cadmium (Cd)		1.2 mg/k (NOAA)		
Chrome (Cr)		373 mg/kg (Canada <sup>3)</sup> )		
Lead (Pb)		35 mg/kg (Canada		
Mercury (Hg)		0.17 mg/kg (Canada)		
Spillage of toxics	-	-		Direct observation

1) NOAA: NOAA Sediment Quality Guidelines developed for National Status and Trends Program.

2) Canadian Environmental Quality Guidelines (2001). Canadian Sediment Quality Guidelines for the Protection of Aquatic life. Canadian Council of Ministers of the Environment.

5) Noise, vibration

Date:

Items	Time of measurement	Value <sup>1)</sup>	Standard <sup>2)</sup>	Location	Remarks
Noise level	Morning ( )		50 dBA		
	Noon ( )		55 dBA		
	Evening ( )		50 dBA		
	Night ( )		45 dBA		
Noise, Vibration <sup>3)</sup>	During construction	-	-		Direct monitoring, hearing

1) Median of seven highest recorded noise levels

2) National Pollution Control Commission. (NPCC) memorandum circular no. 002, 1980

3) Since no standard is set in the Philippines, it is temporary monitored by hearing, etc.

6) Subsidence

Date:

Items	Description
Observation of subsidence	
Observation or measurement of underground water	
Hearing	

7) Ecosystem

Date:

Items	Description
Observation, sampling	
Hearing	
Condition of trees planted, eco-tourism	

8) Hydrology

Date:

Items	Description
Hydrological condition	
Hearing	
Records of flood	

9) Social Environment

Poor/Vulnerable, Local economies, Existing social infrastructures and services, Social institutions, Community severance, Local conflicts of interest, Utilization of land and local resources, Gender, Children's rights, Infectious diseases, Labor conditions Accidents

Date:

Items	Description
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	

10) Complainants

Number of complaints	Description	Counter action and results

**Operation Phase**

1) Social Environment

Community severance, Local conflicts of interest, Utilization of land and local resources, Landscape, Accidents

Date:

<b>Items</b>	<b>Description</b>
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	

2) Complainants

<b>Number of complaints</b>	<b>Description</b>	<b>Counter action and results</b>



(3) Flood control in the Talomo River (M/P)

**Construction Phase**

1) Air Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
CO		9 ppm		
SO2		180 ug/m <sup>3</sup>		
NO2		150 ug/m <sup>3</sup>		
PM10		150 ug/m <sup>3</sup>		
PM2.5		35 ug/m <sup>3</sup>		
Dust	-	-		Direct observation

1) DENR NAAQGV, 24-hours average except CO: 8-hours average.

2) Water Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
BOD		Class A: 3 mg/L Class B: 5 mg/L		
DO		Class A: 5 mg/L and over Class B: 5 mg/L and over		
Fecal coliform		Class A: 200 MPN/100mL Class B: 200 MPN/100mL		
pH		Class A: 6.5 – 8.5 Class B: 6.5 – 8.5		
Inorganic phosphate		Class A: 1.5 mg/L Class B: 1.5 mg/L		
TSS		Class A: 50 mg/L Class B: 65 mg/L		
Oil & Grease		Class A: 1 mg/L Class B: 1 mg/L		
Heavy metals	Pb Hg As Cd Cr <sup>6+</sup>	Pb: 0.01mg/L Hg: 0.001mg/L As: 0.01mg/L Cd: 0.03mg/L Cr6+: 0.01mg/L		
Turbidity	-	-		Direct observation

1) DAO 2016-008, except inorganic phosphate and fecal coliform: DAO 2021-19

3) Waste

Date:

Items	Description
Record of treatment or disposal of waste, manifest	
Observation of storage condition of the waste	

4) Soil Condition (dredged/ excavated soil)

Date:

Items	Value	Standard Value	Location	Remarks (method, etc.)
Arsenic (As)		8.2 mg/kg (NOAA <sup>2)</sup> )		
Cadmium (Cd)		1.2 mg/k (NOAA)		
Chrome (Cr)		373 mg/kg (Canada <sup>3)</sup> )		
Lead (Pb)		35 mg/kg (Canada		
Mercury (Hg)		0.17 mg/kg (Canada)		
Spillage of toxics	-	-		Direct observation

1) NOAA: NOAA Sediment Quality Guidelines developed for National Status and Trends Program.

2) Canadian Environmental Quality Guidelines (2001). Canadian Sediment Quality Guidelines for the Protection of Aquatic life. Canadian Council of Ministers of the Environment.

5) Noise, vibration

Date:

Items	Time of measurement	Value <sup>1)</sup>	Standard <sup>2)</sup>	Location	Remarks
Noise level	Morning ( )		50 dBA		
	Noon ( )		55 dBA		
	Evening ( )		50 dBA		
	Night ( )		45 dBA		
Noise, Vibration <sup>3)</sup>	During construction	-	-		Direct monitoring, hearing

1) Median of seven highest recorded noise levels

2) National Pollution Control Commission. (NPCC) memorandum circular no. 002, 1980

3) Since no standard is set in the Philippines, it is temporary monitored by hearing, etc.

6) Subsidence

Date:

Items	Description
Observation of subsidence	
Observation or measurement of underground water	
Hearing	

7) Ecosystem

Date:

Items	Description
Observation, sampling	
Hearing	
Condition of trees planted, eco-tourism	

8) Hydrology

Date:

Items	Description
Hydrological condition	
Hearing	
Records of flood	

9) Social Environment

Poor/Vulnerable, Local economies, Existing social infrastructures and services, Social institutions, Community severance, Local conflicts of interest, Utilization of land and local resources, Gender, Children's rights, Infectious diseases, Labor conditions Accidents

Date:

Items	Description
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	

10) Complainants

Number of complaints	Description	Counter action and results

**Operation Phase**

1) Social Environment

Community severance, Local conflicts of interest, Land scape, Accidents

Date:

<b>Items</b>	<b>Description</b>
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	

2) Complainants

<b>Number of complaints</b>	<b>Description</b>	<b>Counter action and results</b>

(4) Inland Flood Control (MP)

**Construction Phase**

1) Air Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
CO		9 ppm		
SO2		180 ug/m <sup>3</sup>		
NO2		150 ug/m <sup>3</sup>		
PM10		150 ug/m <sup>3</sup>		
PM2.5		35 ug/m <sup>3</sup>		
Dust	-	-		Direct observation

1) DENR NAAQGV, 24-hours average except CO: 8-hours average.

2) Water Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
BOD		Class D: 15 mg/L		
DO		Class D: 2 mg/L and over		
Fecal coliform		Class D: 400 MPN/100mL		
pH		Class D: 6.0 – 9.0		
Inorganic phosphate		Class D: 5.0 mg/L		
TSS		Class D: 110 mg/L		
Oil & Grease		Class D: 5 mg/L		
Heavy metals	Pb Hg As Cd Cr <sup>6+</sup>	Pb: 0.01mg/L Hg: 0.001mg/L As: 0.01mg/L Cd: 0.03mg/L Cr <sup>6+</sup> : 0.01mg/L		
Turbidity	-	-		Direct observation

1) DAO 2016-008, except inorganic phosphate and fecal coliform: DAO 2021-19

3) Waste

Date:

Items	Description
Record of treatment or disposal of waste, manifest	
Observation of storage condition of the waste	

4) Soil Condition (dredged/ excavated soil)

Date:

Items	Value	Standard Value	Location	Remarks (method, etc.)
Arsenic (As)		8.2 mg/kg (NOAA <sup>2)</sup> )		
Cadmium (Cd)		1.2 mg/k (NOAA)		
Chrome (Cr)		373 mg/kg (Canada <sup>3)</sup> )		
Lead (Pb)		35 mg/kg (Canada		
Mercury (Hg)		0.17 mg/kg (Canada)		
Spillage of toxics	-	-		Direct observation

1) NOAA: NOAA Sediment Quality Guidelines developed for National Status and Trends Program.

2) Canadian Environmental Quality Guidelines (2001). Canadian Sediment Quality Guidelines for the Protection of Aquatic life. Canadian Council of Ministers of the Environment.

5) Noise, vibration

Date:

Items	Time of measurement	Value <sup>1)</sup>	Standard <sup>2)</sup>	Location	Remarks (Source of noise, etc.)
Noise level	Morning ( )		50 dBA		
	Noon ( )		55 dBA		
	Evening ( )		50 dBA		
	Night ( )		45 dBA		
Noise, Vibration <sup>3)</sup>	During construction	-	-		Direct monitoring, hearing

1) Median of seven highest recorded noise levels

2) National Pollution Control Commission. (NPCC) memorandum circular no. 002, 1980

3) Since no standard is set in the Philippines, it is temporary monitored by hearing, etc.

6) Subsidence

Date:

Items	Description
Observation of subsidence	
Observation or measurement of underground water	
Hearing	

7) Ecosystem

Date:

Items	Description
Observation, sampling	
Hearing	
Condition of trees planted	

8) Hydrology

Date:

Items	Description
Hydrological condition	
Hearing	
Records of flood	

9) Social Environment

Poor/Vulnerable, Local economies, Existing social infrastructures and services, Social institutions, Gender, Children's rights, Labor conditions Accidents

Date:

Items	Description
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	

10) Complainants

Number of complaints	Description	Counter action and results

**Operation Phase**

1) Social Environment

Landscape, Accidents

Date:

<b>Items</b>	<b>Description</b>
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	

2) Complainants

<b>Number of complaints</b>	<b>Description</b>	<b>Counter action and results</b>



(5) Coastal Flood Control (MP)

**Construction Phase**

1) Air Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
CO		9 ppm		
SO2		180 ug/m <sup>3</sup>		
NO2		150 ug/m <sup>3</sup>		
PM10		150 ug/m <sup>3</sup>		
PM2.5		35 ug/m <sup>3</sup>		
Dust	-	-		Direct observation

1) DENR NAAQGV, 24-hours average except CO: 8-hours average.

2) Water Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
DO		6 mg/L and over		
Fecal coliform		100 MPN/100mL		
pH		7.0 – 8.5		
Inorganic phosphate		0.5 mg/L		
TSS		50 mg/L		
Oil & Grease		1mg/L		
Heavy metals	Pb Hg As Cd Cr <sup>6+</sup>	Pb: 0.01mg/L Hg: 0.001mg/L As: 0.01mg/L Cd: 0.03mg/L Cr <sup>6+</sup> : 0.01mg/L		
Turbidity	-	-		Direct observation

1) DAO 2016-008, Class SB

3) Waste

Date:

Items	Description
Record of treatment or disposal of waste, manifest	
Observation of storage condition of the waste	

4) Soil Condition (dredged/ excavated soil)

Date:

Items	Value	Standard Value	Location	Remarks (location, method, etc.)
Arsenic (As)		8.2 mg/kg (NOAA <sup>2</sup> )		
Cadmium (Cd)		1.2 mg/k (NOAA)		
Chrome (Cr)		373 mg/kg (Canada <sup>3</sup> )		
Lead (Pb)		35 mg/kg (Canada)		
Mercury (Hg)		0.17 mg/kg (Canada)		
Spillage of toxics	-	-		Direct observation

1) NOAA: NOAA Sediment Quality Guidelines developed for National Status and Trends Program.

2) Canadian Environmental Quality Guidelines (2001). Canadian Sediment Quality Guidelines for the Protection of Aquatic life. Canadian Council of Ministers of the Environment.

5) Noise, vibration

Date:

Items	Time of measurement	Value <sup>1)</sup>	Standard <sup>2)</sup>	Location	Remarks (Source, etc.)
Noise level	Morning ( )		50 dBA		
	Noon ( )		55 dBA		
	Evening ( )		50 dBA		
	Night ( )		45 dBA		
Noise, Vibration <sup>3)</sup>	During construction	-	-		Direct monitoring, hearing

1) Median of seven highest recorded noise levels

2) National Pollution Control Commission. (NPCC) memorandum circular no. 002, 1980

3) Since no standard is set in the Philippines, it is temporary monitored by hearing, etc.

6) Hydrology

Date:

Items	Description
Observation or measurement of underground water	
Hearing	

7) Ecosystem

Date:

Items	Description
Observation, sampling	
Hearing	
Condition of mangroves planted	

8) Social Environment

Poor/Vulnerable, Local economies, Existing social infrastructures and services, Gender, Children's rights, Labor conditions Accidents

Date:

Items	Description
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	

9) Complainants

Number of complaints	Description	Counter action and results

**Operation Phase**

1) Water Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Remarks (location, method, etc.)
DO		6 mg/L and over	
Fecal coliform		100 MPN/100mL	
pH		7.0 – 8.5	
Inorganic phosphate		0.5 mg/L	
TSS		50 mg/L	
Oil & Grease		1mg/L	
Heavy metals	Pb Hg As Cd Cr <sup>6+</sup>	Pb: 0.01mg/L Hg: 0.001mg/L As: 0.01mg/L Cd: 0.03mg/L Cr6+: 0.01mg/L	
Turbidity	-	-	Direct observation

1) DAO 2016-008, Class SB

2) Social Environment

Poor/Vulnerable, Landscape, Accidents

Date:

Items	Description
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	

3) Complainants

Number of complaints	Description	Counter action and results

(6) Priority Project on the Davao River (River Dredging)

1) Air Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
CO		9 ppm		
SO2		180 ug/m <sup>3</sup>		
NO2		150 ug/m <sup>3</sup>		
PM10		150 ug/m <sup>3</sup>		
PM2.5		35 ug/m <sup>3</sup>		
Dust	-	-		Direct observation

1) DENR NAAQGV, 24-hours average except CO: 8-hours average.

2) Water Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
BOD		Class A: 3 mg/L Class B: 5 mg/L		
DO		Class A: 5 mg/L and over Class B: 5 mg/L and over		
Fecal coliform		Class A: 200 MPN/100mL Class B: 200 MPN/100mL		
pH		Class A: 6.5 – 8.5 Class B: 6.5 – 8.5		
Inorganic phosphate		Class A: 0.025 mg/L Class B: 0.025 mg/L		
TSS		Class A: 50 mg/L Class B: 65 mg/L		
Oil & Grease		Class A: 1 mg/L Class B: 1 mg/L		
Heavy metals	Pb Hg As Cd Cr <sup>6+</sup>	Pb: 0.01mg/L Hg: 0.001mg/L As: 0.01mg/L Cd: 0.03mg/L Cr <sup>6+</sup> : 0.01mg/L		
Turbidity	-	-		Direct observation

1) DAO 2016-008, except inorganic phosphate and fecal coliform: DAO 2021-19

3) Waste

Date:

Items	Description
Record of treatment or disposal of waste, manifest	
Observation of storage condition of the waste	

4) Soil Condition (dredged/ excavated soil)

Date:

Items	Value	Standard Value	Location	Remarks (method, etc.)
Arsenic (As)		8.2 mg/kg (NOAA <sup>2)</sup> )		
Cadmium (Cd)		1.2 mg/k (NOAA)		
Chrome (Cr)		373 mg/kg (Canada <sup>3)</sup> )		
Lead (Pb)		35 mg/kg (Canada		
Mercury (Hg)		0.17 mg/kg (Canada)		
Spillage of toxics	-	-		Direct observation

1) NOAA: NOAA Sediment Quality Guidelines developed for National Status and Trends Program.

2) Canadian Environmental Quality Guidelines (2001). Canadian Sediment Quality Guidelines for the Protection of Aquatic life. Canadian Council of Ministers of the Environment.

5) Noise, vibration

Date:

Items	Time of measurement	Value <sup>1)</sup>	Standard <sup>2)</sup>	Location	Remarks (source of noise, etc.)
Noise level	Morning ( )		50 dBA		
	Noon ( )		55 dBA		
	Evening ( )		50 dBA		
	Night ( )		45 dBA		
Noise Vibration <sup>3)</sup>	During construction	-	-		Direct monitoring, hearing

1) Median of seven highest recorded noise levels

2) National Pollution Control Commission. (NPCC) memorandum circular no. 002, 1980

3) Since no standard is set in the Philippines, it is temporary monitored by hearing, etc.

6) Ecosystem

Date:

Items	Description
Observation, sampling of aquatic biota	
Hearing	

7) Social Environment

Local economies, Labor conditions, Accidents

Date:

Items	Description
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	
Others	

8) Complainants

Number of complaints	Description	Counter action and results

**Operation Phase**

1) Social Environment

Local economies

Date:

<b>Items</b>	<b>Description</b>
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	
Others	

2) Complainants

<b>Number of complaints</b>	<b>Description</b>	<b>Counter action and results</b>



(7) Priority Project on the Davao River (Retarding Ponds)

**Construction Phase**

1) Air Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
CO		9 ppm		
SO2		180 ug/m <sup>3</sup>		
NO2		150 ug/m <sup>3</sup>		
PM10		150 ug/m <sup>3</sup>		
PM2.5		35 ug/m <sup>3</sup>		
Dust	-	-		Direct observation

1) DENR NAAQGV, 24-hours average except CO: 8-hours average.

2) Water Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
BOD		Class A: 3 mg/L		
DO		Class A: 5 mg/L and over		
Fecal coliform		Class A: 200 MPN/100mL		
pH		Class A: 6.5 – 8.5		
Inorganic phosphate		Class A: 0.025 mg/L		
TSS		Class A: 50 mg/L		
Oil & Grease		Class A: 1 mg/L		
Heavy metals Pb Hg As Cd Cr6+		Pb: 0.01mg/L Hg: 0.001mg/L As: 0.01mg/L Cd: 0.03mg/L Cr6+: 0.01mg/L		
Turbidity	-	-		Direct observation

1) DAO 2016-008, except inorganic phosphate and fecal coliform: DAO 2021-19

3) Waste

Date:

Items	Description
Record of treatment or disposal of waste, manifest	
Observation of storage condition of the waste	

4) Soil Condition (dredged/ excavated soil)

Date:

Items	Value	Standard Value	Location	Remarks (method, etc.)
Arsenic (As)		8.2 mg/kg (NOAA <sup>2)</sup> )		
Cadmium (Cd)		1.2 mg/k (NOAA)		
Chrome (Cr)		373 mg/kg (Canada <sup>3)</sup> )		
Lead (Pb)		35 mg/kg (Canada		
Mercury (Hg)		0.17 mg/kg (Canada)		
Spillage of toxics	-	-		Direct observation

1) NOAA: NOAA Sediment Quality Guidelines developed for National Status and Trends Program.

2) Canadian Environmental Quality Guidelines (2001). Canadian Sediment Quality Guidelines for the Protection of Aquatic life. Canadian Council of Ministers of the Environment.

5) Noise, vibration

Date:

Items	Time of measurement	Value <sup>1)</sup>	Standard <sup>2)</sup>	Location	Remarks (source of noise)
Noise level	Morning ( )		50 dBA		
	Noon ( )		55 dBA		
	Evening ( )		50 dBA		
	Night ( )		45 dBA		
Noise Vibration <sup>3)</sup>	During construction	-	-		Direct monitoring, hearing

1) Median of seven highest recorded noise levels

2) National Pollution Control Commission. (NPCC) memorandum circular no. 002, 1980

3) Since no standard is set in the Philippines, it is temporary monitored by hearing, etc.

6) Ecosystem

Date:

Items	Description
Observation, sampling	
Hearing	
Condition of utilization for eco-tourism	

7) Hydrology

Date:

Items	Description
Hydrological condition	
Hearing	
Records of flood	

8) Social Environment

Poor/Vulnerable, Local economies, Existing social infrastructures and services, Utilization of land and local resources, Gender, Children's rights, Infectious diseases, Labor conditions, Accidents

Date:

Items	Description
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	
Others	

9) Complainants

Number of complaints	Description	Counter action and results

**Operation Phase**

1) Social Environment

Infectious diseases, Accidents

Date:

<b>Items</b>	<b>Description</b>
Record of accidents	
Hearing	
Public consultation	
Others	

2) Complainants

<b>Number of complaints</b>	<b>Description</b>	<b>Counter action and results</b>

(8) Priority Project on the Davao River (Cut-off Works)

**Construction Phase**

1) Air Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
CO		9 ppm		
SO2		180 ug/m <sup>3</sup>		
NO2		150 ug/m <sup>3</sup>		
PM10		150 ug/m <sup>3</sup>		
PM2.5		35 ug/m <sup>3</sup>		
Dust	-	-		Direct observation

1) DENR NAAQGV, 24-hours average except CO: 8-hours average.

2) Water Quality

Date:

Items	Value	Standard Value <sup>1)</sup>	Location	Remarks (method, etc.)
BOD		Class B: 5 mg/L		
DO		Class B: 5 mg/L and over		
Fecal coliform		Class B: 200 MPN/100mL		
pH		Class B: 6.5 – 8.5		
Inorganic phosphate		Class B: 0.025 mg/L		
TSS		Class B: 65 mg/L		
Oil & Grease		Class B: 1 mg/L		
Heavy metals Pb Hg As Cd Cr6+		Pb: 0.01mg/L Hg: 0.001mg/L As: 0.01mg/L Cd: 0.03mg/L Cr6+: 0.01mg/L		
Turbidity	-	-		Direct observation

1) DAO 2016-008, except inorganic phosphate and fecal coliform: DAO 2021-19

3) Waste

Date:

Items	Description
Record of treatment or disposal of waste, manifest	
Observation of storage condition of the waste	

4) Soil Condition (dredged/ excavated soil)

Date:

Items	Value	Standard Value	Remarks (location, method, etc.)
Arsenic (As)		8.2 mg/kg (NOAA <sup>1)</sup> )	
Cadmium (Cd)		1.2 mg/k (NOAA <sup>1)</sup> )	
Chrome (Cr)		373 mg/kg (Canada <sup>2)</sup> )	
Lead (Pb)		35 mg/kg (Canada <sup>2)</sup> )	
Mercury (Hg)		0.17 mg/kg (Canada <sup>2)</sup> )	
Spillage of toxics			Direct observation

1) NOAA: NOAA Sediment Quality Guidelines developed for National Status and Trends Program.

2) Canadian Environmental Quality Guidelines (2001). Canadian Sediment Quality Guidelines for the Protection of Aquatic life. Canadian Council of Ministers of the Environment.

5) Noise, vibration

Date:

Items	Time of measurement	Value <sup>1)</sup>	Standard <sup>2)</sup>	Location	Remarks (source of noise)
Noise level	Morning ( )		50 dBA		
	Noon ( )		55 dBA		
	Evening ( )		50 dBA		
	Night ( )		45 dBA		
Noise Vibration <sup>3)</sup>	During construction	-	-		Direct monitoring, hearing

1) Median of seven highest recorded noise levels

2) National Pollution Control Commission. (NPCC) memorandum circular no. 002, 1980

3) Since no standard is set in the Philippines, it is temporary monitored by hearing, etc.

6) Ecosystem

Date:

Items	Description
Observation, sampling	
Hearing	
Condition of trees planted	

7) Hydrology

Date:

Items	Description
Hydrological condition	
Hearing	
Records of flood	

8) Social Environment

Poor/Vulnerable, Local economies, Existing social infrastructures and services, Community severance, Utilization of land and local resources, Landscape, Gender, Children’s rights, Infectious diseases ,Labor conditions Accidents

Date:

Items	Description
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	
Others	

9) Complainants

Number of complaints	Description	Counter action and results

**Operation Phase**

1) Social Environment

Existing social infrastructures and services, Community severance, landscape Infectious diseases, Accidents

Date:

<b>Items</b>	<b>Description</b>
Observation of traffic condition, etc.	
Record of accidents	
Hearing	
Public consultation	

2) Complainants

<b>Number of complaints</b>	<b>Description</b>	<b>Counter action and results</b>





## Annex 7

### Records on Stakeholder Meetings in F/S Stage

1st Public Scoping  
Notice to Public  
Program  
Presentation Materials



## **NOTICE OF PUBLIC SCOPING**

On the proposed ***PRIORITY PROJECTS FOR FLOOD CONTROL IN DAVAO RIVER*** of ***DPWH Flood Control Management Cluster*** to be located at ***Brgys. 1, 2, 5, 8, 19, Bucana, Tigatto, Ma-a, New Carmen, Waan, Mandug, New Valencia, and Callawa, Davao City.***

NOTICE is hereby given to all parties who wish to give their opinion regarding the implementation of the proposed ***Priority Projects for Flood Control in Davao River*** to attend a Public Scoping on **07 December 2021 at 1:00 PM** virtual conference via **<https://meet.google.com/rfn-qaqq-isn>**.

This Public Scoping is being conducted as part of the Scoping Stage of the EIA Process in connection with the Environmental Compliance Certificate (ECC) application of the Proponent in the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR).

All interested parties who wish to attend or participate in this Public Scoping should register by email with EMB Region XI through [embxieia@emb.gov.ph](mailto:embxieia@emb.gov.ph). Those who will not be able to register or submit written positions may be given the opportunity to share their issues on the day of the scoping itself. However, priority shall be given to those who register first with the above offices before the scoping, and then to the early registrants during the scoping.

Project Description for Scoping (PDS) can be accessed at the EMB XI website (<http://r11.emb.gov.ph/>) and official Facebook page ([www.facebook.com/Environmental-Management-Bureau-Region-11-353287625118472](http://www.facebook.com/Environmental-Management-Bureau-Region-11-353287625118472)).

Individual and/or organizations may give their opinion(s) in a concise position paper submitted to EMB XI with address at 3<sup>rd</sup> Ave. corner V. Guzman St., Brgy. 27-C, Sta. Ana, Davao City on or before December 03, 2021. Submissions may also be thru mailed letters or thru e-mails at [embxieia@emb.gov.ph](mailto:embxieia@emb.gov.ph).

For more details, please contact the EIA Section of EMB XI at Telephone Number (082) 234 – 0061 or by email through [embxieia@emb.gov.ph](mailto:embxieia@emb.gov.ph) or mail to EMB Regional XI at 3<sup>rd</sup> Ave. corner V. Guzman St., Brgy. 27-C, Sta. Ana, Davao City.



**REPUBLIC OF THE PHILIPPINES**  
**Department of Environment and Natural Resources**  
**ENVIRONMENTAL MANAGEMENT BUREAU**

**PUBLIC SCOPING**

Priority Projects for Flood Control in Davao River in Davao City

Date/Time: 7 December 2021 (1:00 – 5:00PM)

Google Meet Link: <https://meet.google.com/rfn-qaqq-isn>

**PROGRAM OF ACTIVITY**

Time	Program of Activity	Responsible Person
12:00 – 1:00 PM	Online Registration	Secretariat
1:00 – 1:15 PM	Opening Prayer National Anthem	Secretariat
1:15 – 1:30 PM	Welcome Remarks	<b>Representative</b> Local Government Unit
1:30 – 1:40 PM	Introduction of Participants, Workshop Overview, Objectives and Expectation Setting	<b>Dr. Silverio V. Magallon, Jr.</b> Facilitator/ Socio Expert
1:40 – 1:50 PM	Overview of the Scoping Guidelines and Mechanics	<b>Ms. Miralou Blanco</b> Chief, EIA Section, EMB - XI
1:50 – 2:50 PM	Brief Presentation of the Proposed Project	<b>Representative</b> DPWH (Proponent)
2:50 – 3:00 PM	Coffee Break/Snacks	
3:00 – 4:00 PM	Open Forum and Raising of Issues to be Addressed by the EIA Study	<b>Representative</b> EMB - XI
4:00 – 4:30 PM	Synthesis/Summary of Issues and Agreements on Scoping	<b>Representative</b> EMB - XI
4:30 – 5:00 PM	Closing Remarks and Next Steps in the EIA Process	<b>Representative</b> EMB - XI



# PUBLIC SCOPING

## Priority Projects for Flood Control in Davao River of Davao City



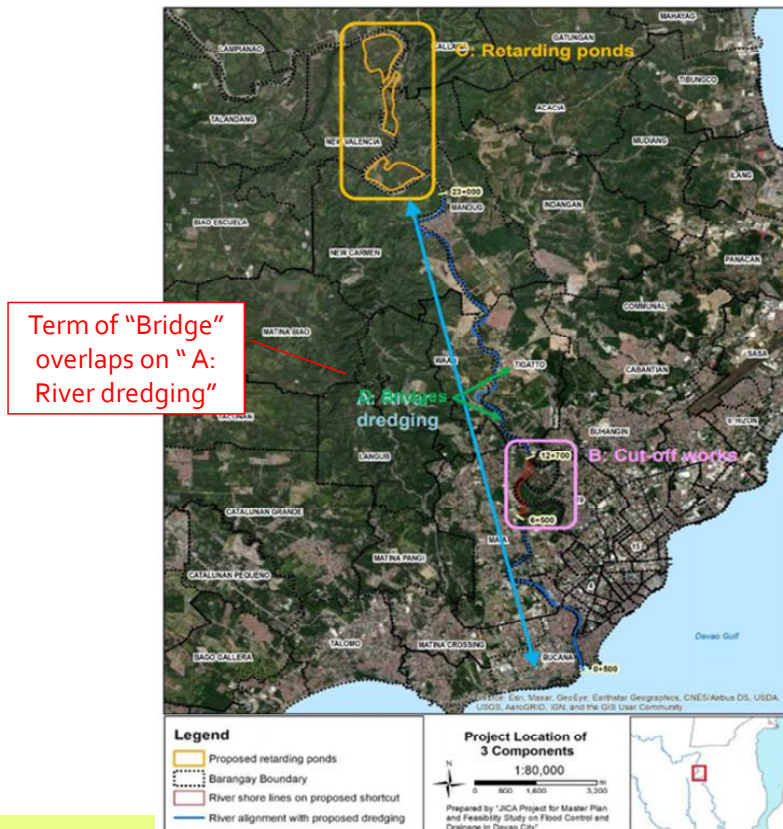
### Basic Project Information

<b>Project Name</b>	Priority Projects for Flood Control in Davao River in Davao City
<b>Project Proponent</b>	DPWH Flood Control Management Cluster (UPMO-FCMC)
<b>Office Address</b>	DPWH 2 <sup>nd</sup> St., Port Area, Manila
<b>Type of Project</b>	Environmental Enhancement
<b>Project Location</b>	Davao City, Davao River Basin
<b>Total Project Area</b>	+ River Dredging: Expected excavated volume - 2.0 MCM + Cut-Off Works: Expected excavated volume - 1.7MCM + Retarding Ponds: Expected excavated volume - 28.2MCM
<b>Project Contact Person</b>	Ramon A. Arriola III Project Director
<b>Project Contact Number</b>	+632-5304-3813/ +632-5304-3752 arriola.ramon@dpwh.gov.ph

# Project Location

Project Component	Project Location
Component A: River Dredging	Barangay 8
	Barangay 1
	Barangay 2
	Barangay Bucana
	Barangay Tigatto
	Barangay 19
	Barangay Ma-a
	Barangay 5
	Barangay New Carmen
	Barangay Waan
	Barangay Mandug
Component B: Cut-Off Works	Barangay 8
	Barangay Tigatto
	Barangay Ma-a
	Barangay 19
Component C: Retarding Ponds	Barangay New Valencia
	Barangay Mandug
	Barangay New Carmen
	Barangay Callawa
Component D: (2) Bridges	Barangay Ma-a

Figure 1 shows the location of three components of the proposed flood control project in Davao City.



## Project Rationale

- The Philippines has suffered devastating damage from natural disasters. During the 10 year-period from 2005 until 2015, a total of 20,000 people were dead and missing, 75 million people have been affected, and the economic loss has reached 182 billion pesos.
- Davao City had been less affected by flooding in the past, but flood damage has recently increased due to changes in typhoon tracks. In 2011, 30 people were killed by the flooding of the Davao and Matina Rivers, more than 2,500 people were affected by the flooding of Davao River in 2013, and 22,911 families were affected by flooding due to Typhoon Vinta in December, 2017. In addition, there are several problems such as inland flooding, insufficient drainage systems, and storm surges due to the geographical features of the 60 km coastline.
- Under the above circumstances, the Government of the Republic of the Philippines (GOP) requested assistance from the Japanese Government on the Master Plan and Feasibility Study on Flood Control and Drainage in Davao City.

## Cont...

- In response to the official request of the Government of the Republic of the Philippines, JICA conducted a detailed planning survey on the Project and confirmed and signed the minutes of meetings (M/M) on the 11th of August 2017, and signed the Record of Discussion (R/D) on the 23rd of April 2018.
- Objective of the Project is to mitigate flood damage in Davao City by the implementation of flood control measures through development of the Master Plan for Davao River, Matina River and Talomo River basin and conducting the Feasibility Study on urgent and/or priority project(s).
- The project is expected to i) develop a Master Plan of the flood control and drainage in Davao City which includes a flood control Master Plan for Davao River, Matina River and Talomo River basins; ii) analyze the Feasibility Study on urgent and/or priority project(s); and iii) enhance the capacity of concerned DPWH personnel/Officials in the development of Flood Control and Drainage Master Plan.



## Project Alternatives

Plan	Alt.-1 (River Dredging and High-Flood Wall)	Alt.-2 (River Dredging and Dam Construction)	Alt.-3 (River Dredging, Cut-Off Works and One Retarding Pond Construction (RP6))	Proposed Plan (River Dredging, Cut-Off Works and 3 Retarding Ponds)
<b>Description</b>	River dredging (approx. 23km from the river mouth) High flood wall (max. 6.7m height)	River dredging (approx. 23km from the river mouth) Dam (approx. 45m height and 58MCM reserve)	River dredging (approx. 23km from the river mouth) Cut-off works Retarding pond (1 location, total of 2.2 km <sup>3</sup> )	River dredging (approx. 23km from the river mouth) Cut-off works Retarding ponds (3 locations, total of 2 km <sup>3</sup> )
<b>Cost</b>	Approx. 18.2 Billion PHP	Approx. 39.3 Billion PHP	Approx. 13.8 Billion PHP	Approx. 11.6 Billion PHP
<b>Environment</b>	Minimal environmental impacts while risk of overflow or dyke break is predicted.	Dam site is located in environmentally critical area (high elevation/slope and protected forest)	Usual pollution by construction works, spreading turbid water, change of land cover,	Usual pollution by construction works, spreading turbid water, change of land cover

<b>Social issues</b>	Possible smaller scale of land occupation and resettlement are predicted.	Dam site is also located in the ancestral domain area. Natural resources for eco-tourism, agro-forest, and community development could be damaged.	Scale of resettlement is bigger than proposed plan (approx. 180 PAHs or more), loss of agricultural product.	Certain scale of resettlement (less than 100 PAHs), loss of agricultural products
<b>Evaluation result</b>	<u>Not recommended</u> Although environmental risk will be lowest; extensive disaster is predicted in case of dyke break. Advanced design, construction, maintenance technology as well are required.	<u>Not recommended</u> Dam site is located in environmentally sensitive area.	<u>Not recommended</u> Scale of resettlement, necessary land and cost are bigger than proposed plan.	<u>Recommended</u> Environmental risk could be smaller than other plans.

## Expected Project Benefit

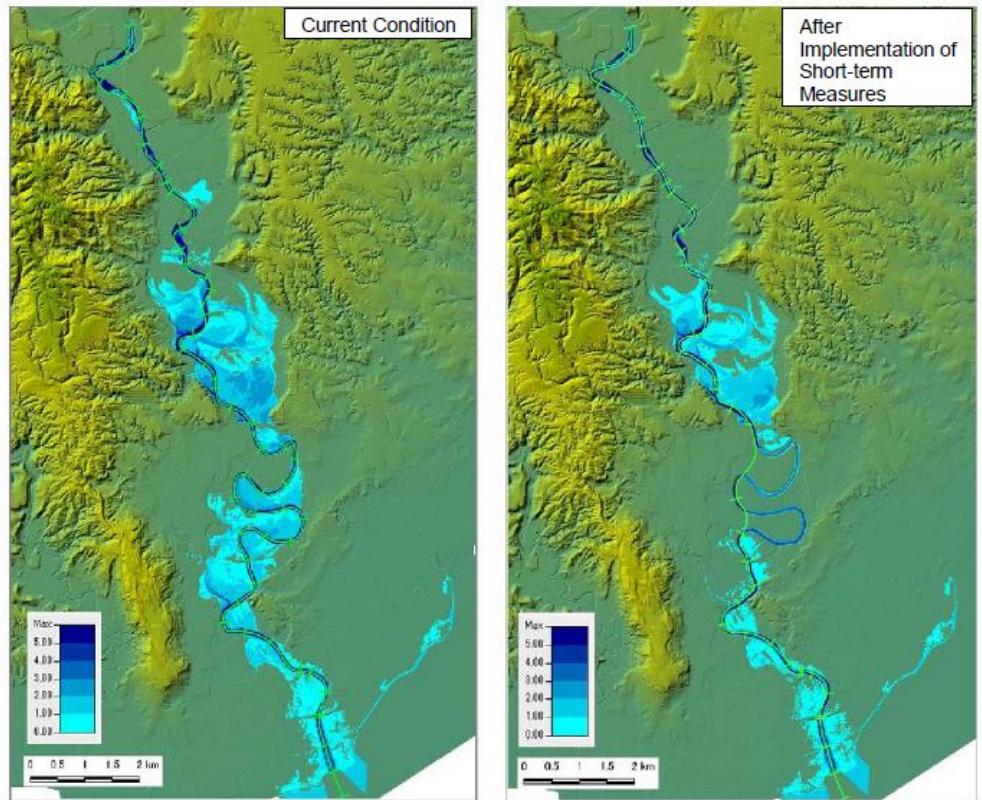
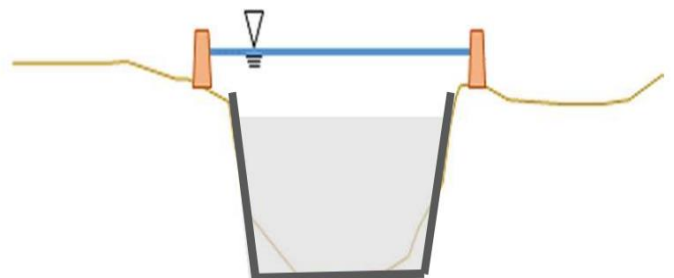


Figure: Comparison of Inundation Condition with 10 year Scale Flood (L) Current Condition, (R) after the Project (Short-Term Measures)

## Project Components

### *Component A: River dredging*

- River dredging work aims to secure appropriate river flow in order to reduce risk of over flow. Dredging work will be taken from Davao River mouth (0+500) to 23km upstream. River soil in the existing river will be dredged; approximate volume is estimated two (2) million m<sup>3</sup>.



## Component B: Cut-Off Works

Cut-off works, will be installed at downstream of near Crocodile Park to shorten the river line; it is expected that flood water are quickly discharge to the sea. Actual design will be examined in the feasibility study. As of now, the standard revetment structure after widening of the river should preferably be a combination of concrete revetment (above mean water level, H=approx. 5 m) and steel sheet pile (below mean water level) (see Figure 3). It is also necessary to have a platform behind the crest of steel sheet pile in order to reduce the embankment load that affects the steel sheet pile.

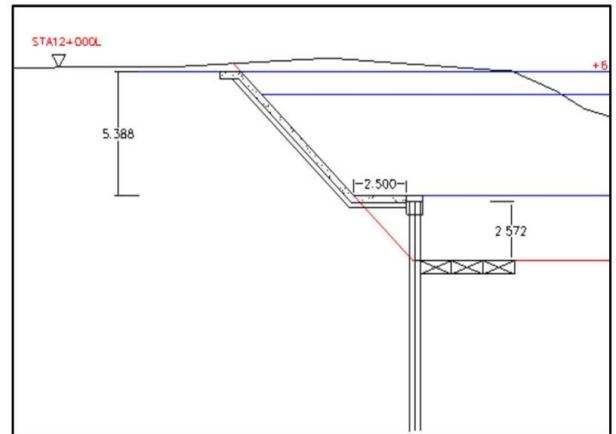


Figure 3. Type of standard revetment for cut-off works of river alignment.

## Component C: Retarding Ponds

Three (3) retarding ponds are planned to install to aim at temporal flood water storage during large-scale flood. Location of these ponds is upper stream of proposed dredging area at 24km, 27km and 29km from the river mouth, and four (4) barangays are located in the project area.

Retarding ponds are composed of various structures, such as overflow dike, surrounding levee and drainage gate. In the facility planning of retarding pond, natural drainage is to be considered so that planned basin-bed elevation will be equal to the planned/ current riverbed elevation of the Davao River. The height of surrounding levees should be the same with Davao River's design levee height taken at the upstream end of the pond. Excavation of the ground down to the planned pond elevation is necessary, if the existing ground level of the candidate site is high, which the case here is seemingly.

Retarding Pond	Area (m <sup>2</sup> )	Service Capacity (MCM)	Dredging Volume (MCM)
RP08	0.75	4.7	6.3
RP09	0.37	2.2	3.0
RP11	0.67	0.67	6.2

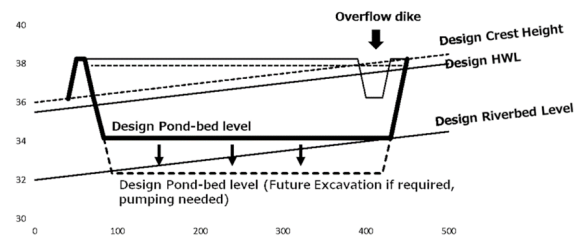


Figure 4. Concept for Facility Planning of the Retarding Pond

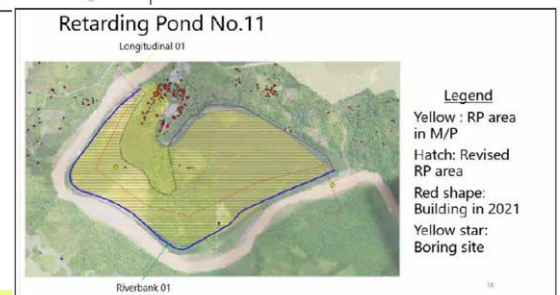
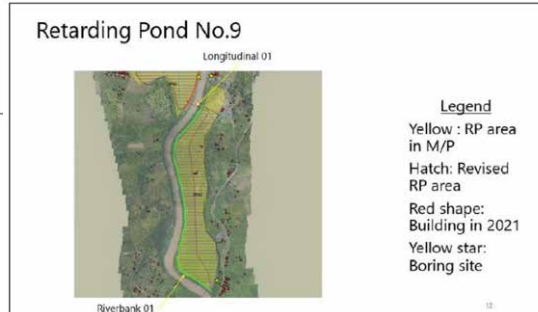
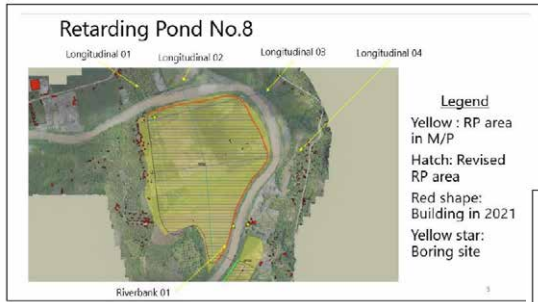


Figure 5. Example section of overflow dike.



Image of dyke between the river and pond

Image of outlet gate



## Project Phases, Key Environmental Aspects, Wastes, Issues, Built-In Measures

Project Phases	Key Environmental Aspect	Impacts/Wastes	Built-in Measures
1. Dredging	<ul style="list-style-type: none"> <li>- Water Quality</li> <li>- Freshwater biota</li> <li>- Land</li> <li>- Air</li> </ul>	<ul style="list-style-type: none"> <li>- Degradation of water quality downstream, siltation</li> <li>- Disruption of freshwater biota</li> <li>- Soil pollution (production of dredged materials, oil and grease)</li> <li>- Emission from heavy equipment (SO<sub>x</sub>, NO<sub>x</sub>, CO)</li> <li>- Noise generation</li> </ul>	<ul style="list-style-type: none"> <li>- Installation of silt curtains</li> <li>- Dispose dredged materials in accordance with the dredging master plan</li> <li>- Use new models and less emission equipment</li> <li>- Provision of muffler to lessen noise</li> </ul>

1. Cut-off works	- Land cover	- Removal of vegetation (solid waste-vegetal wastes)	- Dispose vegetal wastes in accordance with City instituted system
	- Water quality	- Degradation of water quality downstream, siltation	- Plant trees along the cut-off works bank
	- People	- Displacement of directly affected people	- Installation of silt curtains
	- Air	- Emission from heavy equipment (SOx, NOx, CO)	- Formulate RAP
	- Land	- Generation of excavated materials	- Resettle PAPs
		- Noise generation	- Develop acceptable compensation package
		- Emission from heavy equipment (SOx, NOx, CO)	- Use of new model and less emission equipment
		- Noise generation	- Provision of mufflers to lessen noise
		- Generation of excavated materials	- Dispose in accordance with the plan of the City

Just confirm the reason why Bold is used?

Retarding ponds	- Land cover	- Removal of vegetation (solid waste-vegetal wastes)	- Dispose vegetal wastes in accordance with City instituted system
	- Water quality	- Degradation of water quality downstream, siltation	- Plant trees around the ponds
	- People	- Displacement of directly affected people	- Installation of silt curtains
	- Air	- Emission from heavy equipment (SOx, NOx, CO)	- Formulate RAP
	- Land	- Generation of excavated materials	- Resettle PAPs
		- Noise generation	- Develop acceptable compensation package
		- Emission from heavy equipment (SOx, NOx, CO)	- Use of new model and less emission equipment
		- Noise generation	- Provision of mufflers to lessen noise
		- Generation of excavated materials	- Dispose in accordance with the plan of the City

# Project Cost and Duration

As reflected, preparatory stage of dredging will commence in year 2023 and expected to finish in 2031. Meanwhile, construction of retarding ponds will start in 2023 and assumed to end by 2032, including relocation activity. Lastly, cut-off works will take-off in year 2023 and expected to end in 2025.

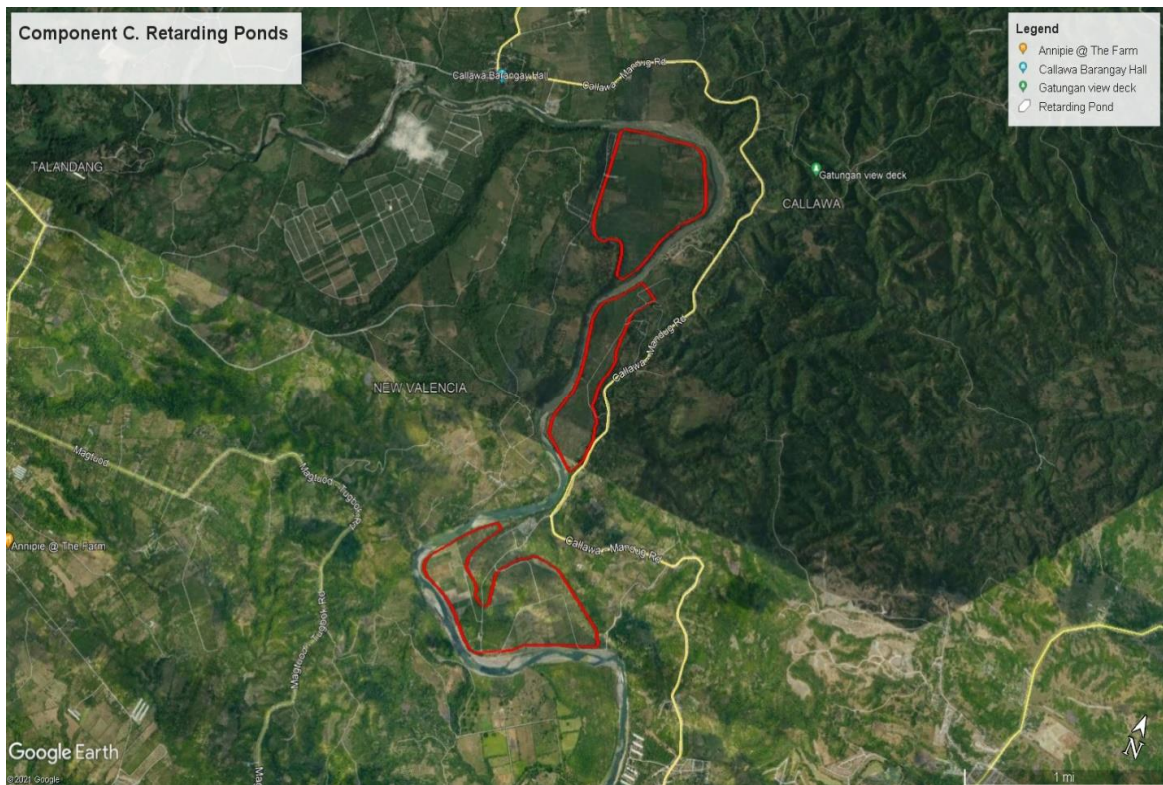
*(It is still under examination).*

The estimated cost for this flood control project is 11.6 billion pesos.

Work Items etc.		Required Period (year)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
			2020	2025	2030	2035										
Dredging	Preparation	Detail Design	1.0		1											
	Work	Temporary Facilities	1.0			1										
		Dredging/Dredged Soil Disposal	7.0				1	2	3	4	5	6	7			
Retarding Pond (RP-8,9,11)	Preparation	Detail Design	2.0		1	2										
		Resettlement Action Plan (RAP) & Right of Way Acquisition	2.0			1	2									
	Procurement	1.0				1										
	Work	Temporary Facilities	0.5					1								
		Excavation/Remained Soil Disposal	5.0						1	2	3	4	5			
		Revetment/Dike Work	2.9						1	2	3					
		Overflow Dike Work	1.8							1	2					
		Drainage Facility Work	0.5						1							
River Widening (Preparation & Cut-off Work)	Preparation	Detail Design	1.0		1											
		Resettlement Action Plan (RAP) & Right of Way Acquisition	1.0		1											
	Procurement	1.0		1												
	Work	Temporary Facilities	0.5			1										
		Cut-off Work (Excavation) 6-13km	1.0				1									
		Cut-off Work (Dredging) 6-13km	1.0				1									
Cut-off Work (Revetment) 6-13km		0.8				1										

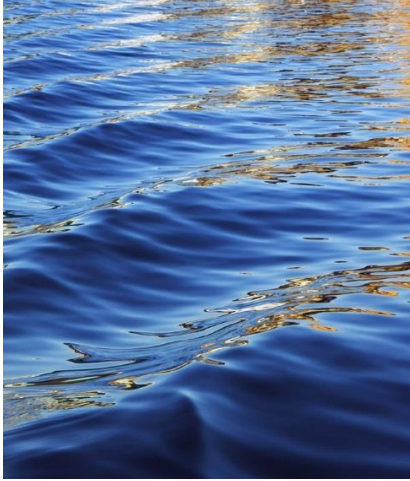
# Proposed Project Sites







Thank you!





2nd Public Scoping  
Notice to Public  
Program  
Presentation Materials



## **NOTICE OF PUBLIC HEARING**

On the **ENVIRONMENTAL IMPACT STATEMENT (EIS)** of the proposed **Flood Control Project in Davao River of Department of Public Works and Highways - Flood Control Management Cluster (DPWH UPMO-FCMC)** to be located in **Brgys. Brgys Bucana, 1-A, 2-A, 3-A, 5-A, 19-B, Maa, Waan, Tigatto, Mandug, New Carmen, New Valencia, and Callawa all in Davao City.**

NOTICE is hereby given to all parties who wish to give their opinion regarding the implementation of the proposed **Flood Control Project in Davao River** to attend a Public Hearing on:

<b>Date</b>	<b>Time</b>	<b>Venue</b>	<b>Details</b>
<i>June 28, 2022</i>	<i>1:30pm</i>	<i>Multi-Purpose Building/Gym, Brgy. Mandug, Davao City</i>	<i>Face to face and via MS Teams thru <a href="https://bit.ly/3xPA2oY">https://bit.ly/3xPA2oY</a></i>

This Public Hearing is being conducted in connection with the review of the EIS of the aforementioned project by the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR).

The following is the public information:

<b>Project Name</b>	<b><i>Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City (Davao River)</i></b>
<b>Project Location</b>	<b><i>River dredging: Brgys Bucana, 1-A, 2-A, 3-A, 5-A, Maa, Waan, Tigatto, Mandug, New Carmen Cut-of - Works with bridge: Brgys 19-B, Maa, Tigatto Retarding ponds: Brgys Mandug, New Carmen, New Valencia, Callawa</i></b>
<b>Project Area</b>	<b><i>+River dredging: Excavated volume – 2.0 MCM +Cut-of- works: Excavated volume – 1.7 MCM +Retarding ponds: Excavated volume – 15.5 MCM</i></b>
<b>Project Type</b>	<b><i>Environmental Enhancement</i></b>
<b>Proponent</b>	<b><i>DPWH Flood Control Management Cluster (UPMO - FCMC)</i></b>

All interested parties who wish to attend or participate in this Public Hearing should register by email with EMB Region XI through [embxieia@emb.gov.ph](mailto:embxieia@emb.gov.ph). Those who will not be able to register or submit written positions may be given the opportunity to share their issues on the day of the hearing itself. However, priority shall be given to those who register first with the above office before the hearing, and then to the early registrants during the hearing.

Full copy of the draft **ENVIRONMENTAL IMPACT STATEMENT (EIS)** and EIS Summary can be accessed at the EMB XI website (<http://r11.emb.gov.ph/>) and official Facebook page ([www.facebook.com/Environmental-Management-Bureau-Region-11-353287625118472](http://www.facebook.com/Environmental-Management-Bureau-Region-11-353287625118472)).

Individual and/or organizations may give their opinion(s) in a concise position paper submitted to EMB XI with address at 3<sup>rd</sup> Ave. corner V. Guzman St., Brgy. 27-C, Sta. Ana, Davao City on or before June 24, 2022. Submissions may also be thru mailed letters or thru e-mails at [embxieia@emb.gov.ph](mailto:embxieia@emb.gov.ph).

For more details, please contact the EIA Section of EMB XI at Telephone Number (082) 234 – 0061 or by email through [embxieia@emb.gov.ph](mailto:embxieia@emb.gov.ph) or mail to EMB Regional XI at 3<sup>rd</sup> Ave. corner V. Guzman St., Brgy. 27-C, Sta. Ana, Davao City.

### Public Hearing Program

**Project Title** : Project for Master Plan and Feasibility Study of Flood Control Project in Davao City (Davao River)

**Project Location** : Barangay Bucana, 1, 2, 3, 5, Ma-a, Waan, Tigatto, Mandug, New Carmen, 19, New Valencia, Callawa

**Project Proponent** : DPWH Flood Control Management Cluster (UPMO - FCMC)

**Date** : 28 JUNE 2022

**Time** : 1:30 PM

**Venue/Address** : Barangay Covered Court, Barangay Mandug, Davao City

TIME	PROGRAM OF ACTIVITIES	RESPONSIBLE PERSON
1:30- 2:00 PM	Registration	Secretariat
2:00 – 2:10 PM	Opening Prayer National Anthem	<b>Ms. Marilyn Aman</b> Technical Specialist, EMB XI  <b>Engr. Cathy M. Saquilabon</b> Case Handler, EMB XI
2:10 – 2:15 PM	Welcome Remarks	<b>Hon. Elmer Ototan</b> Kagawad, Brgy. Mandug
2:15 – 2:20 PM	Rationale	<b>Ms. Miralou A. Blanco</b> Chief, EIAS – EMB XI
2:20 – 2:25 PM	Introduction on the Conduct of Public Hearing and Target Objective / Outcome	<b>Atty. Dennis C. Navarro</b> Public Hearing Officer, EMB XI
2:25-3:00 PM	Brief Presentation of Project Background, Description, Location, Implementation Schedule, and Other Information or Facts Regarding the Project and the Result of the EIA on Impacts, Measures, and Commitments	<b>Dr. Silverio V. Magallon, Jr.</b> Team Leader, GCS
3:00-5:00 PM	Open Forum	<b>Atty. Dennis C. Navarro</b> Public Hearing Officer, EMB XI
5:00 – 5:15 PM	Agreements, Summary of Issues/Concerns/Impacts Raised, and Response of the Proponent	<b>Ms. Melisa H. Aratia</b> Consultant, GCS
5:15 – 5:30 PM	Next Steps of Action in the EIA Process	<b>Ms. Miralou Blanco</b> Chief, EIA Section, EMB XI

# Presentation of Proposed Project & EIS Results

Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City  
(Davao River)

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**PUBLIC HEARING**  
**Barangay Mandug, Davao City**  
**June 28, 2022 – 1:30 pm**

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## OUTLINE OF PRESENTATION

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- Project Description
    - Rationale
    - Basic Project Information
    - Project Components
    - Project Phases
    - Manpower & Cost
    - Project duration and schedule
  - Assessment of Environmental Impacts
    - Land
    - Terrestrial Biology
    - Water
    - Air
    - People
  - Impact Management Plan
  - Institutional Arrangement
- 

# Project Rationale

- Flooding is a water-induced disaster. It is very destructive.
- Frequent flooding incidence in Davao City
- Flooding affects life and livelihood and the development of Davao City in general
- There is need for flood control measures
- Flood control is a national priority
- GOP entered into technical cooperation with JICA
- Flood control project is a grant-in-aid from Japanese government
- JICA consultants will do the feasibility study

## Project Alternatives

Plan	Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Description</b>	River dredging (approx. 23km from the river mouth) High flood wall (max. 6.7m height)	River dredging (approx. 23km from the river mouth) Dam (approx. 45m height and 58 MCM reserve)	River dredging (approx. 23km from the river mouth) Cut-off works Retarding pond (1 location, total of 2.2 km <sup>3</sup> )	River dredging (approx. 23km from the river mouth), Cut-off works Retarding ponds (3 locations, total of 2 km <sup>3</sup> )
<b>Cost</b>	Approx. 18.2 Billion PHP	Approx. 39.3 Billion PHP	Approx. 13.8 Billion PHP	Approx. 11.6 Billion PHP
<b>B/C</b>	1.3	0.6	1.7	2.04
<b>Environment</b>	Minimal environmental impacts while risk of overflow or dyke break is predicted.	Dam site is located in environmentally critical area (high elevation/ slope and protected forest)	Usual pollution by construction works, spreading turbid water, change of land cover,	Usual pollution by construction works, spreading turbid water, change of land cover,
<b>Social issues</b>	Possible smaller scale of land occupation and resettlement are predicted.	Dam site is also located in the ancestral domain area. Natural resources for eco-tourism, agro-forest, and community development could be damaged.	Scale of resettlement is bigger than proposed plan (approx. 180 PAHs or more), loss of agricultural product.	Certain scale of resettlement (less than 100 PAHs), loss of agricultural products
<b>Evaluation result</b>	<u>Not recommended</u> Although environmental risk will be lowest; extensive disaster is predicted in case of dyke break. Advanced design, construction, maintenance technology as well are required.	<u>Not recommended</u> Dam site is located in environmentally sensitive area.	<u>Not recommended</u> Scale of resettlement, necessary land and cost are bigger than proposed plan.	<u>Recommended</u> Environmental risk could be smaller than other plans.

# Project Phases

## Pre-construction phase

- Feasibility study, finalization of other related plans such as dredging plan, securing an ECC and other permits, finalization of RAP
- Detailed engineering design o

## Construction phase

- Construction of three retarding ponds, cut-off channel and the dredging of Davao River.
- Demobilization of contractor

## Operation Phase

- Mainly care and maintenance
- Continuous tree planting

# Basic Project Information

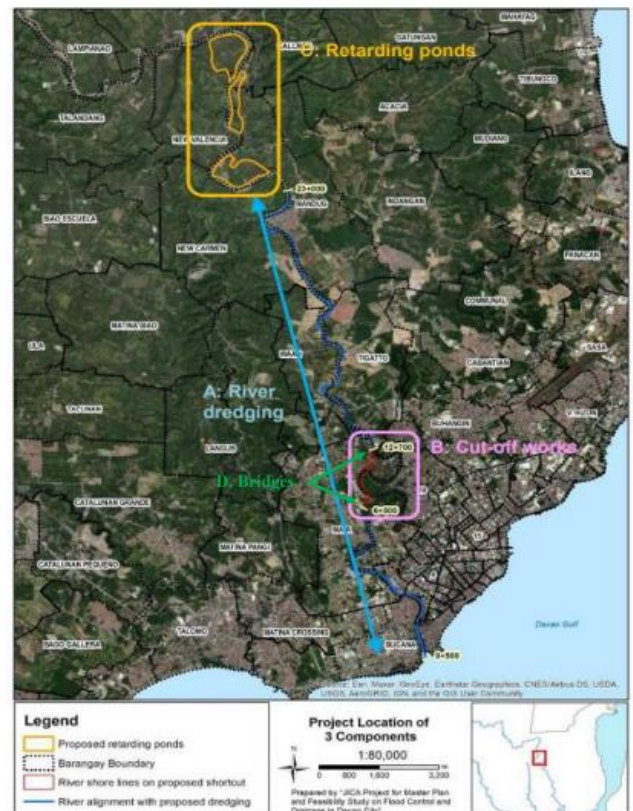
<b>Project Name</b>	<b>Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City (Davao River)</b>
<b>Project Proponent</b>	DPWH Flood Control Management Cluster (UPMO - FCMC)
<b>Contact Information</b>	Ramon A. Arriola III Project Director
<b>Company Name and Address</b>	Department of Public Works and Highways DPWH 2nd St., Port Area, Manila
<b>Proponent Contact Details</b>	+632 – 534 – 3813 / +632 – 534 – 3752/arriola.ramon@dpwh.gov.ph
<b>Project Type</b>	Environmental Enhancement
<b>Project Cost</b>	PhP 11.6 B
<b>Project Location</b>	River dredging: Brgys Bucana, 1, 2, 3, 5, Ma-a, Waan, Tigatto, Mandug, New Carmen Cut-off Works with bridge: Brgys 19, Ma-a, Tigatto Retarding ponds: Bgys Mandug, New Carmen, New Valencia, Callawa
<b>Total Project Area</b>	+River dredging: Excavated volume – 2.0 MCM +Cut-off works: Excavated volume – 1.7 MCM +Retarding ponds: Excavated volume – 15.5 MCM
<b>EIS Preparer</b>	Green-collar Consulting Services

# Project Components

Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City (Davao River)

The flood control priority projects considered under the feasibility study consisted of three (3) retarding ponds, cut-off works, and river dredging & river widening. The major components of the flood control projects are:

1. Dredging works
2. Cut-off works
3. Retarding ponds



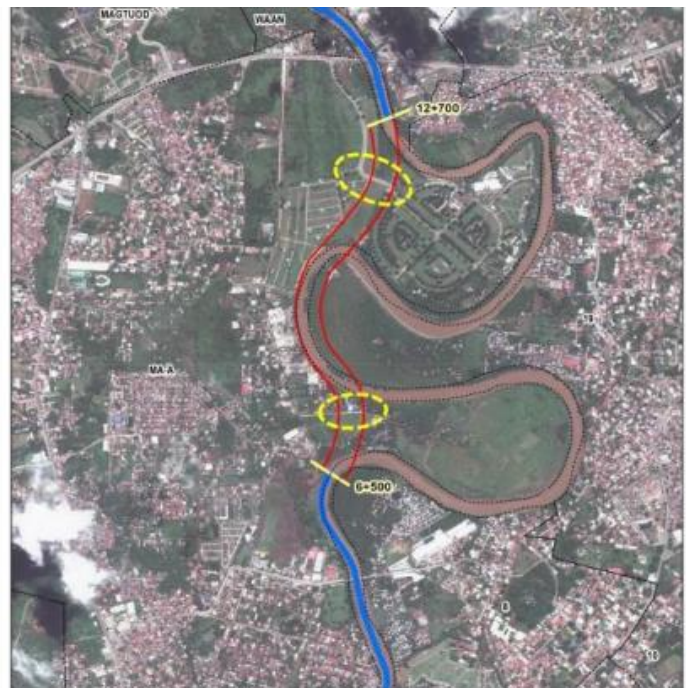
## River Dredging

River dredging work aims to secure appropriate river flow in order to reduce risk of over flow. Dredging work will be taken from Davao River mouth (0+500) to 23km upstream. Approximate volume of dredged material is two (2) million m<sup>3</sup> .



## Cut-off works

Cut-off works will be installed at downstream of near Crocodile Park to shorten the river line; it is expected that flood water is quickly discharge to the sea and to increase flow capacity. Actual design will be examined in the feasibility study.





## Retarding Ponds

Revised design as of October 2021			
Retarding Pond	Area (km <sup>2</sup> )	Service capacity (MCM)	Dredging volume (MCM)
RP 08	0.75	4.7	6.3
RP 09	0.37	2.2	3.0
RP 11	0.67	4.5	6.2
Total	1.79	11.4	15.5



### Manpower Requirement

- Civil engineers, skilled workers and unskilled workers.
- The directly affected **qualified** residents will be given priority in the hiring of manpower. Reference: DO 130 – s2016.

### Project Cost

- The total project cost is estimated to be about PhP 11.6 billion.

# Project Duration

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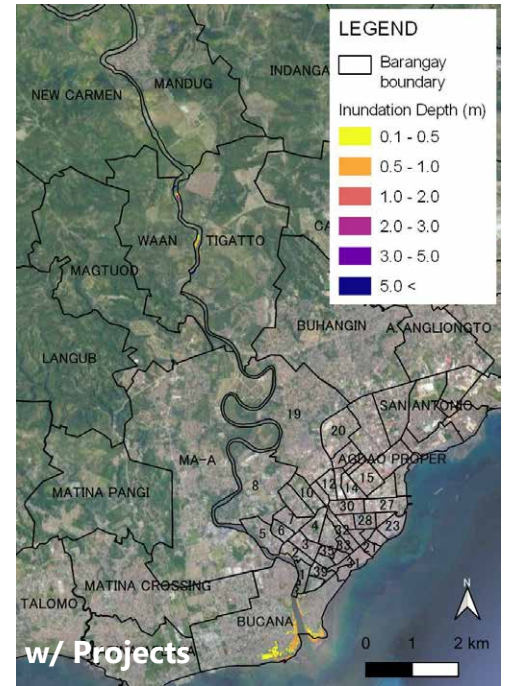
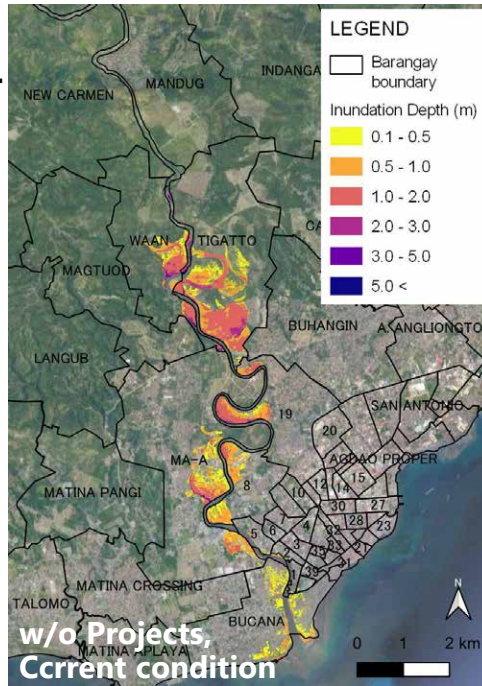
- 1. River Dredging : 2025 – 2030
- 2. Cut-of-Work : 2025
- 3. Retarding Ponds : 2030 - 2035

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# Condition with and without the Project

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**Project Benefit  
– Reduce Flood Area –  
in case 5yr flood**



	W/o Projects	w/ Projects	Reduction Rate
Total flood area (ha)	Approx. 480	Approx. 30	94%
Total no. of affected persons	Approx. 43K	Approx. 5.6K	87%

# Results of Environmental Assessment

# Land

## Land use

- Retarding ponds – floodway mitigation zone and prime agricultural lands with high susceptibility to flood
- Cut-of-works – high and medium density sub-zone, PUD, open space easement zone and floodway mitigation sub-zone with very high susceptibility to flood.

## Land tenure issues

- The locations of retarding ponds and cut-of-works are not within CARP, CADT or any tenurial instruments

## Geology

- sedimentary deposition, unconsolidated to loosely deposits, alluvial sand and gravel

## Terrain

- Flat to undulating without critical slope

## Natural Hazard

- earthquakes, seismic and flood.

# Terrestrial Biology

## Terrestrial Flora

- There are 163 species in 73 families of terrestrial flora, of which sixteen species are endemic. The Shannon diversity index ranged from moderate to very high and the evenness is high to very high.
- Seven are included in the red list – 2 are endangered, 4 are vulnerable and 1 is categorized as threatened.

Plant Type	No. of Families	No. of Species
Trees	33	91
Grass/Shrubs/Herbs/Vines	28	62
Ferns/Pterophytes	8	7
Epiphytes/Mosses	3	3
Palms	1	6
Total	73	163



# Terrestrial Biology

## Terrestrial Fauna

- Volant Mammals : 4 species in 4 families, 1 is resident and 3 are endemic. 1 non-volant mammal. 1 species near threatened (IUCN)
- Avifauna: 18 species in 13 families. 3 are endemic, 15 are resident. Categorized as Least Concern (IUCN).
- Amphibian: 3 species. 1 is endemic and 2 resident. 1 species (Giant Philippine Frog) is threatened as IUCN endemicity category.



# Freshwater Biota

## Macroinvertebrates

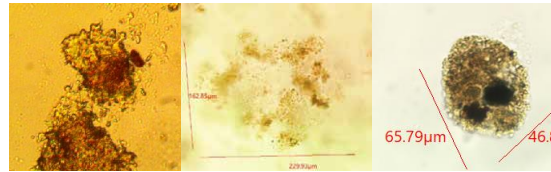
- 4 species in 4 families. Diversity is low



## Planktons

- 13 species of planktons under 2 groups.
  - Bacillariophyta
  - Cyanophyta
- Diversity is low

Macroinvertebrate : a. Unidentified mayfly species b. Rhagovelia philippina  
c. Limnogonus sp. d. Clinabarius sp. e. Calcinus sp.



Recorded Cyanophyta species from the four sampling stations along Davao River From right to left:  
Microcystis aeruginosa, M. wesenbergii, M. flos-aquae

# Water Quality

## Primary Parameters

Parameter	unit	Water body classification					
		Class B			Class A		
		Bucana	Ma-a	Waan	Limit*	Mandug	Limit*
Biochemical oxygen demand	mg/L	2	1	<1	5	<1	3
		2.9	1.5	1.5		1.5	
Chloride	mg/L	535	7.49	6.61	250	6.28	250
		1,047	8.0	7.8		7.4	
Dissolved oxygen	mg/L	7.4	8.1	8.5	NLT 5	8.1	NLT 5
		6.2	7.3	7.6		7.7	
Fecal coliform	MPN/100 mL	23	<1.8	<1.8	100	49	50
		426,853	28,793	16,340		15,635	
pH		7.2	7.6	7.6	6.5-8.5	7.8	6.5-8.5
		8.0	8.3	8.3		8.4	
Phosphate	mg/L	0.64	0.92	0.74	0.025	0.86	0.025
		0.80	1.68	1.29		1.33	
Temperature	°C	27.3	26.9	28.4	26-30	27.5	26-30
		28.4	27.9	28.1		28	
Total suspended solids	mg/L	70	221	84	65	211	50
		386	533	530		485	

# Water Quality

Secondary Parameters

Parameter	unit	Water body classification					
		Class B					Class A
		Bucana	Ma-a	Waan	Limit*	Mandug	Limit*
Arsenic	mg/L	0.006	0.005	0.005	0.01	0.007	0.01
		No data				No data	
Cadmium	mg/L	<0.003	<0.003	<0.003	0.003	<0.003	0.003
		0.006	0.004	0.004		0.003	
Chromium, hexavalent	mg/L	<0.010	<0.010	0.018	0.01	0.019	0.01
		No data				No data	
Lead	mg/L	<0.01	<0.01	<0.01	0.01	<0.01	0.01
		<0.01	<0.01	<0.01		<0.01	
Mercury	mg/L	<0.002	<0.002	<0.002	0.001	<0.002	0.002
		0.0011	0.0016	0.0016		0.0021	
Oil and grease	mg/L	<1	<1	<1	1	2	1
		No data				No data	

# Sediment Quality

Parameter	Mandug	Waan	Ma-a	Bucana	Canadian*	NOAA**
Arsenic (leachable) mg/g	0.122	0.143	0.238	0.285	5.9	8.2
Cadmium, mg/g	0.79	0.78	0.81	0.87	0.6	1.2
Chromium, mg/g	78.69	90.32	83.10	98.81	37.3	81
Lead, mg/g	9.94	8.47	9.68	10.56	35.0	8.0
Mercury, mg/g	0.02	0.02	<0.02	0.02	0.17	0.15
Sulfur, mg/g	41.51	29.23	74.80	376	-	-

# The Air

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## Climatology

- Type of Climate : Type IV climate category based on the Modified Coronas Classification.
- Rainfall : Annual average rainfall – 1977.19 mm. October is the Wettest and Month March the driest
- Temperature : Daytime temperature – 31 – 34 deg C; nighttime 22 deg C
- Climate Extremes: The seasonal average temperature change in mid-21st and late- 21st century would increase and the seasonal changes of precipitation during these periods would decrease


## Air Quality

- PM<sub>10</sub>, PM<sub>2.5</sub>, NOx, SOx and CO are below the guideline values

## Noise

- Noise level in three sampling stations exceeded the guideline values
- 
- 

# The People

- Most of the affected households are long-time residents of the area, with poor educational background, having large size of family, and living below the poverty line.
  - Majority of them owns the house they occupied and mostly lot owners. Top 3 main issues and problems of the affected communities are flooding, landslide, and unemployment.
  - Majority of the households in the direct and indirectly affected areas are aware of the proposed flood control project in Davao River.
  - The majority of them are also willing to accept the project mainly because they believed that it will address the flooding problem in the city.
  - On the other hand, few of them opposes the project as it may dislocate them and affect their properties.
  - As a whole, 9 out of 10 directly affected households are willing to support the project.
  - However, they are appealing that “just compensation” shall be given to them for the affected land, houses, and other assets
- 



# Impact Management Plan

Module/Environmental Aspect	Potential Impact	Mitigation/Enhancement Measures	Schedule of Monitoring
Land	Generation of dredged materials	<ul style="list-style-type: none"> <li>- Handling and disposal should be in accordance with DPWH DO 139-2014 and JMC 01-2019</li> <li>- Formulation of dredging master plan</li> <li>- Identify sufficient and suitable disposal site</li> </ul>	Monthly
	Generation of vegetative wastes	<ul style="list-style-type: none"> <li>- Re-use of vegetative wastes as compost and growing plant medium</li> </ul>	Monthly
	Generation of construction debris	<ul style="list-style-type: none"> <li>- Proper disposal of construction wastes and implement integrated SWMP (RA 9003)</li> </ul>	Monthly
	Generation of excavated materials	<ul style="list-style-type: none"> <li>- Identify sufficient and appropriate/suitable disposal site of excavated soil. The location, capacity, etc will be designed in the next stage, i.e. DED</li> </ul>	Monthly
	Change in land use	<ul style="list-style-type: none"> <li>- Implement appropriate land use zoning</li> </ul>	
	Soil erosion	<ul style="list-style-type: none"> <li>- Implement appropriate land use zoning</li> <li>- Proper engineering design of permanent facilities</li> <li>- Provide buffer zone</li> <li>- Conduct geotechnical study</li> </ul>	Annual
	Removal/loss of vegetation	<ul style="list-style-type: none"> <li>- Prioritize ecologically and economically important species in the conservation initiatives</li> <li>- Establish a nursery</li> <li>- Practice tree balling of endemic tree species and facilitate immediate transfer to open areas</li> </ul>	

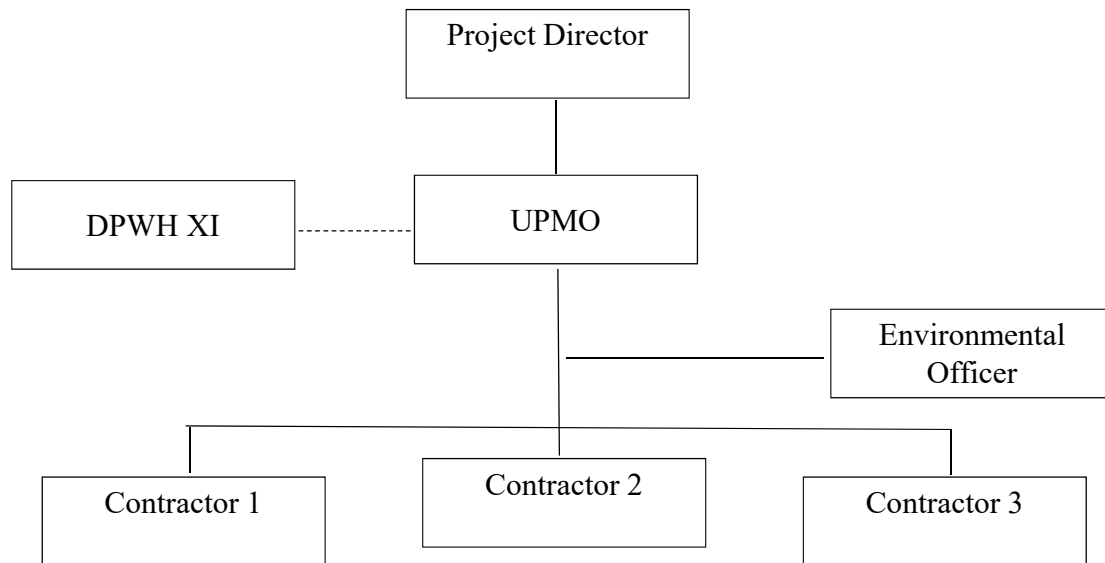
	Removal/loss of vegetation	<ul style="list-style-type: none"> <li>- Prioritize ecologically and economically important species in the conservation initiatives</li> <li>- Establish a nursery</li> <li>- Practice tree balling of endemic tree species and facilitate immediate transfer to open areas</li> </ul>	
	Destruction and fragmentation of habitat	<ul style="list-style-type: none"> <li>- Propagate endemic plant species</li> <li>- Establish buffer zone</li> </ul>	
	Disturbance/displacement of wildlife	<ul style="list-style-type: none"> <li>- Re-establish vegetation in the ponds during non-flood period in order to recolonize faunal species</li> </ul>	
Water Quality	Siltation of Davao River	<ul style="list-style-type: none"> <li>- Installation of silt curtains</li> </ul>	Quarterly
	Degradation of water quality	<ul style="list-style-type: none"> <li>- Provision of temporary sewerage system for workers</li> </ul>	Quarterly
Air Quality	Increase in the concentration of PM10, PM2.5, NO2, SO2 and CO	<ul style="list-style-type: none"> <li>- Use new model low emission vehicles</li> <li>- Regular watering of dust generating mounds</li> <li>- Install cover of hauling trucks</li> <li>- No overloading of hauling trucks</li> </ul>	Semi-annual
	Noise disturbance	<ul style="list-style-type: none"> <li>- Provision of mufflers</li> </ul>	Semi-annual
People	Displacement and loss of livelihood especially sand and gravel concessionaire	<ul style="list-style-type: none"> <li>- Develop and implement IEC to change the mind-set of affected communities toward the project</li> <li>- Involve the community in the design, formulation and resettlement action plan</li> <li>- Compensation of sand and gravel concessionaire will be based on the existing government guidelines</li> </ul>	
	Fear of non-employment due to possibility of hiring of non-local laborers	<ul style="list-style-type: none"> <li>- Hiring of locally qualified labor</li> <li>- Implement DO 130-2016</li> <li>- Close coordination with the CLGU and BLGU</li> </ul>	Semi-annual

	Fear of non-employment due to possibility of hiring of non-local laborers	<ul style="list-style-type: none"> <li>- Hiring of locally qualified labor</li> <li>- Implement DO 130-2016</li> <li>- Close coordination with the CLGU and BLGU</li> </ul>	Semi-annual
	Health and Safety – accident, spread of COVID-19	<ul style="list-style-type: none"> <li>- Provide safety measures and appropriate PPE to workers</li> <li>- Observe Health Protocol</li> <li>- Self-isolate if not feeling well</li> <li>- Observe cleanliness</li> <li>- Implementation of a health &amp; safety program</li> <li>- Establishment of buffer zones</li> <li>- Tree planting in open areas</li> <li>- Regular maintenance of hauling trucks and heavy equipment</li> <li>- No overloading of vehicles</li> <li>- Regular maintenance of roads, e.g. re-graveling, pothole patching, scraping of droppings</li> </ul>	
	Traffic Congestion	<ul style="list-style-type: none"> <li>- Reroute access</li> <li>- Putting up of traffic warning signs</li> <li>- Establishment of construction buffer and containment barriers</li> <li>- Proper scheduling of hauler trucks in reference of the truck ban schedule</li> <li>- Provision of sufficient sidewalks and access routes</li> <li>- Coordinate with CTMO and BLGUs</li> <li>- Conduct road safety campaign</li> <li>- Provision of road safety equipment</li> </ul>	

Issues raised during Public Scoping	Efficacy of the retarding ponds	- Detailed engineering design	
	Flooding of Barangay Ma-a	- Not possible	
	Sudden flush of water to Ma-a	- Detailed engineering design	
	Old river bed should not be used as relocation sites	- RAP will consider this	
	Raise awareness of stakeholder	- IEC and series of public consultation will be done before project implementation	
Displacement of quarry concessionaire	- Alternative livelihood will be considered in the RAP - Compensation in accordance to the government guidelines		

---

# Institutional Arrangement



Organizational Structure

## Duties and Responsibilities

### UPMO-DPWH

- Provide general direction and supervision for the successful completion of the project.
- Set guidelines for the project implementation
- Set sanctions and penalty for the contractors for any violations of the contract.
- Ensure that the environmental management measures and programs are effectively implemented


### DPWH XI

- Coordinate with UPMO in the implementation of the project.
- Assist the environmental officer in the implementation of environmental measures for the adverse impacts.
- Assist the environmental officers in the implementation of the environmental enhancement plan.
- Assist the UPMO in the coordination with the CLGU and BLGU.

# Duties and Responsibilities

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## Environmental Officer

- Monitoring and police compliance of contractors on their implementation of the provisions of ECC;
  - Monitoring and evaluation of the effectiveness of the mitigating and enhancement measures;
  - Planning and implementing modifications or additional measures needed to effectively protect the environment;
  - Submit quarterly compliance report to EMB;
  - Coordinating with concerned oversight agencies and other entities and organization including the local government units to ensure active participation in the implementation of ECC; and
  - Ensure compliance to ECC conditions and reporting requirements of the DENR-EMB.
- 
- 

# Duties and Responsibilities

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## Contractor

- Implement the environmental programs, mitigating and enhancement measures as stipulated in the contract.
  - Cooperate with the environmental officer, CLGU, BLGU.
  - Report to the environmental officers any accident in the work place.
  - Undertake measures in dealing with accidents.
  - Ensure compliance to ECC and contract.
- 

**End of presentation**

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**DAGHANG  
SALAMAT!**



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Annex 8

Supplementary Document on Economic  
Analysis and Economic Evaluation

## Chapter 1 Introduction

### 1.1 Purpose of Economic Analysis of Flood Control Project

Various benefits or stock effects are generated by flood control projects. They include the reduction of direct and indirect damages to human lives, properties, infrastructures and other assets, and benefits such as the increase of income caused by higher productivity of agricultural land, promotion of economic activities in land converted to build-up areas after the implementation of flood control projects.

The purpose of economic analysis of flood control projects is to assess the economic benefits or economic effectiveness of the proposed projects.

**Table 1.1.1 Stock effects generated by flood control projects**

		Category		Outline of the reduced damage (effects)	
Damage prevention effects (Reduction of damage generated by the implementation of flood control measures)	Direct damage	Effects to reduce damage to properties	Damage to general assets	Residential buildings and businesses	Damage to residential buildings and business establishments
				Residential properties	Damage to furniture and cars
			Depreciable assets of business establishments	Damage to depreciable properties excluding land and buildings, out of fixed properties at business establishments	
			Inventory assets of business establishments	Damage to inventory assets at business establishments	
			Depreciable assets of agriculture and fishery households	Damage to depreciable properties excluding land and buildings, out of fixed properties of agriculture and fishery households	
			Inventory assets of agriculture and fishery households	Damage to inventory assets of agriculture and fishery households	
			Damage to agricultural products	Damage to agricultural products	
	Damage to large-scale public works	Damage to large-scale public work facilities, public service offices, farmland and agricultural facilities			
	Effect to prevent damage to human				Loss of lives
	Indirect damage	Effect to prevent damage to normal activities	Damage due to disrupted activities	Household economy	Damage caused by disrupted house works and leisure activities in normal times by a disaster at inundated houses.
				Business establishments	Damage caused by interrupted and/or terminated productions at flooded manufacturing activities due to disasters (reduced production level)
				Public and public interest services	Damage caused by interrupted and/or terminated public or public interest services due to a disaster event
		Effect to prevent aftermath damage	Emergency response costs	Household economy	Damage or additional cost caused due to ex-post disaster activities such as cleaning-up disaster wastes and additional payments (such as procurement of safe drinking water, medicines etc.)
				Business establishments	
				Public and public interest services	In addition to the same damage as household and businesses, include the interest rates of ex-post disaster emergency loans and disaster relief fund.
		Damage due to traffic disruption	Road, railway, airport and harbor		Ripple-off damage spread around affected areas and neighborhood due to traffic disruption including road, railway and etc.
		Damage due to suspension of lifeline	Electricity, water, gas, communications		Ripple-off damage spread around affected areas and neighborhood caused by suspension of lifeline services including electricity, gas, water and communications etc.
Damage due to disrupted activities of business establishments			Ripple-off damage spread around affected areas and neighborhood due to reduced production levels at nearby manufacturing factories because of short supply of half finished products as well as termination of services by public and public interest institutions		
Effect to prevent psychological damage	Damage accompanying business interruption		Psychological stress due to damage to properties		
	Damage accompanying interrupted normal activities		Psychological stress due to damage to normal activities		
	Damage accompanying damage to human bodies		Psychological stress due to damage to human bodies		
	Damage accompanying aftermath damage		Psychological stress due to ex-post cleaning works		
Damage accompanying ripple-off damage		Psychological stress due to ripple-off damage			
Risk Premium			Psychological stress due to anxiety about affecting again		
Intensification benefits			Land price hike due improvements of flood control reliabilities		

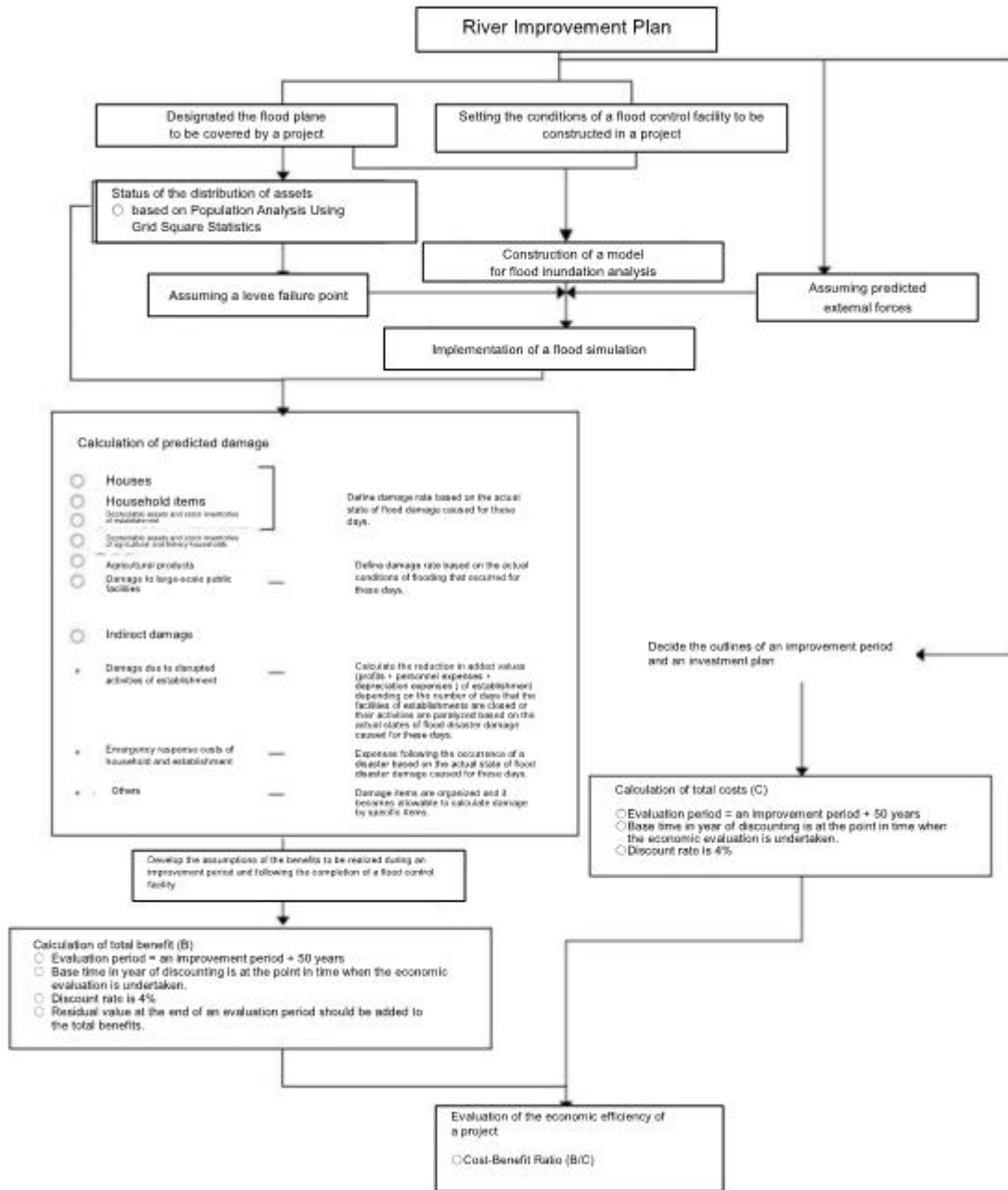
Source: Ministry of Land, Infrastructure, Transport and Tourism of Japan (Draft as of April 2020), Manual for Economic Evaluation of Flood Control Investment



1.2 Methodology

The economic evaluation of the master plan and feasibility study of this project is conducted based on the procedure given by the Manual for Economic Evaluation of Flood Control Investment of the Ministry of Land, Infrastructure, Transport and Tourism of Japan (Draft as of April 2020).

The following figure shows the entire flow to conduct economic analysis.



Source: Ministry of Land, Infrastructure, Transport and Tourism of Japan (Draft as of April 2020), Manual for Economic Evaluation of Flood Control Investment, Figure 1.2 Procedure of an economic evaluation of a flood control investment

Figure 1.2.1 Procedure to conduct economic analysis

### **1.3 Contents of the supporting report**

The main report in details the contents of the Master Plans for the rivers of Davao, Talomo and Matina, drainage system and coastal measures in Chapter 3 and the Feasibility Study in Chapter 4. In addition, the results of the calculation of total costs are explained in the Sessions 3.11 and 4.4, and the results of the calculation of total benefits and economic evaluation in the Sessions 3.12 and 4.5 of the main report.

This supporting report focus on the data used to compute the benefits and supplementary explanations on the assumptions to conduct the economic evaluation.

Concretely, the Chapter 2 of this supporting report gives the details on the assets considered in this Study to compute the benefits, and Chapter 3 provides additional information on how the economic evaluation was conducted.

## Chapter 2 Assets Survey

### 2.1 General

#### 2.1.1 Benefits considered in this the economic evaluation of this project

As explained in the introduction, the benefits generated by the implementation of flood control, drainage and coastal measures are various. In addition, they include indirect benefits such as earlier recovery of economic activities and reduction of psychological stress which are difficult to quantify and convert into economic value.

The benefits considered in the Project for Master Plan and Feasibility Study on Flood Control and Drainage in Davao City are the following.

#### (1) Direct benefits

##### General assets and agriculture

- Reduction of damage to residential buildings and properties,
- Reduction of damage to businesses,
- Reduction of damage to agricultural sector (facilities and production)

##### Infrastructure

- Reduction of damage to infrastructures was computed by multiplying 0.3 to the damage to general assets and agriculture based on the review of past disaster records.

#### (2) Indirect benefits

- Indirect benefits were computed by multiplying 0.3 to direct benefits based on the review of the Post-Disaster Needs Assessment report of Typhoon Odette which hit the Province of Bohol in December 2021.

#### 2.1.2 Documents and basic data reviewed to conduct the economic evaluation

The Comprehensive Land-Use Plan (CLUP) and Ordinance No. 0257-17, Series of 2017, which is the “Ordinance approving the schedule of market values of all lands and base unit construction as basis in the 2018 general revision of real property assessment in Davao City and to take effect beginning calendar year 2019” were reviewed to investigate the assets in Davao City.

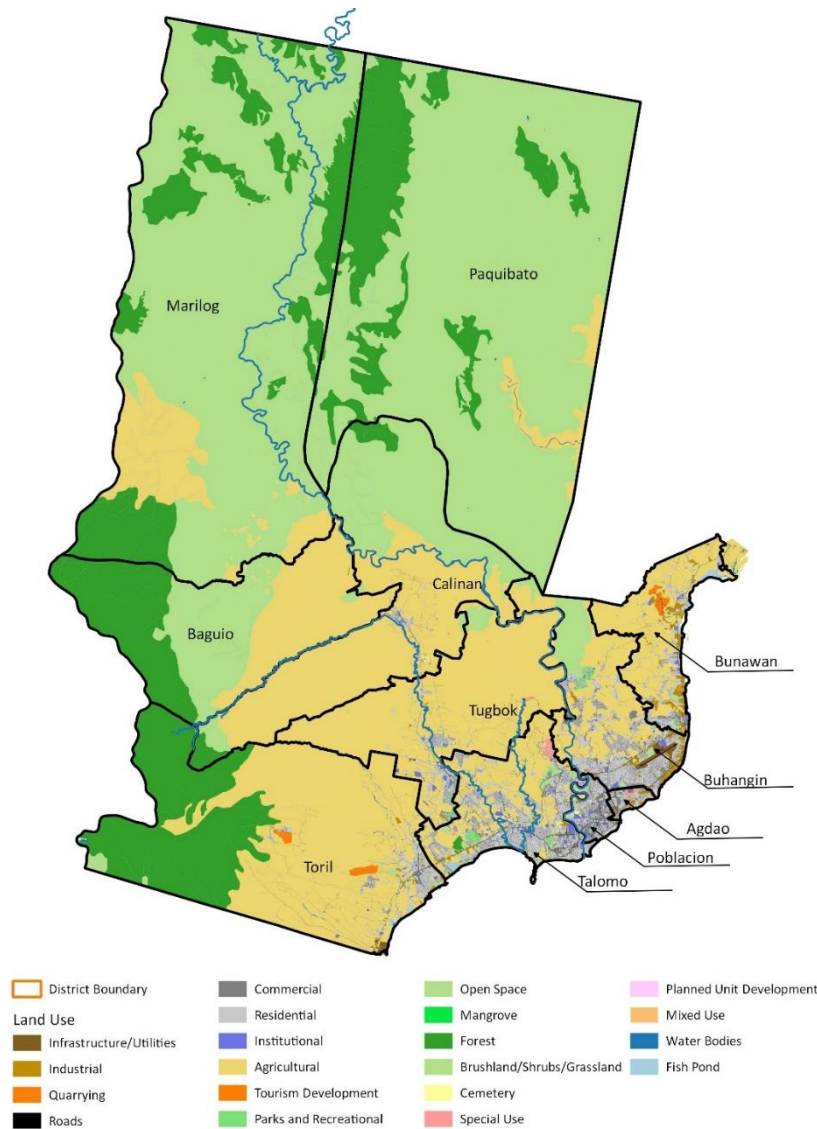
In addition, the following documents were reviewed to calibrate the unit price of each assets.

- Past disaster records to general assets, infrastructures, agricultural sector and others, provided by the Regional and District Engineer Offices of DPWH, Office of Civil Defense, City of Davao (City Disaster Risk Reduction and Management Office, City of Agricultural Office, City Engineering Office),
- General Profile of Davao City and Socio-Economic Indicators provided by the City Planning and Development Office,
- Statistic Data published on the Website of the Philippine Statistic Authority (Population Census, Annual Survey of Philippine Business and Industry).

## 2.2 Aggregation of the assets data

### 2.2.1 Land coverage and buildings distribution

To aggregate the data on land coverage and buildings, the actual land use shown in the Comprehensive Land-Use Plan (2019-2028) and the building footprint data prepared during the “Davao City Infrastructure Development Plan and Capacity Building Project (JICA, 2018)” were analyzed. The details per district are shown in Section 2.2.2.



Source: Project Team by using the data of the City Planning and Development Office (CPDO)

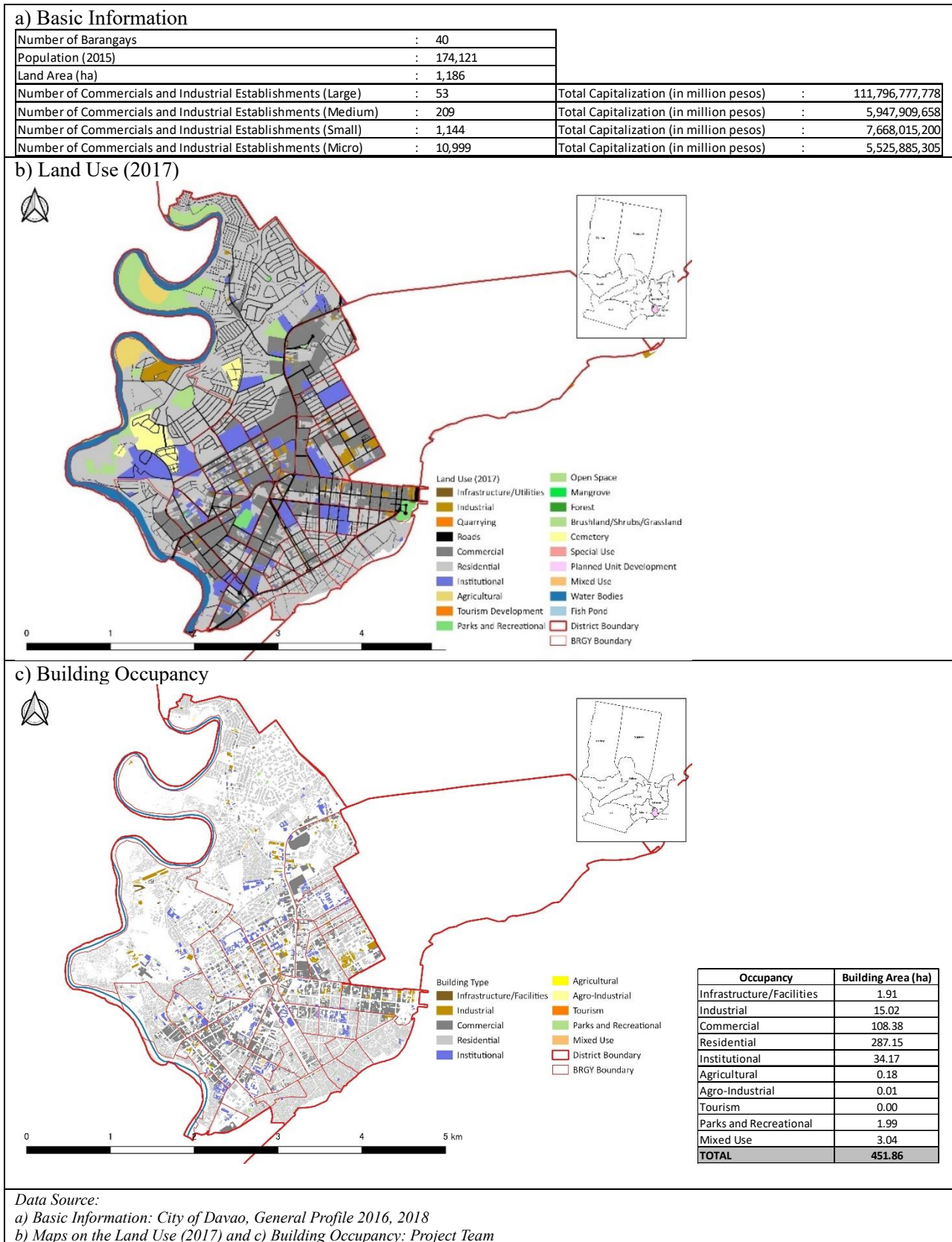
**Figure 2.2.1 Actual Land Use (2017) of the entire City**

### 2.2.2 Summary of the socio-economic aspect of each district

The City of Davao is composed of 3 legislative districts. The first include the districts of (1) Poblacion and (2) Talomo, the second (3) Agdao, (4) Buhangin, (5) Bunawan and (6) Paquibato, and the third (7) Baguio, (8) Calinan, (9) Marilog, (10) Toril, and (11) Tugbok.

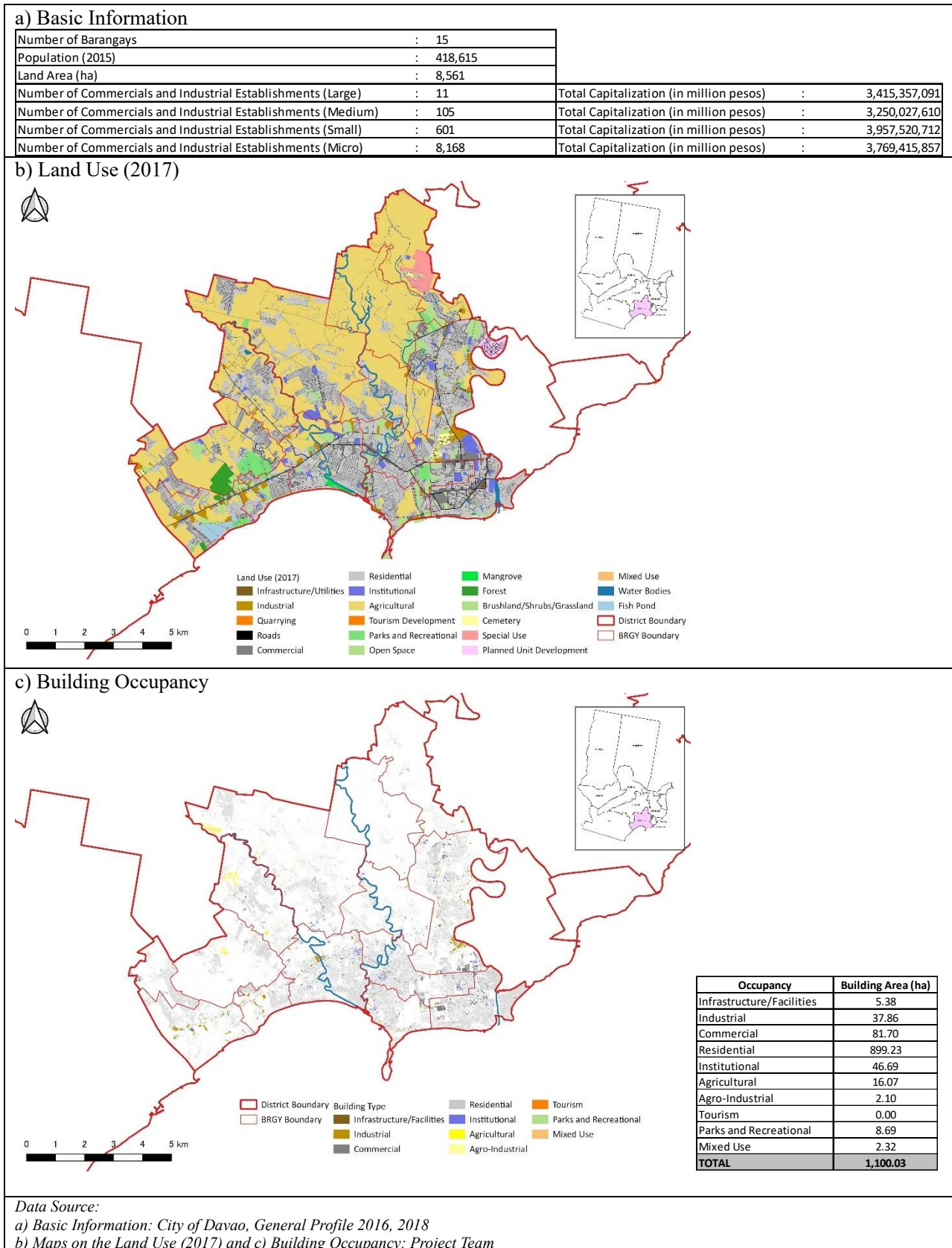
(1) Poblacion District

**Table 2.2.1 Socio-Economic Profile of Poblacion District**



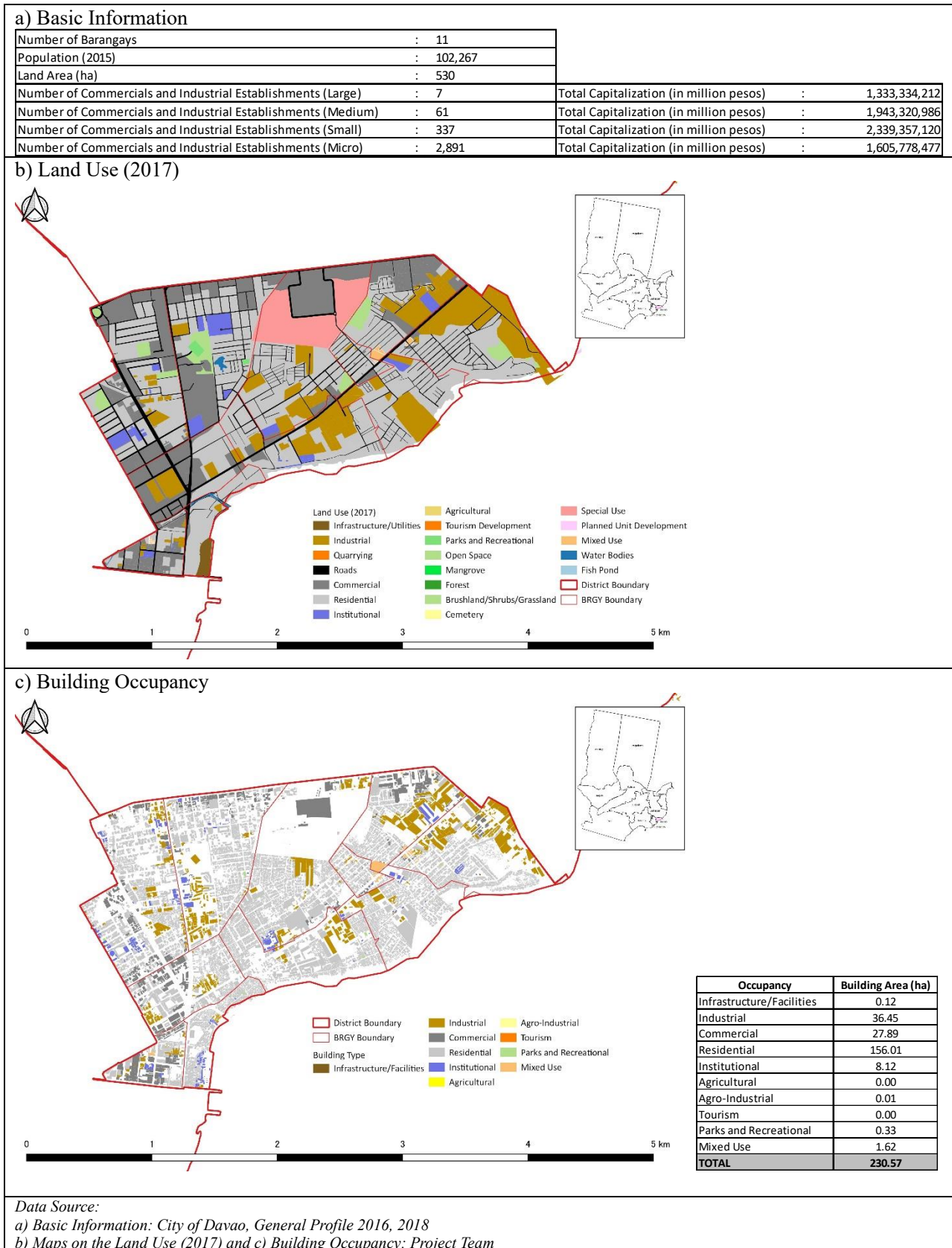
(2) Talomo District

**Table 2.2.2 Socio-Economic Profile of Talomo District**



**(3) Agdao District**

**Table 2.2.3 Socio-Economic Profile of Agdao District**



**(4) Buhangin District**

**Table 2.2.4 Socio-Economic Profile of Buhangin District**

a) Basic Information			
Number of Barangays	:	13	
Population (2015)	:	293,118	
Land Area (ha)	:	9,323	
Number of Commercials and Industrial Establishments (Large)	:	19	Total Capitalization (in million pesos) : 74,027,999,665
Number of Commercials and Industrial Establishments (Medium)	:	108	Total Capitalization (in million pesos) : 3,344,918,776
Number of Commercials and Industrial Establishments (Small)	:	501	Total Capitalization (in million pesos) : 3,574,348,036
Number of Commercials and Industrial Establishments (Micro)	:	5,788	Total Capitalization (in million pesos) : 2,626,875,935

b) Land Use (2017)		c) Building Occupancy																									
<p>Land Use (2017)</p> <ul style="list-style-type: none"> <li>Residential</li> <li>Infrastructure/Utilities</li> <li>Industrial</li> <li>Quarrying</li> <li>Roads</li> <li>Commercial</li> <li>Mangrove</li> <li>Forest</li> <li>Brushland/Shrubs/Grassland</li> <li>Cemetery</li> <li>Parks and Recreational</li> <li>Open Space</li> <li>Mixed Use</li> <li>Water Bodies</li> <li>Fish Pond</li> <li>Planned Unit Development</li> </ul>		<p>Building Type</p> <ul style="list-style-type: none"> <li>Commercial</li> <li>Residential</li> <li>Institutional</li> <li>Commercial</li> <li>Residential</li> <li>Institutional</li> <li>Agricultural</li> <li>Agro-Industrial</li> <li>Tourism</li> <li>Parks and Recreational</li> <li>Mixed Use</li> <li>District Boundary</li> <li>BRGY Boundary</li> </ul>																									
<p>0 1 2 3 4 5 km</p>		<p>0 1 2 3 4 5 km</p>																									
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*Data Source:*  
a) Basic Information: City of Davao, General Profile 2016, 2018  
b) Maps on the Land Use (2017) and c) Building Occupancy: Project Team



(5) Bunawan District

**Table 2.2.5 Socio-Economic Profile of Bunawan District**

a) Basic Information			
Number of Barangays	:	9	
Population (2015)	:	152,102	
Land Area (ha)	:	6,391	
Number of Commercials and Industrial Establishments (Large)	:	8	Total Capitalization (in million pesos) : 12,511,278,049
Number of Commercials and Industrial Establishments (Medium)	:	37	Total Capitalization (in million pesos) : 1,471,135,074
Number of Commercials and Industrial Establishments (Small)	:	195	Total Capitalization (in million pesos) : 1,571,246,195
Number of Commercials and Industrial Establishments (Micro)	:	1,385	Total Capitalization (in million pesos) : 627,132,194

b) Land Use (2017)		c) Building Occupancy																									
<p>0 1 2 3 4 5 km</p> <p>Land Use (2017)</p> <ul style="list-style-type: none"> <li>Infrastructure/Utilities</li> <li>Industrial</li> <li>Quarrying</li> <li>Roads</li> <li>Commercial</li> <li>Residential</li> <li>Institutional</li> <li>Agricultural</li> <li>Tourism Development</li> <li>Parks and Recreational</li> <li>Open Space</li> <li>Mangrove</li> <li>Forest</li> <li>Brushland/Shrubs/Grassland</li> <li>Cemetery</li> <li>Special Use</li> <li>Planned Unit Development</li> <li>Mixed Use</li> <li>Water Bodies</li> <li>Fish Pond</li> <li>District Boundary</li> <li>BRGY Boundary</li> </ul>		<p>0 1 2 3 4 5 km</p> <p>Building Type</p> <ul style="list-style-type: none"> <li>Infrastructure/Facilities</li> <li>Industrial</li> <li>Commercial</li> <li>Residential</li> <li>Institutional</li> <li>Agricultural</li> <li>Agro-Industrial</li> <li>Tourism</li> <li>Parks and Recreational</li> <li>Mixed Use</li> <li>District Boundary</li> <li>BRGY Boundary</li> </ul>																									
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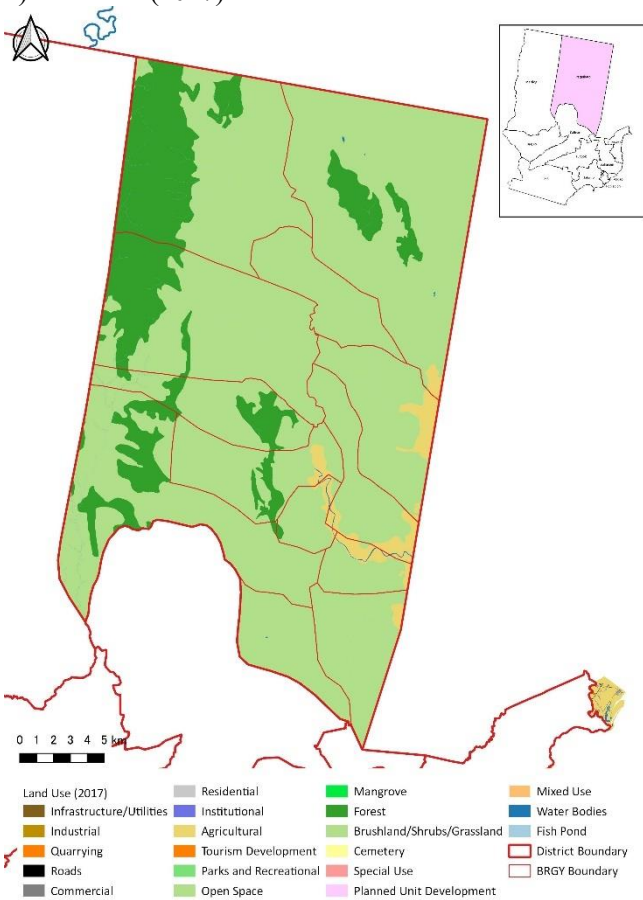
Data Source:  
a) Basic Information: City of Davao, General Profile 2016, 2018  
b) Maps on the Land Use (2017) and c) Building Occupancy: Project Team

**(6) Paquibato District**

**Table 2.2.6 Socio-Economic Profile of Paquibato District**

a) Basic Information			
Number of Barangays	:	13	
Population (2015)	:	44,763	
Land Area (ha)	:	65,339	
Number of Commercials and Industrial Establishments (Large)	:	-	Total Capitalization (in million pesos) : -
Number of Commercials and Industrial Establishments (Medium)	:	-	Total Capitalization (in million pesos) : -
Number of Commercials and Industrial Establishments (Small)	:	-	Total Capitalization (in million pesos) : -
Number of Commercials and Industrial Establishments (Micro)	:	157	Total Capitalization (in million pesos) : 11,968,428

b) Land Use (2017)	c) Building Occupancy
 <p><i>(Map description: The map shows the land use of Paquibato District in 2017. The legend includes categories such as Residential (grey), Institutional (blue), Agricultural (green), Tourism Development (orange), Parks and Recreational (light green), Open Space (light green), Mangrove (dark green), Forest (green), Brushland/Shrubs/Grassland (light green), Cemetery (yellow), Special Use (pink), Planned Unit Development (light pink), Mixed Use (orange), Water Bodies (blue), Fish Pond (light blue), and District Boundary (red line). A scale bar indicates 0 to 5 km. An inset map shows the district's location within Davao City.</i></p>	<p>Not Available</p>

*Data Source:*  
a) Basic Information: City of Davao, General Profile 2016, 2018  
b) Maps on the Land Use (2017) and c) Building Occupancy: Project Team

(7) Baguio District

**Table 2.2.7 Socio-Economic Profile of Baguio District**

a) Basic Information			
Number of Barangays	:	8	
Population (2015)	:	33,873	
Land Area (ha)	:	8,062	
Number of Commercials and Industrial Establishments (Large)	:	-	Total Capitalization (in million pesos) : -
Number of Commercials and Industrial Establishments (Medium)	:	4	Total Capitalization (in million pesos) : 219,002,155
Number of Commercials and Industrial Establishments (Small)	:	6	Total Capitalization (in million pesos) : 32,050,000
Number of Commercials and Industrial Establishments (Micro)	:	205	Total Capitalization (in million pesos) : 45,959,880

b) Land Use (2017)	
<p>Land Use (2017)</p> <ul style="list-style-type: none"> <li>Infrastructure/Utilities</li> <li>Industrial</li> <li>Quarrying</li> <li>Roads</li> <li>Commercial</li> <li>Residential</li> <li>Institutional</li> <li>Agricultural</li> <li>Tourism Development</li> <li>Parks and Recreational</li> </ul>	<ul style="list-style-type: none"> <li>Open Space</li> <li>Mangrove</li> <li>Forest</li> <li>Brushland/Shrubs/Grassland</li> <li>Cemetery</li> <li>Special Use</li> <li>Planned Unit Development</li> <li>Mixed Use</li> <li>Water Bodies</li> <li>Fish Pond</li> <li>District Boundary</li> <li>BRGY Boundary</li> </ul>

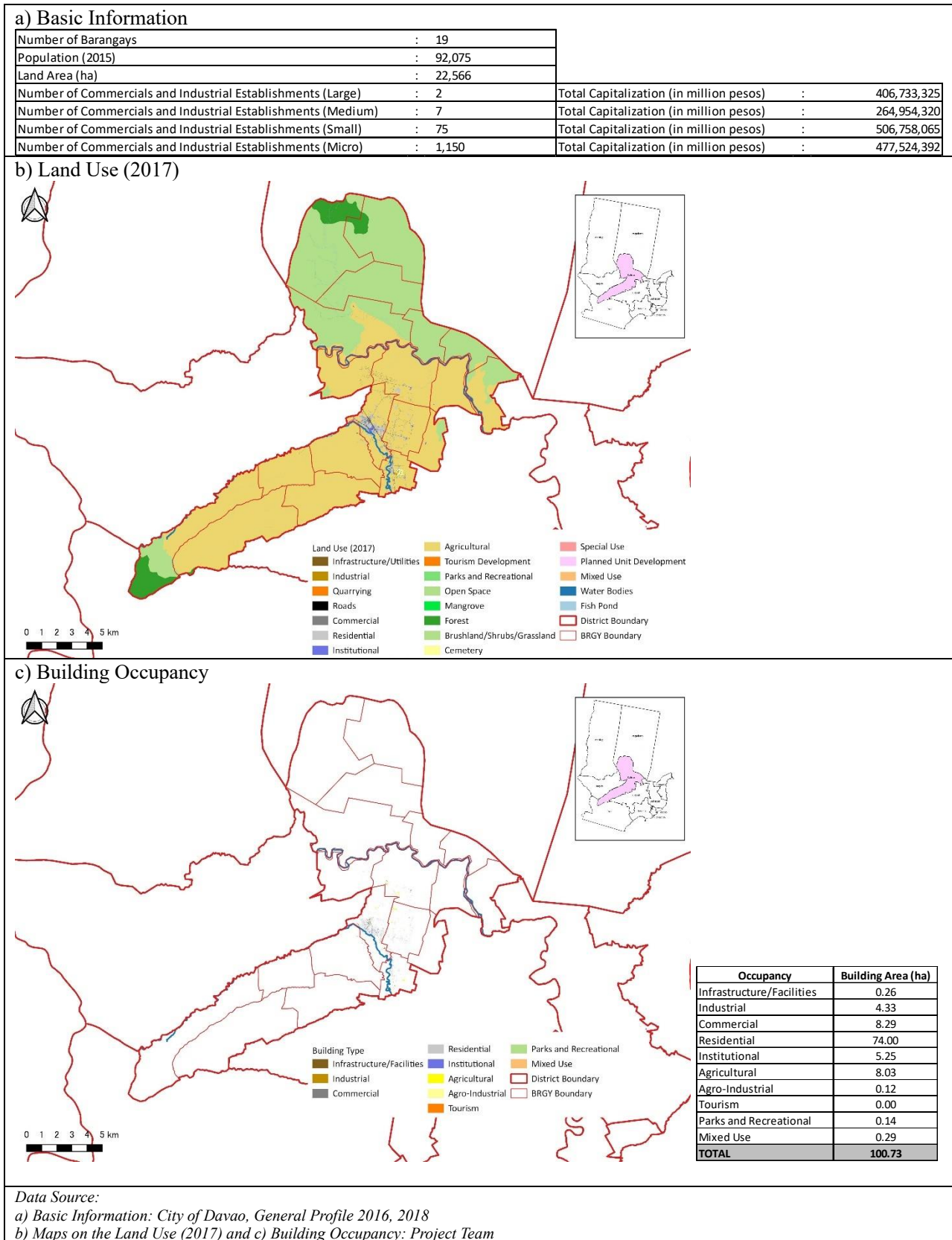
c) Building Occupancy	
Not Available	

*Data Source:*  
a) Basic Information: City of Davao, General Profile 2016, 2018  
b) Maps on the Land Use (2017) and c) Building Occupancy: Project Team

**(8) Calinan District**

**Table 2.2.8 Socio-Economic Profile of Calinan District**



**(9) Marilog District**

**Table 2.2.9 Socio-Economic Profile of Marilog District**

a) Basic Information			
Number of Barangays	:	12	
Population (2015)	:	52,201	
Land Area (ha)	:	62,886	
Number of Commercials and Industrial Establishments (Large)	:	-	Total Capitalization (in million pesos) : -
Number of Commercials and Industrial Establishments (Medium)	:	1	Total Capitalization (in million pesos) : 30,850,000
Number of Commercials and Industrial Establishments (Small)	:	2	Total Capitalization (in million pesos) : 25,500,000
Number of Commercials and Industrial Establishments (Micro)	:	207	Total Capitalization (in million pesos) : 38,753,912

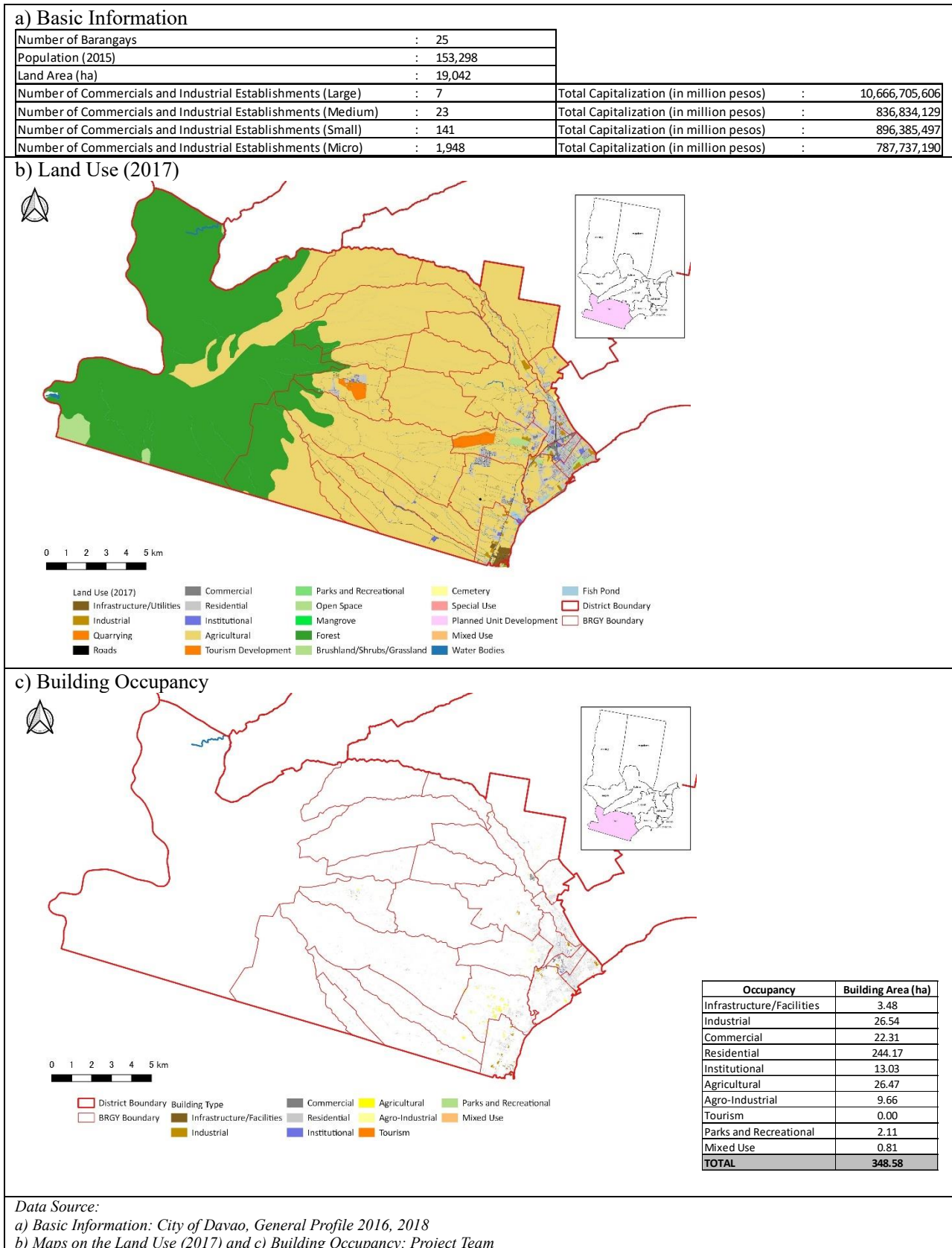
  

b) Land Use (2017)	c) Building Occupancy
<p>Land Use (2017) Legend:</p> <ul style="list-style-type: none"> <li>Residential</li> <li>Infrastructure/Utilities</li> <li>Industrial</li> <li>Quarrying</li> <li>Roads</li> <li>Commercial</li> <li>Institutional</li> <li>Agricultural</li> <li>Tourism Development</li> <li>Parks and Recreational</li> <li>Open Space</li> <li>Mangrove</li> <li>Forest</li> <li>Brushland/Shrubs/Grassland</li> <li>Cemetery</li> <li>Special Use</li> <li>Planned Unit Development</li> <li>Mixed Use</li> <li>Water Bodies</li> <li>Fish Pond</li> <li>District Boundary</li> <li>BRGY Boundary</li> </ul>	Not Available

*Data Source:*  
a) Basic Information: City of Davao, General Profile 2016, 2018  
b) Maps on the Land Use (2017) and c) Building Occupancy: Project Team

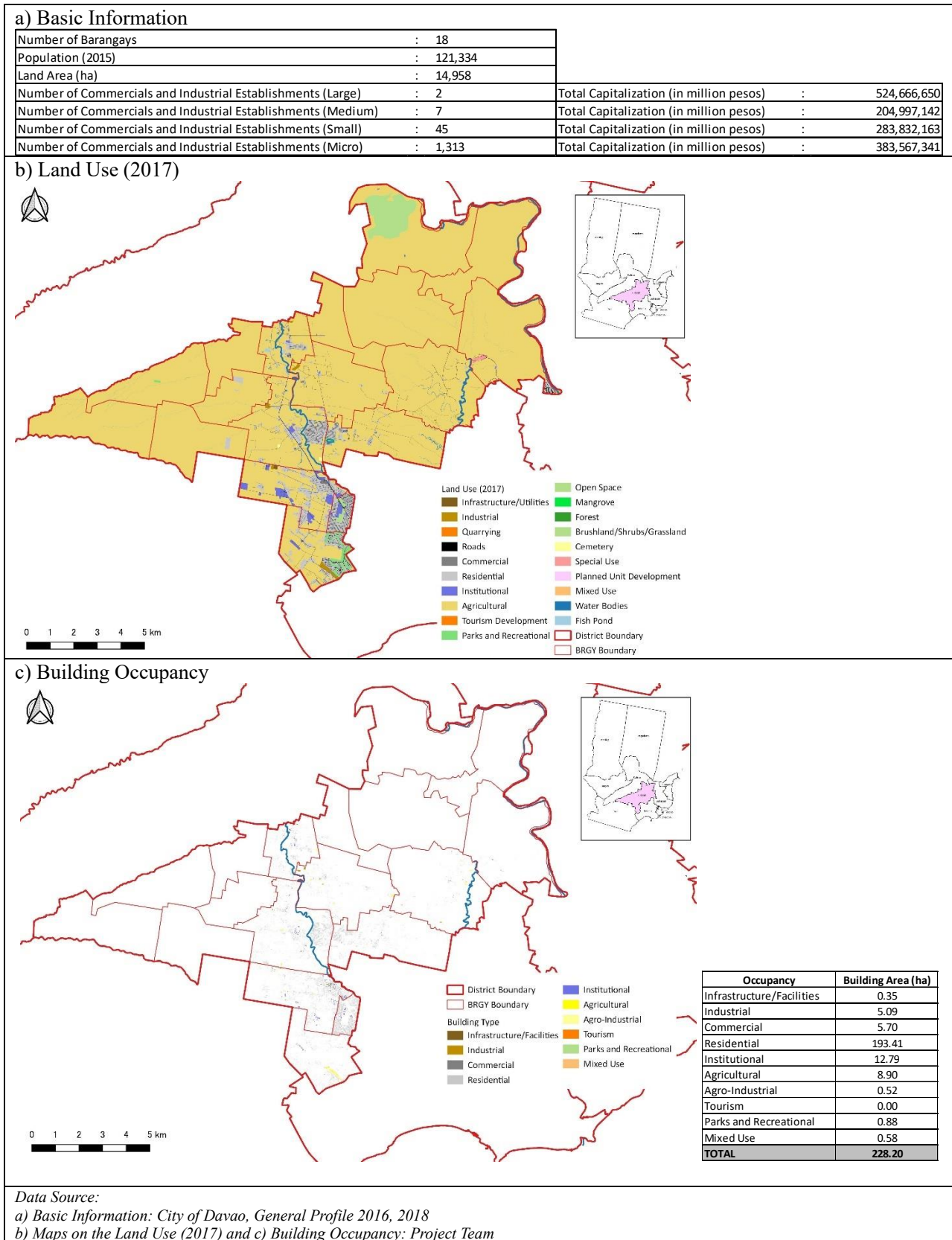
(10) Toril District

**Table 2.2.10 Socio-Economic Profile of Toril District**



**(11) Tugbok District**

**Table 2.2.11 Socio-Economic Profile of Tugbok District**



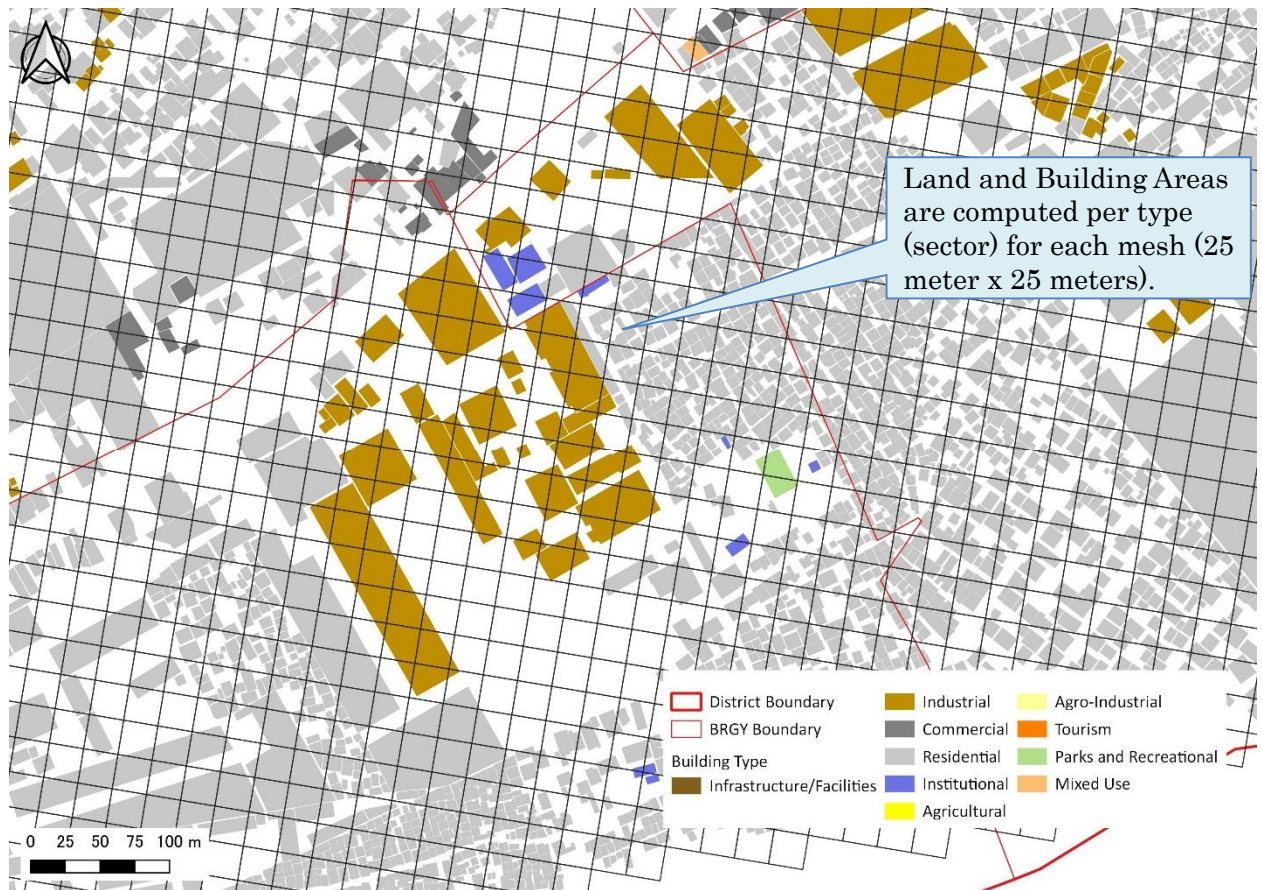
### 2.3 Compute the value of exposed properties

#### 2.3.1 Property Survey

By using the data shown in the Section 2.2, the building area and land area per mesh (25 meters x 25 meters) was computed.

The properties considered to conduct the benefits computation of this study are as follows:

- ✓ Residential buildings;
- ✓ Commercial buildings;
- ✓ Institutional buildings;
- ✓ Industrial buildings;
- ✓ Agricultural/livestock/fisheries buildings;
- ✓ Mixed use buildings; and
- ✓ Agricultural land.



Source: Project Team

**Figure 2.3.1 Image on the computation of the buildings and land areas**



### 2.3.2 Appraisal of the value within the target area

#### (1) Set the appraised value (or unit price of the property) to evaluate the M/P

Table 2.3.1 shows the appraised value of each property per square meter used to compute the assets in the target area for the Master Plan (M/P) for flood control projects (Davao River, Matina River and Talomo River), drainage projects (9 drainage areas) and coastal inundation projects (14 areas). The appraised value was set by reflecting the average floor area and purpose of each building type.

**Table 2.3.1 Appraised Value of each property (M/P)**

		Appraised value of each building type and agricultural land	Appraised value of other assets(*)	Note
1.	Residential buildings	7,560 PhP/m <sup>2</sup>	1,500 PhP/m <sup>2</sup>	Since the average floor area of the residential buildings located in the inundation area is around 70 square meters, the base unit cost of “single detached” houses is reflected.
2.	Commercial buildings	16,000 PhP/m <sup>2</sup>	12,500 PhP/m <sup>2</sup>	Although some shopping malls are located in the inundation area, since the majority of the commercial buildings has an area lesser than 300 square meters, the unit price of “Restaurant, Canteen” is reflected
3.	Institutional buildings	24,490 PhP/m <sup>2</sup>	18,500 PhP/m <sup>2</sup>	The unit price of “schools, churches” is reflected.
4.	Infrastructures/ public facilities	25,860 PhP/m <sup>2</sup>	- PhP/m <sup>2</sup>	The unit price of “Hospital” is reflected (The appraised value is included in the building value).
5.	Industrial buildings	13,060 PhP/m <sup>2</sup>	12,000 PhP/m <sup>2</sup>	The unit price of “Factories, Industrial Building” is reflected.
6.	Agricultural / livestock / fisheries buildings	6,430 PhP/m <sup>2</sup>	- PhP/m <sup>2</sup>	The unit price of “Green Houses” is reflected (The appraised value was included in the building value).
7.	Mixed use buildings	16,470 PhP/m <sup>2</sup>	10,900 PhP/m <sup>2</sup>	The average of the appraised values of “1. Residential Buildings”, “2. Commercial Buildings” and “3. Institutional Buildings” was set.
8.	Agricultural land	100 PhP/m <sup>2</sup>	- PhP/m <sup>2</sup>	The unit value of agricultural land was set by reflecting the annual production per square meter of banana which is the major crop in the inundation area and by taking into account the price of agricultural products in the Philippines.

Source: Davao City Ordinance No.0257-17, Series of 2017

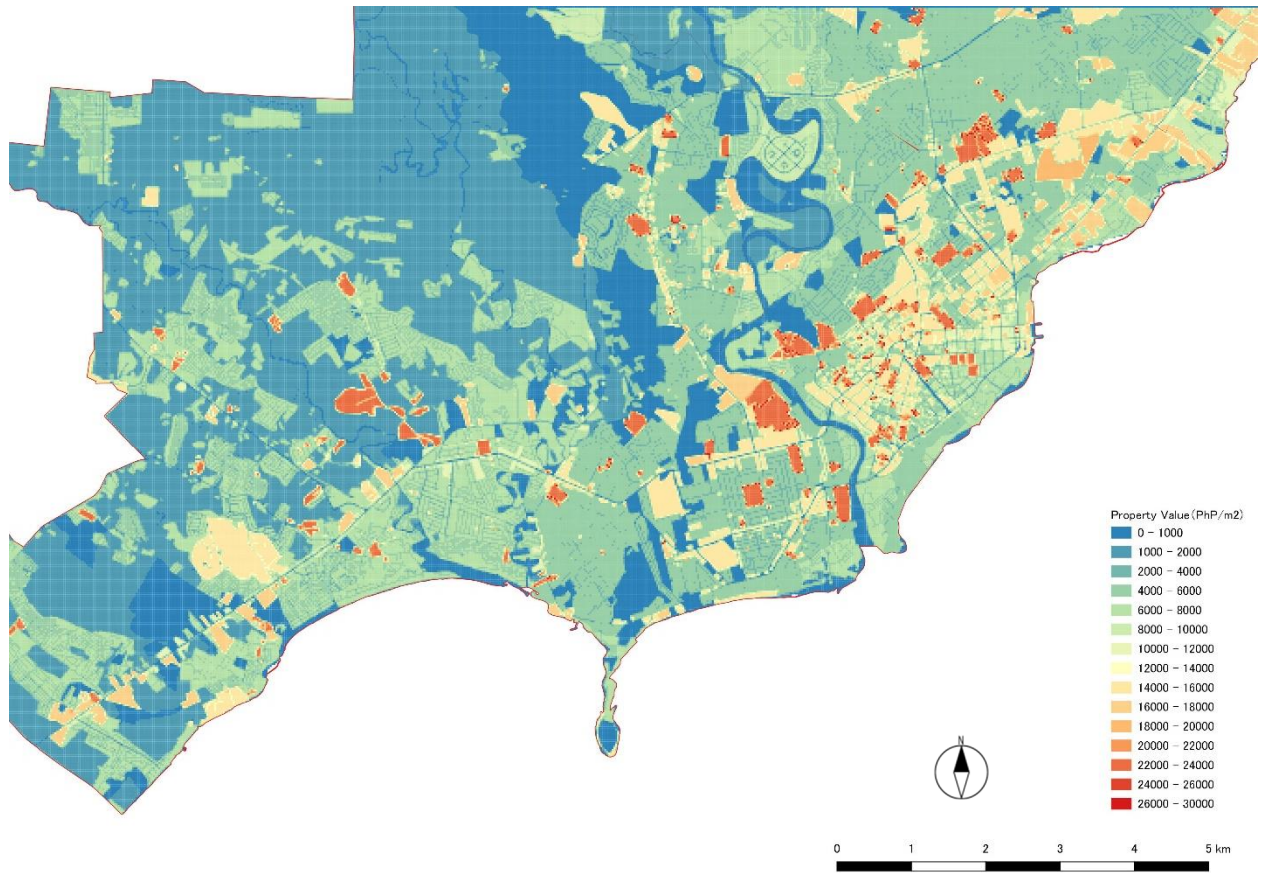
\*Note:

1) An “average” value for the entire target area was set.

2) Appraised value of other assets (such as depreciable assets and inventory assets of households, businesses) were set by referring the “Preparatory Survey for Flood Risk Management Project for Cagayan de Oro River (JICA, 2013)”.

**(2) Computation of the property value per calculation mesh to evaluate the M/P**

The property value per calculation mesh (25 meters x 25 meters) of each inundation simulation model is computed based on the data collected and gathered in 2.3.1. and by using the unit price set in 2.3.2 (a).



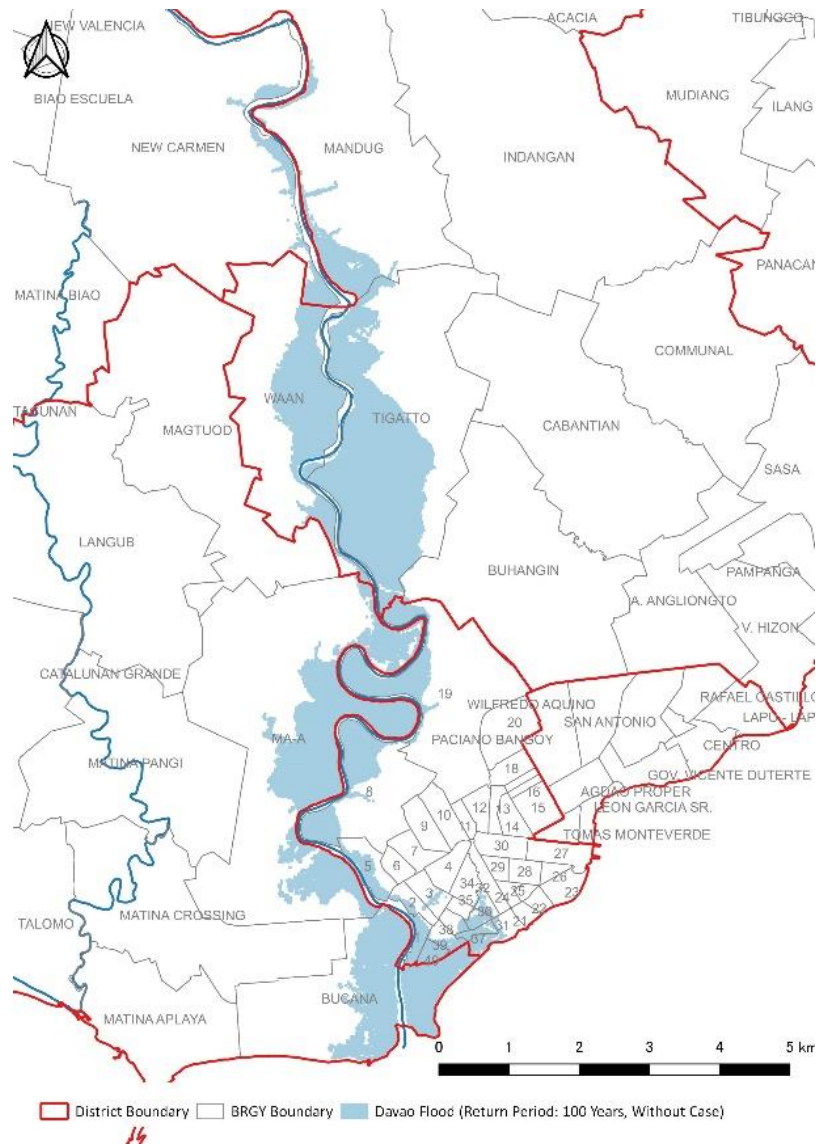
Source: Project Team

**Figure 2.3.2 Property Value per mesh (Land Use as of 2017)**

**(3) Set the appraised value (or unit price of the property) to evaluate the F/S and pre F/S**

Regarding the evaluation of the Feasibility Study (F/S) and Pre-Feasibility Study (Pre-F/S) for Davao River, it is more detailed than the evaluation of the Master Plan Study which covers the entire City. Concretely, in the F/S and Pre-F/S, the value set per mesh is set more precisely by reflecting the building value per size, statistical data such as annual income per type of business and other factors.

Due to the confidentiality of the data used including the detailed market value of some subdivisions, the following Table 2.3.2 shows the highest value set in the 23 barangays covering the flood area of 100-years return period under present situation or when “no project is implemented (without case)”.



Source: Project Team

**Figure 2.3.3 Location of the 23 barangays covering the flood area**

Note: Under 100-years return period flood when the “no project is implemented (without case)”.

**Table 2.3.2 Highest Appraised Value in each Barangay (F/S and Pre-F/S)**

Barangay	Residential buildings	Commercial buildings	Institutional buildings	Industrial buildings	Agricultural / livestock / fisheries buildings	Mixed use buildings	Agricultural land
<b>POBLACION DISTRICT</b>							
No. 1	9,910	31,069	39,176	18,499	4,180	26,718	100
No. 2	9,910	44,484	40,226	35,914	7,140	31,540	100
No. 3	17,190	56,418	40,226	47,848	4,180	37,945	100
No. 4	9,910	812,008	39,176	802,328	4,180	287,031	100
No. 5	9,910	18,877	39,176	9,197	4,180	22,654	100
No. 8	9,910	38,971	40,226	35,271	8,020	29,702	100
No. 19	10,720	189,266	39,176	185,566	7,140	79,721	100
No. 31	8,910	19,014	27,876	6,444	4,180	18,600	100
No. 33	9,910	17,651	27,876	15,121	4,180	18,479	100
No. 34	10,720	87,180	40,226	74,610	4,180	46,042	100
No. 35	10,720	377,417	39,176	364,847	4,180	142,438	100
No. 36	9,910	24,819	39,176	12,249	4,180	24,635	100
No. 37	9,910	10,702	27,876	8,172	4,180	16,163	100
No. 38	10,720	36,042	39,176	23,472	4,180	28,646	100
No. 39	10,720	14,466	27,876	11,936	4,180	17,687	100
No. 40	9,910	121,202	27,876	97,902	4,180	52,996	100
<b>TALOMO DISTRICT</b>							
Bucana	9,910	23,344	39,176	19,644	4,180	24,143	100
Magtuod	9,910	21,077	27,876	18,137	6,430	19,621	100
<b>BUHANGIN DISTRICT</b>							
Buhangin	9,910	72,923	39,176	69,223	4,180	40,670	100
Mandug	9,910	17,237	39,176	14,297	8,020	22,108	100
Tigatto	9,910	19,583	27,876	7,773	8,020	19,123	100
<b>TUGBOK DISTRICT</b>							
New Carmen	8,910	25,114	39,176	25,474	6,430	24,400	100
Waan	9,910	21,374	27,876	9,564	6,430	19,720	100

Note: in PhP/m<sup>2</sup>

Source: Project Team, based on the detailed market value set in the Davao City Ordinance No.0257-17, Series of 2017, and reflecting the capitalization value of the commercial and industrial businesses in each barangay.

## Chapter 3 Economic Evaluation

### 3.1 Damage Estimation

#### (1) Sections of the Main Report including the results of damage estimation

The economic benefit or “expected annual average damage reduction” of the proposed projects is calculated by comparing the assumed economic amount of damage of when “no project is implemented (without case)” and when “projects are implemented (with case)”.

Direct damage to general assets and agricultural products is calculated by multiplying the damage rates depending on the inundation depth by the property value per mesh. Direct damage to large scale infrastructures and public utilities is calculated by multiplying direct damage cost by a ratio set based on the reflection of past disasters.

In this study, the damage rates of the “Manual for Economic Evaluation of Flood Control Investment - Draft (MLIT, 2005)” are used to evaluate the economic effects of flood control measures (Davao River, Matina River and Talomo River) and drainage measures (9 drainage areas), and the rates of the “Cost-Benefit Analysis Guidelines for coastal projects – Revised Edition (MLIT, 2004)” are used to evaluate the coastal measures.

In addition, the damage cost in area where the inundation depth is lesser than 10 centimeters are not counted (eg. In those areas, it is assumed that economic damage do not occur).

The damage rate used to evaluate the M/P, FS and Pre F/S are explained in the Section 3.12.3 of the Main Report.

The following table shows the cases of the simulation analysis conducted for flood, drainage, and the Sections where the results of the damage estimation can be found in the Main Report.

**Table 3.1.1 Section of the Main Report including the results of the damage estimation**

Hazard	Target Area	Case	Section of the main report
Flood (Return Period of 2, 3, 5, 10, 25, 50, 100 years)	Davao River Basin	No projects implemented	Section 3.12.5, 4.5.3, 5.3.3
		M/P Projects implemented	Section 3.12.5
		F/S Projects implemented	Section 4.5.3
		pre F/S Projects implemented	Section 5.3.3
	Matina River Basin	No projects implemented	Section 3.12.6
		M/P Projects implemented	
	Talomo River Basin	No projects implemented	Section 3.12.7
		M/P Projects implemented	
Inland Flood (Return Period of 2, 5, 10, 25, 50 years)	9 Drainage Areas (Agdao, Roxas, Jerome, Mamay, Sasa, Emars, Shanghai, Maa 1, Maa 2)	No projects implemented	Section 3.12.8
		M/P Projects implemented	
Coastal Hazard (Return Period of 10, 25, 50, 100 years)	Coastal Area divided into 14 sub-areas	No projects implemented	Section 3.12.9
		M/P Projects implemented	

Source: Project Team

**(2) Computation of the expected annual average damage reduction**

The expected annual average damage reduction is calculated by aggregating the annual average damage per flood scale. The annual average damage is calculated by multiplying the amount of damage reduction per hazard scale (eg. reduction of flood damage cost which can be expected with the implementation of flood control projects) by the occurrence probabilities of flood events.

The expected annual average damage reduction for the M/P, F/S and pre F/S can be found in the Sections of the Main Report listed in Table 3.1.1 of the previous paragraph.

**3.2 Economic Evaluation**

The results of the economic evaluation can be found in the Sections of the Main Report listed in Table 3.1.1.

This Section aims to explain how the indices to evaluate the cost-benefit analysis, namely (1) Cost Benefit Ratio, (2) Net Present Value and (3) Economic Internal Rate of Return were calculated.

**(1) General**

The Table 3.2.1 gives the definitions of the major indices used to conduct economic evaluation.

**Table 3.2.1 Outline of the Major Economic indices to conduct cost-benefit analysis**

Indices for the evaluation	Definitions	Features
NPV: Net Present Value	$\sum_{t=1}^n \frac{B_t - C_t}{(1+i)^{t-1}}$	<ul style="list-style-type: none"> <li>• Possible to compare the size of net benefits generated by implementation of a project.</li> <li>• Will be influenced by the social discount rate applied.</li> </ul>
CBR: Cost Benefit Ratio ※hereinafter referred to as "B/C"	$\frac{\sum_{t=1}^n B_t / (1+i)^{t-1}}{\sum_{t=1}^n C_t / (1+i)^{t-1}}$	<ul style="list-style-type: none"> <li>• Possible to compare the efficiency of the investments of a project by comparing the size of benefit per investment.</li> <li>• Will be influenced by the social discount rate applied.</li> <li>• When this economic index is used for comparing project alternatives, it should be carefully considered if each cost items (operating cost, maintenance cost and so on) should be evaluated as benefit or as cost.</li> </ul>
EIRR: Economic Internal Rate of Return	$\sum_{t=1}^n \frac{B_t - C_t}{(1+i_0)^{t-1}} = 0$ <small><math>i_0</math> can be describe in the above formula.</small>	<ul style="list-style-type: none"> <li>• Possible to judge the efficiency of the investments of a project by comparing it with the social discount rate applied.</li> <li>• Won't be influenced by the social discount rate applied.</li> </ul>

*N*: the period subject to the economic evaluation, *B<sub>t</sub>*: benefits generated year *t*, *C<sub>t</sub>*: benefits generated in year *t*  
*i*: social discount rate

Source: Manual for Economic Evaluation of Flood Control Investment -Draft (MLIT, 2005)

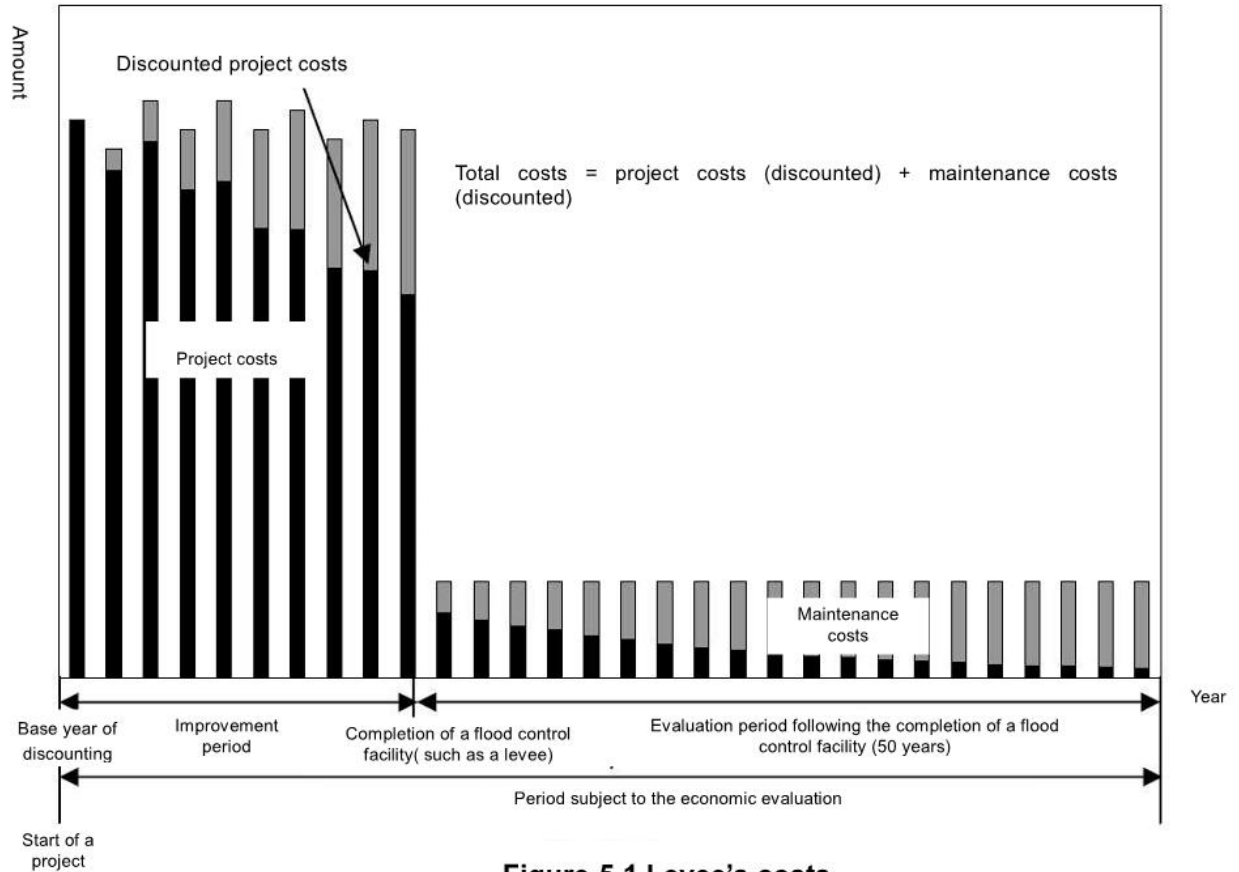
**(2) How the indices were calculated**

Table 3.2.2 was used to calculate the indices.

In this Study, the period target to economic evaluation is defined as “anticipated implementation period + 50 years after the completion of the project”.

Columns A and B are related with the implementation period of the project, and Column C shows the number of year after the completion of the project.

When a flood control project is proposed, the economic efficiency should be assessed based on the current situation of the river channel to be improved. Therefore, the costs consist of the future investments to implement the project (Project Cost) and the funds needed to operate and maintain the facilities (O/M) during the period subject to economic evaluation.



**Figure-5.1 Levee's costs**

Source: Manual for Economic Evaluation of Flood Control Investment -Draft (MLIT, 2005)

**Figure 3.2.1 Image of the Total Cost of flood control project**

In Table 3.2.2, Column D shows the project cost (economic) cost based on the investment schedule for the project implementation and Column E is the cost for Operation and Maintenance (O/M).

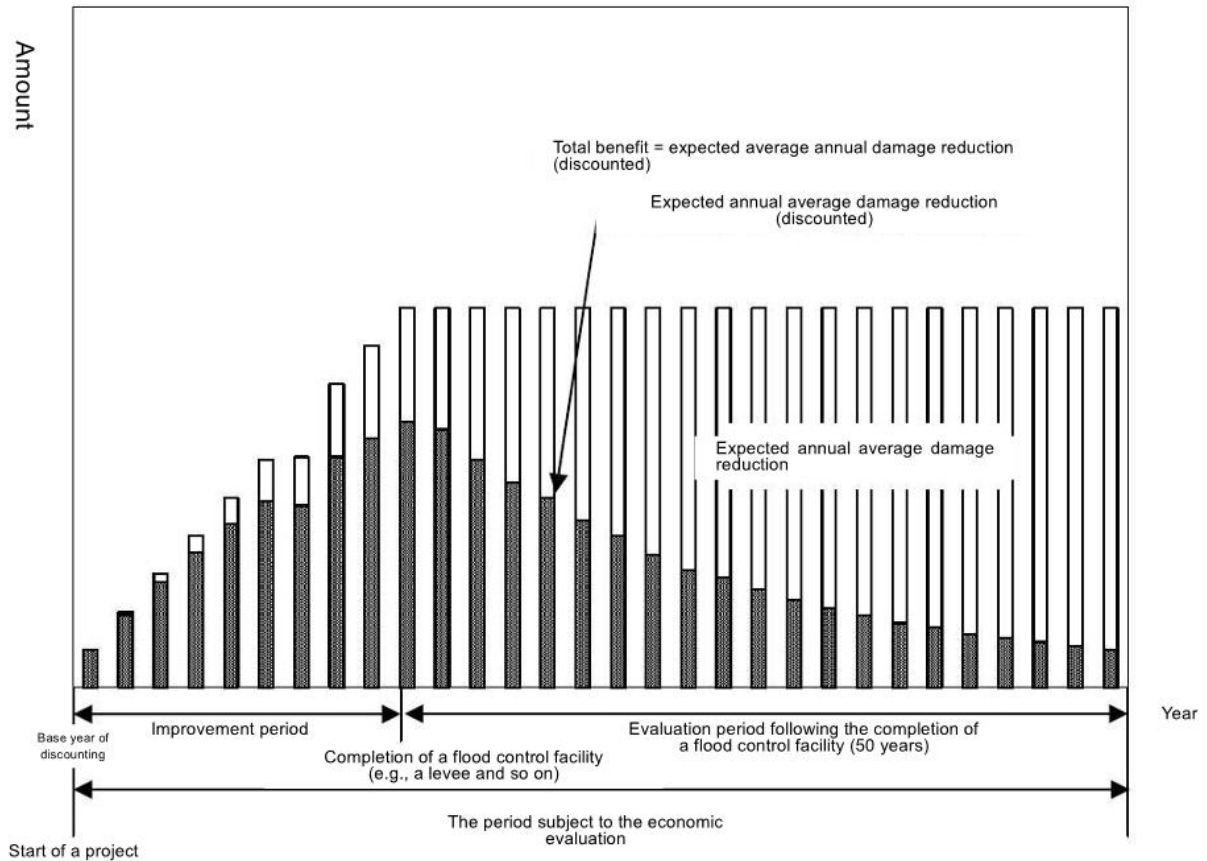
Column F is the addition of the project cost (Column D) and O/M cost (Column E).

Column G is the accumulated project cost (Column D), and is only a reference.

Column H shows the annual project and O/M costs after discount and is calculated as follows.

<p>At the implementation year t (Column B),</p> $\text{Cost after discount (Column H)} = \frac{\text{Total Cost (Column F)}}{(1+SDR)^t}$ <p style="text-align: right;"><i>SDR: Social Discount Rate</i></p>
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When a flood control project is implemented, the effects of the improvement are generated gradually. For example, in the case of the M/P for Davao River, dredging, widening of the channel, cut-off channel, retarding ponds are proposed. Due to the scale of the project, each component will be gradually implemented and the level of protection against flood will be gradually enhanced. Therefore, it is important that the benefits are assessed properly based on the chronology of the project implementation.



**Figure-4.1 Generation of levee's benefits**

Source: Manual for Economic Evaluation of Flood Control Investment -Draft (MLIT, 2005)

**Figure 3.2.2 Image of the Total Benefit of flood control project**

In Table 3.2.2, Column I shows the Annual Benefit reflecting the project implementation schedule and Column J shows the annual benefit after discount which is calculated as the same as the discounted cost of Column H.

Column I shows the annual net benefit which the difference between the annual benefit of Column I and cost of Column F.

The Cost Benefit Ratio was calculated by dividing the total benefit (after discount) by the total cost (after discount), and Net Present Value and Economic Internal Rate of Return were calculated by using the excel formula function similar to the formula shown in Table 3.2.1.



**Table 3.2.2 Table used to calculate economic indices**

(Example of the M/P for Davao River (SDR=10%))

Column A	Column B	Column C	Column D	Column E	Column F	Column G	Column H	Column I	Column J	Column K
Year	No. of Year after completion	Project Cost	O/M Cost	Total	Accumulated Cost	Annual Cost after discount	Annual Benefit	Annual Benefit after discount	Net Benefit	
2023	1	0.713		0.713	0.713	0.713			-0.713	
2024	2	0.713		0.713	1.427	0.590		0.000	-0.713	
2025	3	0.713		0.713	2.140	0.536		0.000	-0.713	
2026	4	2.837		2.837	4.977	1.938		0.000	-2.837	
2027	5	2.837		2.837	7.814	1.762		0.000	-2.837	
2028	6	2.837		2.837	10.651	1.601		0.000	-2.837	
2029	7	2.314		2.314	12.966	1.188		0.000	-2.314	
2030	8	2.314		2.314	15.280	1.080		0.000	-2.314	
2031	9	2.314		2.314	17.594	0.981		0.000	-2.314	
2032	10	2.143		2.143	19.737	0.826		0.000	-2.143	
2033	11	1.799		1.799	21.536	0.631	5.917	2.074	4.118	
2034	12	0.857	0.337	1.194	22.393	0.381	5.917	1.885	4.723	
2035	13	0.857	0.337	1.194	23.250	0.346	5.917	1.714	4.723	
2036	14	1.470	0.340	1.811	24.720	0.477	5.917	1.558	4.106	
2037	15	1.470	0.343	1.814	26.191	0.434	5.917	1.416	4.103	
2038	16	4.332	0.361	4.693	30.522	1.021	9.194	2.001	4.501	
2039	17	3.719	0.375	4.094	34.241	0.810	9.194	1.819	5.100	
2040	18	3.719	0.389	4.108	37.960	0.739	9.194	1.654	5.086	
2041	19	3.719	0.404	4.122	41.678	0.674	9.194	1.503	5.071	
2042	20	3.719	0.418	4.137	45.397	0.615	9.194	1.367	5.057	
2043	21	3.719	0.432	4.151	49.116	0.561	9.194	1.242	5.043	
2044	22	3.719	0.447	4.165	52.834	0.512	9.194	1.129	5.028	
2045	23	3.719	0.461	4.180	56.553	0.467	9.194	1.027	5.014	
2046	24	1	0.461	0.461	56.553	0.047	10.789	1.095	10.328	
2047	25	2	0.461	0.461	56.553	0.043	10.789	0.996	10.328	
2048	26	3	0.461	0.461	56.553	0.039	10.789	0.905	10.328	
2049	27	4	0.461	0.461	56.553	0.035	10.789	0.823	10.328	
2050	28	5	0.461	0.461	56.553	0.032	10.789	0.748	10.328	
2051	29	6	0.461	0.461	56.553	0.029	10.789	0.680	10.328	
2052	30	7	0.461	0.461	56.553	0.026	10.789	0.618	10.328	
2053	31	8	0.461	0.461	56.553	0.024	10.789	0.562	10.328	
2054	32	9	0.461	0.461	56.553	0.022	10.789	0.511	10.328	
2055	33	10	0.461	0.461	56.553	0.020	10.789	0.465	10.328	
2056	34	11	0.461	0.461	56.553	0.018	10.789	0.422	10.328	
2057	35	12	0.461	0.461	56.553	0.016	10.789	0.384	10.328	
2058	36	13	0.461	0.461	56.553	0.015	10.789	0.349	10.328	
2059	37	14	0.461	0.461	56.553	0.014	10.789	0.317	10.328	
2060	38	15	0.461	0.461	56.553	0.012	10.789	0.288	10.328	
2061	39	16	0.461	0.461	56.553	0.011	10.789	0.262	10.328	
2062	40	17	0.461	0.461	56.553	0.010	10.789	0.238	10.328	
2063	41	18	0.461	0.461	56.553	0.009	10.789	0.217	10.328	
2064	42	19	0.461	0.461	56.553	0.008	10.789	0.197	10.328	
2065	43	20	0.461	0.461	56.553	0.008	10.789	0.179	10.328	
2066	44	21	0.461	0.461	56.553	0.007	10.789	0.163	10.328	
2067	45	22	0.461	0.461	56.553	0.006	10.789	0.148	10.328	
2068	46	23	0.461	0.461	56.553	0.006	10.789	0.135	10.328	
2069	47	24	0.461	0.461	56.553	0.005	10.789	0.122	10.328	
2070	48	25	0.461	0.461	56.553	0.005	10.789	0.111	10.328	
2071	49	26	0.461	0.461	56.553	0.004	10.789	0.101	10.328	
2072	50	27	0.461	0.461	56.553	0.004	10.789	0.092	10.328	
2073	51	28	0.461	0.461	56.553	0.004	10.789	0.084	10.328	
2074	52	29	0.461	0.461	56.553	0.003	10.789	0.076	10.328	
2075	53	30	0.461	0.461	56.553	0.003	10.789	0.069	10.328	
2076	54	31	0.461	0.461	56.553	0.003	10.789	0.063	10.328	
2077	55	32	0.461	0.461	56.553	0.002	10.789	0.057	10.328	
2078	56	33	0.461	0.461	56.553	0.002	10.789	0.052	10.328	
2079	57	34	0.461	0.461	56.553	0.002	10.789	0.047	10.328	
2080	58	35	0.461	0.461	56.553	0.002	10.789	0.043	10.328	
2081	59	36	0.461	0.461	56.553	0.002	10.789	0.039	10.328	
2082	60	37	0.461	0.461	56.553	0.002	10.789	0.035	10.328	
2083	61	38	0.461	0.461	56.553	0.001	10.789	0.032	10.328	
2084	62	39	0.461	0.461	56.553	0.001	10.789	0.029	10.328	
2085	63	40	0.461	0.461	56.553	0.001	10.789	0.027	10.328	
2086	64	41	0.461	0.461	56.553	0.001	10.789	0.024	10.328	
2087	65	42	0.461	0.461	56.553	0.001	10.789	0.022	10.328	
2088	66	43	0.461	0.461	56.553	0.001	10.789	0.020	10.328	
2089	67	44	0.000	1.461	1.461	0.002	10.789	0.018	9.328	
2090	68	45	0.000	2.461	2.461	0.004	10.789	0.017	8.328	
2091	69	46	0.000	3.461	3.461	0.005				
2092	70	47	0.000	4.461	4.461	0.006				
2093	71	48	0.000	5.461	5.461	0.006				
2094	72	49	0.000	6.461	6.461	0.007	10.789	0.011	4.328	
2095	73	50	0.000	7.461	7.461	0.007	10.789	0.010	3.328	
<b>Total (in Billion)</b>		<b>56.553</b>	<b>55.696</b>	<b>112.249</b>	<b>56.553</b>	<b>18.711</b>	<b>642.586</b>	<b>32.336</b>		
						<b>EIRR</b>			<b>15.37%</b>	
						<b>Social Discount Rate</b>		<b>10%</b>		
						<b>NPV</b>		<b>12.98</b>		
						<b>B/C</b>		<b>1.728</b>		

Source: Project Team