Environmental Impact Assessment

Project Number: 52310-001
July 2023
Draft

Philippines: Bataan-Cavite Interlink Bridge Project

Volume 2 Annexes (Part 2)

Prepared by the Department of Public Works and Highways for the Asian Development Bank.

NOTES

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Revisions:

Date	Description	Revision	Originator	Reviewer	Approver
2022-12-07	Issue for Coordination	00	Simeon Stairs Renardet [Signature]	Jodi Ketelsen TYLin International [Signature]	Marwan Nader (TYLI/ PEC JV) [Signature]
2023-07-03	Issue for puiblication	01	Simeon Stairs Renardet [Signature]	Jodi Ketelsen TYLin International [Signature]	Marwan Nader (TYLI/ PEC JV) [Signature]

Abbreviations

ADB	Asian Development Bank
AoA	Area of Analysis
AoI	Area of Influence
AOO	Area of Occupancy
BAP	Biodiversity Action Plan
BCIB	Bataan–Cavite Interlink Bridge Project
BFAR	Bureau of Fisheries and Aquatic Resources
CIMP	Corregidor Islands Marine Park
CPA	Conservation Priority Area
CR	Critically Endangered
DD	Data Deficient
DENR	Department of Environment and Natural Resources
DENR-BMB	Biodiversity Management Bureau
DPWH	Department of Public Works and Highways
EAAA	Ecologically Appropriate Area of Analysis
ECC	Environmental Compliance Certificate
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EN	Endangered
EOO	Extent of Occurrence
GN6	Guidance Note 6
IBAT	Integrated Biodiversity Assessment Tool
ICM	Integrated Coastal Management
IFC	International Finance Corporation
IUCN	World Conservation Union
KBA	Key Biodiversity Area
LGU	Local Government Unit
LMMPA	Locally-Managed Marine Protected Area
MBCS	Manila Bay Coastal Strategy
MBEMP	Manila Bay Environmental Management Project
MBSDMP	Manila Bay Sustainable Development Master Plan
MPA	Marine Protected Area
NEDA	National Economic and Development Authority
NT	Near Threatened
PEMSEA	Program on Building Partnerships in Environmental Management for the Seas of East Asia
PS6	Performance Standard 6
RR	Restricted Range
VU	Vulnerable

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Brgy. Alas-asin & Brgy. Mt. View, Mariveles, Bataan;

Corregidor Island (Brgy. 53B), Cavite City; and

Brgy. Timalan Concepcion & Brgy. Sabang, Naic, Cavite

PUBLIC PARTICIPATION ACTIVITIES

DENR Administrative Order (DAO) No. 2017-15 provides the guidelines on public participation under the Philippine EIS system. In line with this guidelines, initial stakeholder identification and IEC meetings were done.

1.1. INITIAL STAKEHOLDER IDENTIFICATION

Stakeholders, as defined by DAO 2017-15, are people (natural or juridical) who affect or are affected by the project or undertaking, such as, but not limited to members of the local community, industry, local government units (LGUs), national government agencies (NGAs) and non-government organizations (NGOs) and people's organizations (POs).

A preliminary stakeholder identification and analysis was done to come up with a list and analysis of stakeholder groups that have interest in or stand to be affected by the project given its potential impacts. Note that stakeholder mapping is an iterative process that is informed by the conduct of site visits, observations, and validations by the study team.

Based on initial site visits, preliminary interviews, initial IEC meetings, and desk research done, the following were the identified stakeholders for the project:

- Local Government Units
- Owners and operators of commercial sea vessels
- National government bodies
- Tourism association
- Transport sector
- Business sector
- Fisherfolk sector
- Senior citizens
- Youth
- Residents
- NGOs/POs

1.2. IEC MEETINGS

1.2.1. MUNICIPALITY OF MARIVELES

An initial IEC meeting was conducted with the Municipal Government of Mariveles in 22 October 2019 at the Mayor's Office. A total of 18 participants attended said meeting, including the Municipal Mayor, key officials and representatives from the Municipal Planning and Development Office, Municipal Environment and Natural Resource Office, Muinicipal Assessor's Office, Municipal Agriculturist's Office, Municipal Engineer's Office, and Municipal Agrarian Reform Office. Also present in said meeting were the Municipal Administrator and

the barangay chairpersons of Alas-asin and Mt. View as the primary impact areas of the project in the Bataan side.

Among the issues and concerns raised during said meeting were the following:

- Accuracy of the project maps shown and the barangays that will be affected;
- Impact of the project on fisherfolk;
- Identification of those who will be resettled;
- Resettlement plans for those who will need to be relocated and the accompanying compensation scheme;
- Installation of toll fees on the proposed bridge; and
- Impact on Bataan's security (public safety) concerns given the accessibility that the bridge will provide and the lack of toll gates on the bridge.

Figure 5 show photos taken during the IEC meeting in Mariveles, Bataan.

Figure 1: Photos taken during the IEC Meeting in Mariveles, Bataan.

Mariveles Mayor during the IEC meeting.

	Barangay Alas-asin Chairperson articulating concerns and issues for his constituents during the open forum.
	
Project Director of EcosysCorp providing details and clarification regarding prescribed guidelines pertaining to the affected community.	EcosysCorp presenting the process of Environmental Impact Assessment and Resettlement Action Plan.

1.2.2. MUNICIPALITY OF NAIC

A separate IEC meeting was also held in Naic in 21 October 2019 at the Mayor's Office. A total of 16 participants were present in said meeting, including the Municipal Mayor and officials and representatives from the Municipal Planning and Development office, Municipal Engineer's Office, Municipal Assessor's Office, Municipal Agriculturist's Office, and Muniicpal Environment and Natural Resources Office. Also present in said meeting were the barangay chairpersons of Timalan Balsahan and Sabang.

Among the issues and concerns raised during said meeting were the following:

- Accuracy of the project maps shown and the barangays that will be affected;
- Impact of the project on fisherfolk;
- Identification of those who will be resettled; and
- Resettlement plans for those who will need to be relocated and the accompanying compensation scheme.

Figure 6 show photos taken during the IEC meeting in Naic, Cavite.

Figure 2: Photos taken during the IEC meeting in Naic, Cavite

<table>
<tr>
<td> 
Presentation during the IEC meeting.</td>
<td> 
IEC meeting attended by the municipal mayor, municipal department heads, and barangay chairpersons.</td>
</tr>
<tr>
<td> 
The Municipal Mayor of Naic actively participating during the IEC meeting.</td>
<td> 
Naic Barangay Chairpersons actively participating during the IEC meeting.</td>
</tr>
</table>

1.2.3. CITY OF CAVITE

Another IEC meeting was also set with the City Government of Cavite in 11 November 2019 at the Mayor's Satellite Office. A total of 15 participants took part in said meeting, including the City Mayor and officials and representatives from the City Planning and Development Office and City Environment and Natural Resources Office. Also present were the City Administrator and chairperson of Barangay 53B for Corregidor Island.

Among the issues and concerns raised during said meeting were the following:

- Number of posts that will be erected on Corregidor Island;

- Clarification on the optional ramp leading to the Island; CPDO clarified that the latest information on the airstrip in the Island is that it will be maintained for its historical value but will not be operational;
- Project's alignment with the Sangley viaduct leading to Cavitex;
- Clarification on whether the alignment will directly lead to Cavite City;
- Clarification on whether the alignment will be connected to Calax; and
- Timeline for commencing the project; Mayor Paredes is anxious to witness the project since it is already his last term as mayor.

Figure 7 show photos taken during the IEC meeting in Cavite City, Cavite.

Figure 3: Photos taken during the IEC meeting in Cavite City, Cavite.

Cavite City Mayor requesting the expeditious implementation of the project during the open forum.

ARUP presenting the project details during the IEC meeting.

1.3. OTHER PUBLIC PARTICIPATION ACTIVITIES

The conduct of other public participation activities are in line with the aim of conducting IEC activities to share information about the project to stakeholders. The conduct of other public participation activities will also provide the Proponent with initial feedback on the perceived positive and negative project impacts from the community. Both activities will be done separately for Mariveles, Naic, and Cavite City.

A sectoral consultation will be set for each of the affected municipalities and cities as part of the IEC campaign. In said sectoral consultations, participation of leaders and/or representatives from the abovementioned sectors will be sought.

A household survey in the primary impact areas will also be done to collect data on demographics, income and employment, living condition, health and sanitation practices, as well as perception about and suggestions for the project.

Information, Education and Communication (IEC) Activities for the Proposed Bataan-Cavite Interlink Bridge (BCIB) Project

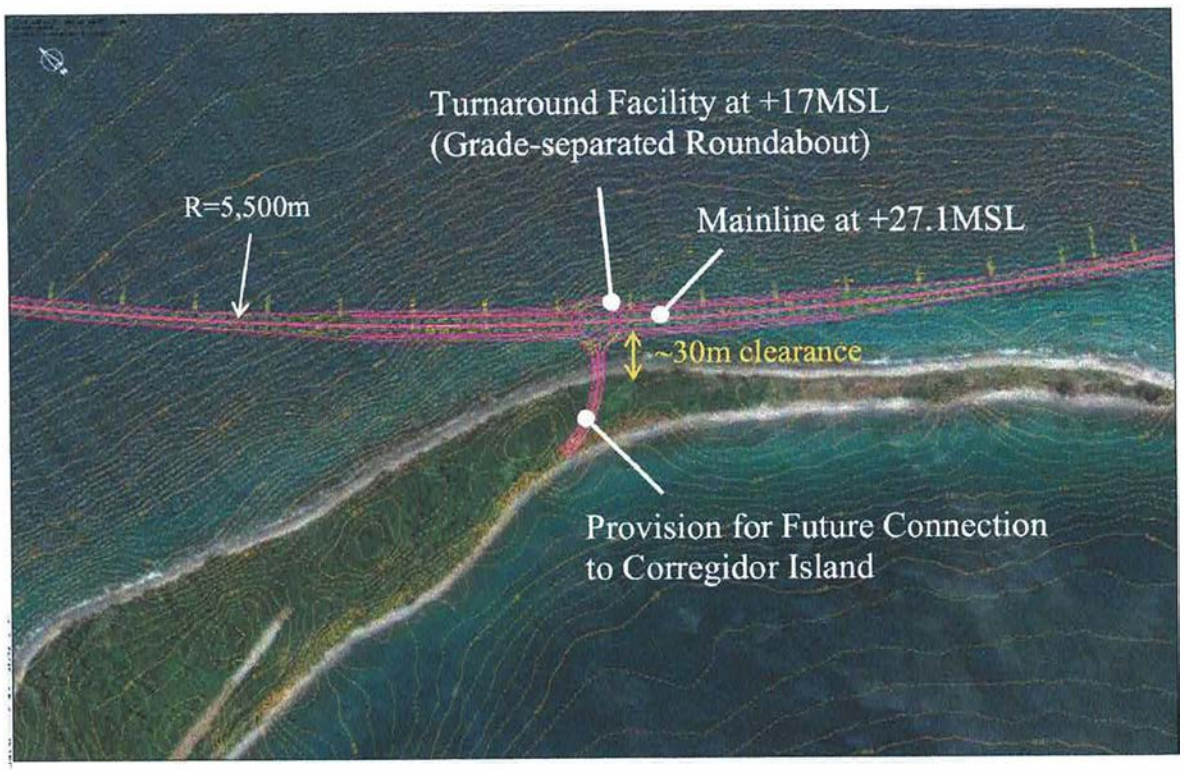
Brgy. Alas-asin & Brgy. Mt. View, Mariveles, Bataan;
Corregidor Island (Brgy. 53B), Cavite City; and
Brgy. Timalan Concepcion & Brgy. Sabang, Naic, Cavite

ANNEXES

Annex 1: Project alignment in Mariveles, Bataan

Annex 2: Project alignment in Naic, Cavite

Annex 3: Project alignment along Corregidor Island



Annex 4: Minutes of Meeting in Naic, Cavite

Date	21 October 2019
Time	2 PM
Venue	Mayor's Office, Naic Municipal Hall
Attendees	**DPWH :** John Eric Arevalo **Arup :** Winfred Liwanag Cristina Villaraza **Ecosys :** Ronnie Manipol Theresa Casuyon Mary Joy Maraat Frederick Esternon Elenor de Leon Lean Ramilo **Naic LGU :** Junio C. Dualan- Municipal Mayor Marissa S. Pabilon Elma T. Valenzuela Eva P. Pangilinan Antonete S. Asturias Rona M. dela Cruz Joel D. Antonio Carolina E. Espineli Christopher Cabuhat Noel H. Catubig Beverly N. Perdon
Particulars	Ms. Maraat introduced the team. She explained that the DPWH is the proponent and that Arup and Ecosys have both been contracted to provide technical assistance to the project. Mr. Liwanag presented the project. He began by situating the project in the context of President Rodrigo Duterte's Build, Build, Build Program. He shared basic information about the project, including brief profiles of its proponent and consultant before presenting the project in more details. He explained the rationale for the project and how it will be beneficial for the economy. He also shared the project alignment, showing maps of landing sites in Bataan and Cavite, including the potential connection to Corregidor Island. He provided an overview of the bridge layout and showed a rendering of the proposed bridge. Finally, he shared the project timeline. Ms. de Leon talked about the EIA process. She first explained what the EIA is and why it needs to be done before sharing the process required for the IEC meeting as one of the important components of the process. She shared the lists of other IEC activities that the Ecosys team will further conduct as well as the other on-site data gathering activities that will also be done in support of the EIA process. Ms. Casuyon discussed the RAP process. She explained what RAP is and why

	it needs to be done. She cited examples of how RAP applies to those who will be affected by the project and what these project-affected persons stand to expect. She discussed the activities that will be conducted in support of RAP before presenting the list of documents or information/data that will be needed to inform and complete the process. In closing, Ms. Maraat presented the contact details of the focal persons from DPWH and Arup for any concerns regarding the project. <u>Open Forum:</u> The participants commented that the current meeting is similar to the one previously held in Naic on the same topic, BCIB. The study team explained that the current meeting is part of the required series of IEC meetings for the conduct of environmental impact assessment (EIA). The participants also commented on the accuracy of the map used in the presentation. Winfred Liwanag asked for a correct map and the Municipal Planning and Development Coordinator (MPDC) promised to provide it. The Municipal Agriculturist raised concern over the fisherfolk who will be affected by the project. Theresa Casuyon explained the RAP process and how compensation will be determined for those who will be adversely affected by the project. On the area that will be traversed by the project, the participants said that the residents in said area have already been considered as living in danger zones, making it better for them to be relocated. They said that the resettlement component of the project is aligned with the municipal government's plan when it comes to addressing the plight of families living in said area. Ms. Casuyon said that they will be identified and tagged and will later on be included in the resettlement action plan.

Annex 5: Minutes of Meeting in Mariveles, Bataan

Date	22 October 2019
Time	10 AM
Venue	Mayor's Office, Mariveles Municipal Hall
Attendees	**DPWH :** John Eric Arevalo **Arup :** Winfred Liwanag Cristina Villaraza **Ecosys :** Annabelle N. Herrera Ronnie Manipol Nesah Jariel Theresa Casuyon Mary Joy Maraat Cyrenne Pelayo Frederick Esternon Elenor de Leon Lean Ramilo **Mariveles LGU :** Jocelyn P. Castaneda - Municipal Mayor Angel V. Peliglorio Fernando V. Bello III Ildefonso G. Tarreza Jr. Susan M. Murillo Jeff Penaloza Roberto M. Arcenal Sr. Daisy Miranda Verdin R. Villareal Corazon M. Palomar Ed R. Escabillo Leoncio A. Lungcay Jose E. Yambao Hannah Micah D. Madrid Cynthia P. Olare Madonna Navata Nicole Santillan Reshell B. Concepcion Chito L. Riego de Dios Carlos Burlas Ruth Badilles Ma. Cristina Magnampo Ronald Arcenal
Particulars	A prayer was said before the start of the meeting. Ms. Maraat introduced the team. She explained that the DPWH is the proponent and that Arup and Ecosys have both been contracted to provide technical assistance to the project. Mr. Liwanag presented the project. He began by situating the project in the context of President Rodrigo Duterte's Build, Build, Build Program. He shared basic information about the project, including brief profiles of its proponent and consultant before presenting the project in more details. He explained the rationale for the project and how it will be beneficial for the economy. He also

	shared the project alignment, showing maps of landing sites in Bataan and Cavite, including the potential connection to Corregidor Island. He provided an overview of the bridge layout and showed a rendering of the proposed bridge. Finally, he shared the project timeline. Ms. de Leon talked about the EIA process. She first explained what the EIA is and why it needs to be done before sharing the process required for the IEC meeting as one of the important components of the process. She shared the lists of other IEC activities that the Ecosys team will further conduct as well as the other on-site data gathering activities that will also be done in support of the EIA process. Ms. Casuyon discussed the RAP process. She explained what RAP is and why it needs to be done. She cited examples of how RAP applies to those who will be affected by the project and what these project-affected persons stand to expect. She discussed the activities that will be conducted in support of RAP before presenting the list of documents or information/data that will be needed to inform and complete the process. In closing, Ms. Maraat presented the contact details of the focal persons from DPWH and Arup for any concerns regarding the project. <u>Open Forum:</u> Alas-asin barangay chair said that the affected area in his barangay is mostly populated by cogon grass. Mt. View barangay chair asked about the project's impact on fisherfolk. They clarified if people would still have access to fishing after the project and if fishermen could stay/standby under the bridge. Mr. Liwanag said that access to fishing areas will only be limited during construction but afterwards, during operation, fishermen can resume their activities. On the question on whether fishermen could stay/standby under the bridge, the study team clarified that for safety purposes, such will not be allowed. The LGU representatives also asked about the identification of those who will be resettled. In response, Ms. Casuyon explained the resettlement action planning process and how project-affected persons and families will be identified and tagged. She explained that those who will be tagged will be considered for the resettlement. There was also question on whether users of the proposed bridge will be asked to pay toll fees. To this, the study team said that use of the bridge will be for free; there will be no toll fees for users. To this, the participants expressed concerned about safety. They feared that

	having no toll fees/gates would make the bridge and Mariveles as well very accessible to everyone. The study team explained that the plan not to collect toll fees is only being contemplated at the current stage and that the final decision on whether to collect or not will depend later on the proponent and for whomever will be operating and maintaining the bridge.

Annex 6: Minutes of Meeting in Cavite City, Cavite

Date	11 November 2019
Time	10 AM
Venue	Mayor's Satellite Office, Cavite City Hall
Attendees	**DPWH :** Junnel Baustista Mary Cris E. Samson-Utod Erlynrose Mari L. Sacote **Arup :** Faustino Abad Lorraine N. Chavez **Ecosys :** Theresa Casuyon Mary Joy Maraat Frederick Esternon Elenor de Leon **Cavite City LGU :** Bernardo Paredes - City Mayor Jose Malumay Beatriz Rosal A. Dimaano Florinda C. Santiago Allyson B. Santiago Daryl R. Solis
Particulars	Mr. Esternon greeted the participants and thanked them for coming over to the IEC meeting. Mr. Abad presented the project. He began by situating the project in the context of President Rodrigo Duterte's Build, Build, Build Program. He shared basic information about the project, including brief profiles of its proponent and consultant before presenting the project in more details. He explained the rationale for the project and how it will be beneficial for the economy. He also shared the project alignment, showing maps of landing sites in Bataan and Cavite, including the potential connection to Corregidor Island. He provided an overview of the bridge layout and showed a rendering of the proposed bridge. Finally, he shared the project timeline. Ms. de Leon talked about the EIA process. She first explained what the EIA is and why it needs to be done before sharing the process required for the IEC meeting as one of the important components of the process. She shared the lists of other IEC activities that the Ecosys team will further conduct as well as the other on-site data gathering activities that will also be done in support of the EIA process. <u>Open forum:</u> CPDO asked about the number of posts that will be erected in Corregidor. Faustino Abad showed again the alignment in Corregidor and explained that there is a junction that can later be developed to connect to the island. Representatives from the city government said that Corregidor Foundation, Inc. (CFI) has a development master plan that was shared to the city government.

	Mr. Abad further explained the considerations for the design of the viaduct in Corregidor, pointing out the presence of an airstrip in the island. To this, CPDO said that the airstrip will be maintained for its historical value but will not be operational. She explained that the decision to just maintain the airstrip without making it operational is based on recommendations from the Civil Aviation Authority of the Philippines (CAAP). She said that the CAAP made such recommendation in light of the potential damages that taking off and landing aircrafts might cause to the road and other structures. Representatives from the city government explained that CFI is in charge of the management aspect but it is the Philippine Veterans Affairs Office (PVAO) that is in charge of preservation. Representatives from the city government also clarified if the project is aligned with the Sangley Point viaduct. Mr. Abad explained the process undertaken by the technical team in coming up with the preferred option. He also explained that the project cannot link to the Sangley Point viaduct project because its proponent is a private entity. He reminded the participants that the BCIB is under the DPWH. Representatives from the city government clarified if BCIB will connect to CALAX. Mr. Abad confirmed the link between BCIB and CALAX. He also mentioned the possible link to the proposed Cavite-Tagaytay-Batangas Expressway (CTBEX). City Administrator asked if the project alignment will connect to Cavite City. Mr. Abad showed again the alignment and explained that the landing site for Cavite will be in Naic. He pointed out, however, that with BCIB, traffic congestion in the area will be eased and that other points in Bataan and nearby areas will become more accessible. Mayor Paredes asked about the project timeline. He said he is eager to witness the completion of the project. Mr. Abad explained project timeline and explained the work that each stage entails. Mayor Paredes said he is already on his last term and that he can no longer seek another one. He expressed support to the project and shared his wish for the construction to immediately start.

Annex 7: Attendance sheets

MARIVELES

Bataan-Cavite Interlink Bridge (BCIB) Project
Information, Education, Communication (IEC) Meeting
Office of the Mayor, Municipal Hall Building,
Roman Super Highway, Mariveles, Bataan
22 October 2019, Tuesday, 9:00 A.M.
ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
1	[illegible]		✓	[illegible]	[illegible]	[illegible]	[illegible]	
2	Cristina Villaraza	○		Transport Planner	Arup	09152403326	cristina-m.villaraza@[illegible]	
3	WINFRED CUANAG II							
4	MADONNA NAVATA	○		DRAFTSMAN III	ASSESSOR	0926205O5?8	chinavata@yahoo.com	
5	Angel V. Peliglorio, Jr.			Administrator	Admin	[illegible]	[illegible]@gmail	
6	NICOLE SANTILLAN		✓	GEO-ENGINEER	Engineering	09157777323		
7	RESHELL P. CONCEPCION	✓		ADMIN AIDE III	[illegible]	[illegible]		
8	CHITO L. RIEGO DE DIOS		✓	ASSESSOR	MAO (ASSESSOR)	09778052099		
9	CARLOS BURLAS		✓	ADMIN AIDE	ADMIN			
10	Ruth Badilles	✓		Farmworker II	MAO (Agri	09095064842		
11	[illegible]	✓		ADMIN ASST. IV	MAO (Agri)		[illegible]@yahoo.com	
12	RONALD R. ARCENAL		✓	SB MEMBER	SB			

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project
Information, Education, Communication (IEC) Meeting
Office of the Mayor, Municipal Hall Building, Roman Super Highway
Municipality of Mariveles, Bataan
22 October 2019, Tuesday, 2:00 P.M.
ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
13	ILDEFONSO G. TARRIELA JR		✓	MUN. ENGR	LGU - Mariveles	09390262071		
14	Susan M. Murillo	✓		SB	LGU Mariveles	09088914277	smmurillo@[illegible]yahoo.com	
15	JEFF PENTALOZA			E. CONSULTANT	"	09369685132		
16	ROBERTO M. ARCENAL SR		✓	P. BARANGAY	LGU	[illegible] 09096068658		
17	[illegible]	✓		LGU	LGU			
18	VERDIN R. VILLAREAL		✓	ADMINISTRATIVE AIDE	MIS	09157136020		
19	Corazon M. Paloma	✓		Admin staff				
20	Eleanor de Leon	○		DTL	ECOSYSCORP			
21	Frederick Estacion		○	Head, Env'l & Energy	EcosysCorp	09175326722		
22	EDDR. ESCABILLO		–	CONSULTANT	LGU	09994008765		
23	LEONCIO F. LUNGCAY		✓	PUNONG BRGY.	BRGY. MT. VIEW	09176244417		
24	VOLT E. YAMBAO			PUNONG BRGY	CAMACHO	09487500847		
25	CYNTHIA P. LLARA			MAYOR'S OFFICE	MUN. BATAAN	0935[illegible]		
26	Hannah Micah D. Madrid	○		mayor's office	Mariveles Bataan	09778875 7904		

EcosysCorp

Bataan-Cavite Interlink Bridge (BCIB) Project
Information, Education, Communication (IEC) Meeting
Office of the Mayor, Municipal Hall Building,
Roman Super Highway, Mariveles, Bataan
22 October 2019, Tuesday, 9:00 A.M.
ATTENDANCE SHEET

27	Fernando V. Bello II		—	Administrative Aide	MPDC	09153954184	mpdc_mavs@bataan.gov.ph	
28	Atty. Jo Castañeda			Mayor	Office of the Mayor	09177400881	attyjocastaneda@gmail.com	
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EcosysCorp, Inc.

NAIC IEC Attendance Sheet

Bataan-Cavite Interlink Bridge (BCIB) Project
Information, Education, Communication (IEC) Meeting
Office of the Mayor, Municipal Hall Building,
Brgy. Ibayo Silangan, Naic, Cavite
21 October 2019, Monday, 2:00 P.M.
ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
1	Cristina Villanueva	O		Transport Planner	Arup	09152405386	cristina-m.villanueva@arup.[illegible]	
2	WILFRED LIWANAG II		O	PROJ. COOR.	ARUP	09957935860	wilfred-liwanag@arup.com	
3	AREVALO, JOHN ERIC		O	ENGR II	[illegible]	[illegible]	[illegible]	
4	ELENOR DE LEON	O		DL	ECOSYSCORP			
5	NOEL H. CATUBIG		O	BRGY CHAIRMAN	BRGY SABANG	0917 [illegible]		
6	Frederick Esternon		O	Head Environment	Ecosyscorp	09175326122	festernon@gmail.com	
7	Beverly N. Perdon	O		C.O.S.	LGU-NAIC	0917 [illegible]	[illegible]@yahoo.com	
8								
9								
10								
11								
12								

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project
Information, Education, Communication (IEC) Meeting
Office of the Mayor, Municipal Hall Building,
Brgy. Ibayo Silangan, Naic, Cavite
21 October 2019, Monday, 2:00 P.M.
ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
1	JUNIO C. DUALAN		/	MUN. MAYOR	LGU-NAIC	0977-8240635	mayorjcd@yahoo.com	
2	Marcus S Paletan			Brgy Capt	Tim Con	09950787[illegible]		
3	ELMA T. VALENZUELA	/		MUN. AGRICULTURIST	LGU-NAIC	0917-813[illegible]		
4	EVA P. PANGILINAN	/		MENRO	LGU-Naic	09178324244	[illegible]@yahoo.com	
5	Antonette S. Asturias	/		MENRO Staff	LGU-Naic	09178094162	[illegible]@gmail.com	
6	RONA M. DELA CRUZ	/		MUN ENGR	LGU NAIC	046 412 0170	[illegible]	
7	JOEL D. ANTONIO		/	[illegible]	NAIC LGU	[illegible]	joel_[illegible]@yahoo.com.ph	
8	CAROLINA E. ESPINELI	/		Mun. Assessor	LGU Naic	0917-1308913	[illegible]@yahoo.com	
9	CHRISTOPHER CABUHAT		/	P.B	TIM. BALSAHAN	09202102786		
10								
11								
12								

CAVITE CITY

Bataan-Cavite Interlink Bridge (BCIB) Project
Information, Education, and Communication (IEC) Meeting
Office of the Mayor
Cavite City, Cavite
11 November 2019, Monday, 10:00 A.M.
ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
1	Beatriz Rosal A. Dimaano	✓		Barangay Chairman	Barangay 35-B	09186733637	[illegible] @ yahoo.com	[signature]
2	Tese U. Maluyan			CENRO - Designee	City-ENRO	09364155357	cenrocavitecity@gmail.com	[signature]
3	Lorraine N. Chavez	✓		[illegible]	ARMP	09178461561	lorraine.chavez@arup.com	[signature]
4	Mary Ohll E. Samson-Utod	✓		Engr. II	DPWH	304 3287	[illegible]@gmail.com	[signature]
5	Erlynrose Mari L. Sacote	✓		Engr. III	DPWH	304823	sacote.erlynrose_mari@dpwh.gov.ph	[signature]
6	Junnel Ray C. Bautista		✓	Engr. II	DPWH		junnelraybautista@gmail.com	[signature]
7	Faustino Abad				ARUP		faustino.abad@arup.com	[signature]
8	Theresa G. Casuyon	✓		RAP Team Leader	Ecosyscorp, Inc	09288480523	tes_garong@yahoo.com	[signature]
9	Mary Joy Macaat	✓		Stakeholder Engagement Team Leader	Ecosyscorp	09088890883	macaat_mj@gmail.com	[signature]
10	Elenor de Leon	✓		[illegible]	Ecosys Corp	09128849015	elenordeleon@gmail.com	[signature]
11	Florinda C. Santiago	✓		CPDC	CPDO-CC	(046) 431-0519	cavitecity.cpdo@gmail.com	[signature]
12	Allison B. Santiago		✓	Aty Admin	CMO-Cavite City	(046) 431 0462	cavitecitycao@gmail.com	[signature]

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project
Information, Education, and Communication (IEC) Meeting
Office of the Mayor
Cavite City, Cavite
11 November 2019, Monday, 10:00 A.M.
ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
13	Bernardo S. Paredes		✓	City Mayor	City Mayor	046 431-1655	cavitecitymayor[illegible]@gmail	[signature]
14	Frederick J. Estrimon		✓	EIA Team	Ecosys	09173326722	[illegible]@gmail.com	[signature]
15	[illegible]		✓	SK President	Cavite City	0917626943	solisdaryl[illegible]@gmail.com	[signature]
16		F	M					
17		F	M					
18		F	M					
19		F	M					
20		F	M					
21		F	M					
22		F	M					
23		F	M					
24		F	M					
25		F	M					
26		F	M					

EcosysCorp

Annex 8: Photo documentation

MARIVELES

Figure 1 Mariveles Mayor Atty . Jocelyn P. Castaneda discussing the project with the EIA study team headed by Frederick Esternon

Figure 2. BCTB project presentation in Mariveles Municipal Hall in, Bataan.

NAIC

Figure 3. The study team as they listen to Naic Mayor Junio C. Dualan.

Figure 4. The study team presenting the project details.

CAVITE CITY

Figure 5. Cavite City Mayor Bernardo S. Paredes as he listens to the presentation of the project alignment.

Figure 6. Faustino Abad of Arup as he shares details of the project.

Information, Education and Communication (IEC) Activities for the Proposed Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Level

Highlights of the 1st Barangay Consultation Meeting (BCM) Meeting
BATAAN-CAVITE INTERLINK BRIDGE (BCIB) PROJECT
Preliminary Engineering Design (PED)

Timalan Concepcion Covered Court
Brgy. Timalan Concepcion, Naic, Cavite
21 January 2020, Tuesday, 1:00 P.M.

Project Presentation - ARUP

EIA and Environmental Activities - EcosysCorp

Open Forum:

Presented in the matrices are the summary of issues, concerns, comments, and suggestions raised during the 1st BCM in Brgy. Timalan Concepcion, Naic. Responses to the queries are also included in the matrices.

Please see the attached attendance sheets for the list of participants during the meeting.

Summary of Issues, Concerns, Comments, and Suggestions Raised during the 1st SCM in Brgy. Timalan Concepcion, Naic, (1/1)	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• Asked where the boats shall dock once the construction of BCIB Project has started (**MR. ROELAN JIMENEZ,** *Boat Operator, Brgy. Timalan Concepcion,* Naic, Cavite)	• The project will diffidently coordinate with the Bgy and BFARMC to address that concern • There will be a separate meeting that will tackle the Right-of-Way Action Plan (RAP); • This meeting will only tackle the Environmental Impact Assessment (EIA) as well as the Perception Survey of the stakeholders (**MR. FREDERICK ESTERNON**, *EIA Team Leader*, EcosysCorp, Inc.)
• Raised concern regarding effect of the BCIB Project in their elementary school **(MS. NANCY C. LOMAT,** *Teacher III***,** *Brgy. Timalan Concepcion,* Naic, Cavite**)**	• If the project is relatively far from the alignment there will be no impact on the elementary school. There will be a separate group to identify the affected structures and residents. • The project will conduct Air and Noise Sampling Study to determine the baseline data of Noise and Air Quality of the area. The data will be used to monitor the impact of the project during construction in terms of Noise and Air Pollution. • This project is funded by the Asian Development Bank (ADB) which is a strict organization that ensures just compensation to those Project Affected Persons (PAPs) and Sectors; • Reiterated that a separate meeting will be conducted that will tackle the Right-of-Way Action Plan (RAP) **(MR. ESTERNON)**
• Raised concern regarding the safety of the students during the project's construction **(MS. LOMAT)**	• For every construction site there is a environmental manager, environmental officer, safety officer, and engineers who will be incharge for that safety concerns' • For possible impact to the students in terms of noise and air pollution, based on the presented material, the project will be gathering and monitoring the noise and air quality prior, during, and after the project has been constructed;

	• Environmental baseline sampling will be conducted to gather the baseline condition of the area to ensure that the environmental quality of the surrounding areas will not change **(MR. ESTERNON)**
• Suggested to let all the fisher-folks attend the meeting not just representatives **(MR. REYNANTE ANATAN,** *Fisherman, Brgy. Timalan Concepcion,* Naic, Cavite**)**	• For the next meeting, a Public Scoping will be conducted where all potential Project Affected Persons (PAPs) shall be invited **(MR. ESTERNON)**
• Asked what are the allowed transportation vehicles on the bridge **(MS. LOMAT)**	• All types of vehicles are allowed to enter except bicycles **(ENGR. WINFRED LIWANAG,** *Engineer,* ARUP**)**
• Asked if the residents from their barangay will be prioritized for employment upon the start of construction **(NAME OF ATTENDEE UNKNOWN)**	Based on guidelines, Priority of employment shall be given to the qualified local residents and will be prioritized during the hiring process. Adequate public information for jobs available to local residents in the affected areas will be posted to the Barangay. The project will comply to the conditions and requirements of the labor code of the Philippines **(MR. ESTERNON)**

Photo No. 1 **Mr. Roelan Jimenez**, a Boat Operator from Brgy. Timalan Concepcion, asks where the boats shall dock once the construction of BCIB Project has started.

Photo No. 2 **Ms. Nancy C. Lomat,** *Teacher III* from from Brgy. Timalan Concepcion, raises concern regarding the effect of the BCIB Project to their elementary school.

Photo No. 3 **Mr. Reynante Anatan**, a *fisherman* from Brgy. Timalan Concepcion, suggesting to let all the fisherfolks attend the meetings and not just a few representatives.

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting

Timalan Concepcion Barangay Hall
Municipality of Naic, Cavite
21 January 2020, Tuesday, 2:00 P.M.

ATTENDANCE SHEET

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
1	Rosie D. Arcilisy	F		member	TODA			[signature]
2	Feminia Vazuela	F			Senior	0920-5843230		[signature]
3	Rosalina Peruca	F			Senior			[signature]
4	JESUSA LINGAT	F		BHW	BRNG. TIMALAN	09241362347		[signature]
5	Belen L. Zabala	F		BHW	Senior	09553703065		[signature]
6	Susan A. Lanat	F		BHW		09308355760		[signature]
7	Rima C. Luna	F		School off.	timalan	09764490820		[signature]
8	RUBY S. BAUTISTA	F		BHW	TIMALAN	09050875049		[signature]
9	Lucena A. Binato	F		Senior	Timalan	09266095544		[signature]
10	Pilita A. Buendia	F		B-H-W	Timalan	09051372543		[signature]
11	Norman L. Bigalbal		M	Brgy kag	Timalan	09269677225		[signature]
12	Reynaldo L. Ching		M	Brgy kag	Timalan	09153547139		[signature]
13	Amante Bigalbal		m	Brgy kag	Timalan	09277712587		[signature]
14	Figilin Ordoñez			Boat operator	Timalan			[signature]
15	Rolando dela Cruz			Mangingisda "	Timalan			[signature]

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting

Timalan Concepcion Barangay Hall
Municipality of Naic, Cavite
21 January 2020, Tuesday, 2:00 P.M.

ATTENDANCE SHEET

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
16	ROELAN JIMENEZ		✓	boat owner	TIMALAN			[signature]
17	Pablo Luna		✓	Brgy Council	"			
18	ERWIN BAUTISTA		✓	Boat operator	"			
19	Shonnalyn Bautista	✓		Boat operator	"			
20	EDGAR VALENZUELA		✓	Boat pilot	"			[signature]
21	alexander Bautista		✓	Brgy tanod	"			
22	Marissa L. Palaton	✓		P.B.	"	09950787010	timalan concepcion.naic@gmail.com	[signature]
23	Rody L. BORRE		✓	BPSO				[signature]
24	RODELH MARALAN							[signature]
25	Arlene D. Maralan	✓			"			[signature]
26	Esmiraldo Maralan		✓		"			
27	Ma. Rosa Sulapas			owner				[signature]
28	Roderick cardinal							[signature]
29	NANCY C. LOMAT	✓		Teacher III DEPED	DEPED/TIMALAN ES			[signature]
30	Perachita P. Asis	F		[illegible]	[illegible]	[illegible]58299		[signature]

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting

Timalan Concepcion Barangay Hall
Municipality of Naic, Cavite
21 January 2020, Tuesday, 2:00 P.M.

ATTENDANCE SHEET

No.	Name	Gender		Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
		F.	M					
31	EDGAR VALENZUELA		✓		BRGY. TIMALAN CONCEPCION	?		
32	Sheralyn O. Bautista	✓			BRGY Timalan Concepcion	09673224[illegible]	jhermalyn1212@gmail.com	
33	ROELAN JIMENEZ		✓		BRGY TIMALAN CONCEPCION			
34	Froilan O Oñez				"			
35	Rolando dela Cruz		✓		Brgy Timalan C.			
36	Rodel H. MARALAN		✓		Brgy Timalan c.	09155543[illegible]		
37	ARLENE D. MARALAN	✓			Brgy TIMALAN	09664562802		
38	REYNANTE ARDTAN		✓		Brgy Timalan			
39	Charlie Labra		✓		Brgy. Timalan	09450157[illegible]		
40	ARIS Maralan		✓		Timalan Bukana			
41	Roberto Cardinal		✓		Timalan -			
42	ERS Utor	✓		ENR-III	DPWH			
43		✓						
44								
45								

Highlights of the 1st Barangay Consultation Meeting (BCM) Meeting
BATAAN-CAVITE INTERLINK BRIDGE (BCIB) PROJECT
Preliminary Engineering Design (PED)

Sabang Barangay Hall,
Brgy. Sabang, Naic, Cavite
21 January 2020, Tuesday, 10:00 A.M.

Presentation of the Project

Project Description - Presented by ARUP

EIA Process and Activities - Presented by Frederick Esternon (Ecosys Corp)

RAP Activities - Presented by Ecosys Corp

Open Forum:

Presented in the matrices are the summary of issues, concerns, comments, and suggestions raised during the 1st BCM in Brgy. Sabang, Naic. Responses to the queries are also included in the matrices.

Please see the attached attendance sheets for the list of participants during the meeting.

Summary of Issues, Concerns, Comments, and Suggestions Raised during the 1st SCM in Brgy.Sabang, Naic, (1/1)	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• Clarified if they will be the Project Affected Persons (PAPs) for the BCIB Project; • Asked regarding the PAPs due compensation **(MR. ZALDY CROOC,** *TODA, Brgy. Sabang*, Naic, Cavite**)**	• There will be a separate meeting that will tackle the Right-of-Way Action Plan (RAP); • This meeting will only tackle the Environmental Impact Assessment (EIA) as well as the Perception Survey of the stakeholders (**MR. FREDERICK ESTERNON**, *EIA Team Leader*, EcosysCorp, Inc.)
• Raised concerns regarding the noise and air pollution as well as the people that will be affected by the project once the construction has started **(MR. Crooc)**	• Based on the presented material, we will be gathering noise and air quality prior, during, and after the project has been constructed; • **E**nvironmental baseline sampling will be conducted to gather the present condition of the area. This is for the project to monitor the possible impact of the project. Once the monitoring team detected any impact or changes to the actual condition of the area, the project will identify and install appropriate mitigating measures to ensure the environmental quality of the Project Affected Areas **(MR. ESTERNON)**
• Asked what will happen to the PAPs of the BCIB Project (**MR. RANDEL ROSS ROBLES,** *Chief Tanod, Brgy. Sabang*, Naic, Cavite)	• Reiterated that there will be a separate activity discussing the RAP; • All questions will be noted and answered on the said activity **(MR. ESTERNON)**
• Asked if the PAPs along the ROW will be compensated by the government;	• Confirmed that the government will be paying all landowners along the ROW;

• Inquired regarding the valuation of the land that will be acquired (**MR. FELIPE CATUBIG**, *TODA, Brgy. Sabang*, Naic, Cavite**)**	• Reiterated that there will be a separate activity discussing the RAP; **(Ecosys RAP Team)**
• Inquired about the manpower that will be hired during the construction of the BCIB Project (**MR. JERRY N. CABUNTON,** *Kagawad, Sabang*, Naic, Cavite)	• Informed that there is a certain percentage of manpower that will be hired locally; • Priority of employment shall be given to the qualified local residents and will be prioritized during the hiring process. Adequate public information for jobs available to local residents in the affected areas will be posted to the Barangay. The project will comply to the conditions and requirements of the labor code of the Philippines **(MR. ESTERNON)**

Photo No. 1 **Mr. Zaldy Crooc**, a *TODA member* from Brgy. Sabang, asking for clarification regarding their status as a PAP of BCIB.

Photo No. 2 **Mr. Jerry N. Cabunton**, a *barangay official* from Brgy. Sabang, inquiring about the manpower that will be hired during the construction of the BCIB Project.

Photo No. 3 **Mr. Frederick Esternon**, *EIA Team Leader* from EcosysCorp, Inc. explaining that environmental baseline sampling will be conducted to gather the present condition of the area. This is for the project to monitor the possible impact of the project. Once the monitoring team detected any impact or changes to the actual condition of the area, the project will identify and install appropriate mitigating measures to ensure the environmental quality of the Project Affected Areas.

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting

Sabang Barangay Hall

Municipality of Naic, Cavite

21 January 2020, Tuesday, 10:00 A.M.

ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
1	FELIPE CATUBIG		✓		SABANG TODA			
2	MARY GRACE SANTOS-UTOD	✓		E-III	DPWH			
3	EDNA LYN D. NGO	✓		E-II	DPWH			
4	JUNNEL BAUTISTA		✓	E-II	DPWH			
5	RAPHAEL JOHN PEDROSO		✓	E-II	DPWH			
6	WINFRED LIWANAG II		✓	PROJ. COOR.	ARUP			
7	Rowena Dolorico	✓			BHW			
8	Flenita A. Lingcuran	✓		Senior	Marigsaff.	0995-145-4271		
9	Anacorita Mendoza	✓		Senior	masagana st			
10	RODOLFO GELERA		✓	TRES. TODA	SABANG TODA	09163178412		
11	Zaldy Crooc		✓	Pres. TODA	Pulo I			
12	Raul H. Catubig		✓	Brgy Admin	PWD	0916950134		
13								
14								
15								

EcosysCorp, Inc.

Representatives from LGUs, BLGUs, DOTR, PNR, JDT, and ADB

LGUs

City/Municipality	Name	Designation/Title
Sabang Naic		

BLGUs

Barangay	Name	Designation/Title
SABANG	CERALYN ROLLON	BHW
SABANG	MARILYN ANTAZO	BHW
~~SABANG~~	~~ELENITA LINGCURAN~~	~~BHW~~
~~SABANG~~	~~ANACORITA MENDOZA~~	~~BHW~~
SABANG	MYRA REMONOS	BHW
SABANG	CHRISTINE JOY LAGUAN	BHW
SABANG	EVELYN ARROGANTE	BHW
SABANG	ROBLES, RANDEL ROSS S.	AKP / B.A.D.A.C
Sabang	Daizon King R. Mobac	Kagawad
Sabang	JERRY N. CABUNTO	KAGAWAD
SABANG	HEIDI E. MANALO	Kagawad
Sabang	AVEGAIL C. CATUBIG	Pres. PWD
SABANG	ANALYNN D. HINTOG	Kagawad
SABANG	Rogelio J. Anggon	Brgy. Kagawad
SABANG	JOSEFINA F. RICOR	HEALTH OFFICER
SABANG	DONATA SISRACON	VWAC

~~DOTR~~	
SABANG / JANELLE M. CALIBA	Sk Chairperson
SABANG Shemilyn M. Tu	Secretary
Donata Sisracon	VAWC Officer
ROLANDO MASAMBA	BPSO
Anna lisa C. Layosa	BHW
~~PNR~~	
FEMPI CATUBIG	[signature]
ALVIN JOSEPH I. CRUZ	PASTORAL COUNCIL/INTERFAITH
rouina M. Malomcom Sabang/BHW	[signature] BHW
~~IDT~~	
~~ADB~~	

Highlights of the 1st Barangay Consultation Meeting (BCM) Meeting
Environmental Impact Assessment (EIA)
Bataan-Cavite Interlink Bridge (BCIB) Project
Preliminary Engineering Design (PED)

Alas-Asin Barangay Hall,
Brgy. Alas-Asin, Mariveles, Bataan
22 January 2020, Wednesday, 1:00 P.M.

Presentation of the Project – ARUP/DPWH/EcosysCorp

EIA and Environmental Sampling Activities - EcosysCorp

Open Forum:

Presented in the matrices are the summary of issues, concerns, comments, and suggestions raised during the 1st BCM in Brgy. Alas-Asin, Mariveles. Responses to the queries are also included in the matrices.

Please see the attached attendance sheets for the list of participants during the meeting.

Summary of Issues, Concerns, Comments, and Suggestions Raised during the 1st SCM in Brgy. Alas-asin, Mariveles, (1/1)	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• Asked the specific areas and Sitio to be traverse by the BCIB Project (**MS. MARIA CRISTINA CANLAS,** *BESMO, Brgy. Alas-Asin*, Mariveles, Bataan)	• Consultations with the barangay captains are still ongoing to identify the specific area to be traversed by the BCIB Alignment; (**MR. FREDERICK ESTERNON**, *EIA Team Leader*, EcosysCorp, Inc.)
• Raised concern regarding the pollution that will be produced during the construction of the BCIB Alignment; • Asked who will be responsible in cleaning the pollutants generated during and after the construction (**MS. CANLAS)**	• Based on the presented material, we will be gathering noise and air quality prior, during, and after the project has been constructed; • **E**nvironmental baseline sampling will be conducted to gather the present condition of the area. This is for the project to monitor the possible impact of the project. Once the monitoring team detected any impact or changes to the actual condition of the area, the project will identify and install appropriate mitigating measures to ensure the environmental quality of the Project Affected Areas; • An Environmental Compliance Certificate (ECC) is the product of these meetings which will serve as a planning tool supervised by the DPWH; • The ECC conditions will be followed during the duration of the BCIB Project **(MR. ESTERNON)**
• Asked if there will be toll gates (**MR. POCHA BALMES,** *Pastor, Brgy. Alas-Asin*, Mariveles, Bataan)	• As of this moment, there are no toll gates **(MR. ESTERNON)**

Photo No. 1 **Ms. Maria Canlas,** *BESMO* of Brgy. Alas-Asin, raising concern regarding the pollution that will be produced during construction of the BCIB Project.

Photo No. 2 **Mr. Pocha Balmes**, a *pastor* from Brgy. Alas-Asin, asks if the BCIB Project will have toll gates.

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting

Alas-Asin Barangay Hall

Municipality of Mariveles, Bataan

22 January 2020, Wednesday, 1:00 P.M.

ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
1	CHRISTINE JOY SANCHEZ	O		TEACHER	DEPED	09772085458		
2	ALECA N. MEDINA	O		TEACHER	DEPED			
3	NESTOR M. CUNANAN		O	CHIEF OF STAFF		09394281633		
4	Rolbel Dave L. Doynay		O	BESMO Clerk		09359679705		
5	MARIA CRISTINA B. CANLAS	O		BESMO	LGU - Alasasin	0949-378-2711		
6	Jonna T. Reyes	O		BADAC	Alasasin	0910-9047854	jonnareyes04@yahoo.com	
7	Cherry D. Abuyo	O		Brgy Kagawad	Alasasin	09192378583		
8	Amalia V. Nieto	O		BCPC Clerk	alasasin	09084767888		
9	Noralina R. alvarez	O		Brgy. Utility	alasasin			
10	ARNOLD PURIO		/	Utility	A			
11	Elmer P Valdez			BPSO Clerk	Alasasin			
12	EFREN C. AZORES		/	INFRA	ALAS ASIN	09494326789		
13	DEANNE IRISH A. TENORIO	F		SK CHAIRPERSON	alasasin	09453247362		
14	CRISTINA C. REYES			PRESIDENT	OFW ASS.	09105044424		
15	ROGER P. Panganiban		/	Utility		094754		

EcosysCorp, Inc.

PARDS - pisaster; BDRRM - ...
BADAC - Progs Anti; BCPC - children; BESMO - Envi.; CBFM - Forest

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting

Alas-Asin Barangay Hall

Municipality of Mariveles, Bataan

22 January 2020, Wednesday, 1:00 P.M.

ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
16	Fely E. Cagungao	O		Homeowner	ERNAI / Eloord	09125117443		
17	RALPH SEGARRA		O	EMHC	STO. NIÑO PARKH	09098774641		
18	Horacito R. Coalumbiel			Kagawad		09482586434		
19	REMMEL R. ARCEFAL		O	KAGAWAD	ALASASIN	09118751384		
20	Galcosin Reyes			Property Custo				
21	CORNELIO V. Pineda		O	BRGY. ELECTRICIAN	ALAS-ASIN	09774152393		
22	Ricardo C. Villagracia		O	Pres. CBFM	Alasasin	09100358486		
23	Gina M. Villagracia	O		Ref. CBFM	Alasasin	09641638584		
24	MARIA AURORA LLANTO	O		POPCOM	ALASASIN	09468968833	ou_llanto@y.c	
25	Roberto M Venturina				KAGAWAD	09281952'2'		
26	Pucha Palmes, OSU		O	Parish Priest	Parish Rd.			
27	Gemma A. Verini	O		Admin. Clerk	Funk	09473712941		
28	Wenie Gu A. Panganiban	O		DCW- Main	Alasasin	09216055830		
29	MARRIZA M. JUSTINIANO	/		DCW - Bakery	Alasasin	09705384480		
30	ROBERTO M. ARCEFAL SR.			P. BARANGAY	LGU	09150505678		

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting

Alas-Asin Barangay Hall

Municipality of Mariveles, Bataan

22 January 2020, Wednesday, 1:00 P.M.

ATTENDANCE SHEET

No.	Name	Gender		Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
		F	M					
31	Marilou I. Ducusin			P. Leader	4 Ps	09661975844		
32	Michael D. Fernandez			AC-Principal	Marina Bay ES	09902705969		
33	TOMASITO R. CARINO		✓	B Rsgl. Kagawad	Alasasin	0946-6145725		
34	Celestina D. Aguilar			OFW	Dama de Noche St.	09505078986		
35	ANALIZ E. PERAN				PARDSS F1	09469725684		
36	ELSA V. RUBIC	✓			PARDSS F1	0910 406134		
37	Marfina K. Borg			DCW-1	DAY CARE	09079703470		
38	Coralie R. Pagorillo	✓		BHW-DCCS	Alasas in Mariveles	0958-2850 6079		
39	ANTONIO R. LUTAZO			BRGY KAGAWAD				
40	W WINDA P. NAVARROSA	F		BHW		09308132930		
41	Marlinda A. Uno	✓		BHW		09124438009		
42	Marilyn G. Asuncion	✓			GPTA/BAPA	09308709388		
43	EDGARDO R. ARRIESGADO		✓	LUPON M.	JMC COMPOUND	09090989767		
44	MERCEDES T. SALANGA	F		DCW	MANGGAHAN DCC	09464868092		
45	SHIRLEY P. YULO	F		DCW	Dama nene			

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting

Alas-Asin Barangay Hall

Municipality of Mariveles, Bataan

22 January 2020, Wednesday, 1:00 P.M.

ATTENDANCE SHEET

No.	Name	Gender		Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
		F	M					
46	GINA V. GREGORIO	✓		MIDWIFE	LGU	0950 1473012		
47	Irenelyn A. Tiu	✓		BHW		09090990272		
48	MA. VICTORIA V. TUMABOW	✓		PWD PRESIDENT	PWD	09299751179		
49	GILBERTO V. PABLO		✓	SAMMAI		0916571392		
50	CRIS Urod	✓		Engr. III	DPWH			
51								
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EcosysCorp, Inc.

Highlights of the 1st Barangay Consultation Meeting (BCM) Meeting
Environmental Impact Assessment (EIA)
Bataan-Cavite Interlink Bridge (BCIB) Project
Preliminary Engineering Design (PED)

Mt. View Barangay Hall,
Brgy. Mt. View, Mariveles, Bataan
22 January 2020, Wednesday, 9:00 A.M.

Presentation of the Project – ARUP

EIA and Environmental Sampling – Ecosys Corp

Open Forum:

Presented in the matrices are the summary of issues, concerns, comments, and suggestions raised during the 1st BCM in Brgy. Mt. View, Mariveles. Responses to the queries are also included in the matrices.

Please see the attached attendance sheets for the list of participants during the meeting.

Summary of Issues, Concerns, Comments, and Suggestions Raised during the 1st SCM in Brgy. Mt. View, Mariveles, (1/2)	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• Asked if there will be an exit to Corregidor on the BCIB Alignment; • Raised concern that a construction of an exit point will result to repercussions on Corregidor Island (**MR. AURELIO TABORNAL,** *Puyat Flooring, Brgy. Mt. View*, Mariveles, Bataan)	• Based on the design, there will be no exit point in Corregidor to avoid further impact in the small island (**MR. FREDERICK ESTERNON**, *EIA Team Leader*, EcosysCorp, Inc.)
• Asked when to expect the development and traffic from the Cavite and Bataan entry points **(MR. TABORNAL)**	• We are still in the Preliminary Engineering Design but based on the timeline, by 2027 there will be apparent changes along the entry and exit points **(DPWH)**
• Raised concern regarding the pollution that the BCIB Project will produce upon construction and operation; • Confirmed if the rumors that fisherfolks would not be allowed to go near the bridge post (**MR. SOTERO DOCULAN,** *Fisherfolk, Brgy. Alas-Asin*, Mariveles, Bataan)	• Based on the presented material, we will be gathering noise and air quality prior, during, and after the project has been constructed; • Environmental baseline sampling will be conducted to gather the present condition of the area. This is for the project to monitor the possible impact of the project. Once the monitoring team detected any impact or changes to the actual condition of the area, the project will identify and install appropriate mitigating measures to ensure the environmental quality of the Project Affected Areas **(MR. ESTERNON)**
• Asked if the fisherfolks could still use the bridge incase their boats break down; • Shared that fisherfolks frequently stays in Corregidor Island when their boats break down (**MR. JOSE CONSON** *Fisherman Brgy. Alas-Asin*, Mariveles, Bataan	• There will be no stairs to climb the post of the bridge; • It will be allowed as long as you have a safe mode of transportation; • Walking and cycling are not allowed on the bridge **(MR. ESTERNON)** • It can be considered in the design and can be written as a suggestion in the Perception Survey **(MS. CRIS UTOD,** *Engineer III*, Department of Public Works and Highways)
• Reiterated **Mr. Tabornal's** point that constructing an entry and exit ramp will result to repurcussions on Corregidor ISLAND	

(MR. ESTERNON)	

Summary of Issues, Concerns, Comments, and Suggestions Raised during the 1st SCM in Brgy. Mt. View, Mariveles, (2/2)	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• Raised Mr. Doculan's unanswered question regarding the Right-of-Way (ROW) of fisherfolks along the Bridge Structure (**MR. BONIFACIO VIRTUOSO,** *Fisherfolk, Brgy. Alas-Asin,* Mariveles, Bataan)	• There will be a separate meeting that will tackle the Right-of-Way Action Plan (RAP) where all fisherfolks in Alas-Asin will be invited; • This meeting will only tackle the Environmental Impact Assessment (EIA) as well as the Perception Survey of the stakeholders **(MR. ESTERNON)**

Photo No. 1 **Mr. Sotero Doculan**, BFARMC from Brgy. Mt. View, raising concerns regarding the pollution that the BCIB Project will produce upon construction and operation.

Photo No. 2 **Mr. Jose Conson,** a *fisherfolk* from Brgy. Mt. View, asks if fishermen can use the bridge incase their boats break down.

Photo No. 3 **Mr. BONIFACIO VIRTUOSO**, *a fisherfolk from Brgy. Mt. View,* raising question regarding the Right-of-Way (ROW) of fisherfolks along the Bridge Structure.

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting
Mt. View Barangay Hall
Municipality of Mariveles, Bataan
22 January 2020, Wednesday, 9:00 A.M.

ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
1	MARY RYE ANN ISO CABAHUG	✓		Youth Sector	MT. VIEW	09266714482		
2	MARYNELLE ISO CABAHUG			Youth Sector	MT-VIEW	0997-180-5553		
3	CRISTOPHER ANDES VERGARA			Youth Sector	ARC-OVEA	09281974986		
4	FRANCIS NARANJA			YOUTH SECTOR	MT VIEW	09709557554		
5	JANETT D. AGAO	✓		HOME HONORS ASC	SAMARIA	09959727120		
6	MARLE L. MAPLA	✓		HOMEOWNERS ASSOCIATION	SAMARIA	09276151725		
7	SOLIOAD K. CENIZAL	✓		TEACHER-ALS	MT VIEW	09336926517		
8	Frederick Esternon		✓	EIA Specialist	EcosysCorp	09175326722		
(9)	JOSE CORSOM		✓	mangingisda		09564158293		
10	Bonifacio Virtuoso		✓	mangingisda				
11	Angelyn B. Opaton	✓		ALS	Mt. View	09276 856812		
12	REY MENDOZA		✓	SAMMAKAUSIRAD	FAMILY RESORT	0917-8997337		
(13)	Sofefo D. Doculan	✓	–	BFARMC		09106176487		
14	ANANIAS P. MIGUEL		·	home owner	Mt. View	09493104927		
15	CECILIO A. LUNGCAY		✓	PRES	MT VIEW	0905[illegible]		

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting
Mt. View Barangay Hall
Municipality of Mariveles, Bataan
22 January 2020, Wednesday, 9:00 A.M.

ATTENDANCE SHEET

IPIF ARUP

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
16	IRENEO G. BARLIS		✓	SENIOR CITIZEN	Villa Carmen	–	–	
17	ELIAS S. DECROSARIO		✓		MT. VIEW VILL			
18	Connie Balansay	✓		PWD	Mt. View			
19	CIRILO CABORALES		✓	PRINCIPAL	MVES			
20	LEONORA B. MORANO	✓		PRESIDENT	KALIPI- MT.VIEW	09667563283		
21	Roselle Alibar	✓		kalipi - Secretary	Mt. view	09399541409		
22	FERDINAND J. GUTIERREZ		✓	BARANGAY	MT-VIEW	09176253745		
23	LEONCIO A. LUNGCAY		✓	P.B.	MT. VIEW	0917624[illegible]		
24	Rheda Cogniat	✓		Brgy. Clerk	mt. View	09672664798		
25	ACMARIO C. QUITONG		✓	Pres/KAGAUKD	MT.V.	09176255146		
26	Dominador Mahayag				MT.V.			
27	RHOEL H. LAHUTA			PPC / V.P	STA. GEMMA PARISH	09399311913		
28	Chris Wtud	✓		E-III	DPWH			
29								
30								

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Barangay Consultation/ Information, Education, Communication (IEC) Meeting

Mt. View Barangay Hall

Municipality of Mariveles, Bataan

22 January 2020, Wednesday, 9:00 A.M.

ATTENDANCE SHEET

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
31	Alma Julia F. Cuevas	✓		Brgy Kagawad				
32	Aurelio Taborial		✓	Plant Mgr	Puyat Flooring	09498817444	altaborial@apflooring	
33	Mara C. Reyna	✓		HR Supervisor	Puyat Flooring		mareyna@apfsystems.com	
34	Aida Catalina E. Avila		✓	BHW		09123085268		
35	FIDEL F. MURILLO		✓	BRGY. KAGAWAD		09083007168		
36	Nelfa M. Ramos			OPTA MVES		09081601609		
37	EDELBERTO ROCLE		✓	BPC VICE PRES/SOS	MT. VIEW Garden Heights	09952729187	edelberto.rocle@sosphilippines.org	
38								
39								
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Public Scoping
Bataan-Cavite Interlink Bridge
Preliminary Engineering Design (PED)

Venue:	**Naic Municipal Hall, Brgy. Ibayo Silangan, Naic, Cavite**
Date:	**07 February 2020 (Monday)**
Time:	**8:30 AM**

ATTENDEES			
SECTORS REPRESENTED	**TOTAL NUMBER OF MALES**	**TOTAL NUMBER OF FEMALES**	**TOTAL NUMBER OF PARTICIPANTS**
• Municipal Fisheries and Aquatic Resources Management Council (MFARMC) – 3 • Municipal Engineering Office – 1 • Municipal Assessor's Office - 1 • Municipal Agriculture Office - 1 • Municipal Planning and Development Office – 1 • Municipal Environment and Natural Resources Office – 1 • Barangay Chairpersons – 2 • Provincial Government- Environment and Natural Resources Officer – 1 • Provincial Environment and Natural Resources Officer (PENRO) – 1 • Manila Bay Coordinating Council – 1 • Municipal Health Office - 1 • Philippine Coast Guard – 2 • Religious Group – 1 • Maritime Group - 1 • DepEd - 1 • DPWH – 2 • ARUP - 2 • EcosysCorp, Inc. - 8	21	11	31

PROCEEDINGS	
Introduction	The EIA Team Lead introduced the team and provided the agenda of the meeting. He also discussed brief results of IEC meetings both from Municipal and Barangay Level activities. He mentioned that there were series of consultations done with the different stakeholder groups present in the project areas all yielded positive results for the project. There was no objection to the project expressed by any stakeholder. Concerned LGUs, from barangay up to municipal/city

	levels, even expressed their support, adding that the project can bring further developments to their respective localities. There were clarifications raised and concerns expressed by some stakeholders, especially with regard to the project's potential environmental impacts and how these may affect residents/people. The EIA Team was able to decisively address these concerns through careful explanation of the EIA process and how impacts and corresponding mitigating measures will be identified, dispelling whatever concerns stakeholders may have regarding the project's potential impacts. The EIA Team also included these concerns in the EMP. He also provided brief project description and the need for baseline information for the study.
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• **MS. ANNABELLE CAYABYAB, *HEAD*, CAVITE PROVINCIAL GOVERNMENT – ENVIRONMENT AND NATURAL RESOURCES OFFICE (PG-ENRO)** said that NAMRIA already conducted the research mapping last year on confirming several habitats like seagrass and mangrove areas in Manila Bay to be used as baseline data. More so, she shared that the UP Marine Science Institute also has several studies done on Manila Bay that can be used as reference for the project's baseline data. She suggested to include a vulnerability assessment of coastal erosion in Naic and indicate the Manila Bay source and sink.	• **DR. RUBEN ESTUDILLO**, ***EIA: MARINE SAMPLING TEAM LEADER*, ECOSYSCORP, INC.)** said that they already gathered secondary data from the UP Marine Science Institute but he did not come across the research mapping conducted by NAMRIA.
• **MS. HERRERA** asked if there are permits or clearance that need to be accomplished before conducting the marine surveys	• **MR. JERSON DETAZA, Coast Guard Substation Naic, Cavite**, answered that coordination works with the Office of the Coast Guard, including submission of letter of request to conduct the marine study and regarding schedules and tasks, must be done prior to any activities of the marine sampling team.
• **MS. HERRERA** affirmed that the team will be coordinating with the Naic Coast Guard regarding the activities and surveys to be done by the marine sampling team.	
• A **Representative from PENRO** suggested to update PG-ENRO regarding the BCIB Project activities, which potentially affect the Manila Bay. Moreover, to properly disseminate information to the whole province so that there will be unified movement and support towards the Project.	• **MS. HERRERA** agreed and noted the suggestion.

Photo 1. DR. RUBEN ESTUDILLO*, EIA: Marine Sampling Team Leader*, discussing the marine activities to be conducted for the BCIB Project

Photo 2. MS. ANNABELLE HERRERA, Project Director for the BCIB Project, Inc., asking if there are permits or clearance that need to be accomplished before conducting marine surveys.

Photo 3. A representative from PENRO suggesting to update the PENRO regarding the BCIB Project activities that can potentially have an effect on the Manila Bay.

Public Scoping
Bataan-Cavite Interlink Bridge
Preliminary Engineering Design (PED)

Venue:	**Mariveles Municipal Hall, Roman Super Highway, Mariveles, Bataan**
Date:	**11February 2020 (Tuesday)**
Time:	**10:00 AM**

ATTENDEES			
SECTORS REPRESENTED	**TOTAL NUMBER OF MALES**	**TOTAL NUMBER OF FEMALES**	**TOTAL NUMBER OF PARTICIPANTS**
• Municipal Administrator– 1 • Municipal Fisheries and Aquatic Resources Management Council (MFARMC) – 2 • Municipal Engineering Office – 2 • Municipal Assessor's Office - 2 • Municipal Agriculture Office - 1 • Municipal Planning and Development Office – 1 • Municipal Environment and Natural Resources Office – 1 • Barangay Chairperson – 3 • Philippine Coast Guard – 3 • Administrative Staff - 2 • DPWH – 2 • ARUP – 1 • EcosysCorp, Inc. - 5	21	5	26

PROCEEDINGS	
Introduction	The EIA Team Lead introduced the team and provided the agenda of the meeting. He also discussed brief results of IEC meetings both from Municipal and Barangay Level activities. He mentioned that there were series of consultations done with the different stakeholder groups present in the project areas all yielded positive results for the project. There was no objection to the project expressed by any stakeholder. Concerned LGUs, from barangay up to municipal/city levels, even expressed their support, adding that the project can bring further developments to their respective localities. There were clarifications raised and concerns expressed by some stakeholders, especially with regard to the project's potential environmental impacts and how these may

	affect residents/people. The EIA Team was able to decisively address these concerns through careful explanation of the EIA process and how impacts and corresponding mitigating measures will be identified, dispelling whatever concerns stakeholders may have regarding the project's potential impacts. The EIA Team also included these concerns in the EMP. He also provided brief project description and the need for baseline information for the study.
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
MR. ANGEL PELIGLORIO, JR of *Municipal Administrator,* Mariveles, Bataan, inquired about the schedules of the marine sampling	• **DR. RUBEN ESTUDILLO,** *Marine Sampling: EIA Team Leader, EcosysCorp, Inc***.,** answered that near shore marine sampling will be conducted on 12 February 2020 while the main trunk marine sampling will be done on 13 February 2020. The survey will start at Brgy. Alas-asin towards the Cavite side. If the weather is good, the team will be diving in Corregidor since it will be difficult to conduct samplings during the afternoon because it is already Amihan season. Additionally, he said that boats will be rented and that a bigger one is preferred
• **ADMIN PELIGLORIO JR** explained that the question regarding the schedules is for the sake of transparency. He suggested to utilize the resources from their municipality when conducting the surveys and asked if it is possible for the team to rent the locals' boats.	• **DR. RUBEN ESTUDILLO** said that the offer is highly appreciated and confirmed that the team will be utilizing the resources of the municipality.
• **ADMIN PELIGLORIO JR** agreed to get the marine sampling team's contact details and will proceed with coordination	• **MR. FREDERICK J. ESTERNON** affirmed the Administrator's statement and added that the meeting is conducted to ask for participation from the locals and the LGU.
• **DR. ESTUDILLO** asked if there are marine sanctuaries in the municipality.	• **MR. FELIX DE LEON, ADMINISTRATIVE STAFF, MARIVELES, BATAAN,** said that there are no marine sanctuaries but there are artificial reefs near the pier in Brgy. Alas-Asin placed almost 10 years ago, which are made of concrete modules and nylon string. He also added that there is a possibility that the nylon strings have already been cut because it was installed a long time ago.

Summary of Issues, Concerns, Comments, and Suggestions Raised during the 1st Marine Sampling and Other Environmental Sampling Consultation Meeting in Mariveles, Bataan (2/4)	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**

• **MR. FREDERICK ESTERNON**, *EIA Team Leader*, EcosysCorp, Inc. asked about the possibility of knowing the location of the artificial reefs.	• **MR. FELIX DE LEON, Administrative Staff, Mariveles, Bataan,** said that the consultant team may request information from the Bureau of Fisheries Regional Office, which funded the installation of said artificial reefs.
• **MR. ANGEL PELIGLORIO JR,** *Municipal Administrator,* inquired if there any coral formations along the BCIB Alignment.	• **MR. DE LEON** answered that there are coral formations in Brgy, Alas-asin, which can be seen if the team would dive.
• **DR. RUBEN ESTUDILLO,** *Marine Sampling: EIA Team Leader, EcosysCorp, Inc***,** asked for the clarity of water within the municipality during the Amihan season.	• **MR. DE LEON** answered that it is best to dive during March and April. He also added that seaweeds can be seen in the waters of Brgy. Alas-asin when diving.
• **MS. ANNABELLE HERRERA,** *Project Director*, EcosysCorp, Inc.), asked if there are permits or clearancs that need to be accomplished before conducting marine surveys.	• **MR. DE LEON** answered that a letter of request was submitted to the Corregidor Foundation and an endorsement letter was already given. • **MR. DE LEON** added that it is important to ask for a letter of request from the office of the coast guard. • **MR. AMBANG, *MARIVELES COAST GUARD SUBSTATION,*** said that the boat that shall be used for the surveys must first be registered to the coast guards based on the boat's category and purpose. • **Mr. de Leon** said that the marine sampling team must update the coast guard regarding their schedule as well as the boats that will be used.
• **MS. MARIA CRISTINA**, *Municipal Agriculturist, Mariveles*, Bataan, asked the number of boats that will be used during the marine sampling.	• **DR. ESTUDILLO** said that three boats will be used for near-shore activities while two larger boats will be used for off-shore surveys.
• **DR. ESTUDILLO** asked with whom to coordinate regarding boat rentals.	• **MR. FERDINAND BANCUA**, *Head-Municipal Fisheries and Aquatic Resources Management Council MFARMC*, Mariveles, Bataan, explained the types of boat that can be used near-shore and offshore. He also added that **Mr. Miguel de Loyola** can be asked for coordination regarding boat rentals.
• **MS. HERRERA** shared that the Environmental Impact Statement (EIS) must be finished by March 2020 so that by May 2020, the BCIB Project can proceed to the Detailed Engineering Design (DED).	
• **DR. ESTUDILLO** assured that everything discussed during the meeting shall be considered in the design.	
• **DR. ESTUDILLO** asked if the barangay local government unit (BLGUs) with the jurisdiction over Corregidor was already informed.	• **MR. ESTERNON** answered that Barangay 51B was already informed as well as the Corregidor Foundation. Mire, the Corregidor Foundation has already given its endorsement letter.

Summary of Issues, Concerns, Comments, and Suggestions Raised during the 1st Marine Sampling and Other Environmental Sampling Consultation Meeting in Mariveles, Bataan (3/4)	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• **MR. AMBANG** informed the marine sampling team that they need to indicate their route as well as the activities that will be conducted, such as scuba diving, in their letter for the Coast Guard.	
• **DR. ESTUDILLO** shared that the meeting also served as a coordination meeting as well as a courtesy call.	• **MR. DE LEON** said that the marine sampling team can coordinate with the Fisheries and Aquatic Resources Management Council (FARMC) should baseline data be needed.
• **DR. ESTUDILLO** asked if the site to be traversed by the BCIB Project in Mt. View is accessible by car.	• **HON. LEONCIO LUNGCAY,** *Chairman*, Brgy. Mt. View, Mariveles, Bataan said that there is a 100-meter walk before arriving to the site
• **MR. BANCUA** asked how the BCIB Project can help the fisherfolks because they will surely be affected by it.	• **Ms. Herrera** answered that aside from the Environmental Impact Assessment (EIA) study, the Right-of-Way Action Plan (RAP) study will also be a part of the proces,s which focuses on the societal impact of the BCIB Project. While the EIA focuses on the environmental aspect and the people's perception, RAP studies will tackle the entitlement and the rights of the Project Affected Persons (PAPs). Interviews will be conducted for the RAP study as well as meetings in the community level where the PAPs, such as the fisherfolks, will be invited to inform them of their rights and compensations.
• **MR. ALFREDO GABIA.,** *Consultant-Municipal Agriculture,* Mariveles, Bataan stated the importance of the conduct of public consultations for the BCIB Project; • He shared that there were no public consultations during the construction of other previous projects in the municipality; • He expressed his hope that all concerns will be raised and that the PAPs shall be justly compensated	• **MS. HERRERA** assured that the Asian Development Bank (ADB), the foreign counterpart of the government that will fund the project, would not allow the project to proceed without RAP and an Environmental Compliance Certificate (ECC). She also said that it is significant part of the social safeguards and meetings will first be with the LGUs followed by the meetings at the barangay level.
• **ADMIN PELIGLORIO** asked about the topic for the next meeting.	• **MS. HERRERA** answered that the next meeting will be at the barangay level meeting where potential PAPs shall be invited and the RAP will further be explained
• **ADMIN PELIGLORIO** raised his concerns that there is a possibility that the Roman Super Highway will be congested upon the operation of the BCIB. • He shared that road-widening is currently happening along the highway, from four lanes to six lanes, but the road widening was planned for the current traffic flow in the	• **MS. HERRERA** said that the traffic component is a part of the BCIB's engineering feasibility study and a traffic feasibility study is already ongoing. Traffic is also being studied in the EIA but only its environmental impact. • A **REPRESENTATIVE OF ARUP** said that traffic

municipality without the BCIB. • He also added that that Roman Super Highway could possibly have an EDSA-like traffic after 10 years.	projection is part of the study.

Summary of Issues, Concerns, Comments, and Suggestions Raised during the 1st Marine Sampling and Other Environmental Sampling Consultation Meeting in Mariveles, Bataan (4/4)	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• **ADMIN PELIGLORIO** raised his concerns regarding the possibility that Mariveles is not yet ready for the impact of the BCIB Project. • He suggested that if transportation is already being developed, all related components should have supplemental developments as well.	• **MS. HERRERA** suggested that since the concern was raised on the municipal council, then to the Provincial Development Council (PDC), then finally to the Provincial Development Council (RDC); reshaping of land use and planning of other surrounding municipalities can simultaneously be done in accordance with new developments. • She also said that it is good that the concern was raised and heard by the Department of Public Works and Highways (DPWH).
• **ADMIN PELIGLORIO** hoped that supplemental projects will be given to the municipality as well as other surrounding municipalities.	• **DR. ESTUDILLO** said that the EIA is a study involving the anticipation of what will happen in the next few years and all concerns will be included in the EIS and RAP recommendations but it will only be actualized through DPWH and ARUP. • A **representative from DPWH** confirmed that there will be road openings and expansions in the future because BCIB is a big project with a big budget.

Photo 1. MR. ANGEL PELIGLORIO, Municipal Administrator of Mariveles, Bataan, inquiring about the schedules of the marine sampling.

Photo 2. MR. FELIX DE LEON, Administrative Staff from Mariveles LGU, sharing that there are no marine sanctuaries but there are artificial reefs near the pier in Brgy. Alas-Asin.

Photo 3. MS. MARIA CRISTINA, Municipal Agriculturist of Mariveles, Bataan, asking the number of boats that will be used during the marine sampling.

Photo 4. MR. FERDINAND BANCUA, Head-Municipal Fisheries and Aquatic Resources Management Council from Mariveles LGU asking how can the BCIB Project help the fisherfolks.

Bataan-Cavite Interlink Bridge (BCIB) Project

Public Scoping and Coordination Meeting for Environmental Sampling

Naic Function Room, Municipal Hall Building, Barangay Ibayo Silangan

Municipality of Naic, Cavite

07 February 2020, Friday, 8:30 A.M.

ATTENDANCE SHEET

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
13	Narcisa A. Mariano	✓		Chair-14FARMC	M-FARMC	09420103841		N. Mariano
14	CPO JERSON A. DE TAZA PCG		✓		PCG			[signature]
15	SN2 BONIFACIO G. DE LUNA		✓		PCG	09953175492		[signature]
16	ROMEO Q. MIRANDA		✓	V. Chair MFARMC	Freedom Ville	09555401284		[signature]
17	ROGELIO E. MENDOZA		✓		"			[signature]
18	Anabelle L. Cuyabyab	✓		PG-ENRO	PG-ENRO	09778236695		[signature]
19	Esternon, Fredericks		✓	Head-Environment	Arup/EcosysCorp	09175326722		[signature]
20	Marina F. Paluton			Brgy Capt	Tim. Cor	09950787010		[signature]
21	Angel Salcedo	✓		Arup				[signature]
22	EDNA LYN NGO	✓		DPWH-EII				[signature]
23	JUNNEL BAUTISTA		✓	DPWH-EII				[signature]
24	WINFRED UMANAC II		✓	SOUTH ARUP				[signature]
25	Juddine A. Faba FABRO	✓		PENRO				[signature]

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Public Scoping and Coordination Meeting for Environmental Sampling

Naic Function Room, Municipal Hall Building, Barangay Ibayo Silangan
Municipality of Naic, Cavite

07 February 2020, Friday, 8:30 A.M.

ATTENDANCE SHEET

No.	Name	Gender		Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
		F	M					
1	BRYAN P. ESTUDILLO	F	✓	TECH. SUPPORT	ECOSYS Q.C.	09339563835		
2	Virgilio S. Paldalantao	F	✓	Consultant	Ecosys Corp.	09195180375		
3	NOEL C. BARUT	F	✓	[illegible]	Ecosys Corp.	09393908999		
4	EDWIN BRIGANTA	F	✓	Consultant	Ecosys Corp	09261246352		
5	JAYSON OBLEN	F	✓	DIVE SUPPORT	ECOSYS CORP.	09778371919		
6	Glenn Dumalag	F	✓	DIVE SUPPORT	ECOSYS CORP	09127592332		
7	Ruben Estudillo	F	✓	Consultant	ECOSYS CORP	09163551264		
8	Kristine Ann Gillado	F	M	Consultant	"	09169261033		
9	Antonette A. Digno	✓	M	STAFF	SB Member Staff	09178694460		
10	Pamela A. Cordin	✓	M	Agri II	DA-LGU	507 0553		
11	Ariel M. Fernandez	F	✓	AT	DA-LGU	507 0553		
12	EVA P. PANGILINAN	✓	M	MENRO	LGU	09178324204		

Bataan-Cavite Interlink Bridge (BCIB) Project

Public Scoping and Coordination Meeting for Environmental Sampling

Naic Function Room, Municipal Hall Building, Barangay Ibayo Silangan

Municipality of Naic, Cavite

07 February 2020, Friday, 8:30 A.M.

ATTENDANCE SHEET

No.	Name	Gender		Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
		F	M					
1	NOEL H. CATUBIG	F	M	BRGY. CHAIRMAN	SAMONG	09178081764		
2		F	M					
3		F	M					
4		F	M					
5		F	M					
6		F	M					
7		F	M					
8		F	M					
9		F	M					
10		F	M					
11		F	M					
12		F	M					

Bataan-Cavite Interlink Bridge (BCIB) Project

Public Scoping and Coordination Meeting for Environmental Sampling Mariveles Municipal Conference Room, Municipal Hall Building, Roman Super Highway, Municipality of Mariveles, Bataan

11 February 2020, Tuesday, 9:00 A.M.

ATTENDANCE SHEET

No.	Name	Gender F	Gender M	Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
1	Ferdinand Banca		✓	MFARMC	Mariveles	09491331858	[illegible]	[signature]
2	PO2 JAINAL AMBANG PCG		✓	MEPO-PCG	MEPO-PCG	0997 641 6190	ajpilgrim_pcg08@yahoo.com	[signature]
3	SN2 Al-Yazar Muyong PCG		✓	member/oper	CGSS MARIVELES	09480174425		[signature]
4	Maria Cristina V. Bagsic	✓		MAO	D.A. Staff	09388281838		[signature]
5	PLT FERNANDO A. DEL MUNDO JR		✓	DEPUTY, STN CHIEF 303rd	MMFSTA	09175406586		[signature]
6	ALFREDO V. GABIOLA JR.			CONSULTANT	MARIVELES	09507254889	gabiola_jhune@yahoo.com	[signature]
7	ROMMEL R. ARCENAL		✓	BRGY KAGAWAD	ALAS-ASIN	09195771603		[signature]
8	Felix S. de Leon		✓	Admin Staff	Admin.	09468839245	felixdeleons@gmail.com	[signature]
9	MIGUEL DE LOYOLA			ADMIN STAFF	ADMIN	09095065525		[signature]
10	DANILO C. ABREIRA / ESCAÑILLO	✓		Spv. Agri. Program Coor.	OPA/Prov. Agri.	09207718760		[signature]
11	ED R. ESCAÑILLO		✓	CONSULTANT	ADMIN.	09494008765		[signature]
12	Ermito Z. de Asis JR.		✓	SB STAFF		09150657812		[signature]
13	LEONCIO A. LUNGCAY		✓	P.B	MT. VIEW	09176244417		[signature]

EcosysCorp, Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Public Scoping and Coordination Meeting for Environmental Sampling Mariveles Municipal Conference Room, Municipal Hall Building, Roman Super Highway, Municipality of Mariveles, Bataan

11 February 2020, Tuesday, 9:00 A.M.

ATTENDANCE SHEET

No.	Name	Gender		Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
		F	M					
1	George Imperial Jr.		✓	Admin Aide III	Mayor's Office	09178691891	imperialgeorge@gmail.com	
2	ELDIE ESCABILLO		✓	MENRO STAFF	MENRO	0930-178-10-30		
3	RESHELL CONCEPCION	✓		MENRO STAFF	MENRO	09123113890	reshellconcepcion@y-c	
4	Angel Y. Peligrino Jr.			Administrator	Admin	09194577564	angelpeligrinojr@gmail	
5	BHAL S ULIJAN		✓	VICE P. BSNAY	SISIMAN			
6	Cecilia A. Sandulan	✓		Secretary	Lucanin	09568491466		Sandulan
7	JUNE DEL ROSARIO	✓		Comm Officer	LGU Mariveles		june.delrosario@yahoo.com	
8								
9								
10								
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Bataan-Cavite Interlink Bridge (BCIB) Project

Public Scoping and Coordination Meeting for Environmental Sampling Mariveles Municipal Conference Room, Municipal Hall Building, Roman Super Highway, Municipality of Mariveles, Bataan

11 February 2020, Tuesday, 9:00 A.M.

ATTENDANCE SHEET

No.	Name	Gender		Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
		F	M					
1	JAMES ANTHONY IGNACIO		/	ENGINEER III	DPWH - MANILA	(02) 5 304 3621	ignacio.james_anthony@dpwh.gov.ph	
2	RAPHAEL JOHN PEDROSO		/	ENGINEER II	DPWH - MANILA		raphos12@gmail.com	
3	Angel Salcedo	/		EES	ARUP - ORTIGAS	09178099805	angel-frances.salcedo@arup.com	
4	~~ANGEL V. PELIGRINO JR.~~			~~ADMINISTRATOR~~				
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Bataan-Cavite Interlink Bridge (BCIB) Project

Public Scoping and Coordination Meeting for Environmental Sampling Mariveles Municipal Conference Room, Municipal Hall Building, Roman Super Highway, Municipality of Mariveles, Bataan

11 February 2020, Tuesday, 9:00 A.M.

ATTENDANCE SHEET

No.	Name	Gender		Designation / Title	Organization / Address	Contact No(s).	E-mail Address	Signature
		F	M					
1	EDWIN PREGANZA		✓	Consultant	Ecosys	09061214632	edwinpreganza@yahoo.com	
2	JAYSON OBIEN		✓	DIVER	ECOSYS	09778371919	obienjayson@gmail.com	
3	GLENN DUMALAOG		✓	DIVER	ECOSYS	09177592332	28glenndumalaog@gmail.com	
4	Virgilio S. Palpal-latac		✓	Consultant	ecosys	09195188377	virpalpal.latac@yahoo.com	
5	Ruben Getudillo		✓	Consultant	Ecosys	09162357744	ruben.getudillo@yahoo.com	
6	Annabelle N. Herrera	○		Consultant	Ecosys	09189016437	aherrera@ecosyscorp.com	
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IEC and Consultation Reports/ Documentation

DRAFT

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Presentation of the BCIB to the Municipal Government of Mariveles under Infrastructure Preparation and Innovation Facility (IPIF) Output 1 – Roads & Bridges, ADB Loan No. 3589-PHI

Date:	**Started:**	**Adjourned:**	**Venue:**
October 7, 2019	9:00AM	12:00NN	Conference Room, Mayor's Office, Mariveles Municipal Hall, Roman Superhighway, Mariveles, Bataan

Meeting Presider:

Arup

Meeting Attended by:

See **Appendix A – Attendance Sheet**

TOPIC	DISCUSSION	ACTION
1. **Introduction**	Atty. Jocelyn Castañeda (Mayor of Mariveles) introduced DPWH and Arup representatives to the group and noted key participants.	
2. **Arup Presentation**	Ms. Maria Catherine Rontos (Arup) introduced the project in the context of the IPIF programme, EIA definition and EIA process. Engr. Miguel Ramos (DPWH) gave a brief overview of the project. Engr. Winfred Liwanag (Arup) presented project information, project objectives, alignment options, artistic rendering, and projected timeframe. Ms. Angel Salcedo (Arup) presented preliminary identified environmental impacts. See **Appendix B – Presentation**	
3. **Discussion**	See **Appendix C – Detailed Transcription**	
3.1.	Mr. Oscar Delos Reyes (Knights of Colombus) commended the project and highlighted the need to consider the impacts to small-scale fisheries in Cabcaben, San Lorenzo Ruiz, and Lamao. Mr. Delos Reyes further asked if restrictions will be imposed in areas during construction; if construction will be undertaken by the Chinese; and if just compensation for informal settlers will be considered. Mr. Delos Reyes cautioned that the lack of public consultations in previous projects hindered their completion. Ms. Angel Salcedo (Environmental Engineer, Arup) responded that IEC is the start of the consultation process and all concerns will be integrated in the EIA. Baseline sampling will be conducted in the next days. A RAP will be included in the study. Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) added that all issues and concerns will be addressed in the public hearing.	Noted
3.2.	Atty. Jocelyn Castañeda (Mayor of Mariveles) asked about the source of funding of the project. Engr. Miguel Ramos (Engineer V, DPWH) said that the current study is funded by the ADB. There is no certainty for the next stages.	
3.3.	Ms. Arlene Nava (Mayor's Office) asked if settlement areas have been identified for people who would be resettled and if data on people who will likely be resettled is available.	

	Engr. Miguel Ramos (Engineer V, DPWH), areas for resettled people have not been identified since the number of affected people remains unknown. Their rights however, will be protected. Ms. Angel Salcedo (Environmental Engineer, Arup) added that they have a designated team to identify affected settlers along the alignment and consultations will be conducted with them.	
3.4.	Mr. Rey Sebastian (Mariveles Mayor's Consultant) remarked that the project presents disadvantages for Mariveles in terms of increasing traffic and waste in the locale, affecting fishermen, and displacing constituents. Mr. Sebastian also remarked that all advantages for Mariveles are mostly generalized. Arup will note all concerns.	Noted
3.5.	Ms. Alitt Fallore (President, Kababaihan Isang Tinig Association) expressed hope that settlers along the coastline relying on the sea for income will be resettled in locations that will still allow this form of dependence on the sea. Ms. Fallore further hopes for proposals on livelihoods that will be affected. Ms. Sheilette Untalan (Urban Development Specialist, Arup) explained that the bridge was designed to be high particularly to allow large vessels and fisheries to pass through. Livelihood impacts will be included in the socioeconomic survey and the RAP.	Noted
3.6.	Mr. Oscar Delos Reyes (Knights of Colombus) proposed for the alignment to be connected to the existing pier instead. Participants generally agreed that the proposed alignment will affect more people.	
3.7.	Mariveles Mayor's Consultant commended the project for convening consultations and hopes that public hearings with affected residents will be conducted and that negative and positive impacts will be presented. Ms. Angel Salcedo (Environmental Engineer, Arup) answered that perception surveys will be conducted in all affected barangays and a similar IEC activity will also be conducted with barangay representatives.	Noted
3.8.	Mr. Rolando Cruz (Administrator, Municipal Government of Mariveles) highlighted that the alignment will traverse transmission lines and suggested that the project coordinates with the NGCP to identify towers and secure permits. Arup noted the suggestion	Noted
3.9.	Dr. Gerald Sebastian (Municipal Health Officer, Government of Mariveles) asked if water lanes and impacts on traffic, peace and order, criminality and health have been considered; and for specific benefits of the project to Mariveles and Cavite. Dr. Sebastian also raised that traffic would be a problem, considering Cavite is a densely populated province. Engr. Miguel Ramos (Engineer V, DPWH-UPMO) noted that economic benefits will be studied. If economic benefits are not adequate, NEDA will not approve the project. Ms. Cristina Villaraza (Transport Planner, Arup) added that a traffic study will be included to identify congested areas and plan out diversion schemes.	Noted

3.10.	Mr. Domingo Pasaraba (Fisheries Sector Representative) expressed support for the project, though questioned how the project will ensure just resettlement for those affected. Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) said that a condition of an ECC is to form a Multi-Partite Monitoring team that would involve all sectors. The team will join DENR to monitor the project for impacts.	
3.11.	Mr. Oscar Delos Reyes (Knights of Colombus) shared that an ECC has been granted by the DENR prior to public consultations in several instances. Mr. Delos Reyes hopes that the study would be thorough enough to avoid corruption issues Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) mentioned that the study will go through the proper process of the DENR and will conduct consultations.	Noted
3.12.	Mr. Manny Molina (Area Inspector, Engineering Department) shared that the municipality has experienced problems with adjusting construction specifications to a substandard level in DPWH projects. Mr. Molina hopes that stricter monitoring of inspectors and certification of materials will be imposed. Engr. Miguel Ramos (Engineer V, DPWH-UPMO) reiterated that DPWH-UPMO will not allow such experience considering strict foreign consultants onboard and that a cable-stayed bridge requires all specifications to be followed. Funds will also be monitored.	Noted
3.13.	Mr. Amante Versoza (Resident of Mariveles, Homeowners Representative) raised concern with the DPWH road project that will be demolished after only being used for a few years; and hopes that the current project will not have a similar experience. Mr. Versoza questioned the reliability of the timelines of DPWH projects and raised that several accidents have occurred due to lack of signages. Atty. Jocelyn Castañeda (Mayor of Mariveles) interjected that one death resulted from the said DPWH road construction project. Mr. Versoza requested DPWH to send inspectors for construction projects since roads frequently require reconstruction. Mr. Versoza expressed fear that the bridge project may collapse as in the case of Taiwan if not properly inspected. Engr. Miguel Ramos (Engineer V, DPWH-UPMO) said that BCIB is a national project and will not reach the kind of experience described. Quality assurance visits are undertaken every 3 or 6 months. A Department Order also requires termination of contract if work exceeds defined number of days and requires the contractor to explain delays, which most likely caused the delays of current projects.	Noted
3.14.	Mr. Oscar Delos Reyes (Knights of Colombus) shared that in another project, the district engineers assigned are unaware of the project and hoped that the Municipal Government's concerns will not happen again in this project. Mr. Delos Reyes agreed with Mr. Versoza that another bridge project has taken six years and yet only half has been completed. Engr. Ken John Barcelona (Engineer III, DPWH-UPMO) responded that for the BCIB project, DPWH will be thoroughly watchful. Everyone is invited to call the	Noted

	hotline of Duterte and the internet is readily available. Do not raise concerns elsewhere. If the district is unaware, leave it to ABS-CBN, GMA, Patroller. Mr. Delos Reyes added that complaints are spread out in social media. Engr. Barcelona said that DPWH has a Stakeholders Relations Service Office to receive public complaints. Official complaints will also be relayed to Malacañang and other offices and we will be embarrassed. Ms. Angel Salcedo (Environmental Engineer, Arup) said that the project will be forming a team to serve as a Grievance Redress Mechanism for locals to raise concerns. Concerns will be addressed by the DPWH. Mr. Delos Reyes expressed frustration over the 8888 hotline and shared that the Government redirects concerns elsewhere instead of having face-to-face consultations such as the current IEC activity with the Mayor. Mr. Delos Reyes hopes that this project will clearly address the locale's concerns. Engr. Miguel Ramos (Engineer V, DPWH-UPMO) said that any tax-paying citizen has the right to complain and complaints will be strongly addressed. Atty. Jocelyn Castañeda (Mayor of Mariveles) questioned the integrity of DPWH projects and questioned how measures to address impacts, such as the Grievance Redress Mechanism, will be sustained if the project will extend more than 12 or 15 years. The Mayor highlighted that DPWH projects take long to complete and that concerns of the locality are not immediately relayed to contractors. The Mayor also reminded the group that even if the project is a DPWH or a national project, the project still lies under the local government jurisdiction and is concerned over her liability. The Mayor further questioned why, despite having project inspectors, DPWH inspectors do not report the status of projects to DPWH, which leads the LGU to regularly report project status. The Mayor further shared that the Municipal Government and LGUs do not have the personality to invite contractors over a meeting to discuss project concerns. The Mayor inquired about the status of the current bridge project. The Mariveles Municipal Engineer shared that the Region 3 engineer has coordinated with the Municipal Government; however, the project remains suspended until a definite completion date is set and a traffic management scheme is enforced to avoid accidents. Mr. Delos Reyes expressed fear that the same concerns will likely happen in the BCIB project and hopes that the BCIB project will be thoroughly studied to avoid public rallies. Engr. Mark Anthony Alejo (Engineer IV, DPWH-UPMO) explained that contracts with every project specifies a completion date. In cases where the contractor is unable to finish on time, the contractor would need to explain why and pay for delayed damages.	

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Presentation of the BCIB to the Municipal Government of Mariveles under Infrastructure Preparation and Innovation Facility (IPIF) Output 1 – Roads & Bridges, ADB Loan No. 3589-PHI

3.15.	Mr. Amante Versoza (Resident of Mariveles, Homeowners Representative) suggested a standardized system is in place for all projects and that impacts will be clearly explained to those people relocated. Arup noted his suggestion.	
3.16.	Ms. Glady Dacion (Municipal Planning and Development Coordinator, Municipal Planning and Development Office) shared that the Comprehensive Development Plan of the municipality does not cover projects that collaborates with the BCIB. Ms. Dacion further shared that some proponents do not coordinate with the LGU once a certificate is secured and hopes that in everything done, including the results of the impact assessment, the project advises the Municipal Government in advance before draft investigations are submitted to national agencies. Ms. Dacion asked how long-term monitoring will be undertaken since this component is sometimes neglected. Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) explained that the DENR issues ECC after a successful review of the EIS and series of consultations. If we will be granted an ECC, it will be coursed through the LGU because that is the EIA process. Atty. Jocelyn Castañeda (Mayor of Mariveles) echoed Ms. Dacion's request that a copy would be provided to the Municipal Government prior to submission among the agencies in order for the Municipality to have a voice. Arup noted the mayor's concern.	Noted
3.17.	Mr. Oscar Delos Reyes (Knights of Colombus) shared how the idea of the project originated, which was from Chairman Payumo in the First District of Bataan.	

Review and Confirmation:		
Prepared by:	Reviewed by:	Approved by:
Cristina Villaraza		
Transport Planner		

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DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Presentation of the BCIB to the Barangay Representatives of Mariveles under Infrastructure Preparation and Innovation Facility (IPIF) Output 1 – Roads & Bridges, ADB Loan No. 3589-PHI

Date:	Started:	Adjourned:	Venue:
October 7, 2019	2:00PM	4:00PM	Conference Room, Mayor's Office, Mariveles Municipal Hall, Roman Superhighway, Mariveles, Bataan

Meeting Presider:

Arup

Meeting Attended by:

See **Appendix A – Attendance Sheet**

TOPIC	DISCUSSION	ACTION
1. **Introduction**	introduced DPWH and Arup representatives to the group and noted key participants.	
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3. **Discussion**	See **Appendix C – Detailed Transcription**	
3.1.	Mr. Joey Carandang (Councilor, Municipality of Mariveles) asked if the bridge will be hanging. Engr. Winfred Liwanag (Project Coordinator, Arup) responded that the bridge will be entirely elevated.	
3.2.	Mr. Ricardo Chua (Councilor, Municipality of Mariveles) asked if the project team has checked and coordinated with the DENR on the piers along the shoreline and their applications. Ms. Angel Salcedo (Environmental Engineer, Arup) noted the query and responded that Arup will check with the DENR.	Noted
3.3.	Mr. Roberto Arcenal (Barangay Captain, Alas-Asin) remarked that no existing pier and no one will be affected in the area, which he identified as pasture land. Engr. Winfred Liwanag (Project Coordinator, Arup) said that Brgy Captain Arsenal is correct. Engr. Liwanag added that based on gathered vessel activity data, no large vessels idle around the area. The project is purposely laid out the planned bridge along the area without any port or ferry terminal.	
3.4.	Mr. Roberto Arcenal (Barangay Captain, Alas-Asin) asked if the road from the shoreline to the existing National Road will be elevated. Engr. Winfred Liwanag (Project Coordinator, Arup) answered that a section of the alignment will be a road and a section will be a land viaduct.	

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Presentation of the BCIB to the Barangay Representatives of Mariveles under Infrastructure Preparation and Innovation Facility (IPIF) Output 1 – Roads & Bridges, ADB Loan No. 3589-PHI

	Mr. Roberto Arcenal estimated that the distance between the existing highway and the shoreline would be about 5-6km. Engr. Liwanag mentioned it is about 5.1km.	
3.5.	Ms. Ludy Funilas (Barangay Captain, Lucanin) remarked that there are several settlements in Cabcaben along the Old Road and Roman Superhighway. Mr. Roberto Arcenal (Barangay Captain, Alas-Asin) clarified that the bridge seems to be far away from Cabcaben and is in Alas-Asin. Ms. Funilas remarked that the bridge will start in Mountain View. Mr. Roberto Arcenal disagreed and clarified that the bridge is far from Mountain View and that the illustration is correct except for the boundaries of Mountain View and Alas-Asin. Mr. Arcenal also clarified that the Alas-Asin river serves as the boundary between Cabcaben and Mountain View. Ms. Angel Salcedo (Environmental Engineer, Arup) explained that the data used was taken from the Provincial Government.	Coordinate with LGU for an updated administrative boundary map for revisions necessary
3.6.	Mr. Ricardo Rocha (Councilor, Municipality of Mariveles) expressed hope that affected parties will be invited in the public consultations and public hearings. Mr. Chua also asked how many public hearings will be conducted. Mr. Roberto Arcenal (Barangay Captain, Alas-Asin) emphasized that the present activity is a consultation and on-the-ground visits with concerned barangays will be conducted before the public hearing.	
3.7.	Ms. Arlene Wabat (Municipality of Mariveles) asked if DPWH and ADB funded the present feasibility study. Mr. Joey Carandang (Councilor, Municipality of Mariveles) requested that the project team emphasizes to everyone that the Chinese are not funding the project and for the team to always cite the source of funding. Engr. Junnel Ray Bautista (Engineer, DPWH-UPMO) said that the current study is funded by the ADB.	
3.8.	Mr. Leoncio Lungcay (Barangay Captain, Mountain View) asked about the impacts to fishermen and if fishing will be restricted. Ms. Sheilette Untalan (Urban Development Specialist, Arup) answered that the bridge was designed to be 41m high in the North Channel and 71m high in the South Channel. The bridge was designed to allow vessels to pass through and to avoid impacts on the livelihoods of fisherfolks. Disruptions will occur in the affected area to ensure the safety of our fisherfolks. Mr. Leoncio Lungcay (Barangay Captain, Mountain View) asked if fishing restrictions will only be temporary during construction. Engr. Winfred Liwanag (Project Coordinator, Arup) said that they have not yet discussed activities during construction and the distance of fisheries and most	

	efficient way for fishermen. The plan is to simultaneously construct both ends to be time-efficient.	
3.9.	Mr. Leoncio Lungcay (Barangay Captain, Mountain View) asked if the bridge provides a way going to Corregidor. Engr. Winfred Liwanag (Project Coordinator, Arup) replied that there will be a roundabout in front of Corregidor to allow travelers to visit Corregidor and to serve as a U-turn to return to Bataan or Cavite.	
3.10.	Mr. Leoncio Lungcay (Barangay Captain, Mountain View) asked if the bridge will pass in front of Mall of Asia and lead to Manila. Engr. Winfred Liwanag (Project Coordinator, Arup) answered no.	
3.11.	Mr. Manny Virgilio (Municipality of Mariveles) expressed his concern that the traffic from Cavite and pollution will be led to Bataan. Ms. Cristina Villaraza (Transport Planner, Arup) mentioned that part of the study will include a traffic component where congested areas will be identified and an efficient routing scheme will be planned.	Noted
3.12.	Councilor Chua (Municipality of Mariveles) expressed concern for the livelihood impacts to boatmen travelling to Corregidor and hopes alternatives could be provided. Ms. Sheilette Untalan (Urban Development Specialist, Arup) asked the participants to elaborate the tourism activities or economic activities that may be affected by the project for initial data gathering. Mr. Roberto Arcenal (Barangay Captain, Alas-Asin) agreed that the livelihoods of boatmen will be affected, though remarked that the project as a whole is favourable. Councilor Chua recognised that the project has both positive and negative impacts and clarified that he requests for alternative jobs to be provided for livelihoods affected. Ms. Sheilette Untalan (Urban Development Specialist, Arup) emphasized that surveys will be conducted to inform the stakeholders and for the development of Resettlement Action Plan. She added that boating associations and tour guides will be included in consultations.	Noted
3.13.	Mr. Ricardo Rocha (Councilor, Municipality of Mariveles) expressed hope that air quality monitoring results will be disclosed. The consultant respondent that before construction phase, surveys will be conducted to provide the team a reference of air quality. Part of the conditions of the ECC is for us to disclose the results.	Noted
3.14.	Mr. Ricardo Rocha (Councilor, Municipality of Mariveles) asked if the project is toll-free. Engr. Winfred Liwanag said that initially the project is toll-free, as proposed by the DPWH. The bridge will only be for vehicles and there will be no pedestrians and cycle lanes.	

3.15.	Ms. Arlene Wabat (Municipality of Mariveles) asked how many lanes will be constructed; if Corregidor will be properly protected from the surge of tourists; and if the bridge will allow trucks. Engr. Winfred Liwanag (Project Coordinator, Arup) clarified that based on the DPWH latest plan, it will be a two-lane dual carriageway, with a lane width of 3.65m and a hard shoulder of 2.5m. In total, there will be four lanes, consisting of 2 lanes per direction. A series of discussions with CFI and their identified stakeholders were conducted. A holding station with a bus transit service provided by Corregidor is being considered to control tourists. Another possible control measure is requiring tourists to make advance reservations before visiting the Island. Engr. Junnel Ray Bautista (Engineer, DPWH-UPMO) supported the statement of Engr, Liwanag and mentioned that DPWH have received an endorsement from the CFI Board of Trustees allowing the connection to Corregidor.	
3.16.	Mr. Joey Carandang (Councilor, Municipality of Mariveles) asked if Bataan can have a share in the income of Corregidor derived from the project. Ms. Angel Salcedo (Environmental Engineer, Arup) said that his concern is noted.	Noted
3.17.	Ms. Lynie Galvan (Barangay Alas-Asin) asked if boat travel will still be allowed. Engr. Winfred Liwanag (Project Coordinator, Arup) answered that boat travel will be optional. Ms. Lynie Galvan (Barangay Alas-Asin) raised concern over the livelihoods of boatmen traveling from Cabcaben to Corregidor and hopes that affected livelihoods will be prioritized. Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) responded that Arup's succeeding surveys and socioeconomic surveys will include considerations for affected parties, whether temporarily or permanently affected.	Noted
3.18.	Mr. Jester Ivan Ricafrente (Barangay Captain, San Carlos) asked for clarification if the present activity is the first step to be issued an ECC and if effects of the project during construction and operation will be considered. Mr. Ricafrente further remarked that the LGU efforts to clean-up the Manila Bay will go to waste if the bridge will cause pollution. Mr. Ricafrente then asked if the project considered the Writ of Continuing Mandamus of the Supreme Court regarding the clean-up of the Manila Bay. Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) said that BCIB project is currently at the IEC stage now -first step of the process. She added that the suggestion of Mr. Ricafrente is good and will be include it in our study. Mr. Ricafrente added that the Municipality is making efforts on solid waste management and allowing more people and vehicles to enter will require double efforts. Mr. Ricafrente expressed hope that the Municipal Government of Mariveles will be prepared for the project.	Noted
3.19.	Mariveles Fisherman Representative (Barangay Mountain View) asked what help could be extended to affected fishermen in Mountain View and Alas-Asin.	

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Presentation of the BCIB to the Barangay Representatives of Mariveles under Infrastructure Preparation and Innovation Facility (IPIF) Output 1 – Roads & Bridges, ADB Loan No. 3589-PHI

	Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) answered that the project will have a baseline assessment, which includes marine ecology and livelihoods. Once existing conditions are established, potential impacts can be identified therefore appropriate mitigating measures to prevent or lessen/compensate the impacts could be provided.	
3.20.	Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) solicited suggestions on organizations or people to invite for pubic scoping. Arup also outlined the next stages of the process which would involve perception surveys and FGD with affected stakeholders before submitting a Project Description Report. Arup further explained that a public scoping, which is a bigger gathering than the IEC will be conducted in 2-3 months. Arup ensured that all participants will be invited to the public scoping. General response from the participants are fisheries, tourism groups	Noted
3.21.	Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) asked if the alignment will affect any ancestral domain and historical site. The participants responded none.	Noted
3.22.	Mr. Joey Carandang (Councilor, Municipality of Mariveles) emphasized that there should be no objections from the LGU in the process of securing the ECC and that the project needs to be clearer before a resolution is requested. Mr. Roberto Arcenal (Barangay Captain, Alas-Asin) remarked that the BCIB project is a government project and the said request is not required. Ms. Angel Salcedo (Environmental Engineer, Arup) said the project will going to request for a Sangguniang Resolution for relevant parties to convene and request for an endorsement from the LGU.	

Review and Confirmation:		
Prepared by:	Reviewed by:	Approved by:
Cristina Villaraza		
Transport Planner, Arup		

DRAFT

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Presentation of the BCIB to the Municipal Government of Naic, Cavite under Infrastructure Preparation and Innovation Facility (IPIF) Output 1 – Roads & Bridges, ADB Loan No. 3589-PHI

Date:	**Started:**	**Adjourned:**	**Venue:**
October 9, 2019			Naic Municipal Hall, Antero Soriano Highway, Naic, Cavite

Meeting Presider:

Arup

Meeting Attended by:

See **Appendix A – Attendance Sheet**

TOPIC	DISCUSSION	ACTION
1. **Introduction**	introduced DPWH and Arup representatives to the group and noted key participants.	
2. **Arup Presentation**	Ms. Maria Catherine Rontos (Arup) introduced the project in the context of the IPIF programme, EIA definition and EIA process. Mr. Winfred Liwanag (Arup) presented project information, project objectives, alignment options, artistic rendering, and projected timeframe. Ms. Angel Salcedo (Arup) presented preliminary identified environmental impacts. See **Appendix B – Presentation**	
3. **Discussion**	See **Appendix C – Detailed Transcription**	
3.1.	Engr. Joel Antonio (Naic Municipal Planning and Development Coordinator) asked if the possibility of hitting submarine cables was considered. Engr. Antonio shared that he has already informed and cautioned DCCD. Engr. Winfred Liwanag (Project Coordinator, Arup) confirmed that submarine cables were laid out with the alignment and were avoided. Engr. Liwanag further explained that the project team had a geodetic survey to determine the alignment.	
3.2.	Mr. Noel Catubig (Barangay Captain, Sabang) inquired about the possible route to Bataan from Dasmariñas. Engr. Winfred Liwanag (Project Coordinator, Arup) showed that from Dasmariñas, once could pass through Antero Soriano Highway. Engr. Liwanag also explained that the project team chose the landing point due to its short distance connection with CALAEx, thereby affecting less settlements.	
3.3.	Ms. Eva Pangilinan (Municipal Environment and Natural Resources Office) shared that the government is active with efforts for the Manila Bay clean-up, citing the Manila Bay Environmental Management Project (MBEMP) and the Manila Bay Coastal Strategy and Operational Plan. Ms. Pangilinan asked which component of the MBEMP does the project belong to. Ms. Angel Salcedo (Environmental Engineer, Arup) recognized that the project will affect Manila Bay and assured that existing plans will be included in the Environmental Impact Statement Report.	Secure a copy of the Operational Plan for Manila Bay

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

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	Ms. Pangilinan requested that the project considers the Manila Bay Coastal Clean-Up and Conservation Program of the DILG and that the Provincial Government will provide the team a copy of the Operational Plan for Manila Bay. Ms. Pangilinan further shared that Naic Government has plans with Bataan on marine turtle conservation, which needs to be considered in the study. Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) assured that such concerns will be addressed later on in the Public Hearing/Consultation.	
3.4.	Mr. Cesar Ryan Nazareno (SB Member, LGU) asked what Naic can offer for the project and if employees and workers will be sourced from Naic. Engr. Miguel Ramos (Engineer V, DPWH-UPMO) confirmed that local workers will be prioritized for the project.	
3.5.	Engr. Joel Antonio (Naic Municipal Planning and Development Coordinator) asked if Naic will have financial gains from the project, such as revenues if a toll gate is implemented. Engr. Antonio also expressed his opinion that Naic should benefit as a "host" municipality. Engr. Miguel Ramos (Engineer V, DPWH-UPMO) explained that funds from a possible toll gate will likely go to bridge maintenance. Engr. Ramos further explained that the consultants (Arup) will look into where excess funds could be diverted to.	Noted
3.6.	Mr. Renato Cabuhat (Kagawad, Timalan Balsahan) asked when the bridge will be operational. Mr. Cabuhat expressed support for the project; however expressed concern and asked if Timalan Balsahan will be completely cleared. Engr. Miguel Ramos (Engineer V, DPWH-UPMO) cited the project timeframe, which sets 2020 as the construction year and 2027 as the possible operational year. Engr. Ramos explained that Arup is conducting activities to determine and assess impacts in order to mitigate them.	
3.7.	Ms. Eva Pangilinan (Municipal Environment and Natural Resources Office) asked what alternatives could be provided for fishermen that will be displaced from the municipal water, which wil be affected by the alignment. Ms. Pangilinan hopes that livelihood alternatives would be a priority. Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) outlined the process of the EIA and emphasised that the present activity is to hear issues, concerns about the project. A series of data gathering activities will be conducted to determine the existing condition of affected areas and to provide appropriate mitigating measures, which would be presented in the Public Hearing/Consultation stage.	Noted
3.8.	A Barangay Representative expressed full support for the project; however, is concerned about the people residing in affected barangays. He asked who should the concerned individuals approach for any incidents relating to the project. Ms. Angel Salcedo (Environmental Engineer, Arup) explained that the project involves forming a Grievance Redress Mechanism, which is a platform where concerns/issues regarding the project could be voiced out and would be addressed. Ms. Salcedo further asked if there are any other workers/communities that may be affected, aside from fisherfolks.	Noted

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

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	The barangay representative identified farmers and others involved in aquaculture. Engr. Joel Antonio (Naic Municipal Planning and Development Coordinator) further suggested that farmers and fisherfolks should be included in the Public Scoping and for the team to coordinate with Barangay chairmen. Ms. Maria Catherine Rontos (Assistant Environmental Engineer, Arup) confirmed that the stakeholders mentioned will be included in the activity.	
3.9.	Engr. Joel Antonio (Naic Municipal Planning and Development Coordinator) highlighted the need to undertake the correct process and shared that the Mayor of Naic fully supports the project.	Noted

Review and Confirmation:		
Prepared by:	Reviewed by:	Approved by:
Cristina Villaraza		
Transport Planner, Arup		

ARUP

Subject IPIF1-BCIB: Corregidor Key Informant Interviews

Date 31 October 2019 **Job No/Ref** 265508

Interviewee	Designation	Length of Service in Corregidor
Jennelyn Abelarde	Frontdesk Assistant (Corregidor Inn), Sun Cruises	2 years
Edward Buko Soriano, Jr.	Security Guard, LC Ibarra Agency	6 months
Alberto Juanico	Sun Cruises Driver	32 years
Cleofe B. Diestro	Clinic / Lodge / Island Disbursement, CFI	27 years
Jovelyn Isla	Saleslady, self-employed	14 years
Ronnie Amado	Corregidor Inn Employee	3 years
Fidel del Losa	Procurement Officer, Island Supervisor	14 years
Restituto Solis	Property Officer	30 years
Armando Hildawa	Freelance Tour Guide	29 years
Kevin Ballon	Safety Officer	1 year
Brian Bongalin	Activity Coordinator	13 years
Jeremy Rolin	CFI Consultant	
Mitos Magrare	CFI Cashier	27 years
William Payumo	Motorpool and Transport Supervisor, Sun Cruises	17 years
Gelio Pascua	Sun Cruises Driver	10.7 years

	Interviewee	Response
Project Awareness		
	Jennelyn Abelarde	Yes

	Interviewee	Response
1. Have you had prior knowledge about the project?	**Edward Buko Soriano, Jr.**	Yes
	Alberto Juanico	Yes
	Cleofe B. Diestro	Yes
	Jovelyn Isla	Yes
	Ronnie Amado	Yes
	Fidel del Losa	Yes
	Restituto Solis	Yes
	Armando Hildawa	No
	Kevin Ballon	Yes
	Brian Bongalin	Yes
	Jeremy Rolin	Yes
	Mitos Magrare	Yes
	William Payumo	Yes
	Gelio Pascua	Yes
1.1 How did you learn about the project?	**Jennelyn Abelarde**	Hearsay in the community here in the island since most of the people are from Cavite.
	Edward Buko Soriano, Jr.	Hearsay in the community
	Alberto Juanico	From Facebook
	Cleofe B. Diestro	Newspaper
	Jovelyn Isla	From the community
	Ronnie Amado	Hearsay. This year
	Fidel del Losa	During a meeting with the consultant (Arup) last year

	Interviewee	Response
	Restituto Solis	Consultants (Arup foreigners) already visited the area last year to inform [Head Office] about the project but, was not officially invited to that meeting
	Armando Hildawa	CFI mentioned about the bridge; though no full details about it
	Kevin Ballon	Hearsay two months ago
	Brian Bongalin	People here in Corregidor have been talking about the bridge since 2015. I also see Facebook posts about it.
	Jeremy Rolin	I represented CFI in the meetings we had with Arup and had the whole project described to me by them. We had another meeting with them about 10 days ago. So, that's how I got to know about the project since CFI is involved and I am their consultant, therefore, I was involved.
	Mitos Magrare	Some people visited here to discuss the project; however, I am unaware of the details of the discussion and who were the visitors. They seemed to be Korean investors. The news about the bridge was also circulated several times on Facebook.
	William Payumo	We were supposed to do an ocular [investigation of the site] for the Bataan-Corregidor-Cavite project with the Bataan Governor and other people who I am unaware of. However, plans were cancelled for some reason.
	Gelio Pascua	I only heard about it one time since there was a newspaper clipping on the bridge project that was circulated here.
1.2 What do you know about the project?	**Jennelyn Abelarde**	The project might take up to 10 years before it is completely built, and the bridge will be from Cavite to Corregidor only.
	Edward Buko Soriano, Jr.	None
	Alberto Juanico	I only know that they have plans of constructing a bridge
	Cleofe B. Diestro	Bridge from Bataan to Cavite
	Jovelyn Isla	Bridge from Bataan to Cavite
	Ronnie Amado	Just hearsays

	Interviewee	Response
	Fidel del Losa	[That there is a] planned bridge
	Restituto Solis	Just hearsays
	Armando Hildawa	None
	Kevin Ballon	Bridge from Bataan to Cavite
	Brian Bongalin	The bridge will connect Bataan, Cavite, and Corregidor. There are Chinese investors involved in the construction of the bridge.
	Jeremy Rolin	(see answer to Q1.1)
	Mitos Magrare	I thought that the bridge will connect to the center of Corregidor from Maap Pier in Bataan.
	William Payumo	Just hearsays about the project. Various VIP guests have mentioned the possibility of the project, though we have no solid evidence to back it up. Last time, news circulated that a DPWH representative mentioned that the bridge project will start soon. At first, we were informed by those who conducted an ocular investigation that the alignment will be positioned at the head part, the point that is closest to Bataan.
	Gelio Pascua	It informed us that the bridge would connect Bataan, Corregidor, and Cavite. Other than that, we are not aware of anything more.
1.3 Have you participated or are you aware of any meetings about it?	**Jennelyn Abelarde**	None. I haven't participated in any meeting about the project
	Edward Buko Soriano, Jr.	I only heard about the bridge from people meeting about it
	Alberto Juanico	No/None.
	Cleofe B. Diestro	No/None
	Jovelyn Isla	No/None
	Ronnie Amado	No, there are none.
	Fidel del Losa	No
	Restituto Solis	No, we were not asked nor informed about any meetings or consultations yet

	Interviewee	Response
	Armando Hildawa	No
	Kevin Ballon	No
	Brian Bongalin	We are not included in any meetings conducted by CFI, particularly about the bridge since we are tenants here. Basically, Sun Cruises is a company that only rents some parts of Corregidor.
	Jeremy Rolin	(see answer to Q1.1)
	Mitos Magrare	There was really no formal meeting about the bridge and only a discussion with the people who visited. We were not included in the discussion. They just arrived and then I just saw the news about the bridge on social media and Bataan Weather.
	William Payumo	I was not supposed to be in the planned meeting, which was cancelled. I was just asked to accompany the group who will be conducting the ocular investigation.
	Gelio Pascua	N/A
2. To what extent is the community aware about the project?	**Jennelyn Abelarde**	The people don't know much about the project. They are not sure if it is a real project or if these will push through.
	Edward Buko Soriano, Jr.	I have no idea
	Alberto Juanico	A lot of people already know about it since we saw it in Facebook and newspapers
	Cleofe B. Diestro	Everyone except newbies know about it.
	Jovelyn Isla	Everyone except other newbies in the island know about the project.
	Ronnie Amado	The community may not be aware but I heard [about] the project from my co-employees
	Fidel del Losa	No idea
	Restituto Solis	I am not sure if employees are aware, though there are hearsays
	Armando Hildawa	N/A
	Kevin Ballon	No idea
	Brian Bongalin	I think so. Some of us have been hearing about the bridge before.

	Interviewee	Response
	Jeremy Rolin	Probably not very much. Probably there are people who don't have any idea. We haven't indulged in sharing the information yet. The information is at the level of the senior management of CFI. The Island Managers know as well as the *bangkeros*, but nobody below that. Because at this stage, we have got more problems to sort out without having to worry about it. Over the last 3 or 4 years, the tourists have gone down. The facilities have become less good because we haven't had tourists, we haven't had the upkeeping, so we need to get the tourists back up. So, we are not waiting for the bridge. We have our own plans. We have very active plans for 2020 to really start. This year we have introduced them slightly but next year we are going to make a big leap and that is one of the reasons why I was talking with the *bangkeros* to bring people over here because one of our main aims is to get people on this island.
	Mitos Magrare	I think they know as much as I do.
	William Payumo	We are just few in the island. Others are in a way, excited about the project, particularly since employees are stranded in the island during a storm. The project will significantly help employees especially in emergency cases requiring easy travel outside of the island. Tabloid material about the project also circulated. However, there has been no formal discussion about the project.
	Gelio Pascua	All the people here know as much as I do.
Perceived Impacts		
1. Do you think the project will pose negative impacts to the barangay?	**Jennelyn Abelarde**	N/A
	Edward Buko Soriano, Jr.	Yes
	Alberto Juanico	No
	Cleofe B. Diestro	No
	Jovelyn Isla	Yes
	Ronnie Amado	Yes
	Fidel del Losa	Yes
	Restituto Solis	No

	Interviewee	Response
	Armando Hildawa	Yes
	Kevin Ballon	Yes
	Brian Bongalin	Yes
	Jeremy Rolin	Depends
	Mitos Magrare	Yes
	William Payumo	N/A
	Gelio Pascua	N/A
1.1 If yes, in what way?	**Jennelyn Abelarde**	The island is currently exclusive to tourists who booked their tours. So, with the presence of the bridge, the island would be more accessible to anyone who would want to visit the island. Increase in the number of tourists might cause more waste in the island.
	Edward Buko Soriano, Jr.	N/A
	Alberto Juanico	N/A
	Cleofe B. Diestro	Waste in the island but it will depend on the management. Lack of parking is also a problem.
	Jovelyn Isla	Waste during construction may end up in the water surrounding Corregidor
	Ronnie Amado	We are concerned with how the boat will pass through when the bridge is already constructed, though maybe the design will allow the boats to pass underneath the bridge. Also concrned that the ferry will no longer be an option to travel from Manila to Corregidor. Tourists will also have no limitations to go to Corregidor, which may impact the preservation of the area. Impacts on water, air pollution, and disturbance to the monkeys, snakes, and marine animals are also expected.
	Fidel del Losa	Since it is now open to the public, there is a possibility that its historical value will not be preserved. Also concerned about the effects of the columns to marine biodiversity during construction.
	Restituto Solis	None, because the bridge will pass through the tail side of Corregidor only. There may be impacts on the airfield, choppers, and airplanes and effects to trees and monkeys, though impacts may be minor
	Armando Hildawa	Sun Cruises will be affected since tourists will now have another option to access Corregidor

	Interviewee	Response
	Kevin Ballon	Since the area is excluded, waste (incl. cement, excavated soils, liquids – fuel and grease) will be generated. Aesthetics and views will also be affected. The Japanese cemetery may be affected. And Sun Cruises will be affected.
	Brian Bongalin	Sun Cruises may be affected since there would be another option going to the island. The negative effect would probably be on the company [Sun Cruises]. Tourists booking their tours through Sun Cruises may decrease in number. Another possible problem is the destruction of some parts of the island where the bridge will be constructed. The bridge may also ruin the bird's eye view of the island since it is known as a tadpole-shaped island. The tail-end of the island was declared as a tourist memorial zone, so it would be okay if ever there are buildings that would have to be destroyed for the development of the island. However, the head part of the island was declared as a war memorial zone which means you cannot destroy any part of it. The tail-end of the island has a runway, which might be affected since there are still small planes landing on that runway. There are limestones in that part of the island. There may be snakes, but there are no monkeys in that part. There is also a civilian cemetery on the tail-end of the island. There are not IPs in the area since this is a national shrine. There are more or less 150 civilians here in the island. [50-60 from Sun Cruises and 50-60 from CFI]. The bridge might ruin the look of the island, but we need to get more people here.
	Jeremy Rolin	You've been in the island and you have seen that basically it is a *wonderland* of trees, plants, and birds. We've been asked to close down the airport and we said "no". As far as we are concerned, we need the airstrip. At the moment, it is being renovated and we're not having people come in, but it's an ideal spot for light aircraft and small aircraft. There are more modern, small aircrafts with up to 30 seats. In the future, we could have them there. We have to ensure that we can keep that open even when the bridge is there. The bridge will have the same height as the runway so that won't get in the way. However, we have to allow 5 meters for the trucks and the like who will pass through the bridge, so that's my concern. We need to have that runway. It is not a civilian runway. It's a military runway. The military wants to maintain it. They want to have the ability to use that. I don't know why. It's a military facility, they don't want to lose it. So we haven't been able to say, 'we'll close it down'. We're not prepared to do that. The military owns this island. We only run it. The Department of Defense owns it. The Department of Tourism appointed CFI to run the island.

	Interviewee	Response
		We have a beautiful, tree-covered island and we have to maintain the element of the "wild" and "quiet". I have problems with the extent of the masterplan. The only way to get people here is through the bridge. But for me, the cutting down of trees and bringing thousands of people here will just ruin Corregidor. The bridge will have that sort of impact to allow more people to come here. But we have to control them. We certainly want them, but there has to be a limit to the number and the amount of development there is here because not only will it ruin the quietness but there are certain remembrance areas which must not be touched. (…) As far as the bridge is concerned, as long as we control the people coming in, it's a very good thing. (…) We can't let the bridge allow too many people here in some way. For example, you might have to talk to your construction people about toll booths or getting permission to have a toll booth. So yes, it could have a negative impact, but we cannot let it have a negative impact. It will be a positive impact if we can get 500 people a day coming off there. We can cope with that. One can also argue that it rather ruins the look of the island.
	Mitos Magrare	In general, allowing access to Corregidor will be good, especially for tourists. However, we are concerned that the bridge will affect the sacredness of the island and historical sites. Also, Corregidor currently has a zero crime rate. Once the bridge is done and more people enter, the likelihood of crime to happen here in Corregidor will increase. Controls would need to be implemented.
	William Payumo	We cannot determine the positive or negative effects. The bridge would have a positive effect if it will be able to increase potential guests. Other than the boatmen traveling from Bataan to Corregidor, most impacts are positive.
	Gelio Pascua	Whatever I will say, even if I do not support the bridge and if the government wants to pursue the project, I cannot do anything about it. The bridge could affect Corregidor since tourists will be coming in and out of the Island. It will not be a tourist destination anymore and will only be a mere thoroughfare for vehicles. But whatever that the government thinks is right and if it will make the Island better, then I support the bridge since I want tourists to come in.

	Interviewee	Response
1.2 Who would be most affected?	**Jennelyn Abelarde**	Sun Cruises. With the presence of the bridge, ferry passengers might decrease in number since there would be another option which is by land. *No IPs
	Edward Buko Soriano, Jr.	N/A
	Alberto Juanico	Bangkeros
	Cleofe B. Diestro	All the people in Corregidor including tourists.
	Jovelyn Isla	None
	Ronnie Amado	Tourists and employees
	Fidel del Losa	CFI and tourists
	Restituto Solis	There are no residents in the island, so just employees
	Armando Hildawa	Sun Cruises business
	Kevin Ballon	Sun Cruises business and tourists
	Brian Bongalin	Sun Cruises and boat operators (boat organization).
	Jeremy Rolin	N/A
	Mitos Magrare	If the project is not implemented properly, the sacredness of the entire island as a whole [will be affected].
	William Payumo	Sun Cruises since it is a private company and our main business is ferry operations. For sure if a link bridge is established, our guests from Manila will be affected.
	Gelio Pascua	The whole island will be affected. Other boatmen will also be affected since the bridge will mostly allow vehicles to enter the island
2. Have you heard of any concerns from the community about the project?	**Jennelyn Abelarde**	Yes
	Edward Buko Soriano, Jr.	No
	Alberto Juanico	No

	Interviewee	Response
	Cleofe B. Diestro	No
	Jovelyn Isla	No
	Ronnie Amado	No official plans, just hearsay
	Fidel del Losa	None
	Restituto Solis	None, just hearsay
	Armando Hildawa	None
	Kevin Ballon	None
	Brian Bongalin	No
	Jeremy Rolin	N/A
	Mitos Magrare	No
	William Payumo	No. Most of my colleagues have mostly positive views and are supportive about the bridge.
	Gelio Pascua	Among us here, we are supportive of the bridge since it will encourage more tourists to come in. If the bridge will destroy parts of the island, we are in no position to oppose the project.
2.1 What are these?	**Jennelyn Abelarde**	The island would not be exclusive to the tourists visiting the island.
	Edward Buko Soriano, Jr.	N/A
	Alberto Juanico	N/A
	Cleofe B. Diestro	N/A
	Jovelyn Isla	N/A
	Ronnie Amado	N/A
	Fidel del Losa	N/A
	Restituto Solis	N/A

	Interviewee	Response
	Armando Hildawa	N/A
	Kevin Ballon	N/A
	Brian Bongalin	N/A
	Jeremy Rolin	N/A
	Mitos Magrare	N/A
	William Payumo	N/A
	Gelio Pascua	N/A
2.2 Who are most concerned?	**Jennelyn Abelarde**	Workers in the island.
	Edward Buko Soriano, Jr.	N/A
	Alberto Juanico	N/A
	Cleofe B. Diestro	N/A
	Jovelyn Isla	N/A
	Ronnie Amado	N/A
	Fidel del Losa	N/A
	Restituto Solis	N/A
	Armando Hildawa	N/A
	Kevin Ballon	N/A
	Brian Bongalin	N/A
	Jeremy Rolin	N/A
	Mitos Magrare	N/A
	William Payumo	N/A

	Interviewee	Response
	Gelio Pascua	N/A
Barriers to Implementation		
1. What are the main barriers to implementation?	**Jennelyn Abelarde**	None because constructing the bridge would be beneficial during typhoons (or LPA)
	Edward Buko Soriano, Jr.	Sorry I cannot answer
	Alberto Juanico	None if there is a budget for the project.
	Cleofe B. Diestro	None
	Jovelyn Isla	None
	Ronnie Amado	None
	Fidel del Losa	Check possible laws, ask CFI
	Restituto Solis	Check with CFI Management
	Armando Hildawa	Check with CFI Management
	Kevin Ballon	No barriers can be identified because the proejct will benefit Corregidor
	Brian Bongalin	It will depend on DENR. There are some employees here who fish on the tail-end of the island, but for leisure only.
	Jeremy Rolin	The barrier is the airstrip at the moment. That's the only barrier. You've gotten the CAAP approval that the height of the bridge does not interfere with Sangley Airport. We haven't yet gotten clearance from CAAP for the Sangley International Airport if that ever opened. We'd have to go back to CAAP to get approval for that.
	Mitos Magrare	Nothing in mind. There just needs to be a mutual consensus between governments [Bataan and Cavite] and CFI needs to agree.
	William Payumo	A big factor to consider are the veterans. The veterans are regarded with highest priority here in Corregidor. From the tour, we can see how important we revere the veterans. There is a veterans association now called FAME. Your group should speak with the association regarding this project. In our case, we previously offered ATV services for our guests; however, the veterans were

	Interviewee	Response
		concerned since the ATVs will pass through hollowed grounds. We were therefore allowed restricted access. They are the biggest factor to consider.
	Gelio Pascua	We are just few in the island and all of us here are not permanently living in the island
Support to Project		
1. Are you willing to support project implementation?	**Jennelyn Abelarde**	Yes
	Edward Buko Soriano, Jr.	I think I will
	Alberto Juanico	Of course
	Cleofe B. Diestro	Yes, as long as Corregidor will stay the same.
	Jovelyn Isla	Yes
	Ronnie Amado	Yes, the project is a good project
	Fidel del Losa	Yes
	Restituto Solis	Yes
	Armando Hildawa	Yes
	Kevin Ballon	Yes
	Brian Bongalin	Depends
	Jeremy Rolin	Yes
	Mitos Magrare	If the three governments – Bataan, Cavite, and CFI – approve of the project, we will support it.
	William Payumo	Yes
	Gelio Pascua	If tourism will be more favorable for Corregidor and as long as the environment, trees, and ruins will not be affected or if there will be ways to ensure that historical remains and artifacts will not be destroyed, I am supportive of the project.

	Interviewee	Response
1.1 In what way?	**Jennelyn Abelarde**	By telling other people about it. I will tell them that Corregidor will be more accessible and travel time will lessen.
	Edward Buko Soriano, Jr.	I can't think of a way right now
	Alberto Juanico	Through surveys, whether people like it or not
	Cleofe B. Diestro	By knowing the opinion of other people and researching about the project
	Jovelyn Isla	By informing others about it.
	Ronnie Amado	I will cooperate if there is something I need to do
	Fidel del Losa	I will participate in meetings when invited
	Restituto Solis	I will participate in activities when invited
	Armando Hildawa	Participate in consultations when invited
	Kevin Ballon	Depends on CFI
	Brian Bongalin	N/A
	Jeremy Rolin	I have put forward the official CFI view of the project and we, in CFI, encourage it.
	Mitos Magrare	N/A
	William Payumo	N/A
	Gelio Pascua	N/A
1.2 Why?	**Jennelyn Abelarde**	I think it is a good project. Many will benefit, not only from Corregidor, but also from Bataan and Cavite. The bridge will lessen travel time.
	Edward Buko Soriano, Jr.	More tourists would come to visit
	Alberto Juanico	The project is very good. A lot of employees and tourists would be happy. Traffic in EDSA would lessen since people coming from the north going to the south can pass by the bridge.
	Cleofe B. Diestro	The project will give everyone easy access for everyone and will boost tourism

	Interviewee	Response
	Jovelyn Isla	It will provide easier access to the island.
	Ronnie Amado	I think this is a good project that can help most employees and help Corregidor to be more easily known
	Fidel del Losa	It is a good project with a lot of benefits
	Restituto Solis	N/A
	Armando Hildawa	The bridge will make access easier
	Kevin Ballon	I believe this is a good project
	Brian Bongalin	DEPENDS on the purpose of the bridge. The question is if it would be open to the public or not.
	Jeremy Rolin	From our point of view, by providing a link for tourists, oru main customers, would be a very good idea. During the period of June to October, our sales are down because of the difficulty in travelling across the bay. If we have road link, we can have them here all year round. However, we have done a masterplan by Jun Palafox and his company on the development of Corregidor as a tourist site because we are struggling. We don't have enough tourists. Our only income is from tourists. We don't get it from anywhere else, so we need people to come here and that is why we support the concept of the bridge.
	Mitos Magrare	The project will encourage tourism and will showcase how beautiful and peaceful Corregidor is.
	William Payumo	Currently, I handle Motorpool Inn. Our main concern is the cost of electricity. The generators contribute to high operational costs. I was hoping that once the bridge provides connections to the mainland, we will easily have an electricity source. I have raised this with the management group and this will be a big advantage for us in terms of electricity costs since our current source [generators] is from Bataan.
	Gelio Pascua	N/A
2. Who are the right / appropriate people to inform?	**Jennelyn Abelarde**	CFI and Sun Cruises
	Edward Buko Soriano, Jr.	I don't know
	Alberto Juanico	Those running the government in Bataan and Cavite

	Interviewee	Response
	Cleofe B. Diestro	(…) Chairman of the Island (Cynthia), everyone
	Jovelyn Isla	CFI
	Ronnie Amado	CFI
	Fidel del Losa	CFI, hotel management, Coast Guard, PPA
	Restituto Solis	CFI, concessionaires
	Armando Hildawa	Sun Cruises and CFI
	Kevin Ballon	Department of Tourism, Sun Cruises, and CFI
	Brian Bongalin	CFI and their consultant. The head of CFI is Ma'am Cynthia Carreon. They also have consultants for the island. Ask CFI if they are okay with the project. Maybe their concern would be if there would be an exit / tollgate here in Corregidor.
	Jeremy Rolin	Me, CFI, Palafox. They [Palafox group] already know about it. We told them. At the last meeting we had about the bridge, the group of Palafox was there, and the bridge had already been included in the draft masterplan. Yet, they need to be talked to. The CFI office in Manila should also be informed. The association of veterans should be informed. The Department of Defense [also needs to be informed] because they own this place. Generally they delegated it to the Chief of the Philippine Veterans Association – General Carolina. We can't do anything major here. We have to refer to them [first]. You should first speak with their technical assistant.
	Mitos Magrare	CFI Head Office Chairman Cynthia Carreon. You should first contact Ms. Rowena Bautista, OIC Department Manager for Corporate Affairs. Office address is in the CCP Complex. Contact number: 2823328
	William Payumo	CFI handles the Island. All matters need to be approved by them.
	Gelio Pascua	CFI since they head the entire Island. Even if we are not supportive of the bridge and if CFI wanted to pursue the project, we cannot do anything about it.

	Interviewee	Response
3. If you could have 3 things to develop in your community as a result of the project, what are these?	**Jennelyn Abelarde**	With the presence of the bridge, I think more people would come so I hope that the destinations here would be maintained, especially the beach area and battery. This would attract more people since they would see that the destinations are well-maintained.
	Edward Buko Soriano, Jr.	Improve and develop other destinations in the island
	Alberto Juanico	Maintenance of the island, as well as waste management.
	Cleofe B. Diestro	Cleanliness, security, and assistance for vehicles who want to enter Corregidor. Management should also regulate tourists and have scheduled visits.
	Jovelyn Isla	Cleanliness and attractiveness
	Ronnie Amado	Higher tourists rates since they will learn about Corregidor; the overall area will improve; easier way of accessing hom and Cavite during emergency situations
	Fidel del Losa	Better access; more people will be knowledgeable about Corregidor; and access in emergency cases
	Restituto Solis	Improves sightseeing options to attract tourists and easier access
	Armando Hildawa	All goods in Corregidor will be cheaper; better access in case of emergencies
	Kevin Ballon	Easier access going to Corregidor; promotes tourism; access in case of emergencies; improved utilities (e.g. electricity)
	Brian Bongalin	Depends if the bridge would be open to the public. If it is private, then why would we go there?
	Jeremy Rolin	What we need to do is to control the traffic in some way, and there are many ways in which we can do it. There is no way we can allow a man from Manila to drive up here and drive around the island. It's not big enough. We have to input a stop or a car park up there and our tour bus will transport them around the island. That's very important. How are we going to do that? Well, there are various ways. We are looking, realistically, 10 years. A construction period of 5 [years], and I know it would take up to 2 years to start the construction or it might take longer, about 5 years, to start the construction because that's the way it is. I know that if we're being realistic, it would be 10 years from now. Our masterplan is for the next 30 years.

	Interviewee	Response
	Mitos Magrare	Improved transport and options to travel to Bataan. The bridge may attract investors to develop golf courses. Water sports activities could be set-up.
	William Payumo	Other than the electricity, I want to see the island develop as a whole.
	Gelio Pascua	We are not in favor of further developments. For example, if a mall or Jollibee will be established here, we are not in favor of that. Before, Henry Sy wanted to buy a part of the island to establish PAGCOR. The government did not allow it because the historical appreciation of Corregidor will be lost.
4. Do you have any other suggestions and recommendations in the design and/or implementation of the project?	**Jennelyn Abelarde**	None at the moment because I haven't seen the actual bridge and the construction haven't been started. Maybe when the bridge is fully operating, I think I can recommend something. So far, from what I can see now in the photos, I think the projects is okay. I think it's safe.
	Edward Buko Soriano, Jr.	None
	Alberto Juanico	Can we pass by the bridge? Can motorcycles pass by the bridge?
	Cleofe B. Diestro	None
	Jovelyn Isla	None at the moment
	Ronnie Amado	None
	Fidel del Losa	None
	Restituto Solis	None
	Armando Hildawa	Will there be lights along the bridge so that Corregidor will also have their own power? Sun Cruises may also consider having a mainland tour
	Kevin Ballon	None
	Brian Bongalin	Hopefully the bridge would be open to the public. Whenever there are typhoons, it would be easier for us to evacuate the island. Also, if it is our day off from work, which is usually once a week, we may opt to travel by land especially if the waves are strong. I think having the bridge and opening it to the public would increase our safety when travelling. I hope it will be open to the public and have an exit here in Corregidor. Hopefully we can have a parking space as well so that other people can

	Interviewee	Response
		have the chance to tour around the island. More signages should also be added on the road to prevent accidents.
	Jeremy Rolin	None
	Mitos Magrare	A toll gate could be set-up and could also collect visitor entrance fees to Corregidor
	William Payumo	We might not be able to reach the time when the bridge materializes. We hope that we are still around once the bridge is operational.
	Gelio Pascua	Help us to ensure that the bridge will be established or stop the establishment of the bridge if it is not favourable because we are not in the position of power to oppose the project.
Other concerns, suggestions	**Jennelyn Abelarde**	Tourists don't usually go to the part of the island where the airport is located. Since on the side of Bataan, the water is usually high/deep, is the bridge high enough if ever there would be typhoons?
	Edward Buko Soriano, Jr.	N/A
	Alberto Juanico	N/A
	Cleofe B. Diestro	N/A
	Jovelyn Isla	N/A
	Ronnie Amado	Concerned about the timeline and if benefits will be soon.
	Fidel del Losa	What are the chances that connection to Corregidor will push through?
	Restituto Solis	Concerned how people will travel from the tailend to the main tourist area of Corregidor; concerned about the toll gate
	Armando Hildawa	Concerned that timeline of construction to operation will not be followed. Who will be using the bridge? Will this be accessible to the public?
	Kevin Ballon	Concerned about waste disposal.
	Brian Bongalin	What is the purpose of the bridge? Is it only for private vehicles? Is the bridge a private, provincial, or national road? The bridge may be beneficial for us. As for me, I live in Batangas so imagine how I

	Interviewee	Response
		travel to and from Corregidor. Most workers are from Bataan, Cavite, Maragondon, Manila, Batangas, and Pangasinan.
	Jeremy Rolin	They say that the saturation rate is 166,000 per day. But I don't agree with them. That's 550 ferries with 300 people on them. I'm not happy with the extent of the masterplan. At the moment, we are expecting a maximum of 1,000 people in February next year. We can't at the moment cope with that much people on the island. We haven't got the toilet. We haven't got the garbage collection system. We are going to have to put a bloc of facilities in here to cope with the people. So at the moment, I would say the saturation rate is about 400 (maybe 500) people in the island at maximum. My own masterplan calls for 2 small hotels – 1 for 250 beds, 1 for 150 beds. So we're talking about 1,000 people and day trippers about 500.
	Mitos Magrare	Only tall grass and rocks are present in the area of the alignment
	William Payumo	Several people died at the tailend part of the island, which is also where the Japanese landed and attacked. The tail end part also mostly has Ipil-Ipil trees and Kawayan, which are fast-growing.
	Gelio Pascua	N/A

Information, Education, and Communication (IEC) Meeting
Bataan-Cavite Interlink Bridge Project
Environmental Impact Assessment
Detailed Engineering Design Stage

Online IEC
Date: 21 October 2021, Wednesday, 10:00 A.M.
Corregidor Islands Marine Park Executive Committee
Meeting ID: 895 1049 4695

Open Forum:

Presented in the matrices are the summary of issues, concerns, comments, and suggestions raised during the IEC Meeting (DED Stage) with Corregidor Islands Marine Park Executive Committee (CIMP). Responses to the queries are also included in the matrices.

Please see the attached attendance sheet/s for the list of participants during the meeting.

Summary of Issues, Concerns, Comments, and Suggestions Raised during the DD IEC Meeting with the Corregidor Islands Marine Park Executive Committee (1/6),	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• Asked how the team got the 3.7 kilometers distance between the sampling point and Corregidor's declared protected area. • Informed that CF5 is in the middle of their protected area, as well as CF3, CF4, and CF6. • Shared that based from their conversation with DENR and other concerned agencies, the Marine Protected Area is all around Cavite. • Stated that the CIMP Executive Committee is not objecting the conduct of study however it only wants the team to be accurate with the declared measurements, especially the distance from the MPA. **MR. JERRY ROLLIN,** *Member,* Corregidor Islands Marine Park Executive Committee	• Responded that the marine experts plotted the alignment in reference to the Management Plan of Corregidor Islands Marine Park, from PENRO-Cavite. • Answered that the team is willing to relocate their sampling station to the boundary of the protected area. • Their concern will be raised to the marine experts to overlay the alignment again and consider having new sampling stations. **MR. FREDERICK ESTERNON,** *Environmental Management Specialist,* DCCD
• Inquired if there is an assurance that the project will push through or prioritized by the new administration. **MR. MARIO DAGA**, Department of Transportation Region 4A	• Answered that the EIA team is trying to double time with their activities and that there are already initial works in the alignment. • Shared that the team is trying to have the ECC amended by December and by early next year, the construction is expected to start. • By doing the said steps, the team is hoping that the activities for the project will not be affected by the forthcoming election. • Reassured that the project will push through. **MR. ESTERNON**
Summary of Issues, Concerns, Comments, and Suggestions Raised during the DD IEC Meeting with the PENRO-Cavite and Corregidor Foundation Inc. (2/6),	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**

• Asked if this is the only IEC that the Cavite City was a participant of. • Inquired if this is the only IEC wherein matters about the MPA was raised. • Requested a confirmation if the construction posts were not supposed to be traversing the MPA based on the FS design. • Informed Mr. Esternon that the MPA is not only the core zone but the surrounding waters as well. • Raised his concern about the alignment passing through the middle of the MPA. • Added that the heritage of the area and the military zones must also be considered during the EIA. • Emphasized that there are bombs in Caballo Island wherein the bridge is passing through and there are also underwater mines within the MPA. • Stated that the CIMP is not anti-progress, they would just like to assure that the progress will not compromise that environmental and historical heritage. • Raised his concern on how will the government will recoup its expenses for the project when areas such as Mariveles (in Bataan), Naic, Ternate, and Maragondon (in Cavite) are all rural areas. • Requested to consider all their concerns to the study of the project. **ATTY. IAN ENCARNACION,** *City Legal,* City of Cavite	• Answered that there already have been around 3 to 4 IECs conducted with participants from Cavite City. • Clarified that during the first few IECs, specifically during the Feasibility Study (FS) stage, the alignment was far from the Corregidor Islands. • Confirmed that it is the plan and still is during the Detailed Engineering Design (DED) stage of the project. • Explained that the team of marine experts are aware with the presence of bombs and mines and assured that the team is knowledgeable and capable of doing the study since they are the same team who made studies for the Manila Bay. • Added that in the ECC Amendment, CIMP Executive Committee is considered as the resource group for consultations with regards to the Corregidor Islands. • Affirmed that the purpose of the meeting is to get inputs from the CIMP, to be incorporated in the study. **MR. ESTERNON**
• Asked for a copy of the results of the underwater studies. Representative from the **Planning and Development Office of Cavite City (CPDO)**	• Answered that they will be providing them copies after it has been made official. **MR. ESTERNON**
• Requested to take note of Atty. Encarnacion's concerns since it is PVAO's concern as well. **COL. AGERICO AMAGNA III,** *Veterans Memorial and Historical Division,* Philippine Veterans Affairs Office (PVAO)	

Summary of Issues, Concerns, Comments, and Suggestions Raised during the DD IEC Meeting with the PENRO-Cavite and Corregidor Foundation Inc. (3/6),	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• Stated that the alignment presented to them before is different comparing to the design in the current stage of the project.	• Responded that the alignment during the FS stage is just the proposed design. • Discussed that the EIA team is concerned about the possible effects of designing an exit point to

• Shared that PVAO requested the proponent an exit point leading to the CIMP. **COL. AMAGNA III**	Corregidor but it is still not final and under further study. **MR. ESTERNON**
• Requested for a copy of the different type of management plans of the CIMP to serve as a reference for the study and align it to the purpose of the Environmental Performance Report and Management Plan (EPRMP) of the project. • Inquired if they are referring to ARUP. **MR. ESTERNON** • Informed that TYLIn has not been communicating with them as of the moment. • Raised his concern about the effects of the project on the operational areas of the island, especially on the tail side of Corregidor wherein there is a military air road drone. • Informed Mr. Esternon that tail side of the Corregidor is planned to be developed. **COL. AMAGNA III**	• Responded that the study was already finished by the Engineering Team or consultants of the project. • Confirmed that it was ARUP. **COL. AMAGNA III** • Clarified that ARUP was the consultant during the FS stage but with the DED stage, TYLin International Group is the new consultant. • Stated that he is part of the TYLin International Group. • Reiterated his request for the management plans or reports for the CIMP. **MR. ESTERNON** • Responded that the Tourism Infrastructure and Enterprise Zone Authority (TIEZA) have the said plans for the CIMP. • Added that it is best to ask TIEZA to provide PENRO Cavite the requested documents so PENRO can share it with the EIA team. **COL. AMAGNA III**
• Informed Mr. Esternon that their team from Mt. Samat FTEZ can request for information disclosure from their main office in TIEZA so they can share the Tourism Master Plan for Corregidor Islands. **MR. FRANCIS INITORIO,** *Representative,* Mt. Samat Flagship Tourism Enterprise Zone (FTEZ) • Asked if Mr. Esternon's team would need to submit a letter for their request. **MS. FAITH FALCUTILA**, *Representative,* PENRO-Coastal and Marine Conservation Unit	• Confirmed that the EIA team must submit a request letter. • Affirmed that TIEZA can closely coordinate with the EIA team to properly incorporate the development of the tail side with the design of the project. **MR. INOTORIO**

Summary of Issues, Concerns, Comments, and Suggestions Raised during the DD IEC Meeting with the PENRO-Cavite and Corregidor Foundation Inc. (4/6),	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• Shared his concern about the master plan, which calls for a large increase in the number of tourists visiting Corregidor. • Informed that the daily number of cars visiting the island will go from 75-100 cars to a thousand, which the island cannot	• Explained that it is the EIA team's concern as well that is why they are not into the idea of constructing an access to the island. • Discussed that the team have considered the "Island Capacity" and also worried that project would not be able to regulate the entry of vehicles into the island.

accommodate since there is no road structure and it is not possible to construct one. • Suggested to establish a bus terminal at the both ends of the bridge so the CIMP can regulate the number of vehicle and tourists in the island. • Stated that the project will be a great help to the CIMP in terms of electricity and water supply as well as garbage disposal but it has to consider how to regulate the number of people going to the island. **MR. ROLLIN**	• Stated that the team needs a copy of the master plan to incorporate such concerns and proposals to the design of the project. **MR. ESTERNON**
• Suggested that since natural heritage, historical and archaeological sites will be affected, not only environmental, assistance and permission from the National Commission for Culture and Arts (NCCA), National Museum, and National Historical Commission of the Philippines (NHCP) must be obtained. **MR. JC ASUNCION** • Informed Mr. Esternon that TIEZA can help them in coordinating with the NCCA and NHCP since they are in partnership for Mt. Samat and Corregidor Islands. **MR. INOTORIO**	• Affirmed that their suggestion is duly noted. **MR. ESTERNON**
• Requested for the recording of the video and minutes of the meeting from PENRO, once available. **MR. ESTERNON**	• Confirmed that PENRO Cavite will provide requested files. **MS. FALCUTILA**
• Asked if the EIA team is aware about the presence of a caldera between the Corregidor Islands and Caballo Island. **MS. ANDREA PANGANIBAN,** *Development Management Officer II,* PENRO Cavite	• Responded that the team is aware about the presence of caldera in the said area. **MR. ESTERNON**

Summary of Issues, Concerns, Comments, and Suggestions Raised during the DD IEC Meeting with the PENRO-Cavite and Corregidor Foundation Inc. (5/6),	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• Requested for a clarification regarding the aforementioned 3.7 kilometers distance, if it is from the tail end of the island or core zone. • Shared that the viaducts will be traversing the MPA, considering that it has buffer zone. • Inquired if the posts to be constructed do not have an impact to the caldera. **MS. PANGANIBAN** • Asked if the exact location of the caldera is available in the CIMP Management Plan so the	• Clarified that the team is referring to the distance from the core zone. • The team will be informed about this concern and assured that they will keep PENRO posted. • Informed that there is already a dredging activity within the area by another company or project and the team reported it to the Environmental Management Bureau Central Office. This is to avoid possible misconception

team can overlay the alignment with reference to the location of the caldera. **MR. ESTERNON** • Requested for a copy of the ECC Amendment once available. **MS. PANGANIBAN** • Informed that the northern side of the caldera is the Corregidor Islands while its eastern side is the Caballo Island. • Recommended to refer to marine charts to locate the caldera. **MR. ROLLIN**	that the said activity is made by the BCIB project. • Assured that their concern would be considered for the ECC Amendment. **MR. ESTERNON** • Explained that it is not actually part of the MPA that is why they do not have its exact location however its details can be requested to DOST or Philvolcs. **MS. PANGANIBAN** • Assured that they will provide PENRO a copy of the ECC Amendment. • Expressed appreciation to Mr. Rollin's input. **MR. ESTERNON**
• Asked who will be providing the Marine and Aquatic Ecology Team a certification, either via email or formal letter, stating that they can proceed with their sampling activity. • Explained the importance of the activity, not only for the project, but as well as for the CIMP. **MR. ESTERNON** • Referred the question to Atty. Encarnacion. • Inquired if the LCE will not act as the CIMP Chairman for this matter. **MS. PANGANIBAN** • Asked for Atty. Encarnacion's contact information. **MR. ESTERNON** • Requested to be copy furnished in all communications with regards to CIMP. **MS. PANGANIBAN**	• Answered that it should be provided by the CIMP. • Added that the DENR/PENRO is just the secretariat of the CIMP and its chairman is the Local Chief Executive (LCE) of Cavite City. **MS. PANGANIBAN** • Responded that they would still convene with the Sangguniang Panglungsod and ask for their concurrence. • Explained that even if the LCE is the Chairman of the CIMP, the Mayor still decide for matters with the concurrence with the Sangguniang Panglungsod. • Shared his contact information with the participants. **ATTY. ENCARNACION** • Assured that the Secretariat will be copy furnished, as requested. **MR. ESTERNON**
Summary of Issues, Concerns, Comments, and Suggestions Raised during the DD IEC Meeting with the PENRO-Cavite and Corregidor Foundation Inc. (6/6)	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• Informed Mr. Esternon that the sampling station CF6 is located in the Caballo Island and they will need permission from the military to enter or proceed with their activity. **MR. ROLLIN**	• Responded that the team will relocate the sampling station. **MR. ESTERNON**
• Inquired if there will be viewing area in the design of the project. **MR. DAGA**	• The view deck area was proposed however it is still under discussion if it would be included in the final design. • Assured that they will be updated regarding this matter. **MR. ESTERNON**

Photos:

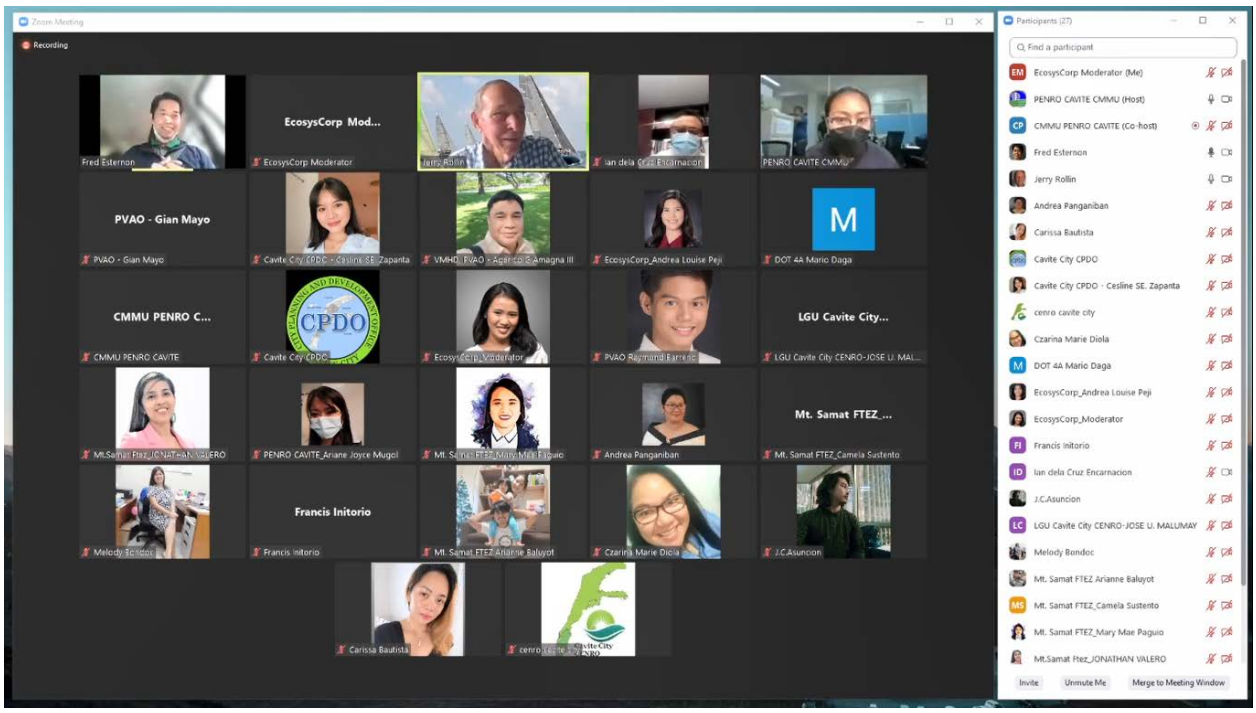

Photo No. 1 **Mr. Jerry Rollin** sharing his concern about the distance of the sampling stations to the MPA.

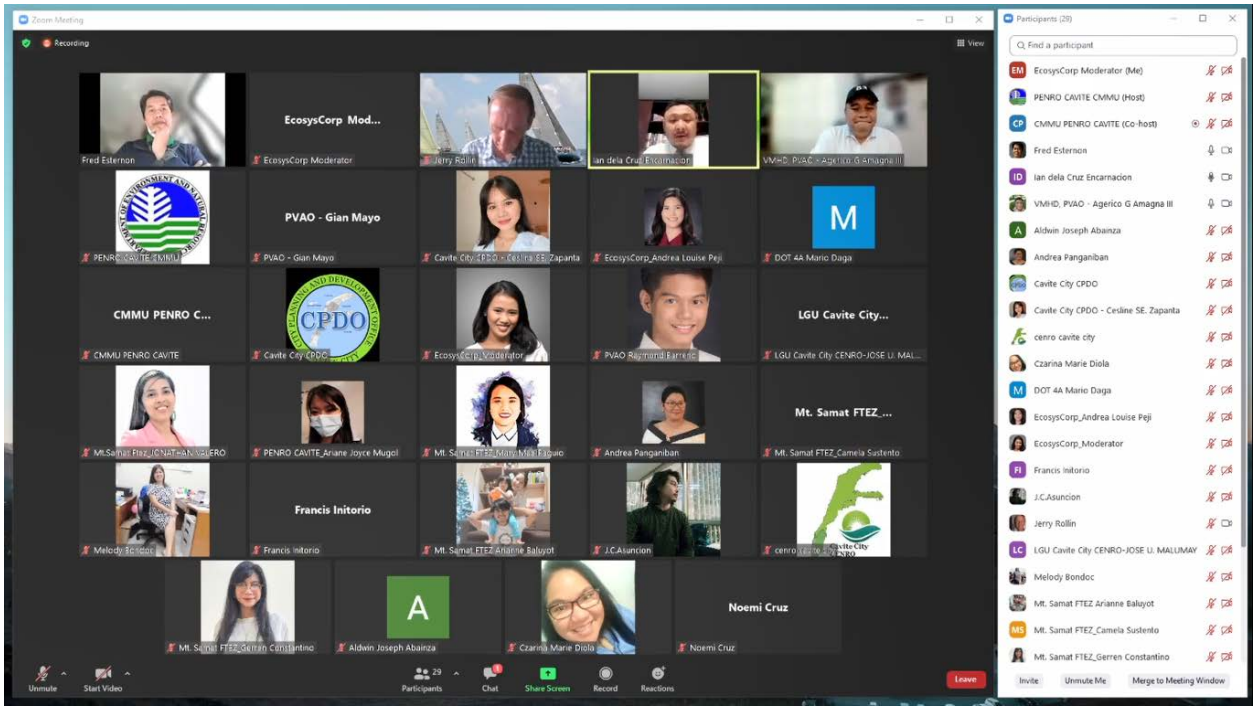

Photo No. 2 **Atty. Ian Encarnacion** clarifying that the surrounding waters is part of the MPA.

Attendance:

NAME	OFFICE
Faith Falcutila	PENRO CMCU

Jose Malumay	CENRO Cavite City
Frederick Esternon	DCCD
Andrea Panganiban	PENRO Cavite
Ariane Joyce Mugol	PENRO CMCU
Carissa Bautista	
Cesline Zapanta	CPDO Cavite City
Melody Bondoc	CFI
Mario Daga	DOT Region 4A
Jerry Rollin	CIMP
Jonathan V.	Mt. Samat FTEZ
Gian Mayo	PVAO
Raymond Barreno	PVAO
Col. Agerico Amagna III	PVAO, VMHD
Andrea Louise Peji	EcosysCorp, Inc.
Francis Inotorio	Mt. Samat FTEZ
Czarina Marie Diola	
J.C. Asuncion	Mt. Samat FTEZ
Arianne Baluyot	Mt. Samat FTEZ
Carmela Sustento	Mt. Samat FTEZ
Gerren Constantino	Mt. Samat FTEZ
Mary Mae Paguio	Mt. Samat FTEZ
Jonathan Valero	Mt. Samat FTEZ
Atty. Ian Encarnacion	Cavite City Legal

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Cavite for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

Date:	Started:	Adjourned:	Venue:
March 30, 2022	9:00 AM	5:00 PM	Cavite

Meeting Presider:

Mr. Simeon Stairs

Meeting Attended by:

Please see the attached Attendance Sheet

TOPIC/DISCUSSION/ACTION ITEM

TOPIC/AGENDA	DISCUSSION

CIMP Technical Meeting and Consultation attended by the representatives from DPWH UPMO RMC II, PEO, PPDO, PVAO – DND, PGENRO, CPDO, CENRO, and PENRO with the DCDD Engineering Corp. and Associates	• Mr. Simeon Stairs started the consultation meeting by presenting the outline of the discussion as listed below:
	  ○ BCIB Project
	  ▪ Project Overview
	  ▪ Updates on alignment and turnaround position
	  ▪ Updates on construction activity and impacts
	  ○ ADB Requirement for Mitigation Planning in Natural, Critical, and Protected Habitat
	  ○ Next Steps
	  ▪ Development of mitigation options and plans
	  ▪ Further consultation with marine science community to shape Biodiversity Action Plan
	  ○ Questions and Discussions
	• During the discussion of the BCIB Project particularly on the updates on construction activity and impacts, Mr. Roldan Bayaga asked on the specific ideas for the habitat offset to compensate for habitat loss. Mr. Stairs stated that currently, they are on the stage of identifying impacts and about to move on finding mitigation. In general, there will be an enhancement on existing habitats on nearby areas. Ideally that will be in coordination and support with CIMP artificial reef program. He added that artificial reef is the most obvious idea to make up habitat loss which will be located in installation area (pointed out on the map). Another idea is that, the parts of the bridge that will be constructed particularly on the foundation part can serve as one of the mitigation measures as a habitat offset.
	• Ms. Anabelle Cayabyab asked on the extent of the coral cover and seagrass bed that will be affected by the project and the depth of the project to be able to consider the area for the computation of the marks (silk curtain) and its location within the project alignment. Mr. Stairs stated that they still don't have the exact number yet from the marine team. He added that the extent of coral cover in the area along the Corregidor area is quite long, estimated to be 10% coral cover. In terms of the overall coral area that will be affected, he stated that there is still no exact number yet. As long as the sea grasses are concerned, the number is close to zero. Along the Corregidor Island, much of the bottom part were boulders which is not conducive to seagrass quarrying. Near the Cavite shore, the water is naturally very turbid, and they are more turbid by the existing activities which is a very significant

	limitation to development. In terms of depth, the alignment has quite some range of depths. The deepest area is in the North Channel between the Corregidor Island and Bataan, the deepest depth in that area is about 90 meters, but where the bridge will across, its 40 to 50 meters. He added that the exact number is not yet determined since the geophysical survey is still ongoing. For areas close to the shore, there were some shallow areas. Along the coast of Corregidor particularly in tail end, much of the alignment is more or less 10m. • Ms. Cayabyab asked whether the bathymetry and wave direction were being considered in order to address or identify the possible risk like inclination, sea level rise and tsunamis. Mr. Stairs stated that the sea level rise and tsunami risk were being part of the design. He added that it is one of the reasons why there were consultation meetings being conducted in order to input important aspects in the updating of the EMP. • Ms. Cayabyab asked if the ongoing dredging project or seabed quarrying along Cavite is being considered since it is near the BCIB Project site plus the ongoing proposal of the DENR PENRO for the Corregidor-Ternate Marine Protected Area Network. Mr. Stairs stated that they were aware of the seafloor dredging operations and the extent of possessions that have been defined all throughout the Manila Bay. He added that obviously, this should be taken seriously and its conducive effects. As far as the bridge is concerned, the bridge is going to have a protective effect wherein the areas near the BCIB Project site will have a strict monitoring for other dredging activities. Mr. Stairs added that buffer zone is not yet identified. Mr. Esternon stated that there will be a 1000m boundary, as mentioned by EMB, away from the alignment just to make sure the integrity of the structure (the figure is still needed to be confirmed). • Ms. Cayabyab stated that there will be a time where the BCIB project and the ongoing dredging project will be simultaneously conducting activity in the area which might affect the seabed floor especially the depth on the proposed project site. Mr. Esternon stated that since the BCIB project is an ADB project, every step is scrutinized and as mentioned by Mr. Stairs, there will be navigating measures needed to install prior and during the construction. He added that it's saddening that the dredging activity is currently on process according to meeting with MENRO. Ms. Cayabyab added that there were two (2) for-approved dredging companies which started last December. • Along the discussion of the ADB Requirement for the Mitigation Planning in Natural, Critical, and Protected Habitat, Ms. Cayabyab stated that in the biodiversity team, they already studied the seek and source of the egg of the fishes for the computation of the net losses of the biodiversity. Mr. Stairs stated that seek and source will be needed to be followed-up. Ms. Caybyab stated that each habitat is interconnected to one another; the seagrass bed, coral comfort, seek-source area for the species of fish and eggs which is needed to be considered for biodiversity to be able to consider the carrying capacity and to be to target the natural habitat and no net loss of biodiversity values. Mr. Stairs stated that on a conceptual level, they were not aware of it but will be one part to considerate. He added that if ever they collected sufficient data, they will be conducting a detailed calculation of net gain and loss. When it comes to next steps, Mr. Stairs stated that they will

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	call the local marine science community and experts especially in the area in refining the EMP as a requirement to have local expert's involvement to help figure out what is the appropriate offset to achieve the 'no net losses. Mr. Esternon recalled the project way back 2019 presented in Naic Conference by a marine biologist with the consultation to stakeholders. He stated that one of the targets is to identify possible biodiversity or the area where the species can grow. It just happened that there were no resources like mangrove area along the alignment where most of it have boulders. That's why there was no seagrass base from the 1000m boundary from the alignment. Mr. Esternon requested for the assumptions and pictures from the project way back 2019. As mentioned by Mr. Stairs, all the data that will be acquired will be part on the updating of EMP. • Ms. Cayabyab suggested to consider marine turtle conservation since Corregidor Island and several coastal areas in Cavite is the location of the nesting site of the Olive Ridley which is the only species in Cavite nesting in the coastal area. She added that they have a protection conservation program and even in Morong, Bataan, they also have conservation project for the 3 species of turtle. Mr. Esternon asked for data regarding the existing monitoring report on the marine turtle conservation. Ms. Cayabyab stated that she can provide the study at the Marine Science Institute of the University of the Philippines regarding the olive ridley and its nesting site. She added that she used the Landsat image to project the coastal erosion and abrasion to the nesting area. Recently, her office has conducted the coastal assessment to be able to identify the extent the coastal erosion in Cavite and the sea level rise based on the five species in Manila Bay. • Ms. Cayabyab asked on the status of the compliance with the ECC. Mr Esternon stated the ECC was already secured early 2021. Since the project started, he added that they need to find out whether there will be a minor or major amendments with the ECC. Ms. Cayabyab asked whether the amendment will be based on the new alignment. Mr. Esternon stated that there will be no new alignment, just a minor addition along the alignment particularly on the changing of the interchange. Mr. Esternon added that during the FS stage, it was presented that the design will have possible connection to the Corregidor Island, but now, it was completely removed. Mr. stairs added that there was also changed in the land site wherein the area for land part is getting final, about 90%. Ms. Cayabyab asked on the status of other permits, particularly on the requirement of an area clearance and area status prior to commencement since it will affect the start and the time for the execution of the BCIB Project. Mr. Esternon stated that with regards to other permits, the DPWH have already secured necessary permits as per terms with the ECC. Ms. Cayabyab asked the target date of the start of the project. Mr. Esternon stated that the project will start probably early next year, 1st quarter as mentioned by Mr. Stairs. Ms. Cayabyab requested for the project briefer for them to prepare and see the Direct Impact Area (DIA) which could be similar with the DIA of the ongoing dredging activity for them to prepare the SDP which is also one of the compliances to the ECC and to be able to address some issue which could emerge in the area during the construction phase. Mr. Esternon stated that as per mentioned by PENRO, we have options whether to provide the current EMP or the revised one. Ms. Cayabyab requested to have both copy for comparison.

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	• Mr. Bayaga stated that on the side of CIMP, they have adopted the zoning of the Corregidor Island Marine Science Project. Mr. Esternon asked on the target date of the revised masterplan. Mr. Bayaga stated that it would probably be available on the start of the second quarter. • Engr. Aldrin Malabad asked on how far the turnaround area from the Corregidor is. Mr. Stairs stated that the turnaround is approximately 250 m. Engr. Malabad asked on the reason why the link was not included in the design. Mr. Esternon stated that during the consultation with the CIMP, a representative from MAO stated that there is a possibility of unexploded material in the area. He added that since the BCIB Project was a Build Build Build Project, they don't want to delay more of the project for the conducting of research studies just to pinpoint the unexploded materials. Engr. Malabad anticipated a direct link to the island since it was a great link potential for economic growth wherein, he is asking for reconsideration from the DPWH. Mr. Esternon stated that if there will be reconsideration, it will take an extension for the project to be constructed. He added that the link to the island can be the next project after the construction of the bridge. Mr. Stairs stated that the link in the island is not part of the Terms of Reference (TOR) of the environmental study of the BCIB project. Engr. Malabad suggested to indicate connection for electricity from the bridge to the island. • Ms. Cayabyab asked on the area clearance of the BCIB Project. Mr. Esternon stated that if required, DPWH will process other necessary clearances. Ms. Cayabyab asked on the status of the permits from the LGU and the provincial government. Mr. Esternon stated that the permits were already processed by the NEDA. Ms. Cayabyab asked on the preparation of the proponent or the ECC holder regarding the preparation stage of the SDP since the presented one is for EMP. Mr. Esternon stated that the EMP is being updated which includes the SDP since what stated on the previous EIS is just the framework of the SDP. Ms. Cayabyab stated that the EMP, the study, and the SDP is connected to one another. She added that for the Economic Resource Evaluation, for whatever habitat that will be impacted by the project, there should be value for whatever losses especially for the biodiversity loss. She also stated that for the output of the EMP particularly on the conducted ERV, for every hectare of coral reef cover, there will be an equivalent species of fish per day or month production which could affect the SDP based on the fish catch or fish net value which is needed to be considered for the amendment or improvement of the plan. This could also affect the LGU if the DIA area will ask on what will be the support if there will be a loss of fish catch. Ms. Cayabyab then asked on a copy of SDP, the whole EIS, and the project description for them to have a background on the impact area for both environment and social. • Ms. Lorna R. Leyran asked whether consultants already have the copy of the CIMP Management Plan. Mr. Stairs asked for the updates on the CIMP Plan. Mr. Bayaga stated that they have already incorporated the plan to another comprehensive plan. He added that they have two (2) management team in wherein the Corregidor Island Foundation should be onboard in order for the plan to be updated. He added that it has to be the secretary's task to continue for the consultation and negotiation regarding the implementation of the plan.

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DPWH Cavite 2nd District Engineering Office	• The meeting started with the introduction of the participants from DPWH NCR RMC II, DPWH Cavite 2nd District Engineering Office, DCDD Engineering Corp. and T.Y. Lin International- Pyunghwa Engineering Consultant JV and Associates • Mr. Stairs asked the cases of accidents within the area. Engr. Ariel P. Umipon stated that the data on accidents was not updated and the last record was in 2018 (pre-pandemic). He added that they acquired the data on Naic Police Station. They have the data but they were not sure whether the data was transferred to the newly constructed building in Alfonso, Cavite. • Mr. Stairs asked whether the municipality is experiencing road congestion. Mr. Umipon stated that they seldomly have accidents in the area and the last one they know was during the collecting of reports in 2018. Mr. Frederick Esternon the asked whether the DEO experienced complains from the community regarding the hazards, and safety signages since during the past meetings, it was stated that the community were complaining on the signages. Mr. Umipon stated that they don't experience any complains. He added that there is a possibility that the regional office may have experience complains. • Mr. Stairs asked whether the DEO have plans for the Antero Soriano Highway particularly on the Governor's Drive since the BCIB Project could create traffic in the said road. Mr. Stairs added that the question was asked due to two (1) main reasons: (1) In the short term when the construction will be starting, there will be a lot of construction that will happen. It is interesting to know whether there will be plans for upgrading or maintenance of roads that will be simultaneous with the BCIB Project for the consultant and proponent side to have advance thinking for the necessary coordination purposes and (2) traffic will increase and needed time to think for traffic safety. Engr. Umipon stated that they already widened the roads from a 2-lane road to 4 lanes. Mr. Stairs asked if the upgrading of roads was full length. Mr. Umipon stated that there were still areas with obstruction such as Meralco posts and trees in which they already requested for relocation of the posts and tree cutting permit. Mr. Esternon asked whether the area can be cleared within the year in preparation for the BCIB Project. Engr. Vicente Gutierrez cannot answer the question since they were still not sure on the exact date for the removal of the post and trees. Mr. Stairs asked on any plans for the Governor's Drive. Engr. Umipon stated whether there will be widening or not in the area. He added that Palanas Bridge and Bisaya Bridge were already widened from two (2) lanes to four (4) lanes. For the bridge located within the boundary of Naic and Tanza, there was a new bridge constructed beside an old bridge. There was a proposed demolition of the old bridge and creating a new parallel one which is included in the budget proposal for 2023. Mr. Esternon then asked whether the construction of the proposed bridge will be on 2023. Engr. Umipon stated that it depends whether there will be a budget. He added that the new bridge which has two (2) lanes was the one being used not the old one. Engr. Gutierrez asked whether there will be alternative route for the construction materials for the BCIB project. Mr. Esternon stated that there was no alternative route and the only option is to upgrade the existing road within the area. Engr. Gutierrez asked on the barging point. Mr. Stairs stated that the barging point would be near the alignment but the river is not too deep to bring the barges

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	from the river to the site. He added the possible barging point is within the coastline located on the north side. Mr. Stairs showed on the map on the location of the proposed staging area. Mr. Stairs asked on the capacity of the newly constructed bridge. Engr. Umipon stated that the bridge can carry more than 20 tons. Mr. stairs opened the topic on the plan for coastal road (Tanza to Nasugbu). Engr. Umipon stated that they were not aware of the proposed coastal road project. • Mr. stairs asked whether the DEO have environmental unit or environmental specialists for the monitoring of the project. Engr. Umipon stated that they don't have environmental specialists wherein for concerns, the Right-of-Way Acquisition Unit was the one handling it. Mr. Stairs asked on the office handling projects. Engr. Umipon stated that the bigger project was handled by the Regional Office and the small ones were handled by the DEO. Mr. Esternon stated that they were expecting that the DEO will be the one leading the monitoring since they will the first one to know the cultural background of the local communities. • Engr. Rafael Espino asked regarding the ROW of the project especially the payment of the land. Mr. Esteron stated that there is a team handling the LARP or the Land Acquisition. Engr. Erica Juria stated that the Ecosys were the one doing the IEC and the Stakeholders Consultation Meeting.

Review and Confirmation:		
Prepared by:	Reviewed by:	Approved by:
EZEKIEL A. CALINAGAN	**DANTE B. BAUTISTA**	**TERESITA V. BAUZON**
Environmental Management Specialist II	Deputy Project Manager	Project Manager III
RMCII (Multilateral), UPMO	TYLI-PEC JV	RMCII (Multilateral), UPMO

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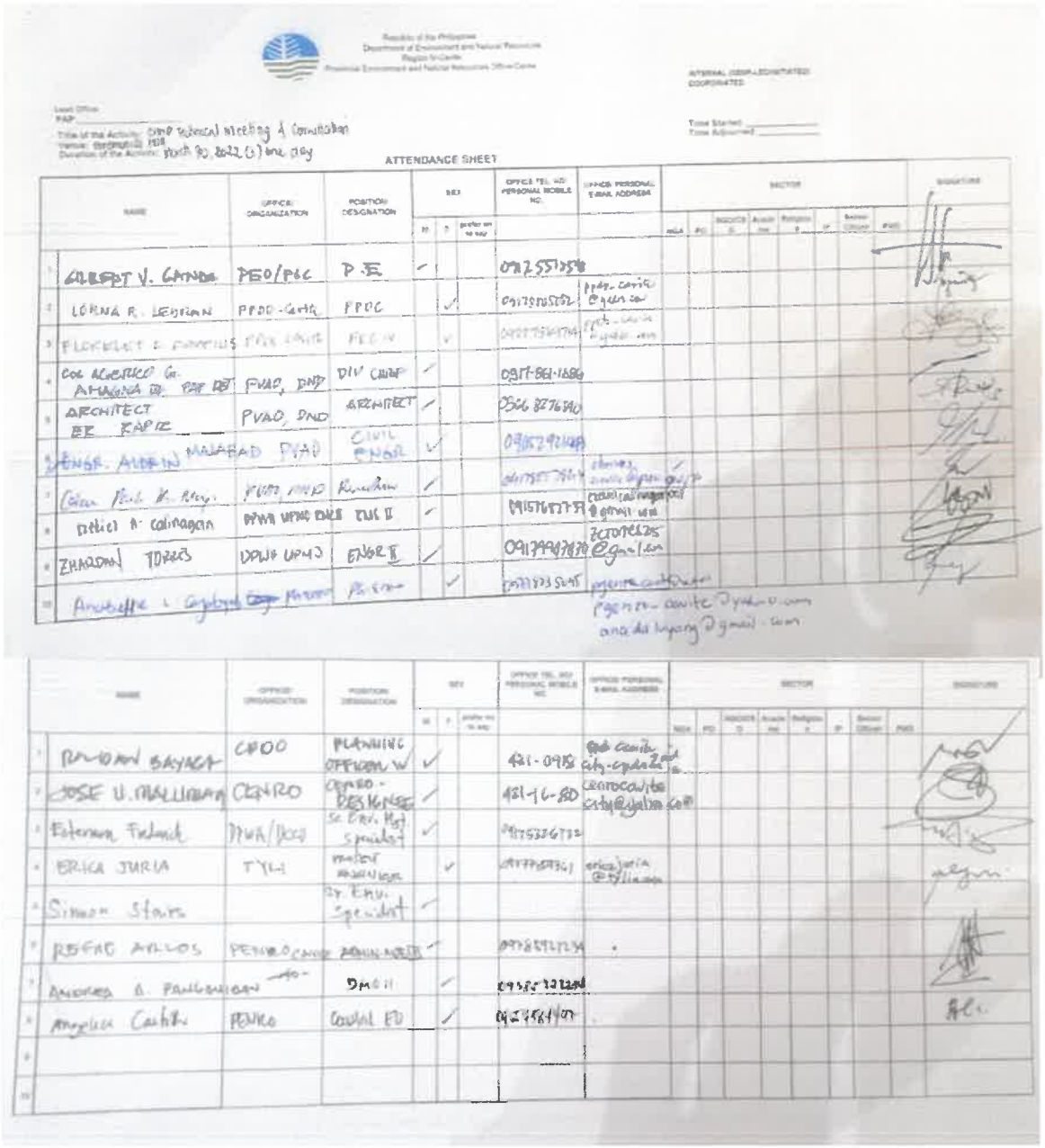
ATTENDANCE SHEET

A. CIMP Technical Meeting and Consultation attended by the representatives from DPWH UPMO RMC II, PEO, PPDO, PVAO – DND, PGENRO, CPDO, CENRO, and PENRO with the DCDD Engineering Corp. and Associates



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PHOTOS

A. CIMP Technical Meeting and Consultation attended by the representatives from DPWH UPMO RMC II, PEO, PPDO, PVAO – DND, PGENRO, CPDO, CENRO, and PENRO with the DCDD Engineering Corp. and Associates

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Title/Description:

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Date:	Started:	Adjourned:	Venue:
March 29, 2022	8:30 AM	4:30 PM	Cavite

Meeting Presider:

Mr. Frederick Esternon

Meeting Attended by:

Please see the attached Attendance Sheet

TOPIC/DISCUSSION/ACTION ITEM

TOPIC/AGENDA	DISCUSSION

Provincial Environment and Natural Resources Office – Cavite (PENRO-Cavite)	• The meeting started with the introduction of the participants from PENRO - Cavite, DPWH UPMO RMC II, DCDD Engineering Corp. and Associates.
	• Mr. Simeon Stairs discussed the outline of the meeting
	  ○ BCIB Project
	  ▪ Project Overview
	  ▪ Updates on alignment and turnaround position
	  ▪ Updates on construction activities and impacts
	  ○ ADB Requirements for Mitigation in Natural, Critical and protected habitat
	  ○ Next steps
	  ▪ Development of Mitigation options and plans
	  ▪ Further consultation with marine science community to shape Biodiversity Action Plan
	  ○ Questions and Discussion
	• During the discussion of the project alignment and turnaround position, Mr. Januel Peras asked if the alignment of the project will touch the Corregidor Island. Mr. Simeon Stairs stated that the boundary of the alignment to the island is 50m. away from the coastline.
	• During the discussion on the construction activities, its impact, and the mitigations to be used, Mr. Peras asked on the definition of habitat offset. Mr. Stairs stated that habitat offset is an area that will be enhanced and rehabilitated due to some losses from the impacts of the project. Mr. Stairs stated that habitat offset could be in a form of artificial reefs or a support/improved enforcement of fisheries spot. Mr. Peras asked on the deployment of silk curtains since its their first time to hear that approach. Mr. Stairs stated that during the construction process, there will be probability that soil below will be suspended due to presence of fine sediments. Deployment of silk curtains will keep the sediments within the area. Mr. Peras clarified on the possible impact of the project particularly on the navigation of fishes. Mr. Stairs stated that the best way to avoid impacts it create a containment area; as small as possible. He added that the impact depends on the situation but with the process of localizing silk curtains, it can lessen the localized destruction. Mr. Peras suggested to put sample photos to better picture what will happen during the deployment of silk curtains and bubble curtains for siltation and sedimentation and underwater noise and vibration effects, respectively since they were not familiar with the

concept. Mr. Peras asked the deepest part on the alignment. Mr. stairs stated that the deepest area was 40m around the north area.

- During the discussion of concrete work and shallow water construction, Mr. Reynaldo asked for some elaboration on addition of new hard substrate on the sea floor. Mr. Stairs stated that new hard substrate pertains to additional properties under water which could add as artificial reef for the habitat of fishes. Ms. Judaline Fabro asked if it is possible to put artificial coral reefs prior the construction period to attract the fishes to its new habitat to lessen the impact to fishes' underneath. Mr. Stairs stated that it makes a lot of sense conceptually but it will be hard since it will require a lot of time for the artificial reef to be an offset. Mr. Esternon agreed that it will require a lot of time plus, sampling or survey is needed on where to put the artificial reefs. Ms. Andrea Panganiban stated that the Bureau of Fisheries and Aquatic Resources (BFAR) already conducted study on artificial reef in Rosario and Tanza. Mr. Stairs pointed out that there is a conflict with the timing of the artificial reef to be introduced in the project. Ms. Panganiban added that it is doubtful that the CIMP would agree with the concept of artificial reef on the tail of Corregidor since the area is shallow. She added that the shallow part of the tail was mostly rocky due to boulders. She then suggested to go farther (few hundred meters) for the concept to be possible. Mr. Stairs stated that the one way for the concept to be possible is to move the boulders. Mr. Esternon stated that the alignment will be maintained but the best option is to move the boulders prior to the study. Mr. Stairs asked on the date of the study. Ms. Andrea stated that BFAR Region IV-A conducted the study in 2017.
- Ms. Merly M. Piad asked whether the project was discussed with the representatives of Corregidor Island Foundation. Mr Stairs stated that there was already a conversation between the two parties and discussed the ideas and management plan for the island. So far, the representative from CIF stated that for year, the island is served as a historical island.
- Mr. Reynaldo asked on the sustainability of the mitigation measures and restoration. Mr. Esternon stated that the project is compiled from the Philippine Standard. The proposed mitigation measures were part of the compliance, ECC, and the MMT. He also added that during the FS, itvwas already scrutinized by the Review Committee (REVCOM) which is composed of different experts from the central office.
- Mr. Reynaldo asked on the Return of Investment (ROI) of the project. Engr. Maria Eugenia Karisma Oarde stated that the Economic Internal Rate of Return is 34% wherein the requirement for NEDA is 10% therefore, the project is economically viable.
- Ms. Oli asked why there is still an updating of EIA when the ECC was granted and also if the EMP was still on preparation. Mr. Esternon stated that the updating of EIA is due to the possible amendments. Moreover, Mr. Stairs added that the updating of EIS was also due to the continuous updating with the stakeholders. Mr. Esternon stated they were still updating the EMP. Ms. Oli also asked on the impact of the project to the fisherfolks, the biodiversity that will be affected, and the coverage of the area of concern. Mr. Stairs stated there were still concerns and is still gathering concerns from the sector that's why the EIA and the EMP will be updated. Mr. Stairs then shown on the map of the biodiversity that is present in the area and the area

	of biodiversity that will be affected. He also added that the coverage of the area of concern is 1.3km landward. • Mr. Reynaldo asked on the territorial boundary of the project whether the project is mostly in Cavite or Bataan side. Mr. Esternon stated that most of the alignment is part of Cavite due to the presence of Corregidor Island. He added that the part can be 60% of the total alignment in terms of water body. • Ms. Piad asked if the affected persons can be hired from the project. Engr. Oarde stated that as part of the compliance with the ECC, affected people will be hired. • Ms. Oli asked if there can be accessed to the Corregidor Island as part of the bridge project. Mr. Esternon stated the project will not land on the island. But the project can help in providing electricity in the island. • Ms. Fabro asked on the specific project that could be implemented for habitat implementation. Mr. Stairs stated that there should be a proof of concept which can be adopted from other projects that could be used for habitat implementation. Ms. Fabro added that it is better for the CIF and other science-based team to join the MMT for the suggested restoration. • Mr. Stairs as the status of the implementation on the ground of the CIMP. Ms. Oli stated that the CIMP was declared locally last year. They currently have two (2) in Cavite: Ternate Marine Park and Corregidor Marine Park. Ms. Andrea stated that the implementation of the management plan of the CIMP was ongoing and have several targets based on the CIMP management plan which is a 3-year plan. Recently, they have conducted coastal clean-up within the area. The CIMP management plan was legislated locally. Mr. Stairs asked for the budget allocation of the CIMP implementation. Ms. Andrea stated that Cavite allocated an estimate of 1 million Pesos.
Municipal Environment and Natural Resources Office – Cavite (MENRO-Naic, Cavite)	• The meeting started with the introduction of the participants from DPWH NCR RMC II, MENRO – Naic, Cavite, and Associates. • Mr. Simeon Stairs asked whether the LGU is concerned on the extraction of groundwater in the area which will be used for construction purposes such as casting yard and staging area. Ms. Elma Valenzuela agreed that they were concerned on the extraction since ground water could not replenished easily and could create problem to the municipality for water supply. Ms. Pangilinan stated that the province of Cavite is experiencing water depletion, in which water applicants for extraction was not approved by the National Water Resources Board (NWRB) due to the current situation with ground water. There is a presence of water concessionaire which is Naic Water wherein pumping station is present for water supply. The communities are operation their own deep wells due to water scarcity wherein even during pumping of deep wells, no water is coming out. Ms. Antonete Digno added that the community in the upland area near the pumping station were complaining due to water scarcity. • Mr. Stairs asked whether the problem of water is worse within the coastline. Ms. Pangilinan stated that the community is experiencing salt water intrusion on shallow wells near the coastal area (shallow wells near the coastal area, deep wells in the upland). • Mr. Stairs asked on the intensity of the problem and if the water can be used for irrigation. Ms. Pangilinan stated that there is a presence of dam but is not sufficient for farming section due to *Baldo System* in which there is a

	shifting/rotation of water supply. The source of water is fresh water from Tagaytay. • Mr. Esternon asked if there is a connection of NAWASA in the area. Ms. Pangilinan stated that NAWASA only supply water to some parts of Cavite but not in Naic since they have Naic Water. Mr. Esternon suggested that if source of water for the project could be acquired from NAWASA, it would lessen the burden of the municipality of Naic for water supply. • Mr. Esternon asked on the concerns of the municipality to flooding. Ms. Pangilinan stated that there is a presence of floodings in the coastal barangays particularly near Balsahan River. Timalan Concepcion River do not affect the population since the river is wide enough. Mr. Esternon asked on the data of flood history in the area. Timalan Balsahan, which is the first barangay near Balsahan River, is experiencing flooding unlike in Timalan Concepcion wherein the river is wide enough. Mr. Stairs asked whether the people evacuates once there were flooding events in Timalan Balsahan. Ms. Pangilinan stated that people were not relocating since the flood subsides easily. If ever they were relocated, they will be going to covered court. • Mr. Stairs asked on the situation of solid waste management in the municipality. Ms. Pangilinan stated that currently, there is an ongoing establishment of a Category 2 Sanitary Landfill in one of the upland barangay particularly in Malainin Luma. The said landfill has a size of 5 hectares and is expected to be used by five (5) LGUs for 15 years. Moreover, the landfill is now in excavation stage and is expected to be operational on the third quarter of the year. Currently, the LGU is implementing RA 9003 or the Ecological Solid Waste Management Act particularly on the segregation of wastes. They also have private roller which is EMB accredited until semi-quarter. She added that wastes were being disposed in Sta. Cruz, Laguna. For Hazardous wastes, wastes were being collected by registered transporter and treated on a treatment facility in Silang, Cavite. The municipality have Material Recovery Facility wherein recyclable and biodegradable wastes were being retained in the facility and other types of waste were being transported in landfill. • Mr. Stairs asked on the possible location for the construction wastes from the BCIB project and how the municipality will accept the BCIB project's construction wastes. Ms. Pangilinan stated that the municipality will accept the wastes. She added that the landfill that will be using from the third quarter is a private one and they will be preparing a Memorandum of Agreement on the amount of tipping fee from wastes that will be deposited in the landfill. Mr. Esternon added that recyclable wastes during the construction such as woods can be utilized by the municipality. • For road-related concerns, the municipality is concern on the presence of too narrow roads. With the presence of ongoing project by the municipality of Tanza, Cavite, traffic is being experienced in the municipality of Naic. Moreover, there is a presence of accidents due to absence of signages. • For other information, there is a presence of Pawikan nesting located within the municipality particularly in Barangay Labac and sites for hatching which is located along the beach areas. The said activity was being monitored for 11 years. Data for this activity has been acquired during the meeting. The other economic activities in the municipality are fishing, farming, and presence of Overseas Filipino Workers. According to Ms. Pangilinan, there

	will be a soon to be project, Cavite Metro Park, wherein there is 4 locations and is expected to have 50 or more locators which could increase employment in the municipality. The municipality called their maincrops as Pakbet Vegetables, wherein its ingredients were the one being planted in the municipality and other food such as rice and shrimp paste/'alamang'. The said crops were being delivered to nearby areas. • Ms. Pangilinan stated that there is a presence of fish sanctuary in the area wherein the is a requirement from BFAR of a yearly assessment. It was managed before by the Cavite State University and was transferred to the LGU of Naic 10 years ago through an ordinance for adaptation. There were no data for yearly assessment. The area of the said sanctuary was decreased from a very large area. For the checking on the condition of the sanctuary, the LGU together with BFAR deployed 20 continuously trained bantay dagat. • For the establishment of the role of MENRO to MMT, Ms. Pangilinan stated that they have no experience on leading MMT According to her, mostly, the Municipal Administrator usually represents in the MMT of the province of Cavite. On the topic of the capacity of MENRO for seabed quarrying, on a personal opinion, Ms. Pangilinan stated that she doesn't want to be involved with the destructive activities. • In relations to capacity building, currently, there were two (2) technical staffs for MENRO. Mr. Esternon stated that to develop capacity building for MMT, there will be seminars and workshops to be technically capable to do the tasks.
Municipal Agriculture Office (MAO) - Cavite and Fisherfolks from Barangays Timalan Balsahan, Timalan Concepcion, Munting Mapino, and Bukana Sasahan	• The meeting started with the introduction of the participants from MAO – Cavite and Representatives from Fisherfolks from different barangays, DPWH NCR RMC II, and Associates. • Mr. Stairs asked the fisherfolks on the location of boundaries where fisherfolks do fishing activities and the docking area for fishing boats by locating it through the maps provided. • The representatives stated that there is no boundary on the location of fishing activities by fisherfolks since they do it along the whole Manila Bay, including the area on the North of Corregidor Island near the Province of Bataan. The area they pointed out for the docking area is within the project alignment which was then clarified by Mr. Esternon since on both side of the project alignment, there were boulders which means, the docking area for boats is after the boulders so there's no boat positioned within the alignment. • Ms. Virginia Poblete re-clarified the boundary of fishing activities near the project alignment to give space for the construction. Mr. Esternon elaborated that there will only be a certain time of no fishing activities within the alignment during the construction period. He then added that there is a strategic plan for fishermen to cross the alignment. This is through construction of by-portions of the bridge in which he also explained that the time allotted for the construction of the said portion could help then in providing artificial reefs which will be home for fishes. • Mr. Stairs asked on the number of fishermen per barangay along the coastline. Engr. Arianne stated that for all coastal barangays, there were approximately 700 fishermen. According to representatives from different barangays who have provided the data, there were 86 fishermen from Timalan Balsahan, 87 in Timalan Concepcion, 300 in Munting Mapino, and

	500 in Bukana Sasahan. All representatives agreed to the benefits of the project but was worried on possible impacts which was then raised. • Ms. Nancy Mariano pointed out that there is a presence of talaba culture which can be affected by the project especially those near the alignment. Mr Estenior informed the representatives that there will be a silk curtain that will be used to prevent siltation and sedimentation. • Mr. Danilo Cavasa asked on the possible impacts of the changes in weather to the project. Mr. Stairs stated that there will be a possibility of delayed in the project due to unexpected weather condition especially during rainy period. • Mr. Romeo Miranda raised concern on the possibilities of coastal erosion due to construction activities such as dredging. • Mr. Orlando Persa asked on the possible alternative livelihood for those affected fisherfolks. Mr. Esternon stated on hiring affected fisherfolks as laborers during the construction period which was agreed by Mr. Edgar Valenzuela. Mr. Esternon also clarified that the affected fisherfolks will be prioritized first for hiring of laborers. Mr. Cavasa, who was a senior citizen, was worried on the side of fisherfolks who are senior citizens on the possible alternative livelihood for them since some seniors cannot do labour for construction. He then suggested for provision of financial assistance. Mr. Esternon stated that those young fisherfolks can do the labour tasks and those older ones can still continue fishing since the number of people who will do fishing activities will be lessen since some will be applying as labourers during for the construction period. Mr. Cavasa also worried on the possibilities of hiring few laborers since he thought that additional laborers will not be needed due to presence of machineries that will be used for construction. Mr. Esternon clarified that additional laborers will still be needed not only for construction but also to other areas (e.g., manual mixing of concrete, sieving of sand, etc.) of the construction phase of the project. • Mr. Valenzuela asked whether they can be provided trainings from TESDA for capacity building. Engr. Oarde stated that the suggestion will be raised from DPWH authorities. • Engr. Arianne Armijo asked on the estimated number of labourers that can be hired for construction. Mr. Esternon stated that for the initial year, there will be an estimated number of 500 people that will be hired and will increased throughout the 2nd and 4th year of the construction phase and then decrease on the succeeding year. Engr. Armijo ask whether the hired labourers will be provided temporary shelter near the site. Mr. Esternon stated that labourers will still be going home since the labourer that will be hired for the construction in Cavite side is coming from the area where the people reside. Engr. Armijo also clarified on the disposal of construction waste which was then answered by Mr. Esternon that there was already a conversation with MENRO regarding the disposal of construction wastes.

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Cavite for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

Review and Confirmation:		
Prepared by:	Reviewed by:	Approved by:
EZEKIEL A. CALINAGAN	**DANTE B. BAUTISTA**	**TERESITA V. BAUZON**
Environmental Management Specialist II	Deputy Project Manager	Project Manager III
RMCII (Multilateral), UPMO	TYLI-PEC JV	RMCII (Multilateral), UPMO

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

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Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Cavite for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

ATTENDANCE SHEET

A. Meeting with the Provincial Environment and Natural Resources Office – Cavite (PENRO-Cavite)

29 March 2022
8:00 AM
DENR-PENRO Building

BCIB DED - ENVIRONMENTAL CONSULTATION MEETING WITH CORREGIDOR ISLANDS MARINE PARK MANAGEMENT TEAM

PRE - TECHNICAL MEETING WITH DENR - PENRO ~~CAVITE~~

1.	Andrea A. Panganiban	DMO II	09385927234	cmeucavite@gmail.com
2	Judoline A. Fabro	Supervising EMS	09457640616	mbcocavite@yahoo.com
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4	Marie Belle A. Ignot	Supervising EMS	0956-379 7541	emucavite@~~yahoo~~ gmail.com
5.	[illegible] G. [illegible]	FORESTER	0915 591 8319	
6.	Angelica L. Castillo	Coastal ED	09554384497	cmeucavite@gmail.com
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8.	ERA RAVEN CRIS DELA CRUZ	Engineer I - MBSCMO	0992 268 9355	erdelacruz.sc@gmail.com
9.	MARK ANTHONY GARCIA	Tourism I - SMU	0915-135-[illegible]	markgarcia.mag@gmail.com
10.	Ezekiel A. Calinagan	EMS II	0915 768 2737	ezekielcalinagan1001@gmail.com
11.	MARIA EUGENIA KARISMA OARDE	DPWH - ENGR II	09352558132	mekoarde@yahoo.com
12.	GERALDO G TACBAD	SEMS	0909846002[illegible]	geraldtacbad@gmail.com
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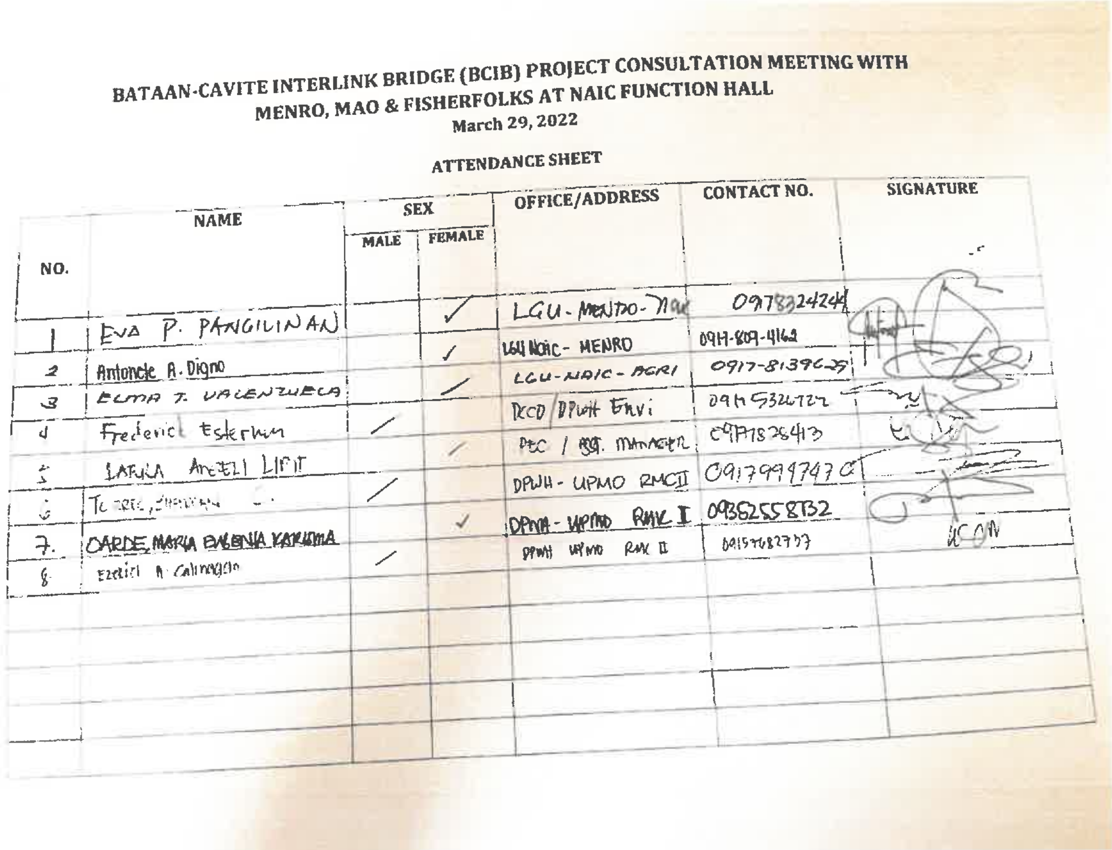
14.	LARRA ANGELI C. LIPIT	PEC	09171828413	geklipit@gmail.com
15.	ZHARDAN C. TORRES	DPWH - RMC II - ENGR II	09179997970	zctorres25@gmail.com
16.	AILEEN JOY D. ESTAMO	UMI	09381262062	estamoaileen@gmail.com
17	Esternon, Frederick J.	Sr. Envi Mgt. Specialist	09175324722	festernon@gmail.com
18.	Simeon Stairs	Sr. Envi Specialist	09694368301	
19.	SAMUEL A. FABRO	Sr. EMS	0906[illegible]	[illegible]@gmail

B. Meeting with the Municipal Environment and Natural Resources Office – Cavite (MENRO-Cavite)



BATAAN-CAVITE INTERLINK BRIDGE (BCIB) PROJECT CONSULTATION MEETING WITH MENRO, MAO & FISHERFOLKS AT NAIC FUNCTION HALL
March 29, 2022

ATTENDANCE SHEET

NO.	NAME	SEX		OFFICE/ADDRESS	CONTACT NO.	SIGNATURE
		MALE	FEMALE			
1	EVA P. PANGILINAN		✓	LGU-MENRO-Naic	0978324244	
2	Antonele A. Digno		✓	LGU Naic - MENRO	0917-809-4162	
3	ELMA T. VALENZUELA		✓	LGU-NAIC-AGRI	0917-8139625	
4	Frederick Esterhuin	✓		RCD/DPWH Envi	0915324722	
5	LAURA ANGELI LIPIT		✓	PEC / Asst. MANAGER	09178528413	
6	[illegible]	✓		DPWH - UPMO RMC II	09179997470	
7.	OARDE, MARIA EUGENIA KARISMA		✓	DPWH - UPMO RMC I	09352558732	
8	Ezekiel A. Calimagan	✓		DPWH UPMO RMC II	09157082777	

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Title/Description:

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Cavite for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

C. Meeting with Fisherfolks from Naic, Cavite

BATAAN-CAVITE INTERLINK BRIDGE (BCIB) PROJECT CONSULTATION MEETING WITH MENRO, MAO & FISHERFOLKS AT NAIC FUNCTION HALL
March 29, 2022

ATTENDANCE SHEET

NO.	NAME	SEX – MALE	SEX – FEMALE	OFFICE/ADDRESS	CONTACT NO.	SIGNATURE
1	EVA P. PANGILINAN		✓	LGU-MENRO-Naic	09178324244	[signature]
2	Antonete A. Digno		✓	LGU Naic - MENRO	0917-809-4162	[signature]
3	ELMA T. VALENZUELA		✓	LGU-NAIC-AGRI	0917-8139625	[signature]
4	Frederick Esteran	✓		DCD / DPWH Envi	09175326727	[signature]
5	LARRA ANGELI LIPIT		✓	PEC / Asst. MANAGER	09171826413	[signature]
6	TORRES, SHARAN C.	✓		DPWH - UPMO RMC II	09179947970	[signature]
7.	OARDE, MARIA EUGENIA KARANILA		✓	DPWH - UPMO RMC I	09852558132	[signature]
8.	Ezekiel A. Calimagan	✓		DPWH UPMO RMC II	[illegible]	[signature]
9.	Narcisa A. Mariano			T. Balsahan	09957631418	N. mariano
10	DANILO M CAYABA	✓		B. SABAHAN	09162453558	Danilo M. Cayaba
[illegible]	Romeo A. Miranda	✓	✓	Gardenville	09553181484	[signature]
12	VIRGINIA P. POBLETE			Munting Mapino	09179109447	[signature]
13	EDGAR R. VALENZUELA	✓		T. Coro Bosch	09173904390	[signature]

NO.	NAME	SEX – MALE	SEX – FEMALE	OFFICE/ADDRESS	CONTACT NO.	SIGNATURE
	Orlando J Persa	✓		M. Mapino N.C	09552819612	[signature]
	ALLAN L. IGLIP	✓		LONTOC	09605602368	A. [signature]
	Carlito P. Aragon	✓		J. Balsahan	097596441029	C.P. Aragon
	Niña Modell Magbiray		✓	LGU Naic	09773097303	[signature]
	Arianne T. Lemino			LGU Naic	[illegible]	[signature]
	Helen A. Poblete		✓	H. Mapino	0915[illegible]9	[signature]

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Cavite for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

PHOTOS

A. Meeting with the Provincial Environment and Natural Resources Office – Cavite (PENRO-Cavite)

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Title/Description:

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Cavite for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

B. Meeting with the Municipal Environment and Natural Resources Office – Cavite (MENRO-Cavite)

C. Meeting with Fisherfolks from Naic, Cavite

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Minutes of Meeting

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Bataan: for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

Date:	Started:	Adjourned:	Venue:
March 22, 2022	9:00 AM	4:00 PM	Mariveles, Bataan

Meeting Presider:

PM Marlon V. Galerio

Meeting Attended by:

Please see the attached Attendance Sheet

TOPIC/DISCUSSION/ACTION ITEM

TOPIC/AGENDA	DISCUSSION
Municipal Environment and Natural Resources Office – Mariveles (MENRO-Mariveles)	• The meeting started with the introduction of the participants from MENRO-Mariveles, DPWH NCR RMC II, DCDD Engineering Corp. and T.Y. Lin International- Pyunghwa Engineering Consultant JV and Associates • Mr Simeon Stairs presented the outline of the discussion: o Ground Water o Safety and Environmental Concerns on Receiving Roads o Institutional Capacity for Roles in Project Oversight o Monitoring o Disposal Site • Mr. Stairs asked on the availability of groundwater resources in Alas-Asin and also if there can be a presence of water scarcity in the area once the project started. • Ms. Reshell Concepcion stated that the only water concessionaires which provides water in Alas-Asin is the Mariveles Water District (MARIWAD). Also, there is a presence of Dam which is operated by the Authority of the Freeport Area of Bataan (AFAB) which supplies water for four (4) barangays: Baseco, Sisiman, Malaya, and Maligaya. She added that water for some portion of the LGU were also provided by FAB. For other water supply, there were also presence of deep wells (Data for deep wells will be provided from the census coming from PG-ENRO/MENRO). Moreover, CENRO and PENRO conducted survey on deep wells (data will be asked from sanitation section). Mr. Banjo Laurel asked if there were studies pertaining to water quality. Ms. Concepcion mentioned that GN Power conducted studies on water quality within and on nearby communities. • For road concerns, she stated that the presence of road accidents in the area is due to the problems with steep roads in which the mitigation they come-up with are certain hours for large vehicles such as trucks to passed through and speed limit especially for those unloaded trucks. There is a proposed widening but they are experiencing problem with Right-of-Way Acquisition. • For institutional capacity of MENRO, it has four (4) sections (coastal, forest, solid waste, and administrative) headed by Ms. Gladies Reyes under the umbrella of the Mayor's Office in which their staffs are composed of Job Orders/Volunteers and One (1) Environmental Management Specialist II. She stated that the office can help with manpower but not much on the technical side/aspect due to lack of skilled/knowledgeable staff on the environment side.

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Bataan: for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

	• The conversation lead on the discussion of the possible participants for Multi-Partite Monitoring Team (MMT) in which Mr. Ian Borja stated that mostly, participants are composed of mayor, barangay officials, stakeholders, people's organization/NGOs, MENRO, and Engineering Office. Ms. Concepcion stated that there is a presence of IIMT (Inspection, Inventory, and Monitoring Team) in the area in which they conduct quarterly meeting about the environmental concerns in the area. For the capacity to monitor the bridge project, there will be further discussion with regards to the monitoring of the bridge project (e.g., MENRO, DEO, or MPDO). • Last topic discussed were disposal sites particularly on the presence of disposal site for the present waste generation and waste coming from the project and budget for construction of disposal sites. Ms. Concepcion stated that annually, 40M funds are needed for waste transfer station but they can't afford to produce one due to lack of funds brought by small amount of money they can collect from fees from factories/companies (P10,000.00/year). But there is a proposed area of disposal site (sanitary landfill) which is located within Mariveles, Bataan. With the absence of owned disposal site, wastes in the area are being transferred to Metro Clark which requires additional payment for disposal. Ms. Concepcion also stated that based from PG-ENRO, there is also a proposed sanitary landfill located in Abucay, Bulacan. The municipality has its own treatment machines but not yet operating. • For additional information about the area particularly on coastal and forest section, Mariveles, Bataan has a nesting and hatchling site for marine turtles. There were activities for coral reefs with the help of the Department of Agriculture and the presence of National Greening Program which is near but not within the project site. Concerns on the forest side particularly on the key biodiversity area in Mariveles, Bataan for the long-term project have no discussions yet from the authorities.
DPWH Bataan 2nd District Engineering Office	• The meeting started with the introduction of the participants from DPWH NCR RMC II, DPWH Region III 2nd District, DCDD Engineering Corp. and T.Y. Lin International- Pyunghwa Engineering Consultant JV and Associates. • For the road widening along the Roman Expressway, there will be a presence of drainage canals which will also serve as sidewalk for both sides. Not all sections are widened due to problem with Right-of-Way Acquisition, fundings, and some properties that are privately owned. According to DE Ulysses Llado, if ever fund is available, road widening will stop in Mariveles seaside but is still to be confirmed from the ocular visit that will be conducted. There is a presence of steep roads (by-pass road) that is planned to be widened but there is currently encroachment and presence of informal settlers in the area. The local community suggested to have a diversion road in the area for the informal settlers to not be affected by the planned widening. • For institutional capacity of DEO to monitor the bridge project, DE Llado stated that they have the capacity to monitor but the problem is the funding since 50% of the budget of DEO was cut. • Additional information: No presence of environmental unit
Brgy. Alas-Asin Fisherfolks	• The meeting started with the introduction of the participants from Barangay Alas-Asin Officials, Representative from Fisherfolks, DPWH NCR RMC II, DCDD Engineering Corp. and T.Y. Lin International- Pyunghwa Engineering Consultant JV and Associates.

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Bataan: for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

	• Mr. Stairs asked the representative from Bantay Dagat regarding on their fishing boundary and possible alternative livelihood that is aligned to their skills once the project started. • Mr. Norly Francisco, representative from Bantay Dagat stated that the area where they are fishing is not covered by the alignment of the project; it is located more on the Cabcabin side. But he stated that when the project begins, there'll be possibilities that fishermen will be affected and could cause other areas to be crowded. He added that there were certain boundaries where there were abundant of fish which can be affected once the project started. Moreover, they are also worried on the environmental impact that the project could cause. • For alternative livelihood, Mr. Ian Borja asked for alternative livelihoods which are aligned to their skills. Since no suggestions have yet to provide, he then provided suggestions such as labourers during construction of the project and assistance for possible business such as convenience store. Mr. Francisco suggested to offer affected fishermen as labourers during construction period. According to the barangay officials (Mr. Elpidio Estiebar, Sr. and Mr. Rommel Arcenal), there were various skilled workers (carpentry and welding) and people who are willing to be a labourer (legal-age children). But they are worried on the possibilities of hiring workers outside of the affected project area than those within Alas-Asin. Mr. Florante Malimban suggested to have MOA on prioritizing workers from Alas-Asin. Mr. Francisco also suggested to provide financial assistance and alternative business to compensate certain loss during the project period. PM Marlon Galerio asked if the representative for fishermen can provide lists of the number of registered boats and with their names. • PM Galerio verified the estimated number of registered fishermen that will be affected. Mr. Malimban asked Mr. Francisco to provide only the estimated number for those affected people along the alignment of the project. Mr. Galerio stated that not all fishermen will be affected since the project will only affect a certain area. Mr. Francisco stated that there were 208 fishing boats in the area wherein 96 of these were registered. Moreover, there were 100 estimated boats sailing along Alas-Asin. In addition, PM Galerio clarified that fishermen can cross along the alignment but not allowed to catch fish until the construction is done. • For mitigation measures, Mr. Malimban suggested for resettlement areas for affected people. He also suggested to have artificial coral reefs in the area which can help for fish culture even after the construction period. Mr. Estiebar suggested to have a talaba and tahong culture that could serve as alternative for fishing which can be located in Dinginin river. Mr Francisco was worried about the daily income from talaba and tahong culture since they will wait several days for the harvesting period. • Additional Information: Representative stated that income depends on the fishermen on whether they will catch fish for a longer time to have more income. Per day, a three (3) people per boat can earn P5,000 per day in which they sail every day. He also stated that income may vary depending on the sizes of fish: P10,000 for bigger fish such as swordfishes and tanigue and P2000-P3000 for small fishes. There were also crab spot in the area which is a good generation today.

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Bataan: for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

Review and Confirmation:		
Prepared by:	Reviewed by:	Approved by:
EZEKIEL A. CALINAGAN	**DANTE B. BAUTISTA**	**TERESITA V. BAUZON**
Environmental Management Specialist II	Deputy Project Manager	Project Manager III
RMCII (Multilateral), UPMO	TYLI-PEC JV	RMCII (Multilateral), UPMO

DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Bataan: for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

ATTENDANCE SHEET

A. Meeting with the Municipal Environment and Natural Resources Office – Mariveles (MENRO-Mariveles)

REPUBLIC OF THE PHILIPPINES
PROVINCE OF BATAAN
MUNICIPALITY

OFFICE OF THE
MUNICIPAL MAYOR

AGENDA:
VENUE:
DATE/TIME:

NAME	GENDER	COMPANY/DEPT.	ADDRESS	CONTACT NO.	SIGNATURE
1. JAO MAY ZAMORA	F	TY Lin	MANILA	09615523950	
2. Jam Borja	M	DOCA	Manila	09175170271	
3. Simeon Stairs	M	Renardet SA	Chicago USA	09194368501	
4. Marlon V. Galerio	M	DPWH-RMC2	Manila	09178133232	
5. BANDO LAUREL	M	DPWH - RMC2	MANILA	09178506646	
6. Dulkiel A. Calaogan	M	DPWH - RMC2	Manila	09157112777	
7. Nicole Bumagat	F	DPWH - RMC2	Manila	09171198996	
8.					
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C. Meeting with the Brgy. Alas-Asin Fisherfolks

SAGISAG NG ALASASIN
MARIVELES, BATAAN

Republic of the Philippines
Province of Bataan
Municipality of Mariveles

BARANGAY ALASASIN

OFFICE OF THE PUNONG BARANGAY

BCIB CONSULTATION MEETING WITH FISHERMEN AND LGU
MARCH 22, 2022 @ 3:00 pm

NO	NAME	DESIGNATION	GENDER	SIGNATURE
1	Elpidio S. Estiebar Sr.	Brgy. Kagawad	M	
2	DONASITO R. ONRIWO	Brgy. Kagawad	M	
3	Marlon V. Galerio	PM II	M	
4	NICOLE ANNE T. BUMAGAT	ENGR. II	F	
5	Ezekiel A. Camagan	EMS II	M	
6	BANJO LAUREL	DPWH NMCT	M	
7	Simeon Stairs	Sr Env. Specialist	M	
8	JAD MAY ZAMORA	TV LID	F	
9	Ian Borja	DCCD	M	
10	Nonly K. Francisco	Bantay Dagat	M	
11	Lourdes A. Bautista	MFFARMC Alasasin	F	
12	Marestel Platestay	Sitio Dinginin	F	
13	ROMMEL R. [illegible]	BRGY. KAGAWAD	M	
14	MARIA CONCEPCION N. CHUA	BRGY. SECRETARY	F	
15	FLORANTE R. MAMIMBAN	PUNONG BARANGAY	M	
16				
17				
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DPWH - ISO – QUALITY MANAGEMENT SYSTEM

Title/Description:

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Bataan: for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

PHOTOS

A. Meeting with the Municipal Environment and Natural Resources Office – Mariveles (MENRO-Mariveles)

Title/Description:

Consultation Meetings on Environmental Impact Assessment with Mr. Simeon Stairs at Bataan: for the Detailed Engineering Design Consultancy Services for the Bataan-Cavite Interlink Bridge Project

C. Meeting with the Brgy. Alas-Asin Fisherfolks

Notes from conversations with Mr. Jerry Rollin of Corregidor Foundation, Inc (28 Mar 2022)

Prepared by Simeon Stairs, Sr. Environment Specialist, Renardet SA

1. Objective of conversations. The purpose of the conversations with Mr. Rollin was to gather background information relevant to the updating of the EIA for the BCIB project. Although the BCIB project does not include a link to Corregidor Island, existing conditions on the island and in the surrounding waters, as well as proposals for the island's future development, shape the potential for impacts from the BCIB both on and off the island. In addition, consideration of the appropriateness of the proposed positioning of the turnaround structure along the BCIB alignment relies in part on information that could be supplied by Mr. Rollin. Several subject areas were covered during the conversation, including

(i) Environmental history of the island;
(ii) Use of Corregidor Island nearshore waters by local fisherfolk;
(iii) Corregidor Islands Marine Park;
(iv) Visual and aesthetic impacts of the BCIB on Corregidor Island;
(v) Vehicular access expectation under the 'with BCIB' scenario; and
(vi) Development plans under the 'with BCIB' scenario.

2. Environmental history of the island. During the period of heaviest military use and bombardment (WWII), Corregidor Island was almost completely denuded of vegetation. It is therefore considered unlikely that any old-growth vegetation remains. Tree seeds (ipil-ipil) were spread from airplanes sometime after the war to jump-start regeneration, and this explains the prevalance of ipil-ipil in the forest seen on the island today. Relatively low avian species diversity on the island is attributed to the relative absence of fruit-bearing trees used by birds (seeds of fruit-bearing trees were not included in the aerial seeding). Goats roam wild on the island, and this likely shapes the range of plant species present in the understory. Forest and rangeland fires of natural origin have not been reported in living memory, which suggests that the grassland areas found on the island are likely related to precipitation and soil capability, rather than a recurrent fire regime.

The island's ecology is not well documented; ecological studies were not conducted as part of the preparation of the Tourism Master Plan for the island, and the only study Mr. Rollin is aware of is a bird survey conducted by a group of local birders. There are significant numbers of monkeys (Long-tailed macaques) resident on the island, and these had become quite a problem before the pandemic, as some individuals had grown habituated to people and dependent on handouts of food from tourists, and were getting aggressive. Recently, a policy of routinely scaring monkeys away when they appear near the developed areas (as well as a lack of tourists due to the pandemic-induced shutdown) has helped encourage the monkeys to stay in the woods and eat a natural diet. CFI has also been collaborating with DENR on population control, primarily through castration. Other notable wildlife on the island includes Philippine brown deer, but these are shy and tend to stay in the forest, and are rarely observed. CFI has considered setting up a captive breeding program to boost the deer population. Mr. Rollin reported that marine turtles are known to nest occasionally on the South Beach; nesting success has been threatened in the past by egg collectors and also by roaming dogs, but egg collection, at least, has been reduced by educational efforts.

The possible presence of contaminated or dangerous sites was discussed, with a view to understanding the potential for a landing site on the Tail End to generate safety or environmental risks. Mr. Rollin reported that there are no known abandoned munitions dumps anywhere on the island (Caballo Island, by contrast, has large stores of live ammunition left over from WWII, in underground vaults). Regular solid waste has always been disposed of in haphazard dump sites (and is presently thrown into a ravine), but waste dumping has always been closer to the developed portions of the island, and there are no known dumps in the Tail End. With regards to known or suspected unexploded ordnance, the island is reported to have been cleared of bombs and mines by the US Navy after the war, and there have been no known incidents involving UXO. Spent shells and shell fragments can be found all over the island, however. Recent trail-building work (including in the Tail End) by Philippine marines stationed on the island has been carried out without any problems.

3. Use of Corregidor Island nearshore waters by local fisherfolk. For purposes of corroborating information gathered from other sources on fishing activity in the vicinity of the BCIB alignment, Mr. Rollin was asked for his insights on the presence of local fishing boats in the waters around Corregidor Island. He reported that fisherfolk come to the island's waters from both Bataan and Cavite, but mostly Bataan. He pointed out a group of 30–40 outrigger canoes positioned about 1 km north of the ferry dock during the visit; the fisherfolk typically gather like this at a dividing line that sets up at certain times of the tidal cycle between independently circulating water masses, where the fishing tends to be particularly good. Small fishing boats were observed from shore in several places during the island visit, indicating substantial fishing activity in the project area. Mr. Rollin indicated that fisherfolk are not allowed to land or camp on the island, although this rule is sometimes broken. When camps have been discovered on the past, they have been demolished by CFI staff. Illegal fishing practices such as dynamite fishing are known to be a problem in the area around the island, and it is hoped that implementation of the Corregidor Islands Marine Park (CIMP) will put an end to this eventually.

4. Corregidor Islands Marine Park (CIMP). The current status of the CIMP was discussed briefly. Mr. Rollin reported that there hasn't been any activity with respect to installation of artificial reefs within the park's designated Artificial Reef Zone yet. He indicated that the marine environment is now seen as a significant potential tourism resource alongside the historical features of the island, and the CIMP is critical to conserving and benefiting from it. CFI foresees that watersports and nature-based recreation would be key components of a revitalized tourism on the island, and the multiple-use and dive spot zones in the CIMP reflect this interest. He noted that reef surveys conducted as part of the lead-up to the park's establishment highlighted some attractive diving areas, including some areas where a surprising density of seahorses were observed. Furthermore, although most wrecks in the area are in water too deep for most recreational divers, two substantial wrecks have been identified in suitably shallow water, and are seen as potentially viable underwater attractions.

The vision for tourism on the island, from the perspective of CFI, is to try and transition away from the (currently typical) quick 'in-and-out' partial-day historical tours, and towards a more holistic and engaging tourism experience, in which people might come to the island for overnight or longer, and enjoy both historical and nature-based experiences while there. The previous hotel concessionaire of the Corregidor Inn pulled out of its contract when COVID-19

hit, and CFI has had trouble attracting any interest from other companies, because the inn only has 30 rooms, and most operators consider 90 rooms to be the minimum viable size. So CFI is considering plans for developing an additional 70 rooms at the Corregidor Inn to make it more attractive to potential concessionaires.

5. Visual and aesthetic impacts of the BCIB on Corregidor Island. When asked how he felt—from an aesthetic perspective—about the prospect of a four-lane elevated highway running within 50 m of the shore of Corregidor Island, Mr. Rollin expressed a certain amount of dread, and also resignation: "That is the price of progress, I suppose". He went on to acknowledge that most of the visitor activity is and always will be centered on the Middleside and Bottomside portion of the island, and eastward-facing vantage points offering a close-range view of the BCIB are actually rare. When asked how the visibility of the BCIB infrastructure—particularly the high cable-stayed bridges—might change the visitor experience to the island, he said he didn't think there would be any real effect, as most people are quite accustomed to having such infrastructure in their visual space, and don't necessarily experience it as an intrusion.

5. Vehicular access expectation under the 'with BCIB' scenario. As far as CFI is concerned, private vehicles and tour buses do not belong on the island. The road system is not capable of handling any significant traffic, there is very limited parking anywhere, and traffic jams would significantly detract from the atmosphere of history and remembrance, as well as the peacefulness that characterizes so much of the island. Any vehicular breakdowns occurring on the island would be a significant hassle, as a towing service would have to come out from either Bataan or Cavite. If a link were to be established from the BCIB, the preferred access model would be for a parking lot to be built at each end of the bridge, with shuttle buses bringing visitors to and from the island.

6. Development plans under the 'with BCIB' scenario. The Tourism Master Plan has been produced and distributed amongst selected stakeholder entities, but Mr. Rollin indicated that he was not at liberty to share it with DPWH, as it is TIEZA's plan. Mr. Rollin did mention that the TIEZA plan is rather more ambitious in terms of visitor numbers and facilities than are CFI's ideas for the island, and that some proposals would be likely to push up against the realities of carrying capacity quite early on, if implemented. CFI's focus is on investing in rehabilitation, rebuilding and upgrading of on-island facilities and buildings to "bring things back up to where they were before the decline", and argued that these efforts should be considered a prerequisite for implementation of TIEZA's more scaled-up development proposals. As an example, he noted that water supply and sewage treatment are two areas in which old, non-operational and non-existing basic infrastructure simply cannot support a significant increment of tourism facilities without considerable prior work. No studies have been done to determine the extent of on-island groundwater resources and how much tourism development they could feasibly support, and the possibilities with respect to sewage treatment, electricity and solid waste management remain under-investigated. It is conceivable that the BCIB could serve as a conduit for potable water and electricity from Bataan, but the feasibility of this is unknown, and on-island distribution would remain a constraint without prior investment.

Regarding the Tail End specifically (i.e., the portion of the island that would interact most directly with the adjacent BCIB), the potential for incompatibility between planned tourist developments and the bridge (e.g., noise and emissions from the bridge affecting the aesthetic qualities of lodging or contemplative spaces) was discussed. Mr. Rollin pointed out that most of the Tail End is quite rugged, with very steep slopes in many places; there is little land that could be considered suitable for building. The air strip occupies the most readily buildable land in the Tail End, and that is expected to be rehabilitated and used as a passenger airport eventually. Hiking trails are the most likely development near the east coast of the Tail End. In view of this, the potential for incompatibilities between the BCIB and planned tourism developments in the Tail End is fairly limited.

Notes from meeting with Ms. Hazel de Guzman, Environment Officer of the Authority of the Freeport Area of Bataan (AFAB), March 23 2022

Prepared by Simeon Stairs, Senior Environment Specialist (Renardet SA)

1. The objective of this informal meeting was to learn more about the Freeport Area of Bataan's solid waste management facility, as solid waste generated in Mariveles is processed through there under an agreement between the LGU and the AFAB (Authority of the Freeport Area of Bataan). The arrangement had been reported to us the previous day by the Mariveles MENRO representative. We also took the opportunity to ask some background questions about the FAB, in relation to the road linkage situation between the FAB and the BCIB area, as well as the importance of the BCIB to AFAB's plans for the future.

2. **Waste transfer station operation.** All of the municipal solid waste collected by the LGU is brought to the transfer facility run by the FAB, under a MOA. Ms. de Guzman indicated that the formulation of the MOA was driven by or otherwise linked to the Mandamus Writ on the cleanup of Manila Bay. In accordance with national law and its own Solid Waste Plan, the LGU is supposed to conduct at-source reduction, i.e., 3R, but there is considerable doubt as to whether they are actually doing that. Ms. de Guzman said it would be in the LGU's interest to pursue at-source reduction much more aggressively, as this would save them a lot of money every year (they pay the AFAB by the bin). The LGU presently sends 80–120 bins per month to the transfer facility. The transfer station is on 1.5 ha of land, of which 1,500 m^2 is allocated to the LGU's waste (more than this is presently taken up by the LGU's waste, because of the lack of at-source reduction). Ms. de Guzman indicated that 1.5 ha is plenty of space for the waste transfer operation, and does not foresee any kind of space crunch in the event that the BCIB construction process adds significantly to the solid waste output of the LGU. It was acknowledged that the waste transfer station and MOA are limited to regular municipal solid waste; other arrangements would have to be made for demolition waste and hazardous waste generated by the BCIB construction.

The waste processed though the FAB transfer facility is sent to a sanitary landfill operated by Metro Clark (the tipping fee is reflected in the fee paid to FAB by the LGU). Hazardous waste is accepted by a hazardous waste facility also operated by Metro Clark, which reportedly consists of an 'engineered sanitary landfill', and may also do some segregated treatment of selected wastes. It was agreed that the BCIB project (or each Contractor) would have to register as a hazardous waste generator under national law, and make arrangements with accredited hazardous waste haulers and treatment/recycling enterprises. Non-recyclable demolition wastes unsuitable for use as fill would have to be transported by the Contractors to the landfill operated by Metro Clark, by arrangement with that entity.

3. **Background on FAB.** The FAB, as an institutional instrument for trade and development, is not limited to the site around the north side of Mariveles Bay, but is actually applicable to the whole province. The Mariveles site is the original and still primary site, however, and presently has about 38,000 workers employed by about 90 locator enterprises; this is down from a pre-pandemic peak of 44,000, but further growth back to the peak and beyond is expected. There are other sites under development already, including the large under-construction port and warehousing facility noted north of the Cabcaben waterfront (being developed by Seafront

Townsite Corp.), as well as a couple of smaller sites in Mt. View (away from the shore) and another site west of the BCIB alignment, near GN Power.

When asked about the importance of the BCIB to future expansion of the FAB, Ms. de Guzman was emphatic that the project is instrumental to planned expansions, as linkage to Calabarzon will greatly improve access between the FAB and a major market. When asked about plans for development of a new port in Mariveles Bay to serve the FAB, she acknowledged that there is a plan for this, said that it would be a 'huge investment', and indicated that she was not at liberty to divulge any more. As far as existing port facilities go, she said they are all operated by private entities, but the FAB does have a role in regulating their operations.

The road link between the main Mariveles FAB site and the BCIB was discussed. It was agreed that the situation with the Mariveles Diversion Rd is not a good one. She estimates that there are about 200 heavy trucks per day using the road just for the cement works; the total daily heavy truck traffic is considerably higher than that.

2022 Consultation Meeting Documentation

EIA-IEC Meeting Documentation for the Bataan-Cavite Interlink Bridge (BCIB) Project – Detailed Engineering Design (DED) Phase

1. Stakeholder consultation in Naic Cavite

Venue:	**Timalan Balsahan Basketball Court, Brgy. Timalan Balsahan, Naic, Cavite**
Date:	**25 May 2022 (Wednesday)**
Time:	**8:00 AM**

ATTENDEES						
First Name	**Last Name**	**Full Name**	**Female**	**Male**	**Municipality**	**Barangay/ Office**
Joylyn Perucho	Isorena	Joylyn Perucho - Isorena	x		Quezon City	Ecosyscorp
Michael	Garcia	Michael Garcia		x	QC	QC
Joseph	Villacasten	Joseph Villacasten		x	Quezon City	Sauyo
Cyrenne	Pelayo	Cyrenne Pelayo	x		QC	Quezon City
Erica	Juria	Erica Juria	x		Manila	Manila
Weedy	Jintalan	Weedy Jintalan	x		Naic	Bucana Malaki
Annabelle	Herrera	Annabelle Herrera	x		Quezon City	Ecosys
Frederick	Esternon	Frederick Javier Esternon (DCCD)		x	Quezon City	Quezon City
Rose	Bobis	Rose Minay Bobis	x		Naic, Cavite	Brgy. Palangue Central, Naic, Cavite
Junnel Ray	Bautista	Junnel Ray Bautista		x	N/A	Manila City (Sampaloc)
Sheila	Estacion	Sheila E. Estacion	x		Naic	Labac
Melanio	Guevara	Melanio Guevara		x	Maragondon (Cavite)	NHCP

Adrienne	De Guzman	Adrienne De Guzman	x		Ermita (Manila)	TYLin
Carl Luis	Tamayo	Carl Luis Tamayo		x	Quezon City	Culiat
Ezekiel	Calinagan	Ezekiel A. Calinagan		x	Quezon City	DPWH NCR RMC-II
Adele Michaela	Libunao	Adele Michaela Libunao	x		Quezon City	San Martin De Porres
Kristine Joy	Monillas	Tin Monillas	x		Rosario (Cavite)	Tejeros Convention
Hainess Serene	Cortez	Ness Cortez	x		Dasmariñas City (Cavite)	MERALCO
EVANGELINA	PANGILINAN	Evangelina P. Pangilinan	x		Naic	MENRO
Jesusa	Vilburn	Jesusa Vilburn	x		Naic	MENRO-Naic
Jhonnalyn	Bautista	Jhonnalyn Bautista	x		Naic	Timalan Concepcion
Teresita	Bautista	Teresita Bautista	x		Naic	Timalan Balsahan
Tin	Monillas	Tin Monillas	x			Meralco
Francis	Custodio	Francis Custodio		x		Meralco
Emilio	Poblete	Emilio Poblete		x	Naic	Makina
Mary John Claire	Nepomuceno	Mary John Claire Nepomuceno	x		Naic	Malainen Bago
Clemente	Nepomuceno	Clemente Nepomuceno	x		Naic	Malainen Bago
Josephine	Haboc	Josephine Haboc	x		Naic	Timalan Balsahan
Donna Ross	Del Monte	Donna Ross Del Monte	x		Naic	Timalan Balsahan
Chona	Antonio	Chona B. Antonio	x		Naic	Timalan Balsahan
Grace	Apuyan	Grace Apuyan	x		Naic	Timalan Balsahan
Nannette	Nacasi	Nannette B. Nacasi	x		Naic	Timalan Balsahan
Mary Rose	Dela Cruz	Mary Rose dela Cruz	x		Naic	Timalan Balsahan
Dorriss	De Lara	Dorriss de Lara	x		Naic	Timalan Balsahan
TOTAL			25	9		

Sectors represented: Fisherfolk, Women, PWD, Senior/Elderly, Youth, Business

PROCEEDINGS	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• **Ms. Jhonnalyn Bautista, fishing boat owner,** asked if they will be allowed to fish while the bridge construction is ongoing.	• **Engr. Erica Juria of TYLin** said that construction will be by phases, meaning construction will begin at specific parts of the alignment. Only specific portions will be restricted during construction. These areas will be delineated by buoys and markers. Fishing activities may proceed if these will be done far from the construction site and outside the markers.
• **Ms. Teresita Bautista** asked if tricycles will be allowed to pass through the highway. She added that she only asked because that area is the junction that people use to go to Timalan Concepcion.	• **Engr. Juria** said that no alterations were proposed to the design of the Antero Soriano Highway. Tricycles will still be able to pass through it. However, for the area connecting the Highway to the bridge, tricycles will not be allowed. Tricycles will be prohibited from entering the alignment. Service roads will be provided along intersections with Antero Soriano Highway, specifically along the partial cloverleaf interchange, to ensure the continuous flow of traffic along the highway. If there are terminals in those intersections, coordination will be done with respective LGUs to determine a relocation site for them. These terminals will be merely relocated, not removed.
• **Ms. Josephine Haboc** said that their house is near the water. She asked if they will be asked to leave and what is the length of the area by the water that the project will require. She said that they do not have titles to the land that they occupy. If ever they will be asked to leave, she expressed hope that they will be relocated near the water since it is also from there that they source their livelihood.	• **Ms. Annabelle Herrera of Ecosys** asked Ms Haboc if their house has a sticker. To which Ms. Haboc replied in the negative. Ms. Herrera went on to explain that only structures with stickers will be affected/displaced. If their house does not have a sticker, it means that they will not be asked to leave to make way for the project. On the concern raised regarding Ms. Haboc possessing no title for the land she occupies, Ms. Herrera said that this matter is between her and their LGU and if the property in question is privately owned. She said that their use of the property depends on the LGU.

• **Ms. Evangelina Pangilinan of Naic MENRO** asked for clarification on the plan in place regarding the waste that will be generated during the construction stage pf the project. She asked if the project will have its own solid waste management plan, especially in compliance with the requirements of the DENR and DILG.	• **Mr. Frederick Esternon of DCCD** clarified that as discussed with MENRO during the team's site visit, the project will have its own solid waste management plan. He emphasized that the current effort is part of the updating of the Environmental Management Plan (EMP) and that the project already has its Environmental Compliance Certificate (ECC). He noted that the ECC requires coordination with the LGU, which means that the project will be closely coordinating with the LGU.

SCREENSHOTS OF ONLINE PARTICIPANTS

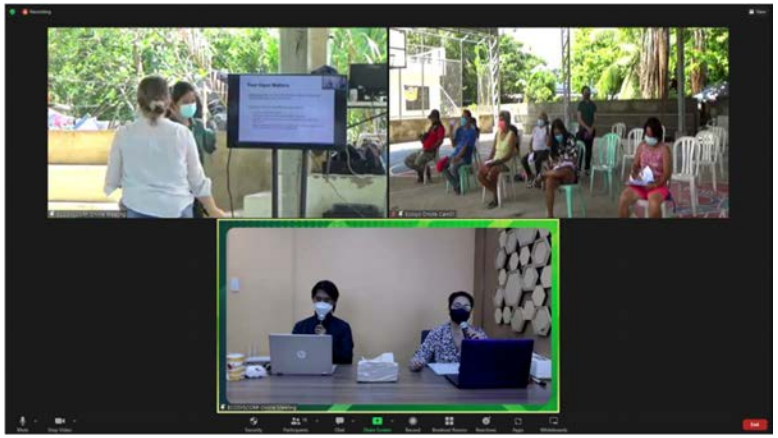

PHOTO OF ON-SITE PARTICIPANTS

ATTENDANCE SHEETS

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

Barangay Timalan Balsahan Covered Court
Naic, Cavite
25 May 2022, 08:00 A.M.

ATTENDANCE SHEET

TYLIN INTERNATIONAL — A JOINT VENTURE
PEC Pyunghwa Engineering Consultants

No.	Name	Barangay	Sex		Sector									Contact Number	Email Address	Signature
			M	F	Y	P	S	W	R	B	L	A	F			
1	TIN MONILLAS	MERALCO	M	F	Y	P	S	W	R	B	L	A	F	09984489167	trjrmonillas@meralco.com	
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4	Emilio B. Poblete	MAKINA	M	F	Y	P	S	W	R	B	L	A	F	0951-872-0729	HM TODA NAIC	
5	Mary John Claire Nepomuceno	Malainen Bago	M	F	Y	P	S	W	R	B	L	A	F	09956047079/09351162979	mmnepomuceno9@yahoo.com	
6	Clemente Nepomuceno		M	F	Y	P	S	W	R	B	L	A	F			
7	JHONNALYN BAUTISTA	Timalan Concepcion	M	F	Y	P	S	W	R	B	L	A	F	09632933555	Jhonnalyn121@gmail	
8	Erwin B. Bautista	Timalan Concepcion	M	F	Y	P	S	W	R	B	L	A	F	09678174525	Jhonnalyn121@gmail	
9	JESUSA VILLAMOR	MENRO	M	F	Y	P	S	W	R	B	L	A	F	09159911857		
10	EVA PANGILINAN	MENRO	M	F	Y	P	S	W	R	B	L	A	F	433-5195		
11	Donna Ross Del Monte	Timalan Balsahan	M	F	Y	P	S	W	R	B	L	A	F	09352914906	23dylan2017@gmail.com	
12	Josephine Haboc	Timalan Balsahan	M	F	Y	P	S	W	R	B	L	A	F			
13	Chona B. Antonio	Timalan Balsahan	M	F	Y	P	S	W	R	B	L	A	F	09366878978		

EcosysCorp Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

Barangay Timalan Balsahan Covered Court
Naic, Cavite
25 May 2022, 08:00 A.M.

ATTENDANCE SHEET

TYLIN INTERNATIONAL
A JOINT VENTURE
PEC Pylonpava Engineering Consultants

No.	Name	Barangay	Sex		Sector										Contact Number	Email Address	Signature
			M	F	Y	P	S	W	R	B	L	A	F				
1	GRACE APUYAN	TIMALAN BAL	M	F	Y	P	S	W	R	B	L	A	F		09759091817	graceapuyan45@gmail.com	
2	NANNETTE B. MACASI	TIMALAN BAL	M	✓	Y	P	S	W	R	B	L	A	✓		09275557096		
3	MARY ROSE DELA CRUZ	TIMALAN BAL	M	✓	Y	P	S	W	R	B	L	A	F		09122168352	WALK IN	
4	DORRIS DE CHUA	TIMALAN BAL	M	F	Y	P	S	W	R	B	L	A	F		0905 855 8295		
5	TERESITA B. BAUTISTA	" "	M	F	Y	P	S	W	R	B	L	A	F		0918 699 2123	WALK IN	
6			M	F	Y	P	S	W	R	B	L	A	F				
7			M	F	Y	P	S	W	R	B	L	A	F				
8			M	F	Y	P	S	W	R	B	L	A	F				
9			M	F	Y	P	S	W	R	B	L	A	F				
10			M	F	Y	P	S	W	R	B	L	A	F				
11			M	F	Y	P	S	W	R	B	L	A	F				
12			M	F	Y	P	S	W	R	B	L	A	F				
13			M	F	Y	P	S	W	R	B	L	A	F				

EcosysCorp Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

Barangay Timalan Balsahan Covered Court
Naic, Cavite
25 May 2022, 08:00 A.M.

ATTENDANCE SHEET

EcosysCorp, Inc.

No.	Name	Gender		Designation / Title	Department/Office	Contact No(s).	E-mail Address	Signature
		F	M					
1	MADILEN MERCADO	✓		ADMIN ASST.	ADMIN	09206904280	madiequin@gmail.com	
2	ANDREA LOUISE B. PEJI	✓		PC	RAP	09190020121	pejiarb@gmail.com	
3	CHRISTIAN DE GUZMAN		✓	REGISTRATION	ADMIN	09953370023	cdg.ecosyscorp@gmail.com	
4	Junihen Padogao		✓		Admin	09193153870		
5	[illegible]		✓	PS	RAP	[illegible]	[illegible]	
6	Jeffrey Cape		✓	PS	RAP	09266760761	jey	
7	[illegible]		✓	TECH	TECH	09151860507	[illegible]	
8	BIMBO AVILA		✓	DRIVER	TAGGING TEAM	09605457676		
9	Roger Agbit		✓	Driver pegi				
10	MICHAEL GARCIA		✓	HSP GUAPO	TECH/ HSP	09568978746	michaelgarcia101@gmail.com	
11	JOSEPH VILLACATEN		✓	TECH	TECH			
12								

EcosysCorp Inc.

Venue:	**Timalan Balsahan Basketball Court, Brgy. Timalan Balsahan, Naic, Cavite**
Date:	**25 May 2022 (Wednesday)**
Time:	**1:00 PM**

ATTENDEES						
First Name	**Last Name**	**Full Name**	**Female**	**Male**	**Municipality**	**Barangay/Office**
Rowena	Pajares	Rowena Oros Pajares	x		Naic Cavite	Timalan Balsahan
Adele Michaela	Libunao	Adele Michaela Libunao	x		Quezon City	DPWH
Joylyn Perucho	Isorena	Joylyn Perucho – Isorena	x		Quezon City	Ecosyscorp
Joseph	Villacasten	Joseph Villacasten		x	Quezon City	Sauyo
Meriam	Caldaira	Meriam Seballos Caldaira	x		Tanza	Biga
EVANGELINA	PANGILINAN	Evangelina P. Pangilinan	x		Naic	MENRO
Michael	Garcia	Michael Garcia		x	QC	QC
Erica	Juria	Erica Juria	x		Manila	Manila
Jad	Zamora	Jad Zamora	x		Ermita	TYLin
Jan Michael	Elbit	Jan Michael Elbit		x	Dasmarinas City	Paliparan 2
Cyrenne	Pelayo	Cyrenne Pelayo	x		QC	Quezon City
Annabelle	Herrera	Annabelle Herrera	x		Quezon City	EcosysCorp
Junnel Ray	Bautista	Junnel Ray Bautista		x	A	Manila City (Sampaloc)
Frederick	Esternon	Frederick Javier Esternon (DCCD)		x	Quezon City	Quezon City
Carl Luis	Tamayo	Carl Luis Tamayo		x	Quezon City	Culiat
Ivan Aristotle	Digal	Ivan Aristotle		x	Maragondon	Bucal 1 Maragondon Cavite

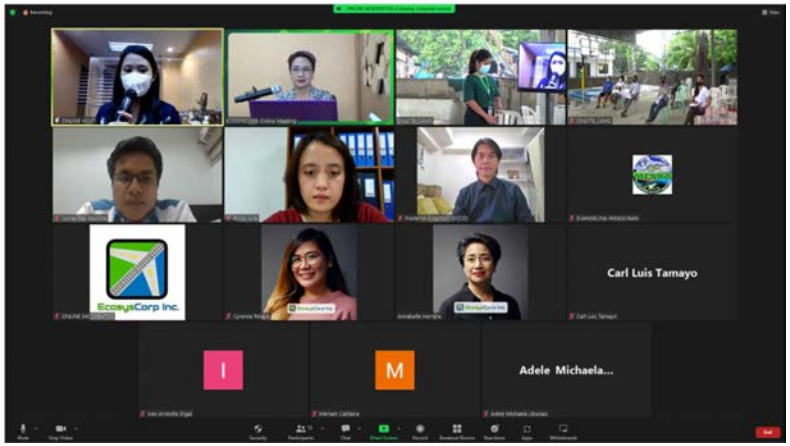
Ismael	Diaz	Ismael Diaz		x	Naic	Timalan Balsahan
Ryan	Mateo	Ryan Mateo		x	Naic	Labac
Edgar	Valenzuela	Edgar Valenzuela		x	Naic	Timalan Concepcion
Maureen	Macas	Maureen Macas	x		Naic	Timalan Concepcion
Jenifer	Meniel	Jenifer Meniel	x		Naic	Timalan Balsahan
TOTAL			11	10		

Sectors represented: Fisherfolk, Faith-based, Women

PROCEEDINGS	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• **Ms. Jenifer Meniel** asked about what to do should a resident be interested to be employed by the project. Ms. Meniel asked how they will know if the Proponent is already looking for applicants.	• **Engr. Junnel Ray Bautista of DPWH** said that a livelihood restoration study for the DED stage of the project. After said study is done, DPWH will provide details/guidelines to residents interested to work for the project. Engr. Bautista said that once the construction is ongoing, DPWH will issue notices. There are also notices on job hiring for different projects that are posted on the DPWH website, which is regularly updated.
• **Mr. Ismael Diaz** asked if there are plans to provide substitute employment or source of livelihood for fisherfolk whose activities/fish catch will be affected. Mr. Diaz pointed out that he is already a senior citizen and will no longer be fit to take on construction-related work.	• **Engr. Bautista of DPWH** said that the project has a livelihood restoration program, which will try to identify the best fit alternative employment for those who will be affected. Engr. Bautista said that the project will try to find other employment that will suit the capacity/skills of those who will be displaced/affected by the project.
• **Mr. Edgar Valenzuela, President of fisher folk in the area,** asked the type of jobs that the project will offer. He added that some of the fishermen are likely interested to work as welders, but they do not have sufficient skills. He asked if the project would provide them skills training so they can become qualified for positions needed by the project.	• **Engr. Bautista** said that DPWH can coordinate with TESDA and other relevant institutions to provide skills training to affected fisher folk. • **Ms. Herrera of Ecosys** added that the concern raised is already part of the livelihood restoration program and that as presented earlier, training needs assessment will be conducted. Meetings will be organized as the construction start date nears to help identify who are interested to work for the project and also for the DPWH to facilitate coordination with relevant agencies.

• **Ms. Meniel** asked if flooding will not be a problem in the area once the bridge has been constructed.	• **Engr. Bautista of DPWH** shared that a Drainage Engineer has been employed at the DED stage to study the slope and flow of water in the area and make sure that the project will not cause any flooding. Engr. Juria of TYLin confirmed that the project has a Drainage Engineer who studies the drainage system in the project area and makes recommendations to the design team accordingly.
• **Ms. Meniel** asked how others can have access to the information provided in the IEC meeting.	• **Ms. Herrera** said that the study team disseminated about 500 flyers and even made postings in barangay halls. She added that it was disappointing that only a handful could attend the IEC meeting. She encouraged the residents of Timalan Balsahan and Timalan Concepcion to actively participate in IEC meetings being organized for the project. She also said that all the information presented during the IEC meeting can be accessed using the QR codes found in the flyers and Project Information Brochures. She asked the participants again to attend meetings being organized by DPWH regarding the project.
• **Ms. Evangelina Pangilinan of Naic MENRO** asked how the project took into consideration the existing seabed quarrying in Manila Bay.	• **Ms. Herrera** said that the matter on the seabed quarrying is a matter that should be settled by the DENR and DPWH. She noted that the topic was not raised during the public hearing for the BCIB Project. She said that she thinks that the matter will be resolved once the DENR's concerned units, the EMB and MGB, provide clarification on the matter. She noted that the EMB is the unit that issues ECC while the MGB issues permits for quarry projects.
• **Ms. Pangilinan** asked about the mitigating measures to be put in place in the context of the BCIB Project and seabed quarrying in the area.	• **Ms. Herrera** said that it should be up to the DENR to advice project proponents to recognize the projects already awarded with ECC and to discourage applicants from intervening with projects already awarded with ECC. She added that in the case of the BCIB, which has already been issued its ECC, no other projects or activities, especially quarrying, should be done within or around its foundations.

SCREENSHOTS OF ONLINE PARTICIPANTS



ATTENDANCE SHEETS

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

Barangay Timalan Balsahan Covered Court
Naic, Cavite
25 May 2022, 01:00 P.M.

ATTENDANCE SHEET

T.Y.LIN INTERNATIONAL JOINT VENTURE
PEC Pyunghwa Engineering Consultants

No.	Name	Barangay	Sex		Sector									Contact Number	Email Address	Signature
1	DIAZ, ISMAEL	TIMALAN BALSAHAN	M	F	Y	P	S	W	R	B	L	A	F	09163039655		
2	MATEO KYAN.	LABAC	M	F	Y	P	S	W	R	B	L	A	F	09675166721		
3	EDGAR R. VALENZUELA	TIMALAN CONCEPCION	M	F	Y	P	S	W	R	B	L	A	F	09959703513		
4	Maureen Macas	Timalan Concepcion	M	F	Y	P	S	W	R	B	L	A	F	09177390439		
5	JENIFER MENIEL	TIMALAN BALSAHAN	M	F	Y	P	S	W	R	B	L	A	F	09122477330		
6			M	F	Y	P	S	W	R	B	L	A	F			
7			M	F	Y	P	S	W	R	B	L	A	F			
8			M	F	Y	P	S	W	R	B	L	A	F			
9			M	F	Y	P	S	W	R	B	L	A	F			
10			M	F	Y	P	S	W	R	B	L	A	F			
11			M	F	Y	P	S	W	R	B	L	A	F			
12			M	F	Y	P	S	W	R	B	L	A	F			
13			M	F	Y	P	S	W	R	B	L	A	F			

EcosysCorp Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

Barangay Timalan Balsahan Covered Court
Naic, Cavite
25 May 2022, 01:00 P.M.

ATTENDANCE SHEET

EcosysCorp, Inc.

No.	Name	Gender		Designation / Title	Department/Office	Contact No(s).	E-mail Address	Signature
		F	M					
1	MADILEN MERCADO	✓		ADMIN ASST.	ADMIN	09208904280		
2	ANDREA LOUISE B. PEJI	✓		PC	RAP	09190020120		
3	CHRISTIAN DE GUZMAN		✓	REGISTRATION	ADMIN	09953370023		
4	JUNIBEN PADAYAO		✓		ADMIN	09193153870		
5	RUPERT DOCENA		✓	PSS	RAP	09366547806		
6	JEFFREY CAFE		✓	PSS	RAP	09266780761		
7	ARTHUR RAMIREZ		✓	TECH	TECH	09151866059		
8	BIMBO AVILA		✓	DRIVER	TAGGING	09605V576776		
9	ROGER AGBISIT		✓	DRIVER				
10	[redacted]EL GARCIA		✓	HSP	TECH / HSP	09568878760		
11	[redacted] VILLACASTEN		✓	TECH	TECH			
12								

EcosysCorp Inc.

Venue:	**Timalan Concepcion Basketball Court, Brgy. Timalan Concepcion, Naic, Cavite**
Date:	**28 May 2022 (Saturday)**
Time:	**1:00 PM**

ATTENDEES						
First Name	**Last Name**	**Full Name**	**Female**	**Male**	**Municipality**	**Barangay/Office**
Joseph	Villacasten	Joseph Villacasten		x	Naic	MENRO
Michael	Garcia	Michael Garcia		x	QC	QC
Erica	Juria	Erica Juria	x		Manila	Manila
Adrienne	De Guzman	Adrienne De Guzman	x			TYLin
Cyrenne	Pelayo	Cyrenne Pelayo	x		QC	Quezon City
Annabelle	Herrera	Annabelle Herrera	x		Quezon City	EcosysCorp
Edna Lyn	Ngo	Edna Lyn Ngo	x		Quezon City	DPWH
Frederick	Esternon	Frederick Javier Esternon		x	Quezon City	DCCD
Carl Luis	Tamayo	Carl Luis Tamayo		x	Quezon City	TYLin
Raphael	Pedroso	Raphael Pedroso		x	Manila	DPWH
Joylyn Perucho	Isorena	Joylyn Perucho - Isorena	x		QC	Ecosyscorp
Carl Escel	Eyas	Carl Escel M. Eyas		x	Taguig City	Pinagsama Village
Ma. Fe	Laryestan	Ma. Fe Laryestan	x		Naic	Timalan Concepcion
Arnold	Escotote	Arnold Escotote		x	Naic	Timalan Concepcion
Carolina	Nazareno	Carolina Nazareno	x		Naic	Timalan Concepcion
Renson	Paño	Renson Paño		x	Naic	Timalan Concepcion
Joseph	Llagas	Joseph Llagas		x	Naic	Sabang
Jun	Cultivo	Jun Cultivo		x	Ternate	Sapang
Violeta	Constantino	Violeta Constantino	x		Naic	Timalan Concepcion

Maribel	Peregrina	Maribel Peregrina	x		Naic	Timalan Concepcion
Wilson	Barco	Wilson Barco		x	Naic	Timalan
Chester	Jinayon	Chester Jinayon		x	Naic	Timalan Concepcion
Marco	Castro	Marco Castro		x	Tanza	
Camilo	Pluma	Camilo Pluma		x	Naic	Timalan
Adelma	Perea	Adelma Perea	x		Naic	Timalan
	De Nuestra	De Nuestra	x		Naic	Timalan Balsahan
Mercado	Vañeza	Mercado Vañeza	x		Naic	Timalan Concepcion
Joshua	Aniel	Joshua Aniel		x	Naic	Timalan Concepcion
Feldornia	Enriquez	Feldornia Enriquez	x		Naic	Timalan Concepcion
Narcisa	Mariano	Narcisa Mariano	x		Naic	Timalan Balsahan
TOTAL			15	15		

Sectors represented: Fisherfolk, Women, Senior, Business, Youth

PROCEEDINGS	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• **Mr. Chester Jinayon** said that his property is within the proposed cloverleaf interchange. He asked if the government would acquire his property.	• **Mr. Carl Tamayo of TYLin** explained that for safety and accessibility reasons, properties within the cloverleaf will be acquired by DPWH.
• **Mr. Jinayon** asked if a figure could already be shared since his concern is that his property is under loan through PAGIBIG. He wanted to know how much he could possibly receive for his property should it be acquired.	• **Ms. Annabelle Herrera of Ecosys** said that the mortgage must first be released from PAGIBIG and that whatever has already been paid for by Mr. JInayon will be divided between him and PAGIBIG.
• **Mr. Jinayon** clarified that he was asking about the appraisal because he can just simply pay the whole amount since he thinks it would be confusing if there will still be division of cost between him and PAGIBIG.	• **Ms. Herrera of Ecosys** confirmed that the property has been appraised and that another appraisal will be done to get the latest valuation of the property. This is required by the law. She said that Mr. Jinayon's plan to fully pay the whole amount is better since there will be no need any more to share the cost between PAGIBIG and Mr. Jinayon. She said that his plan is better so that DPWH ned only to talk to him.

• **Mr. Jinayon** asked where and with whom he could make follow ups.	• **Ms. Herrera** asked Mr. Jinayon how he came to know about the meeting. She then explained the tagging process, which requires a structure to put the sticker on. For properties without any structure yet, she said that the parcellary survey applies to it, a process that helps identify property owners. In the case of Mr. Jinayon, it was confirmed that his property is still under PAGIBIG and has not yet been transferred to his name, which explains why his name does not appear yet in the parcellary survey. She informed Mr. Jinayon that he could get in touch with the contact details identified in the flyers and Project Information Brochure that were disseminated in the barangays.
• **Mr. Marco Castro** asked about the bridge's ability to withstand earthquakes.	• **Engr. Erica Juria of TYLIn** said that studies on it have been done while finalizing the design. She explained that these designs are submitted to DPWH PMO, which then shares it with other concerned units within the department to ensure its safety. She mentioned the various studies done, as well as the Independent Checking Engineer hired by the DPWH to review the submissions of the design team.
• **Mr. Jinayon** asked when the cut-off date is.	• **Ms. Herrera** explained what the cut-off date is. She pointed out that it only applies to occupants of properties that they do not own.
• **Mr. Jun Cultivo of Ternate** asked how those who will be displaced will be compensated by the government once the project starts, if they will be provided assistance on their source of livelihood.	• **Engr. Juria** said that part of the studies being done for the project is the formulation of a livelihood restoration plan/program. She explained the process of how this livelihood restoration plan will be executed under the coordination between the DPWH and concerned LGUs. • **Ms. Herrera** clarified if Mr. Cultivo was interviewed, to which he answered in the negative. She said that the resettlement action plan that was mentioned earlier contains plans on how these issues will be addressed and that budget has been allocated for specifically for its implementation. Said Plan covers project-affected persons, including those whose businesses will be affected.
• **Ms. Adelma Perea, representative of a project-affected person (Enriquez),** opined that housing may not be appropriate for them with properties and sources of livelihood/businesses that will be affected by the project.	• **Ms. Herrera** clarified if the person that Ms. Perea represents was interviewed, which was answered in the affirmative. Ms. Herrera explained that the interview aims to determine the kind of entitlement or assistance that an affected person should receive. She said that there is the livelihood restoration component of the project for those with affected businesses. She added that the determination of entitlement considers two things: first is the immediate solution, or compensation for lost income for a certain number of months and second, what the new source of livelihood could be for the project-affected person. She said that these concerns are included in the Livelihood Restoration and Improvement Program of the project and that the DPWH,

	together with the host LGUs of Naic and Mariveles, will be ensuring its implementation.
• **Mr. Cultivo** asked the type of vehicles that will be allowed to pass by the bridge and if there will be toll fees.	• **Engr. Juria** said that there will be no toll fees but that there will be weighbridges to determine if passing vehicles are within the allowed weight limit. She added that there will be border control points to help ensure that only allowed vehicles will pass through the bridge. She said that single motors below 400 cc and tricycles are not allowed within the bridge. Bike lanes, according to her, are also not included in the bridge design for safety reasons.
• **Ms. Narcisa Mariano, chair of the Samahan ng Magtatalaba at Mangingisda ng Timalan Balsahan and chair of MFARMC of Naic,** asked about fishermen's access once construction begins and compensation for fisherfolks whose source of livelihood will be affected. She added that there already are ongoing discussions with the municipal government of Naic regarding the project's impacts on fisherfolks. She said that the younger fishermen can be employed in the construction.	• **Engr. Juria** said that construction will be done in phases, which means that restriction will only be imposed on areas with ongoing construction activities. She said that markers and buoys will be used to mark restricted areas. She clarified that fishermen's will not be restricted by the project but that for safety reasons, they will not be allowed to go near or within areas with ongoing construction activities. On the question about compensation, she said that concerns raised by affected communities are well documented by the study team and that these will be consolidated to be forwarded to the DPWH, which will then communicate with the concerned LGUs for appropriate action.
• **Mr. Wilson Barco** clarified if payment will be given directly to those who will be affected.	• **Ms. Herrera** said that monetary compensation will be given to the person named in the identification of project-affected persons. She also clarified that based on the new law, compensation for affected structures will be based on current price for materials that will be used in constructing said structure.

PHOTO OF ONSITE PARTICIPANTS

ATTENDANCE SHEETS

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

Barangay Timalan Concepcion Covered Court
Naic, Cavite
28 May 2022, 01:00 PM

ATTENDANCE SHEET

TY·LIN INTERNATIONAL
A JOINT VENTURE
PEC PYUNGHWA ENGINEERING CONSULTANTS

No.	Name	Barangay	Sex		Sector									Contact Number	Email Address	Signature
1	Ma·fe Laryestan	Timalan Concepcion	M	F ✓	Y	P	S	W ✓	R	B	L	A	F	09654687860	fe-kitty@yahoo.com	[signature]
2	Arnold N. Escototc	TIMALAN CONCEPCION	M	F	Y	P	S	W	R	B	L	A	F	09654687860	[signature]	[signature]
3	CAROLINA NAZARENO	Timalan Con	M	F ✓	Y	P	S ✓	W	R	B	L	A	F	09065369558	carolinanazareno@[illegible].com	[signature]
4	Renson Pano	Timalan, Con	M ✓	F	Y	P	S	W	R	B	L	A	F	09979325722		[signature]
5	JOSEPH V. LLAGAS	SABANG NMC	M ✓	F	Y ✓	P	S	W	R	B	L	A	F	09120040325		[signature]
6	Jun Cultiro D	Sapang, Ternate	M ✓	F	Y	P	S	W	R	B	L	A	F	09485839710	Sapang-2 Ternate, Cavite	[signature] - TITA
7	VIOLETA E. CONSTANTINO	TIMALAN CON	M	F ✓	Y	P	S	W ✓	R	B	L	A	F	09368829983	VIOLETACONSTANTINO@gmail.com	[signature]
8	MARIBEL F. PEREGRINA	TIMALAN CON	M	F ✓	Y	P	S	W ✓	R	B	L	A	F	09183224324	MARIBELPEREGRINA@gmail.com	[signature]
9	WILSON BARCO	TIMALAN	M ✓	F	Y	P	S	W	R	B ✓	L	A	F	09350283337		[signature]
10	CHESTER JINAYON	T-Concepcion	M ✓	F	Y	P	S	W	R	B	L	A	F	09224840328	JINAYON.CHESTER@GMAIL.COM	[signature]
11	Marco V. Castro	TANZA CAVITE	M ✓	F	Y	P	S	W	R	B	L	A	F	09293173612	mc0043727@gmail.	[signature]
12	Camilo R. Pluma	Timalan	M ✓	F	Y	P	S ✓	W	R	B	L	A	F			[signature]
13	ADELMA R. PEREA	timalan	M	F ✓	Y	P	S ✓	W	R	B	L	A	F	09354301729		[signature]

EcosysCorp Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

Barangay Timalan Concepcion Covered Court
Naic, Cavite
28 May 2022, 01:00 P.M.

ATTENDANCE SHEET

TY·LIN INTERNATIONAL – A JOINT VENTURE – PEC Pyunghwa Engineering Consultants

No.	Name	Barangay	Sex		Sector									Contact Number	Email Address	Signature
			M	F	Y	P	S	W	R	B	L	A	F			
1	Mikka Ella de Nuestra	T. Balsahan Naic, Cav	M	✓	Y	P	S	✓	R	B	L	A	F	09456011161	mikkadenv@gmail.cor	[signature]
2	Mercado Vañeza	T. Conception	M	✓	✓	P	S	W	R	B	L	A	F	09754353392	mercadovaneza@gmail.com	[signature]
3	Joshua Aniel	T. Conception	✓	F	✓	P	S	W	R	B	L	A	F	09754353392	joshuaniel477@gmail.com	[signature]
4	[illegible] TC		M	✓	Y	P	✓	W	R	B	L	A	F			[signature]
5	Narcisa A. Mariano	T. Balsahan	M	✓	Y	P	S	W	R	B	L	A	✓	09957631418		[signature]
6			M	F	Y	P	S	W	R	B	L	A	F			
7			M	F	Y	P	S	W	R	B	L	A	F			
8			M	F	Y	P	S	W	R	B	L	A	F			
9			M	F	Y	P	S	W	R	B	L	A	F			
10			M	F	Y	P	S	W	R	B	L	A	F			
11			M	F	Y	P	S	W	R	B	L	A	F			
12			M	F	Y	P	S	W	R	B	L	A	F			
13			M	F	Y	P	S	W	R	B	L	A	F			

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

Barangay Timalan Concepcion Covered Court
Naic, Cavite
28 May 2022, 01:00 PM

ATTENDANCE SHEET

EcosysCorp, Inc.

TYLIN INTERNATIONAL
A JOINT VENTURE
PEC PYUNGHWA ENGINEERING CONSULTANTS

No.	Name	Gender		Designation / Title	Department/Office	Contact No(s).	E-mail Address	Signature
		F	M					
1	MAHALAEL GAPUZ		/	CAT	ECOSYS CORP	09271206337	gapuzmike@gmail.com	
2	ROGER AGBISIT		/	CAT	ECOSYS CORP	09361830374		
3	CHRISTIAN DE GUZMAN		/	ADMIN/REG	ADMIN	09953370023	cdg.ecosyscorp@gmail.com	
4	MADILEN MERCADO	/		ADMIN ASST.	ADMIN	0920 8904280	ecosysmadi@gmail.com	
5	JEFFREY CAPE		/	PSS	Ecosys Corp	09266780761		
6	ANDREA PEJI	/		PC	RAP	09190020121	pejial6@gmail.com	
7	[illegible] DOCENA		/	PSS	RAP	09[illegible]		
8	MICHAEL GARCIA		/	HSP/TOLL	TOLL	09563387874	michaelgarcia101@gmail.	
9	JOSEPH VILLACASTEN		/	HSP/TECH	TECH	09063777[illegible]		
10								
11								
12								

EcosysCorp Inc.

2. Stakeholder consultation in Mariveles, Bataan

Venue:	**Alas asin Basketball Court, Brgy. Alas asin, Mariveles, Bataan**
Date:	**15 June 2022 (Wednesday)**
Time:	**8:00 AM**

First Name	Last Name	Full Name	Female	Male	Municipality	Barangay/Office
Gemma R.	Bautista	Gemma R. Bautista	x		Mariveles	Alas- Asin
Norma R.	Lalunio	Norma R. Lalunio	x		Mariveles	Alas- Asin
Bibiana S.	Caliboso	Bibiana S. Caliboso	x		Mariveles	Alas- Asin
Claitz	Lezada	Claitz Lezada		x	Mariveles	Alas- Asin
Bavani	Mariano	Bavani P. Mariano		x	Mariveles	Alas- Asin
Donato	Anda	Donato Anda		x	Mariveles	Alas- Asin
Vincente	Aguilar	Vincente Aguilar		x	Mariveles	Alas- Asin
Jimmy	Venturina	Jimmy Venturina		x	Mariveles	Alas- Asin
Juancholito	Baal	Juancholito Baal		x	Mariveles	Alas- Asin
Isagani	Adona	Isagani Adona		x	Mariveles	Alas- Asin
Geraldine	Reyes	Gelrdine Reyes		x	Mariveles	Alas- Asin
Rheda Kathleen	Caguiat	Rheda Kathleen Caguiat	x		Mariveles	Mt. View
Reneo	Barlis	Reneo Barlis		x	Mariveles	Alas- Asin
Elena F.	Temaje	Elena F. Temaje	x		Mariveles	Alas- Asin
Mary Jean	Ilanto	Mary Jean Ilanto	x		Mariveles	Alas- Asin
Leojean	Ponte	Leojean Ponte	x		Mariveles	Alas- Asin
Melvin	Ponte	Melvin Ponte		x	Mariveles	Alas- Asin

Jenezyn	Abon	Jenezyn Abon	x		Mariveles	Alas- Asin
Cornelio	Pineda	Cornelio Pineda		x	Mariveles	Alas- Asin
Rodalie	Pajarilao	Rodalia Pajarilao	x		Mariveles	Alas- Asin
Ligaya C.	Dones	Ligaya C. Dones	x		Mariveles	Alas- Asin
Margie	Enriquez	Margie Enriquez	x		Mariveles	Alas- Asin
Christine	Pepito	Christine Pepito	x		Mariveles	Alas- Asin
Frederick	Esternon	Frederick Esternon		x	Quezon City	Marilag
Ezekiel	Calinagan	Ezekiel Calinagan		x	QC	DPWH
Annabelle	Herrera	Annabelle Herrera	x		QC	Ecosys
Cyrene	Pelayo	Cyrene Pelayo	x		QC	Quezon City
Banjo	Laurel	Banjo Laurel		x	Manila	Port Area
Niccole Anne	Bumagat	Nicole Anne Bumagat	x		Manila	DPWH
Edna Lyn	Ngo	Edna Lyn Ngo	x		Manila	DPWH
Erica	Juria	Erica Juria	x		Manila	TYLI
Carl Luis	Tamayo	Carl Luis Tamayo		x	Quezon City	Culiat
Mike	Garcia	Mike Garcia		x	Quezon City	Ecosyscorp
Ellaine	Rabot	Ellaine Rabot	x		N/A	Manila
Adrienne	De Guzman	Adrienne De Guzman	x		Ermita	TYLin
Allain	Caasi	Allain Caasi	x		Ermita	1579/ TYLIN International
Joseph	Villacasten	Joseph Villacasten		x	QC	Sauyo
Andrea Louise	Peiji	Andrea Louise Peiji	x		QC	Ecosysq

Test	Test	Test	x		QC	Qc
Adele Michaela	Libunao	Adele Michaela Libunao	x		Metro Manila	DPWH
TOTAL			23	17		

PROCEEDINGS	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• **Mr. Chester Jinayon** said that his property is within the proposed cloverleaf interchange. He asked if the government will acquire his property.	• **Mr. Carl Tamayo of TYLin** explained that for safety and accessibility reasons, properties within the cloverleaf will be acquired by DPWH.
• **Mr. Rene Barlis of Mt. View** asked which particular agency should residents go to should accidents occur. **Mr. Barlis** requested to publicly disclose the contact details, adding that agencies concerned usually tend to give people the runaround.	• **Engr. Nicole Bumagat of DPWH** said that the Project Information Brochure on the project that was distributed contains information on who to call and what number should residents have any concern about the project. • **Ms. Annabelle Herrera of Ecosys** asked the site team to show the requested contact details on the screen. She also said that the ECC contains provision on Environmental Guarantee Fund (EGF), which will serve as fund source for unexpected incidents or accidents related to the project. She said that aggrieved parties may go to the DENR to access the EGF.
• **Ms. Norma Lalunio** clarified if all structures bearing stickers are already confirmed to be affected. • **Ms. Lalunio** added if relocation will be provided for those who will be displaced.	• **Ms. Herrera of Ecosys** advised the participants to wait for meeting notices in the future. • **Ms. Herrera** explained that

ATTENDANCE SHEETS

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

Barangay Alas-asin Covered Court
Mariveles, Bataan
15 June 2022, 08:00 A.M.

ATTENDANCE SHEET

EcosysCorp, Inc.

TYLIN INTERNATIONAL
A JOINT VENTURE
PEC Pyunghwa Engineering Consultants

No.	Name	Gender		Designation / Title	Department/Office	Contact No(s).	E-mail Address	Signature
		F	M					
1	MADILEN MERCADO	/		ADMIN ASST.	ADMIN	09208904280		
2	CHRISTIAN DE GUZMAN		/	RECS / ADMIN	ADMIN	09953770023		
3	JUNIBEN B. PADAYAO		/		ADMIN	09193153870		
4	JOSE MONTE DE RAMOS		/		DMT	0945785136		
5	KIM LAWRENCE C. DIVINA		/		DMT	09162576070		
6	PALOMARIA, REINNERE		/		CAT	0905 449 1313		
7	ARTHUR RAMIREZ		/		TECH	0915[illegible]		
8	Peji, Andrea Louise B	/		PC	RAP	0919 002 0121		
9	Isorena, Joylyn	/			TECH	09152424932		
10	EFREN IBARRALOZA		/	PSG	CAT	09457586819		
11	MICHAEL GANUA		/	HSP / TECH	TECH / HSP	[illegible]		
12	JOSEPH VILLACASTEN		/	HSP / TECH	TECH	0905[illegible]		

EcosysCorp Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

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ATTENDANCE SHEET

TY·LIN INTERNATIONAL — A JOINT VENTURE
PEC Pyunghwa Engineering Consultants

No.	Name	Barangay	Sex		Sector										Contact Number	Email Address	Signature
			M	F	Y	P	S	W	R	B	L	A	F				
1	GEMMA R. BAUTISTA	ALAS-ASIN		F				W						09383812468		
2	NORMA J. LALUNIO	ALAS-ASIN		F				W						09166315074		
3	Bikiana S. Calikoso	Alas-asin				P	S							09150657176		
4	LEZADA, CLAITZ	ALAS-ASIN	M							B				09232126690		
5	BAYANI P. MARIANO	ALAS-ASIN	M				S							09208884665		
6	DONATO ANDA	ALAS-ASIN	M								L			09301932862		
7	VICENTE AGNIJAN	"	M				S							09813074069		
8	JIMMY VENTURINA	"	M								L			09989124859		
9	JUANCHOLITO BASL	"	M								L			0948 378 2080		
10	ISAGANI ADONA	"	M				S							09771414419		
11	Gylledin Reyes	"	M				C							0910 633 6279		
12	Rheda Kathleen Caguiat	mt. View		F							L			0967 1664798	BRGY CLERK	
13	RENED BARLIS	-do	M								L			09098473048	~~[illegible]~~	

EcosysCorp Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project
Information, Education, and Communication Meeting

Barangay Alas-asin Covered Court
Mariveles, Bataan
15 June 2022, 08:00 A.M.

ATTENDANCE SHEET

TY·LIN INTERNATIONAL — A JOINT VENTURE
PEC Pylonghwa Engineering Consultants

No.	Name	Barangay	Sex		Sector									Contact Number	Email Address	Signature
			M	F	Y	P	S	W	R	B	L	A	F			
1	Elena F. Tomaj	Alasasin	M	(F)	Y	P	S	W	R	B	L	A	F	09129963420		
2	Mary Stella Llanto	Alasasin	M	(F)	Y	P	S	W	R	B	L	A	F	09146755723		
3	Leojean Ponte	Alasasin	M	F	Y	P	S	W	R	B	L	A	F	09976380157		
4	Melvin Ponte	ALAS-ASIN	M	F	Y	P	S	W	R	B	L	A	F	09067984527		
5	ABON, JENELYN	Alasasin	M	(F)	Y	P	S	W	R	B	L	A	F	09158681294		
6	Pineda Cornelio	ALAS-ASIN	(M)	F	Y	P	S	W	R	B	L	A	F	09774152293		
7	Rosalie Pasamilo	Alasasin	M	(F)	Y	P	S	W	R	B	(L)	A	F	09176327521		
8	Ligaya C. Doms	Alasasin	M	(F)	Y	P	(S)	W	R	B	(L)	A	F	09951818537		
9	ENRIQUEZ Margie	alas-asin	M	F	Y	P	S	W	R	B	L	A	F	09165767159		
10	Pepito Christian	Alas-asin	M	(F)	Y	P	S	W	R	B	L	A	F	09076855479		
11			M	F	Y	P	S	W	R	B	L	A	F			
12			M	F	Y	P	S	W	R	B	L	A	F			
13			M	F	Y	P	S	W	R	B	L	A	F			

EcosysCorp Inc.

Venue:	**Alas asin Basketball Court, Brgy. Alas asin, Mariveles, Bataan**
Date:	**18 June 2022 (Saturday)**
Time:	**8:00 AM**

ATTENDEES						
First Name	**Last Name**	**Full Name**	**Female**	**Male**	**Municipality**	**Barangay/Office**
Noelito M.	Rea	Noelito M. Rea		x		Mt. View
Ricardo V.	Maghanay	Ricardo V. Maghanay				Townsite
Almario C.	Quizon	Almario C. Quizon		x		Mt. View
Ernesto V.	Austria	Ernesto V. Austria		x		Alas- Asin
Cornelia	Cruz	Cornelia Cruz	x			Alas- Asin
Teresita	Gervacio	Teresita Gervacio	x			cabcaben
Adelle Michaela	Libunao	Adelle Michaela Libunao	x		Metro Manila	DPWH
Cyrenne	Pelayo	Cyrenne Pelayo	x		QC	Ecosys
Frederick	Esternon	Frederick Esternon		x	QC	Marilag
Erica	Juria	Erica Juria	x		Manila	TYLI
Carl Luis	Tamayo	Carl Luis Tamayo		x	Manila	TYLin
Adrienne	De Guzman	Adrienne De Guzman	x		Manila	TYLin
Jad	Zamora	Jad Zamora	x		Manila	TYLin
Elenor	De Leon	Elenor De Leon	x		NA	Ecosys
Ellaine	Rabot	Ellaine Rabot	x		Manila	DPWH
Junnel Ray	Bautista	Junnel Ray Bautista		x	Manila	Manila City (Sampaloc)
Annabelle	Herrera	Annabelle Herrera	x		QC	Ecosys
TOTAL			10	6		

Sectors represented: Women, Senior/Elderly, and Local leaders

PROCEEDINGS	
Queries/Concerns/Suggestions/Comments	**Responses to Queries**
• **Mr. Noelito Rea** asked if those from the informal sector who will be displaced by the project will be compensated by the government.	• **Ms. Annabelle Herrera of Ecosys** explained that part of the preparation for the formulation of the resettlement plan is the conduct of structure tagging. She added that if the houses of those informal settlers have been tagged or have colored stickers, it means that they will be affected/displaced by the project. She added that white stickers were used to tag structures during the feasibility study stage. She clarified that based on Philippine laws and on ADB's policies, qualified informal settler families are entitled to receive compensation. She said that the DPWH will review their qualifications and should they qualify, they will be entitled to relocation. She added that DPWH will be working closely with the local government of Mariveles to address said concern.
• **Mr. Ernesto Austria** asked about the steps that will be undertaken by the project to minimize its adverse impact on the environment.	• **Mr. Frederick Esternon of DCCD** explained that baseline study on the water, air, marine life, etc. was undertaken during the feasibility study stage, results of which served as bases for determining the actual status of the environment in the project-affected area, which should be maintained according to the standards of the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR). He said that an environmental impact statement (EIS) was produced during the feasibility study stage, which underwent thorough validation by the EMB and served as basis for the issuance of the project's environmental compliance certificate (ECC). The ECC will serve as the planning tool or the project's guide in protecting the environment. He said that the ECC contains conditions, which the project must fulfill or meet. He also clarified that affected trees will also be treated similar to the structure tagging earlier explained. He then explained the permitting process being done by the DENR in issuing tree cutting permits and in ensuring that cut trees will be properly replaced. • **Ms. Herrera** added that adverse environmental impacts cannot be avoided during the construction period and that it will likely take time before certain aspects of the affected environment will go back to its initial condition. She added that interested community members may join the multi-partite monitoring team (MMT) so they can witness the sampling activities and see for themselves if conditions worsen or not.

	• **Mr. Esternon** confirmed that temporary changes in the environment should be expected.
• **Kgd Almario Quitong of Mt. View** asked what how the project will compensate the fisherfolk who stand to be adversely affected by temporary changes to the environment and by the construction activities. He also asked how coral reefs will be protected.	• **Mr. Esternon** said that construction activities will be done progressively and that measures will be established to ensure safety of fisherfolk and avoid limiting their access. On the question on the coral reefs, Mr. Esternon cited the result of the study that determined the presence of coral reefs in the area but although the project will not affect these, he assured Kgd. Quitong that appropriate steps will still be undertaken to avoid any adverse impact on these. • **Engr. Erica Juria of TYLin** confirmed what Mr. Esternon said about the progressive conduct of construction activities and the considerations being undertaken to minimize adverse impacts to fisherfolks. • **Ms. Herrera** added that based on the study done by experts, fishing grounds will not be affected by the project. She said that fisherfolks' access will not be limited. She confirmed the management plan that will be followed during the construction stage to ensure that access will not be limited. She also said that livelihood interventions will also be taken for those who will be displaced by the project.
• **Mr. Rea** asked how far away from the bridge, once it is finished, will fishermen be allowed to fish.	• **Ms. Herrera** said that it is important for the BFAR and concerned groups to discuss the navigational routes in the area. • **Engr. Junnel Bautista of DPWH** said that the DPWH will coordinate with BFAR and local agencies to discuss safety of fisherfolks and specify guidelines on fishing activities.
• **Mr. Austria** asked about the exact restrictions that will be imposed on fisherfolks.	• **Engr. Bautista** said that security personnel will be installed to ensure the strict implementation of regulations around the bridge.
• **Kgd. Quitong** asked about the project timeline so he can advise fisherfolks.	• **Engr. Bautista** said that the DED stage will be finished by the first quarter of 2023. He added that the project is divided into packages and that procurement will take about two to three quarters, including loan negotiations. He said that **considering** said timeline, construction activities are expected to start on the last quarter of 2023 up to the first quarter of 2024.
• **Mr. Austria** asked if employees from Bataan will be prioritized for the project.	• **Ms. Herrera** pointed out that priority will be given to residents from affected areas and that this is indicated in the Resettlement Plan as well as in the ECC. She also added that based on the provision of RA 6685, for any government project, 50% of unskilled laborers and 30% of skilled laborers should come from the area where construction is being undertaken.

	• **Mr. Esternon** added that affected areas include Cavite City and Naic and that distribution among these areas will be done.

ATTENDANCE SHEETS

Bataan-Cavite Interlink Bridge (BCIB) Project

Information, Education, and Communication Meeting

Barangay Alas-asin Covered Court
Mariveles, Bataan
18 June 2022, 08:00 A.M.

ATTENDANCE SHEET

EcosysCorp, Inc.

T·Y·LIN INTERNATIONAL
A JOINT VENTURE
PEC PYUNGHWA ENGINEERING CONSULTANTS

No.	Name	Gender		Designation / Title	Department/Office	Contact No(s).	E-mail Address	Signature
		F	M					
1	CHRISTIAN DE GUZMAN		✓	ADMIN / REGS.	ADMIN	09953370023		[signature]
2	Andrea Louise B. Peji	✓		PC	RAP	0919 002 0121		[signature]
3	MADILEN MERCADO	✓		ADMIN ASST.	ADMIN	09208904280		[signature]
4	PALOMARIA, REIN		✓	LINE MARSHALL ~~CAT~~	CAT	09053441513		[signature]
5	Juniben B. Padayao		✓		ADMIN	09193153870		[signature]
6	MICHAEL C. GARCIA		✓	SO1 / TECH	TECH / HSP	09565878764		[signature]
7	JOYLYN ISORENA	✓		tech	TECH	09162424932		[signature]
8	JOSEPH VILLAREPTON		✓	TECH	TECH	0706397704		[signature]
9	[illegible]		✓	[illegible]	TECH	09151864057		[signature]
10	MAHALAEL GARUZ		✓	CAT	CAT	09271205337		[signature]
11	ROGER AGBISIT		✓	CAT	CAT	09360183034		[signature]
12	EFREN IBARDALOZA JR.		✓	PSS	CAT	09457386819		[signature]

EcosysCorp Inc.

Bataan-Cavite Interlink Bridge (BCIB) Project

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18 June 2022, 08:00 A.M.

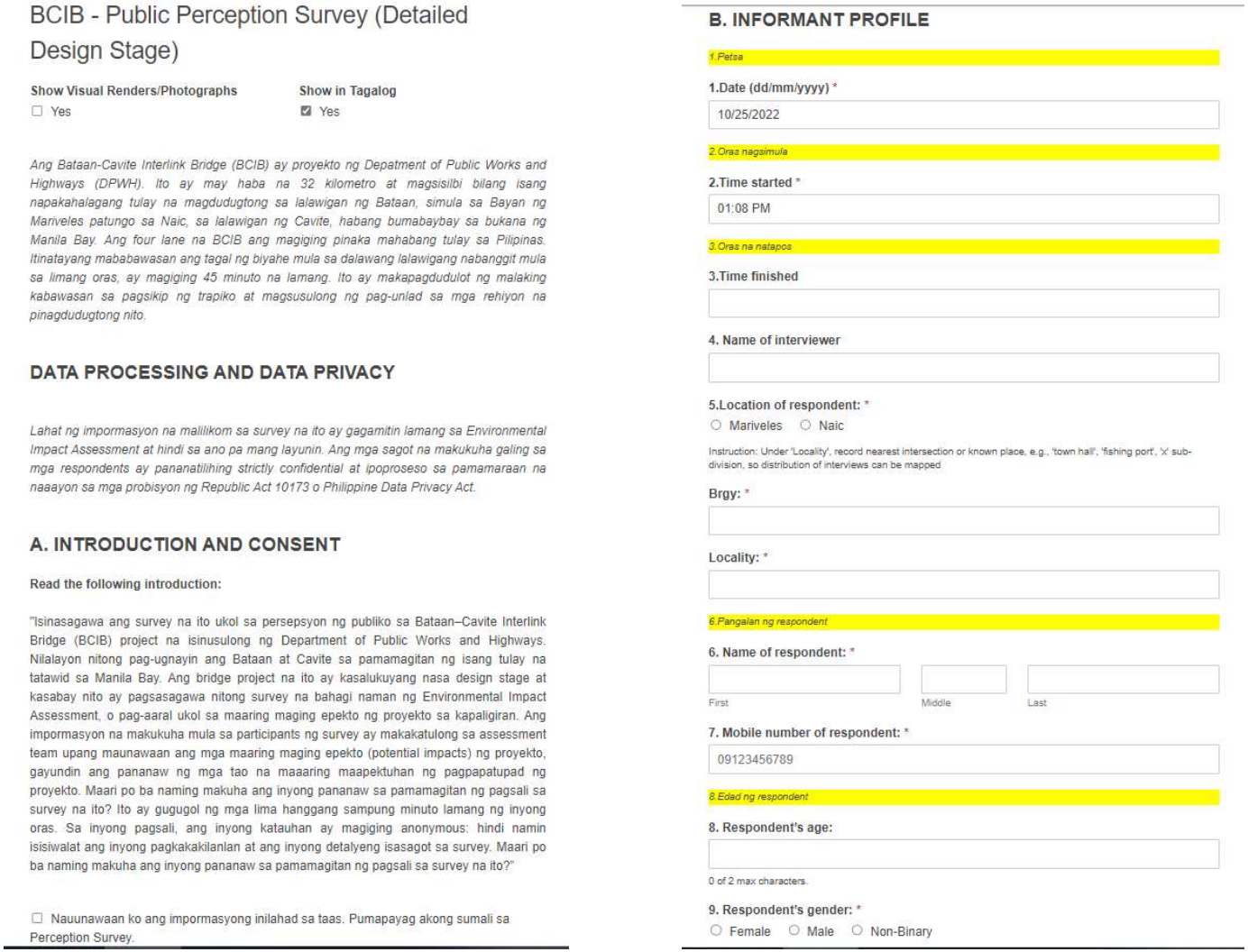
ATTENDANCE SHEET

TY·LIN INTERNATIONAL — A JOINT VENTURE
PEC Pyunghwa Engineering Consultants

No.	Name	Barangay	Sex		Sector									Contact Number	Email Address	Signature
			M	F	Y	P	S	W	R	B	L	A	F			
1	NOELITO M. PIA	MT. VIEW	✓								✓			09207027791	NARRA/IPIL HOA	
2	RICARDO V MAGHANAY	TOWNSITE												09568747093		
3	ALMARIO E. QUIÑO	MT. VIEW									✓			09617347963	CATODA	
4	ERLINDA V. AGUSTIN	ALAS-ASIN												0938-281-2381	DHOAI	
5	CORNELIA CRUZ	ALAS-ASIN		✓				✓						09632849817		
6	Teresita Gervacio	Cabcaben		✓				✓							kal.pe	
7																
8																
9																
10																
11																
12																
13																

EcosysCorp Inc.

APPENDIX 2 : Screenshots of the BCIB Online Survey Form



BCIB - Public Perception Survey (Detailed Design Stage)

Show Visual Renders/Photographs
☐ Yes

Show in Tagalog
☑ Yes

Ang Bataan-Cavite Interlink Bridge (BCIB) ay proyekto ng Depatment of Public Works and Highways (DPWH). Ito ay may haba na 32 kilometro at magsisilbi bilang isang napakahalagang tulay na magdudugtong sa lalawigan ng Bataan, simula sa Bayan ng Mariveles patungo sa Naic, sa lalawigan ng Cavite, habang bumabaybay sa bukana ng Manila Bay. Ang four lane na BCIB ang magiging pinaka mahabang tulay sa Pilipinas. Itinatayang mababawasan ang tagal ng biyahe mula sa dalawang lalawigang nabanggit mula sa limang oras, ay magiging 45 minuto na lamang. Ito ay makapagdudulot ng malaking kabawasan sa pagsikip ng trapiko at magsusulong ng pag-unlad sa mga rehiyon na pinagdudugtong nito.

DATA PROCESSING AND DATA PRIVACY

Lahat ng impormasyon na malilikom sa survey na ito ay gagamitin lamang sa Environmental Impact Assessment at hindi sa ano pa mang layunin. Ang mga sagot na makukuha galing sa mga respondents ay pananatilihing strictly confidential at ipoproseso sa pamamaraan na naaayon sa mga probisyon ng Republic Act 10173 o Philippine Data Privacy Act.

A. INTRODUCTION AND CONSENT

Read the following introduction:

"Isinasagawa ang survey na ito ukol sa persepsyon ng publiko sa Bataan–Cavite Interlink Bridge (BCIB) project na isinusulong ng Department of Public Works and Highways. Nilalayon nitong pag-ugnayin ang Bataan at Cavite sa pamamagitan ng isang tulay na tatawid sa Manila Bay. Ang bridge project na ito ay kasalukuyang nasa design stage at kasabay nito ay pagsasagawa nitong survey na bahagi naman ng Environmental Impact Assessment, o pag-aaral ukol sa maaring maging epekto ng proyekto sa kapaligiran. Ang impormasyon na makukuha mula sa participants ng survey ay makakatulong sa assessment team upang maunawaan ang mga maaring maging epekto (potential impacts) ng proyekto, gayundin ang pananaw ng mga tao na maaaring maapektuhan ng pagpapatupad ng proyekto. Maari po ba naming makuha ang inyong pananaw sa pamamagitan ng pagsali sa survey na ito? Ito ay gugugol ng mga lima hanggang sampung minuto lamang ng inyong oras. Sa inyong pagsali, ang inyong katauhan ay magiging anonymous: hindi namin isisiwalat ang inyong pagkakakilanlan at ang inyong detalyeng isasagot sa survey. Maari po ba naming makuha ang inyong pananaw sa pamamagitan ng pagsali sa survey na ito?"

☐ Nauunawaan ko ang impormasyong inilahad sa taas. Pumapayag akong sumali sa Perception Survey.

B. INFORMANT PROFILE

1.Petsa

1.Date (dd/mm/yyyy) *
10/25/2022

2.Oras nagsimula

2.Time started *
01:08 PM

3.Oras na natapos

3.Time finished

4. Name of interviewer

5.Location of respondent: *
○ Mariveles ○ Naic

Instruction: Under 'Locality', record nearest intersection or known place, e.g., 'town hall', 'fishing port', 'x' sub-division, so distribution of interviews can be mapped

Brgy: *

Locality: *

6.Pangalan ng respondent

6. Name of respondent: *
First | Middle | Last

7. Mobile number of respondent: *
09123456789

8.Edad ng respondent

8. Respondent's age:
0 of 2 max characters.

9. Respondent's gender: *
○ Female ○ Male ○ Non-Binary

APPENDIX 3 : Screenshot of the flyer used to attract online respondents to the survey

Bataan-Cavite Interlink Bridge (BCIB) Project

The proposed Bataan-Cavite Interlink Bridge (BCIB) Project will be a four-lane median-separated roadway spanning a total length of 32 km, 26 km of which would be over the waters of Manila Bay. This highway will only be accessible via two interchanges: the north interchange from Roman Super Highway at Barangay Alas-Asin in Mariveles, Bataan, and the south interchange from Antero Soriano Highway at Barangay Timalan Balsahan in Naic, Cavite.

We want your feedback! Please go to this link to answer the survey:
https://www.ecosyscorp.ph/bcib-perception-survey-dd/

See more photos of the proposed bridge by scanning the QR codes at the back of this flyer.

IPIF ROADS & BRIDGES

Republic of the Philippines
Department of Public Works and Highways

ADB ASIAN DEVELOPMENT BANK

Bataan-Cavite Interlink Bridge Project

Environmental and Social Studies

Final Climate Change Study Report

April 14, 2023

Prepared By:

TYLin PEC

A JOINT VENTURE

T.Y. Lin International | Pyunghwa Engineering Consultants Joint Venture

Document Code: 481714-BCIB-PS-ECOS-ENV-RPT-0002
Revision: 02

Design/ Provisional Sums Reference:

Reference:
Task Order No. 16R1 “Environmental and Social Studies” Task 1 “Climate Change Study” Item No. 2 “Final Climate Change Study Report”

Revisions:

Date	Description	Revision	Originator	Reviewer	Approver
2023-02-19	Issue for Coordination	00	Edwin Combalicer (ECOSYS)	IG Park (PEC) BY Lim (PEC) Jodi Ketelsen (TYLI) Simeon Stairs (REN)	Marwan Nader (TYLI / PEC JV)
2023-02-28	Issued to DPWH	01	Edwin Combalicer (ECOSYS)	Hardik Patel (TYLI) BY Lim (PEC) Jodi Ketelsen (TYLI) Simeon Stairs (REN)	Marwan Nader (TYLI / PEC JV)
2023-04-14	Issued to DPWH	02	Edwin Combalicer (ECOSYS)	Hardik Patel (TYLI) BY Lim (PEC) Jodi Ketelsen (TYLI) Simeon Stairs (REN)	Marwan Nader (TYLI / PEC JV)

Major Contributors of the Current Revision:

Contributors
Rami Bushebel (TYLI)

ABBREVIATIONS

ADB	Asian Development Bank
AR5	fifth assessment report
AR6	sixth assessment report
AASHTO	American Association of State, Highways and Transportation Officials
BCIB	Bataan-Cavite Interlink Bridge
BMMC	Bridge Monitoring and Maintenance Compound
CCC	Climate Change Commission
CERAM	climate extreme risk assessment matrix
CHASSAM	Coastal Hazards and Storm Surge Assessment and Mitigation
CLIRAM	climate information risk analysis matrix
CISS	cast-in-steel-shell
CMIP5	Coupled Model Intercomparison Project, Phase 5
CMIP6	Coupled Model Intercomparison Project, Phase 6
CORDEX-SEA	Coordinated Regional Climate Downscaling Experiment - Southeast Asia
CRA	climate risk and adaptation
DED	detailed engineering design
DENR	Department of Environment and Natural Resources
DGCS	design guidelines, criteria, and standards
DFL	design flood level
DPWH	Department of Public Works and Highways
DO	departmental order
DOST	Department of Science and Technology
DTR	daily temperature range
ENSO	El Niño Southern Oscillation
GHG	greenhouse gas
GMSL	global mean sea level
HSDS	highway safety design standards
IPCC	Inter-Governmental Panel for Climate Change
IFIP	Infrastructure Preparation and Innovation Facility
LUD	lock-up devices
MDCR	master design criteria report
MDRRMO	Municipal Disaster Risk Reduction and Management Office
msl	mean sea level
NAIA	Ninoy Aquino International Airport
NCCAP	National Climate Change Action Plan
NCR	National Capital Region
NEDA	National Economic and Development Agency
NFSCC	National Framework Strategy on Climate Change
NOAH	Nationwide Operational Assessment of Hazards
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PHIVOLCS	Philippine Institute of Volcanology
PAR	Philippine area of responsibility
PEISS	Philippine Environmental Impact Statement System

PGA	peak ground acceleration
PEM	Philippine earthquake model
PRECIS	providing regional climates for impact studies
PSCCA	Philippine Strategy on Climate Change Adaptation
RCM	regional climate models
RCP	representative concentration pathways
Rx1day	maximum 1-day rainfall total
SDII	simple daily intensity index
SLC	sea level change
SLR	sea level rise
SRES	special report on emissions scenarios
SRSS	square-root-sum-of-squares
SROCC	special report on the ocean and cryosphere
SSPs	shared socioeconomic pathways
TD	tropical depressions
TS	tropical storm
TX90p	fraction of hot days
TXx	warmest daytime temperature
TY	tropical typhoon
UNFCCC	United Nations Framework Convention on Climate Change

TABLE OF CONTENTS

LIST OF EXHIBITS

APPENDICES

EXECUTIVE SUMMARY

1. The Infrastructure Preparation and Innovation Facility (IPIF) is a technical assistance (TA) loan package of Asian Development Bank (ADB) for the Philippine government, which entails updating the feasibility studies conducted in 2019 for the Bataan-Cavite Interlink Bridge (BCIB) and preparing the detailed design package. The Department of Public Works and Highways (DPWH) will be implementing this project.

2. The BCIB project was classified as 'Category A' based on ADB Environment Safeguards Categories; therefore, requiring a more detailed climate risk adaptation assessment.

3. This Climate Risk and Adaptation (CRA) assessment was prepared to i) assess the climate and climate change threats to the BCIB project, ii) consider the project adaptation measures, iii) determine to what extent the performance and design are vulnerable to climate change, and iv) recommend actions that will improve the project climate resilience.

4. The BCIB project covers the construction of 32.15 km roadways and bridges, including the provision of navigational bridges, marine viaducts, interchanges, and land viaducts, bridge and monitoring facilities, and other road facilities.

5. The project location was found to be sensitive to climate conditions such as temperature increase, precipitation increase, onshore storms, sea-level rise, and wind speed increase. It experienced climate change in the past and is expected to experience these in the future. Given the Project location, the designers must consider the possibility of Climate Change effects.

6. This report relies upon the recent Philippine climate extremes data to describe the general trajectories of rainfall and temperature. The downscaled historical and projected daily extremes data were used to calculate the projected changes in 24 climate extremes indices for two Representative Concentration Pathways: RCP4.5 and RCP8.5. The annual extremes were averaged over the 20-year-time periods to come up with the climatological extreme. The projections from two scenarios, RCP4.5 and RCP8.5, were provided for three time periods: early future (2020–2039), mid-future (2046–2065), and late future (2080–2099). Based on PAGASA Climate Extreme Projection, temperatures in the project areas will increase by as much as 1.6 °C (2020-2039) for the RCP4.5 scenario and by as much as 3.6 °C (2080-2099) for the RCP8.5 scenario.

7. The maximum 1-day rainfall total (Rx1day) series (1900–2100) for the project area were downloaded from the KNMI Climate Change Atlas for CMIP5 extremes ensemble under RCP8.5 to assess the adequacy of engineering designs, which are generally based on climate extremes. The climate model outputs are separated for 1850–2005 and 2006–2100. The observed design values of Rx1day were 315 mm for the Bataan side and 260 mm for the Cavite project site. Rx1day shows an increasing trend and a non-stationarity that raises the possible need for the DPWH design return periods to be adjusted. The design values were calculated for the baseline (1986-2005) and future periods (2016-2035). A probability curve and the percentage increase in Rx1day with a 25-year return period were interpolated to determine the required percentile from the climate model ensemble. A 30% climate change factor was computed to handle 97.5% of the projected rainfall

intensity extremes. The assessment found that the design values of Rx1day for the future climate must be 409 mm for the Bataan side and 338 mm for the Cavite area.

8. The daily maximum temperature projections vary at an increasing rate from 35.5 °C (historical) to 39.3 °C (future) on the Bataan side and from 35.7 °C (historical) to 39.1 °C (future) on the Cavite side under CMIP5 ensemble of the RCP8.5 scenario. Potential climate impacts and risks on the project of higher temperatures and extreme heat can cause bridges to be stressed by thermal expansion and movement, lead to premature deterioration of the structure, and damage pavements that protect the bridge decks.

9. Climate change is projected to influence the anomaly of sea-level rise. Both the medium-low GHG concentration scenario (RCP4.5) and the high-end scenario (RCP8.5) lead to similar increases in sea level. The project estimated future regional sea level changes for the Philippines by using changes in the projections for the Global Mean Sea Level (GMSL) from the IPCC AR5 and combining them with non-uniform regional patterns of sea level change around the country. It is projected to be slightly higher than the global mean at the end of the 21st century. The Special Report on the Ocean and Cryosphere (SROCC) projection of the sea level rise is likely in the range of 0.61 to 1.10 m and 1.2 to 1.6 m in 2100 and 2130, respectively. The projected sea level rise for the BCIB Project conservatively uses an increase of 1.0 m (2100) and 1.2 m (2130). However, the BCIB design has a generous freeboard to permit large vessels to pass with ample clearance regardless of the full range of projected sea level rise through 2130.

10. The BCIB project locations have been exposed to 27 tropical cyclone winds in the past 7 decades. Many of these tropical cyclones hit the area from September to October. The latest and strongest typhoon occurrences in the project areas were in November 2019 and 2020 with maximum sustained winds of 150 and 220 kph, respectively. Bataan and Cavite sections have mean wind speeds ranging from 6.61 to 7.05 m/s and from 6.60 to 7.37 m/s, respectively, while the Corregidor Island portion is exposed at rate ranging from 6.96 to 7.19 m/s. The mean wind at the Sangley Weather Station is 5.91 m/s, or about 1.2 times less than on Bataan alignment. In essence, the wind speed in Bataan could reach 231 kph considering the historically recorded peak wind speed of 194 kph in Sangley Point Station. A study on Design Tropical Cyclone Wind Speed when considering climate change indicated that wind speed during tropical cyclones increases by 1.2-1.4 times the historical record. These could increase the wind speed in Bataan section to well over 300 kph.

11. The project assessed its quantitative greenhouse gas (GHG) emissions upon which the total amount of fuel and electricity, construction materials, and/or fuels used were calculated using specific values. The project is estimated to account for about 445,200 tons of CO_2e (tCO_2e) during its construction, with an annual release of 89,049 tCO_2e. The project's construction is an insignificant source of emissions based on ADB's threshold of 100,000 tCO_2/year. Considering the 100 years assessment period (service life) during its operation, the total GHG emissions of about 7.0 million tCO_2e will likely be attributed to the project with average annual emissions in forecast years of 61,100 tCO_2e. It can be observed that the operation phase has the highest contribution of GHG emissions (more than 94%). On the other hand, the construction stage has a share of not more than 6% of the project's overall GHG emissions.

12. The BCIB project would reduce congestion by providing an alternative route from north Luzon Island to South Island without traveling through Manila's heavy congested roadways. This would help to reduce emissions. The net change in emissions on account of the BCIB project was identified and valued, using a *with* and *without* project comparison. The assessment and computation were based on the travel activity that relies on the trip distance data, considering the Metro Manila transport network model with travel sectors. Net changes in GHG emissions due to changed traffic flows were estimated in 2030 and 2050, representing the year the BCIB project commenced and 20 years during the project implementation. The assessment found that the BCIB in place will decrease GHG emissions from 319,900 tCO_2 to 255,800 tCO_2 in 2030 and from 479,500 tCO2 to 401,300 tCO_2 in 2050. Results indicated GHG reductions of about 64,100 tCO_2 in the opening year and about 142,300 tCO_2 during the entire appraisal period (2030-2050).

13. The detailed design is anticipated to be resilient and counteract extreme weather events. Certain sections and facilities that would be exposed to risks have been reviewed and design considerations have been incorporated and will be implemented during the construction and operation phases. Design considerations and adaptation measures that address or counter climate change and associated risk on the project's physical infrastructure and assets as currently designed are summarized below:

(i) Increases in very hot days and heat waves, decreased precipitation

Design Considerations

- The flexible pavement type is considered due to environmental and weather exposure, traffic loading, and constructability (i.e., Package 1: 920 mm, Package 2: 750 mm, Package 3 and 4: 80 mm, Package 5 and 6: 50 mm).
- The PSMA's Performance Grade is PG76-22, a material that can maintain durability for seven (7) days at the maximum design temperature of 76 °C and the minimum design temperature of -22 °C.

Adaptation Measures

- GHG emissions offsetting through the enhanced National Greening Program of the government.
- Use of Polymer Modified Stone Mastic Asphalt and concrete due to its higher temperature resistance.
- Incorporate rainwater harvesting in BMMC building designs to reduce the energy used for pumping water.
- Designate the interchange areas in Cavite and Bataan as a green urban corridor.
- Preservation and easement retention of natural drainage waterways.
- Based on the local climate and projected average increase in temperature, increased thermal loading will be used for the bridge structures.

(ii) Extreme Precipitation Events, Flooding

Design Considerations

- Construction of Mt View Waterway Bridge
- Provision of the typical drainage at grade road portion of the crossing.
- Construction/Installation of box and pipe culverts, roadside and median ditches, and gutter flow.

- Surface run-off from the deck (marine viaducts) and bridge deck (long span bridges) will be collected and drained at the low points of the deck surface into Manila Bay.

Adaptation Measures

- Rainfall intensities will be increased by 10% to reflect potential climate change per DCGS Vol 3, Section 9.2.4.1.
- Construction of slope protection measures on natural slopes and man-made structures, such as road embankments and cuttings.
- Stream bank stabilization for the protection of the Mt View waterway (riprap protection).

(iii) Sea Level Rise, Storm Surge

Design Considerations

- Package 1: The terrain ground condition has a steep slope from abutment towards the shoreline, and column heights vary from 8 m to 17 m high.
- Package 2: The terrain ground condition is flat, and the shoreline and column heights vary from 6 m to 7 m high
- Packages 3 – 6: Designed to clear a compounded effect of high tide, sea level rise, storm surge and typhoon-generated tidal waves.
    - Highway Alignment Level: Northern Main Navigation Channel = + 47.4m mean sea level (msl); Corregidor Interchange = +31.1m msl; Fast Ferry to Corregidor Island = +20.9m msl
    - The vertical profile of the mainline varies from +21.5m msl to +23.0m msl near Corregidor Island.
    - P4: Southern Main Navigation Channel = +72.3m msl; Nearshore Navigation Channel = +23.1m msl; and Non-navigation Span = +14.5m msl.
    - Highway Alignment Level: +81.7m MSL; Nearshore Navigation Channel = +32.5m msl; and Non-navigation Span = +21.5m msl.
    - P5: Air Draft above msl (m): Northern Main Navigation Channel = +40.5m;
    - Highway Alignment Level: Northern Main Navigation Channel = + 47.4m msl;
    - P6: Northern Main Navigation Channel = +40.5m; Corregidor
- The project design adopts the Philippine Coast Guard-approved navigational clearance for the project.
- Vessel collision force has been applied considering both current conditions and conditions with 1.6 m of SLR.

Adaptation Measures

- Coastal wall protection
- Raise piles by the amount of SLR
- Preservation and easement retention of natural drainage waterways

(iv) Increase of storm intensity and wind speed

Design Considerations

- Use of a flexible pavement to be more resistant to weather and climate extremes.

- Wind design criteria: 1700-year wind standard– industry standard for cable bridges.
- The horizontal alignment near the landing point at Bataan and Cavite is designed to be perpendicular to the shoreline and perpendicular to the Northern and South Main Navigation Channel.
- Exposure category D ('flat unobstructed areas and water surfaces') was applied.
- Speeds are reported at a reference deck height above sea level for the BCIB project.
- Wind Speed at Deck Heights (87.6 m) for BCIB (South Channel Bridge)
  - Hourly Mean: 71.0 m/s (255 kph)
  - 10 Minute Mean 72.7 m/s
  - 3s-Gust: 95.8 m/s (345 kph)
- Wind Speed at Deck Heights (48.4 m) for BCIB (North Channel Bridge)
  - Hourly Mean: 67.2 m/s (242 kph)
  - 10 Minute Mean 68.8 m/s
  - 3s-Gust: 91.9 m/s (331 kph)

Adaptation Measures

- Reinforcing piers, columns, and bridge foundations against scouring.
- Coastal wall protection.
- Additional climate change factor of 1.05 was applied to Strength Design of the bridges in consideration of future climate change effects on wind.

14. The BCIB Project estimated a total of US$ 20,261,500 of the civil works on addressing (adaptation) climate change risks.

15. The assessment recommended additional adaptation measures during the project implementation and operation stages such as i) nature-based solutions (mangroves can provide coastal protection), ii) installing the nonstructural (soft) barriers to flooding that reduce coastal flooding, erosion, and storm surge impacts, iii) develop green corridors to the interchange areas and the existing riparian galleries, iv) communicate through community-based adaptation options and activities, and v) build early warning systems and information networks to support community disaster information and awareness.

1. DESCRIPTION OF THE PROJECT

1.1 Background

16. The IPIF is a TA loan package of ADB for the Philippine government (the "borrower/ client"). This entails updating the feasibility studies conducted in 2019 for the Bataan-Cavite Interlink Bridge (BCIB) and preparing the detailed design package which includes engineering design, study on environment and social safeguards, preparing the bid documents, and carrying out due diligence requirements to support the Philippine government and ADB in project processing and procurement.

17. The Department of Public Works and Highways (DPWH) of the Philippines signed a contract with T.Y. Lin International and Pyunghwa Engineering Consultants Joint Venture (hereinafter called "TYLI/PEC") and in association with Renardet S.A. and DCCD Engineering Corporation for the Detailed Engineering Design (DED) of the Bataan–Cavite Interlink Bridge Project (BCIB). Under Package 1, the Climate Change Study (Climate Risk and Adaptation Assessment) is included as an additional work in the BCIB project detailed engineering design.

18. The BCIB is one of the major projects of the Build Build Build Program of the national government. The project aims to provide a permanent road linkage between the provinces of Bataan and Cavite to reduce travel time and ease traffic congestion between Metro Manila and the South Luzon and North Luzon gateways. It will provide opportunities for expansion outside Metro Manila for economic growth and support the development of seaports of Cavite and Bataan as premier international shipping gateway to the country. The BCIB originates from Brgy. Alas-Asin to Bgry. Mt. View of Mariveles, Bataan in Central Luzon; crosses the Manila Bay with the possible connection at Corregidor Island and touches down at Barangays Timalan Concepcion and Timalan Balsahan, Municipality of Naic, Cavite with a total length of 32.15 km (Exhibit 1-1).

1.2 Project Components

19. Along the 32.15 km long BCIB, the marine section's structures are categorized into different components as shown in the sketch below. On Bataan and Cavite land area, both at grade roads and land viaducts are required. Generally, the structures are categorized into the following different components:

(i) Navigation bridges – The main structure that provides the necessary navigation clearance for safe operation of shipping at the project site. For BCIB, the navigation bridges are the North Channel Bridge and South Channel Bridge.

(ii) Marine viaducts – The typical viaduct structures which will be constructed above sea water with varying column heights and water depth. Constant span arrangement is adopted to have standardized construction methodologies and minimize the duration of the construction program.

(iii) Interchanges and viaducts on land – These are the viaduct structures which will be constructed on land to provide the connection to the existing road networks.

(iv) Ancillary facilities – These are Bridge Monitoring and Maintenance Compound (BMMC) on a 0.5-hectare site on the Bataan side, electrical service building, technical shelter, emergency response office, guard outposts, utilities, fuel pump shed, water tank, portable sewage treatment plant, and fenced open areas for parking and yard.

Exhibit 1-1: The BCIB Project Alignment

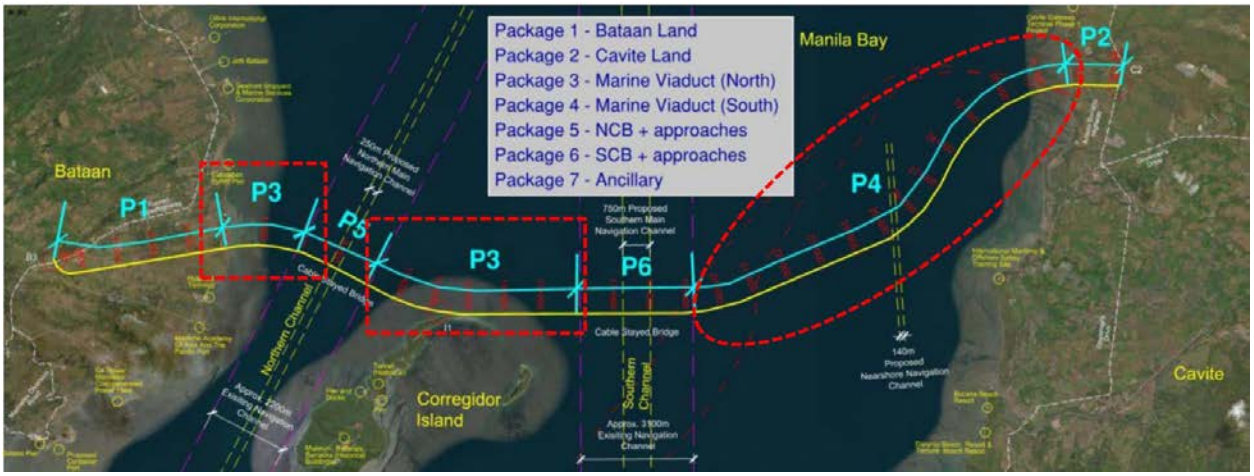
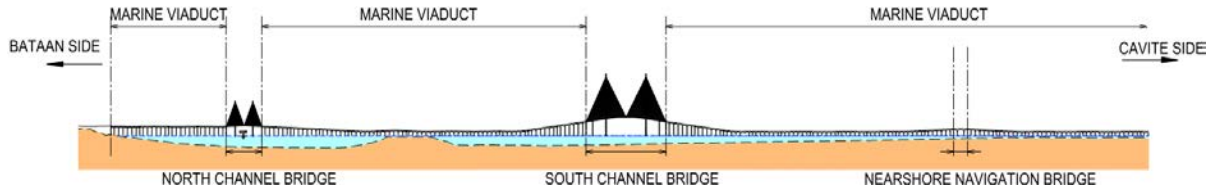


Exhibit 1-2: Structure Component Types along BCIB



Sources: Bataan – Cavite Interlink Bridge (BCIB) Project – Environmental Impact Assessment Report. p.81.

20. Brief descriptions of the project structures of each Work Package are presented in Exhibit 1-3.

Exhibit 1-3: The BCIB Main Project Structures

Package and Project Structure	Brief Description
Package 1 - Bataan Land Approach[a]	The alignment is 5.4 km long and its major structure components include the trumpet interchange that connects the BCIB with Roman Highway, Roman Interchange Bridge, the Alas-Asin reinforced concrete box culvert, Alas-Asin Overpass Bridge, Mt. View Overpass Bridge, Mt. View Waterway Bridge, and the Bataan land viaduct.
Roman Interchange Bridge	The Roman Interchange Bridge is located along the Bataan Roman Highway and will be constructed at-grade and passing above the expressway. It forms part of the trumpet

Package and Project Structure	Brief Description
	interchange. The bridge span articulation is a typical 2@25m span, and the longitudinal alignment has a small curvature, and has a 13-degree skew angle.
Alas-Asin Reinforced Concrete Box Culvert	A reinforced concrete box culvert serves as both a drainage facility and as a farm crossing for the local community.
Alas-Asin Overpass Bridge	A local road bridge crossing is provided for communities to access either side of the BCIB.
Mt. View Overpass Bridge	A local road bridge crossing is provided for communities to access either side of the BCIB.
Mt. View Waterway Bridge	There is a gully along the alignment and the bridge structure is a 4@25m span and has a 25-degree skew angle to match the waterway alignment.
Bataan Land Viaduct	The Bataan land viaduct connects with the marine viaduct at the shoreline. The articulation developed for the structure is 5@40m span on a composite deck slab.
Package 2 – Cavite Land Approach[b]	The alignment is 1.38 km long and its major structure components include the partial clover leaf that connects the BCIB with Antero Soriano Highway, the Antero Soriano Interchange Bridge, Tramo Underpass, Timalan-Balsahan Underpass, and the Cavite Land Viaduct.
Cavite Land Viaduct	The Cavite Land Viaduct is the land approach at the Cavite side and connected to the marine viaduct at the shoreline. The articulation developed for the structure is 2@40m span on composite deck slab.
Timalan-Balsahan Underpass	A reinforced concrete box culvert underpass will be constructed for the local road along Timalan Balsahan Road.
Tramo Underpass,	A reinforced concrete box culvert underpass will be constructed for the local road along Tramo Road.
Antero Soriano Interchange Bridge	The Antero Soriano Interchange Bridge is located at the Antero Soriano Highway and will be constructed above grade and forms part of the interchange. The bridge span articulation is a typical 2@25 m span, the longitudinal alignment is straight and skewed at a 17.4-degree angle.
Package 3 and 4 – Marine Viaduct[c]	The alignment of Package 3 and Package 4 are divided into two areas, that is, shallow water areas and deep-water areas. The shallow water areas where water depth is less than 10 m, are in three (3) separate zones, i.e., nearshore Bataan, Corregidor Island, and Cavite. The alignment length of each shallow water area is estimated to 0.88 km (nearshore Bataan), 1.09 km (Corregidor Island), and 6.48 km (Cavite). The areas are with main span of 100m and 60 m in deep water and shallow water areas. A special navigation span near Cavite, with a main span length of 100m also adopts a haunch at the piers to allow navigation for Coastguard vessels and other small vessels sailing near the shore.
Package 5 - North Channel Bridges + Approaches[d]	The North Channel Bridge is situated between Bataan and Corregidor Island, a smaller version compared to the south channel, with a 400 m long main span cable stayed bridge,

Package and Project Structure	Brief Description
	with two 168 m long back spans, and the total length of the bridge is 736 m. The bridge features two monopole style towers which stand about 190m tall above the seabed and about 140 m above the sea level.
Package 6 - South Channel Bridges + Approaches[e]	The South Channel Bridge is situated between Corregidor Island and Cavite, the largest of two proposed cable-stayed bridges. With a span of 1800m between the two (2) pylons, it creates an opening for ships to pass through as they go in and out of Manila Bay. The bridge features two (2) monopole style towers which stand about 346 m tall above the seabed and about 306 m above the sea level. Near Cavite shoreline, a smaller "Nearshore Navigation Channel" is provided for the vessel traffic. The Nearshore Navigation Channel is 150 m wide and 23.1 m high above msl.
Package 7 – Ancillary Facilities	Bridge Monitoring and Maintenance Compound (BMMC) on a 0.5-hectare site on the Bataan side, featuring a 2-story, 475-m2 maintenance building; electrical service building; technical shelter; emergency response office; guard outposts; utilities, fuel pump shed, water tank, portable sewage treatment plant; and fenced open areas for parking and yard. Other associated facilities may include a substation on either side of the bridge, although solar energy is proposed to supply most lighting needs. The project anticipates enlarging the BMMC by another 0.5 hectare at a later date for future maintenance and operation purposes, and establishing a border control point and weigh stations on either side of the BCIB.

[a] T.Y. Lin International/Pyunghwa Engineering Consultants (2021). Bataan-Cavite Interlink Bridge Project. Package 1: Preliminary Engineering Design
[b] T.Y. Lin International/Pyunghwa Engineering Consultants (2021). Bataan-Cavite Interlink Bridge Project. Package 2: Preliminary Engineering Design
[c] T.Y. Lin International/Pyunghwa Engineering Consultants (2022). Bataan-Cavite Interlink Bridge Project. Baseline Design Report: P3 & P4: Marine Viaduct.
[d] T.Y. Lin International/Pyunghwa Engineering Consultants (2022). Bataan-Cavite Interlink Bridge Project. Baseline Design Report: North Channel Bridge.
[e] T.Y. Lin International/Pyunghwa Engineering Consultants (2022). Bataan-Cavite Interlink Bridge Project. Baseline Design Report: South Channel Bridge.

1.3 Objectives

21. The Climate Risk and Adaptation Assessment aims to i) assess the climate and climate change threats to the BCIB, ii) assess the adaptation measures that are proposed in the BCIB design, iii) determine to what extent the performance and design of BCIB is vulnerable to climate change, and iv) recommend measures that will improve the climate resiliency of the project.

1.4 Methodology

22. Preparing this Climate Risk and Adaptation Assessment involves the following steps:[1]

(i) Understand the problem being addressed by the baseline project (the BCIB) including the climate-related challenges.

(ii) Review the current DPWH design criteria and adequacy to future climate change (rainfall, temperature, and wind).

(iii) Understand the BCIB including its evolving nature as it progresses and endeavors to meet challenges and opportunities. This also includes understanding the BCIB's approach to climate risk.

(iv) Determine how climate change may influence the BCIB; and identify gaps, if any, in the BCIB approach to climate risks, and make recommendations.

23. Likewise, the framework and steps must be in accordance with the principles of climate risk management for climate proofing projects in the transport sector.[2] For this assessment, it follows the steps below.[3]

(i) Review, based on literature of the sensitivity of major subproject types to specific climate parameters (i.e., which climate parameters are critical to performance and durability, and in what way are existing assets already being affected by increasing variability and extremes in these parameters under the current climate).

(ii) Using model-based projections, assess how the critical climate parameters are expected to change relative to historical (1986–2005) and future: early future (2016–2035), mid-future (2046–2065), and late future (2086–2100), including levels of confidence based on degree of agreement among the models used.

(iii) Collect sea level data within Manila Bay along with future projections.

(iv) Conduct conditional survey of existing roads to identify deterioration and failures due to weather events.

(v) Conduct small number of key informant interviews or focus group discussions at local project locations to confirm/deny suspected climate patterns to enhance the credibility of the climate data.

[1] Stated in the Climate Change Study proposal.
[2] Relevant ADB publications: i) Climate proofing ADB investment in the transport sector: initial experience, 2014, ii) Information Sources To Support ADB Climate Risk Assessments and Management, 2018, iii) Principles of Climate Risk Management for Climate Proofing Projects, 2020.
[3] Items iii to vi are stated scope of work for Climate Change Study under Package 1.

(vi) Collect additional data on extreme weather event projections, to include tropical cyclones, heat waves, droughts, and wildfires with determinations of implications on the BCIB project.

(vii) Determine and calculate the embedded emissions during construction (i.e., processing and transport of cement, steel, and asphalt) and operation (i.e., lighting, building cooling, and maintenance), for determination of total GHG emissions attributed to the project.

(viii) Identify adaptation measures needed during the detailed engineering design stage.

(ix) Identify gaps in the current design standards viz climate change.

24. The assessment focuses on the climate risk of the project under climate change scenarios (RCP 4.5 and RCP 8.5) as used by the Department of Science and Technology (DOST) - Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) and the KNMI Climate Change Atlas. It does not compare climate risk on a with-project or without-project basis, but rather directly examines the project risks and impacts based on the preliminary engineering designs, location, and other relevant factors.

2. FRAMEWORK FOR CLIMATE CHANGE

2.1 Climate Change Modelling and Emissions Scenarios

25. In 2011, PAGASA released the report, "Climate Change in the Philippines".[4] The main outputs of this report were: a) the observed climate trends using historical data from 1951 to 2010 and climatic normal (1971–2000) as a reference value, and b) the climate projections in 2020 and 2050 in the Philippines using the PRECIS (Providing Regional Climates for Impact Studies) climate model developed by the Hadley Centre of UK Met. Simulation outputs used three Special Report on Emissions Scenarios (SRES) such as A2 (high-range), A1B (mid-range), and B2 (low-range). Further, climate projections for each province in the Philippines were presented in terms of temperature increase and rainfall change by seasons (e.g., DJF or northeast monsoon, MAM or summer season, JJA or southwest monsoon, and SON or transition from southwest to northeast monsoon season).

26. In 2018, PAGASA updated the Climate Change in the Philippines report with its existing set of local climate information using the latest climate models.[5] PAGASA summarized a seasonal

[4] DOST- PAGASA. 2011. *Climate Change in the Philippines*. Philippine Atmospheric, Geophysical and Astronomical Services Administration. Quezon City, Philippines.

[5] PAGASA. 2018. *Observed and Projected Climate Change in the Philippines*. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines.

climate projection data for each province of the Philippines using Representative Concentration Pathways (RCPs) through Department of Science and Technology (DOST) - PAGASA's recently developed Climate Information Risk Analysis Matrix (CLIRAM) with the following scenarios: i) RCP4.5 – moderate level of GHG emissions scenario, and ii) RCP8.5 – high level of GHG emissions scenario. The CLIRAM provides the projected changes in climate variables (particularly for rainfall, mean, minimum and maximum temperature) in both the mid-21st century (2036–2065) or the late-21st century (2070–2099) relative to the 1971–2000 baseline period.

27. Recently, DOST-PAGASA in partnership with the Manila Observatory and the Ateneo de Manila University published the Philippine Climate Extremes Report 2020, introducing the Climate Extreme Risk Assessment Matrix (CERAM), a complimentary risk assessment tool to assist local government units in creating their plans. The report features the results from the "Multitemporal and extremes analysis of modeled climatology over the Philippines in the SEA-CORDEX domain project. This is part of the Analyzing CORDEX-SEA (Coordinated Regional Climate Downscaling Experiment – Southeast Asia) Regional Climate Simulations for Improved Climate Information over the Philippines: SST Influence, Variability and Extremes, Tropical Cyclone Activity" Program.[6] In the report, the downscaled historical and projected daily extremes data were used to calculate the projected changes in 24 climate extremes indices for two Representative Concentration Pathways: RCP4.5 and RCP8.5. Historical simulations for the baseline period (1986–2005) served as the threshold. The multi-model ensemble consisted of 12 models with three regional climate models (RCMs) forced with data from 10 global climate models (GCMs) from the Coupled Model intercomparison Project- Phase 5 (CMIP5) archive. SA-OBS, a daily gridded observational dataset for Southeast Asia based on the Southeast Asian Climate Assessment & Dataset project was used as the historically observed baseline data.

28. The Philippine Climate Extremes Report 2020 also presents information on historical and projected annual climate extremes indices of the country and demonstrates their relevance to sector-specific climate impacts assessment. The report extends the climate projection information released by DOST-PAGASA in 2018 which used the 10th, 50th, and 90th percentile thresholds of temperature and rainfall to describe the average annual and seasonal changes in future climate scenarios. The annual climate extremes indices were used to identify areas and sectors which are most at risk to climate extremes, and thus require rapid disaster risk assessment and climate adaptation planning to minimize current and future impacts.

29. These trends and scenarios, which are further discussed in the succeeding chapters, indicate that the country and the project location will not be spared by the impacts of climate change given its geographical location, archipelagic formation, biophysical characteristics, and population distribution. Additionally, even if GHG emissions are drastically reduced, the magnitude of GHG presence in the atmosphere is irreversible. Stabilizing these GHGs will take time and climate change impacts will continue to be felt for the years to come.

[6] DOST-PAGASA, Manila Observatory and Ateneo de Manila University. 2021. *Philippine Climate Extremes Report 2020: Observed and Projected Climate Extremes in the Philippines to Support Informed Decisions on Climate Change Adaptation and Risk Management.* Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines. 145pp.

2.2 Climate Change Policy in the Philippines

30. In 2009, the Climate Change Act (Republic Act 9729) was enacted creating the Climate Change Commission (CCC) to help mainstream climate change into government policy formulations and establish framework strategies and actions towards adaptation and mitigation. After a year, the National Framework Strategy on Climate Change (NFSCC) was adopted to serve as a reference point to steer national mitigation and adaptation strategies. In line with the NFSCC, the Philippine Strategy on Climate Change Adaptation was prepared to guide the country's climate change adaptation actions.

31. In 2011, the National Climate Change Action Plan (NCCAP) outlined the priority areas for adaptation and mitigation.

32. In 2012, the People's Survival Fund (RA 10174) was passed to finance adaptation programs and projects based on the NFSCC. Important strategy documents include the NFSCC (2010–2022) and the NCCAP (2011–2028), which set out policies related to food and water security, environmental stability, human security, climate smart industries and services, sustainable energy, and knowledge and capacity development.

33. In terms of greenhouse gas (GHG) emissions, the Philippines emits an average of 1.98 metric tons of carbon dioxide equivalent per capita in 2020, or way below the global average of four (4) metric tons per capita. The Philippines commits to a projected GHG emissions reduction and avoidance of 75%, of which 2.71% is unconditional and 72.29% is conditional, representing the country's ambition for GHG mitigation for the period 2020 to 2030 for the sectors of agriculture, wastes, industry, transport, and energy. This commitment is referenced against a projected business-as-usual cumulative economy-wide emission of 3,340.3 $MtCO_2e$ for the same period.[7]

34. The Philippines ratified the Paris Agreement on 23 March 2017 and submitted its Nationally Determined Contributions to the United Nations Framework Convention on Climate Change (UNFCCC) in 2016. The Philippines submitted its Second National Communication to the UNFCCC in 2014, identifying agriculture, water resources, infrastructure, and human health as sectors highly vulnerable to climate change.[8]

2.3 PAGASA Climate Extreme Projection

35. Climate projections are necessary for climate change impact assessment and national planning. In particular, the impacts of climate change on road projects for the coming years are critical. With this, the project utilized the recent Philippine Climate Extremes Report 2020 published by DOST-PAGASA in partnership with Manila Observatory and the Ateneo de Manila University.

36. In the PAGASA 2021 report, the downscaled historical and projected daily extremes data were used to calculate the projected changes in 24 climate extremes indices for two Representative

[7] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Philippines%20First/Philippines%20-%20NDC.pdf
[8] Based on the Climate Risk Country Profile: Philippines

Concentration Pathways: RCP4.5 and RCP8.5. The annual extremes are averaged over the 20-year time periods to come up with the climatological extreme. The observed data is based on the SA-OBS gridded data for 1986–2005 while the projected changes are based on the ensemble median of the 12 models. The projections from two scenarios, RCP4.5 and RCP8.5, are provided for three time periods: early future (2020–2039), mid-future (2046–2065) and late future (2080–2099).

37. Based on DOST-PAGASA, climate extreme indices provide additional information that can describe the magnitude, frequency, and duration of extremes, which could help in the assessment of possible adaptation options. Extreme indices are grouped by variable (rainfall and temperature) and by attribute (magnitude, frequency, and duration).

2.4 Global Climate Extreme Projection

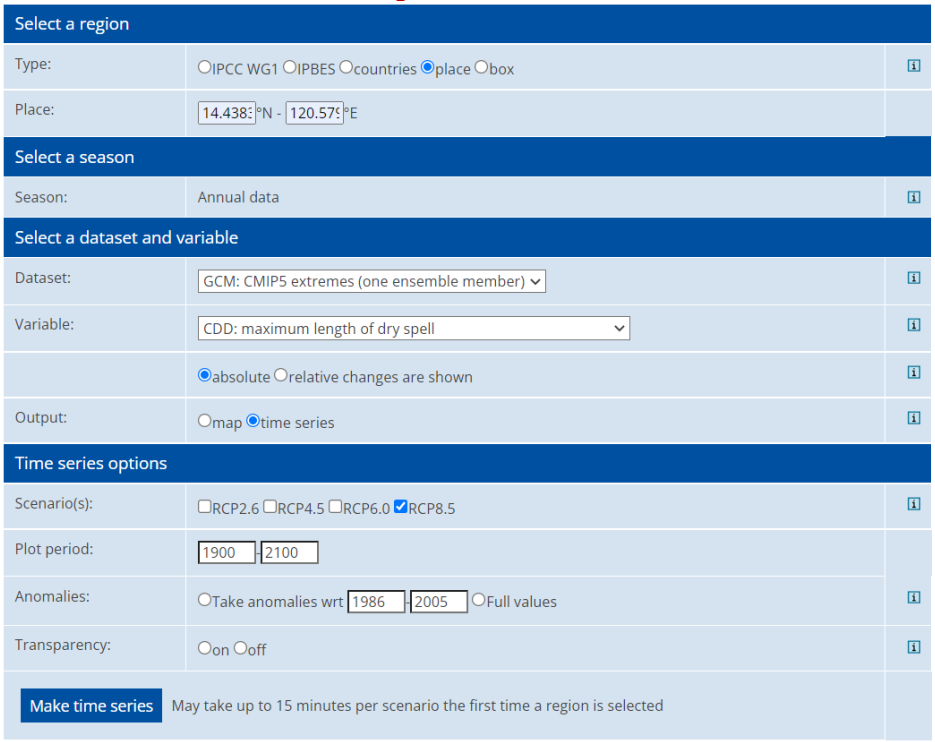
38. It is worthy to note that the use of projected average climate extremes published by PAGASA provides a good set of data to describe the general trajectories of rainfall but not to assess the adequacy of engineering designs that are generally based on climate extremes. In this assessment, extreme rainfall and temperature data were downloaded from the KNMI Climate Explorer, which provides 25 CMIP5 climate model results for the project.[9] The projected climate change was assessed based on the representative concentration pathways (RCP) 8.5 representing the high emission scenario.

39. The main objective is to comply with the DPWH standards of design flood frequency of 50 years. However, the assessment can achieve this objective by recognizing increased rainfall, typhoon, and flooding in the project area. A historical 1-day annual maximum daily rainfall (Rx1day) was adopted in the project. The level of precaution in the climate projection was set at 90.0 percentile and a stress test level of 97.5%.

40. Rx1day series (1900–2100) for the project area were downloaded from the KNMI Climate Change Atlas for CMIP5 extremes ensemble under RCP8.5 with the setup illustrated in Exhibit 2-1. The climate model outputs are separated for 1850–2005 and 2006–2100. Individual model results are provided in each subfolder for the specified RCP8.5 scenario. For the project site, 23 CMIP5 climate models are available and used in the assessment.

[9] The KNMI Climate Explorer is a tool to investigate the climate. http://climexp.knmi.nl/plot_atlas_form.py

Exhibit 2-1: KNMI Climate Change Atlas



2.5 Institutional Framework for Climate Change

41. Climate change risk assessment for road and bridge projects has not been much referred to in drawing up Philippine regulations and strategy. Currently, there are more requirements for projects to review climate change risk. Some of these are outlined below:

(i) Presidential Decree 1586 – Philippine Environmental Impact Statement System (PEISS) requires all agencies and instrumentalities of the national government, government- owned or controlled corporations, as well as private corporations, firms, and entities to conduct an environmental impact assessment for every proposed project and undertaking which significantly affects the quality of the environment. The PEISS requires the identification of direct and indirect impacts of a project on the biophysical and human environment and the development of appropriate environmental protection and enhancement measures to address adverse impacts and risks.

(ii) Republic Act No. 10121 (RA 10121), also known as the Philippine Disaster Risk Reduction and Management Act of 2010, to deal specifically with disaster risks.

(iii) The People's Survival Fund (RA 10174) was passed to finance adaptation programs and projects based on the NFSCC.

(iv) National Framework Strategy on Climate Change (2010–2022) and the National Climate Change Action Plan (2011–2028), which set out policies related to food and

water security, environmental stability, human security, climate smart industries and services, sustainable energy, and knowledge and capacity development.

(v) Philippine Green Building Code, which aims to improve efficiency of building performance through a framework of standards that will enhance source environmental and resource management through efficient use of resources, site selection, planning, design, construction, use, occupancy, operation, and maintenance.

(vi) Republic Act 8749 – Philippine Clean Air Act of 1999, which aims to achieve and maintain healthy air for the people. It addresses air pollution coming from stationary sources such as fuel burning equipment and industrial plant; mobile sources such as motor vehicles; and other potential sources of air pollutants; and includes certain limits/standards and its corresponding penalties.

(vii) Republic Act 9275 – Philippine Clean Water Act of 2004, which provides the comprehensive water pollution policy and applies quality management in all water bodies in the Philippines. It aims to protect the country's water bodies from pollution from land-based sources (industries and commercial establishments, agriculture and community/household activities) and covers all water bodies such as fresh, brackish, and saline waters, and includes but not limited to aquifers, groundwater, springs, creeks, streams, rivers, ponds, lagoons, water reservoirs, lakes, bays, estuarine, coastal, and marine waters.

42. The highway designs and standards are considered when undertaking climate change risk assessment for transport projects. For the BCIB project, the primary design guidance is found in the Design Guidelines, Criteria and Standards (DGCS) Volumes 3, 4 and 5 (DPWH 2015), DGCS - DPWH Volume 2A, Geohazard Assessment 2015, American Association of State, Highways and Transportation Officials (AASHTO) (2020), National Structural Code of the Philippines 2015, and Highway Safety Design Standards (HSDS) of DPWH (2012).[10]

43. Various DPWH Departmental Orders (DO) have also been adopted as basis of design where relevant. Applicable DOs, but not limited to, are shown below:

Exhibit 2-2: DPWH Department Orders as it Relates to Climate Change

Department Orders	Title	Anticipated Climate Change Parameters
DO No. 88 s. 2020	Guidelines on the Design of Bicycle Facilities Along National Roads	GHG reductions, Change in temperature
DO No. 21 s. 2019	Amendment to the Guidelines on Price Adjustment on Payments for Projects with Non-Compliance with the Prescribed IRI Value	Rainfall, Temperature
DO No. 35 s. 2018	Revision on the Adoption of the DPWH Standard Specifications for Highways, Bridges and Airports, Volume II; for Public Works Structures, Volume III; Special Items of Work (SPLs) in DPWH Projects	Rainfall, Temperature

[10] Design standards and references are listed in the preliminary detailed designs report of each package for the BCIB project.

Department Orders	Title	Anticipated Climate Change Parameters
	and Revised Standard Pay Item List for Infrastructure Projects	
DO No. 116 s. 2018	Environmental Impact Assessment (EIA) for DPWH Projects and Tree Cutting Permit Application	GHG emissions, Change in temperature
DO No.166 s. 2016	Navigational Clearance for Bridges over Navigable Waterways	Water level, Flooding, Storm frequency
DO No. 53 s. 2016	Minimum Vertical Clearance Above the Roadway for Railway, Flyover, Bridge, and Footbridge Structures along and Crossing National Highways	Water level, Flooding, Rainfall intensity
DO No. 45 s. 2016	Bridge Seismic Design Specifications (BSDS), 1st Edition, 2013 with 2018 interim revisions	Typhoon, Surge
DO No. 41 s. 2016	Amended Policy Guidelines on the Maintenance of Roads and Bridges	Rainfall, Temperature
DO No. 32 s. 2016	Guidelines on the Use of Dowel Bars in Portland Cement Concrete Pavement	Increase in temperature
DO No. 8 s. 2016	Adopting Uniform Transition Joints on High Type Pavement Surfacing Along National Roads and Local Street	Change in temperature, Storm frequency
DO No. 135 s. 2015	Strict Compliance to Road Works Safety and Traffic Management and Construction Safety and Health Requirements during Construction and Maintenance of Roads and Bridges	Rainfall, Temperature
DO No. 90 s. 2015	Revised Guidelines on the Installation of Road Right-of- Way (RROW) Boundary Marker, Kilometer Post, and Street Name along National Highways on Rural and Urban Areas	Wind, Typhoon frequency
DO No. 47 s. 2015	Adoption of International Roughness Index Values for all National Primary Roads	Increase in temperature
DO No. 94 s. 2014	Technical Manuals and Guidelines on Road and Bridge Maintenance and Inspection	Water level and discharge, Rainfall
DO No. 40 s. 2014	Prescribing Minimum Design Standard for Portland Cement Concrete Pavement (PCCP) in Arterial and Secondary National Roads and Access Roads Leading to Ports	Change in temperature, Increase in precipitation, Storm frequency
DO No. 68 s. 2012	Prescribing Guidelines on the Design of Slope Protection Works	Landslide, Storm frequency
DO No. 41 s. 2012	Adoption of the Revised Manual on DPWH Highway Safety Design Standards, May 2012 Edition	Flooding, Storm frequency
DO No. 40 s. 2012	Guidelines on Shoulder Paving along National Roads	Flooding, Increase in Rainfall
DO No. 22 s. 2011	Minimum Pavement of Thickness and Width of National Roads	Storm frequency, Rainfall, Temperature
DO No. 245 s. 2003	An Act to Social and Environmental Management Systems 2016	Rainfall, Temperature, Wind speed, Water level,

3. CLIMATE RISK SCREENING AND ASSESSMENT

3.1 Climate Risk Screening

44. The BCIB project is classified as a 'Category A' project based on the ADB Environmental Safeguards Categories.[11] Category A projects are those that are likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. Category A projects are those whose impacts may extend beyond the boundaries of the project or those of the project facilities.

45. Based on ADB climate risk screening checklists, the project climate risk classification is high, which means that it is extremely sensitive to climate impacts. A more detailed climate risk screening was prepared by ADB using AWARE for Investment that complements the information provided in the REA. Two sets of AWARE screening reports (AWARE BATAAN and AWARE CAVITE) were utilized for CRA report of the project.[12]

46. The exposure to climate hazards of the project locations is also high.[13] The project location has a high risk for precipitation increase, flood, sea level rise, landslide, wind speed increase, and onshore category storms and a medium risk for precipitation decrease. The study also identified drought and wildfires are climate risks but had minimal effect on the project design. A risk spider chart for Bataan, which is the same as Cavite, supports the high climate risk categorization of the project (Exhibit 3-1).

47. The potential impacts of climate hazards on the project's physical infrastructure and assets as currently designed is high. Climate hazards have the potential to significantly impact the structural integrity, materials, siting, longevity, and overall effectiveness of the investments.

3.2 Climate Risk Assessment

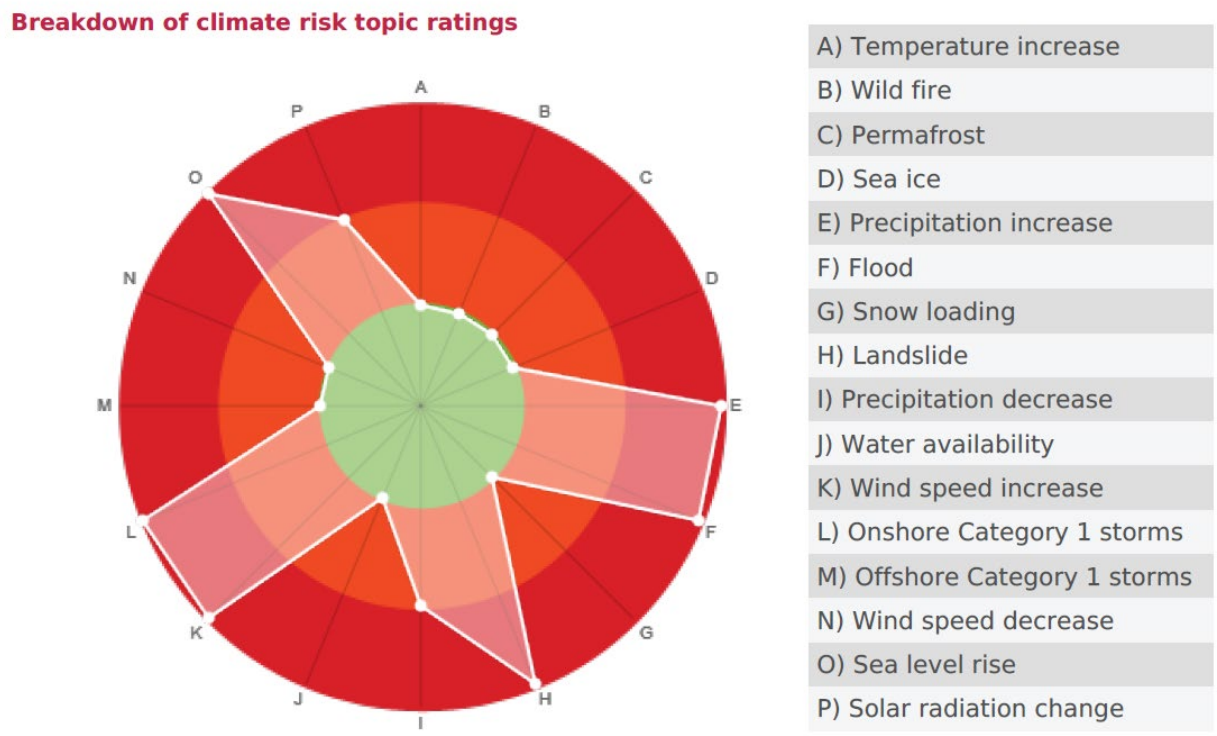
48. Climate model projections agree to the increasing temperature, high intensity and frequency of heavy rainfalls, increased frequency of typhoons, sea level rise and storm surge in the project locations. The annual rainfall will likely decrease, but Rx1day will increase its magnitude. Also, climate change is projected to influence the anomaly of sea level rise. Engineering designs and specifications need to take into consideration the impact of climate change on the risks to the project.

[11] The environment categorization was made in conformance with ADB Safeguard Policy Statement 2009 during the environment impact assessment preparation for the BCIB project.

[12] AWARE for Bataan and Cavite projects created, and report generated by Carlito Mendoza Rufo, Jr., Asian Development Bank. February 05, 2022.

[13] Climate and Disaster Risk Screening Report for Bataan-Cavite Interlink Bridge Project.

Exhibit 3-1: The Project Climate Risk Ratings



49. The transport sector particularly bridges is vulnerable to changes in climate variables, expected changes in the frequency and intensity of extreme weather events, and increased sea level. IPCC's AR5 describes that climate change may negatively affect roads and bridges infrastructure in a variety of ways, including the following:[14]

(i) Changes in temperature – both gradual increase in temperature and an increase in extreme temperatures are likely to impact bridge deck material (for example, heat-induced heaving and buckling of joints).

(ii) Changes in sea water levels will impact bridge foundations and structures.

(iii) Extreme weather events such as stronger and/or more frequent storms will affect the capacity of drainage and overflow systems to deal with stronger or faster velocity of water flows.

(iv) Increased wind loads and storm strengths will impact long-span bridges, especially suspension and cable-stayed bridges.

(v) Increased storm surges will significantly impact all components of the coastal transportation infrastructure.

[14] Climate Proofing ADB Investment in the Transport Sector

(vi) Increased salinity levels will reduce the structural strength of pavements and lead to precipitated rusting of the reinforcement in concrete structures.

50. Based on the design standards adopted for the BCIB project detailed designs, the road and bridge design criteria are robust to meet the context of the Manila Bay geotechnical conditions, large expanse of the crossing and secure against the potential for vessel collision, and therefore additional measures for climate change mitigation and adaptation are not necessary.

3.3 Sensitivity of Project Components to Climate/Weather Conditions and Sea Level

51. The project components are likely to be exposed to climate conditions such as precipitation increase, changes in temperature, flood, landslide, wind speed increase, sea level rise, and onshore category 1 storms and medium risk for precipitation decrease. The key components of the project have been reviewed for the potential to be affected by climatic conditions during construction and the project lifetime as shown in Exhibit 3-2.

Exhibit 3-2: Project Components and their Sensitivity to Climate Conditions

Project Components	Sensitivity to Climate Conditions
Navigation bridges – The main structure that provides the necessary navigation clearance for safe operation of shipping at the project site.	Sea Level Rise. Climate change is expected to contribute to more rapid sea level rise. It will impact the horizontal and vertical navigational clearances over navigable waters. Storm Surge and Waves. Storm surge is caused by strong winds and pressures, which lead to a rise in water surge. Storm surge during powerful storms or hurricanes can reach over 20 feet (6 m) in elevation and can cause significant damage to bridges.[15] Additionally, waves are more powerful and have higher arches, which can cause considerable damage to bridges. Since most infrastructure design is based on historical data and experience, the asset design is not always capable of withstanding such impacts. Wind Speed Increase. Increased storm surges will significantly impact all the components. Increased wind loads and storm strengths will impact roadside street lightings, traffic barriers, and cable-stayed bridge structures. Tropical Storms/Typhoon. Bridges may encounter stronger and more powerful storm surges and waves causing direct physical damage. Increase in Temperature. Both a gradual increase in temperature and extreme temperature - are likely to impact bridge pavements. Bridges are subject to many modes of heat transfer and variation in the average daily temperature can cause bridges to extend or shorten.
Marine viaducts – The typical viaduct structures which will be constructed above sea water with varying column heights and water depths. Constant span	The sensitivity to climate conditions of the navigational bridge has similar impacts to the marine viaducts. However, marine viaducts are also sensitive to the following:

[15] NOOA, National Hurricane Center: Storm Surge overview. Retrieved from http://www.nhc.noaa.gov/surge/ on September 9, 2015.

Project Components	Sensitivity to Climate Conditions
arrangement is adopted to have standardized construction methodologies and minimize the duration of the construction program.	Sea Water Levels. It will impact bridge foundations and structures and navigation span for small vessels sailing near the shore. Coastal Scouring. Extensive damage associated with scour can cause a bridge to collapse. Scour causes stabilizing material to move away from the bridge substructure, causing instability of the bridge's foundation.
Interchanges and viaducts on land – These are the viaduct structures which will be constructed on land and provide the connection to the existing road networks.	Increase Precipitation. Heavy rainfall may affect the optimal number of bridges and culverts and bridge and culvert design adequacy. Increased frequency of heavier short duration rainfalls is expected to cause more frequent and severe flash floods. Higher flow rates can create erosion and carry debris (large boulders and trees) that can create dams behind bridges or directly impact the footings of the bridge and cause it to collapse. River Scouring. Extensive damage associated with scour can cause a bridge to collapse. Scour causes stabilizing material to move away from the bridge substructure, causing instability of the bridge's foundation. Landside. Heavy rainfall may also affect soil saturation which can cause landslides along with the sloping areas of the project sites. Tropical Storms/Typhoon. Extreme weather events, such as stronger and/or more frequent storms, will affect the capacity of drainage and overflow systems to deal with stronger or faster velocity of water flows. Increased flooding events may adversely affect the road and waterway bridge infrastructure if not designed adequately. Wind Speed Increase. Increased wind loads and storm strengths will impact roadside street lightings, traffic barriers and tree landscapes.

4. DESCRIPTION OF ENVIRONMENT AND CLIMATE

4.1 Local Climate (Baseline)

52. This section describes the climatic characteristics based on records from two different weather stations near the project location. First is the Sangley Point station in Cavite located at the southern side with geographic coordinates of 14°29'29.23" north latitude and 121°53'54.90" east longitude, and about 20 km away from Cavite interchange station. Second is the Cubi Point station on the northern side at the coordinates of 14°47'30.43" north latitude and 121°16'15.24" east longitude and approximately 45 km away from the Bataan interchange project.

53. Aside from two (2) stations datasets, the baseline climate conditions of the project areas at the provincial scale are taken following the latest Philippine Climate Extreme Report.

54. In terms of climate classification, the prevailing winds and topography constitute the major climatic controls that forge the climate in the area (Exhibit 4-1). The provinces of Bataan and Cavite, including Corregidor Island, are under Type I climate based on Modified Corona's Classification. This climate type is characterized by two pronounced seasons, wet and dry. It is relatively dry from November to April and wet during the rest of the year. These two provinces are influenced by the southwest monsoon (*habagat*) that is generally enhanced by passing typhoons or tropical depressions. The northeast monsoon (*Amihan*) occurs from October to April due to the Philippines' geographical location. It is also a perennial path of typhoons crossing the Philippine archipelago.

4.1.1 Rainfall

55. The average rainfall from the PAGASA daily data indicates that the total monthly rainfall is constantly low during the first quarter of the year, then escalates from May, reaching its highest value in August, then declines until December. The highest average monthly rainfall reached 492 mm at Sangley Point and 837 mm at Cubi Point, both in August, while the lowest recorded was 15 mm at Sangley Point in March and 4 mm at Cubi Point in February (Exhibit 4-2). This is similar to the recorded climatological normal in 1981–2010, where trends consistently follow the Type I climate category description.

56. The total average rainfall based on 1991–2020 records was about 2,100 mm, with an annual average number of 130 rainy days at Sangley Point. The total average rainfall recorded (1994–2020) at Cubi Point was about 3,400 mm with an annual average number of rainy days of 125. The highest annual rainfall at Sangley Point was recorded in 2013 with 3,562 mm. The daily maximum total was 475 mm on 19 August 2013. At Cubi Point, the highest recorded was in 2011 with 5,463 mm rainfall while the daily maximum total was 432 mm on 5 July 2016.

4.1.2 Temperature

57. The temperature recorded from Sangley Point and Cubi Point has the lowest value in December then increases from January to May (Exhibit 4-3). Sangley Point recorded an annual temperature that ranges from 26.67 °C to 27.9 °C, with the highest temperature in 1998 and the lowest temperature in 1999. During the same period, Cubi Point recorded an annual temperature range of 27.69 °C to 28.55 °C, with the highest temperature in 2020 and the lowest in 1993 (Exhibit 4-4). The difference between the highest and lowest temperatures over last 30 years is 1.23 °C (Cavite) and 0.89 °C (Zambales).

Exhibit 4-1: Climate Map of Luzon, Philippines

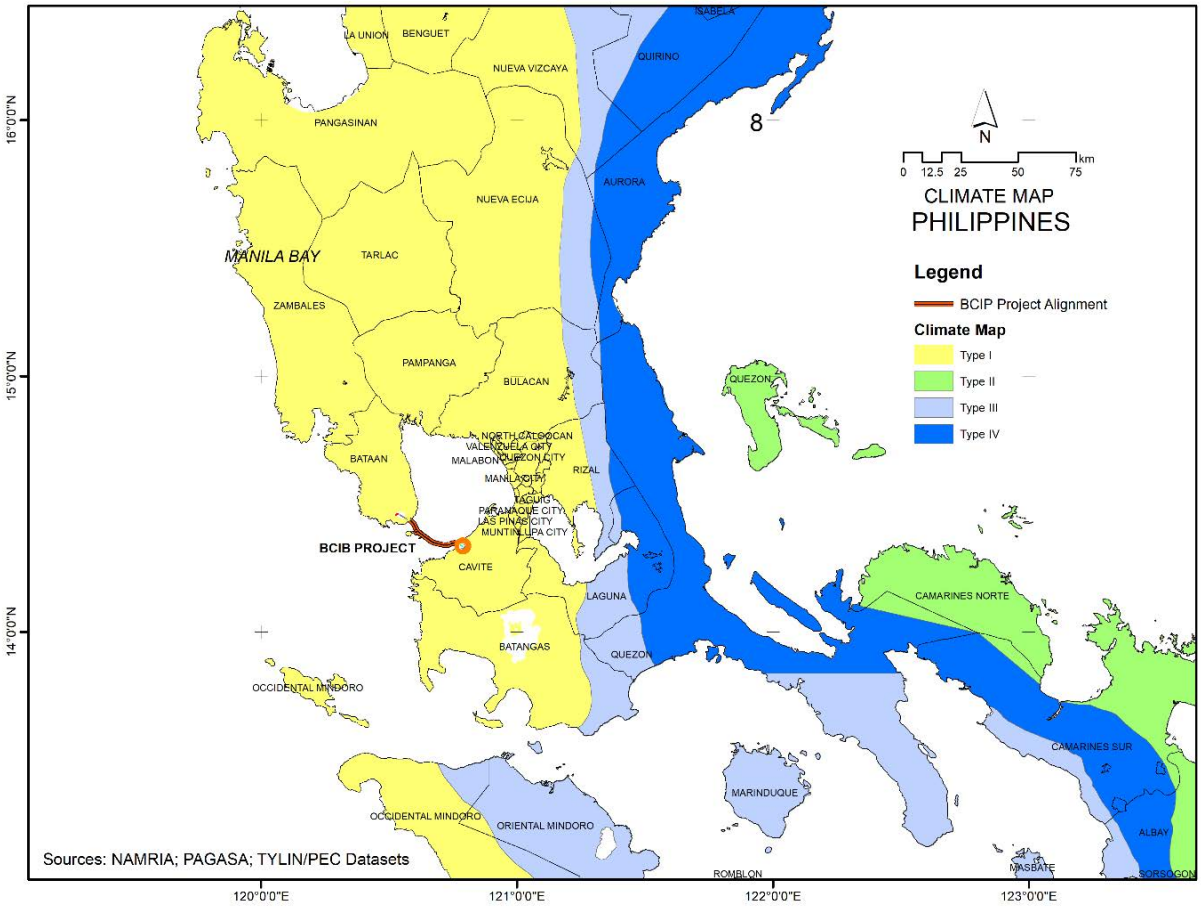
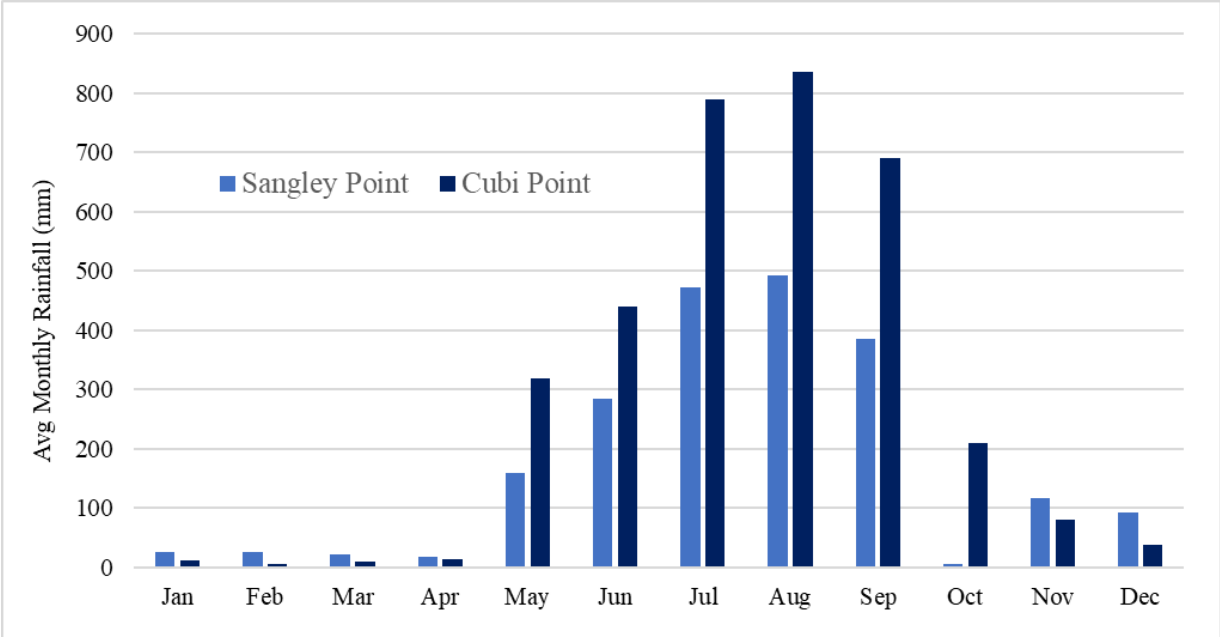
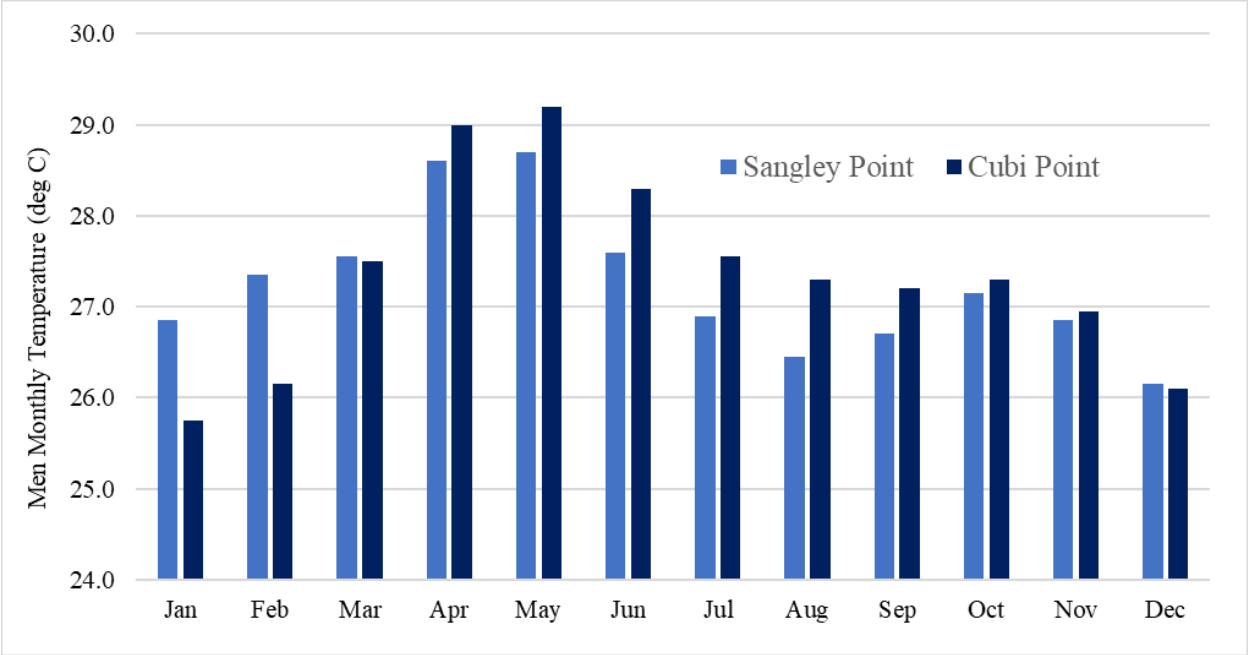


Exhibit 4-2: Average Monthly Rainfall for the Last 30 Years (1991–2020) in the Project Areas



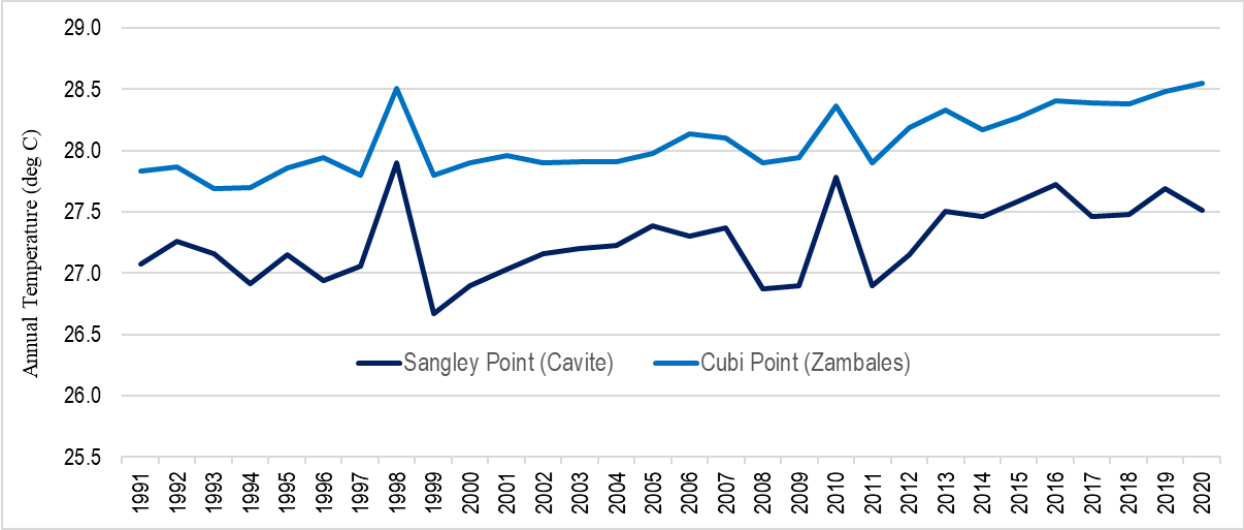
Note: Interpolated based on DOST-PAGASA datasets (1991-2020)

Exhibit 4-3: Monthly Mean Temperature for the Last 30 Years in the Project Areas



Note: Interpolated based on DOST-PAGASA datasets (1991-2020)

Exhibit 4-4: Annual Mean Temperature Over the Last 30 Years in the Project Areas



4.1.3 Wind Regime

58. A wind rose analysis is included to describe the prevailing wind in the project areas based on wind speed and direction from the PAGASA weather stations. From October to April, ESE winds dominate the region and shift from the westerly direction from May to September. Average wind speed during *Amihan* ranges from 3.1m/s–3.5m/s and during *Habagat*, 2.8 m/s – 3.1 m/s.

According to the Beaufort Wind Force Scale, this wind intensity is described as light (Exhibit 4-5 and 4-6).

Exhibit 4-5: Windspeed and Direction during *Amihan* Season

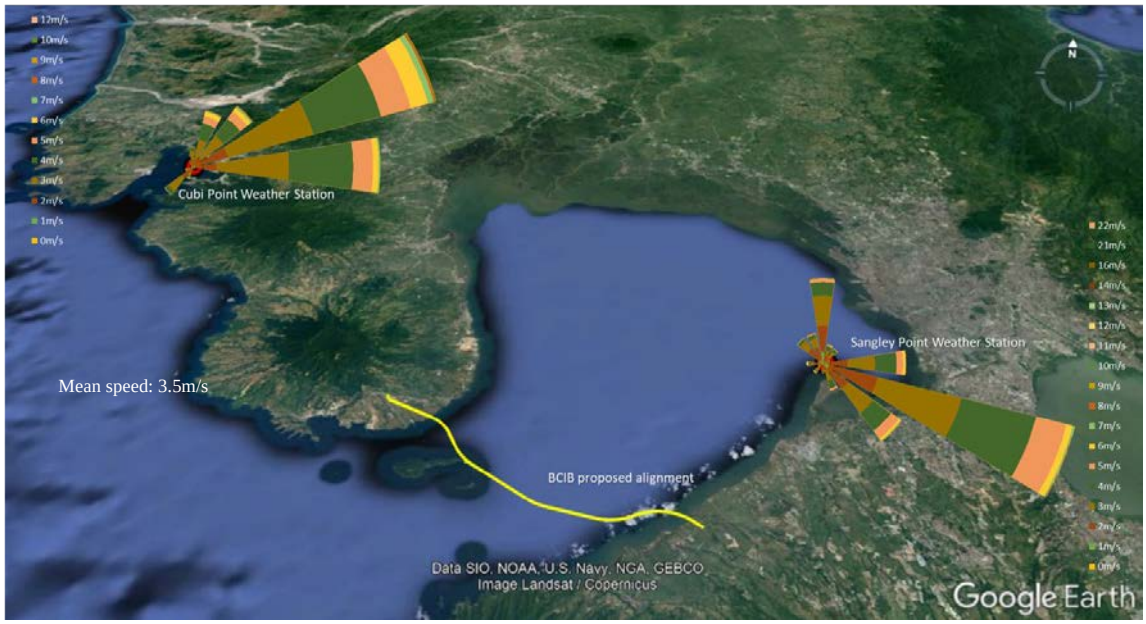


Exhibit 4-6: Windspeed and Direction during *Habagat* Season

4.1.4 Magnitude of Extreme Events

59. The climatological extreme values of the monthly and annual summaries of temperature, rainfall, and wind speed influencing the project locations are presented in Exhibits 4-7 and 4-8. In

Sangley Point station in Cavite, the recorded annual extreme high and low temperatures (1974–2020) were 38.5 °C on 16 May 1987 and 18.0 °C on 01 February 1982, respectively. The most significant daily rainfall recorded was 475 mm on 19 August 2013. The strongest wind recorded was on 13 July 2010 at 54 m/s blowing at an easterly direction.

60. In Cubi Point station in Zambales, the recorded annual extreme high and low temperatures (1994 – 2020) were 39.2 °C on 15 April 2018 and 17.3 °C on 03 February 2020, respectively. The most significant daily rainfall recorded was 436 mm on 22 July 2018. The strongest wind was recorded on 03 November 1995 at 40 m/s towards the east-north-east direction.

61. Comparing the baseline magnitude of rainfall and temperature extremes for Cavite and Bataan, the recorded and observed (baseline) values are not distinct. It must be noted that the baseline datasets only cover the period from 1986 to 2005, and it was the average of the 20-year observation. Extreme rainfall events from Sangley Point in Cavite (475 mm) and Cubi Point in Zambales (436 mm) stations were recorded in 2013 and 2018, respectively, beyond the baseline period. It was recorded on a single-day rainfall event and reached as much as 480 mm over the project areas (Exhibit 4-9).

62. The magnitude of extreme temperatures (low and high) was recorded later than the baseline period. Other details are presented in Exhibit 4-10.

4.1.5 Cyclone Frequency and Magnitude

63. The most number of cyclones occur from June to December. These tropical cyclones are associated with the occurrence of low-pressure areas typically originating over the North-Western Pacific Ocean side of the Philippine Area of Responsibility (PAR) and generally moving northwestward. Tropical cyclones also develop in the West Philippines Sea. These cyclones have unusual motions and are rare, with just 32 occurrences in more than 70 years. PAGASA categorizes cyclones based on their sustained winds as i) tropical depressions (TD) with wind speeds of up to 61 kph or less; ii) tropical storm (TS) with wind speeds of 62 – 88 kph, iii) severe tropical storm (STS) with a wind speed of 89 – 117 kph, iv) tropical typhoon (TY) with wind speeds of over 118–220 kph, and v) super typhoon with a wind speed of more than 220 kph.

64. With a medium to high risk, Bataan and Cavite are hit by one typhoon per year (Exhibit 5-11). In 2020, for instance, the project areas were among those that were affected by Super Typhoon *Rolly*[16] or Goni (international name) that occurred in the PAR on 29 October 29–01 November 2020. Super typhoon *Rolly* had sustained winds of more than 220 km/h. It made its first landfall over Bato, Catanduanes, and second landfall in Tiwi, Albay. It weakened into a typhoon and made its third landfall in San Narciso, Quezon, and fourth landfall in Lobo, Batangas on 01 November 2020. It eventually continued to weaken and became a tropical storm. Before leaving the Philippine Area of Responsibility, Super Typhoon *Rolly* also left damage in Southern Luzon and the south of Metro Manila. In particular, 2,030,130 persons from regions 1–3, CALABARZON, MIMAROPA, Region V, Region VIII, CAR, and NCR were affected by Super Typhoon *Rolly*. There were 25 dead, 399 injured, and six missing. A total of 170,773 houses were damaged. The total cost of damage in infrastructure amounted to about Php 13 Billion and Php 5 Billion in agriculture. The

[16] Typhoon Rolly is the most powerful storm recorded worldwide in 2020 and intensified into a super typhoon.

super typhoon caused various incidents/situations, namely: 23 flooded areas, two landslide/soil collapses, one maritime incident, seven places with uprooted trees/fallen posts and one lahar flow.[17]

65. In November–December 2019, typhoon *Kammuri*, with local name *Tisoy*, hit Central Luzon and Bataan with maximum sustained winds of 150 kph and gustiness of up to 185 kph which caused moderate wind damage all over these provinces. Still another strong typhoon was *Rammasun* (local name typhoon *Glenda*), which hit the country in 2014. Its winds peaked at 120 kph and gustiness at 165 kph and caused widespread flooding due to heavy downpours.

66. On 8 September 2021, Severe Tropical Storm *Jolina* made another landfall in San Juan, Batangas. Despite interaction with land in South Luzon, the system maintained strength while traversing CALABARZON region. It then weakened as its low-level circulation center became disorganized over Manila Bay, with the PAGASA downgrading it into a tropical storm. Tropical Storm Jolina made its last landfall in the Philippines in Mariveles, Bataan, at 17:00 PHT, with winds at 120 km/h (75 mph).

67. From 1948 to 2020 (more than 70 years), PAGASA recorded an annual average of 20 tropical cyclones in the PAR, with nine passing through Philippine landmasses. For instance, PAGASA tracked 27 tropical cyclones that crossed Bataan while 26 tropical cyclones crossed the Province of Cavite from 1948–2020 as shown in Exhibits 4-12 and 4-13. The months from September to October see many tropical cyclones traversing the project location (Exhibit 5-14).

68. Thirteen typhoons, or about 48% of tropical cyclones and 11 tropical storms are recorded to have crossed Bataan from 1948 to 2020. Likewise, 11 typhoons, or about 42% of tropical cyclones and 12 tropical storms were recorded to have crossed the province of Cavite. The pattern shows no indication of an increase in the frequency, but a slight increase in the number of tropical cyclones with maximum sustained winds of greater than 150 kph and above (typhoon category) are observed to occur during El Nino years. Other details are shown in Exhibit 4-15.

Exhibit 4-7: Climatological Extremes Recorded (1974 -2020) at Sangley Point Station in Cavite Province

Month	Temperature (°c)				Greatest daily rainfall (mm)		Strongest winds (mps)		
	High	Date	Low	Date	Amount	Date	Spd	Dir	Date
Jan	34.8	01-25-1999	19.0	01-03-1982	94.0	01-12-1977	17	ESE	01-19-2010
Feb	35.2	02-28-1998	18.0	02-01-1982	45.8	02-06-2016	15	ESE	02-27-1992
Mar	36.6	03-29-1981	19.1	03-25-1980	102.2	03-21-2018	24	ESE	03-23-1998
Apr	37.8	04-07-1983	21.5	04-03-2007	53.9	04-24-1975	16	ESE	04-05-1996
May	38.5	05-16-1987	22.0	05-15-1980	237.1	05-26-1997	27	SW	05-22-1976
June	38.4	06-04-1987	22.0	06-16-1981	172.4	06-27-1985	25	SE	06-08-2011
July	36.3	07-25-2007	21.2	07-15-1982	231.4	07-20-2002	54	E	07-13-2010
Aug	36.5	08-16-2009	22.0	08-02-1994	475.4	08-19-2013	30	W	08-18-1990
Sep	35.6 35.6	09-02-1996 09-11-2020	21.0	09-16-1979	275.4	09-22-2013	44	NNW	09-28-2006
Oct	35.8	10-08-1996	21.0	10-24-1988	260.7	10-05-1986	45	NW	10-21-1994
Nov	36.4	11-08-1978	21.5	11-26-1982	171.2	11-02-2000	49	NW	11-03-1995
Dec	34.0	12-06-1998	20.0	12-24-1985	131.3	12-10-2006	22	NNW	12-05-1993
Annual	38.5	05-16-1987	18.0	02-01-1982	475.4	08-19-2013	54	E	07-13-2010

[17] Dela Cruz Santos (2021). 2020 tropical cyclones in the Philippines: A review. p.193.

Source: PAGASA-DOST

Exhibit 4-8: Climatological Extremes Recorded (1994 – 2020) at Cubi Point Station in Zambales

Month	Temperature (°C)				Greatest Daily Rainfall (mm)		Strongest Winds (m/s)		
	High	Date	Low	Date	Amount	Date	Spd	Dir	Date
Jan	35.2	01-31-2007	17.5	01-25-2014	14.8	01-07-2006	25	ENE	01-05-2020
Feb	38.0	02-20-1998	17.3	02-03-2020	13.0	02-06-2008	21	NE	02-13-2018
Mar	36.8	03-28-2014	19.4	03-02-2019	46.0	03-02-2013	19	ENE	03-17-2011
Apr	39.2	04-15-2018	21.5	04-27-1997	25.0	04-25-2014	17	ENE	04-02-2017
May	38.9	05-04-2016	21.5	05-05-1997	314.5	05-26-1997	27	WSW	05-27-2003
June	38.2	06-04-2013	19.0	06-04-1995	230.0	06-06-2004	28	SW	06-24-2011
July	36.2	07-03-1995	20.0	07-31-2007	436.4	07-22-2018	29	ENE	07-16-2014
Aug	36.3	08-17-2017	21.4	08-28-2008	293.0	08-07-2012	25	SW	08-18-1997
Sep	35.7	09-28-2010	21.0	09-02-1996	401.2	09-27-2011	34	WSW	09-27-2011
Oct	35.3	10-07-2010	20.6	10-01-2012	175.6	10-23-1998	30	SW	10-23-1998
Nov	34.7	11-01-2011	20.5	11-09-2016	121.4	11-03-2000	40	ENE	11-03-1995
Dec	34.5	12-25-2016	18.5	12-26-1996	114.0	12-15-2015	20	E	12-28-2012
Annual	39.2	04-15-2018	17.3	02-03-2020	436.4	07-22-2018	40	ENE	11-03-1995

Source: PAGASA-DOST

Exhibit 4-9: Comparison of the Greatest Daily Rainfall Between Weather Station Values and the Baseline (Observed)

Location	Rainfall (mm)	Date
Synoptic Stations		
Sangley Point, Cavite	475.4	08-19-2013
Cubi Point, Zambales	436.0	07-22-2018
Bataan, Baseline (Observed)[a]		
Maximum 1-day total	133.1	1986-2005
Maximum 5-day total	360.6	1986-2005
Total rainfall from extremely wet days	206.5	1986-2005
Cavite, Baseline (Observed)[a]		
Maximum 1-day total	116.4	1986-2005
Maximum 5-day total	243.2	1986-2005
Total rainfall from extremely wet days	162.0	1986-2005

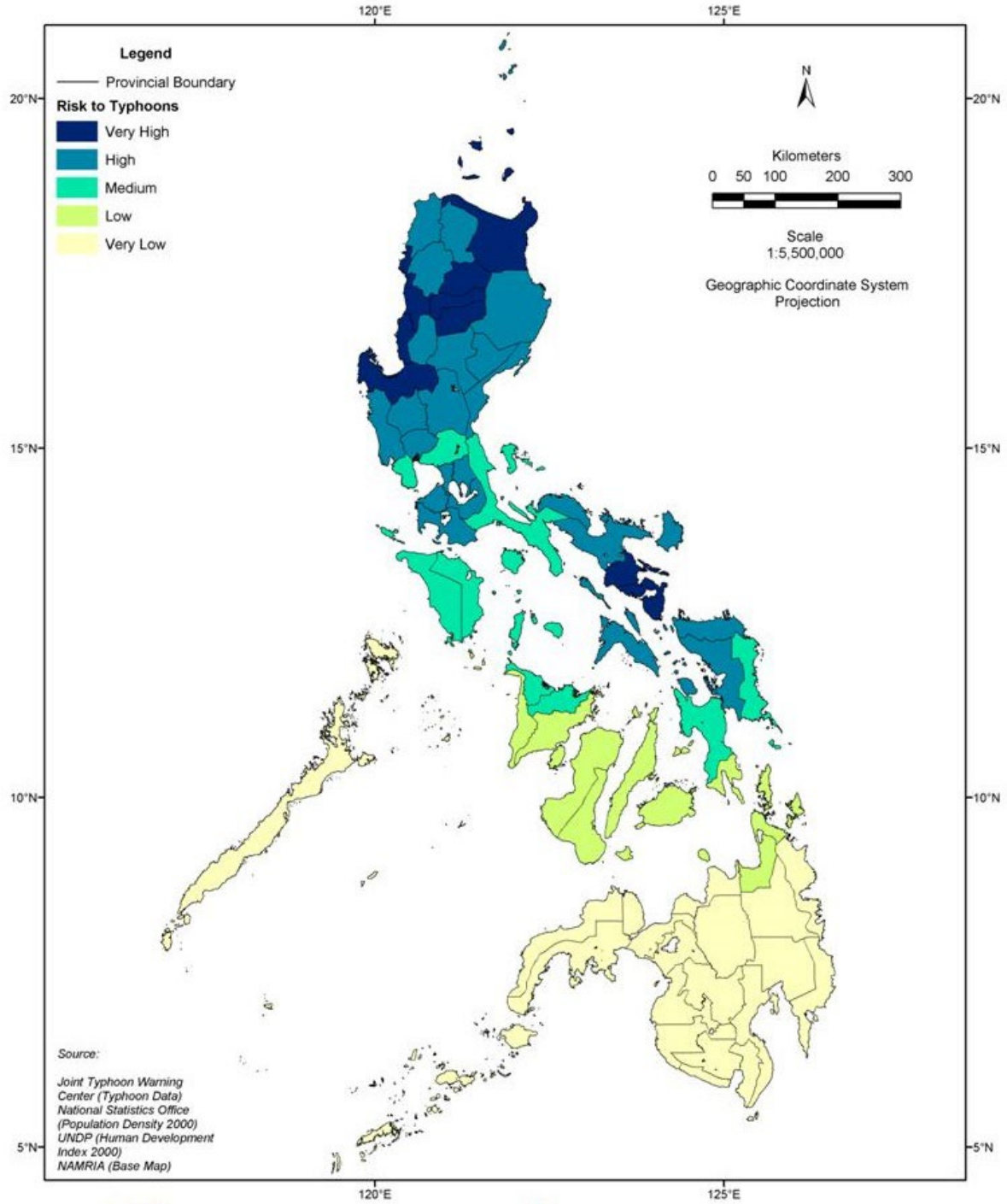
[a] Source: Philippine Climate Extremes Report 2020

Exhibit 4-10: Comparison Between the Recorded Temperature Extremes in the Weather Stations and the Baseline (Observed)

Temperature Extremes	Weather Station		Baseline[a]	
	Sangley Point, Cavite	Cubi Point, Zambales	Bataan	Cavite
Temperature (low)/ Coldest night time temperature (TNn), °C	18.0	17.3	17.2	17.5
Temperature (high)/ Warmest day time temperature (TXx), °C	38.5	39.2	35.7	35.5

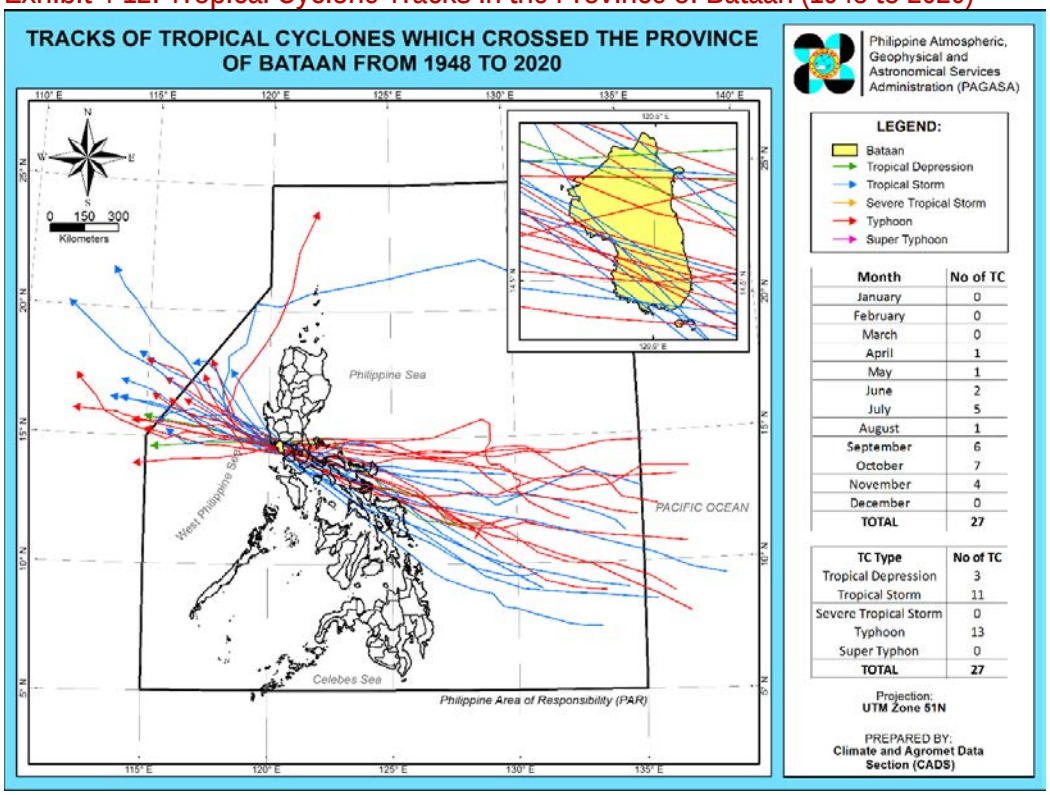
[a] Source: Philippine Climate Extremes Report 2020

Exhibit 4-11: Typhoon Risk Map of the Philippines



Source: Joint Typhoon Warning Center (Typhoon Data 1945-2003) National Statistics Office (Population Density 2000) UNDP (Human Development Index 2000) NAMRIA (Base Map 1998)

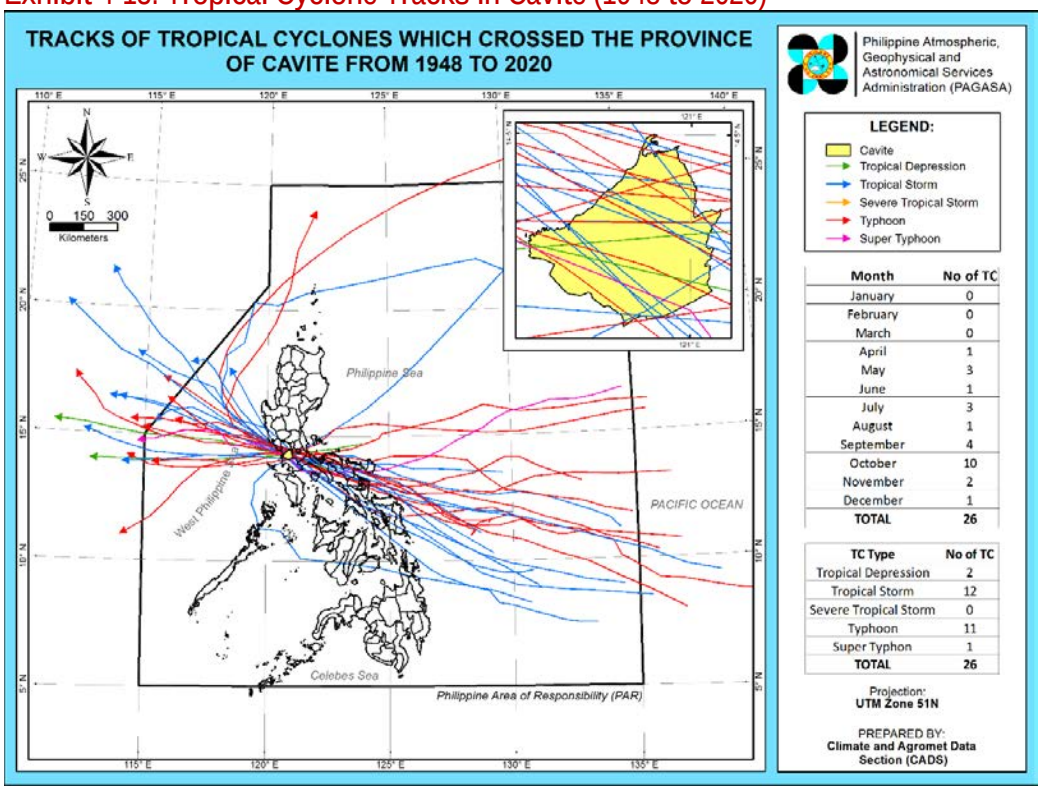
Exhibit 4-12: Tropical Cyclone Tracks in the Province of Bataan (1948 to 2020)



Month	No of TC
January	0
February	0
March	0
April	1
May	1
June	2
July	5
August	1
September	6
October	7
November	4
December	0
TOTAL	27

TC Type	No of TC
Tropical Depression	3
Tropical Storm	11
Severe Tropical Storm	0
Typhoon	13
Super Typhon	0
TOTAL	27

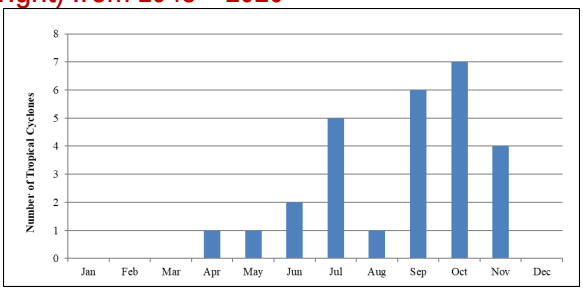
Exhibit 4-13. Tropical Cyclone Tracks in Cavite (1948 to 2020)



Month	No of TC
January	0
February	0
March	0
April	1
May	3
June	1
July	3
August	1
September	4
October	10
November	2
December	1
TOTAL	26

TC Type	No of TC
Tropical Depression	2
Tropical Storm	12
Severe Tropical Storm	0
Typhoon	11
Super Typhon	1
TOTAL	26

Exhibit 4-14: Monthly Distribution of Tropical Cyclones which Crossed Bataan (left) and Cavite (right) from 1948 – 2020



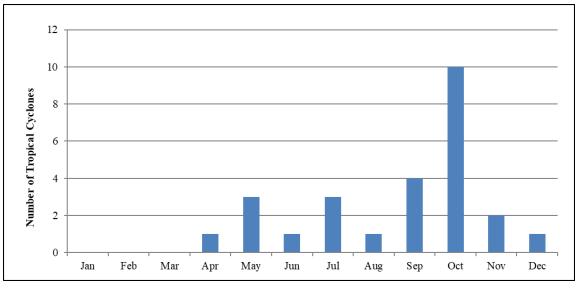
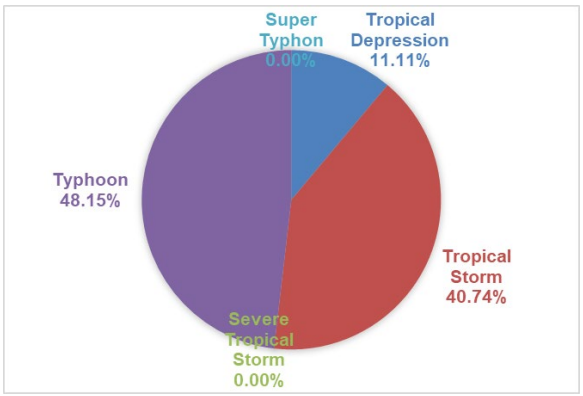
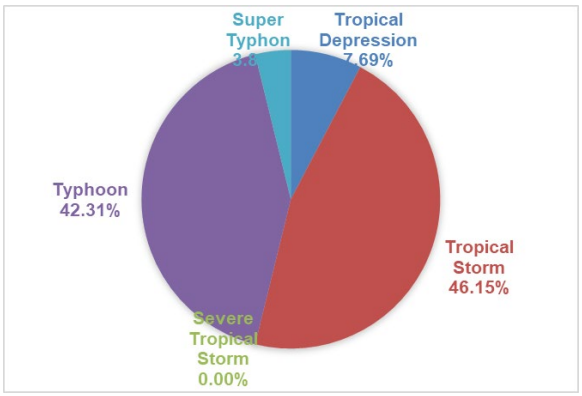


Exhibit 4-15: Breakdown of Tropical Cyclones which Crossed Bataan (left) and Cavite (right) from 1948 to 2020





4.2 Topography, Geomorphology, and Soils

4.2.1 Topography

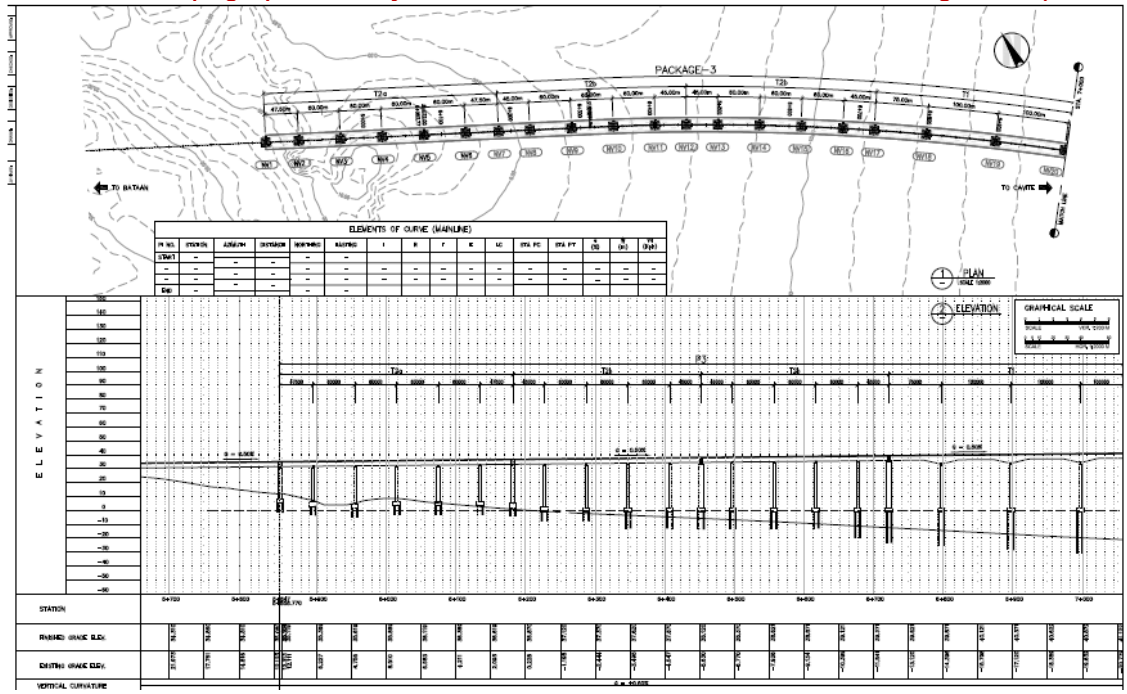
69. The project will link Bataan and Cavite through a 32.15-km bridge across Manila Bay. The bridge on the Bataan side will be landing on the Municipality of Mariveles, traversing the barangays of Alas-asin and Mt. View. On the Cavite side, the bridge will be landing on the Municipality of Naic, traversing barangays Timalan Concepcion and Timalan Balsahan. It should be pointed out that the alignment will not touch Corregidor Island but will pass through the southwest tip of the island.

70. Along the project alignment, the topography of the area is composed of hilly coasts of Bataan and Corregidor Island, alluvial plains in Cavite, flat to gently sloping bathymetry at the Southern Main Navigation Channel, and sloping bathymetry at the Northern Main Navigation Channel (Exhibits 4-16 - 4-18).

71. Based on the bathymetric profile, three levels of marine terraces can be observed from the main navigation channels (i.e., offshore) to the inland terrace. They are step-like landscape exhibits along with coastal areas and inland surface water bodies formed by coastal erosions and reflect the history of sea-level changes. “Level 1” is the offshore area with relatively flat and deep bathymetry

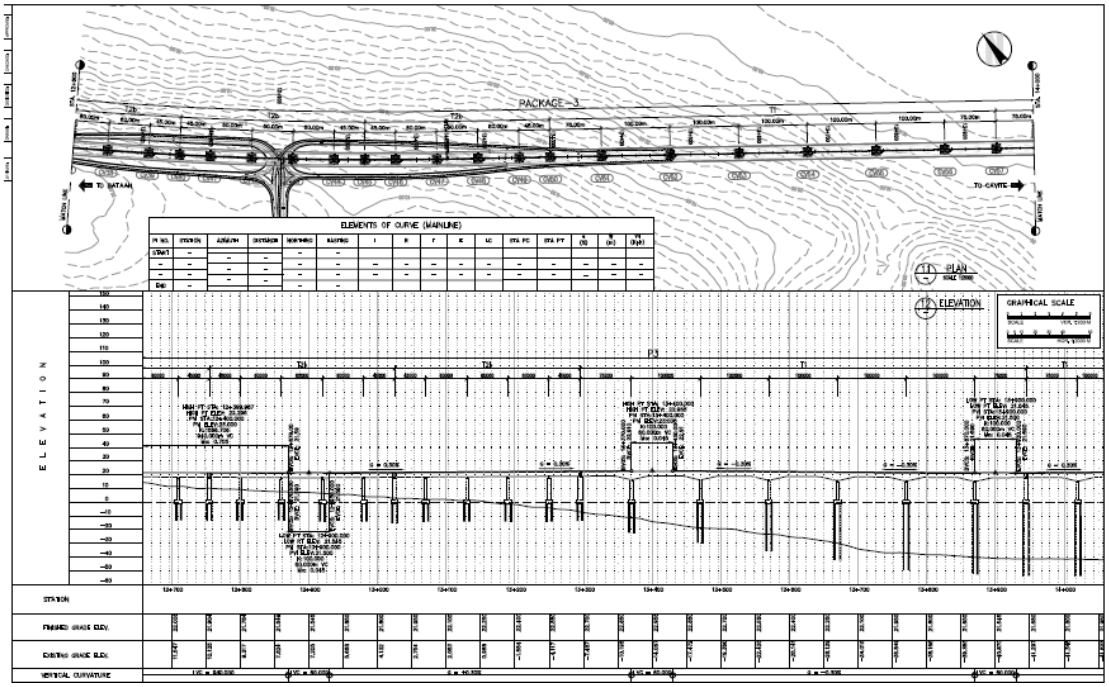
where main navigation channels situate. It is terminated by a change of slope at near shores reached by "Level 2." "Level 3" demarcates the coastlines of Bataan, Corregidor Island, and Cavite by coastal slopes where slopes steepen.

Exhibit 4-16: Topographic, Bathymetric and Marine Terraces at the BCIB Alignment (Bataan Side)



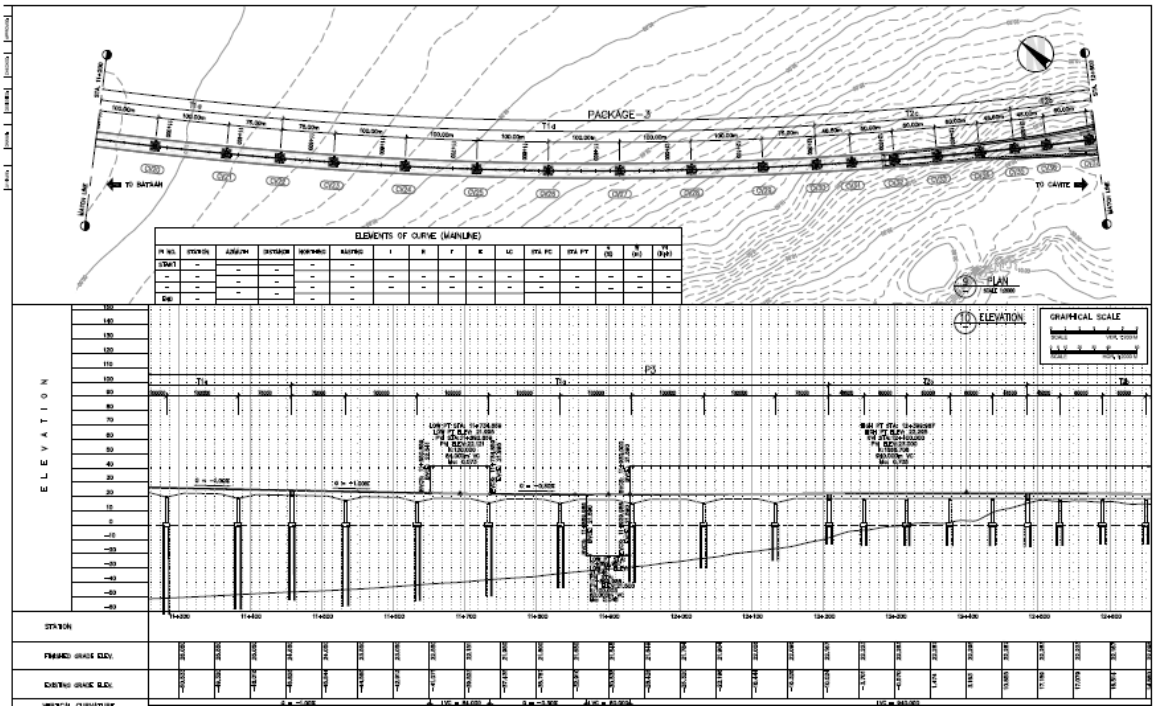
Source: Baseline Design Reports (P3 & P4), 07 January 2022.

Exhibit 4-17: Topographic, Bathymetric and Marine Terraces at the BCIB Alignment (Corregidor Island)



Source: Baseline Design Reports (P3 & P4), 07 January 2022.

Exhibit 4-18: Topographic, Bathymetric, and Marine Terraces at the BCIB Alignment (Cavite Side)



Source: Baseline Design Reports (P3 & P4), 07 January 2022.

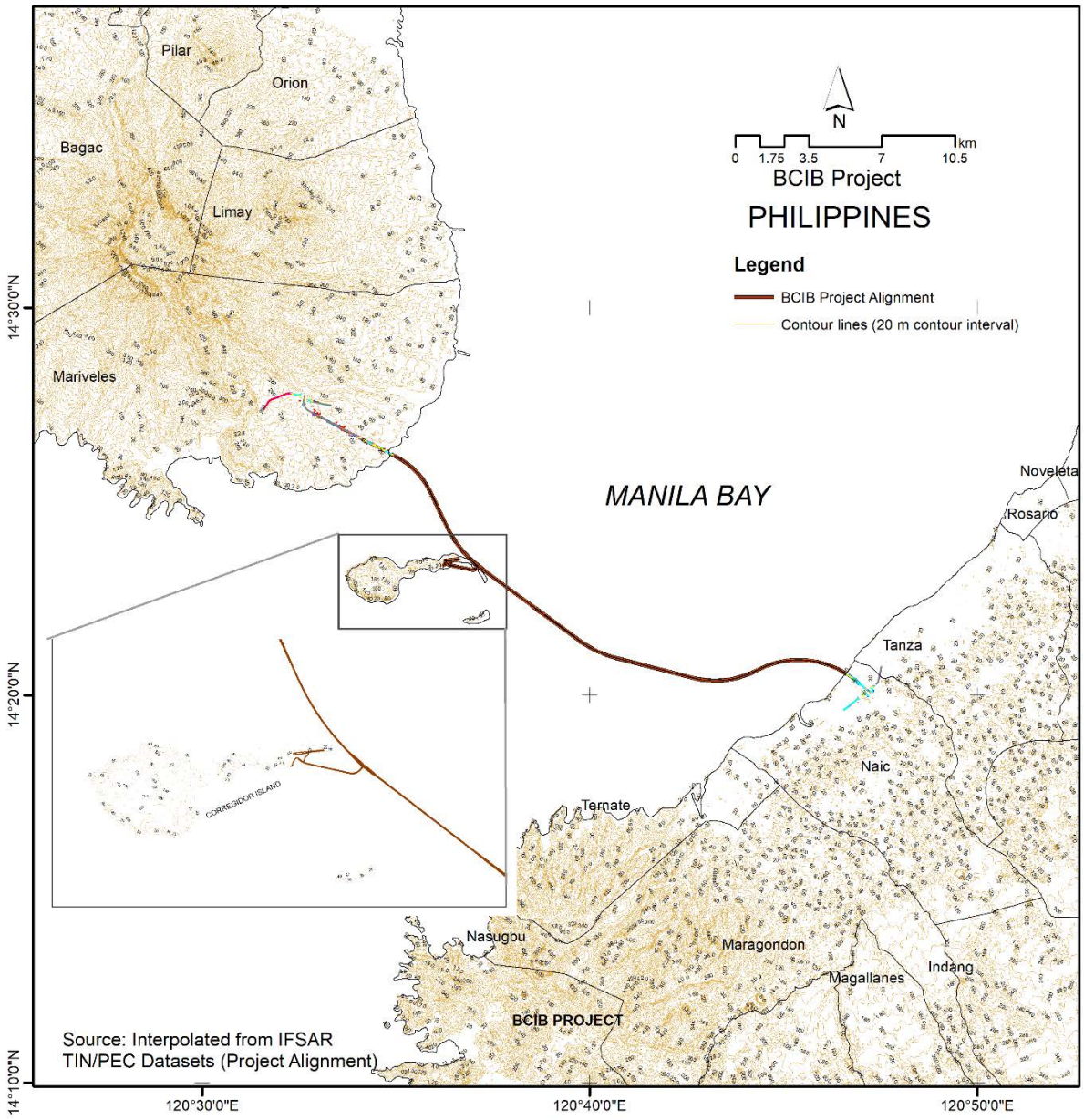
72. In the Bataan segment, the upland area's landform has been slightly modified by agricultural lands, pasture lands, small dwellings, and roads. The landing point forms narrow sandy beaches, rocky shores, high coastal slopes, and gently sloping coconut and grassland areas.

73. Bataan is characterized by a rocky, hilly, circular terrain of barren ground, brushlands, grasslands, and plantation forests formed by the Mariveles volcano. It flattens to gently sloping terraces punctuated by strips of steeply sloping terraces to form a series of rivers flowing toward the sea. The highest elevation is represented by the peak of Mt. Mariveles at approximately 1,400 m asl (Exhibit 4-19).

74. Cavite alignment contains alluvial plains toward the coast with a flat ground slope of less than 0.5% and low ground elevation, which steepens toward Mt. Maculot at the southeast. Mt. Maculot and the surrounded Taal Lake are formed by eruptions and flank collapses of the Taal Volcano. The flank of the Taal Volcano represents the highest elevation at approximately 600 m asl.

75. Corregidor Island is located south of Bataan, separated by the Northern Main Navigation Channel for about 4-6 km. The island is circular in shape, relatively small and with a generally flat terrain. The highest elevation is located near the island's center at approximately 173 m asl.

Exhibit 4-19: Topography of the Project Sites



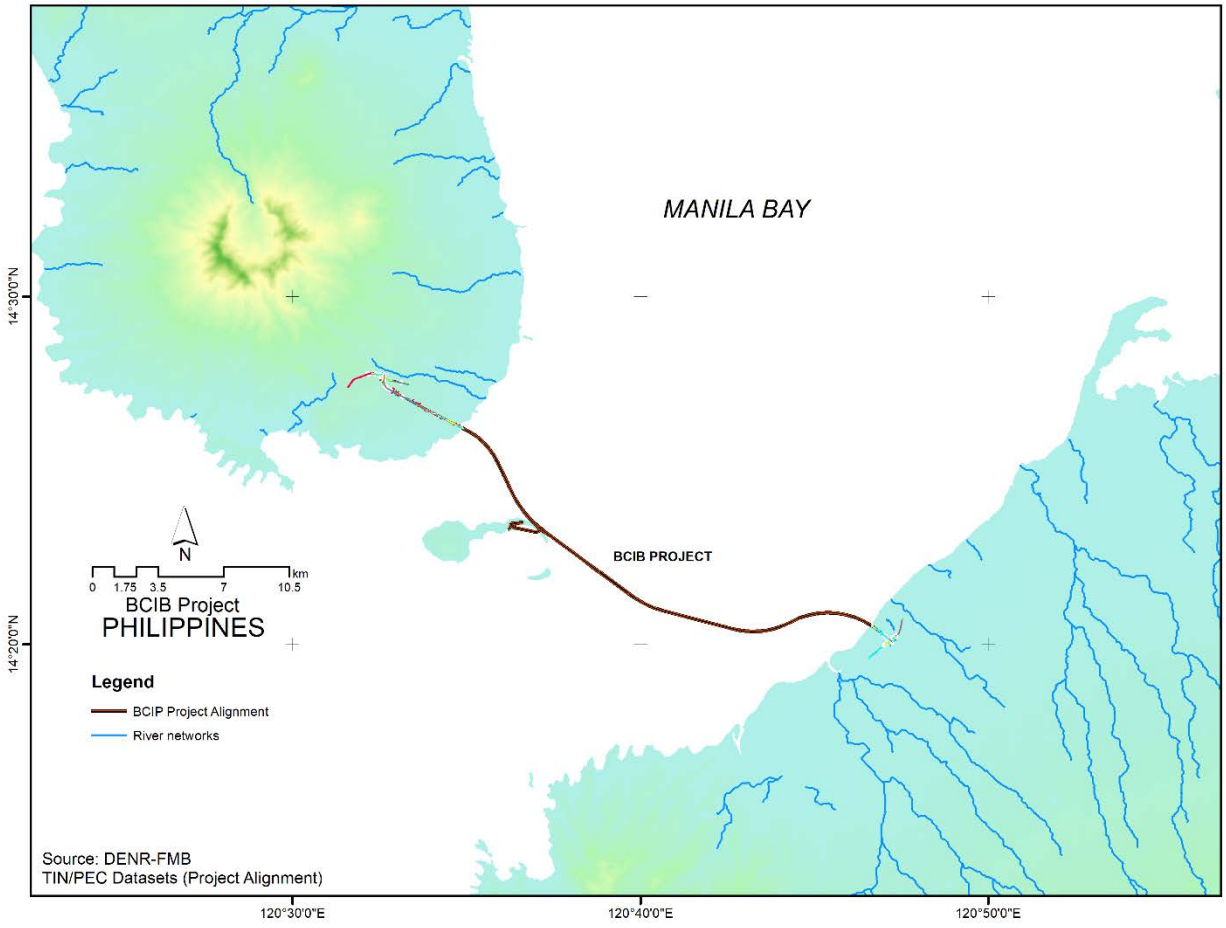
4.2.2 Geomorphology

76. As seen in Exhibit 4-20, the river networks in the project areas are positioned into a radial pattern. The waterway discharges into Manila Bay. The landing point in Bataan is located inside the Pangolisanin/Real River Basin, with a drainage area of 36.3 km^2. In comparison, the landing point and roadway in Cavite are along the Timalan and Labac River mainstream.

77. In the Bataan portion, the alignment is 5.4 km long, and its major structural components include the trumpet interchange that connects the BCIB with Roman Highway, Roman Interchange Bridge, the Alas-Asin reinforced concrete box culvert, Alas-Asin Overpass Bridge, Mt. View Overpass Bridge, Mt. View Waterway Bridge, and the Bataan land viaduct.

78. At the Mt. View waterway, a four-span bridge that crosses a wide and deep intermittent channel is proposed at Station 4+800. Based on the preliminary engineering design report, the vegetative cover consists mainly of patches of trees, drought-tolerant shrubs, and grassland along the waterway alignment. The Mt. View waterway is a shallow depression traversing a gently sloping to flat topography. The east-flowing intermittent channel has a small catchment, has no tributaries, and flow is generated only during the wet season.

Exhibit 4-20: River Systems Near the Project Alignment



79. The BCIB project conducted a frequency analysis to calculate probable floods based on a 100-year storm return period. Considering the impact of climate change, where it is projected, the Mt. View waterway will experience higher rainfall extremes in the future. The study added 10% of the calculated rainfall intensity following the provision of the DGCS (DPWH, 2015). Further, no flow was observed during the site visit, and added a base flow following the recommendation put forward in the design guideline.

80. The assessment found that the waterway has maintained its course and alignment for the past 35 years. It also found that a four-span bridge with a total length of 100 m can maintain the waterway regime and reduce adverse impacts considering its present morphology.

81. Further analysis results are available in Section 4.2 in the Updated Preliminary Design Report – Package 1 and 2. Under Package 2, it must be noted that there is no waterway crossed along the roadway alignment, and this was confirmed during the site visits.

4.2.3 Soils

4.2.3.1 North-western Portion of Project Alignment – Bataan

82. The Bureau of Soil and Water Management soil erosion map indicates that the project site has a moderate erosion rate (Exhibit 4-21). This erosion rate can be attributed to the topography and the presence of Antipolo Clay in Bataan areas. Accordingly, the soil belongs to Typic Dystropepts, which are formed from volcanic materials. They are extensively mapped on pyroclastic and volcanic complex hills. They are brownish and reddish in color, moderate deep to deep, well-drained, and clayey textured. Commonly occurring on pyroclastic and volcanic hills, these soils are mainly used for grasslands and secondary frost. However, soils with undulating slopes are sometimes cultivated to upland crops. Some portions are devoted to orchard mango and other tree crops.

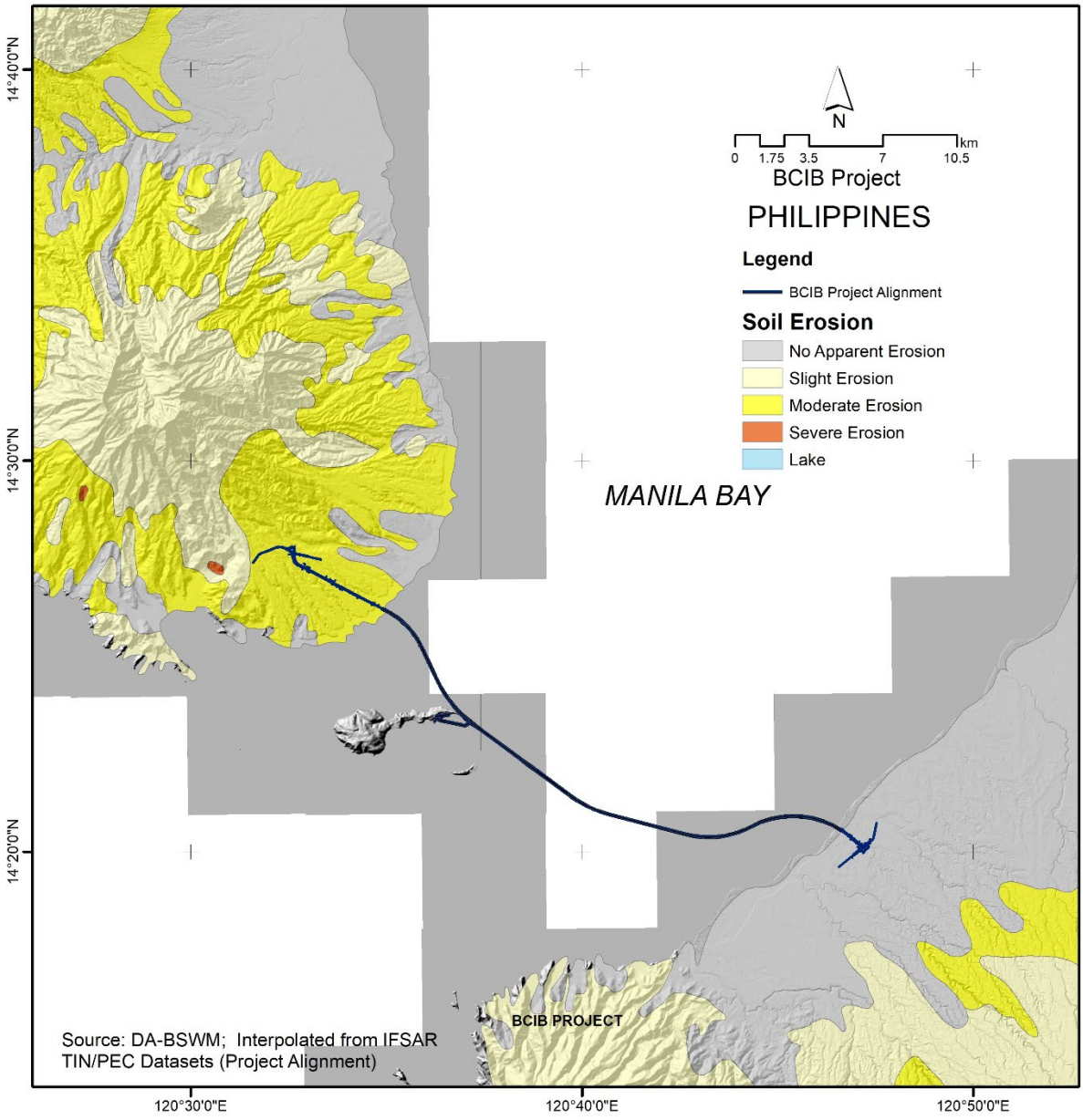
83. A confirmatory geotechnical study was conducted for the project during the detailed engineering design phase. Details are found in Chapter 5 of the Package 1 Baseline Engineering Design Report. The Bataan onshore is consistent for the length, with all boreholes encountering the relatively thick sublayers of the Antipolo Clay and the Bataan pyroclastic deposits at depth. The soil layers are generally described as stiff to very stiff, discolored clay, silt, and clayey/silty sand. The lithic tuff and the volcanic breccia are the underlying rock layers that comprise the Bataan pyroclastic deposits.

4.2.3.2 South-eastern Portion of Project Alignment – Cavite

84. The project site in Cavite has categorically no apparent soil erosion and signifies the presence of Guadalupe Clay. This soil series comprises dark clay with spherical tuffaceous concretions derived from Diliman Tuff (Carating et al., 2014). It is generally classified as fine, montmorillonitic, isohyperthermic Lepic Udic in lowland rice area or Lithic Trophorthents in undulating areas as Typic Ustropepts, which corresponds to shallow to moderately deep poorly drained dark brown to black clay.

85. During the detailed engineering design stage, the geotechnical conditions completed in October 2021 on the Cavite onshore were consistent for the length, with nearshore boreholes encountering the tidal sediments and the alluvial deposits towards the Antero Soriano partial clover interchange. The bedrocks are stratified lithic tuff layers, tuffaceous sandstone, sandstone, and conglomerate. Other details are found in Chapter 5 of the Package 2 Baseline Engineering Design Report.

Exhibit 4-21: Soil Erosion in the BCIB Project Alignment



4.3 Existing Road Conditions

4.3.1 Bataan Side

86. The existing Roman highway is a dual 2-lane PCCP road with a total carriageway width of 14.70 m and gravel shoulders on both sides. The right-of-way along this section is about 20 m. A combination of open earth and rectangular concrete channel for drainage are present along the roadway. Concrete poles carrying power and telecommunications cables are also present on both sides of the Roman Highway.

87. The alignment of BCIB connects with the existing 4-lane Roman Highway in Barangay Alas-asin, Mariveles, Bataan (Exhibit 4-22). Electric wooden poles are observed on the right side of the road at a typical spacing of 40 m.

88. Based on preliminary design findings, two (2) significant developments in the area can affect the project. First, there will be an expansion of the whole stretch of the Roman Highway from 2x2 lanes to 3x3 lanes in the future. Second, the plan is to have an international container port terminal in Barangay Baseco in Mariveles, of which the construction, development, and operation right at the mouth of the Manila Bay is meant to complement the already congested Manila Port Harbor. This port terminal will be located at a 180-ha. reclaimed land with a berth length of more than 6 km, 20 container berths, and 100 ha of container storage. The connection point of BCIB with the Roman Highway is well-positioned to service this port.

89. Meanwhile, climate change can directly impact environmental conditions and, therefore, change pavement performance. The energy and moisture balance of pavement can be disturbed by climate stressors, and the long-term pavement performance (rate of deterioration) will change as a consequence. The most common climate stressors include temperature, precipitation, and wind speed. Typically, pavement performance is most influenced by temperature and moisture, and the long-term impacts from the climate stressors can be significant.

Exhibit 4-22: BCIB Alignment at Bataan Side

Source: Revised Updated Preliminary Design Report – Package 2, 21 January 2022

90. The climate change assessment team conducted a conditional survey of existing roads to identify deterioration and failures due to weather events and to determine the potential impacts of climate change on the main roadway infrastructure that leads to the BCIB project. The survey considered a set of parameters, such as: i) investigation of damage caused by the recent typhoon, ii) existing damage to road from drainage issues, iii) existing damage to stream crossing structures, iv) stream crossing structures that may be under capacity when average annual precipitation and maximum daily rainfall increase, v) existing damage to drainage structures and bridge, vi) drainage structures that may be under capacity when average annual precipitation and maximum daily rainfall increase, vii) existing road damage from heat issues, viii) existing evidence of landslides and slope creep affecting or threatening to affect the road, ix) steep cross slopes, cut slopes, and embankments that may become unstable as precipitation/slope saturation increases, x) road segments that may be affected by flooding from storm surge and sea-level rise (possibly in combination with land subsidence), and xi) road segments that may be affected by coastal erosion. Exhibit 4-23 shows the stretch of the survey.

Exhibit 4-23: Stretch of the Conducted Conditional Road Survey

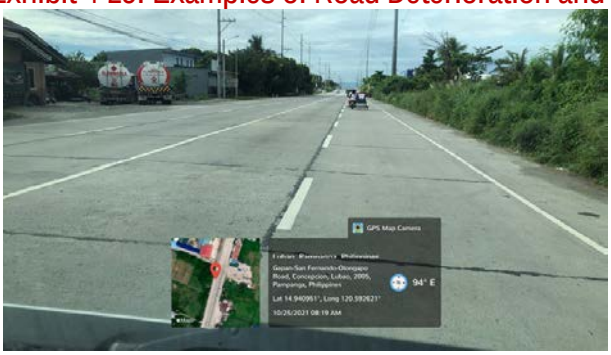
91. During the site visit, the assessment spotted some road deteriorations and failures on the stretch of Jose Abad Santos Avenue, Roman Expressway, Gov. JJ Linao Road, Junction Layac-Balanga Mariveles Port Road, and Bagac-Mariveles Road. Due to heavy vehicles and poor construction, longitudinal and traverse cracks can already be seen in the areas. A new pavement construction and the washed-out slope protection on the flood-prone portions are also noticed on the roadways. Due to the missing drainage system, the solid wheel guard and slope protection collapsed along Junction Layac-Balanga Mariveles Port Road. The assessment recommends immediate and emergency maintenance, partial re-pavement, a quick recovery, expanded pipe size, river section check, and installation of additional drainage facilities as adaptation measures on this road network. Other survey details are shown in Exhibit 4-24 and 4-25, and Appendix 1.

Exhibit 4-24: Results of the **Conditional Road Survey in Bataan**

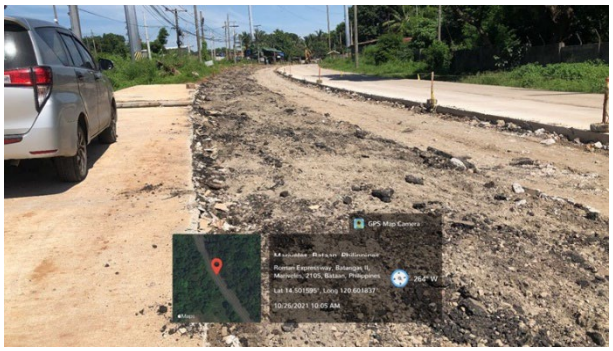
Location/ KM	Road Condition	Cause of Damage	Recommended Adaptation Strategy
Jose Abad Santos Avenue (K0069+000 - K0126+000)			
K0069+300	Longitudinal crack	Heavy vehicle	Emergency maintenance
K0074+700	No problems with flooding in the past.		
K0083+250	Transverse crack	Poor construction	Partial re-pavement
K0083+800	No problems with flooding in the past.		
K0086+900	No problems with flooding in the past.		
K0087+300	No problems with flooding in the past.		

Location/ KM	Road Condition	Cause of Damage	Recommended Adaptation Strategy
Roman Expressway (K0100+000 – K0165+000)			
K0091+750	No problems with flooding in the past.		
K0093+100	-		
K0100+375	No problems with flooding in the past.		
K0100+400	No problems with flooding in the past.		
K1000+480	Transverse crack	Poor construction	Partial re-pavement
K0100+500	No problems with flooding in the past.		
K0104+400	-		
K0104+500	No problems with flooding in the past.		
K0104+550	-		
K0113+850	-		
K0120+300	Longitudinal crack	Heavy vehicle	Emergency maintenance
K0121+250	-		
K0121+330	New pavement construction		
K0124+142	Washed out slope protection	Flood prone area	Need a quick recovery
K0126+188	Washed out slope protection	Flood prone area	Need a quick recovery
K0127+550	Longitudinal crack	Heavy vehicle	Emergency maintenance
K0142+675	No problems with flooding in the past		
K0135+550	No problems with flooding in the past		
K0135+600	No problems with flooding in the past		
K0135+959	No problems with flooding in the past		
K0143+760	New pavement construction		
K0146+930	No problems with flooding in the past		
K0150+330	Longitudinal crack	Heavy vehicle	Emergency maintenance
K0158+300	-		
Gov. JJ Linao Road (K0126+000 to K0175+000)			
K0130+100	-		
K0132+088	No problems with flooding in the past		
K0133+350	No problems with flooding in the past		
K0135+645	New pavement construction (ongoing)		
K0136+350	Pipe crack	Insufficient drainage capacity	Expanded pipe size
K0137+013	No problems with flooding in the past		
K0151+829	Washed out slope protection	Flood prone area	Need a quick recovery
Junction. Layac-Balanga Mariveles Port Road (K0102+000 to K0142+000)			
K0124+500	Longitudinal crack	Heavy vehicle	Emergency maintenance
K0124+700	House flooding	Flood prone area	River section check
K0132+450	No problems with flooding in the past		
K0160+000	Collapsed solid wheel guard and slope protection	Drainage system missing	Installation of additional drainage facilities
Bagac-Mariveles Road (K0152+000 to K0195+000)			
K0193+780	Transverse crack	Poor construction	Partial re-pavement
K0186+100	No problems with flooding in the past		
K0180+100	No problems with flooding in the past		
K0174+100	New slope protection construction		
K0172+400	No problems with flooding in the past		
K0174+318	No problems with flooding in the past		
K0169+254	No problems with flooding in the past		
K0161+650	No problems with flooding in the past		
K0160+135	No problems with flooding in the past		

Exhibit 4-25: Examples of Road Deterioration and Failures in Bataan Roads



K0086+900 (Santa Cruz Bridge)



K0143+760

K0146+930 (Lucanin Bridge)

K0136+350

K0137+013 (Pantingan Bridge)

K0132+450 (Orion Bridge)

4.3.2 Cavite Side

92. The BCIB interchange connects to the existing 4-lane Antero Soriano Highway in Barangay Timalan, Naic, Cavite (Exhibit 4-26). The alignment passes along the ongoing construction of the Northdale Subdivision. The BCIB project crosses the populated Tramo road in Naic, Cavite. The road has a total width of 4 m with drainage channels on both sides.

93. Also, the road alignment traverses the Timalan-Balsahan road in Naic, Cavite, which runs through a populated area. The road has a total width of 7 m with 1 m shoulders on both sides. Concrete drainage channels are present on both sides of the road. Concrete electrical posts are also

located on one side of the road. It is estimated that about 20 houses will be affected directly within the project alignment.[18]

Exhibit 4-26: BCIB Alignment at Cavite Side

Source: Revised Updated Preliminary Design Report – Package 2, 07 February 2022.

94. On a site in Cavite, it was observed that the Kawit-Noveleta Highway to Juanito R. Remulla SR. Road has been experiencing road deteriorations and failures influenced by weather events. The most common road conditions are longitudinal cracks, new pavement constructions, box cracks, washed slope protection, and landslides at cut areas (Exhibit 4-27). Cracks typically change direction, but they appear longitudinally and extend continuously to many slabs. A few examples are shown in Exhibit 4-28, while the full documentation is found in Appendix 1.

Exhibit 4-27: Results of the **Conditional Road Survey in Cavite**

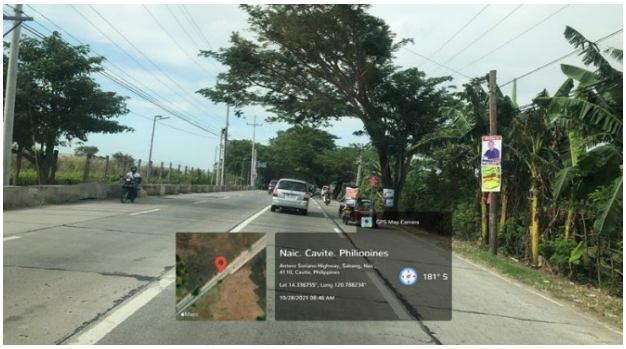
Location/ KM	Road Condition	Cause of Damage	Recommended Adaptation Strategy
Manila-Cavite Expressway (K0007+500 to K0021+700); Kawit-Noveleta Div. Road (K0021+700 to K0025+500) Noveleta-Rosario Div. Road (K0025+500 to K0030+700); Noveleta-Naic Tagaytay Road (K0030+700 to K0048+000) Juanito R. Remulla SR. Road (K0048+000 to K0072+000)			
K0007+500	-	-	-
K0007+900	Waiting many vehicles	Increasing CO_2	Installing smart tolling
K0021+000	-	-	-
K0021+700	Waiting many vehicles	Increasing CO_2	Installing smart tolling
K0022+000	-	-	-
K0028+700	Longitudinal crack	Heavy vehicle	Emergency maintenance
K0036+925	New pavement construction		
K0039+525	New pavement construction		
K0043+600	Longitudinal crack	Heavy vehicle	Emergency maintenance

[18] Other details are described in the Preliminary Design Report – Package 2

Location/ KM	Road Condition	Cause of Damage	Recommended Adaptation Strategy
K0058+930	-	-	-
Nasugbu Road (K0067+000 to K0097+000); Juanito R. Remulla, Sr. Road (K0048+000 to K0072+000)			
K0070+000	Box crack	Insufficient drainage capacity	Expanded box size
K0069+400	Landslide at cut area	Drainage system missing	Installation of additional drainage facilities
K0068+600	Washed out slope protection	Flood prone area	Need a quick recovery
K0068+200	Landslide at cut area	Drainage system missing	Installation of additional drainage facilities
K0067+200	Washed out slope protection	Flood prone area	Need a quick recovery
K0067+000	Landslide at cut area	Drainage system missing	Installation of additional drainage facilities
K0069+219	No problems with flooding in the past		
K0057+783	No problems with flooding in the past		
K0056+157	No problems with flooding in the past		
K0069+190 (DPWH)	Landslide at cut area	Drainage system missing	Installation of additional drainage facilities
K0068+800 (DPWH)	Landslide at cut area	Drainage system missing	Installation of additional drainage facilities

Exhibit 4-28: Existing Road Conditions along the Kawit-Noveleta Highway to Juanito R. Remulla SR. Road

Noveleta-Naic-Tagaytay Road K0036+925



Noveleta-Naic-Tagaytay Road K0043+600

Nasugbu Road K0070+000 (Kaybiang Tunnel)

Nasugbu Road K00690+400

Nasugbu Road K0068+200

K0056+157 (Maragondon Bridge)

5. CLIMATE CHANGE AND RISK ASSESSMENT

95. This chapter describes the project's exposure to climate hazards and locations based on the current and future time frames. The future time frame is based on changes between the 1986–2005 average and a future average. This future average is most likely the early future (2020–2039), mid-future (2046–2065), and late future (2080–2099) average. Highlights of exposure and description of risks are summarized in the table below. Other details are discussed in the succeeding sections of this chapter.

Exhibit 5-1: Summary of Exposure to Climate Hazards at Project Locations

Risk/Hazard	Time Frame	Description of Risk/Hazard of the Project Locations
Extreme Temperature	Current	Baseline TXx observation (1986-2005) records 35.5 °C on the Bataan side and from 35.7 °C on the Cavite side. The number of hot days (TX90p) occurs 11.5% (42 days) of the year.
	Future	TXx projections diverge at an increasing rate up to 39 °C (late-future) on the Bataan and Cavite sides. TX90p will increase by at least 21% (76 days) in the early future, and as much as 79% (288 days) in the late future, essentially making every day of the year a hot day.
Extreme Rainfall	Current	Based on PAGASA Extreme Projection (2020) using ensemble median, maximum 1-day rainfall totals (Rx1day) are 133 mm (Bataan) and 116 mm (Cavite). Using KNMI Climate Change Atlas for CMIP5 extremes ensemble under RCP8.5, the observed values of Rx1day is 315 mm for the Bataan side and 260 mm for the Cavite project site.
	Future	Based on PAGASA Extreme Projection (2020) using ensemble median, Rx1day under RCP4.5 can get as much as 8.2 mm additional rainfall in the mid- and late future. The RCP8.5 scenario projects an increasing Rx1day from approximately 0.5 mm in the early future to around 8.4 mm in the mid-future. Comparing with the KNMI Climate Change Atlas for CMIP5 extremes ensemble under RCP8.5, the trend of Rx1day is increasing, which indicates the need to look

Risk/Hazard	Time Frame	Description of Risk/Hazard of the Project Locations
		closely at the hydraulic structure designs based on a specific return period. The design values of Rx1day for the future climate must be 409 mm for the Bataan side and 338 mm for the Cavite area considering the climate change factor of 30% and 25 year return period.
Flooding	Current	Under Package 1, the landing point between Station 5+800 and Station 5+900 is considered at high risk to coastal flooding due to seawater intrusion during the high tide. Under Package 2, between Station 31+600 and Station 32+500 and between Station 33+100 and Station 33+200 roadways, and from Station 0+000 to Station 0+501.782, and Station 0+000 to Station 0+700 interchange areas are highly susceptible to flooding.
	Future	Under Package 1, the landing point between Station 5+800 and Station 5+900 is considered at high risk to coastal flooding due to seawater intrusion during the high tide. Under Package 2, between Station 31+600 and Station 32+500 and between Station 33+100 and Station 33+200 roadways, and from Station 0+000 to Station 0+501.782, and Station 0+000 to Station 0+700 interchange areas are highly susceptible to flooding.
Sea Level Rise	Current	Sea level in the project locations has increased by roughly 0.2 m over the past three (3) decades as per records at Manila Harbor Tidal station.
	Future	Under Package 3 & 4 and Package 5 & 6, annual sea level changes in the project locations are expected to increase by 0.6 to 1.1m, and 0.8 to 1.6m in 2100 and 2130, respectively plus a 1.0 m storm surge.
Storm Surge	Current	Slight incidents of storm surge occurred in the areas in the past.
	Future	Incidents of storm surge and tall waves are expected to increase, a 1.0-meter maximum water level increase in Manila Bay, given a 10% increase over historical typhoons.
Strong Winds	Current	The latest and strongest typhoon to have struck the project areas was Typhoon Rolly in November 2020 with maximum winds of 220 kph. The project locations have been exposed to 27 tropical cyclone winds in the past seven decades. The months of September and October record a high number of tropical cyclones that traverse the project location. Using Global Wind Atlas, Bataan and Cavite sections have mean wind speeds ranging from 6.61 - 7.05 m/s and from 6.60 to 7.37 m/s, respectively, while the Corregidor Island portion is exposed at rate ranging from 6.96 to 7.19 m/s. The mean wind at the Sangley Weather Station is 5.91 m/s, or about 1.2 times less than on Bataan alignment.
	Future	A study on Design Tropical Cyclone Wind Speed when Considering Climate Change indicated that wind speed during tropical cyclones could increase by 1.2-1.4 times the historical record.
Heat Waves	Current	The project areas have been experiencing warmer temperatures, with an average monthly maximum of 31.3 °C and the warmest day temperature of 35.7 °C. The current median probability of a heat wave is around 2%. Heat waves might increase due to projected increases in temperature.

Risk/Hazard	Time Frame	Description of Risk/Hazard of the Project Locations
Landslide	Current	In the Bataan end alignment, the susceptibility to landslide is high at the interchange section. At the Cavite segment, the interchange and roadway alignment are running through a gentle to flat alluvial plain at the shoreline and the susceptibility to landslide is negligible.

5.1 Temperature Extremes

96. Based on PAGASA (2020) projection, the temperature extreme indices show spatial variability in the baseline; but projected changes indicate almost spatially uniform warming trends, with the magnitude and duration of warming increasing in the future. The change in daily temperature range is particularly interesting as it indicates a slight cooling and greater spatial variability in the future. However, the magnitude of change is relatively small over Bataan and Cavite project areas.

97. The summary of the temperature extremes over project areas is presented in Exhibit 5-2.

Exhibit 5-2: Temperature Extreme Indices (in °C) of the Project Areas

Scenario	Period	Bataan			Cavite		
		TXm	TXx	TX90p	TXm	TXx	TX90p
Baseline Value	1986-2005	31.3	35.5	11.5	31 .0	35.7	11 .5
Moderate Emission (RCP 4.5)	Early (2020-2039)	31 .8 (0.5)	36.3 (0.6)	23.6 (12.1)	31 .6 (0.6)	36.0 (0.5)	25.5 (14.0)
	Mid (2046-2065)	32.5 (1.2)	37.0 (1 .3)	49.3 (37.8)	32.2 (1 .2)	36.7 (1 .2)	53.2 (41.7)
	Late (2080-2099)	32.8 (1.5)	37.3 (1.6)	60.9 (49.4)	32.5 (1 .5)	37.0 (1 .5)	64.1 (52.6)
High Emission (RCP 8.5)	Early (2020-2039)	32.0 (0.7)	36.6 (0.9)	31.7 (20.2)	31 .8 (0.8)	36.3 (0.8)	33.4 (21.9)
	Mid (2046-2065)	32.9 (1.6)	37.4 (1.7)	60.6 (49.3)	32.6 (1.6)	37.2 (1 .7)	65.1 (53.6)
	Late (2080-2099)	34.5 (3.2)	39.3 (3.6)	90.6 (79.1)	342 (3.2)	39.1 (3.6)	91.4 (79.9)

Source: DOST-PAGASA, Manila Observatory and Ateneo de Manila University (2021). Philippine Climate Extremes Report 2020: Observed and Projected Climate Extremes in the Philippines to Support Informed Decisions on Climate Change Adaptation and Risk Management. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines. p.77&p.84.

5.1.1 Average Daytime Temperature (TXm)

98. TXm refers to the average of daytime temperatures.

99. Historical data shows that the average daytime temperature over project areas ranges from 31.0°C to 31.3°C. This is projected to increase in both RCP scenarios. In the RCP4.5 scenario, TXm is expected to increase by as much as 0.6°C in the early future and 1.5°C in the late future; in the RCP8.5 scenario, it is expected to increase by as much as 3.2°C in the late future.

5.1.2 Warmest Daytime Temperature (TXx)

100. TXx refers to the temperature on the hottest day of the year.

101. Baseline observations show that the hottest daytime temperature in the project areas ranges from 35.5 °C to 35.7 °C. It is also projected to increase in the future, by as much as 1.6 °C in the late future for the RCP4.5 scenario and by as much as 3.6 °C in the RCP8.5 scenario.

5.1.3 Fraction of Hot Days (TX90p)

102. TX90p tracks the number of hot days when the maximum temperature exceeds the 90th percentile threshold.

103. Historically, the number of hot days occurs 11.5% (42 days) of the year. This is projected to increase significantly in the future, with projections indicating an increase of at least 21% (76 days) in the early future, and as much as 79% (288 days) in the late future, essentially making every day of the year a hot day.

5.2 Rainfall Extremes

104. Based on PAGASA (2020) projection, the precipitation extreme indices show distinct patterns of spatial variability in the baseline data, especially for the magnitude and frequency indices. The projected changes indicate a general drying trend but also the occurrence of extreme rainfall events in the area. Prolonged wet events tend to decrease, but prolonged dry events also show localized decreases, indicating possibilities of increased frequency of wet events in the future which would interrupt the long-duration dry events.

105. The summary of rainfall extremes of the project areas (observed and projected annual climate extremes) is presented in Exhibit 5-3.

Exhibit 5-3: Rainfall Extremes (in mm) of the Project Areas

Scenario	Period	Bataan			Cavite		
		Rx1day	P99	R99p	Rx1day	P99	R99p
Baseline Value	1986-2005	133.2	115.3	206.5	116.4	87.1	162
Moderate Emission (RCP 4.5)	Early (2020-2039)	128.9 (-4.3)	113.4 (-1.9)	181.0 (-25.5)	118.0 (1 .6)	89.1 (2.0)	169.9 (7.9)
	Mid (2046-2065)	135.9 (2.7)	11 5.2 (-0.1)	215.7 (9.2)	121.0 (4.6)	96.5 (9.4)	202.2 (40.2)
	Late (2080-2099)	136.7 (3.5)	112.1 (-3.2)	203.6 (-2.9)	124.6 (8.2)	94.9 (7.8)	184.4 (22.4)
High Emission (RCP 8.5)	Early (2020-2039)	137.7 (4.5)	113.6 (-1.7)	189.3 (-17.2)	116.9 (0.5)	87.3 (0.2)	151 .5 (-10.5)
	Mid (2046-2065)	141.6 (8.4)	114.1 (-1.2)	227.4 (20.9)	124.6 (8.2)	95.4 (8.3)	190.0 (28.0)
	Late (2080-2099)	132.9 (-0.3)	102.7 (-12.6)	169.2 (-37.3)	122.9 (6.5)	92.3 (5.2)	183.8 (21.8)

Source: DOST-PAGASA, Manila Observatory and Ateneo de Manila University (2021). Philippine Climate Extremes Report 2020: Observed and Projected Climate Extremes in the Philippines to Support Informed Decisions on Climate Change Adaptation and Risk Management. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines. p.77&p.84.

5.2.1 Maximum 1-day Rainfall Total (Rx1day)

106. Rx1day describes the maximum amount of rain that can fall in one day. Such extreme rainfall is typically associated with local thunderstorms or large-scale systems such as monsoons or tropical cyclones and may induce flash floods or landslides. It is useful variable as an engineering design criterion in sizing hydraulic structures.

107. Baseline observations show that the project areas experience a maximum 1-day rainfall total of up to 133 mm. For RCP4.5, the project areas can get as much as 8.2 mm additional rainfall in the mid- and late future. In the RCP8.5 scenario, the project areas are projected to have an increasing Rx1day as time progresses, from approximately 0.5 mm in the early future to around 8.4 mm in the mid-future. A possible decrease will likely occur in Bataan (-0.3 mm) and increase in Cavite (6.5 mm) in the late future.

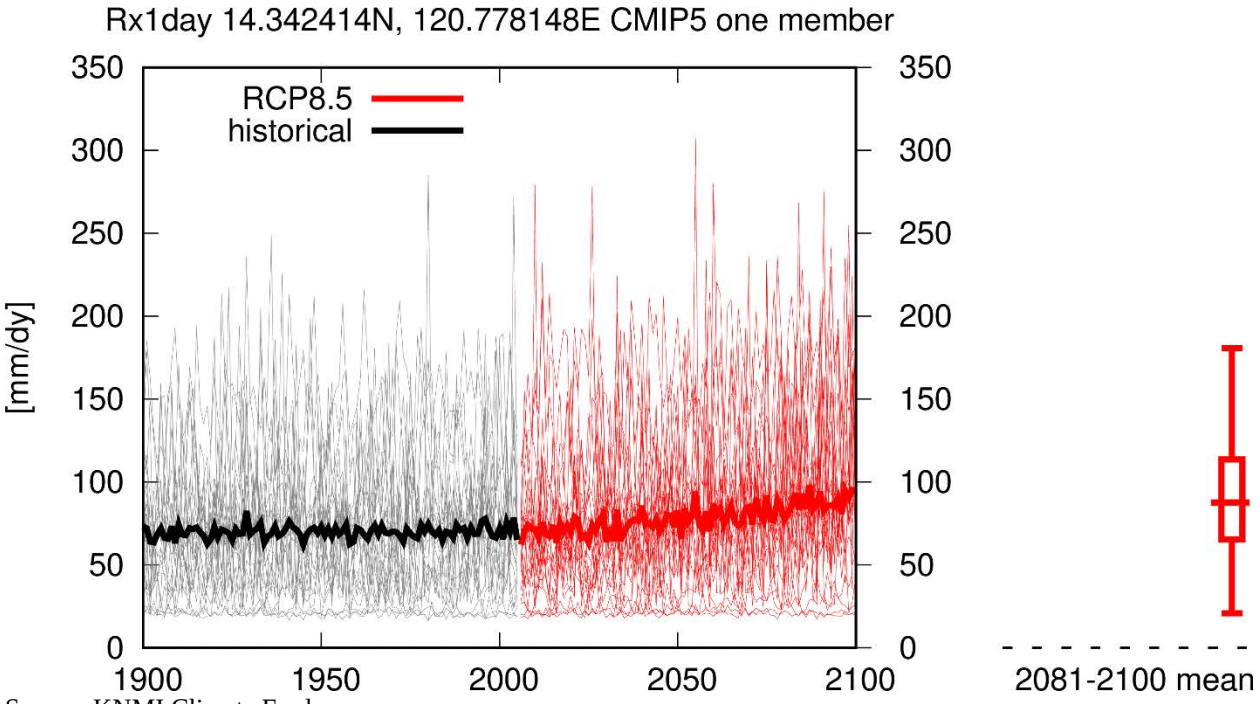
108. It is worthy to note that the use of projected average climate extremes published by PAGASA provides a good set of data to describe the general trajectories of rainfall but not to assess the adequacy of engineering designs that are generally based on climate extremes. Again, the extreme climate projections are fairly in agreement until the early future (2020-2039) scenario, and ensemble medians as criteria to test engineering design parameters may be acceptable. After that, the climate change model projections diverge at a fluctuating rate, and therefore, the use of median values discounts the extremes.

109. Exhibits 5-4 and 5-5 show the RCP8.5 CMIP5 extreme ensemble using the KNMI explorer. The box plots on the right side demonstrate the underestimation of the extreme projections using the ensemble median which was used in the PAGASA projection. The top whisker represents the 95th percentile, and the bottom is the 5th percentile. The middle line is the median (50th percentile), representing climate extremes in Exhibit 5-5. Following the 1-day maximum historic data, the observed design values of Rx1day must be 315 mm for the Bataan side and 260 mm for the Cavite project site.

110. The trend of Rx1day is increasing, which indicates the need to look closely at the hydraulic structure designs based on a specific return period. The non-stationarity of Rx1day raises the possibility that the DPWH design return periods must be adjusted. The design values were calculated for the baseline (1986-2005) and future periods (2016-2035). Exhibits 5-6 and 5-7 present the extreme Rx1day values for a 25-year return period. The bcc-csm1-1 climate model indicated the highest Rx1day values during the baseline and future periods at Bataan and Cavite sides.

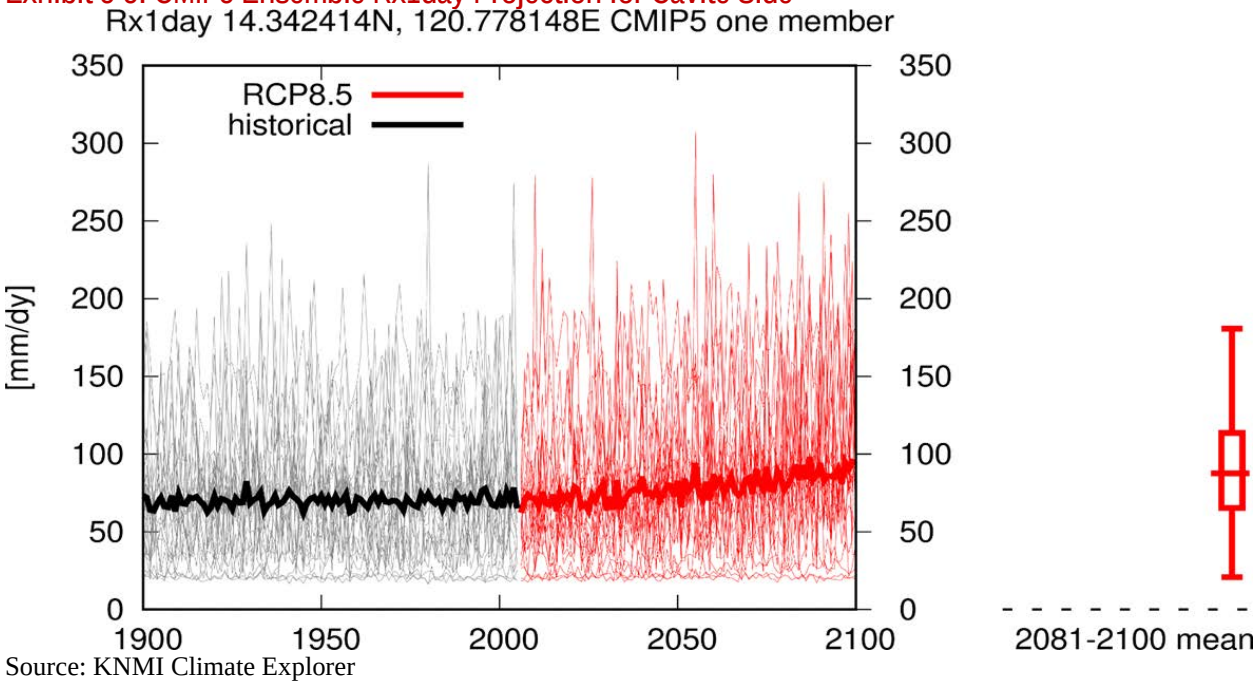
111. Exhibit 5-8 shows a probability curve and the percentage increase in Rx1day with a 25-year return period. It was extracted to determine the required percentile from the climate model ensemble. The plot supports the need to adjust the Rx1day design criteria by 30% to handle 97.5% of the projected rainfall intensity extremes. As a result, the design values of Rx1day for the future climate must be 409 mm for the Bataan side and 338 mm for the Cavite area. This information helps assess all hydraulic structures designed based on a 25-year return period and the need to recommend upward adjustments.

Exhibit 5-4: CMIP5 Ensemble Rx1day Projection for Bataan Side



Source: KNMI Climate Explorer

Exhibit 5-5: CMIP5 Ensemble Rx1day Projection for Cavite Side



Source: KNMI Climate Explorer

Exhibit 5-6: Estimates of Rx1day with 25-Year Return Period at Bataan Side

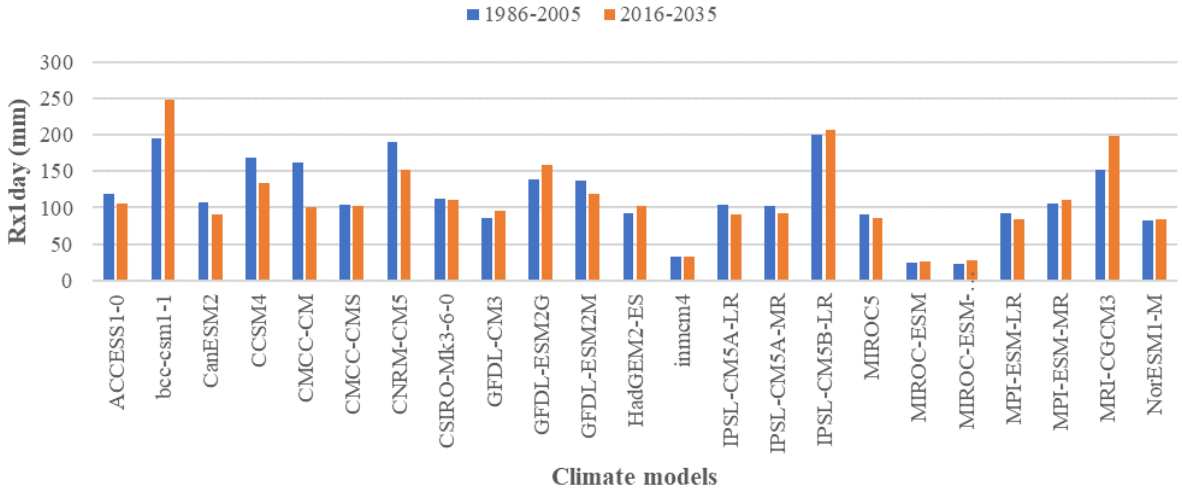
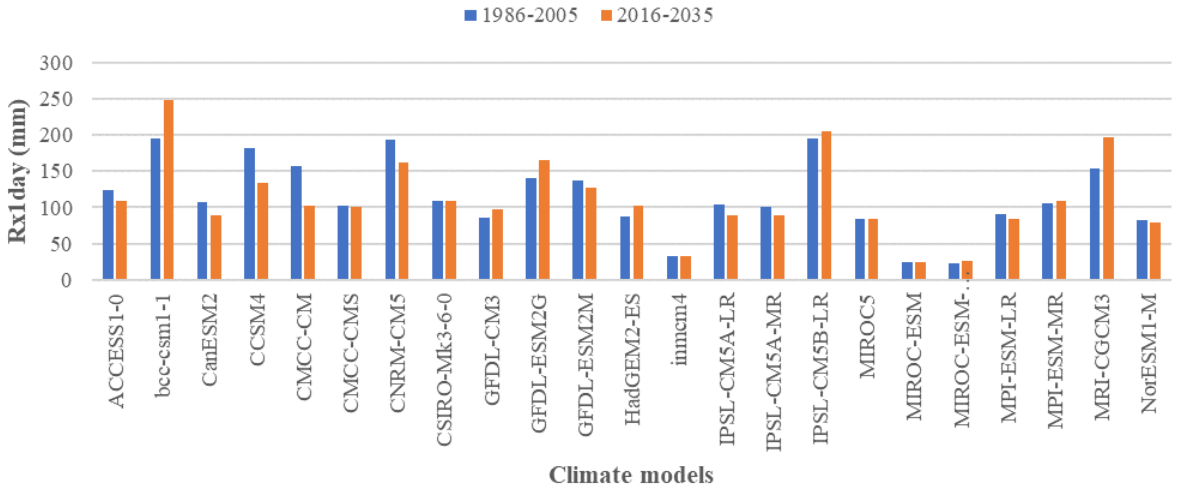


Exhibit 5-7: Estimates of Rx1day with 25-Year Return Period at Cavite Side

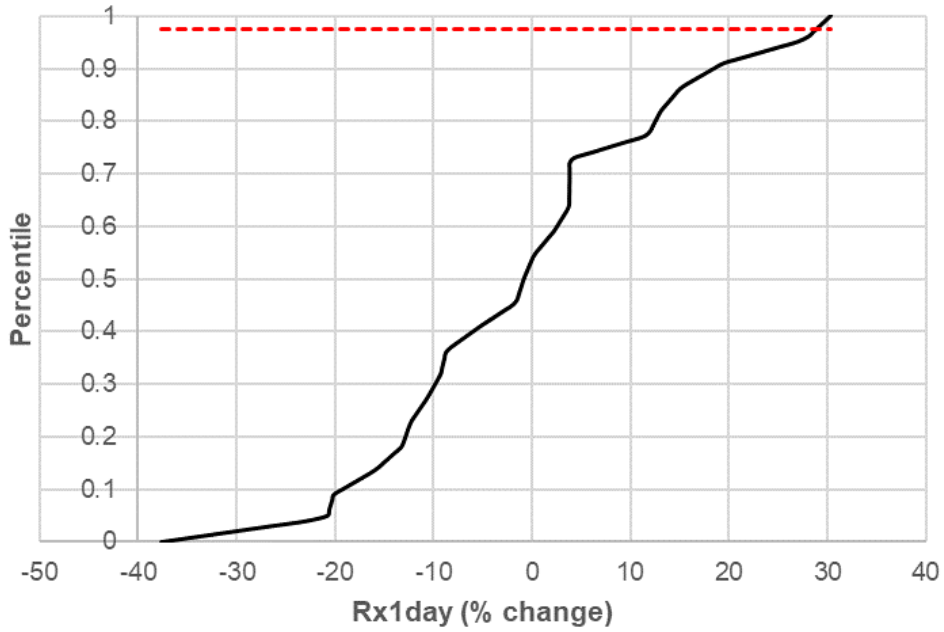


5.2.2 Rainfall on Extremely Wet Days (P99)

112. P99 indicates the amount of rainfall "extremely wet" days, defined as those exceeding 99th percentile threshold.

113. Historically, the distribution of rainfall on extremely wet days is similar to P95 with maxima reaching up to 115 mm/day and minima at around 87 mm/day. In both scenarios, the P99 is projected to increase by as much as 9 mm/day in the early future to late future in Cavite. It decreases from approximately 12 mm/day in the late future over Bataan areas; and in Cavite the decrease can be in the late future. The changes are projected to become slight in the early future and mid-future.

Exhibit 5-8: Probability Curve Showing the Percentile from CMIP5 and the Percentage Increase in Rx1day with a 25 Year Return Period



5.2.3 Total Rainfall Extremely Wet Days (R99p)

114. R99p describes the total amount of rain that falls on "extremely wet" days when rainfall exceeds the 99th percentile. Similar to R95p, it is related to the rainfall events that occur during the wet season as well as during tropical cyclone events.

115. Historically, R99p can reach up to 206 mm and was concentrated over Bataan area. In the future, wet conditions are projected with maximum increase of up to 40 mm in Cavite area. Meanwhile, dry trends of up to 37 mm are projected over project areas in the late future RCP8.5 scenario.

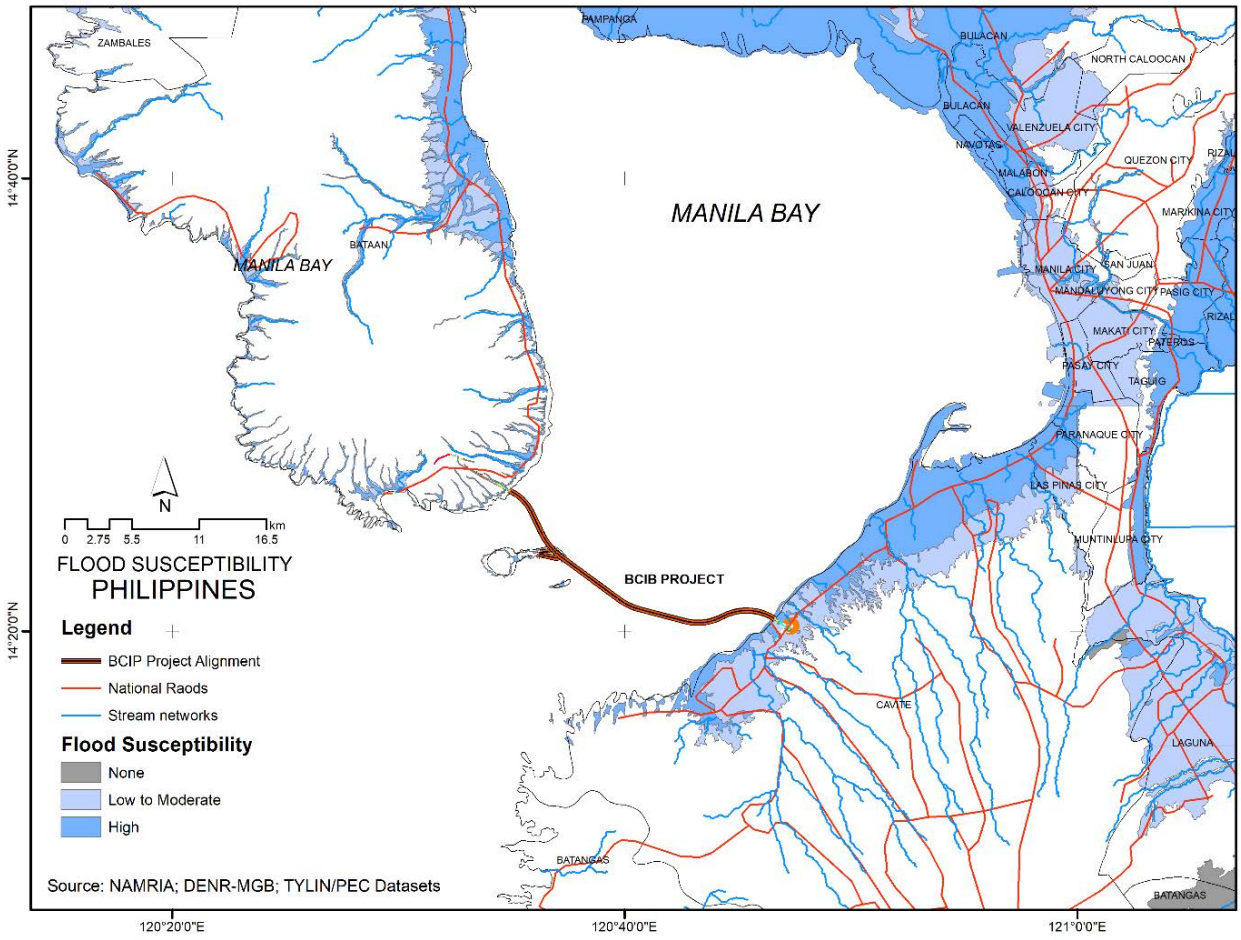
5.3 Flooding

116. Based on MGB's combined flood and landslide susceptibility map for Bataan and Cavite, the project alignment along the coast of Cavite is categorically low to moderately and highly susceptible to flooding (Exhibit 5-9).

117. The project will not likely affect the surface drainages within the Bataan and Cavite coastal areas. However, some sections along the project alignment in the Cavite areas have been experiencing flooding. The flooding is mainly due to the insufficient drainage canals that drain storm waters into the river and the coastal regions. This is further aggravated by the area being very close to the water line and forming a depressed low-elevation catchment surrounded by slightly elevated highway areas and residential lots.

118. Based on the rainfall projection, changes in the maximum 1-day rainfall total are expected to vary temporally with wetter trends of about 140 mm during the mid-future (2046-2065) in both scenarios over the project areas. It will likely be drier conditions during the late future under RCP8.5 of up to 28 mm over the Bataan portion. The assessment predicts that there will probably be flooding downstream, considering primarily its topographic location. A portion of the Labac River Basin appears highly susceptible to flooding. Vulnerable areas are most evident in the eastern part, including the municipality of Naic, downstream and urban areas. However, there would be an improvement in flooding susceptibility in the late future under two scenarios due to a projected significant decline in rainfall amounts and possible long dry spells.

Exhibit 5-9: Flood Susceptibility of the Project Location



119. The BCIB interchanges and viaducts component are being designed at an elevation above the projected water level. The project will not be blocking water flows and impeding water drainages. Installation of pipes, box culverts, and side ditches follows the provision of the DPWH-DO No. 40 series of 2012, on the guidelines on required drainage works along the approach roads. Flood and stormwater will run off into drainage canals and nearby creeks.

120. Under Package 1, the south-eastern portion of Bataan exhibits a radial drainage pattern since it is located on the flanks of Mt. Mariveles. The landing point in Bataan is part of the Pangolisanin/ Real River Basin, with a drainage area of 36.3 km^2. It is observed that the Mt. View Waterway Bridge location is considered low to very low susceptible to flooding due to its alignment across the gully, although it is intermittent. The rest of the project alignment will likely not be exposed to any flooding because of the high elevation and the drainage patterns near the project areas. The stream networks of the Santolan-Bulok River and Pangolisanin-Real River along the project alignment are radial patterns, which means all river systems directly flow to the seas. However, the landing point between Station 5+800 and Station 5+900 is considered to be at high risk to coastal flooding due to seawater intrusion during high tides.

121. Under Package 2, flooding in the Cavite segments is primarily due to inundation from sea and stormwater during extreme events. The landing point in Cavite is part of the Labac River Basin, which has a drainage area of 94.5 km^2.

122. In Cavite, the Provincial Government already undertook surface water and groundwater assessment through the Cavite Integrated Water Resource Management Master Plan in 2012. The evaluation was made to estimate the stream discharge of major river basins that originate in the southern mountainous part of the province and flow northerly, traversing the various municipalities and emptying into Manila Bay. The four (4) gauged rivers are the Maragondon River in Maragondon, the Panaysayan River in General Trias, the Balsahan River in Naic, and the Ilang-ilang River in Imus City. The flow of a river varies in response to available precipitation, topographic features, soil conditions, land cover, hydro-geologic characteristics, and channel geometry. Changes in land use, drainage patterns, stream geometry, and groundwater levels also produce variations in streamflow. In Naic, for instance, the Balsahan River monthly discharge records ranged from 0.07 cm to 17.89 cm with a peak discharge during July.

123. During the field site visit, the team held interviews with the head of the Municipal Disaster Risk Reduction and Management Office (MDRRMO), barangay captain and its administrator, and local community residents to confirm the exposure and susceptibility of the project areas to flooding (Exhibit 5-10 and Appendix 2). While on-site, the project team confirmed that areas in the Cavite segment already experienced moderate flooding in 2014, 2019, and 2020. In 2014, flooding was associated with extreme rainfalls brought about by typhoon Glenda that caused almost a meter inundation of the entire low-lying areas of the municipality of Naic. This event happened again in 2019 and 2020 due to typhoons *Tisoy* and *Rolly*. Poor drainage systems mainly caused the flooding in the municipality.

124. Participating stakeholders in the consultations were also aware of the project location and alignment and confirmed that the project areas are susceptible to flooding. Interchange areas between Station 33+100 and Station 33+200 roadways, and from Station 0+000 to Station 0+501.782 and Station 0+000 to Station 0+700 are highly vulnerable to flooding. It must be noted that the project alignment is 500 m away from the main tributary of the Labac and Timalan Rivers.

Exhibit 5-10: Conducted Interviews to Validate Project Areas Exposure and Susceptibility to Flooding

Interview with Mr. Alvin Binondo and Engr. Marcelo Serrano of the Municipal Disaster Risk and Management Officer, Mariveles, Bataan on 25 October 2021.

Interview with Brgy. Chairman Leoncio Lungcay (represented by his Brgy. Administrator), Mt. View, Mariveles, Bataan on 26 October 2021

Interview with Mr. Jesly Gonzales, the Municipal Disaster Risk and Management Officer of Naic, Cavite on 28 October 2021.

Interview with Brgy. Chairwoman Marissa Pabiton, Timalaya Conception, Naic, Cavite on 28 October 2021.

Interview with Mr. Sitoy Doculan, a Bantay Dagat in Barangay Mt. View, Mariveles, Bataan on 26 October 2021

Interview with Mr. Nick Salvador, a Bantay Dagat and Tanod of Barangay Timalaya Conception, Naic, Cavite on 28 October 2021.

5.4 Mean Sea Level

5.4.1 Global Sea Level Rise

125. The observed global sea-level rise rate for the 20th century has been reported in various literature to be about 1.7 mm/yr (Church et al., 2013; Kahana et al., 2016; Oppenheimer et al., 2019; Wang et al., 2021). Recent estimates from the IPCC AR5 assessment indicate that it is very *likely* (probability > 90%) that this rate has increased in the last part of the century, between 1993 and 2015, to 2.8–3.6 mm/yr, and that the total sea-level rise for 1901–2010 was 1.9 mm (Church et al., 2013; Kahana et al., 2016; Oppenheimer et al., 2019).

126. Based on the report of Oppenheimer et al. (2019), future rise in global mean sea level (GMSL) caused by thermal expansion, melting of glaciers and ice sheets and land water storage changes, is strongly dependent on which RCP emission scenario is followed. The sea level rise (SLR) at the end of the century is projected to be faster under all scenarios, including those compatible with achieving the long-term temperature goal set out in the Paris Agreement. GMSL will rise between 0.43 m (0.29–0.59 m, *likely* range; RCP2.6) and 0.84 m (0.61–1.10 m, *likely* range; RCP8.5) by 2100 (*medium confidence*) relative to 1986–2005 (Exhibit 5-11).

127. Beyond 2100, sea level will continue to rise for centuries and will remain elevated for thousands of years (*high confidence*). Only a few modelling studies are available for SLR beyond 2100. However, all studies agree that the difference in GMSL between RCP2.6 and RCP8.5 increases substantially on multi-centennial and millennial time scales. On a millennial time scale, this difference is about 10 meters in some model simulations, whereas it is only several decimeters at the end of 21st century. The larger the emissions the larger the risks associated with SLR as already assessed in SR1.5. Under RCP8.5 the few available studies indicate a likely range of 2.3 – 5.4 m in 2300. With strong mitigation efforts (RCP2.6), SLR will be kept to a *likely* range of 0.6 – 1.1 m. Regardless, ambitious and sustained adaptation efforts are needed to reduce risks.

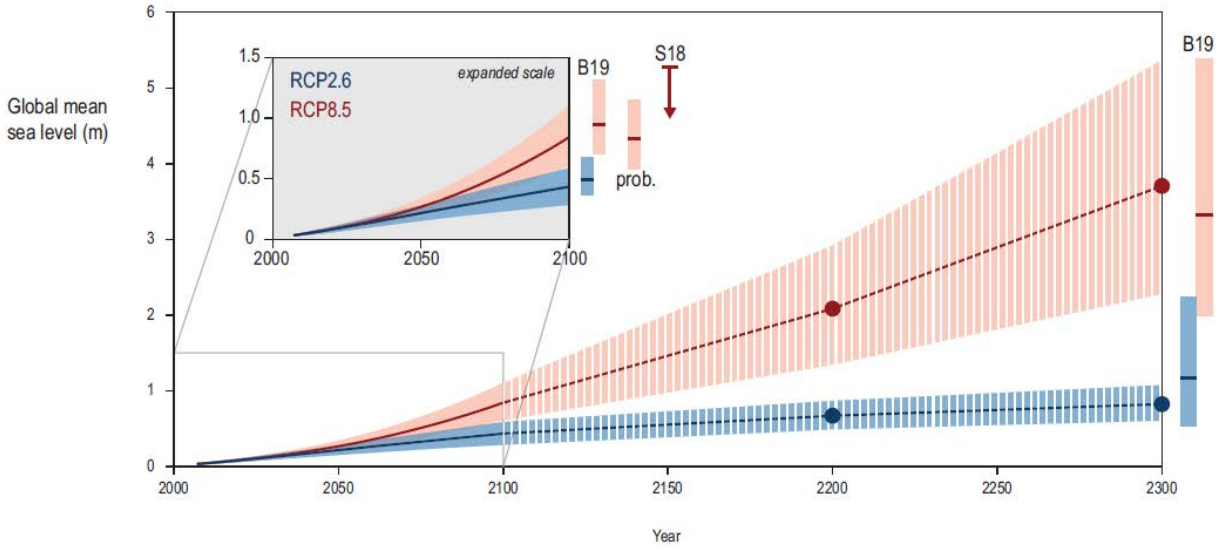
128. The global and regional mean sea levels will change due to climate change. Coupled climate models are used to make projections of the climate changes and the associated SLR. Results from the CMIP5 model archive used for AR5 provide information on expected changes in the oceans and the evolution of climate, glaciers, and ice sheets. The new estimates from CMIP6 are not yet available and will be part of the discussion in the IPCC 6th Assessment Report (AR6).

129. Projections of sea-level rise are larger than in the AR4, primarily because of improved modeling of land-ice contributions. For the period 2081–2100, compared to 1986–2005, global mean sea level rise is likely (*medium confidence*) to be in the 5 to 95% range of projections from process-based models, which give 0.53 m (0.36 to 0.71 m) for RCP4.5, and 0.74 m (0.52 to 0.98 m) for RCP8.5. For RCP8.5, the global mean sea level rise rate in 2100 is 11.2 mm/yr (7.5 to 15.7 mm/yr).

5.4.2 Sea-Level in the Philippines

130. Exhibit 5-14 shows satellite observations for 1993–2015 of the Tropical Western Pacific region, to the east of the Philippines, experiencing sea level rise at a rate of 5–7 mm/yr, which is more than thrice the global average. The most considerable rate of 4.5–5 mm per year is observed in the east of the islands of Leyte and Samar, and Mindanao, south of Zamboanga, and along the southwestern coasts of the Central and Western Visayas. However, Kahana et al. (2016) reported that the satellite record is relatively short, and the regional patterns and rates do not necessarily represent the entire 20th century. It might be caused by the timing and magnitude of shorter natural modes of variability such as El Nino Southern Oscillation (ENSO) and the Pacific Decadal Oscillation.

Exhibit 5-11: Projected Sea Level Rise Until 2300



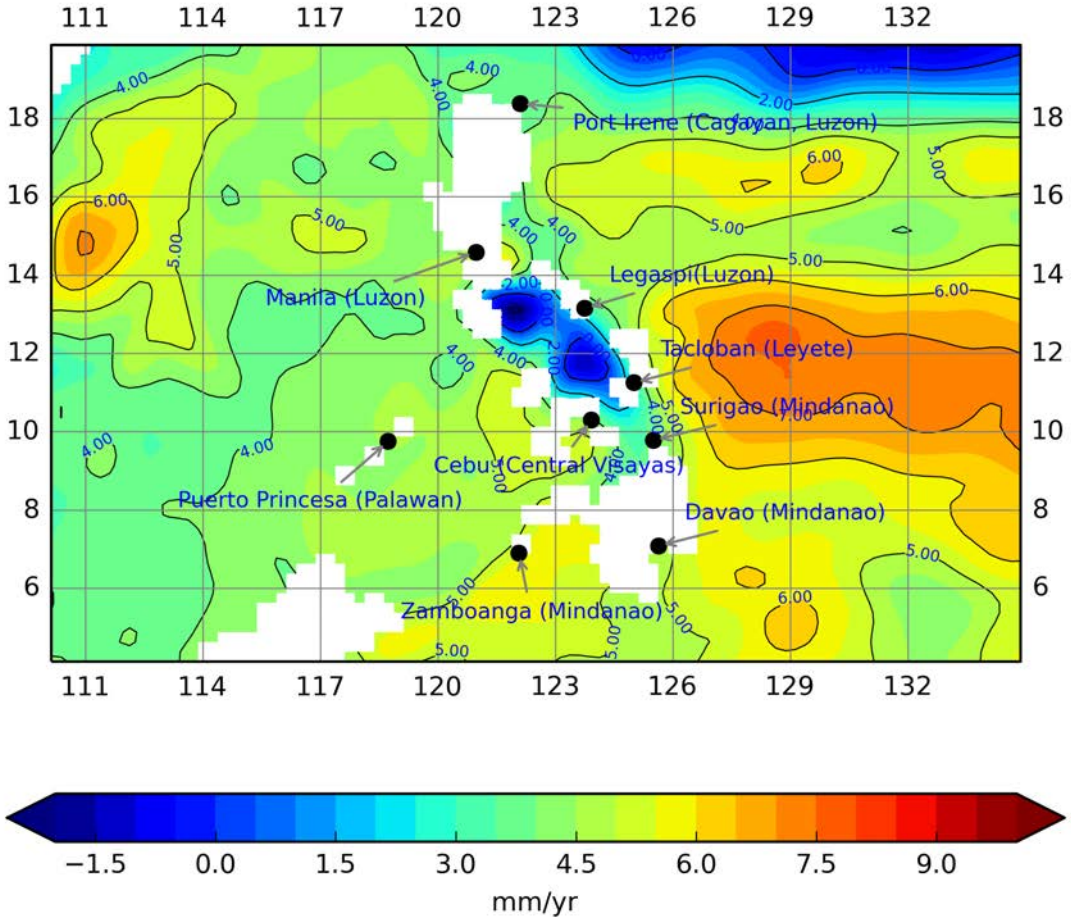
Source: Chapter 4: Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities. p.327.
Note: The inset shows an assessment of the likely range of the projections for RCP2.6 and RCP8.5 up to 2100 (medium confidence). Projections for longer time scales are highly uncertain but a range is provided (low confidence). For context, results are shown from other estimation approaches in 2100 and 2300. The two sets of two bars labelled B19 are from an expert elicitation for the Antarctic component (Bamber et al., 2019), and reflect the likely range for a 2 ºC and 5 ºC temperature warming (low confidence). The bar labelled "prob." indicates the likely range of a set of probabilistic projections. The arrow indicated by S18 shows the result of an extensive sensitivity experiment with a numerical model for the Antarctic Ice Sheet (AIS) combined, like the results from B19 and "prob.", with results from Church et al. (2013) for the other components of SLR. S18 also shows the likely range.

131. The time series of the projected sea level change (SLC) under RCP4.5 and RCP8.5 are presented in Exhibit 5-12. The solid line represents the central (50th percentile, median) estimate. The dotted line of uncertainty covers the likely (10% and 90%) rather than the full range of possible future sea-level changes. This implies that there is still a probability of ~40% that sea level will rise or decline beyond these range.

132. The World Bank projection for the Philippines reveals a slightly lower than global average sea-level rise in the 21st century.[19] In the near term, both the medium–low GHG concentration scenario (RCP4.5) and the high-end scenario (RCP8.5) lead to similar increases in sea level. However, the high-end scenario adds approximately 0.20 m to the projected mean sea level with 0.63 m sea-level change by the end of the 21st century (Exhibit 5-13).

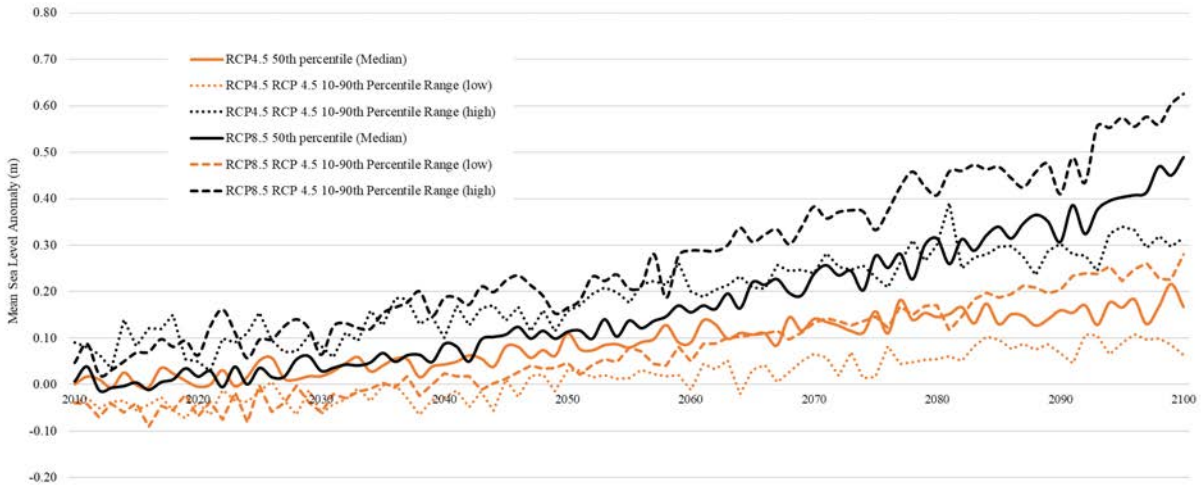
[19] Based on sea level change projection from the climate change knowledge portal.

Exhibit 5-12: Sea Level Changes in the Philippines Region from 1993 to 2015 Produced from the AVISO Satellite Observations



Source: Kahana R, Abdon R, Daron J and Scannell C. 2016. Projections of Mean Sea Level Change for the Philippines. p.9.

Exhibit 5-13: Change Anomaly of the Mean Sea Level in the Philippines



Note: Interpolated based on the Philippines' Climate Change Knowledge Portal dataset.

5.4.3 Mean Sea Level at a Site

133. Following the methods adopted by the US Army Corps of Engineers,[20] a local historical rate of sea-level change is used as the estimate. The past rate is extrapolated over the (economic or service) life of the infrastructure project and added to the datum. This must be regarded as a lower bound because future contributions from ice melt, thermal expansion, and changes in the Earth's gravity field are expected to be greater in a warmer world than before.

134. The estimate of the mean sea level at a site only considers the lower bound mean sea-level change because of insufficient information on the upper sea level rise, surge, wave, high tide, and tidal regime. The assessment derived a linear extrapolation of the trend of mean sea-level from the historical tide records and adjusted to a revised local reference level by the Permanent Service for Mean Sea Level (Exhibits 5-14 and 5-15).

135. Manila harbor is considered the nearest available tide-gauge at a site about 40 km away from Cavite and Bataan navigation bridges and marine viaduct projects. The sea-level datum for Manila Harbor in the year 2000 was 7,450 mm. The observed rate of sea-level change at the site is +8.286 mm/year over the available period of record. This yields a sea-level estimate of 8,150 mm by 2100, after rounding up to the nearest 50 mm. It must be noted that local storm surge, tide, and wave effects are not included.

136. The Manila tide-gauge record shows a massive change in the early 1960s. Values published in various literature since the 1960s reached 26 mm/yr (Perez et al.,1999; Rodolfo and Siringan, 2006), but it was reported to be heavily influenced by groundwater extraction and land subsidence (Church et al., 2013; Amiruddin et al., 2015). The observed sea-level rise shows that the above-average sea-level rise experienced in Manila Bay in recent decades (between 1960 and 2019) is estimated to be at 16.35 mm/yr, about ten times the global average. Groundwater extraction has been reported as the leading cause of cumulative subsidence of over 1.0 m since the early 1990s in the Manila Bay area (due to urban use) and the neighboring Pampanga delta (due to agricultural use) (Rodolfo and Siringan, 2006).

137. For their part, Kahana et al. (2016) made projections of mean sea level change for the Philippines. This study was part of a DFID-funded project focusing on building resilience to the country's tropical cyclones and climate extremes. It aimed to provide a range of predictions for regional changes in the mean sea level through the 21st century. Estimates are based on the projections for future changes to the GMSL from the IPCC AR5 (Church et al., 2013a), combined with the effects of the oceanic, atmospheric, and land processes operating in the Philippines region.

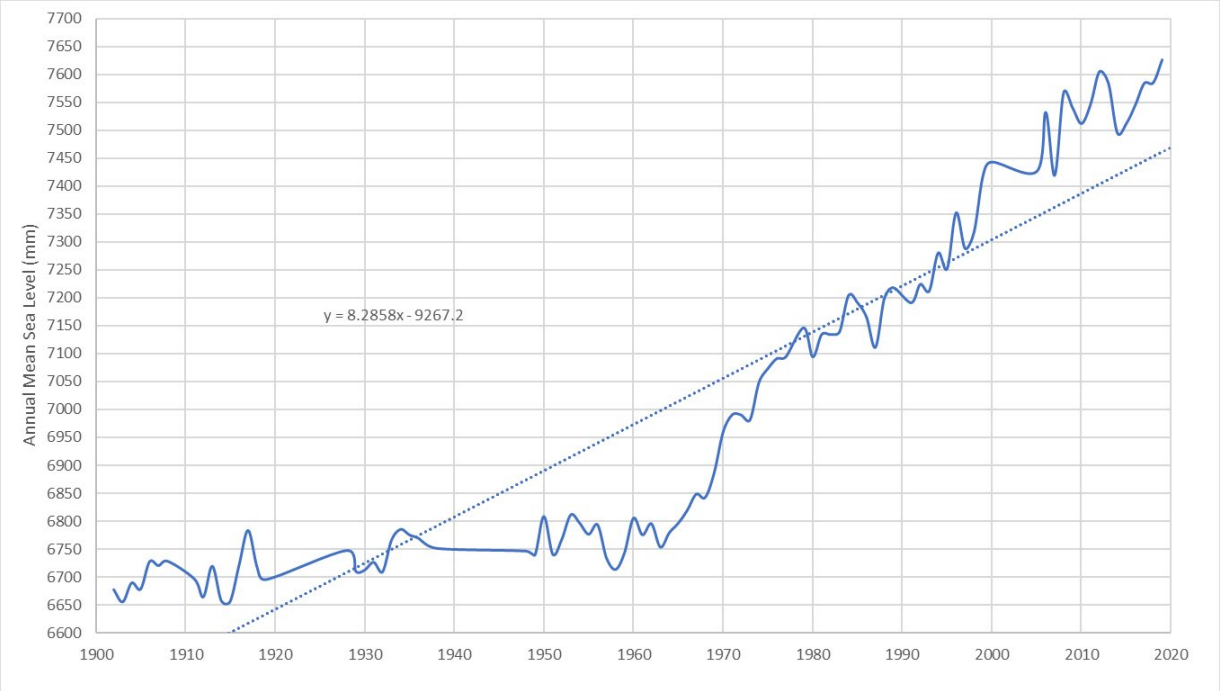
138. The project estimated future regional sea level changes for the Philippines by using projections for the GMSL changes from the IPCC AR5 and combining them with non-uniform regional patterns of sea level change around the country. It is projected to be *slightly* larger than the global mean at the end of the 21st century. The Special Report on the Ocean and Cryosphere projection that the sea level rise is likely in the range of 0.61 to 1.10 m and 0.8 to 1.6 m in 2100 and 2130, respectively. The time series of the projected SLC under RCP4.5 and RCP8.5 are

[20] As cited in ADB 2020 Manual on Climate Change Adjustments for Detailed Engineering Design of Roads using examples from Viet Nam. pp. 11-17.

presented in Exhibit 5-16 (global mean) and Exhibit 5-17 (manila mean). The solid line represents the central (50th percentile, or median) estimate, and the shaded range of uncertainty covers the likely (66-100%) rather than the full range of possible future sea level changes.

139. Exhibit 5-18 shows the potential inundation coverage considering the projected sea-level rise combined with a storm surge and high tide wave in the project areas.

Exhibit 5-14: Interpolated Mean Sea Level at Manila Harbor Tide Station



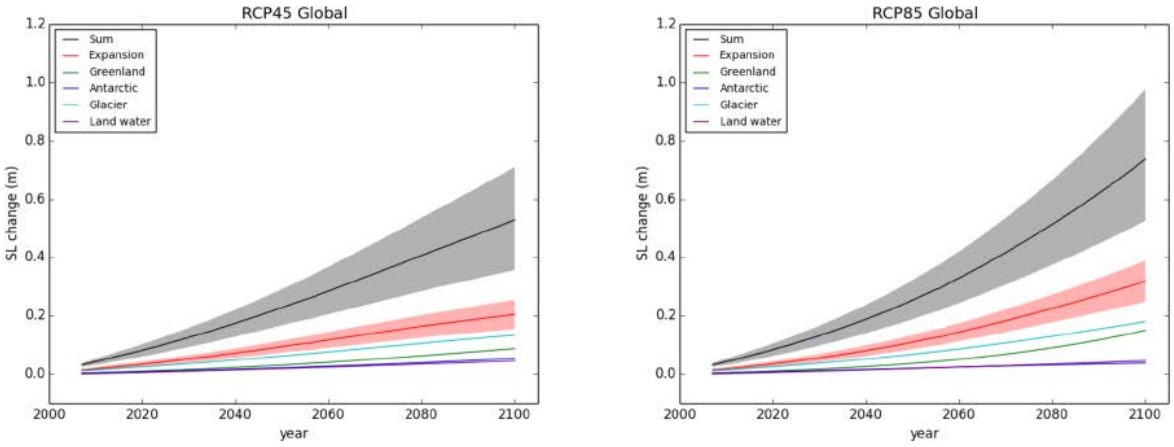
Source: Consultant's formulation

Exhibit 5-15: Projected Mean Sea Level Change (m) at Manila Harbor Tide Station

Scenario	Projected Sea Level Rise (m)			
	2021-2040	2041-2060	2061-2080	2081 -2100
Linear projection (median)	0.11	0.27	0.44	0.60
Lowest	0.03	0.19	0.36	0.53
Highest	0.19	0.35	0.52	0.68

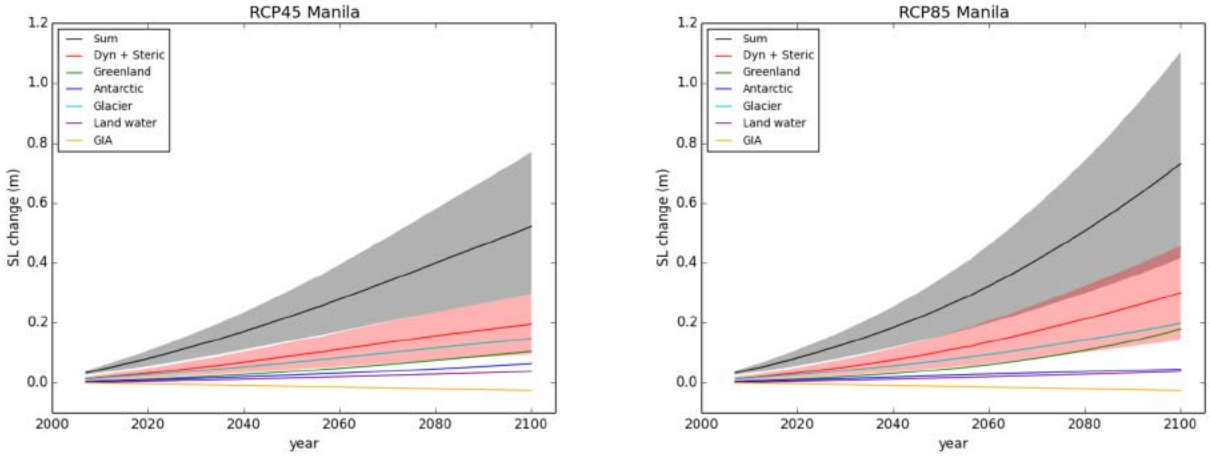
Source: https://www.psmsl.org/data/obtaining/map.html; Consultant's formulation

Exhibit 5-16: Time Series of the Global Mean Sea Level Change Projections Under RCP 4.5 and RCP8.5



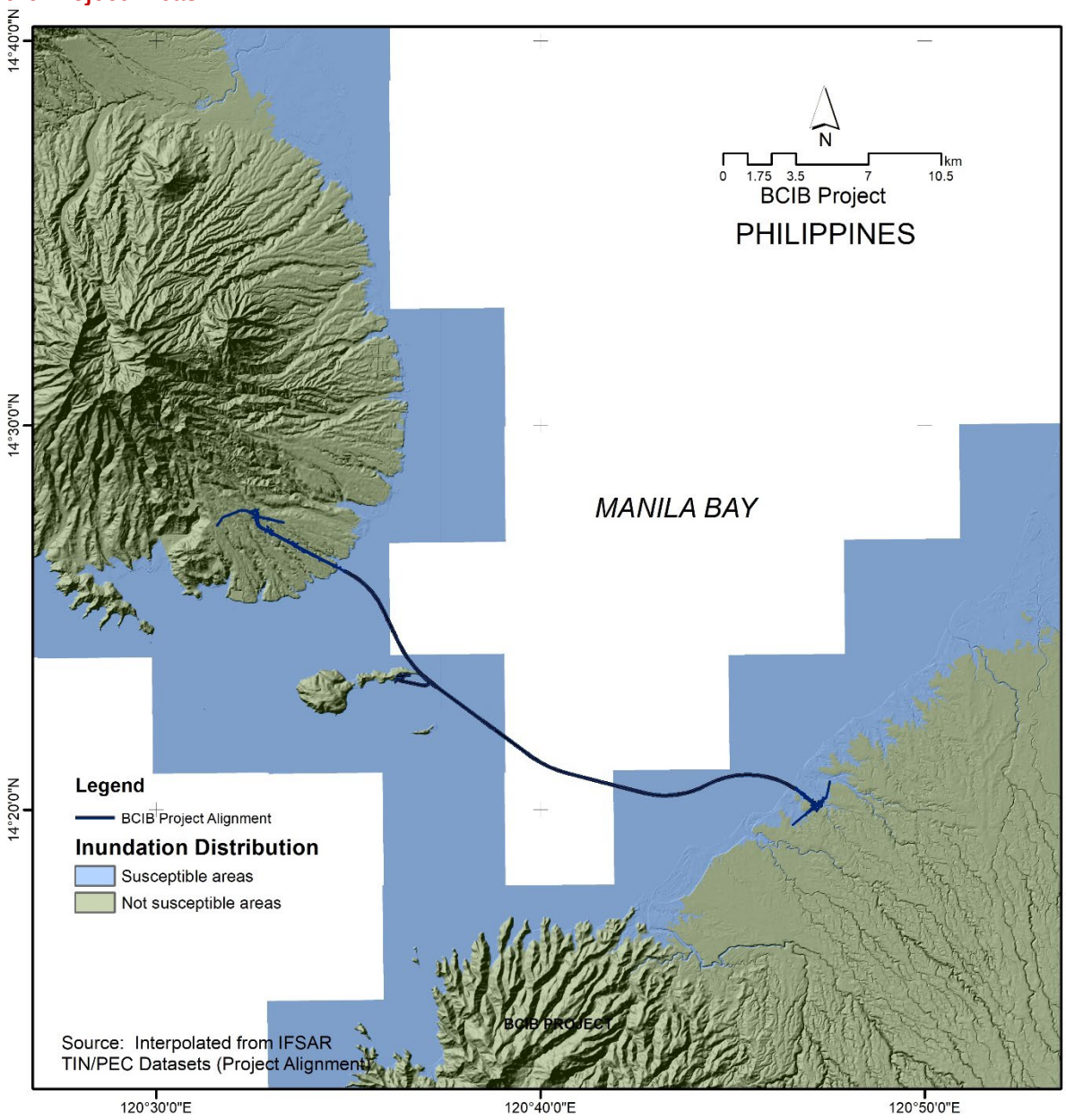
Source: Projections of mean sea level change for the Philippines, p.23.
Note: The solid line represents the central estimate, shaded area represents the uncertainty of the likely range.

Exhibit 5-17: Time Series of the Mean Sea Level Change for Manila



Source: Projections of mean sea level change for the Philippines, p.24.
Note: The solid line represents the central estimate, shaded area represents the uncertainty of the likely range.

Exhibit 5-18: Inundation Distribution Considering Sea Level Rise, Storm Surge, and High Tide Wave of the Project Areas



5.5 Storm Surge

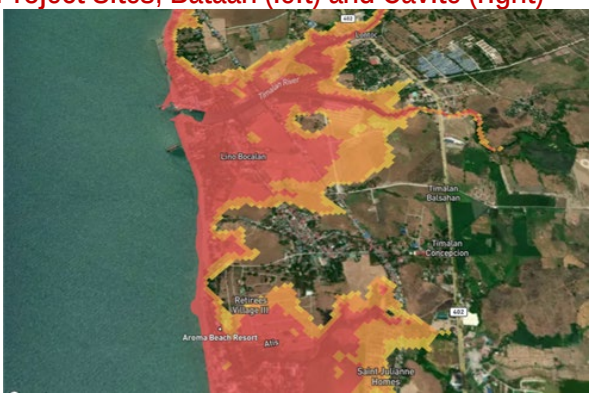
140. The Department of Science and Technology (DOST), together with the Philippine Institute of Volcanology (PHIVOLCS), has published a map showing tsunami-prone areas in the country (Exhibit 5-19). As seen on the map, the coastal areas of Manila Bay, including Bataan and Cavite, are prone to "trench-related" local tsunami, which means that seismic activity in the Manila Trench can trigger a tsunami along the coastal areas.

141. The passage of strong typhoons also generates storm surges along the coastal areas of the archipelago.[21] Project NOAH (Nationwide Operational Assessment of Hazards) in partnership with DOST through PAGASA, PHIVOLCS, and the DOST-Advanced Science and Technology Institute (ASTI), the UP National Institute of Geological Sciences, and the UP College of Engineering has embarked on Coastal Hazards and Storm Surge Assessment and Mitigation (CHASSAM). Along with other vital components of the project, the aim is to generate wave surge, wave refraction, and coastal circulation models to understand and recommend solutions for coastal erosion. NOAH maintains an online publication of storm surge maps along with other hazard maps.[22]

142. It can be seen from the image below that the coastal areas of Brgy. Timalan Concepcion are the only and potentially susceptible to storm surge events. Much of the sensitive areas can be dispersed on the main tributaries of the Labac River, which is about 500 m away from the Cavite interchange roadway alignment. Other adjacent areas along the alignment are susceptible to the storm surge, including Bataan project sites.

Exhibit 5-19: Susceptibility to Storm Surge of the Project Sites, Bataan (left) and Cavite (right)

Susceptibility of the project site in Barangay Mt. View, Mariveles, Bataan



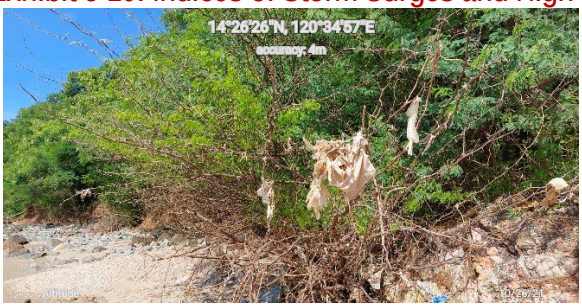
Susceptibility of the project site in Barangay Timalan Concepcion, Naic, Cavite

143. Motu et al. (2010) reported the maximum simulated tidal deviation caused by storm surges in Manila Bay. The model typhoon was the historic typhoon that caused the most considerable rise above general sea level. The study found that typhoons with the lowest pressures or strongest winds do not always yield the highest storm surge. After choosing the model typhoon, it's at-sea winds and barometric pressure field were calculated, then used to estimate the storm surge. In addition, the study calculated an intensified storm surge case (the model typhoon with 10% lower central pressure). The study found that the maximum calculated surge based on a typhoon that hit the islands in November 1957 was a 0.91-meter water level increase. The study estimated a 1.0-meter maximum water level increase in Manila Bay, given a 10% increase over historical typhoons.

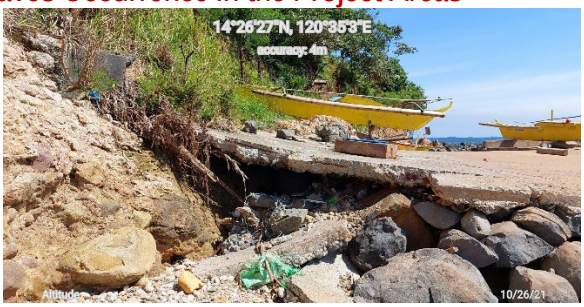
[21] A storm surge is a tsunami-like phenomenon of rising water resulting from typhoons (storms).
[22] https://noah.up.edu.ph/know-your-hazards/storm-surge

144. During the site visit, the study team observed different signs and indices of storm surge because of typhoons (Exhibit 5-20). Local communities, barangay officials, and MDRRMO staff of both municipalities also confirmed the slight incidences of storm surges in the areas.

Exhibit 5-20: Indices of Storm Surges and High Waves Occurrence in the Project Areas



Height indices of the storm surge



Collapse of the community boat landing areas due to high waves during the onset of typhoons

Exposed roots due to high tidal waves during typhoons Tisoy and Rolly occurred in 2019and 2020, repectively along Brgy. Timalaya Conception, Naic, Cavite

Affected beach offshore areas during the storm surge

5.6 Strong Winds

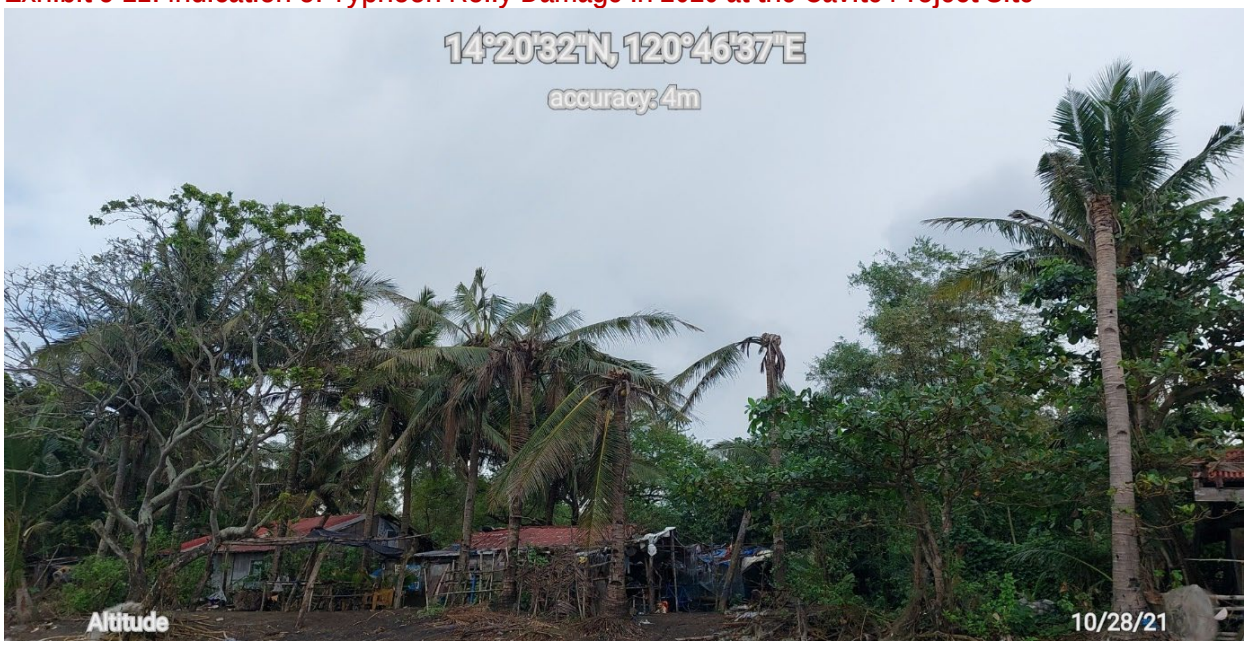
145. The project areas are categorically *medium* to *high risk* in typhoon occurrences. Again, Bataan and Cavite are hit by one (1) typhoon per year. Typhoon *Jolina* (with international name *Conson*) with sustained winds of more than 120 km/h was the latest to hit the project areas on 08 September 2021.

146. In 2019, Typhoon *Kammuri* hit Central Luzon with maximum sustained winds of 150 kph and gustiness of up to 185 kph causing moderate wind damage to Bataan province and other provinces of Region 3. Another noted tropical storm, typhoon *Rammasun*, hit the country in 2014 with peak winds at 120 kph and gustiness of 165 kph, caused widespread flooding due to heavy downpours.

147. For the last 70 years, PAGASA recorded an annual average of 20 tropical cyclones in the PAR, with nine of these passing through Philippine landmasses. PAGASA also tracked 27 tropical cyclones that crossed Bataan while 26 tropical cyclones crossed the Province of Cavite. These tropical cyclones traversed the project location during the months of September to October. The latest typhoon's effect is evident in a photo below of coconut trees along coastal areas on the Cavite side (Exhibit 5-21).

148. Although the estimates are uncertain, the maximum wind speed of future tropical cyclones is generally expected to increase. Similarly, the intensity of future storms is generally expected to increase, although the details of these changes are highly uncertain. The frequency of future severe storms is even more uncertain. Some scientists predict that their intensity may increase with climate change (Knutson et al., 2010; Emanuel 2013). Moreover, regardless of any increase in intensity or frequency, their effects would likely be exacerbated by the Philippines' rapidly growing population, particularly along the coast, and by localized environmental degradation (Holden and Marshall, 2018).

Exhibit 5-21: Indication of Typhoon Rolly Damage in 2020 at the Cavite Project Site

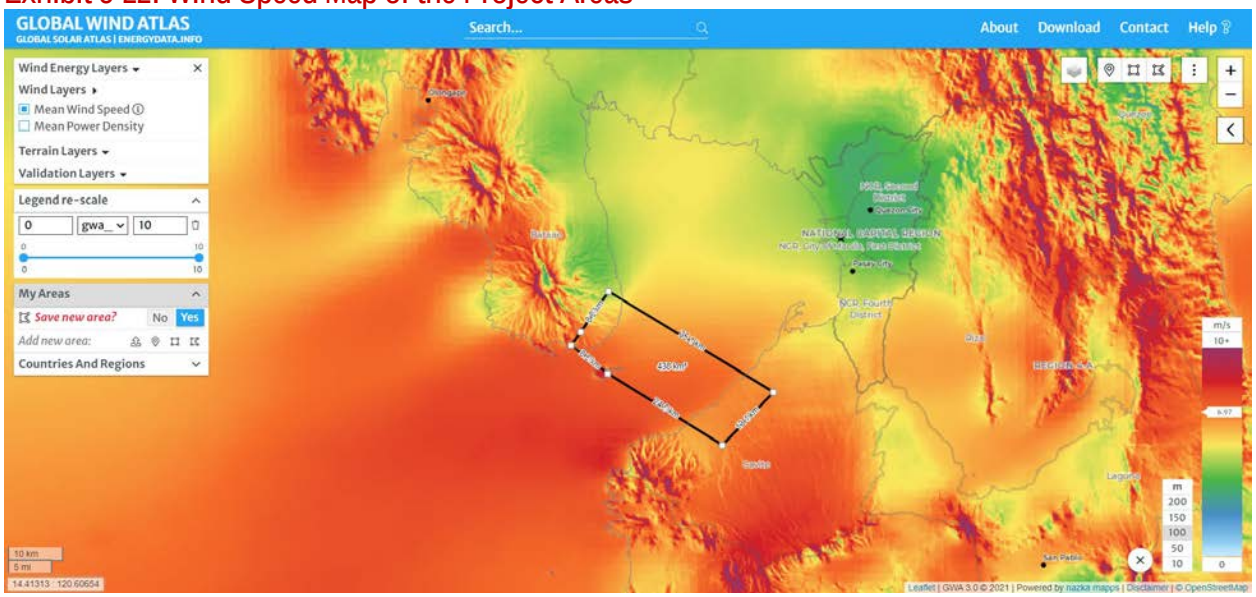


149. Exhibit 5-22 shows the project area and mean wind speed map. Seasonally, the Mariveles and Nasugbu mountain ranges create a funnel that constricts the wind from the West Philippine Sea towards Corregidor Island. Bataan and Cavite sections have mean wind speeds ranging from 6.61 to 7.05 m/s and from 6.60 to 7.37 m/s, respectively, while the Corregidor Island portion is exposed at rates ranging from 6.96 to 7.19 m/s. In contrast, the mean wind at the Sangley Weather Station is 5.91 m/s, or about 1.2 times less than on the Bataan alignment. For instance, based on the orographic effect and a simple ratio and proportion, the wind speed in Bataan could reach 231 kph considering the historically recorded peak wind speed of 194 kph in Sangley Point Station.[23] A study on Design Tropical Cyclone Wind Speed when considering Climate Change indicated that wind speed during tropical cyclones increases by 1.2-1.4 times the historical record.[24] These could increase the wind speed in Bataan section to well over 300 kph. Other details are presented in Exhibit 5-23.

[23] 54 mps or 194.4 kph is the extreme wind speed event recorded on 13 July 2010

[24] Xu H et al. (2020). Design Tropical Cyclone Wind Speed when Considering Climate Change. https://ascelibrary.org/doi/pdf/10.1061/%28ASCE%29ST.1943-541X.0002585.

Exhibit 5-22: Wind Speed Map of the Project Areas



Source: https://globalwindatlas.info/

Exhibit 5-23: Estimated Peak Wind Speed with Climate Change Consideration

Alignment Section	Mean Wind Speed Range (m/s)[a]	Estimated Wind Speed (kph)[b]	With Climate Change Consideration[c]
Bataan	6.61 – 7.05	231	300
Corregidor	6.96 – 7.19	236	307
Cavite	6.60 – 7.37	242	315

[a] Values are taken from global wind atlas with an altitude of 100 m.

[b] A simple ratio and proportion considering the historically recorded peak wind speed of 194 kph in Sangley Point Station

[c] Tropical cyclones increase by 1.3 times the historical record considering climate change as per study on Design Tropical Cyclone Wind Speed.

5.7 Landslide

150. Landslide is essentially described as the downward movement of a relatively dry mass of earth and rock. It is a process where soil particles are detached, transported, and deposited from one place to another. It is usually triggered by excessive rainfall or the occurrence of an earthquake strong enough to cause instability in the underlying rock layer.

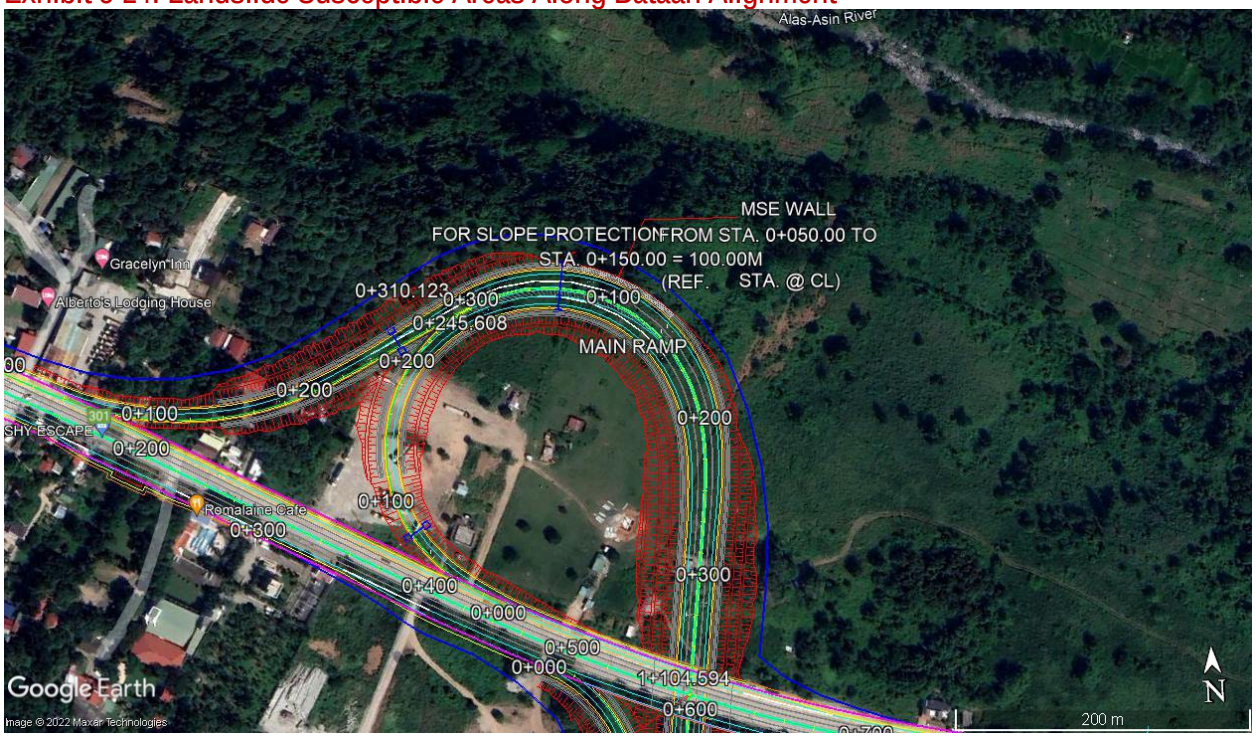
151. The DENR-MGB (undated) issued a landslide susceptibility map for both provinces. At the Cavite segment, the interchange and roadway alignment runs through a gentle to flat alluvial plain at the shoreline, and the landslide susceptibility is negligible. Consequently, it is expected that the hazards from mass movements will not significantly affect the project structures onshore in the future.

152. The BCIB project is within a gently sloping interfluve terrain at the coastal area of the Bataan end alignment with generally low landslide susceptibility although the project alignment located between Station 0+050 and Station 0+150 is highly susceptible to landslide (Exhibit 5-24).

153. The maximum 1-day total (Rx1day) describes the maximum amount of rain that can fall in one day. This extreme rainfall is typically associated with local thunderstorms or large-scale systems, such as monsoons or tropical cyclones, and may induce flash floods or landslides. Based on the rainfall projection in Bataan, changes in the Rx1day are expected to vary temporally with wetter trends during the mid-future (2046 – 2065). In the RCP8.5 scenario, the project areas are projected to have an increasing Rx1day as time progresses, to around 300 mm in the mid-future.

154. Increased Rx1day rainfall and higher intensities will likely reduce soil stability. This applies to natural slopes and man-made structures, such as road embankments and cuttings. Consequently, the frequency of slope failures affecting the road system is believed to increase in such stations (between 0+050 and 0+150), where more intense rainfall is expected. It means that the area requires slope protection and climate change considerations in making protective measures.

Exhibit 5-24: Landslide Susceptible Areas Along Bataan Alignment



5.8 Heatwaves

155. The project areas (Bataan and Cavite) have been experiencing warmer temperatures, with the warmest daytime temperature of about 39 °C. The current median probability of a heatwave (a period of 3 or more days where the daily temperature is above the long-term 95th percentile of daily mean temperature) is around 2%. This low value reflects the relatively stable temperature regime. Under two (2) emission pathways projections, the probability of experiencing a heatwave increases dramatically by up to 76% under the RCP8.5 pathway in 2081–2100. However, this

indicator is somewhat distorted by the definition of a heatwave. Usually, climate change continually pushes temperatures away from the baseline (1986–2005), meaning a long-term change is captured as a heatwave. Another lens to measure heatwave potential is through the annual maximum of daily maximum temperatures.

6. GREENHOUSE GAS EMISSIONS REDUCTION

156. The transportation sector is a major contributor to GHG emissions, considering energy and fuel consumption as the main factors in the analysis. Transport accounts for around one-fifth of global carbon dioxide (CO_2) emissions.[25] Carbon dioxide comprises most of the transport GHG emissions. Thus, the implementation of the BCIB project will certainly increase GHG emission through the consumption of fossil fuel during construction and operation phases.

157. A quantitative GHG assessment was performed to estimate the potential GHG emissions of the project through the methodology of the Inter-governmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories and ADB Guidelines for Estimating GHG Emissions of ADB Projects (Additional Guidance for Transport Projects).[26] The guidelines provide suggested methodologies in calculating GHG emissions in different transport subsectors.

158. With the above guidelines, the framework of the Greenhouse Gas Protocol classifies emissions as *direct* GHG emissions and *indirect* GHG emissions. Under this definition, the majority of GHG emissions for the transport sector are Scope 3 indirect GHG emissions, since they primarily arise from the use of energy by vehicles whose movements occur on or due to the infrastructure. This generally comes in the form of the consumption of gasoline, diesel, and other forms of fossil fuels. Therefore, Scope 3 emissions are the primary consideration for the project. Emissions that relate to the construction of the transport infrastructure are considered direct GHG emissions and included in the analysis.

[25] Ritchie H. 2020. URL https://ourworldindata.org/co2-emissions-from-transport

[26] ADB. 2016. *Guidelines for estimating greenhouse gas emissions of Asian Development Bank projects additional guidance for transport projects.* Manila, Philippines. 21p.

6.1 CO_2 Emissions During Construction

159. The concept and approach of estimating GHG emissions attributed to the project are shown in the table below.

Exhibit 6-1: Estimation of GHG Emissions during Construction Phase

Emission Source	Approach	Variable
Emissions from the carriage of construction plant equipment to site	For each plant type: carbon emissions = distance traveled by plant type x relevant emissions factor (kg CO_2/km)	Number and type of plant equipment, distance traveled (km)
Emissions from the carriage of bulk construction materials to site	For each bulk material: carbon emissions = total volume of material (tonnes) x % carried by road x distance from point of manufacture to site (km) x relevant emissions factor (kg CO_2/km)	Volume of each bulk material (tonnes), % carried by mode of transport (road), distance from point of manufacture to site (km)
Emissions from the carriage of excavated material from site	Carbon emissions = total volume of excavated material (tonnes) x % carried by road, rail x distance traveled to landfill site(s) (km) x relevant emissions factor (kg CO_2/km)	Volume of excavated material (tonnes), distance to landfill site(s) (km), % carried by mode of transport (road)
Emissions from construction personnel travel to and from the site	Mode of transport characteristics (i.e., private transport or public transport)	Mode of transport specification and/or efficiency
Emissions from the manufacture (cradle to gate) of bulk construction materials (embedded carbon) for each type of track feature (i.e., viaducts, tunnels, stations); bulk construction materials include concrete, steel, aluminum, copper, and aggregate	Carbon emissions = tonnes of steel x relevant emissions factor (kg CO_2/ton)	Tonnes of steel
	Carbon emissions = tonnes of concrete x relevant emissions factor (kg CO_2/ton)	Quantity (tonnes) and grade (% of cement) of concrete used
	Carbon emissions = tonnes of ballast (aggregate) x relevant emissions factor (kg CO_2/ton)	Quantity (tonnes) of aggregate required
Emissions from materials	Quantity (m^3) x Density (kg/m^3) x EF	
Emissions from equipment	Fuel Consumption Rate x Quantity x Duration (hr) x EF	Duration (hours)
Emissions from transportation	Mass (kg transported) x Distance (km) x EF	

Note: Emission factor of GHG in consideration, based on the default EF by type of fuel (kg fuel/gal). Based on the Emission Factors for Greenhouse Gas Inventories for mobile combustion of CO_2 for diesel fuel, 2.70 kg CO_2/liter (10.15 kg CO2/gal) is used. 1L = 0.26417 gallon

160. The GHG emission attributed to the project during the construction stage are assessed as direct GHG emissions and indirect GHG emissions. The direct sources of CO_2 emissions during the BCIB project construction phase include on-site use of oil or electricity in construction machinery, vehicles, and power generators. The transport of construction materials to the project sites also contributes to CO_2 emissions. The indirect emissions are attributed to the embodied

carbon in construction materials and fuels used on-site. CO_2 emissions are released during the production of construction materials. The production process includes extraction, transportation, processing, and distribution. These emissions are indirect emissions as they are not released at the project sites but elsewhere.

161. In particular, the assessment has considered four (4) types of emission sources: i) GHG emissions that occur in *producing* the main materials, ii) GHG emissions that occur in *transporting* the main materials, iii) direct emissions due to combustion of fossil fuels that are used at road and bridge construction sites using different types of construction machinery and vehicles, iv) GHG emissions from the buildings, vehicles, and other road facilities, and v) removal of vegetation.

162. The first type is based on the fuel consumption that occurs in producing main materials. Again, these emissions are indirect emissions as they are not released at the construction site but elsewhere. The assessment provided quantities of steel, cement, fine aggregate, coarse aggregate asphalt which are determined during the feasibility study and DED stage. Exhibit 6-2 gives the quantity of materials to be used in producing main materials and the estimated CO_2 emissions during construction.

163. The second type of GHG emissions are from fuel consumption that arises from transporting main materials. GHG emissions associated with the use of materials, equipment, and their transportation during the construction phase were estimated in the project. An average of 100 km is assumed transport distance from point of manufacture to the project site. Exhibit 6-3 summarizes the number of different materials used per kilometer during the construction stage.

Exhibit 6-2: Estimated CO_2 Emissions Generated from Main Materials Used for the BCIB Project

Material [a]	Quantity (ton)	Emission Factor ($kgCO_2$/ton)[b]	CO_2 Emissions (tonnes/CO_2)
Steel	303,896	1.460	444
Cement	440,543	0.762	336
Fine aggregate	1,071,486	0.002	2
Coarse aggregate	1,398,493	0.004	6
Asphalt	149,420	0.066	10
Fly Ash	124,108	0.240	30
Total	3,487,946		828

[a] Based on the estimated material delivery quantities for the project.

[b] ADB. 2016. *Guidelines for estimating greenhouse gas emissions of Asian Development Bank projects additional guidance for transport projects.* Manila, Philippines. p.20.

Exhibit 6-3: Estimated CO_2 Emissions Generated from Transporting Main Materials for the BCIB Project

Material	Vehicle	Transport Distance (km)	Volume of Materials (tons)	Emission Factor ($kgCO_2$)	CO2 Emission (tonnes)
Steel	Heavy Truck 49T	100	303,896	1.460	44,369
Cement	Heavy Truck 49T	100	440,543	0.762	33,569
Fine aggregate	Medium Truck 18T	100	1,071,486	0.002	214
Coarse aggregate	Medium Truck 18T	100	1,398,493	0.004	559
Asphalt	Medium Truck 18T	100	149,420	0.066	986
Fly Ash		100	124,108	0.240	2,979
Total					82,677

Note: 100 km is assumed transport distance based on the similar project in Korea (11.65 km Bridge to Incheon International Airport Mega Project).

164. The third type is fuel and electricity consumption from the use of heavy equipment and different types of construction machinery, generators, vehicles, and batching plants used at the construction sites.[27] Exhibit 6-4 summarizes the CO_2 emissions according to the amount of oil or electricity consumption per equipment and other machinery specifications used on the marine viaduct, navigational bridge, interchanges and viaducts on land, and approach ramps construction.

Exhibit 6-4: Estimated CO_2 Emissions Generated from Heavy Equipment, Generators, and Other Machineries

Device Name	Fuel Consumption Rate (l/hr)	Fuel Consumption Rate (kWh)	Quantity*Duration	GHG Emissions (Tonnes CO2e)
400 Amp Welding Machine (kWh)		453	538,096	106,035
500 Amp Welding Machine (kWh)		562	95,680	23,384
Alimak Elevators		1,404	24,336	14,868
80 kW Generator	12.00		193,648	6,274
CAT 374 Excavator	34.10		5,616	517
CAT 325 Excavator	18.90		71,552	3,651
CAT D7 Dozer	10.00		11,232	303
CCS9 Compactor/Roller	8.00		11,232	243
CAT 938 Wheel Loader	10.00		5,616	152
CAT 986K Rubber Tire Loader	10.00		79,456	2,145
CAT 14 Motor Grader	10.00		8,424	227
10-Ton 4WD Forklift	8.00		76,960	1,662
2-Ton Flatbed Trucks	2.90		59,488	466
1/2-Ton Pickup Trucks	2.00		317,200	1,713
S-30 Derrick Crane	10.00		6,240	168
Lifting Frame w/ Hoists	10.00		16,640	449
3,000-Ton Crane	400.00		17,472	18,870
2,000-Ton Crane	300.00		21,008	17,016
4100 Series 3 Ringer Crane	400.00		8,320	8,986
300-500 Ton Derrick Crane	10.00		97,552	2,634
300 Ton Crawler Crane	50.00		138,112	18,645
200 Ton Crawler Crane	25.00		36,712	2,478
160-Ton Rubber Tire Crane	25.00		8,320	562
60-Ton Rubber Tire Crane	12.00		58,032	1,880
45-Ton Rubber Tire Crane	12.00		8,320	270
Small Boom Truck (Neckbreaker)	15.90		8,320	357
375 kW Generator + CAT C9 Engine	50.00		97,552	13,170
2 Drum Aux. Hoist on Crane for Pile Driving	10.00		195,104	5,268
3-Drum 20,000 Lb Winch for Spuds	10.00		105,872	2,859
IHC Hydraulic Pile Hammer	10.00		36,608	988
Powerpack for IHC Hydraulic Pile Hammer	10.00		36,608	988
APE 400 Vibratory Hammer	10.00		86,216	2,328

[27] Equipment and diesel consumptions are based on the completed 11.65 km Bridge to Incheon International Airport Mega Project from 2005 to 2009 in the Republic of Korea.

Device Name	Fuel Consumption Rate (l/hr)	Fuel Consumption Rate (kWh)	Quantity*Duration	GHG Emissions (Tonnes CO2e)
Powerpack for APE 400 Vibratory Hammer	10.00		86,216	2,328
D46 Pile Hammer	19.10		8,944	461
185 CFM Air Compressor	13.00		235,456	8,265
750 CFM Air Compressor	13.00		44,928	1,577
Hoisting Gear 120 kW Generator	10.00		73,008	1,971
36 kW Portable Generator	7.00		278,096	5,256
10 kW Portable Generator	5.00		98,384	1,328
47 ft Crew Boats (28-Person)	10.00		94,848	2,561
38 ft Mechanic Boats	50.00		71,552	9,660
Survey Boats	50.00		71,552	9,660
Superintendent Boats	50.00		71,552	9,660
900 HP Tugboats	50.00		94,848	12,804
1200 HP Tugboats	50.00		35,776	4,830
1400 HP Tugboats	50.00		35,776	4,830
3-Axle Trucks	29.00		67,392	5,277
6 kW Light Plants	4.20		271,024	3,073
Schwing Concrete Pump	7.60		80,912	1,660
100-Ton Straddle Lift	10.00		122,304	3,302
Steam Generator	38.00		84,240	8,643
Air Tugger for Cart System	10.00		112,320	3,033
FSLM Overhead Gantry	10.00		21,008	567
FSLM Transporter	10.00		18,928	511
Slip Form Paving Machine	10.00		2,496	67
Ready Mix Truck	3.90		39,936	421
Bidwell for Overlay	10.00		2,496	67
Total				361,368

Note:

- Fuel consumption rates are based on the available equipment specifications and information taken from the 11.65 km Bridge to Incheon International Airport Mega Project from 2005 to 2009 in the Republic of Korea. The project comprised a cable-stayed bridge (1.48 km), an approach bridge (1.78 km), and a viaduct (8.40 km).
- Operating hours computation is based on the equipment quantity multiplied by the duration of working hours per day. Eight (8) hours are considered the working duration of all equipment during weekdays. The quantity of equipment is taken from the project document on BCIB Equipment Study (Equipment and Deliveries).
- Emission Factor = 2.70 kgCO_2 (Diesel); 0.435 kgCO_2 (Electricity)

165. The fourth type is on-site CO_2 emission on oil and electricity consumption from buildings, business and road management vehicles, and road facilities (i.e., streetlamps, closed-circuit televisions (CCTVs), cameras and variable message signs (VMSs)). Exhibit 6-5 summarizes the oil and electricity consumption from buildings, business and road management vehicles, and road facilities. For this type, the project contributes an annual estimate of 370 tonnes of CO_2e during its construction period.

166. The fifth is the carbon sequestration potential lost. The bridge and road project requires clearance of vegetation that may lead to a certain amount of carbon sequestration potential being lost. However, the project proponent and its constructors will replace new trees to compensate for the tree lost, making up for the potential sequestration losses for trees cut during construction. The assessment does not include the CO_2 sequestration potential lost due to the removal of vegetation in the carbon footprint accounting of the BCIB project, where the replacement of new seedlings

will compensate for this loss.[28] A total of 1,454 trees (1,120 trees in Bataan and 334 trees in Cavite) with a diameter of more than or equal to 15 cm at breast height will be affected during construction. The replacement of 145,000 seedlings is required in compliance with the DENR Memorandum Order No. 2012 – 02.

Exhibit 6-5: Estimated CO_2 Emissions Based on Oil Consumption from Buildings, Business and Road Management Vehicles, and Road Facilities

Oil Type	Unit	Building	Business Vehicles	Road Management Vehicles	Road Facilities	Annual Consumption	Emission Factor ($kgCO_2$)	CO2 Emission (tonnes)
LPG	liter	196				196	1.50[a]	0.3
Diesel	liter	1,000	10,000	100,000		111,000	2.70[a]	299.7
Gasoline	liter		10,000			10,000	2.32[a]	23.2
Electricity	kw	10,000			100,000	110,000	0.44[b]	47.9
Total								371.0

[a] ADB. 2016. *Guidelines for estimating greenhouse gas emissions of Asian Development Bank projects additional guidance for transport projects.* Manila, Philippines. p.17.

[b] National Electricity Emission Factor (Philippines) kg CO_2/kWh = 0.4350061

167. Based on GHG emissions estimation, the total quantum of fuel and electricity to be consumed for marine viaduct, navigational bridge, interchanges and viaducts on land, and approach ramps construction was converted to equivalent CO_2 emissions using the Philippine-specific emission factors. Similarly, the embodied CO_2 in construction materials and/or fuels used was estimated using specific values. The CO_2 estimation results for the construction phase of the BCIB project is found in Exhibit 6-6. Given these, the construction of the project releases 89,049 tons of CO_2 (tCO_2) annually. Based on ADB's threshold of 100,000 tCO_2/year, the project's construction is an insignificant source of emissions.[29] Throughout the 5-year construction period, about 445,200 tCO_2 are attributed to the BCIB project.

Exhibit 6-6: Estimated CO_2 Emissions for the Entire Construction Phase

GHG Emissions	CO_2 Emission (ton)
1) GHG emission in producing the main materials	828
2) GHG emission in transporting the main materials	82,677
3) GHG emission for various equipment, machinery, and vehicle	361,368
4) GHG emission for buildings, vehicles, and road facilities	371
5) Carbon sequestration	0
Total	445,244
Construction period	5
Average GHG emission	89,049

[28] The permittee shall replace the tree to be cut with one hundred (100) seedlings of indigenous species in compliance with the DENR Memorandum order No. 2012 - 02 dated November 5, 2012 re: "*Uniform Replacement for Cut and Relocated Trees"* to be turned-over to the local DENR office concerned in support to the National Greening Program (NGP) and climate change initiatives of the Government.

[29] ADB. 2017. *Guidelines for estimating greenhouse gas emissions of Asian Development Bank Projects: Additional guidance for clean energy projects.* Mandaluyong City, Philippines. p.1.

6.2 CO_2 Emissions During Operation

6.2.1 GHG Emissions from Buildings, Lights, Service Vehicles, and Road Facilities

168. To estimate GHG emissions from buildings, lights, service vehicles, and road facilities, the oil or fuel consumption rates and the given emission factor were considered in the project. For streetlights, the number of lamps to be installed, as well as their wattage, type, and the operation period are required inputs. Streetlamps in the project are assumed to operate on the average of 11 hr/day. The electricity emission factor was 0.43501 $kgCO_2e/kWh$. Exhibit 6-7 and 6-8 summarize the absolute contributions of building facilities, lightings, service vehicles, and road facilities to GHG emissions at the operational phase. The GHG emissions assessment during the operation of the BCIB project is estimated at about 5,000 tCO_2e/yr.

Exhibit 6-7: CO_2 Emissions from Buildings, Service Vehicles, and Road Facilities

Mode	Oil Type			
	LPG (li)	Diesel (li)	Gasoline (li)	Electricity (kW)
Building				
Bridge Monitoring and Maintenance Compound (BMMC)	200	1,000		50,000
Weighbridge Station and Grounds (WGS facilities)	40	200		400
Business vehicles (e.g., shuttles)		10,000	10,000	
Road management vehicles		100,000		
Estimated Annual Consumption	240	111,200	10,000	50,400
Emission Factor ($kgCO_2$)	1.50	2.70	2.32	0.43501
Calculated CO_2 Emission (ton/yr)	0.4	300.2	23.2	21.9
Total CO2e				345.7

Assumptions: 400 kWh electricity consumption in each station per month, which is equal to 400 kW in a year.
100,000 kWh electricity consumption per month for the BMMC facilities, which is equivalent to 50,000 kW per year.

Exhibit 6-8: CO_2 Emissions from Street Lightings

Lighting	Wattage (kW)	Quantity	Duration (hr/yr)	EF (kgCO2e/kWh)	Calculated CO_2e Emission (ton/yr)
Street lighting (P1 and P2 only)	3.3	680	4015	0.4350	3,919
Cable lightning	2.2	130	4015	0.4350	500
Pylon lighting	2.2	50	4015	0.4350	192
Total CO_2e					4,611

Note: The project emissions of the street lighting are not included in the computation because of using the latest solar technology.

6.2.2 GHG Emissions on the BCIB Project Vehicle Movements

169. For this GHG emission assessment, the structure of the ADB GHG emissions estimation formula was considered (ADB, 2016):

$$Total\ Transport\ Emissions = Activity\ (vkm) \times ModalStucture \times Intensity\ \left(\frac{l}{pkm}\right) \times Fuel\ Carbon\ Content\ (\frac{g}{l})$$

170. The transport fuels used in vehicles during the project operation contribute to direct and indirect CO_2 emissions on account of fuel combustion in vehicle engines and embodied carbon in fuels, respectively. The cumulative GHG emissions are attributable to the increasing number of vehicles on the road, the number of kilometers traveled by each vehicle, the fuel consumed for each kilometer traveled, and the carbon content of the different fuels used.

171. Traffic volume is an important component in the GHG estimation of vehicle movements. The forecasted volume (2030 and 2050) in terms of Annual Average Daily Traffic was considered in the Detailed Engineering Design reports. On the opening year of the project in 2030, around 18,100 vehicles along the eastbound direction and 17,500 vehicles along the westbound direction are expected to use the BCIP. In the year 2050, traffic is expected to increase to about 30,200 vehicles and 29,300 vehicles for the eastbound direction and westbound direction, respectively. Exhibit 6-9 presents the volume of traffic by each vehicle class for forecast years 2030 and 2050 with BCIB in place.

Exhibit 6-9: Traffic Volume in 2030 and 2050

Year	Direction	MC	Car	PUJ	Bus	Truck	Total
2030	BCIB Eastbound	8,900	6,233	598	666	1,762	18,159
	BCIB Westbound	8,788	6,341	296	768	1,370	17,563
2050	BCIB Eastbound	12,654	12,671	0	1,293	3,597	30,215
	BCIB Westbound	12,654	13,113	0	1,293	2,312	29,372

Source: Bataan-Cavite Interlink Bridge Project: Updated Traffic Projection (2023); B2 Highway Alignment and Traffic Study Report for Bataan – Cavite Interlink Bridge (BCIB) Project, DCCD, 2023.

172. The vehicle traffic was converted into Passenger Car Units (PCU). The conversion is done by directly multiplying the factor to the vehicle volume by class. The Passenger Car Equivalent Factor (PCEF) of each vehicle class based on the FS and Preliminary Engineering Design reports is presented in the table below.

173. The contribution to GHG emissions by the operation phase is summarized in Exhibits 6-11 and 6-12. The absolute GHG emissions from vehicular movements on the project are about 14,100 tCO_2e and 33,100 tCO_2e in 2030 and 2050, respectively. The highest contribution of emissions would be associated with trucks (6,300 tCO_2e) in the opening year, followed by cars CO_2 emissions (5,200 tCO_2e). By 2050, truck emissions (17,700 tCO2e) and private car emissions (12,100 tCO2e) will increase significantly compared to the opening year. The assessment of GHG emissions also found a reducing trend for jeepneys while increasing bus movements. There will

be no significant change in motorcycle GHG emission contribution. Again, the project's operation could be an insignificant source of emissions based on ADB's threshold of 100,000 tCO_2/year.

Exhibit 6-10: Passenger Car Equivalent Factor by Vehicle Class

Vehicle Class	MC	Car	PUJ	Bus	Truck
PCEF	0.75	1.0	1.5	2.0	2.5

Source: Bataan-Cavite Interlink Bridge Project: Updated Preliminary Design – Package 2

Exhibit 6-11: CO_2 Emissions from the Vehicular Movement in the Project in 2030

Mode	Direction	Activity	Modal Structure	Intensity (l/km)	Fuel Carbon Content (CO2/l)	CO_2 Emission (ton/yr)
Motorcycle	Eastbound	74,037,431	0.15	0.020	2.32	579
	Westbound	73,105,724	0.15	0.020	2.32	558
Car	Eastbound	69,134,878	0.18	0.080	2.32	2,596
	Westbound	70,332,787	0.18	0.080	2.32	2,641
Jeepney	Eastbound	9,949,300	0.06	0.180	2.70	326
	Westbound	4,475,521	0.03	0.180	2.70	64
Bus	Eastbound	14,774,211	0.03	0.280	2.70	424
	Westbound	17,036,928	0.05	0.280	2.70	651
Truck	Eastbound	48,859,159	0.08	0.300	2.70	3,545
	Westbound	37,989,244	0.08	0.300	2.70	2,756
Total		419,695,182				14,141

Note: Computed based on traffic demand forecast for the BICIB project during the Detailed Engineering Design, DCCD, 2023.

Exhibit 6-12: CO_2 Emissions from the Vehicular Movement in the Project in 2050

Mode	Direction	Activity	Modal Structure	Intensity (l/km)	Fuel Carbon Content (CO2/l)	CO_2 Emission (ton/yr)
Motorcycle	Eastbound	105,266,253	0.12	0.020	2.32	651
	Westbound	105,266,253	0.12	0.020	2.32	651
Car	Eastbound	140,543,564	0.20	0.080	2.32	5,860
	Westbound	145,446,118	0.21	0.080	2.32	6,276
Jeepney	Eastbound	-	0.02	0.180	2.70	-
	Westbound	-	0.01	0.180	2.70	-
Bus	Eastbound	28,683,266	0.04	0.280	2.70	963
	Westbound	28,683,266	0.04	0.280	2.70	963
Truck	Eastbound	99,742,562	0.14	0.300	2.70	12,873
	Westbound	64,110,315	0.09	0.300	2.70	4,883
Total		717,741,597				33,119

Note: Computed based on traffic demand forecast for the BICB project during the Detailed Engineering Design.

6.2.3 GHG Emissions on the NCR Transport Network

174. Vehicular movement for the entire life period of the BCIB Project was described from Traffic Study Report in the FS and the Preliminary Engineering Design Report of the project. Since the project construction activity is based on these vehicular projections, it is appropriate to use these traffic forecast numbers for the entire project life and its service life. These vehicular projections include the vehicular growth resulting from population increase and economic growth

in the region (natural growth). Also, the natural traffic growth is considered to be the normal growth of traffic that would have taken place *with* or *without* the project.

175. A transport model was set up and validated to assess the traffic impact of the BCIB scheme.[30] The origin-destination matrices outputs were used to inform the economic appraisal. Two (2) forecast years were modeled: 2030 and 2050. The analysis forecast overall traffic volume would increase up to 10 million vehicle trips between 2030 and 2050.

176. The assessment and computation are based on the travel activity that relies on the trip distance data, considering the Metro Manila transport network model with travel sectors shown in Exhibit 6-13. Net changes in GHG emissions due to changed traffic flows are estimated in 2030 and 2050, representing the commencement year of the BCIB project and 20 years during the project implementation. Exhibit 6-14 shows the assumptions considered in the computation.

177. Following the basic structure of the ADB GHG emissions estimation formula (as described in Para 169) to calculate the gross GHG emissions, the modal structure, the intensity (fuel consumption), and the fuel carbon content were applied to the total network vehicle kilometers (vkm) for *with* and *without* BCIB scenario. Again, the modal structure was determined by estimating the percent (%) share of petrol and diesel vehicles by mode. Intensity referred to liters of petrol/diesel used per kilometer and was included for each mode considered in this analysis. The mobile combustion emission factor was determined for both petrol and diesel with kg CO_2/liter of 2.32 and 2.70, respectively. Other details of the GHG emissions impact assumptions are presented in Exhibit 6-15.

178. Road projects like the BCIB project can reduce congestion which can assist in reducing emissions. The net change in emissions on the account of the BCIB project was identified and valued, which was done through a *with* and *without* project comparison.

179. Exhibit 6-16 shows that the BCIB in place will decrease GHG emissions from 319,900 tCO_2 to 255,800 tCO_2 in 2030 and from 479,500 tCO_2 to 401,300 tCO_2 in 2050. Results indicated GHG reductions of about 64,100 tCO_2 in the opening year and about 142,300 tCO_2 during the entire appraisal period (2030-2050) (Exhibit 6-17). The estimated annual GHG emissions in 2030 are still below the reported findings of Regidor (2019) of 357,246 tons of CO_2e (2035) for the Manila-Quezon City Metro Manila Bus Rapid Transit corridor.

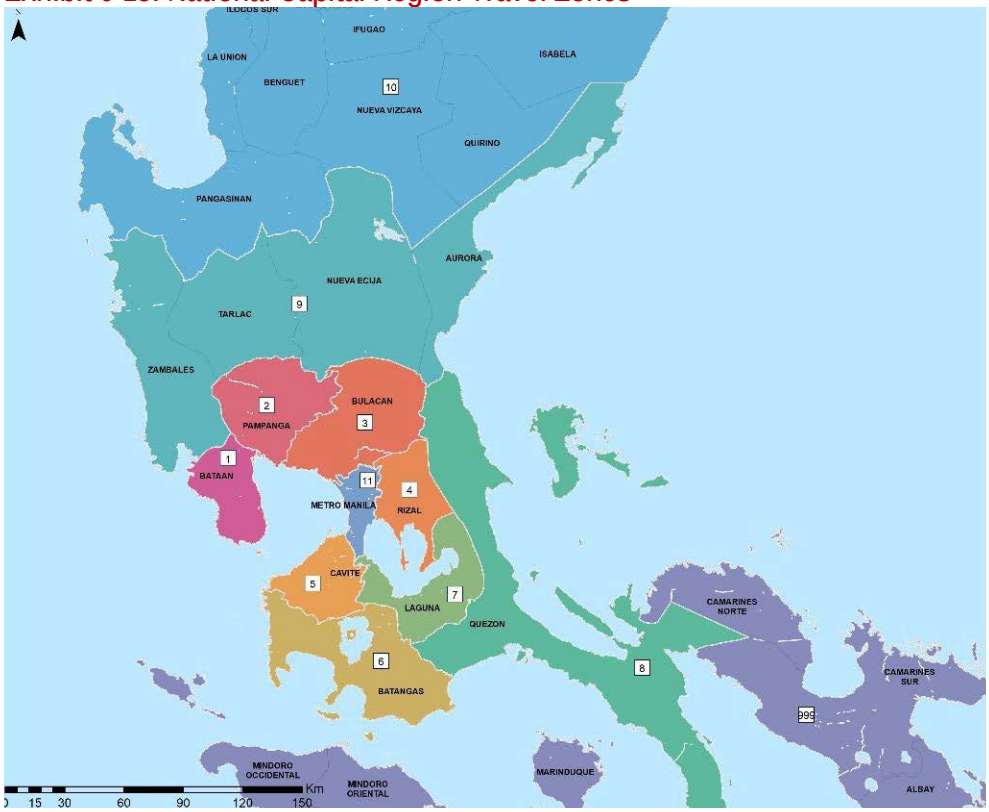
180. It must be noted that the monetization of changes in net emissions was accounted for in the Economic Analysis Report of this project. The global social cost of carbon of $36.30 per ton of CO_2 cited in the ADB guidance was applied for this project.[31] The real growth rate of 2% per annum was also applied to allow for the potential of increasing marginal damage of global warming over time. The change in net emissions multiplied by the social cost of carbon represents the GHG emission impact. As a result, the project's economic impact due to change in transport

[30] ARUP and DPWH (2020). B2 Highway Alignment and Traffic Study Report for Bataan – Cavite Interlink Bridge (BCIB) Project

[31] Asian Development Bank. Guidelines for the economic analysis of projects.

emissions was accounted for at PhP -10,915 (non-discounted) and PhP -1,390 (discounted) GHG emissions impact.[32]

Exhibit 6-13: National Capital Region Travel Zones



Sources: IPIF BCIB B6 Economic Analysis Report

Exhibit 6-14: Trip Distance (person-km)

Modes	2030		2050	
	Without Project	With Project	Without Project	With Project
Car	57,196,580	57,596,898	93,891,892	94,947,352
Bus	4,424,774	3,889,993	4,307,608	6,146,285
Truck	16,025,164	7,518,423	25,253,436	12,007,734
Motorcycle	43,511,893	44,119,737	78,466,964	79,366,593
Jeepney	14,187,620	14,252,348	18,334,559	18,491,289
Total	135,346,032	127,377,399	220,254,459	210,959,253

[32] IPIF1 BCIB B6 Economic Analysis

Exhibit 6-15: GHG Emission Impacts Assumptions

Modes	Modal Structure [a]		Intensity [b,c]
	% Diesel	% Petro Gas	(l/km)
Car	10	90	0.08
Bus	80	20	0.28
Truck	90	10	0.30
Motorcycle	0	100	0.02
Jeepney	100	0	0.18

[a] http://www.neda.gov.ph/wp-content/uploads/2015/03/FR-MAIN-TEXT.-12149605_01.pdf. p. 2-25

[b] Clean Air Asia. 2012. *Air pollution and GHG emissions indicators for road transport and electricity sectors – guidelines for development, measurement, and use*. p 131. *https://cleanairasia.org/wp-content/uploads/portal/files/documents/Guidelines_for_AP_and_GHG_Indicators_2012_Edition.pdf.*

[c] Assumed 18 liters/100km is equivalent to 5.65 liters/km. https://businessmirror.com.ph/2018/05/05/political-will-drives-puv-modernization/

Exhibit 6-16: GHG Emissions (tCO_2e) of the NCR Network

Modes	2030		2050	
	Without Project	With Project	Without Project	With Project
Car	106,817	107,564	175,346	177,318
Bus	34,135	30,010	33,231	47,416
Truck	115,179	54,038	181,507	86,304
Motorcycle	13,527	13,716	24,394	24,673
Jeepney	50,335	50,564	65,047	65,603
Total	319,993	255,892	479,525	401,315

Exhibit 6-17: Net GHG Emissions (tCO_2e) Impacts

Estimation Scenario	2030	2050	Annual Increment	Entire Appraisal Period (2030 - 2050)
Without project (A)	319,993	479,525	15,953	799,518
With project (B)	255,892	401,315	14,542	657,207
Net emissions (B-A)	-64,101	-78,211		-142,311

6.3 Overall GHG Emissions

181. To assess the overall GHG emissions directly associated with the BCIB project, emissions during the construction and operation (i.e., emissions from buildings, lights, service vehicles, and road facilities, and vehicular movement) phases are combined as shown in Exhibit 6-18. Considering the 100-year assessment period (service life) during its operation, the total GHG emission of about 7.0 million tCO_2e will likely be attributed to the project with average annual emissions in the forecast years of 61,100 tCO_2e. It can be observed that the operation phase has the highest contribution of GHG emissions (more than 94%). On the other hand, the construction stage has a share of not more than 6% of the project's overall GHG emissions.

Exhibit 6-18: Gross GHG Emissions Attributed to the Project

Activity	GHG Emissions (tCO_2e)
Construction Phase - 5 years	
Producing the main materials	828
Transporting the main materials	82,677
Various equipment, machinery, and vehicle	361,368
Buildings, vehicles, and road facilities	371
Carbon sequestration	0
Total	445,244
Average during construction	89,049
Operation Phase - 100 years	
Vehicular movement	6,111,263
Lightning	461,100
Buildings, road facilities and service vehicles	34,570
Total	6,606,933
Gross Emissions	7,052,177
Average annual emission during project life	61,113
Average annual emissions during appraisal period (2030-2050)	23,630

Assumptions: 100 years' service life of the project is considered in the assessment. The computed annual increment of GHG emissions during the appraisal period (2030 – 2050) is 948 tCO_{2eq}/yr. With this annual increment, the Project will likely contribute about 7.0 million during its service life with a yearly average of 61,113 tCO_2eq.

7. CLIMATE RISK MANAGEMENT RESPONSE WITHIN THE PROJECT

182. This chapter describes the climate risk management response within the project considering the particular risk profile. A Climate Risk and Adaptation Assessment is prepared to help assess climate change impacts of BCIB project and prescribe adaptation options as part of its detailed design. The detailed BCIB design is robust able to withstand extreme weather events. Certain sections and facilities that would be exposed to risk have been reviewed and design considerations have been incorporated and will be implemented during the construction and operation phases. Design considerations and adaptation measures that address or counter climate change and associated risk on the project's physical infrastructure and assets as currently designed are summarized below.

7.1 Impacts of Climate Change on the Project

7.1.1 Potential Impacts

183. Identified potential climate change impacts, risks, and the standards and design criteria being applied to address this risk are in Exhibit 7-1.

Exhibit 7-1: Climate Change Impacts, Risks, Impacts on the Project and Engineering Design Considerations

Potential Climate Change[a]	Description of Risks	Impacts on the Project[a, b]	Design Standards and Parameters
Increases in very hot days and heat waves	TXx as much as 1.6 °C in the late future for the RCP4.5 scenario and by as much as 3.6°C in the RCP8.5 scenario. TXx projections diverge at an increasing rate from 35.5 °C (historical) to 39.3 °C (late-future) on the Bataan side and from 35.7 °C (historical) to 39.1 °C (late-future) on the Cavite side. TX90p is with projections indicating an increase of at least 21% (76 days) in the early future, and as much as 79% (288 days) in the late future, essentially making every day of the year a hot day.	Higher temperatures and extreme heat can cause bridges to be stressed by thermal expansion and movement and lead to premature deterioration of the structure. Thermal expansion of bridge expansion joints and paved surfaces. Corrosion of steel reinforcements in concrete structures due to increase in surface salt levels.	Pavement design standards are following codes and guidelines: i) 1993 AASHTO Guide for Design of Pavement Structures, and ii) 2013 Volume II Standard Specifications for Highways, Bridges and Airports DPWH D.O. No. 22 series of 2011 - Minimum Pavement Thickness and width of National Roads.
Sea level rise and storm surges	Increase annual sea level changes in the project locations by 0.6 to 1.1m, and 0.8 to 1.6m in 2100 and 2130, respectively. Increase storm surge by a 1.0-meter maximum water level increase in Manila Bay, given a 10% increase over historical typhoons	Damage to highways, roads, and bridges due to flooding, inundation in coastal areas, and coastal erosion, Damage to infrastructure from land subsidence, More frequent flooding of low-lying infrastructure, Erosion of road base and bridge supports, Reduced clearance under bridges, Decreased expected lifetime of highways exposed to storm surges, Placement of precast segments may disturb seabed sediments which may have accumulated heavy metal content.	The navigation clearance studies were based on the Harbor Approach Channel Design Guidelines calculation method (PIANC 121-2014). Based on Internal Memo 001 – Design Life of BCIB Bridges, the BCIB project considered a 1.2 m (2130) sea level rise to design bridges to adapt to the operation and safety of critical infrastructure elements. SLR's Effects on Structural Design of Bridges: SLR may not only increase the Mean High Tide (MHT) but also extend or broaden the stream channels. The structural elements shall be designed for the following forces both with and without considering 1.2 m of SLR as well as other applicable loads. i) Vessel collision force, ii) Water load including: static pressure, stream pressure and wave force. Vessel collision force was applied considering both current conditions and conditions with most conservative projection of 1.6 meter of SLR. Wave Parameters

Potential Climate Change[a]	Description of Risks	Impacts on the Project[a, b]	Design Standards and Parameters
			The hydrodynamic modeling has been run under two scenarios: (i) existing sea level, and (ii) assuming a +1.2 m SLR.
Increase in intense precipitation events	Following the 1-day maximum historic data, the observed design values of Rx1day must be 315 mm for the Bataan side and 260 mm for the Cavite project site. Under CMIP5 RCP8.5 scenario, a 30% climate change factor is computed to handle 97.5% of the projected rainfall intensity extremes. The design values of Rx1day for the future climate must be 409 mm for the Bataan side and 338 mm for the Cavite area.	Damage to bridge and drainage systems due to flooding, Increase the scouring rate of piers and bridge foundations, and build-up of sediments, Damage to road infrastructure due to landslides in the Bataan side, Overloading of drainage systems in Bataan and Cavite project alignments, Deterioration of structural integrity of roads and bridges due to increasing soil moisture levels. Landslide and soil erosion: extreme rainfall may also affect soil saturation which can cause landslides along with the sloping areas of the project site.	Calculated rainfall intensity following the provision of Table 9-3 of the DGCS (DPWH, 2015) Hydraulic design of all the drainage structures including the bridges is the flow generated from 1:100 years storm return period. Rainfall intensities will be increased by 10% to reflect potential climate change per DCGS Vol 3, Section 9.2.4.1.
Increase of storm intensity and wind speed	Have been exposed to 27 tropical cyclone winds in the past seven (7) decades. As per the strongest typhoon occurred in November 2019, maximum sustained winds of 150 kph and gustiness of up to 185 kph. Bataan and Cavite sections have mean wind speeds ranging from 6.61 - 7.05 m/s and from 6.60 to 7.37 m/s, respectively, while the Corregidor Island portion is exposed at rate ranging from 6.96 to 7.19 m/s. The wind speed in Bataan could reach 231 kph considering the historically recorded peak wind speed of 194 kph in Sangley Point Station. Climate change wind speed during tropical cyclones could increase by 1.2 to 1.4 times the historical record, which means the wind speed in Bataan to well over 300 kph.	Expected to cause flooding or increase in the sea's surface water level (sea rise) in the project areas. Damage to road infrastructure and increased probability of infrastructure failures, Increased threat to the stability of bridge decks, and Increased damage to signs, lighting fixtures, and supports.	Design storm frequencies used in the project were recommended values shown in Table 5-3 of the DPWH DGCS 2015, Volume 4. *Wind load:* Wind design criteria: 1700 year wind standard– industry standard for cable bridges. A directional, and topographical factors of 1 were used in absence of any recommendations from Site Specific Climatology and Wind Study. Skew wind loads were calculated as per Article 3.8.1.2.3a of AASHTO LRFD Bridge Design Specification 8th Edition (2017). Vertical wind loads were determined based on published literature or findings from wind tunnel testing. Additional climate change factor of 1.05 was applied to Strength Design of the bridges in consideration of future climate change effects on wind.

[a] ADB. 2014. *Climate proofing ADB investment in the transport sector: initial experience*. p.9.

[b] IPIF1-BCIB-Environmental Impact Assessment Report Issue 3.
[c] T.Y. Lin International / Pyunghwa Engineering Consultants. 2021. *Bataan-Cavite Interlink Bridge Project. Package 1,2,3,4,5 &6: Baseline Engineering Design.* January 2022

7.1.1.1 Increases in Very Hot Days and Heat Waves

184. Baseline observations show that the hottest daytime temperature in the project areas is 35.6 °C. The temperature at project sites is projected to increase by as much as 1.6 °C in the late future for the RCP4.5 scenario and by as much as 3.8 °C in the RCP8.5 scenario. Since temperatures on the warmest days are projected to increase at similar rates, the temperature range for bridge design is considered to determine the right course of action.

185. Potential climate impacts and risks of higher temperatures and extreme heat can cause bridges to be stressed by thermal expansion and movement and lead to premature deterioration of the structure. Increased temperatures can damage pavements that protect the bridge decks and the expansion joints of bridges. In addition, corrosion of steel reinforcements in concrete structures due to increase in surface salt levels is likely to happen.

186. The project design team reviewed the trends for average annual maximum and average yearly minimum temperature for the region from 1901 to the present and is utilizing a more extensive thermal range to account for the anticipated increase in temperature. This leads to more significant movements for bearing and expansion joints and higher stress on the fixed piers; however, these demands do not control the design as the movements and stresses from other loading are more strenuous. Therefore, no cost impact is anticipated due to increased thermal loading.

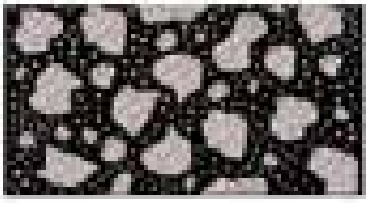
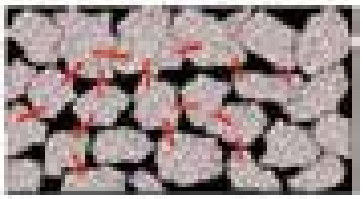
187. In terms of pavements, these are climate-sensitive infrastructure, where the climate can impact their deterioration rate, subsequent maintenance, and life-cycle costs. Various studies have supported the view that temperature is the most influential for flexible pavement performance compared to other climatic factors. For instance, Qiao et al. (2020) made a comprehensive review of flexible pavements and climate change implications. The study found that high temperature is the greatest climate concern as flexible pavements are highly sensitive to high temperature, and the impacts can accumulate over the complete service life.

188. Pavement design needs to consider changes in high temperatures to adapt to future climates. Qiao et al. (2020) further described that asphalt binder upgrading to adapt to greater temperatures can be applicable. Underwood et al. (2017) and Wistuba and Walther (2013) explained the upgrading binder grade or increasing layer thickness in pavement design may be desirable in areas with increasing extreme temperatures. In addition, Dave et al. (2013) described where gaps between daily/monthly/seasonal high and low-temperature increases, the choice of binder needs to be able to cover all extremes.

189. The BCIB Project will be exposed to a higher temperature in the future. The applied pavement design is a Polymer Modified Stone Mastic Asphalt (PSMA), which is stronger and more durable than Conventional Mixtures Asphalt (CMA) (Exhibit 7-2). The PSMA's Performance Grade is PG76-22, a material that can maintain durability for seven (7) days at the maximum design temperature of 76 °C and the minimum design temperature of -22 °C. Also, the

PSMA secured more than three (3) times the pavement life of Conventional Mixtures Asphalt by applying grain size of the wearing surface asphalt. Exhibit 7-3 presents an investigation of the pavement temperatures during a heat wave in Korea.

Exhibit 7-2: Comparison of Materials of Conventional Mixtures Asphalt and Polymer Modified Stone Mastic Asphalt

DIV	CMA	PSMA
Concept	Normal Performance Grade + Grain size of Conventional	High Performance Grade + Grain size of SMA
Schematic Diagram		
Performance Grade [a]	PG64-22	PG76-22 PG82-22
Grain size range (Coarse aggregate: fine aggregate)	Grain size of Conventional (50: 50)	Grain size of SMA (75: 25)
Cost [b] (US$)	24,714,000	35,305,000

[a] Performance Grade: it is unified standard applied to both general and modified asphalt since 1997 in the USA. (ASTM D 637 9-99, KS F 2389).

[b] PSMA construction cost refers to the construction cost performed by ARUP in 2019. Pakage3~6: Wearing Surface Asphalt (WSA).

Exhibit 7-3: Investigation of the Pavement Temperature During Heat Wave in Korea

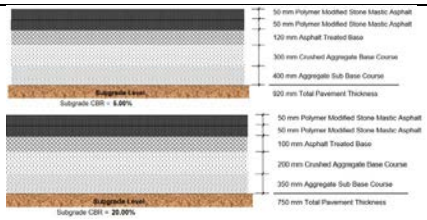
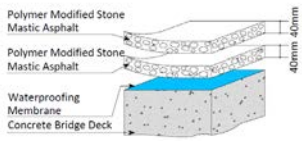
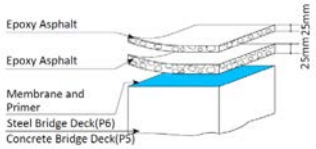
Pavement Types/ Temperature	At-grade Roads	At-grade Roads	Steel Bridge
	Flexible Pavement	Concrete Pavement	Flexible Pavement
Average Surface Temperature (°C)	51.4	44.6	51.7
Average Temperature (°C)	34.1	34.2	35.1

Source: https://www.joongang.co.kr/article/23543932

190. Under Package 1 and 2 (at-grade road), the project will use paving materials that are more resistant to expansion in extreme heat conditions. The flexible pavement type is considered due to environmental and weather exposure, traffic loading, and constructability. As the surface course, the flexible pavement of a 920 mm (P1) and 750 mm (P2) polymer-modified stone mastic asphalt is required to enhance the dynamic shear modulus against permanent deformation. Exhibit 7-4 shows the design considerations of the pavement type in different packages of the project.

Exhibit 7-4: Design Consideration of the Pavement Type

Design Considerations	Pakage1 & 2	Package 3 & 4	Package 5	Package 6
		Concrete Bridge Deck	Concrete Bridge Deck	Steel Bridge Deck
BCIB Project Component	At-grade Roads	Land / Marine Viaducts	North Channel Bridge	South Channel Bridge

Pavement Type (Thickness)	Flexible Pavement (P1: 920 mm; P2: 750 mm)	Flexible Pavement (80 mm)	Flexible Pavement (50 mm)
Pavement Structure			
Pavement Performance period	10-year	10-year	10-year

191. At the Land and Marine Viaducts (Package 3 and 4), a flexible pavement is considered with an 80 mm of polymer modified stone mastic asphalt. Concrete bridge deck is designed in the project that has many benefits, which include the ability to resist high temperatures. The concrete can withstand extreme hot climatic condition, and generally has the advantages of being durable and having a long service life.[33]

192. In Package 6 (South Channel Bridge) and Package 5 (North Channel Bridge), a flexible pavement is also taken into consideration with a 50 mm epoxy asphalt cement.

193. The BCIB pavement structure is designed in accordance with the AASHTO 1993 Guide for Design of Pavement Structures. The design parameters used in the pavement includes pavement performance period, roadbed and subgrade soil properties, projected traffic loads, design serviceability and material properties for pavement structure design. Pavement structures are analyzed for the 20-year and 10-year performance periods. The structural design of the pavement is based on fatigue loads. Fatigue loading is taken as the cumulative number of passes of an Equivalent Standard Axle Load (ESAL) of 8,300 kg (18 kip) per axle, to which the pavement structure will be subjected throughout its design life. The structural design of a pavement is expressed in terms of the Present Serviceability Index (PSI), which is obtained from measurements of distress and roughness. PSI values of 2.0 and 1.7 are considered in the rigid (Portland cement concrete) pavement, and flexible (asphalt) pavement, respectively. Also, reliability factor is introduced in the design to account for chance variations in both traffic prediction and to provide a predetermined level of assurance that pavement sections will survive the period for which it is designed. Based on analyses, the project considered 80-99 level of reliability as per AASHTO Guide recommendation.

7.1.1.2 Sea Level Rise and Storm Surges

194. The sea level of the BCIB project on the marine portion is expected to rise by as much as 0.70 meters in 2100 based on Manila Bay tidal gauge station extrapolation and about 0.61 to 1.10 m (2100) and 0.8 to 1.6 m (2130) range under RCP8.5 scenario. Storm surge is also likely to increase with a 1.0-meter maximum water level increase in Manila Bay, given a 10% increase over historical typhoons.

[33] A Guide for USAID Project Managers BRIDGES.

195. Following the SROCC projection (of AR5) that the sea level rise is likely to be in the range of 0.80 to 1.60 m by 2130, the BCIB Project proposes that the design should consider accommodating a sea level rise of 1.20 m in 2130. This recommendation is based on the global sea level rise experience demonstrating that the Asian-Pacific International engineering community (based on Cadangan Project Jambatan Temburong in Brunei and Hongkong) comfortably relies on the medium confidence line which indicates a central estimate of a 1.2 m sea level change in Manilla Bay by 2130. The BCIB design team considered a 1.2 m rise by 2130 during its project engineering design. Also, the BCIB design team (TYLI, PEC, DCCD) found that current the BCIB Project design already accommodates the most conservative projection of 1.6 m by 2130 (Internal Memo 001 – Sea Level Rise of BCIB Bridges, 2022). A copy of the BCIB Internal Memo 001 – Sea Level Rise of BCIB Bridges is found in Appendix 3.

196. The anticipated impacts and risks on the projects include the following: i) damage to highways, roads, and bridges due to flooding, inundation in coastal areas, and coastal erosion, ii) damage to infrastructure from land subsidence, iii) more frequent flooding of low-lying infrastructure, iv) erosion of road base and bridge supports, v) reduced clearance under bridges, vi) decreased expected lifetime of bridges exposed to storm surges, and vii) placement of precast segments may disturb seabed sediments which may have accumulated heavy metal content.

SLR's effects on structural design of marine and navigational bridges

197. The sea level rise and its impacts and risks are part of the bridge design considerations. The navigation clearance studies were based on the Harbor Approach Channel Design Guidelines calculation method (PIANC 121-2014). Also, the project design structures adopted the Philippine Coast Guard-approved navigational clearance for the BCIB.

198. The BCIB project appears that it can accommodate the 1.7 m sea level rise (i.e., 1.6 m asl in 2130). The approved navigational clearance for North Channel is 380 m in width, and 40.5 m high above mean sea level (msl) (Exhibit 7-5). The Northern Main Navigation Channel is amended to 300 m width and 40.5 m high above msl.[34] The required minimum vertical clearance was calculated as 39.77 m assuming an increase in sea level rise from 1.0 m to 1.7 m based on Ship Maneuvering Simulation conducted for the North Channel. Results revealed that the value is below the 40.5 m vertical clearance, and thus there is no need to increase the clearance envelope. Other details are presented in Exhibit 7-6.

199. The Southern Main Navigation Channel is designed to be 650 m in width and 72.3 m high above msl (Exhibit 7-7). The required minimum vertical clearance was computed as 65.04 m considering an increase in sea level rise of 1.7 m. The value is below the 72.3 m vertical clearance. Hence, there is no need to increase the clearance envelope for the SCB.

200. In addition, the passage is necessary near the Cavite shoreline for smaller vessels such as Philippine Coastguard patrol vessels and ferries. The Cavite shoreline also includes marine facilities, like the International Maritime & Offshore Safety Training Centre, Cavite Gateway Terminal, and various beach resorts. Hence, a smaller "Nearshore Navigation Channel" is provided

[34] Amended during the DED, and the clearance was referenced in the ARUP report "Working Paper No.5-1 Navigation Clearance Study Report for Feasibility Study for BCIB Project".

for this vessel traffic. The Nearshore Navigation Channel is designed as 140 m wide and 23.1 m high above msl.

Exhibit 7-5: North Channel Bridge General Arrangement - Elevation

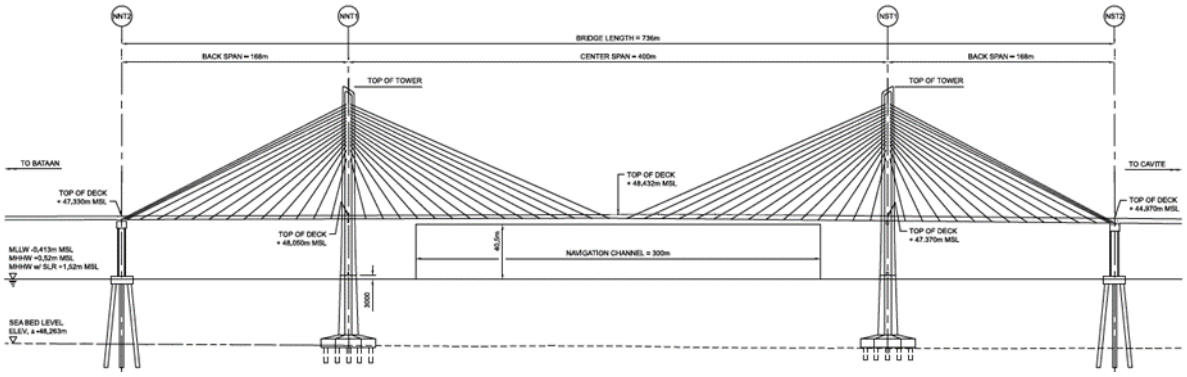
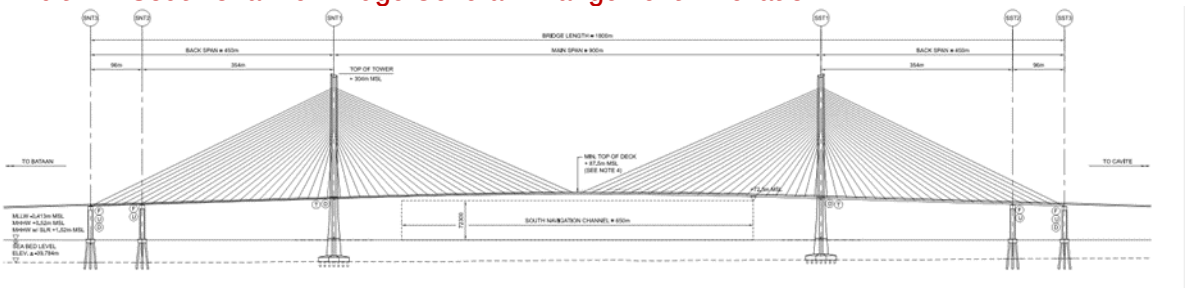


Exhibit 7-6: BCIB Minimum Clearance Considerations

Considerations	North Channel Bridge	South Channel Bridge
Air draft (m)	32	60
Tidal level from the mean sea level	1.1	1.1
Sea level rise (m)	1.7	1.7
Vertical dynamic motion (m)	4.97	2.24
Minimum clearance (m)	39.77	65.04

Exhibit 7-7: South Channel Bridge General Arrangement - Elevation



201. The marine viaduct vertical profile varies between EL 87.600 Sta 17+645.000 at the South Cable Bridge high point to EL 21.446 Sta 12+874.197 at the Corregidor Island Turnaround intersection. The design accommodates commercial vessel air draft with 72.3 m vertical navigation clearance at the South Cable Bridge. The low deck at the Corregidor Island Turnaround facility does not provide recreational air draft, however it is designed to clear a compounded effect of high tide, sea level rise, storm surge and typhoon-generated tidal waves.

202. Exhibit 7-8 shows the typhoon-generated maximum wave heights simulation in the vicinity of the Corregidor Turnaround facility, which varies spatially along with the project. West Consultants performed the oceanic wave study in June 2022, considering the vertical datum elevations and the maximum astrometric tide elevation at the Corregidor Island Gauge. Based on the Lapidez report (2015), the study also assessed the predicted maximum storm surge between 1

and 3 meters. These surge values come from simulations that evaluated a storm with the intensity of Super Typhoon *Haiyan* following storm tracks for typhoons observed from 1948 through 2013.

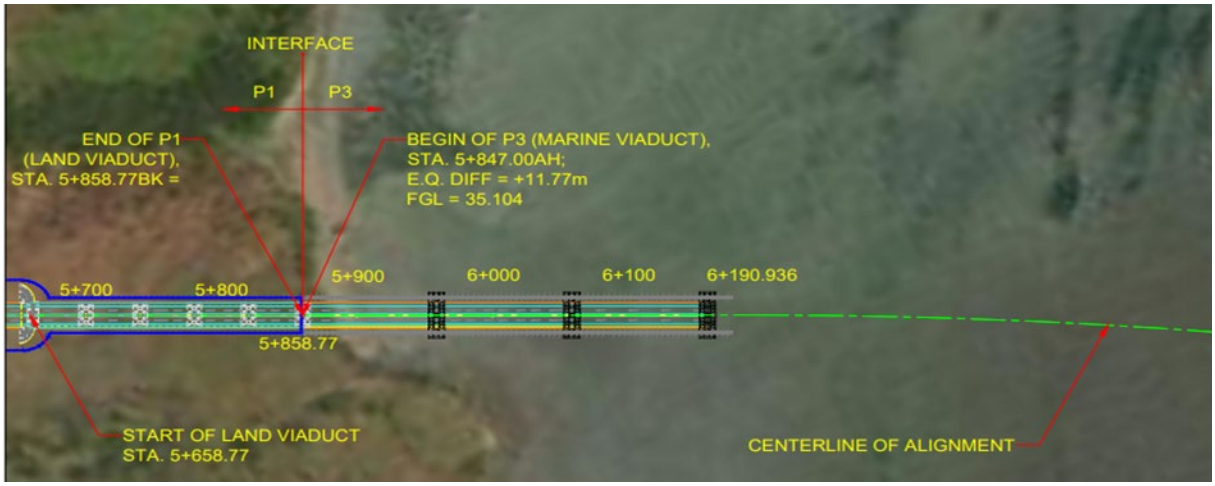
Exhibit 7-8: Typhoon-Generated Maximum Wave Heights Simulation in the Vicinity of the Corregidor Island Turnaround Facility

Pier	H max (m)	Pier	H max (m)
CV35	7.6	CV43	7.6
CV36	7.6	CV44	7.6
CV37	7.6	CV45	7.7
CV38	7.6	CV46	7.7
CV39	7.6	CV47	7.7
CV40	7.6	CV48	7.7
CV41	7.6	CV49	7.7
CV42	7.6	CV50	7.7

203. Likewise, the project engineering team confirmed that the current design can remain the same even when using the conservative projection of a 1.6 m sea level rise for 2130. The freeboard allows all ship sizes to pass easily, given a large surge in tidal movements and sea level rise. Therefore, no additional design or added costs are necessary to accommodate the sea level rise projection.

204. In land viaduct and interchange components, the Bataan land viaduct (Package 1) begins at Sta. 5+658.77 and ends at Sta. 5+858.77 and connects with the marine viaduct at the shoreline. The substructure is a 2-column pier bent type supported on pilecap and multiple rows of bored pile substructure. The terrain ground condition has a steep slope from abutment towards the shoreline, and column heights vary from 8 m to 17 m high (Exhibit 7-9 & 7-10). Under Package 2, the Cavite Land Viaduct starts at Sta 31+840 and ends at Sta 31+900. The substructure is a 2-column pier bent type supported on pilecap and multiple rows of bored pile substructure. The terrain ground condition is flat, and the shoreline and column heights vary from 6 m to 7 m high (Exhibit 7-11 & 7-12). The two (2) land viaducts locations and pavement surface are resilient to the sea level rise and storm surge influence with the preferred designs.

Exhibit 7-9: Interface with P3 Marine Viaduct



Vessel collision force

205. Vessel collision force has been applied considering both current conditions and conditions with 1.2 m of SLR and 1 m surge. It is noted that bridge elements that currently do not have vessel collision risk may have such risk with 1.6 m of SLR.

Exhibit 7-10: Road Section at the Bataan Land Viaduct

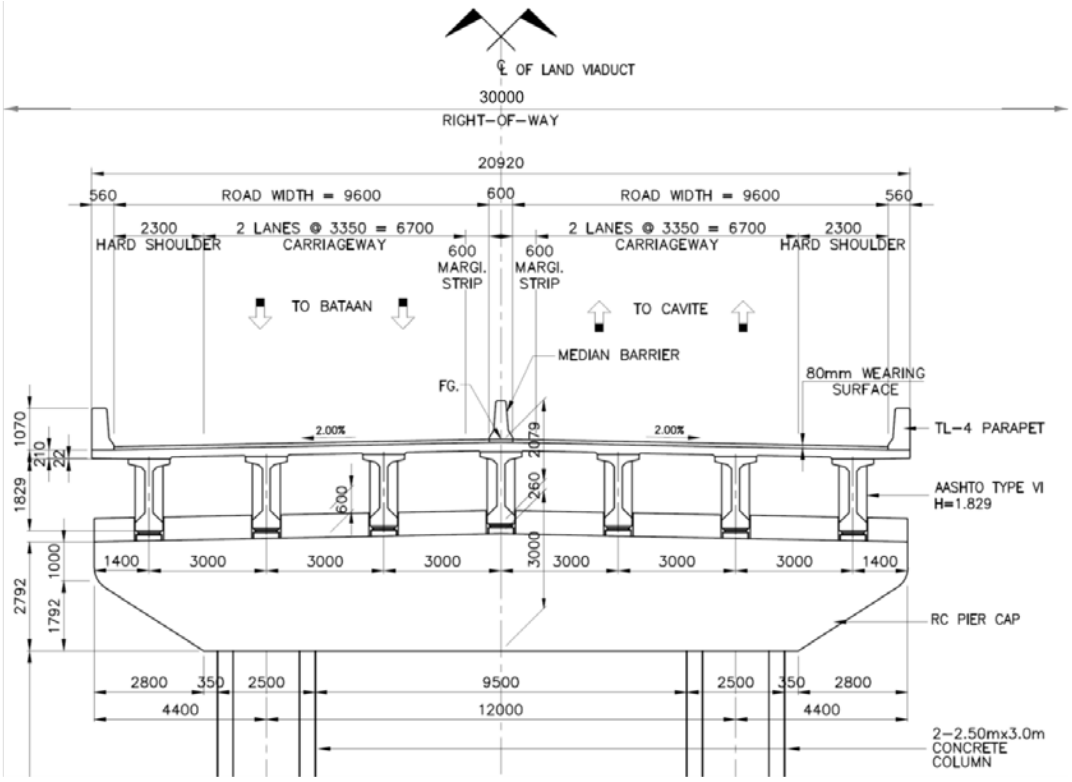


Exhibit 7-11: Cavite Land Viaduct interface with P4 Marine Viaduct

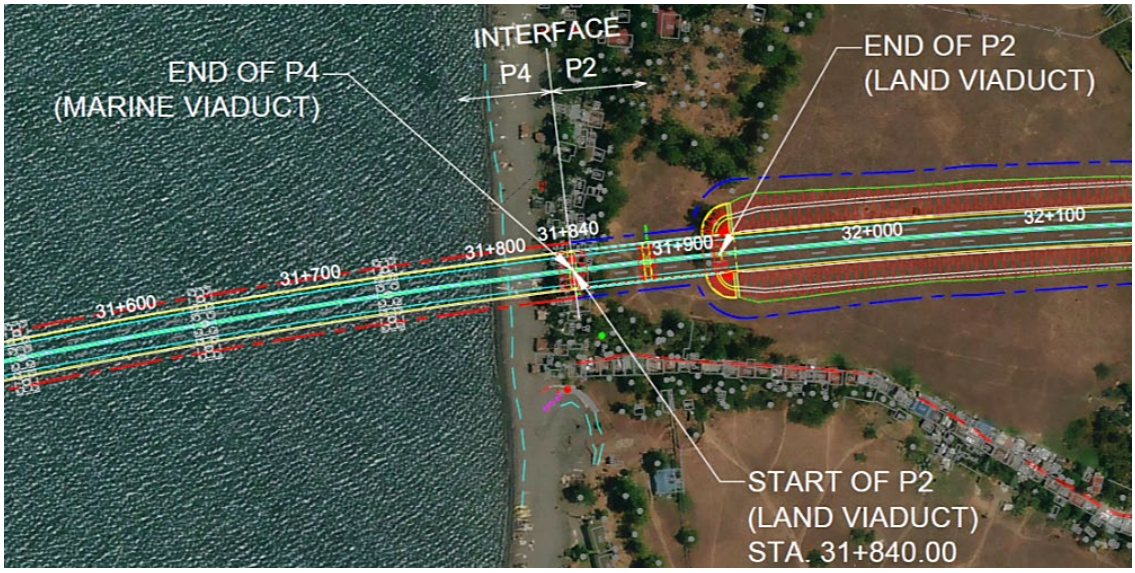
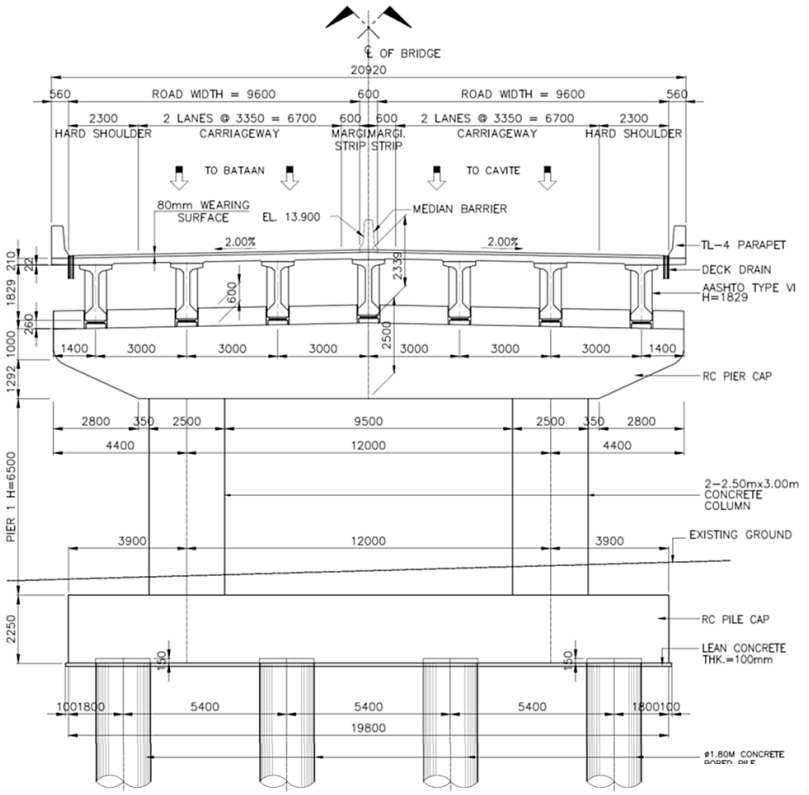


Exhibit 7-12: Typical Cross Section of the Cavite Land Viaduct



7.1.1.3 Increase in Intense Precipitation Events

206. Increased frequency of extreme precipitation events increases the risk for flooding and landslide, which can reduce the service life of bridges through i) damage to bridge and drainage systems due to flooding, ii) increasing the scouring rate of piers and bridge foundations and build-up of sediments, and iii) deterioration of structural integrity of roads and bridges due to increasing soil moisture levels. A potential impact of increased risk of flooding on bridges is that it could lead to total submersion. Bridges designed using a lower return period may lead to premature deterioration or total submersion before its intended lifespan.

207. The rainfall extremes (i.e., maximum 1-day total) are projected to vary temporally with wetter trends in the project sites. The observed design values of Rx1day are 315 mm for the Bataan side and 260 mm for the Cavite project site. Using RCP8.5 CMIP5 extreme ensemble, the assessment estimated the climate change factor for R1xday to be about a 30% increase with a 25-year return period. It supports the need to adjust the design criteria by 30% to handle 97.5% of the projected rainfall intensity extremes. The assessment computed the design values of Rx1day for the future climates are 409 mm for the Bataan side and 338 mm for the Cavite side.

208. Under Package 1 (Bataan Land), the project alignment will traverse on a gully, a wide and deep intermittent waterway at Sta. 4+800. Construction of Mt View Waterway Bridge begins at Sta. 4+757 (back of back wall) and ends at Sta. 4+857. The creek is considered intermittent since there is no observed surface water during the dry season. Also, the hydraulic study revealed that the waterway has maintained its course and alignment for the past 35 years as indicated by Google's historical imageries. However, Mt. View Waterway Bridge is still exposed to moderate erosion that could deteriorate foundations and damage a bridge. Extreme weather events can cause erosion to occur more frequently as they can generate flash floods.

209. Mt View waterway covers a very small catchment (0.20 km^2). Despite assessment of the design values of Rx1day for the future climates, the project design of bridge structures utilizes historical climatic data, including documented peak, 10% increase in design rainfall intensity, and base flows. It was designed to accommodate Q100 (mean flow) discharge.[35] The discharge corresponding to 1:25, 1:50, and 1:100-year storm return periods are computed based on the requirement of the DGCS (DPWH, 2015).

210. Studies suggest that in the next 30 years, floods that currently have a 50-year return period will only have a 20-year return period due to changes in extreme rainfall.[36] With BCIB in place, the design flow used in the hydraulic analysis of bridges, culverts, and roadside ditches, is the flow generated from 1:100 years return period. The hydraulic study added 10% of the calculated rainfall intensity following the provision of Table 9-3 of the DGCS (DPWH, 2015) and considering the impact of climate change, where it is projected to experience higher rainfall extreme in the future. While no flow was observed during the site visit, a base flow was added following the recommendation put forward in the design guideline. Exhibit 7-13 shows the hydrology and hydraulic parameters of Mt View Waterway Bridge.

Exhibit 7-13: Hydrology and Hydraulic Parameters of the Mt View Waterway Bridge

Catchment Area	100-Year Design Discharge (m^3/s)	Max Experienced Flood Level	Computed Flood Level	Design Flood Level	Velocity (m/s)	Remarks/ Recommendation
Mt. View Waterway Bridge	Brgy. Mt. View, Bataan	200 m	32.59	32.59	1.34	Intermittent Waterway

211. Also, the flood analysis for Mt View Waterway Bridge site was conducted using the HEC-RAS software. The hydraulic study was conducted using the calculated discharges derived in the runoff analysis, the river geometry, and the proposed bridge geometry. The design flood water level was calculated to determine the bridge's height considering clearance between the flood water surface level and bridge soffit. Clearance between the design flood level (DFL) and bridge soffit is dictated by the design grade rather than the DFL vis-a-vis discharge. The bridge clearance was pegged at 1.5 m in the feasibility study and detailed design stages (Exhibit 7-14).[37] A clearance

[35] DPWH DGCS only requires 15- and 25-years storm return periods for pipe culverts and box culverts, respectively.

[36] Amro Nasr, Erik Kjellström, Ivar Björnsson, Daniel Honfi, Oskar L. Ivanov & Jonas Johansson. 2020. *Bridges in a changing climate: a study of the potential impacts of climate change on bridges and their possible adaptations*, Structure and Infrastructure Engineering, 16:4, 738-749, DOI: 10.1080/15732479.2019.1670215

[37] The DGCS Volume 5 (DPWH, 2015) provides a minimum clearance of 1.50 m for bridges with the potential of having flows with debris.

between the DFL and the bridge soffit is provided in anticipation of floating debris that may potentially clog the bridge opening.

Exhibit 7-14: Clearance for the Bridge Design

Bridge	Clearance Height(m)	
	BCIB F/S	BCIB Detailed Design
Clearance	1.50	1.50

212. Extreme changes in the magnitude of precipitation events (rainfall extreme magnitude indicators) may pose a severe threat to roads and bridges' safety and structural integrity since designs are mainly based on the assumption of historical rainfall events. Extreme rainfall events (Rx1day) will increase siltation and reduce its useful lifetime. An increase in rainfall may induce an increase in runoff, leading to flash floods. Mt. View Waterway Bridge substructure is designed as a 3-column-pile bent type structure to accommodate the terrain condition and waterway flow on this situation (Exhibit 7-15). Again, the flood discharge and bridge span lengths were calculated according to the rainfall increase considering climate change and base flow (Exhibit 7-16).

213. Also, increased Rx1day rainfall and higher intensities will likely reduce soil stability. This applies to natural slopes and man-made structures, such as road embankments and cuttings. Consequently, the frequency of slope failures affecting the road system along Package 1 is believed to increase in such stations (between 0+050 and 0+150), where more intense rainfall is expected. It means that the area requires slope protection and climate change considerations in making protective measures.

214. In terms of drainage structures, the project will construct and install box and pipe culverts, roadside and median ditches, and gutter flow based on hydrology and hydraulic analysis per station limits. Hydraulic design of all the drainage structures, including the bridges, is based on the flow generated from 1:100 years storm return period. Similarly, there will be an installation of the typical drainage cross-section for land viaducts (Exhibits 7-16 & 7-17). It must be noted that there are no watercourses that traverse P1 and P2, only intermitted waterways and valleys. In P1, flows are discharged to the environment following their natural flow pattern and courses. In P2, however, a parallel drain will be provided to intercept flows from cross drainages considering that the outflows are in residential areas. They firmly are against the direct discharge of flow from culverts to their property.

215. Infiltration is naturally induced in P1 as flows from cross culverts are discharged to natural waterways. Again, using concrete-lined ditches or channels prevents saturation of cut slopes and embankment fill slopes. It may not be similar in P2 due to the social considerations mentioned above.

216. In Bataan interchange section, its configuration was optimized to avoid the steep and unstable slopes observed in the area. This process removes the need to provide the 3-span curve bridge, which considerably lowered the cost. An MSE wall to stabilize the slopes at the northern curve of the Main Ramp replaces the curved bridge. This rationale is behind Design Query (DQ) No 23 that was accepted by the DPWH Bureau of Design (BOD) dated 26 June 2021.

217. Exhibits 7-17 and 7-18 show the optimized Trumpet Interchange avoiding the steep slopes. This resulted in changes to the main ramp with a length of 371.67 m and a spiral length of 100 m with 100 m radius (Exhibit 7-19). The two side ramps have 50 m radius spiral curves (Exhibit 7-20). Ramp 1 has an effective length of 310.11 m and Ramp 2 has an effective length of 233.37 m for (Exhibit 7-21).

Exhibit 7-15: Road Cross Section of Mt View Waterway Bridge in Bataan

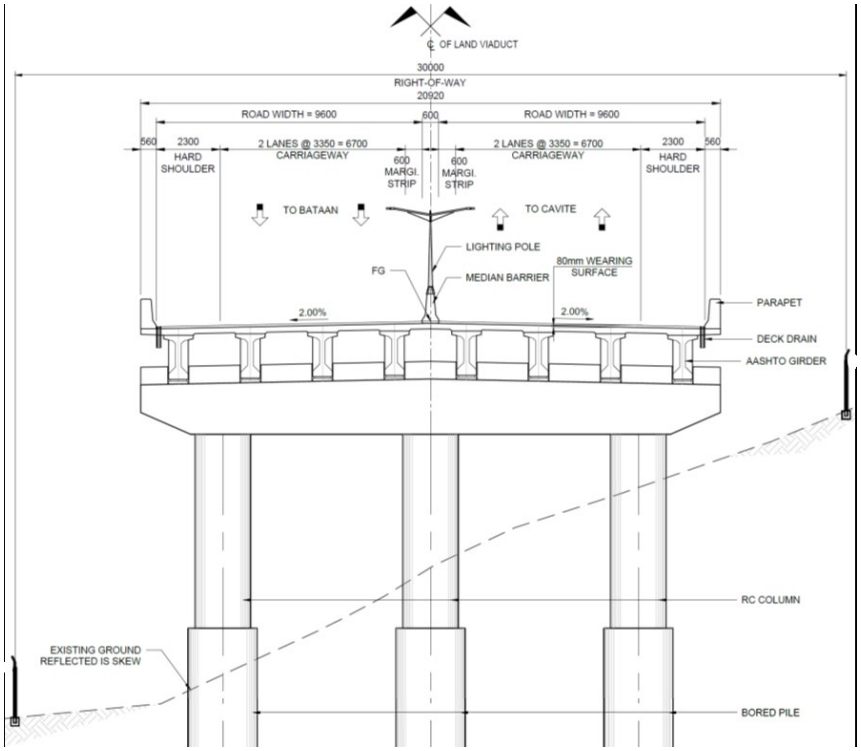


Exhibit 7-16: Span Length for Mt. View Bridge Design

Classification	Flood Discharge (m^3/s)	Minimum Span length (m)	Remarks
50 year + 10% increase in rainfall +base flow	1.13	20	BCIB DED

Source: Bataan-Cavite Interlink Bridge Project. Package 1: Updated Preliminary Engineering Design

Exhibit 7-17: Typical Cut and Fill Road Section on the Main Line in Bataan

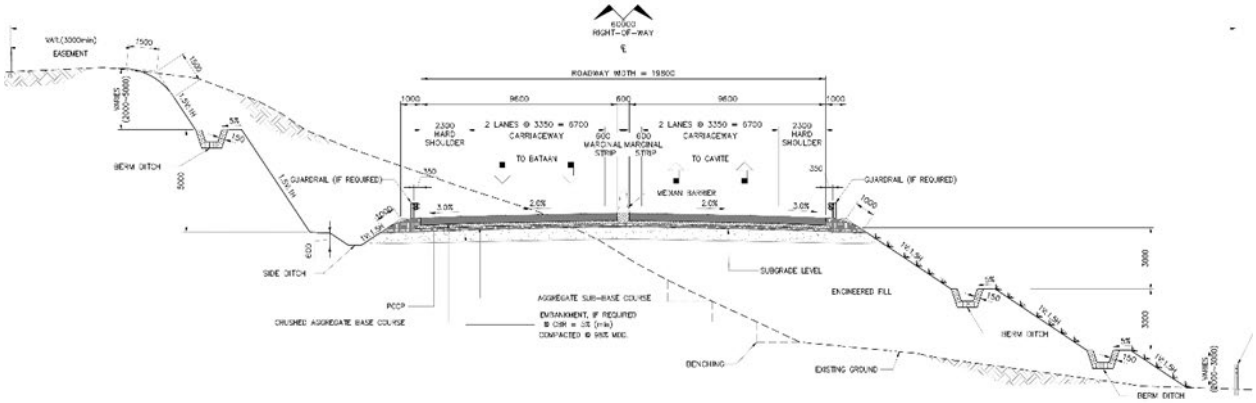


Exhibit 7-18: Mainline Cross Section with Super-elevated Section in Bataan

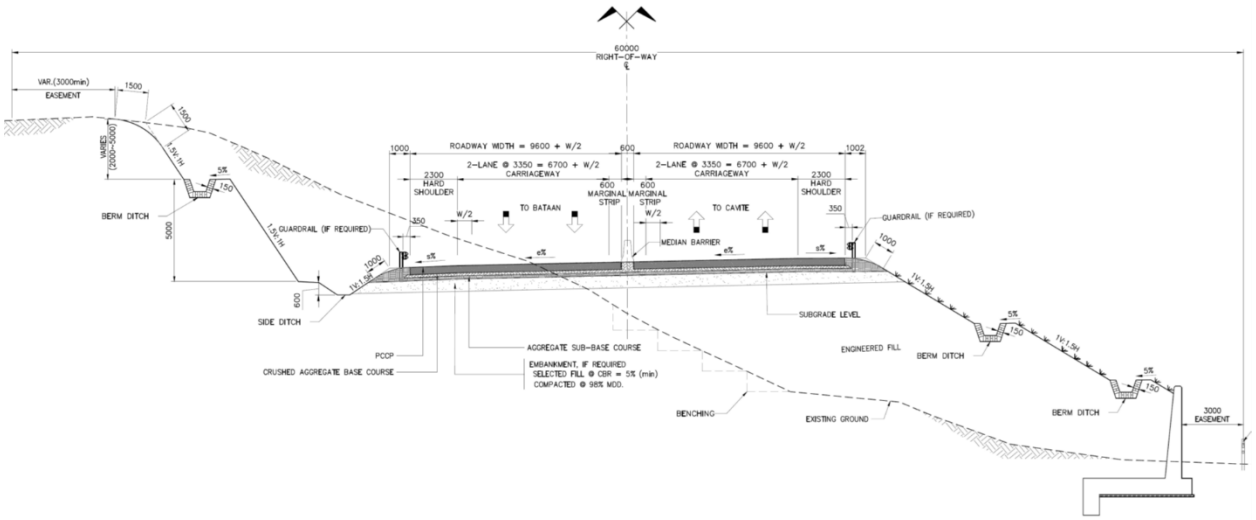


Exhibit 7-19: Overlay of the FS Alignment (grey) and the Optimized Alignment (colored)

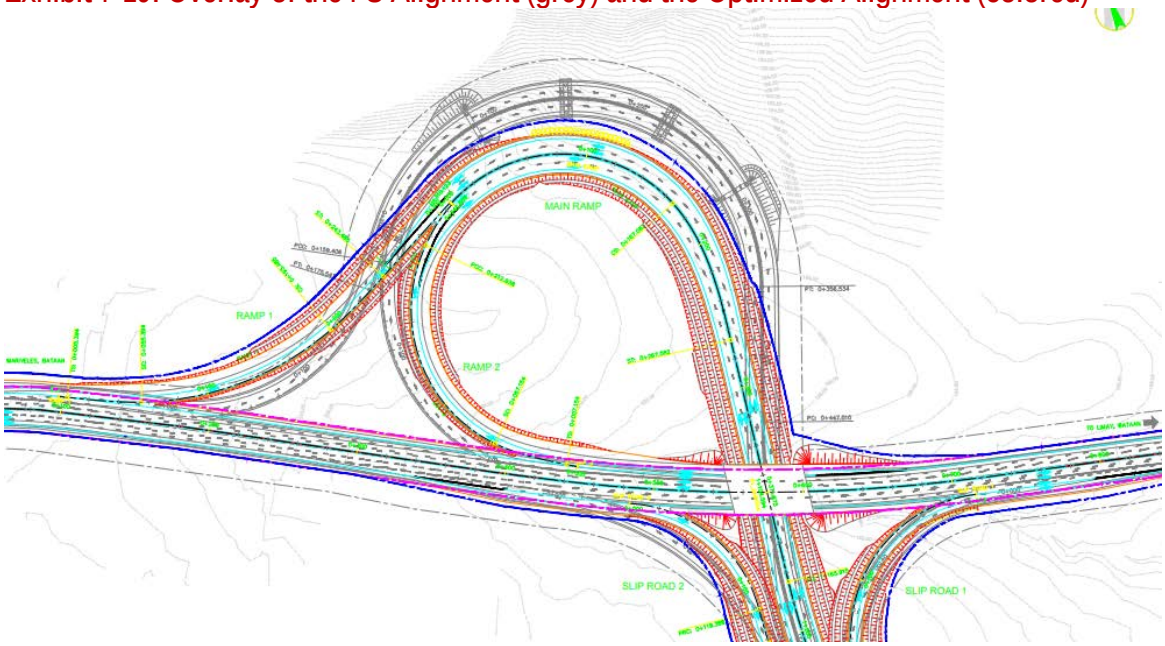


Exhibit 7-20: Road Cross Section at Main Ramp Showing Retaining Wall

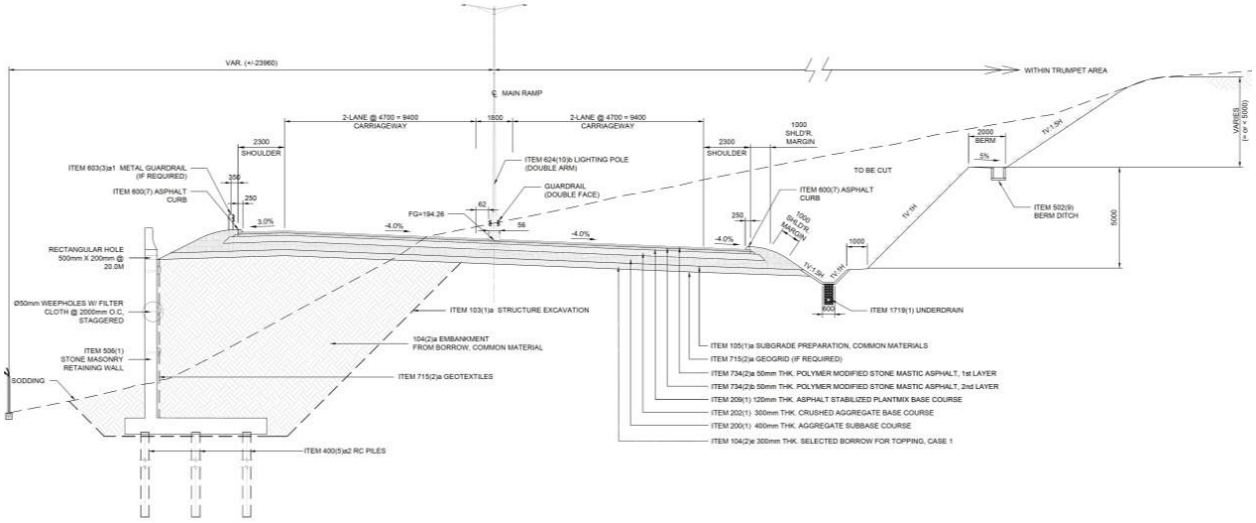


Exhibit 7-21: Road Cross Section at Main Ramp showing Cut and Fill Areas on the Bataan Side

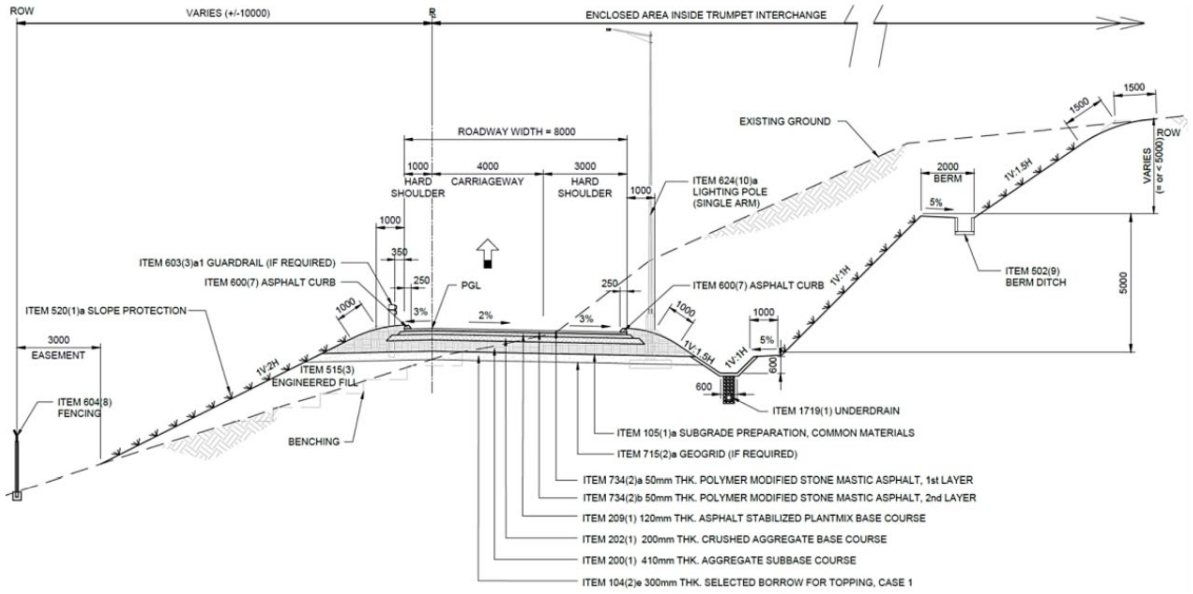


Exhibit 7-22: Ramp at Fill Section on the Bataan Side

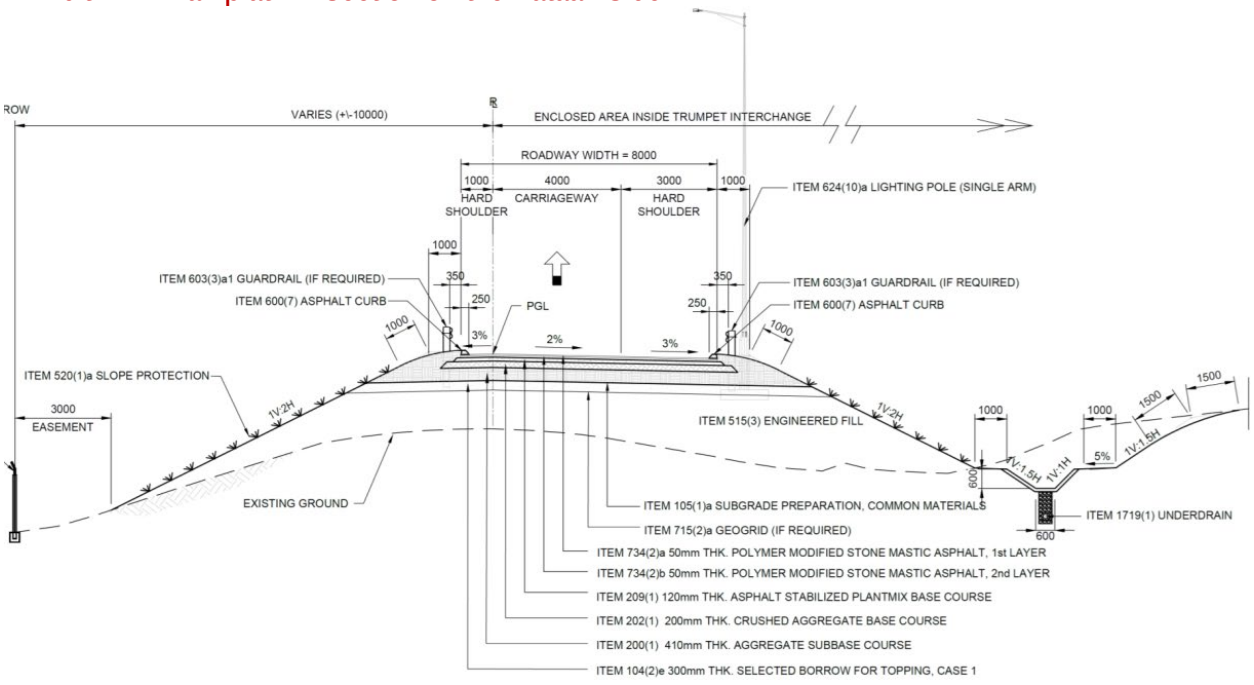
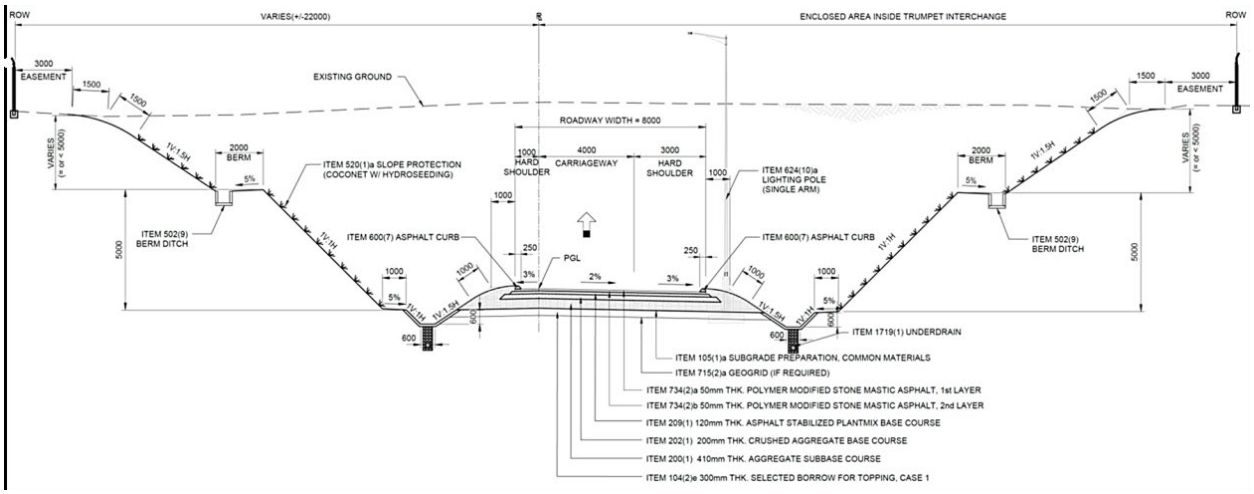
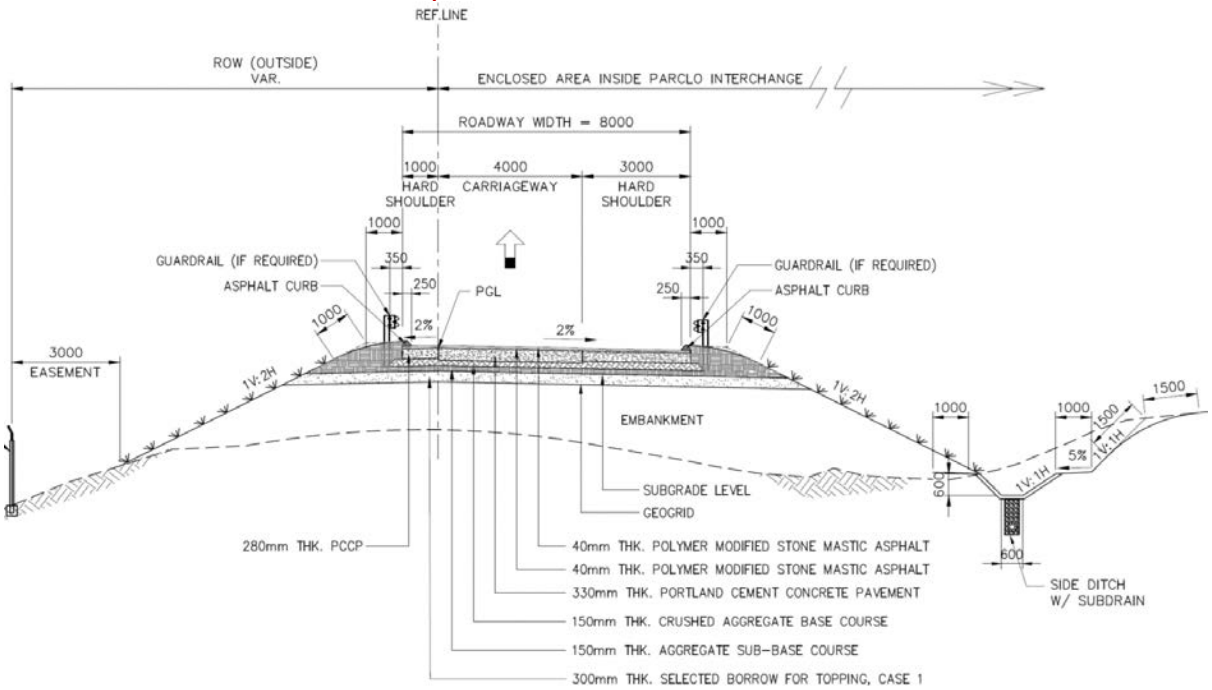


Exhibit 7-23: Ramp Super-elevation at Cut Section on the Bataan Side



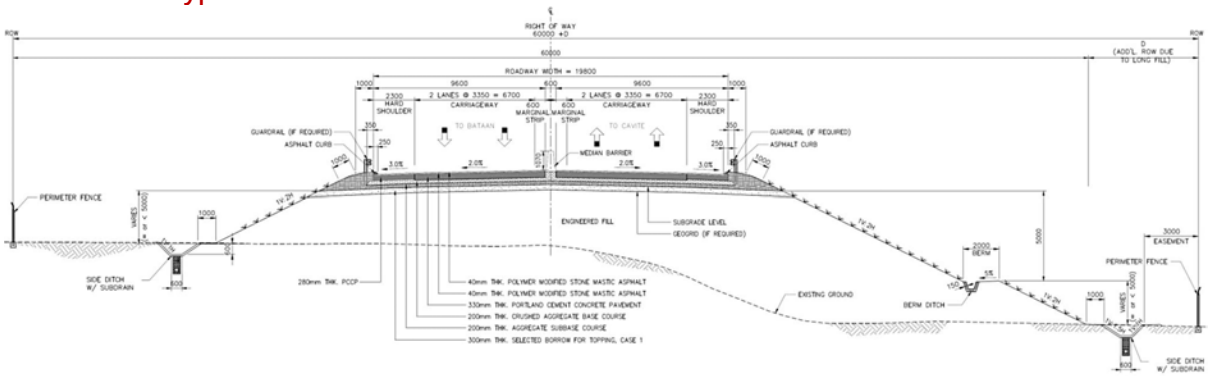
218. Under Package 2 (Cavite Land), between Station 31+600 and Station 32+500 roadway, and from Station 0+100 to Station 0+501.782, interchange areas are highly susceptible to flooding. The preliminary detailed design is going to fill a section of the entire stretch from Sta. 30+800 to Sta. 32+000, and the cover-leaf interchange alignment. The project will also provide a typical drainage on its side based on various hydrologic and hydraulic analyses made in the hydraulic design of cross drainage structures, parallel drains, and bridges (Exhibit 7-24).

Exhibit 7-24: Cross Section of Loop at Fill



219. Again, the BCIB interchange and viaduct components are being designed to an elevation above the projected water level. The project will not be blocking water flows and impeding water drainages because of installation of pipes, box culverts, and side ditches (Exhibit 7-25).

Exhibit 7-25: Typical Mainline Road Section at Fill



220. Exhibit 7-26 shows the vertical difference between the FS (magenta line) and existing grade (gray line) as well as the finished grade (blue line). The maximum gradient of 1.50% continues the gradient from Package 4 and maintains the elevation of 14.50 m at the interface of Sta. 31+840. The height of the mainline at the Antero Soriano Interchange is raised 1.10 m above the current ground level in consideration of the maximum flood level of 0.50 m experienced in the area plus 0.60 m freeboard. The table below summarizes the changes to the alignment during the development of the preliminary engineering design.

Exhibit 7-26: Vertical Difference Between FS and PED

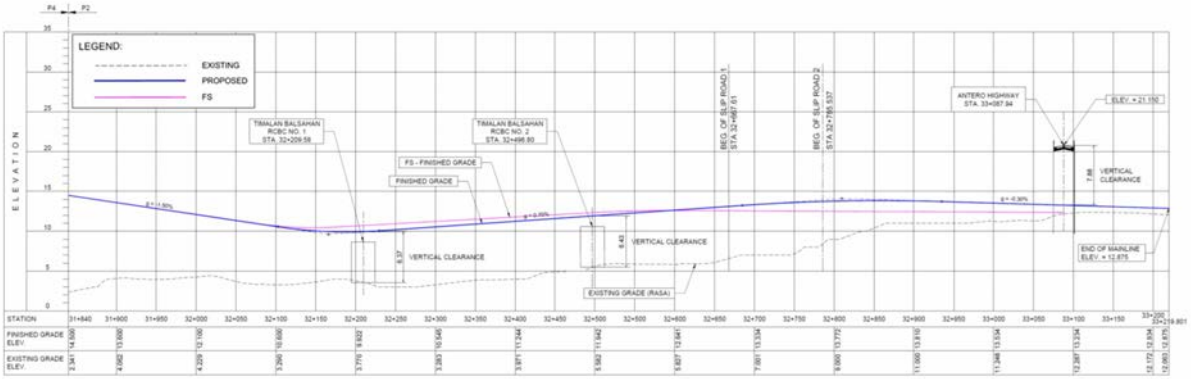


Exhibit 7-27: Summary of Changes in the Design

Parameter	Feasibility Study	Preliminary Engineering Design
Type of Interchange	Directional T-Interchange	Partial Cloverleaf
Level of Antero Soriano Interchange	At-grade	Elevated
Reference Topography	Satellite image from NAMRIA	Actual ground survey and LIDAR data of areas with access problems

Parameter	Feasibility Study	Preliminary Engineering Design
Mainline Elevation at Antero Soriano Interchange	12.36m	Finished grade elevation = 13.27 m. In consideration of the drainage requirements: max flood level of 0.50 m + freeboard of 0.60 m
Antero Soriano Highway Interface Elevation	12.36m	21.15 m; in consideration of the 5.10m vertical clearance

221. Based on the detailed design under Package 3 and 4 (North and South Viaduct), and Package 5 and 6 (North and South Channel Bridge), surface run-off on the deck (marine viaducts) and bridge deck (long-span bridges) will be collected and drained at the low points of the deck surface into the Manila Bay. A flexible pavement is more resistant to the prevalent wet climate condition, especially during the rainy season.

7.1.1.4 Increase of Storm Intensity and Wind Speed

222. The project areas have been exposed to 27 tropical cyclones in the past 7 decades. The intensity of future storms is generally expected to increase, but the frequency of future severe storms is even more uncertain. However, a study on Design Tropical Cyclone Wind Speed when considering climate change indicated that wind speed during tropical cyclones increases by 1.2-1.4 times the historical record (Xu et al., 2020). In essence, the wind speed in Bataan and Cavite sections could increase to well over 300 kph and 315 kph, respectively.

223. Potential impacts on the project include i) damage to bridge infrastructure and increased probability of infrastructure failures, ii) increased threat to the stability of bridge decks, and iii) increased damage to signs, lighting fixtures, and supports.

Wind load on structure

224. Under P3 and P4, the BCIB project design considerations calculated wind loads based on gust wind pressures and solid area exposed to wind. Gust wind pressure was calculated using the exposure coefficient, a factor of the exposure category, and the directional factor and topographical factor provided in the MDCR. The basic 1700 year return period wind speed was applied differently for each limit state in the "3-second gust wind at 10 m above ground Exposure D" condition as shown in Exhibit 7-28.

Exhibit 7-28: Basic Wind Speed

Load Combination	3-Second Gust Wind Speed, V
Strength III	289 km/hr (80.3 m/s)
Strength V	129 km/hr (35.8m/s)
Service I	113 km/hr (31.4m/s)
Service IV	0.75 of the speed used for the Strength III Limit State

225. Also, additional climate change factor of 1.05 was applied to Strength Design of the bridges in consideration of future climate change effects on wind.

7.1.2 Adaptation Measures

226. The project's detailed engineering design will consider climate change adaptation measures to deal with the increased risk of temperature, sea-level rise, storm surge, strong wind, extreme rainfall and flooding (Exhibit 7-29).

227. Adaptation aims to minimize climate change-related risks on infrastructure, including damage to assets. It decreases long-term operational and maintenance costs and protects its revenues and socioeconomic benefits. The BCIB critical infrastructures (i.e., buildings, roads, culverts, drainages, waterway bridges, maritime and navigation bridges) must be more resilient to reduce these impacts.

228. Design measures that have been taken to address climate impacts and risks are the following:

(i) Use of low-carbon concrete where structural considerations and curing time are allowed. Greater use of concrete due to its higher temperature resistance and other advantages (longer lifetime, possibility of increased load, and lower maintenance). Thickening the design cover of concrete increases, the carbonation and chloride ingress, which reinforces it to delay carbonation and chloride-induced corrosion aggregated by extreme temperatures.

The pavement design of the BCIB is Polymer Modified Stone Mastic Asphalt, which has a life of more than three (3) times longer than Conventional Mix Asphalt. Maintenance is required once during the operation period (20 years). Thus, it may also reduce the amount of CO_2 generated during the operation and maintenance period (Exhibit 7-30).

(ii) The polymer-modified stone mastic asphalt will be considered a surface roadway pavement. PSMA has increased durability to reduced cracking, rutting, and other damages caused by extreme temperature and precipitation.

(iii) Incorporate rainwater harvesting in BMMC building designs to reduce the energy used for pumping water. It is vital to construct an efficient water management system in responding to future water shortages.

(iv) Designate the interchange areas in Cavite and Bataan as a green urban corridor. The project will use drought-adapted native tree species in landscaping.

(v) A drainage ditch will be installed along the roads on both sides. The design is based on hydrologic and hydraulic analysis with the provision of increased and regular monitoring for more intense rainfall events.

(vi) From a foundation design perspective, the BCIB Project considers that the piles will need to be longer by the amount of SLR, and the special concrete at the splash zone will need to be extended to a higher elevation to account for SLR.

(vii) Construct slope protection measures (i.e., coconet and retaining wall) on natural slopes and artificial structures, such as road embankments and cuttings in Bataan and Cavite land interchange areas.

(viii) The project will offset all affected trees and coconuts at a ratio of 1:100 (naturally grown) and 1:50 (planted), all preferably of indigenous tree species to be donated to the DENR provincial offices in support of the enhanced National Greening Program (eNGP) and climate change initiatives of the government.

(ix) Undertake preservation and easement retention of natural drainage waterways in conformance with the provisions of the DENR Administrative Order No. 97-05.[38] Trees will be planted and maintained along the easement from the start of the project implementation to enhance soil stability and provide aesthetics.

Exhibit 7-29: Adaptation Measures and Costs taken by the BCIB Project

Climate Drivers	BCIB Design Considerations	Adaptation Measures
Increases in very hot days and heat waves, decreased precipitation	Package 1 & 2 The flexible pavement type is considered due to environmental and weather exposure, traffic loading, and constructability. The flexible pavement of a 920 mm (P1) and 750 mm (P2) of polymer modified stone mastic asphalt as the surface course is required to enhance the dynamic shear modulus against permanent deformation Package 3 & 4 A flexible pavement is considered with an 80 mm of polymer modified stone mastic asphalt. Package 5 & 6 A flexible pavement is also taken into consideration with a 50 mm (P5) and 80 mm (P6) polymer modified stone mastic asphalt. Steel bridge deck is designed in the project that has many benefits, which include the ability to resist high temperatures Ancillary facilities: The color palette is preferably of textured light colors to cool the wall surfaces, minimize solar heat absorption, and to maximize solar heat reflection. Integration of solar panels on roofs and over parking areas to reduce fossil energy use. High-albedo exterior hard surfaces to counteract heating.	GHG emissions offsetting through the enhanced National Greening Program of the government. Use of Polymer Modified Stone Mastic Asphalt and concrete due to its higher temperature resistance. Designate the interchange areas in Cavite and Bataan as a green urban corridor. The project will use drought-adapted native tree species in landscaping. Undertake preservation and easement retention of natural drainage waterways conformance with the provisions of the DENR Administrative Order No. 97-05. Incorporate rainwater harvesting in BMMC building designs to reduce the energy used for pumping water.

[38] Procedures in the retention of areas within certain distances along the banks of rivers, streams, and shores of seas, lakes and oceans for environmental protection.

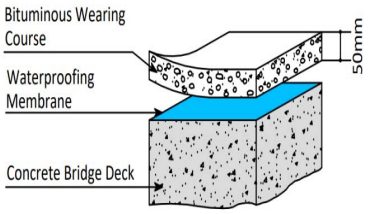
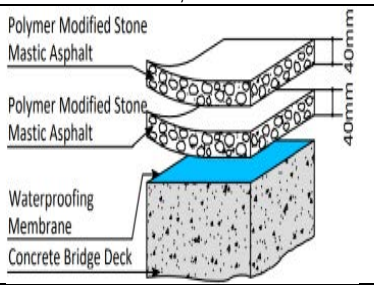
Climate Drivers	BCIB Design Considerations	Adaptation Measures
	Rainwater harvesting to reduce pumping needs to reduce fossil energy used in pumping well water Natural light in interior spaces to reduce lighting needs. Solar hot water to reduce use of fossil energy. High-efficiency equipment, appliances, fixtures to reduce fossil energy use.	
Extreme Precipitation Events, Flooding	Package 1: *Construction of Mt View Waterway Bridge* • No observed water level during the dry season. • designed to accommodate Q100 design discharge. • 3-column-pile bent type structure • Clearance between the design flood level and bridge soffit is dictated by the design grade rather than the DFL vis-a-vis discharge • Bridge clearance was pegged at 1.50 m. • Design flood level is 32.59 m. • 1.13 m^3/s flood discharge considering 50 year + 10% increases in rainfall + base flow • 20 m minimum span length (m) *Construction of slope protection* The Bataan Side of BCIB is a cut section from Sta. 1+000 to Sta. 1+500 and from Sta. 2+000 to Sta. 2+600, and fill section from Sta. 1+500 to Sta. 2+000 and Sta. 2+600 to Sta. 4+400. Package 2: Fill section is for the entire stretch of Cavite Side from Sta. 30+800 to Sta. 32+000. Provision of the typical drainage at grade road portion of the crossing. Construction/Installation of box and pipe culverts, roadside and median ditches, and gutter flow. Installation of the typical drainage cross-section for land viaducts. Package 3 & 4, Package 5 & 6 Surface run-off from the deck (marine viaducts) and bridge deck (long span bridges) will be collected and drained at the low points of the deck surface into Manila Bay.	Reinforcing piers, columns and bridge foundations against scouring Installation of infiltration trenches along roads Construction of slope protection measures on natural slopes and man-made structures, such as road embankments and cuttings. Stream bank stabilization for the protection of the Mt View waterway (riprap protection)

Climate Drivers	BCIB Design Considerations	Adaptation Measures
Sea Level Rise, Storm Surge	Package 1: The substructure is a 2-column pier bent type supported on pilecap and multiple rows of bored pile substructure. The terrain ground condition has a steep slope from abutment towards the shoreline, and column heights vary from 8 m to 17 m high. Package 2: The substructure is a 2-column pier bent type supported on pilecap and multiple rows of bored pile substructure. The terrain ground condition is flat, and the shoreline and column heights vary from 6 m to 7 m high Packages 3 – 6: <u>Sea Level</u> Designed to clear a compounded effect of high tide, sea level rise, storm surge and typhoon-generated tidal waves. P3: Minimum Vertical Design Requirements Estimate: • maximum astrometric tide elevation at that location = 0.91m MSL • Typhoon generated maximum wave height (pier CV 43) = 7.60 m MSL • Sea Level Rise Allowance (Preliminary recommendation) = 1 .2 m MSL • Minimum Low bridge/deck member elevation: = 9.51 m MSL Minimum Vertical Design Requirements Provided (Corregidor Turnaround) • maximum astrometric tide elevation at that location = 0.91m MSL • Typhoon generated maximum wave height (pier CV 43) = 7.60 m MSL • Sea Level Rise Allowance (Preliminary recommendation) = 1.2 m MSL • Minimum Low bridge/deck member elevation: = 9.51 m MSL The vertical profile of the mainline varies from +21.5 msl to +23.0 msl near Corregidor Island. Highway Alignment Level: Northern Main Navigation Channel = + 47.4 m asl; Corregidor Interchange = +31.1 m asl; Fast Ferry to Corregidor Island = +20.9 m asl P6: Southern Main Navigation Channel = +72.3m; Nearshore Navigation Channel = +23.1m; and Non-navigation Span = +14.5m. Highway Alignment Level: +81.7 m asl; Nearshore Navigation Channel = +32.5 m asl; and Non-navigation Span = +21.5 m asl.	Coastal wall protection: Protection of bridges from powerful storm surges and waves by reinforcing piers, columns and bridge foundations against scouring Raise piles to be longer by the amount of the SLR (1.2 m) Treat metal components of the bridge to resist corrosion due to increased exposure to salinity Preservation and easement retention of natural drainage waterways Enhancement and retention of areas within certain distances along the banks of rivers, streams, and shores of seas for environmental protection

Climate Drivers	BCIB Design Considerations	Adaptation Measures
	P5: Air Draft above MSL (m): Northern Main Navigation Channel = +40.5m; Highway Alignment Level: Northern Main Navigation Channel = + 47.4 m asl; P5: Northern Main Navigation Channel = +40.5m; Corregidor Interchange+21.5m+ 5.10m headroom =+26.6m; <u>Vessel collision force</u> Vessel collision force has been applied considering both current conditions and conditions with 1.6 m of SLR.	
Increase of storm intensity and wind speed	Package 1 & 2: Use of a flexible pavement to be more resistant to weather and climate extremes. Package 3 -6: Wind design criteria: 1700-year wind standard– industry standard for cable bridges. The horizontal alignment near the landing point at Bataan and Cavite is designed to be perpendicular to the shoreline and perpendicular to the Northern and South Main Navigation Channel. Package 5 & 6: *Wind load on structure* Exposure category D ('flat unobstructed areas and water surfaces') was applied. *Wind speeds* Speeds are reported at a reference deck height above sea level for the BCIB project. Wind Speed at Deck Heights (87.6 m) for BCIB (South Channel Bridge) • Hourly Mean: 71.0 m/s (255 kph) • 10 Minute Mean 72.7 m/s • 3s-Gust: 95.8 m/s Wind Speed at Deck Heights (48.4) for BCIB (North Channel Bridge) • Hourly Mean: 67.2 m/s (242 kph) • 10 Minute Mean 68.8 m/s • 3s-Gust: 91.9 m/s (331 kph)	Reinforcing piers, columns and bridge foundations against scouring. Coastal wall protection: Protection of bridges from powerful storm surges and waves by reinforcing piers, columns, and bridge foundations against scouring. Additional climate change factor of 1.05 was applied to Strength Design of the bridges in consideration of future climate change effects on wind.

[a] ADB. 2014. *Climate proofing ADB investment in the transport sector: initial experience*. p.9.

Exhibit 7-30: Comparison of Maintenance of Conventional Mixtures Asphalt and Polymer Modified Stone Mastic Asphalt

DIV		Conventional Mixtures Asphalt	Polymer Modified Stone Mastic Asphalt
Maintenance and Repair cycle (Total 20 years)		Construction → Replacement of the Asphalt Surface Layer 50mm (5 years) → Replacement of the Asphalt Surface Layer 50mm (5 years) → Replacement of the Asphalt Surface Layer 50mm (5 years) → Reconstruction	Construction → Replacement of the PSMA Layer 40mm (10 years) → Reconstruction
Total Replacement of the Asphalt Quantities (ton) [a]		1,834,128	489,100
Pavement Structure			
CO_2 Emissions (ton CO_2)	Maintenance [b]	610,264	162,736
	Running Vehicles [c]	1,083,851	412,895
	Asphalt Disposal [d]	40,438	10,783
	Total	1,734,553	586,414

Source: Hong JW. Assessment of Life Cycle Carbon Dioxide Emissions for Asphalt Road: G901: A-0005558937

[a] The quantity is based on the data prepared by ARUP at the FS stage, so it will be changed when DED is completed.

[b] CO_2 emission during maintenance = CO_2 emission during Asphalt Processing + CO_2 emission during Asphalt Transporting + CO_2 emission during the construction equipment.

[c] CO_2 emission during Running Vehicles (20 Years) = CO_2 emission during normal operation + CO_2 emission due to reductio n in vehicle speed during maintenance work.

[d] CO_2 emission during Asphalt Disposal = CO_2 Emissions from Asphalt Demolition + CO_2 Emissions from Asphalt Disposal

7.1.3 Estimated Climate Change Adaptation Cost

229. A total of about US$ 20,261,500 of the civil works will be spent on addressing (adaptation) climate change risks. The estimated costs for adapting to climate change risks are shown below.

Exhibit 7-31: Estimated Costs for Adaptation Measures of the Project

Description	Quantity	Amount	
		Pesos (PhP)	US Dollar ($)
Slope Protection (Coconet with hydroseeding)			
Stone Masonry Retaining Wall			
Geotextiles			
Streambank Stabilization (Riprap)			
Coastal Protection Wall			
GHG Emissions Offsetting (seedling replacement)	145,000 seedlings	14,500,000	261,500
Reinforcing piers, columns, and bridge foundations against scouring			
Construction of a drainage ditch along the roads on both sides.			

Description	Quantity	Amount	
		Pesos (PhP)	US Dollar ($)
Treat metal components of the bridge			
Raise piles by the amount of SLR (1m)		1,097,799,680	20,000,000
Preservation and easement retention of natural drainage waterways			
Enhancement and retention of areas within certain distances along the banks of rivers, streams, and shores of seas			
Use of Polymer Modified Stone Mastic Asphalt and concrete			
Road landscaping			
Rainwater harvesting			
Total		1,112,299,680	20,261,500

7.2 GHG Emission/Contribution of the Project to Climate Change

7.2.1 Construction Phase

230. During the construction stage, the project is expected to contribute approximately 445,200 tCO_2e, which is a small contribution to the total anthropogenic CO_2 load of the country. The construction of the project releases 89,000 tons of CO_2 (tCO_2) annually. This emission amount is below ADB's threshold of 100,000 tCO_2 per year and the project's construction is an insignificant source of emissions. The estimated CO_2e emissions will be contributed from fuel consumption in i) producing the main materials (828 tCO_2e), ii) transporting the main materials (82,677 tCO_2e), iii) different equipment (361,368 tCO_2e), and iv) vehicles, buildings, and road facilities (371 tCO_2e) in the project construction phase.

231. To minimize unnecessary CO_2 generation, the following measures should be employed by the project: i) minimize vegetation removal and alteration of topography, if possible, ii) implement regular inspection and preventive maintenance of heavy equipment, machinery, and service vehicles in conformance with the DENR emission standards; and iii) use electric or fuel-efficient equipment, machinery, and vehicles and maximize their operation.

232. Before a land clearing preparation, the project needs to secure tree cutting permits following DENR guidelines (i.e., Forest Management Bureau Technical Bulletin No. 3) with consideration of the DPWH Department Order 116, series of 2018 on the tree cutting and earth-balling permit application.[39] Also, a coconut cutting permit must be secured from the Philippine Coconut Authority provincial office.

233. The project roadways, navigational bridges, marine viaducts, and interchanges shall be well-lighted throughout the alignment during construction. It will provide adequate lighting and safety for the road users (land), shipping navigation (sea) and air transport to see roadside facilities. The project prefers use of Light Emitting Diode (LED) luminaries because the other types of vapor

[39] Department Order 116, S-2018. Tree cutting and earth-balling permit application process and requirements for DPWH infrastructure projects.

lamps would require twice the number of fixtures and produce low quality of illumination. The lighting system of the project will be able to function with low power consumption and running cost. Lighting will be arranged depending on the roadway alignment of each component.

7.2.2 Operational Phase

234. The project can still be considered on the low-end GHG emitter level based on average annual CO_2 equivalent emissions (61,100 tCO_2e) in forecast years. However, necessary measures will likely be enforced to further reduce its possible impacts and that of climate change on the BCIB project.

235. To sustain its contribution to reducing GHG emission, the project must implement necessary adaptation measures during operation. These include: i) planting of local or endemic trees along its land roadway alignment and facilities between Station 0+000 and Station 31+840 on the Cavite side, and between Station 0+000 and Station 5+800 on the Bataan segment; ii) provision of the roadway lighting powered by the latest solar technology that is durable and weather resistant, ii) implementing energy/water conservation programs such as use of energy-efficient products and monitoring carbon footprint; iv) use of a color palette of textured light colors to cool the wall surfaces, minimize solar heat absorption and to maximize solar heat reflection, plus various service areas (i.e. parking areas for different vehicle types and an impound yard, and various green/ soft-scaped areas), v) designating the interchange areas in Cavite and Bataan as a green urban corridor, and vi) regularly inspecting and properly maintaining road systems and facilities, and equipment and machinery.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

236. The BCIB project climate risk classification is high. This CRA has been prepared to assess the climate and climate change threats to the BCIB project, consider the project adaptation measures, determine to what extent the performance and design are vulnerable to climate change, and recommend actions that will improve the project climate resilience.

237. The climate risk assessment found that the project is exposed to climate hazards based on the current and future time frames. The project location experienced climate and geophysical hazards in the past and is expected to experience these in the future with high intensity, frequency, or duration. However, the project components are not likely sensitive to the climate conditions such as temperature and rainfall extremes, flooding, sea-level rise, storm surge, strong winds, drought, and heatwaves. Based on the design standards adopted for the BCIB project detailed designs, the road and bridge design criteria are robust to meet the context of the Manila Bay geotechnical conditions, large expanse of the crossing and secure against the potential for vessel

collision, and therefore additional measures for climate change mitigation and adaptation are not necessary.

238. Although climate hazards are treated separately here, it is essential to recognize that they can be concurrent. For instance, tropical cyclones typically bring heavy rainfall, high wind speeds, and storm surges. Therefore, the BCIB project should reflect the possibility of climate-driven changes in multi-hazards at a site. This assessment is a step forward towards an efficient management of roadways, bridges, and other facilities of the project in a changing climate.

8.2 Recommendations

239. In terms of marine ecosystem influences, nature-based solutions are recommended. Healthy natural systems can provide many of the critical services communities seek from engineered, hard infrastructure - for example, mangroves can provide coastal protection by reducing the impact of waves, storm surge, and coastal erosion. Nature-based solutions (NBS) are now becoming a popular risk management approach that involve working with nature and enhancing ecosystem services to help address collective goals. According to Nesshöver et al. (2017), actions cover a spectrum of interventions, from protecting, restoring, and improving the management of marine or terrestrial ecosystems, to the creation of natural processes in modified or artificial ecosystems. A vital advantage of using NBS for disaster management in the context of climate change is that they can be flexible in the face of changing conditions if not disturbed (Spalding et al., 2014). In addition, NBS can provide co-benefits in a way hard infrastructure may not. Looking at mangroves in Bataan and Cavite coastal areas, they can provide coastal protection and support fisheries and food security, tourism, and act as a significant carbon sink (Narayan et al., 2016).

240. Installing the nonstructural (soft) barriers to flooding that reduce coastal flooding, erosion, and storm surge impacts are recommended. In close collaboration with the DENR and LGUs, the project needs to develop riparian buffers within the proximity of the land viaduct areas even after its completion. The creation of the coastal development setbacks between shoreline development and the sea may accommodate long-term fluctuations in changes in shoreline profile. It will also provide a natural defense against coastal flooding and storm surges by wave energy dissipation and erosion reduction, helping to stabilize shore sediments.

241. The project needs to develop green corridors to the interchange areas in Bataan and Cavite and the existing riparian galleries during its operation. Vegetation along roads contributes to environmental protection, reducing noise, pollution, and protecting the road from direct sunlight. It will help to reduce roadways' vulnerabilities to fires and heatwaves and serve as a carbon sink within the project areas. The use of fire-resistant, endemic, and indigenous flowering trees is proposed for landscaping.

242. It would be advisable to implement a climate change communication notice process to communities through community-based adaptation options and activities, including film showing and local videos, to increase the level of acceptance of communities to interventions and heighten their involvement in the adaptation options.

243. Again, the entire project infrastructure is located in a high to risk location. Safety of travelers is a concern during typhoon events. The project needs to build early warning systems and information networks to support community disaster information and awareness. In partnership with PAGASA, real-time weather reports and forecasts monitoring is a must in operational decision-making during extreme events. The use of GIS employs ultra-low-cost environmental monitoring devices designed to enable, through a cloud-based data collection mechanism, extensive and real-time monitoring of the status of floods, sea level, tidal wave, and physical structures and facilities in the project areas.

244. Overall, BCIB overwater infrastructure development has not been planned "as usual." Investment decisions have specifically been robust to address the geotechnical context and scale that makes it defensive against future climate change risks.

REFERENCES

ADB. 2009. Safeguard Policy Statement. Manila, Philippines. URL: https://www.adb.org/documents/safeguard-policy-statement

ADB. 2014. *Climate Proofing ADB Investment in the Transport Sector: Initial Experience*. URL: https://www.adb.org/sites/default/files/publication/152434/climate-proofing-adb-investment-transport.pdf

ADB. 2016. *Guidelines for Estimating Greenhouse Gas Emissions of Asian Development Bank Projects Additional Guidance for Transport Projects*. URL: https://www.adb.org/sites/default/files/institutional-document/219791/guidelines-estimating-ghg-emissions-transport.pdf

ADB. 2017. *Pathways to Low-Carbon Development for the Philippines*. ADB Manila, Philippines. 70p. URL: https://www.adb.org/publications/pathways-low-carbon-development-philippines

ADB. 2017. *Guidelines for Estimating Greenhouse Gas Emissions of Asian Development Bank Projects: Additional guidance for clean energy projects.* ADB Manila, Philippines. URL: https://www.adb.org/documents/guidelines-estimating-ghg-energy-projects

ADB. 2018. *Information Sources to Support ADB Climate Risk Assessments and Management (Technical Note)*. Manila Philippines. 50 p. URL: https://www.adb.org/sites/default/files/publication/458756/adb-climate-risk-assessments-info-sources.pdf

ADB. 2020. *Manual on Climate Change Adjustments for Detailed Engineering Design of Roads Using Examples from Viet Nam.* ADB Manila, Philippines. URL: https://www.adb.org/sites/default/files/publication/613611/manual-climate-change-design-roads-viet-nam.pdf

ADB. 2020. *Principles of Climate Risk Management for Climate Proofing Projects. ADB* Sustainable Development Working Paper Series, No. 69 by Paul Watkiss, Robert Wilby, and Charles Andrew Rodgers. ADB Manila, Philippines. https://http://dx.doi.org/10.22617/WPS200203-2

ALMEC Corporation. 2014. *Roadmap for Transport Infrastructure Development for Metro Manila and its Surrounding Areas.* URL: https://neda.gov.ph/roadmap-transport-infrastructure-development-metro-manila-surrounding-areas-region-iii-region-iv/

Amiruddin AM, Haigh I D, Tsimplis MN, Calafat FM and Dangendorf S. 2015. *The Seasonal Cycle and Variability of Sea Level in the South China Sea*'. J. Geophys. Res. Oceans 120 (8), 5490–5513. URL: http://dx.doi.org/10.1002/2015jc010923

ARUP and DPWH. 2020. B2 Highway Alignment and Traffic Study Report for Bataan – Cavite Interlink Bridge (BCIB) Project.

Cadangan Projek Jambatan Temburong, 2013. https://overseas.mofa.go.kr/bn-ko/brd/m_2277/down.do?brd_id=1800&seq=1012209&data_tp=A&file_seq=1

Cannaby H, Palmer MD, Howard T, Bricheno L, Calvert D, Krijnen J, Wood R, Tinker J, Bunney C, Harle J, Saulter A, O'Neill C, Bellingham C, and Lowe J: 2016. *Projected Sea Level Rise and Changes in Extreme Storm Surge and Wave Events During the 21st Century in the Region of Singapore*. Ocean Sci., 12, 613–632. https://doi.org/10.5194/os-12-613-2016.

Carating RB, Galanta RG, and Bacatio CD. 2014. *The Soils of the Philippines*. Springer Netherlands, Dordrecht.

Church, J.A., P.U. Clark, A. Cazenave, J.M. Gregory, S. Jevrejeva, A. Levermann, M.A. Merrifield, G.A. Milne, R.S. Nerem, P.D. Nunn, A.J. Payne, W.T. Pfeffer, D. Stammer and A.S. Unnikrishnan, 2013. *Sea Level Change. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Clean Air Asia. 2012. Air Pollution and GHG Emissions Indicators for Road Transport and Electricity Sectors – Guidelines for Development, Measurement, and Use. Pasig City, Philippines. URL: https://www.gcca.eu/sites/default/files/2019-12/Air%20Pollution%20and%20GHG%20Emissions%20Indicators%20for%20Road%20Transport%20and%20Electricity%20Sectors%20Guidelines%20for%20Development%2C%20Measurement%2C%20and%20Use%2C%202012.pdf

Climate Change Commission. 2017. *Philippine GHG Inventory and Reporting Protocol: Manual for Business.* URL: https://climate.gov.ph/files/GHG-Manual-for-Business-2017.pdf

Climate Risk Country Profile: Philippines 2021: The World Bank Group and the Asian Development Bank. URL: https://www.adb.org/publications/climate-risk-country-profile-philippines

Dave, EV, Buttlar WG, Leon SE, Behania B and Paulino GH. 2013. *ILLiTC-low-temperature Cracking Model for Asphalt Pavements.* Road Mater. Pavement Des. 14, 57–78.

Dela Cruz Santos G. 2021. 2020. *Tropical Cyclones in the Philippines: A review*. Tropical Cyclone Research and Review 10 (3): 191-199. URL: https://doi.org/10.1016/j.tcrr.2021.09.003.

Department Order 116, S-2018. *Tree Cutting and Earth-Balling Permit Application Process and Requirements for DPWH Infrastructure Projects*. Manila, Philippines.

DOST- PAGASA. 2011. *Climate Change in the Philippines*. Philippine Atmospheric, Geophysical and Astronomical Services Administration. URL:https://pubfiles.pagasa.dost.gov.ph/climps/climateforum/ClimatechangeinthePhilippines.pdf

DOST-PAGASA, Manila Observatory and Ateneo de Manila University. 2021. *Philippine Climate Extremes Report 2020: Observed and Projected Climate Extremes in the Philippines to Support Informed Decisions on Climate Change Adaptation and Risk Management*. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines. 145p. URL: https://pubfiles.pagasa.dost.gov.ph/climps/climateforum/ClimatechangeinthePhilippines.pdf

DOST-PAGASA. 2018. *Observed and Projected Climate Change in the Philippines*. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines.

DPWH, ARUP and ADB. 2020. Bataan – Cavite Interlink Bridge (BCIB) Project – Environmental Impact Assessment Report. URL: http://eia.emb.gov.ph/wp-content/uploads/2021/01/IPIF1-BCIB-Environmental-Impact-Assessment-Report.pdf

Emanuel KA. 2011. *Global Warming Effects on US Hurricane Damage*. Weather, Climate, and Society 3 (4): 261–68.

FMB Technical Bulletin No. 3. *Measurement Standards and Procedures in the Conduct of Inventory for Standing Trees (Timber)*. Diliman. Quezon City.

Harris I, Osborn TJ, Jones P and Lister D. 2020. *Version 4 of the CRU TS Monthly High-Resolution Gridded Multivariate Climate Dataset. Scientific Data* (https://doi.org/10.1038/s41597-020-0453-3).

Holden, WN, and Marshall SJ. 2018. *Climate Change and Typhoons in the Philippines: Extreme Weather Events in the Anthropocene*. In Integrating Disaster Science and Management, 407–21.

IPCC. 2016. *Guidelines for National Greenhouse Gas Inventories*. URL: https://www.ipcc-nggip.iges.or.jp/public/2006gl/.

IPCC. 2022. *Sixth Assessment Report*. URL:https://www.ipcc.ch/assessment-report/ar6/

IPIF, DPWH, ADB, TYLIN International, and PEC. 2021. Bataan-Cavite Interlink Project - Aesthetic Manual. 42p.

Kahana R, Abdon R, Daron, J and Scannell C. 2016. *Projections of Mean Sea Level Change for the Philippines.* URL:https://www.researchgate.net/publication/320800587_Projections_of_mean_sea_level_change_for_the_Philippines

Knutson TR, McBride JL, Chan J, Emanuel K, Holland G, Landsea C, Held I, Kossin JP, Srivastava AK, and Sugi M. 2010. *Tropical Cyclones and Climate Change*. Nature Geoscience 3: 157–63.

Lapidez JP. 2015. *Identification of Storm Surge Vulnerable Areas in the Philippines Through the Simulation of Typhoon Haiyan-Induced Storm Surge Levels Over Historical Storm Tracks*. Philippine Atmospheric, Geophysical and Astronomical Services Administration.

Muto M, Morishita K, and Syson L. 2010. *Impacts of Climate Change upon Asian Coastal Areas: The Case of Metro Manila*. URL: https://www.jica.go.jp/jica-ri/publication/other/jrft3q0000002aif-att/Impacts_of_Climate_Change_to_Asian_Coastal_Areas_The_Case_of_Metro_Manila.pdf

Nesshöver C, Assmuth T, Irvine KN, Rusch GM, Waylen KA, Delbaere B, Haase D, Jones-Walters L, Keune H, Kovacs E, Krauze K, Külvik M, Rey F, van Dijk J, Vistad OI, Wilkinson ME, and Wittmer H. 2017. *The Science, Policy and Practice of Nature-Based Solutions: An Interdisciplinary Perspective", Science of The Total Environment*. (579): 1215-1227. URL: https://www.academia.edu/33319883/The_science_policy_and_practice_of_nature_based_solutions_An_interdisciplinary_perspective

Narayan S, Beck M, Reguero B, Losada I, Wesenbeeck B, Pontee N, Sanchirico J, Ingram JC, Lange GM, and Burks-Copes K. 2016. *The Effectiveness, Costs and Coastal Protection Benefits of Natural and Nature-Based Defences*. PLOS ONE, 11(5): e0154735. URL: https://pubmed.ncbi.nlm.nih.gov/27135247/

Nasr A, Kjellström E, Björnsson I, Honfi H, Ivanov O and Johansson J. 2020. *Bridges In a Changing Climate: A Study of the Potential Impacts of Climate Change on Bridges and their Possible Adaptations*. Structure and Infrastructure Engineering, 16:4, 738-749, DOI: 10.1080/15732479.2019.1670215

Olsen R. 2015. *Adapting Infrastructure and Civil Engineering Practice to a Changing Climate*. Virginia: American Society of Civil Engineers. 93 p. URL: https://ascelibrary.org/doi/book/10.1061/9780784479193

Oppenheimer, M., B.C. Glavovic , J. Hinkel, R. van de Wal, A.K. Magnan, A. Abd-Elgawad, R. Cai, M. Cifuentes-Jara, R.M. DeConto, T. Ghosh, J. Hay, F. Isla, B. Marzeion, B. Meyssignac, and Z. Sebesvari. 2019: *Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities. In: IPCC Special Report on the Ocean and Cryosphere*

in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)]. URL: https://www.ipcc.ch/site/assets/uploads/sites/3/2019/11/08_SROCC_Ch04_FINAL.pdf

PEMSEA. 2012. *Integrating Climate Change and Disaster Risk Scenarions into Coastal Land and Sea Use Planning in Manila Bay: Partnership in Environmental Management for the Seas of East Asia (PEMSEA)*. Quezon City, Philippines. URL: http://pemsea.org/publications/reports/integrating-climate-change-and-disaster-risk-scenarios-coastal-land-and-sea-use

Perez RT, Amadore LA and Feir RB. 1999. *Climate Change Impacts and Responses in the Philippine Coastal Sector*. Climate Research 12: 97-107. URL: https://www.int-res.com/articles/cr/12/c012p097.pdf

Provincial Government of Cavite. 2012. Cavite Integrated Water Resource Management Master Plan. URL: http://seaknowledgebank.net/sites/default/files/1538111106_field_management_plan_2012%20Master%20Plan%28Final%29%20.pdf

Qiao Y, Dawson AR, Parry T, Flintsch G and Wang W. 2020. *Flexible Pavements and Climate Change: A Comprehensive Review and Implications. Sustainability*. URL: https://www.researchgate.net/publication/339045444_Flexible_Pavements_and_Climate_Change_A_Comprehensive_Review_and_Implications

Regidor JR. 2019. *Current State of Transportation Data and Statistics in the Philippines and Opportunities for Improvement Towards Usability*. URL: https://www.psa.gov.ph/sites/default/files/7.5.1%20Current%20State%20of%20Transportation%20Data%20and%20Statistics%20in%20the%20Philippines%20and%20Opportunities%20for%20Improvement%20Towards%20Usability%20_0.pdf

Rodolfo K and Siringan FP. 2006. *Global Se-Level Rise is Recognized but Flooding from Anthropogenic Subsidence is Ignored around Northern Manila Bay, Philippines*. Disasters 30 (1): 188-139. URL: https://www.researchgate.net/publication/7264797_Global_sea-level_rise_is_recognised_but_flooding_from_anthropogenic_land_subsidence_is_ignored_around_northern_Manila_Bay_Philippines

Spalding MD, Susan R, Carmen L, Imèn M, Lynne ZH, Christine S, and Beck M. 2014. *The Role of Ecosystems in Coastal Protection: Adapting To Climate Change And Coastal Hazards*. Ocean & Coastal Management, (90): 50-57. URL: http://dx.doi.org/10.1016/J.OCECOAMAN.2013.09.007

Stewart MG, Wang XM and Nguyen MN. 2012. *Climate Change Adaptation for Corrosion Control of Concrete Infrastructure*. Structural Safety, 35, 29-39. http://dx.doi.org/10.1016/j.strusafe.2011.10.002

T.Y. Lin International/Pyunghwa Engineering Consultants. 2022. Bataan-Cavite Interlink Bridge Project. Wind Engineering Studies: Wind Buffeting Effects on Structure – North Channel Bridge Deck.

T.Y. Lin International/Pyunghwa Engineering Consultants. 2021. Bataan-Cavite Interlink Bridge Project. Package 1: Preliminary Engineering Design.

T.Y. Lin International/Pyunghwa Engineering Consultants. 2021. Bataan-Cavite Interlink Bridge Project. Package 2: Preliminary Engineering Design.

T.Y. Lin International/Pyunghwa Engineering Consultants. 2022. Bataan-Cavite Interlink Bridge Project: Internal Memo 001 – Design Life of BCIB Bridges.

Underwood S, Guido Z, Gudipudi P, and Feinberg Y. 2017. *Increased Costs to US Pavement Infrastructure from Future Temperature Rise*. Nat. Clim. Change. 7, 704–707.

USAID. 2015. *A Guide For Usaid Project Managers (BRIDGES).* URL: https://www.climatelinks.org/sites/default/files/asset/document/ROADS_PRIMER_CCA_ENGINEERING_DESIGN.pdf

Virginia Department of Transportation. 2021. *Chapter 33, Climate Change and Coastal Storms*. URL: https://www.virginiadot.org/business/resources/bridge/Manuals/Part2/Chapter33.pdf

Wang J, Church J, Zang X, and Chen X. 2021. *Reconciling Global Mean and Regional Sea Level Change in Projections and Observations.* Nature Communications 12. URL: https://www.nature.com/articles/s41467-021-21265-6

Watkiss P. Wilby R. and Rodgers CA. 2020. *Principles of Climate Risk Management for Climate Proofing Projects. ADB Sustainable Development Working Paper Series No. 69.* Manila, Philippines. URL: https://www.adb.org/publications/climate-risk-management-climate-proofing-projects

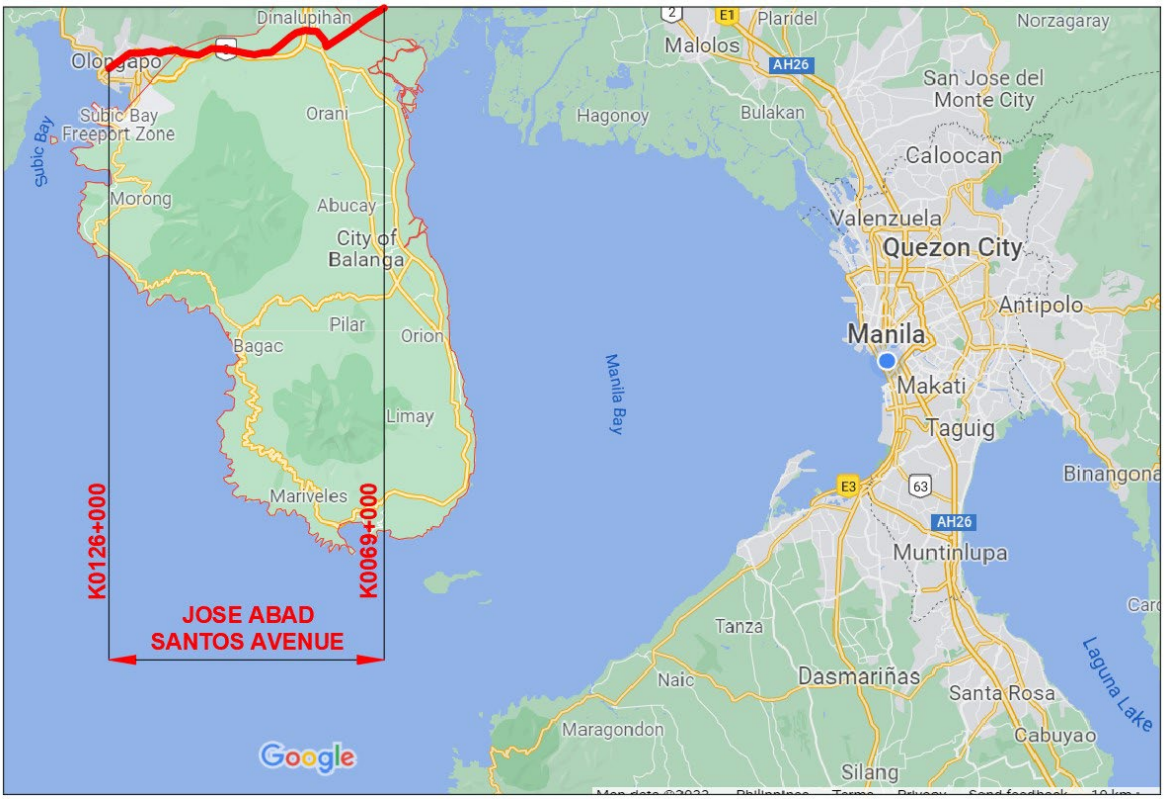
Wistuba MP, and Walther A. 2013. *Consideration of Climate Change in the Mechanistic Pavement Design*. Road Mater. Pavement Des. 14, 227–241.

Xu H, Lin N, Huang M, and Lou W. 2020. Design Tropical Cyclone Wind Speed when Considering Climate Change. J. Struct. Eng., 2020, 146(5): 04020063. https://ascelibrary.org/doi/pdf/10.1061/%28ASCE%29ST.1943-541X.0002585.

APPENDICES

Appendix 1: Documentation of the Conditional Road Surveys Conducted in Bataan and Cavite

Jose Abad Santos Avenue (K0069+000 - K0126+000)



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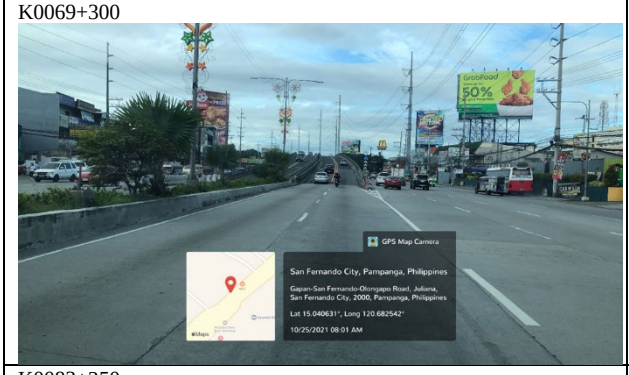

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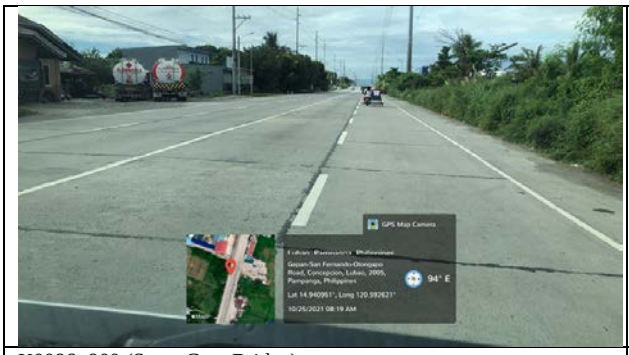
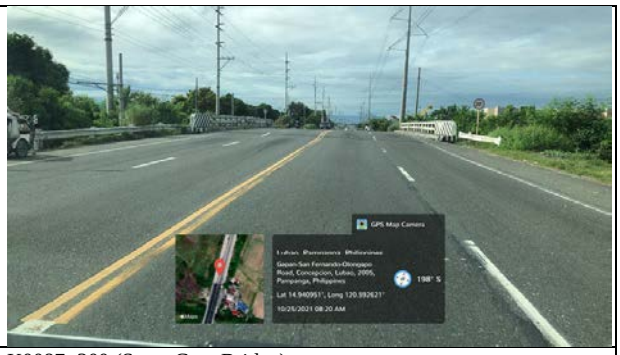
K0083+250

K0083+800 (San Antonio Bridge)



K0086+900 (Santa Cruz Bridge)



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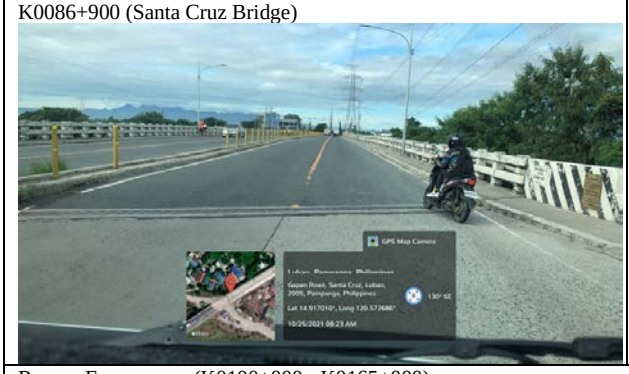
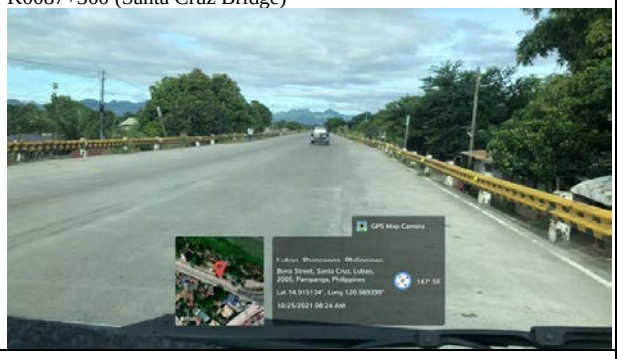
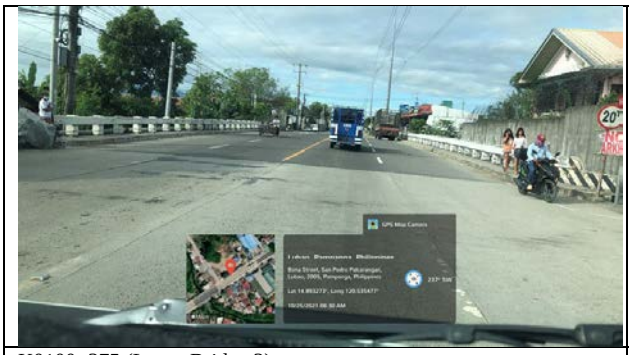
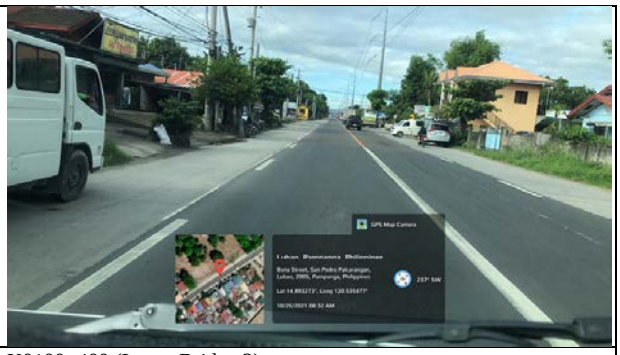




Roman Expressway (K0100+000 - K0165+000)

K0091+750 (Lauc Pao Bridge)

K0093+100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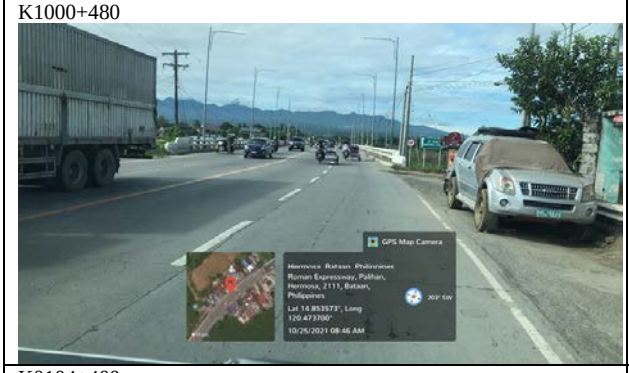
K1000+480	K0100+500
	
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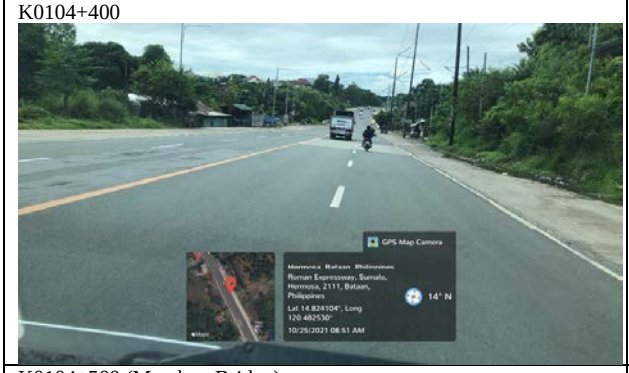	
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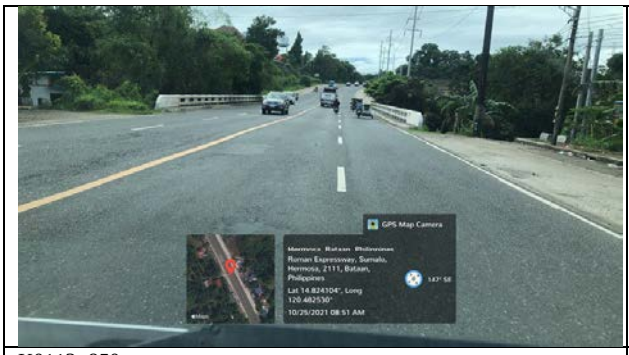

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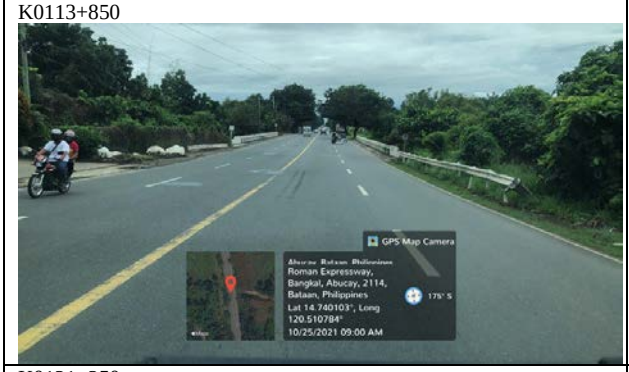
K0120+300



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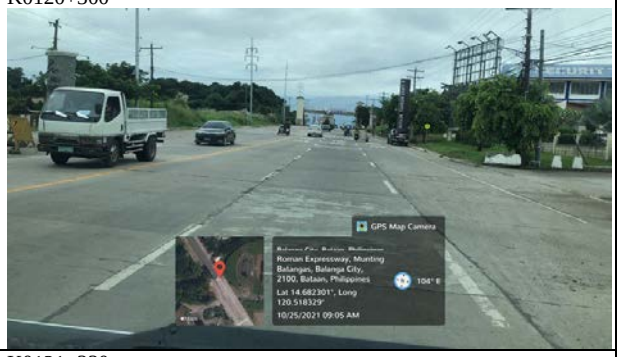

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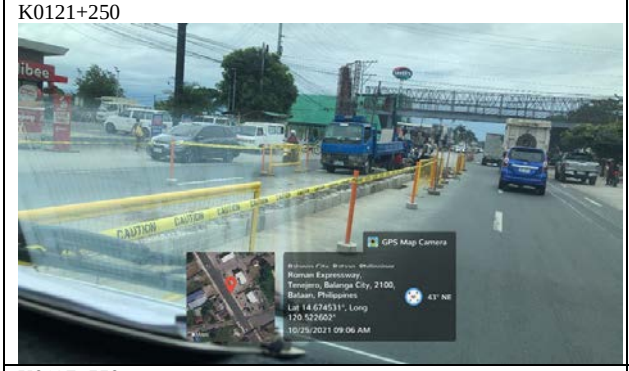
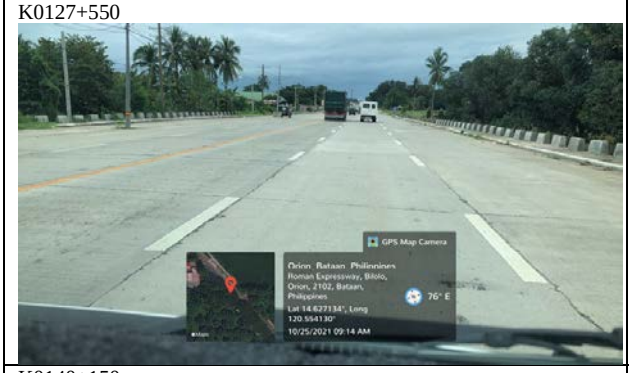
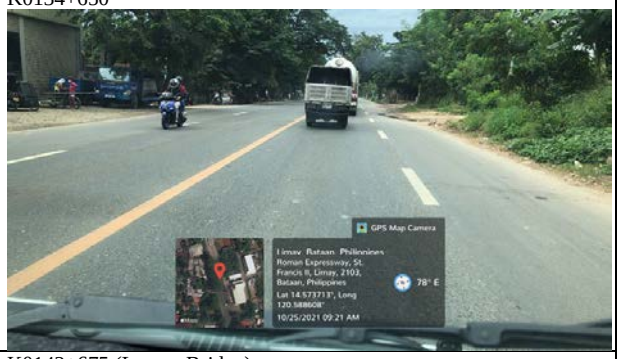


K0127+550

K0134+650

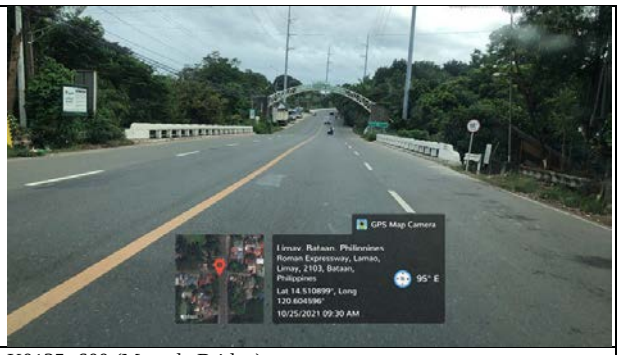


K0140+150



K0142+675 (Lamao Bridge)

K0135+550 (Mamala Bridge)

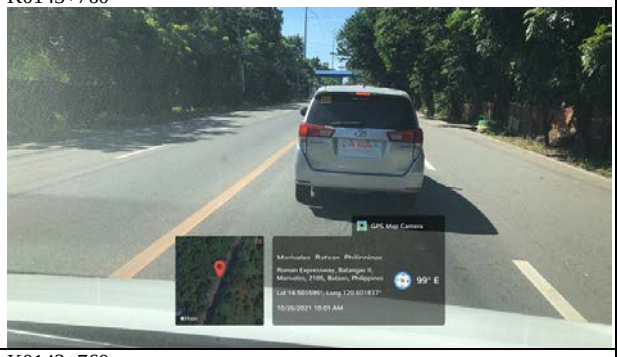


K0135+600 (Mamala Bridge)

K0135+959 (T. Kaliwa Bridge)

K0143+760

K0143+760



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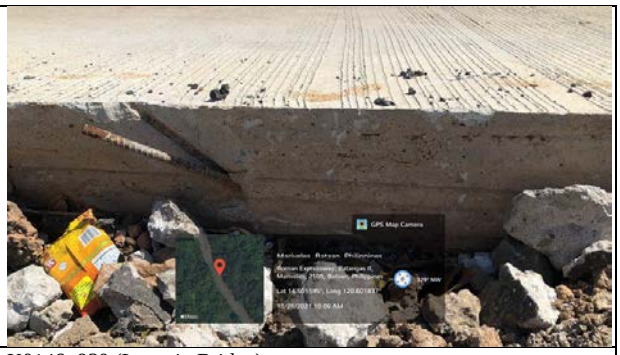
K0143+760

K0143+760

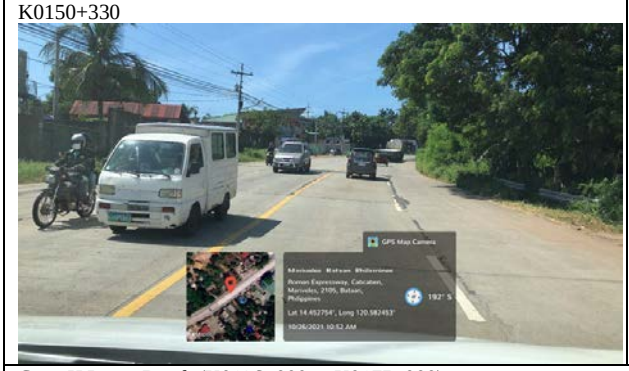


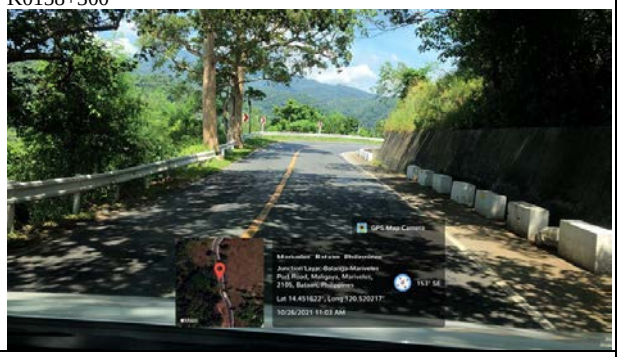
K0146+930 (Lucanin Bridge)

K0146+930 (Lucanin Bridge)

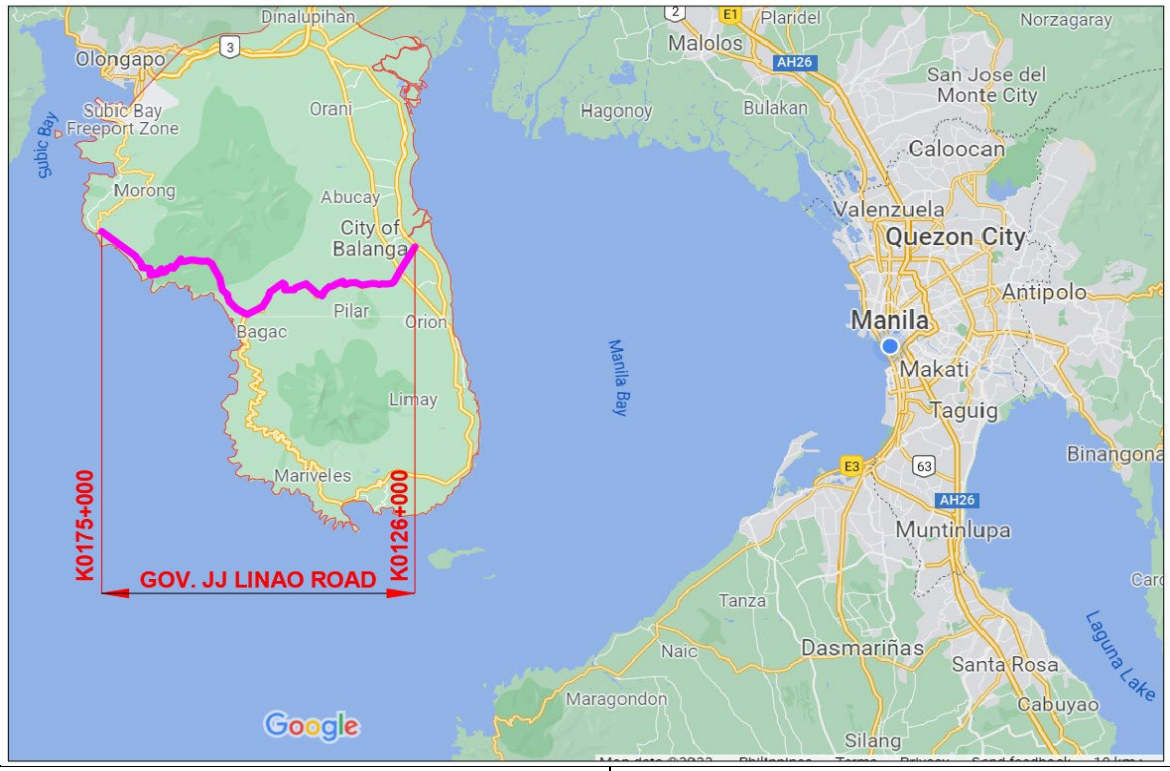
K0150+330

K0158+300

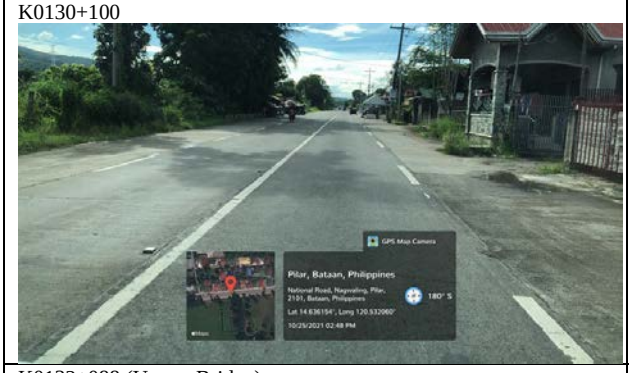




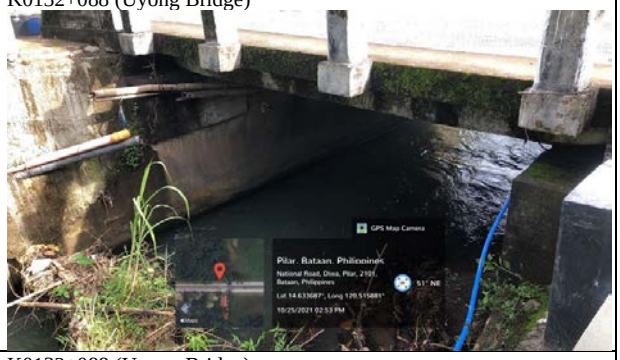
Gov. JJ Linao Road. (K0126+000 to K0175+000)



K0130+100



K0132+088 (Uyong Bridge)



K0132+088 (Uyong Bridge)

K0132+088 (Uyong Bridge)

K0132+088 (Uyong Bridge)

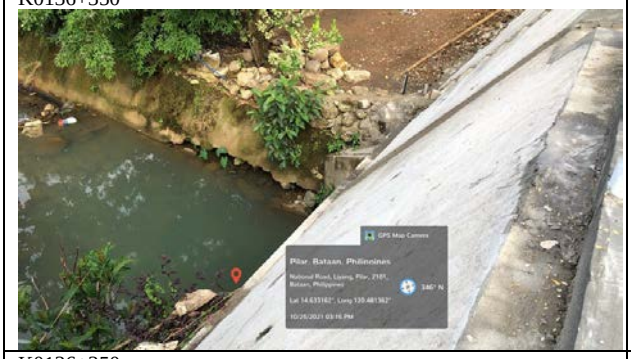
K0133+350 (Catmon Bridge)

K0133+350 (Catmon Bridge)

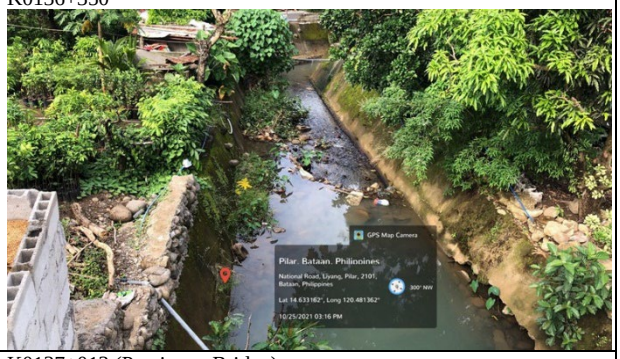
K0135+645

K0136+350

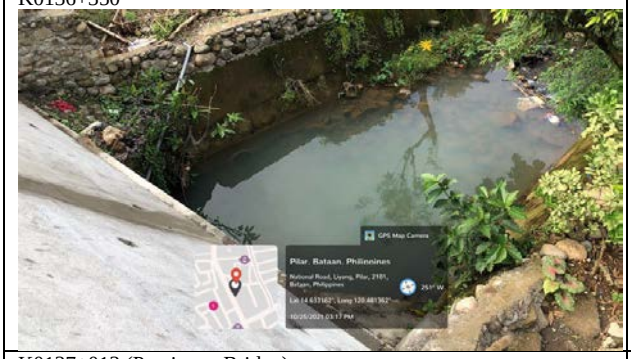
K0136+350



K0136+350



K0137+013 (Pantingan Bridge)



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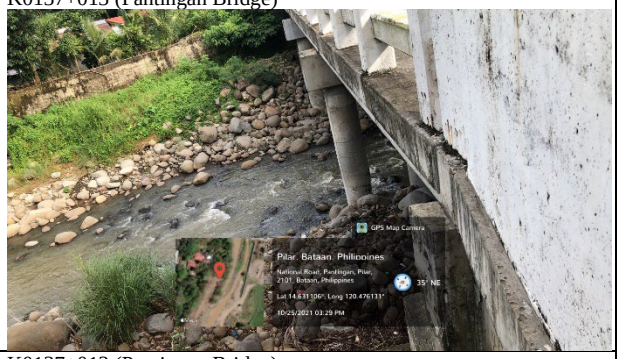
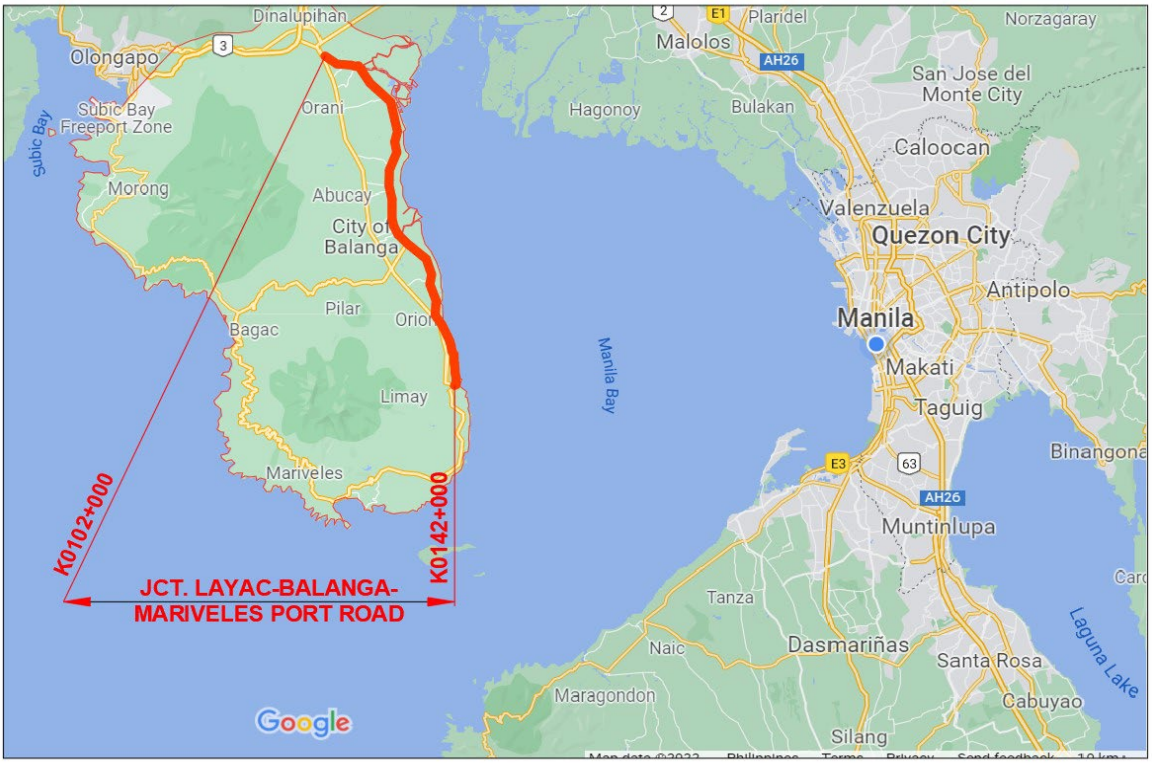


K0137+013 (Pantingan Bridge)

K0137+013 (Pantingan Bridge)

K0137+013 (Pantingan Bridge)

Junction. Layac-Balanga Mariveles Port Road (K0102+000 to K0142+000)



K0124+500

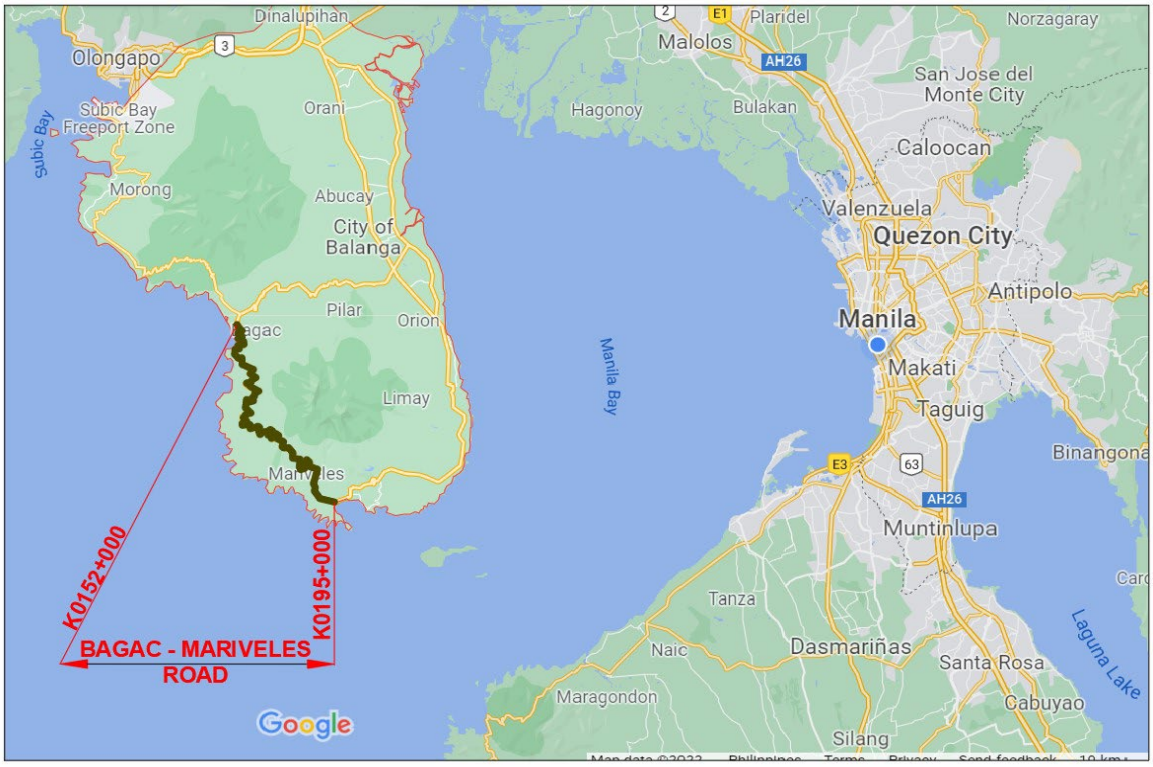
K0124+700 (Camacho Bridge)

K0124+700 (Camacho Bridge)

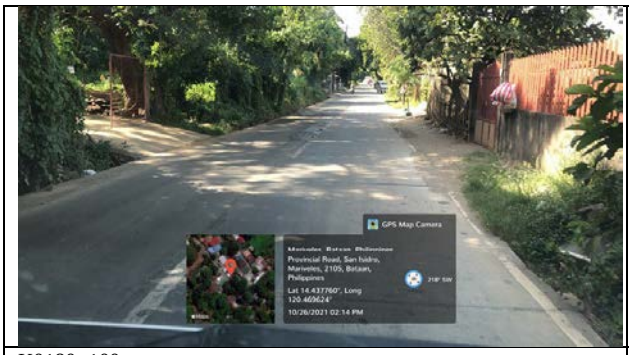
K0132+450 (Orion Bridge)

Bagac-Mariveles Road. (K0152+000 to K0195+000)

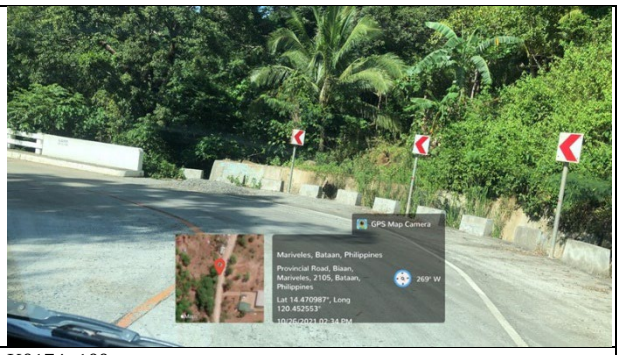
K0193+780



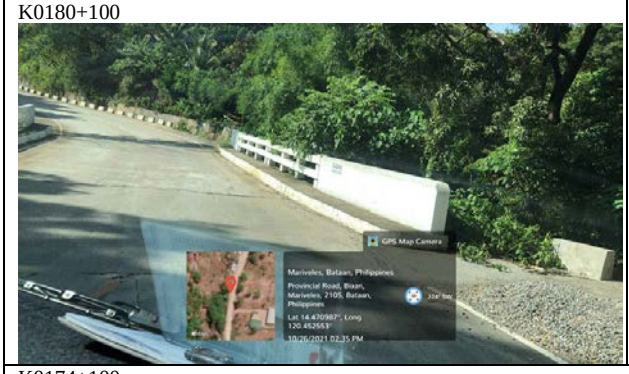
K0186+100



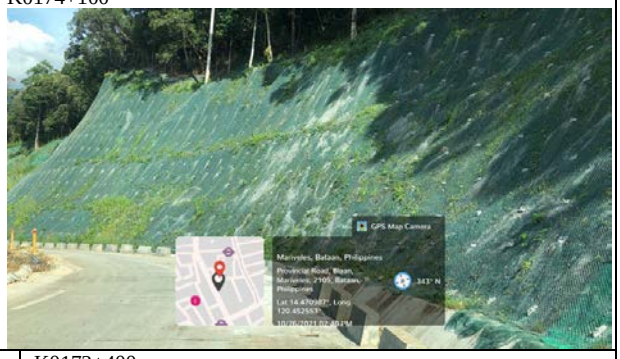
K0180+100



K0174+100



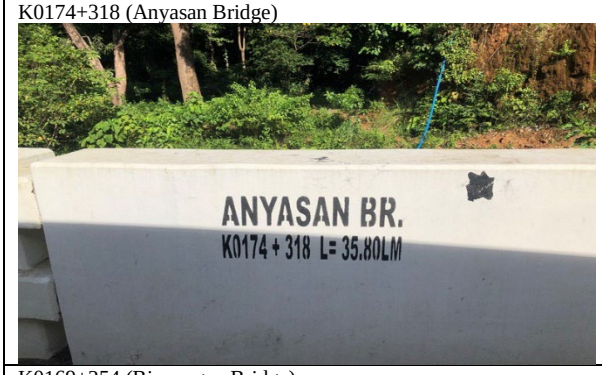
K0174+100



K0174+100

K0172+400

K0174+318 (Anyasan Bridge)



K0174+318 (Anyasan Bridge)

K0169+254 (Binuangan Bridge)

K0169+254 (Binuangan Bridge)

K0161+650 (Bulingal Bridge)

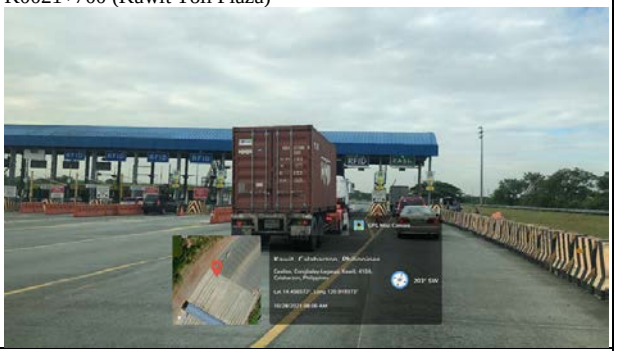
K0160+135 (Banayam Bridge)

Manila - Cavite Expressway K0007+500

K0007+900 (Parañaque Toll Plaza)

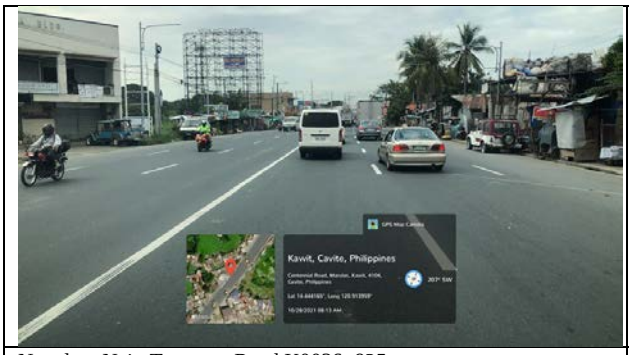
Manila - Cavite Expressway K0021+000

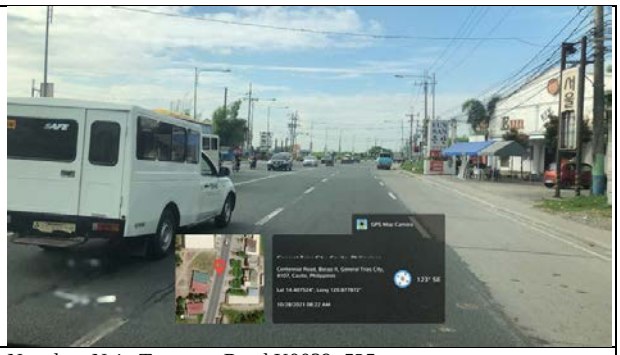
K0021+700 (Kawit Toll Plaza)



Kawit-Noveleta Div. Road K0022+000

Noveleta-Rosario Div. Road K0028+700





Noveleta-Naic-Tagaytay Road K0036+925

Noveleta-Naic-Tagaytay Road K0039+525

Noveleta-Naic-Tagaytay Road K0043+600

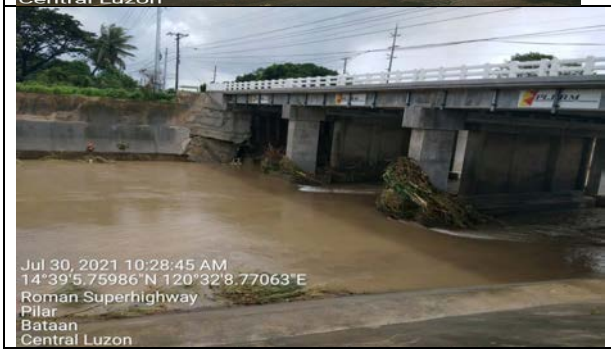
Juanito R. Remulla, Sr. Road K0058+930

Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

Junction Layac Balanga-Mariveles Port Road(K0160+000 - K0160+030)

Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

Talisay Bridge - Roman Expressway (K0124+142)



Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

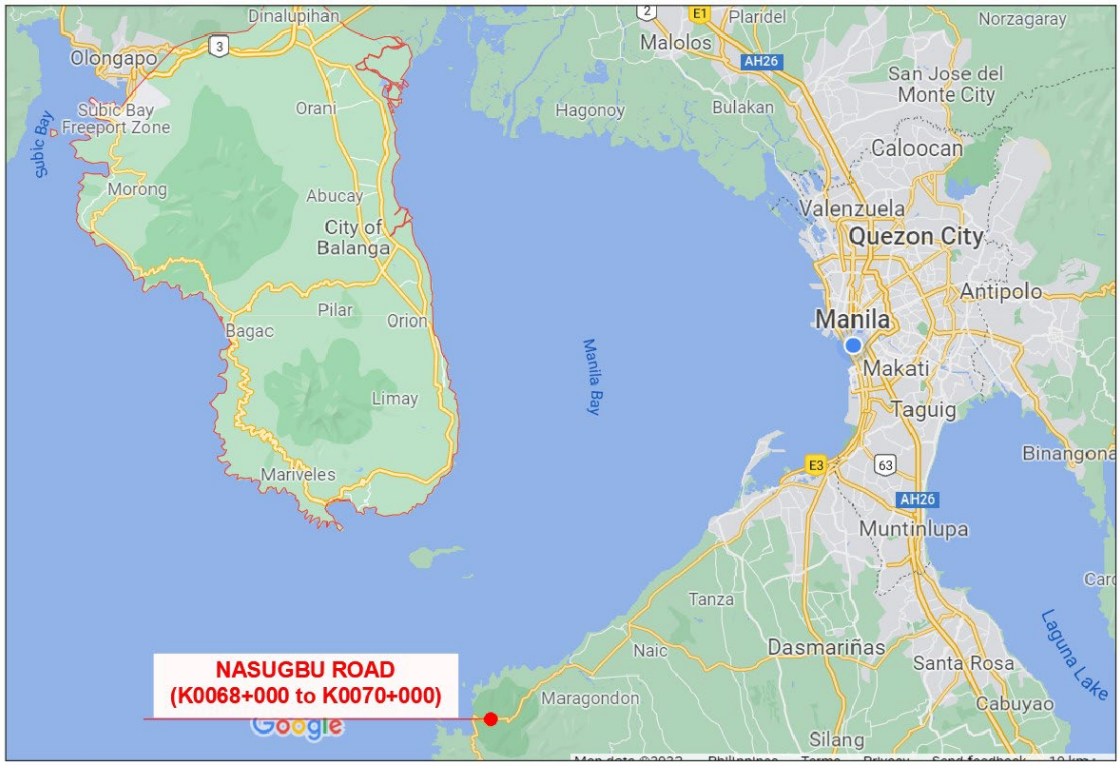
Gov. JJ Linao Road (K0151+829)-Umagol Bridge

Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

Roman Expressway (K0126+188)-Capot Bridge

Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

NASUGBU ROAD, K0068+800, Clearing Operation of Fallen Rocks and Debris



Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

NASUGBU ROAD, K0069+190, Road Close due to Landslide

Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

NASUGBU ROAD, K0069+350, Road Close due to Landslide

Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

NASUGBU ROAD, K0069+350, Road Close due to Landslide

Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

NASUGBU ROAD, K0069+500, Road Close due to Landslide

Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

NASUGBU ROAD, K0069+500, Road Close due to Landslide

Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

NASUGBU ROAD, K0069+750, ROAD CLOSE due to Landslide

Source Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

NASUGBU ROAD, K0069+750, ROAD CLOSE due to Landslide

Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

1. NASUGBU ROAD, SINALAM BRIDGE, Damaged Slope Protection @ Abutment "A"

Source: Typhoon FABIAN and JOLINA Survey Report by DPWH,2021

Appendix 2: List of Participants, Photographs, and Guide Questionnaire Used During the Interview

List of Participants in Bataan Province

Name	Designation	Office
Gladys Gomez	EMS	MENRO, Mariveles, Bataan
Alvin Binondo Marcelo Serrano	Officer 1 MDRRO Head	MDRRM, Mariveles, Bataan
Leoncio Lungcay	Brgy Chairman	Mt. View, Mariveles, Bataan
Sitoy Doculan Ricky Ritomalta	Bantay Dagat, Brgy. Tanod	Mt. View, Mariveles, Bataan
Maria Concepcion Tua	Brgy. Secretary	Brgy. Alas-asin, Mariveles, Bataan

List of Participants in Cavite Province

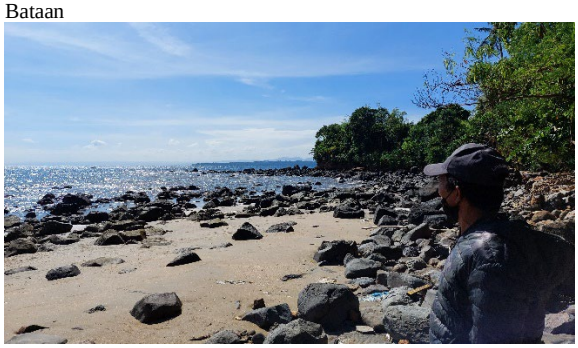
Name	Designation	Office
Jesty Gonzales	MDRRO Head	MDRRMO Naic, Cavite
Christopher Cabuhat	Brgy Chairman	Balsahan Timalan, Naic Cavite
Marissa Pabiton	Brgy. Chairman	Timalan Concepcion, Naic Cavite
Nick Salvador	Bantay Dagat, Brgy. Tanod	Timalan Conception, Naic Cavite

Photographs During Interviews

Interview with the Municipal Disaster Risk and Management Officer of Mariveles, Bataan

Interview with the Barangay Administrator, Mt. View, Mariveles, Bataan

Interview with the Barangay Secretary, Alas-asin, Mariveles, Bataan



Interview with the Bantay Dagat and local resident, Mt. View, Mariveles, Bataan

Interview with the Municipal Disaster Risk and Management Officer of Naic, Cavite

Interview with the Barangay Chairman, Timalaya Conception, Naic, Cavite

Interview with the local community in Barangay Mt. View, Mariveles, Bataan

Interview with the local community in Barangay Timalaya Conception, Naic, Cavite

Interview with the Barangay Chairman, Balsahan Timalaya, Naic, Cavite

CLIMATE RISK ASSESMENT - QUESTIONAIRE

Name:			
Position/Designation			
Location		**Date**	

Confirmatory Questions	**Answer (Yes/No)**	**Remarks/Findings**
Areas frequently visited and/or hard-hit by **climate hazards**:		
Extreme temperature The temperature recorded from Sangley Point and Cubi Point both have the lowest value during December then escalates from January to May. • Sangley Point Weather Station recorded an average temperature at 24.6°C, with the highest temperature at 38.5°C on 13 and 16 May 1987, and lowest temperature at 18°C on 1 February 1982 and 14 December 1988. • Cubi Point weather station recorded an average temperature at 24.6°C, with the highest temperature at 38.9°C on 4 May 2016, and lowest at 18°C on 25 January 2014.		
Extreme rainfall The average rainfall from the PAGASA daily data indicates that the total monthly rainfall is constantly low during the first quarter of the year then escalates from May, reaching its highest value in August, then declines until December. The highest average monthly rainfall reaches 488 mm at Sangley Point and 837 mm at Cubi Point both in August, while the lowest recorded is 15 mm at Sangley Pt. in March and 4 mm at Cubi Point in February. The total average rainfall from 1980-2017 recorded was 2,148 mm with an annual average number of 130 rainy days at Sangley Point, while the total average rainfall from 1994-2017 recorded at Cubi Point was 3,451 mm with an annual average number of rainy days of 125.		
Extreme flooding The alignment will transact areas where are moderately to highly susceptible to flooding in the Cavite side. On the other hand, the Bataan side generally has a sloping ground, hence, this area is not significantly affected by flooding. Flooding in the Cavite coastal area is primarily due to water inundation from marine waters. On the other hand, the Bataan coastal region is located at a relatively higher elevation.		
Drought-prone areas:		

Sea level rise or extreme tides?		
Seasonally occurring very high waves?		
Areas frequently visited or hard-hit by typhoons: With a high to medium risk, Cavite and Bataan are hit by 1 typhoon per year. Recently in November – December 2019, typhoon Kammuri, with local name Tisoy, hit Central Luzon and Bataan with maximum sustained winds of 150 kilometers per hour (kph) and gustiness of up to 185 kph, which has caused moderate wind damage all over these provinces. Another noted tropical storm is in 2014 named Glenda that caused widespread flooding due to heavy downpours having a peak at 120 kph with gusts as strong as 165 kph.		
Storm surge-prone areas: These are abnormally high sea waves driven by extreme weather conditions such as strong typhoons. As the site is within the coast, it may be affected by abnormal disturbances of sea level.		
Is the project area vulnerable to wildfire?		
Is the project area vulnerable to heatwaves?		
Areas frequently visited and/or hard-hit by **geophysical/seismic hazards**:		
Earthquakes The seismic hazard of Bataan-Cavite areas is mainly contributed by several seismic sources such as subduction along Manila Trench, active faulting of Valley Fault System, Philippine Fault Zone and Lubang-Verde Passage Fault System. These seismic sources have generated earthquakes with magnitude greater than 6 in the past including 1990 Luzon earthquake of magnitude 7.7 along Philippine Fault Zone.		
Is the project area vulnerable to landslides or mass movement? The proposed BCIB will be running through a gently sloping interfluve terrain at coastal area at the Bataan end of the alignment where the susceptibility to landslide is low.		

At the Cavite end of the proposed BCIB, the alignment will be running through a gentle to flat alluvial plain at the shoreline where the susceptibility to landslide is negligible.		
Tsunami According the Tsunami Hazard Maps published by PHIVOLCS in 2014, the coast of the Bataan City where the BCIB project transects has a thin frame of tsunami inundation of more 6 metres, potentially up to 8 metres. High tsunami inundation is noted more inland along the river situated roughly 120 metre northeast of the proposed alignment. Along the coastline of Corregidor Island, a tsunami inundation of 5 metres to 6 metres is recorded. At the Cavite side, the BCIB alignment lies on an alluvial plan with a tsunami inundation of less than 1 metre. As the coastlines of Bataan side and Corregidor Island of the BCIB project are prone to tsunami events, mitigation measures such as breakwaters or wave dissipating blocks and coastal structures will be considered. Final designs will be based on the results of a more detailed study of the area.		
Liquefaction The Cavite side of the BCIB is within a zone that is prone to liquefaction. The offshore region of the BCIB is considered to have a considerable thickness of superficial deposits which may comprise soft/loose material including loose sand. As such, it is anticipated that liquefiable soil is highly likely to be present.		
Lateral Spreading In the BCIB, the onshore area along the waterfront of Cavite side is located on a sloping ground and lateral spreading may potentially occur. Though there are no liquefaction susceptible soils being indicated from liquefaction susceptibility map at both onshore area of Bataan and Corregidor island, the bathometry data suggests that the nearshore area of Bataan and Corregidor island exhibit a relatively steeper slope.		
Ground acceleration Based on these maps, the location of the BCIB will likely experience 0.3g, 0.3g-0.4g, and 0.4g for rock site areas at return periods of 500, 1000 and 2500 years, respectively (Figure 2.33 to Figure 2.36). For areas with stiff soils, it is modelled that the BCIB location will have an expected PGA of 0.3g in 500-year return period events.		
Ground Rupture and Fault Creep Along the proposed alignment of the BCIB, ground traces of local faults were not observed both on the Bataan and Cavite sides of the project.		
Volcanic hazards The nearest active volcanic centres to the BCIB project is the Taal Volcano and the Pinatubo Volcano, which is located approximately 50 kilometres to the southeast and 80 kilometres to the north northwest respectively. The potentially		

active volcanos are Mt. Corregidor on the Corregidor Island located about 4.4 kilometres west to the proposed alignment and Mt. Mariveles located 10.3 kilometres northwest to the proposed alignment. The closest inactive volcanic centre is Mt. Palay, which is around 16 kilometres southwest to the proposed alignment. Considering the distance of the project to the active volcanoes, it is expected that the only volcanic hazard that could impact the development is ashfall.		
Others:		

Signature

Investigator/Signature

Samples:

- ☐Mariveles, Bataan MDRMO
- ☐Affected barangay (Bgry Mt. View Mariveles, Bataan)
- ☐Local residents in Brgy. Mt. View, Mariveles Bataan
- ☐Naic, Cavite MDRMO
- ☐Affected barangay (Bgry Timalan Balsahan, Naic, Cavite)
- ☐Local residents in Bgry Timalan Balsahan, Naic, Cavite

Appendix 3: A Copy of the BCIB Project Internal Memo 001 – Sea Level Rise of BCIB Bridges

IPIF ROADS & BRIDGES

Republic of the Philippines
Department of Public Works and Highways

ADB ASIAN DEVELOPMENT BANK

Bataan-Cavite Interlink Bridge Project

Internal Memo 001 – Sea Level Rise of BCIB Bridges

September 06, 2022

Prepared By: BY Lin

TYLin PEC
A JOINT VENTURE

T.Y. Lin International | Pyunghwa Engineering Consultants Joint Venture

Document Code: 481714-BCIB-xxx-xxx-xxx-xxx-00xx

Revision: 0x

References:

Reference:
Asian Development Bank. 2018. Information Sources to Support ADB Climate Risk Assessments and Management.
ARUP. 2018. Feasibility Study Environmental Impact Assessment Report.
Department for International Development[1]. 2016. Projections of mean sea level change for the Philippines, p.2, p23, p24.
Cannaby, H., Palmer, M. D., Howard, T., Bricheno, L., Calvert, D., Krijnen, J., Wood, R., Tinker, J., Bunney, C., Harle, J., Saulter, A., O'Neill, C., Bellingham, C. and Lowe, J. 2016. 'Projected sea level rise and changes in extreme storm surge and wave events during the 21st century in the region of Singapore', Ocean Science 12(3), 613–632.
Church, J., Clark, P., Cazenave, A., Gregory, J., Jevrejeva, S., Levermann, A., Merrifield, M., Milne, G., Nerem, R., Nunn, P., Payne, A., Pfeffer, W., Stammer, D. and Unnikrishn, A. 2013a. Sea level change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
Intergovernmental Panel on Climate Change (IPCC). 2019. The Ocean and Cryosphere in a Changing Climate (SROCC) Report Chapter 4: Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities.
Moss, R. H., Edmonds, J. A., Hibbard, K. A., Manning, M. R., Rose, S. K., van Vuuren, D. P., Carter, T. R., Emori, S., Kainuma, M., Kram, T., Meehl, G. A., Mitchell, J. F. B., Nakicenovic, N., Riahi, K., Smith, S. J., Stouffer, R. J., Thomson, A. M., Weyant, J. P. and Wilbanks, T. J. (2010), 'The next generation of scenarios for climate change research and assessment', Nature 463(7282), 747–756.

[1] Since 1997, Department for International Development (DFID) is the department of the UK government that manages Britain's aid to developing countries and aims to eliminate extreme poverty worldwide.

Revisions:

Date	Description	Revision	Originator	Reviewer	Approver
2022-Sep-06	Issue for SLR	00	Booyoung Lin (PEC)	FirstName LastName (company)	Marwan Nader (TYLI/ PEC JV)

	Printed Name	*Signature*	*Date*
Originators:	Boo Young Lim	임부영	2022-08-28
Reviewer:	Edwin Combalicer		2022-08-28
QAQC:	Jodi Ketelsen		2022-08-28

Table of Contents

List of Exhibits

1 PURPOSE

The Design Memorandum is prepared to

- document the evolution of SLR projection,
- document information sources used and to support the Climate Risk and Adaptation (CRA) assessment report for the Bataan - Cavite Interlink Bridge (BCIB) project and
- provide a confirmation of Sea Level Rise projections for the Philippines for the design joint venture partners and sub-consultants to rely upon in their design considerations.

2 BACKGROUND

The Department of Public Works and Highway (DPWH) was previously entrusted to carry out the feasibility study to provide Infrastructure Preparation and Innovation Facility Output 1 (IPIF1) – Roads and Bridges. The BCIB project is one of the sub-projects assignments under the IPIF1. The feasibility study for the BCIB was originally prepared by Ove Arup & Partners Hong Kong Ltd (Arup).

Section 2.3.1.2 of the Feasibility Study Environmental Impact Assessment Report prepared by ARUP states that sea level in the Philippines is expected to increase by approximately 20 cm by the end of 21st century under RCP8.5 scenario, and such projected increase in sea level might worsen storm surge hazards particularly on coastal communities.

3 SEA LEVEL RISE

3.1 Selection of Information Sources

Information Sources to support ADB Climate Risk Assessments and Management was published by ADB in September 2018. Appendix 3 of this publication provides sources of information about future climates based on Global Climate Model (GCM) and downscaled regional climate scenarios (Exhibit 1).

Exhibit 1: Global Climate Model Projection (CMIP5)

Description	Advantages	Disadvantages	Source
Global climate model projections (CMIP5)	An atlas of global and regional climate projections from the IPCC Fifth Assessment Report; a point of reference for projected seasonal and annual precipitation and temperature changes relative to 1986–2005; maps show the 25th, 50th, and 75th percentiles of the ensemble for 2016–2035, 2046–2065, and 2081–2100; maps cover SREX regions as well as the Caribbean, Indian Ocean, and Pacific island states and land and sea areas of the two polar areas; hatching denotes areas with weak signals relative to model variability	Seasonal and annual climate changes are based on the unweighted ensemble, averaged across large regions (i.e., regional climate change signals may be obscured); note that the underlying climate model output can be accessed by the KNMI Climate Explorer (see above)	IPCC AR5 Annex 1

Source: ADB. 2018. Information Sources to Support ADB Climate Risk Assessments and Management. Appendixes p.47.

The Intergovernmental Panel on Climate Change (IPCC) is currently in its Sixth Assessment cycle, during which the IPCC will produce the Assessment reports of its three Working Groups, three Special Reports, a refinement to the methodology report and the Synthesis Report. The Synthesis Report will be the last of the AR6 products, due for release in late 2022 or early 2023.

The AR6 SYR is based on the content of the three Working Groups Assessment Reports and three Special Reports: WGI – The Physical Science Basis, WGII – Impacts, Adaptation and Vulnerability, WGIII – Mitigation of Climate Change, and the three Special Reports: Global Warming of 1.5°C, Climate Change and Land, The Special Report on Ocean and Cryosphere in a Changing Climate (SROCC).

For the BCIB Project, SROCC recent study results found in IIPC's AR5, Annex 1 are applied relative to the sea level rise (SLR) projections.

3.2 Components of SROCC

3.2.1 Scenarios

The assessment of the projected future changes in SROCC is based mainly on CMIP5 climate model projections using Representative Concentration Pathways (RCPs). RCPs are scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases (GHGs), aerosols and chemically active gases, and land use/land cover.

The word 'representative' signifies that each RCP provides only one of many possible pathways that would lead to the specific radiative forcing characteristics. The term 'pathway' emphasizes the fact that the long-term concentration levels, and the trajectory taken over time to reach that outcome are of interest.

SROCC uses RCP2.6 and RCP8.5 in its assessment, reflecting the available literature. RCP2.6 represents low greenhouse gas emissions and high mitigation future that in CMIP5 simulations gives a two in three chance of limiting global warming to below 2°C by 2100.

By contrast, RCP8.5 is a high greenhouse gas emissions scenario in the absence of policies to combat climate change, leading to continued and sustained growth in atmospheric greenhouse gas concentrations. Compared to the total set of RCPs, RCP8.5 corresponds to the pathway with the highest greenhouse gas emissions.

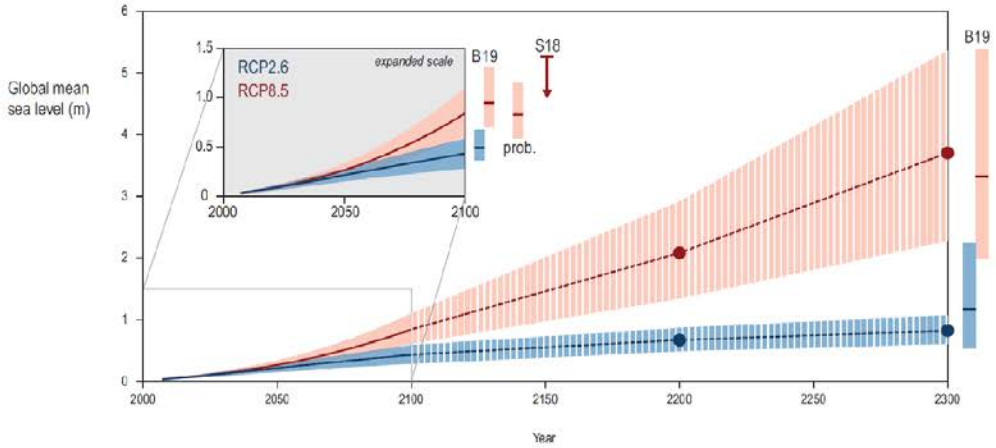
3.2.2 Baselines

A baseline provides a reference period from which changes can be evaluated. In the context of anthropogenic climate change, the baseline should ideally approximate the 'pre-industrial' conditions before significant human influences on the climate began. The IPCC 5th Assessment Report (AR5) and SR15 (Allen et al., 2018) use 1850–1900 as the pre-industrial baseline for assessing historical and future climate change. Atmospheric greenhouse gas concentrations and global surface temperatures had already begun to rise in this interval from early industrialization (Abram et al., 2016; Hawkins et al., 2017; Schurer et al., 2017). However, the scarcity of reliable climate observations represents a major challenge for quantifying earlier pre-industrial states (Hawkins et al., 2017). To maintain consistency across IPCC reports, the 1850–1900 pre-industrial baseline is used wherever possible in SROCC, recognizing that this is a compromise between data coverage and representativeness of typical pre-industrial conditions.

In SROCC, the 1986–2005 reference interval used in AR5 is referred to as the recent past, and a 2006–2015 reference is used for present day, consistent with SR15 (Allen et al., 2018). The 2006–2015 reference interval incorporates near-global upper ocean data coverage and reasonably comprehensive remote-sensing cryosphere data (Section 1.8.1) and aligns this report with a more current reference than the 1986–2005 reference adopted by AR5. This 10-year present day period is short relative to natural variability. However, at this decadal scale the bias in the present-day interval due to natural variability is generally small compared to differences between present day conditions and the pre-industrial baseline. There is also no indication of global average surface temperature in either 1986–2005 or 2006–2015 being substantially biased by short-term variability (Allen et al., 2018), consistent with the AR5 finding that each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850 (IPCC, 2013).

SROCC commonly provides future change assessments for two key intervals: A near term interval of 2031–2050 is comparable to a single generation time scale from present day and incorporates the interval when global warming is likely to reach 1.5°C if warming continues at the current rate (IPCC, 2018). An end-of-century interval of 2081–2100 represents the average climate conditions reached at the end of the standard CMIP5 future climate simulations and is relevant to long-term infrastructure planning and climate-resilient development pathways (CRDPs).

Exhibit 2 Projected Sea Level Rise at 2100 and up through 2300



Source: IPCC. 2019. The Ocean and Cryosphere in a Changing Climate (SROCC) Report Chapter 4: Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities. p.327.
Note: The inset shows an assessment of the likely range of the projections for RCP2.6 and RCP8.5 up to 2100 (within a medium confidence). Projections for longer time scales are highly uncertain but a range is provided (low confidence). For context, results are shown from other estimation approaches in 2100 and 2300(Section 4.1.2). The two sets of two bars labelled B19 are from an expert elicitation for the Antarctic component (Bamber et al., 2019), and reflect the likely range for a 2 °C and 5 °C temperature warming (low confidence). The bar labelled "prob." indicates the likely range of a set of probabilistic projections(Perrette et al., 2013; Slangen et al., 2014a; Grinsted et al., 2015; Jackson and Jevrejeva, 2016). The arrow indicated by S18 shows the result of an extensive sensitivity experiment(Schlegel et al., 2018) with a numerical model for the Antarctic Ice Sheet (AIS) combined, like the results from B19 and "prob.", with results from Church et al. (2013) for the other components of SLR. S18 also shows the likely range(Section 4.2.3).

3.3 Future Projections of SLR

3.3.1 Design Life

The design life of BCIC Bridges is 100 years. Assuming funding comes efficiently, a build of 2030 means we are considering a design life through 2130.

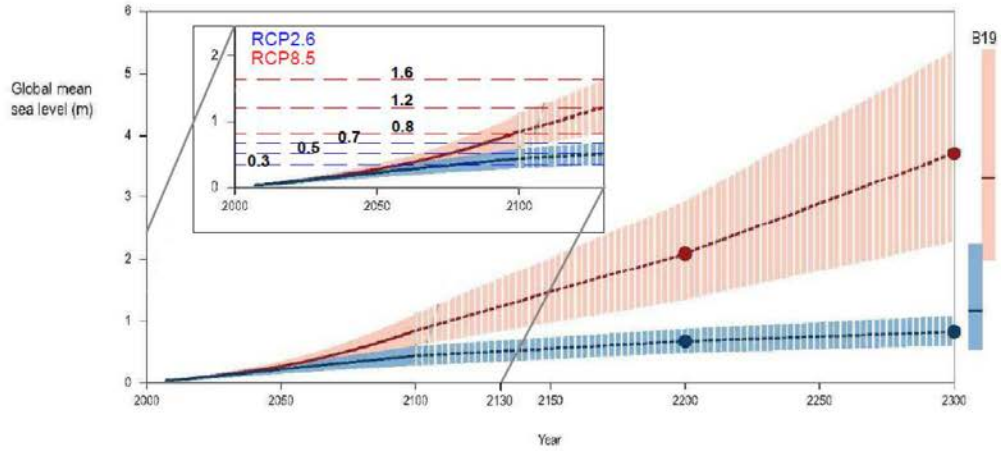
3.3.2 Sea Level Rise Concerns the BCIB Design

Future projections of SLR might affect the design of the BCIB. For instance, it is essential that the bridge does not restrict the movement of vessels into and out of Manilla Bay. The bridge needs to be designed to have sufficient navigation clearance to small vessels and large vessels. SLR could influence bridge clearance, points of collision and overall structural integrity.

3.3.3 Future of Projection of SLR

Based on the SROCC, the Global Mean Sea Level (GMSL) will rise between 0.45 m (based on the 0.30–0.70 m range, from projected RCP2.6) and 0.84 m (based on the 0.80–1.60 m range from projected RCP8.5) by 2130 (within a medium confidence level) relative to the baseline period (1986–2005) (Exhibit 3).

Exhibit 3 Projected Sea Level Rise Until 2130



Source: IPCC. 2019. The Ocean and Cryosphere in a Changing Climate (SROCC) Report Chapter 4: Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities. p.327.

3.4 Sea Level Rise Consideration

The projected values of the SLR are in maximum, minimum, and average confidence.

The average confidence has been applied during the design engineering stage of the project. The BCIB project estimated the future regional SLC for the Philippines by using projections for the global mean sea level changes from the IPCC AR5 and combining them with regional non-uniform patterns of sea level change around the Philippines. The methods follow those presented by Cannaby et al. (2016).[2]

The projections for the global mean change are provided in the AR5 supplementary data files as an annual time series with a range of estimations. These include the upper (95th) and lower and (5th) percentiles, and the median estimations for the contribution of future thermal expansion, glacier and ice sheet mass changes, and terrestrial water inputs, under different climate change scenarios (Moss et al., 2010)[3]. The thermal expansion component

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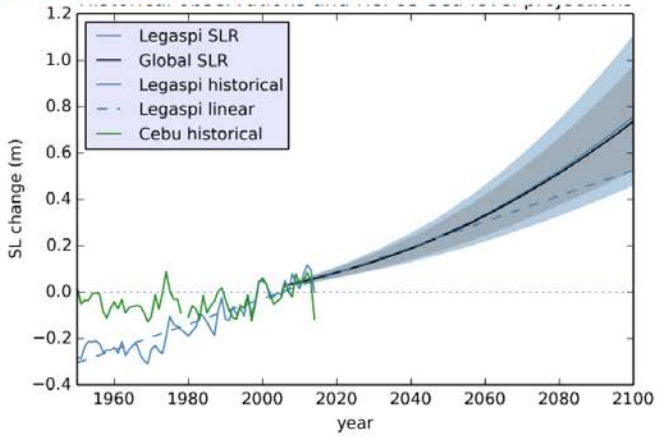
2 Cannaby, H., Palmer, M. D., Howard, T., Bricheno, L., Calvert, D., Krijnen, J., Wood, R., Tinker, J., Bunney, C., Harle, J., Saulter, A., O'Neill, C., Bellingham, C. and Lowe, J. (2016), 'Projected sea level rise and changes in extreme storm surge and wave events during the 21st century in the region of Singapore', Ocean Science 12(3), 613–632.

3 Moss, R. H., Edmonds, J. A., Hibbard, K. A., Manning, M. R., Rose, S. K., van Vuuren, D. P., Carter, T. R., Emori, S., Kainuma, M., Kram, T., Meehl, G. A., Mitchell, J. F. B., Nakicenovic, N., Riahi, K., Smith, S. J., Stouffer, R. J., Thomson, A. M., Weyant, J. P. and Wilbanks, T. J. (2010), 'The next generation of scenarios for climate change research and assessment', Nature 463(7282), 747–756.

was obtained from a set of 21 coupled AOGCMs participating in the World Climate Research Program Coupled Model Intercomparison Project Phase 5 (CMIP5). The other components (glaciers, ice sheet and terrestrial water inputs) were obtained from offline model simulations, mainly driven by the GCMs output of temperature and precipitation fields and by extrapolation of observation datasets (Church et al., 2013a).[4]

From these inputs, the sea level change (SLC) in the Philippines at the end of the 21st century is projected to be slightly larger than the global mean (Exhibit 4). The time series of the projected SLC under RCP4.5 and RCP8.5 are presented in Exhibit 5 (global mean) and Exhibit 6 (Manila mean). The solid line represents the central (50th percentile, or median) estimate, and the shaded range of uncertainty covers the likely (66-100%) rather than the full range of possible future sea level changes.

Exhibit 4 Projected Sea Level Rise under RCP8.5 Until 2100



Source: Department for International Development [1]. 2016. Projections of mean sea level change for the Philippines, p.2.
Note: Plot shows the sum of SLR components discussed in this study for the global ocean (black line as the mean SLR projection and the range of uncertainty noted in grey) and for the coastal region of Legaspi City in the South of Luzon Island in the Philippines (blue line, with uncertainty), under the RCP8.5 future scenario. Projections for the City of Legaspi, Philippines are generally 3-5% higher than the global average. Annual mean tide-gauge measurements from Legaspi (blueline) and Cebu City located below Negros Island (green line) are also presented. A linear trend is added to the observations from Legaspi because the observed historical sea level trend from the tide gauge in Cebu is much smaller than at Legaspi. The plotted actual changes in SLR preceding 2020 indicates that a simple extrapolation of the trends would underestimate the projected values for the Philippines regardless of the reference city used.

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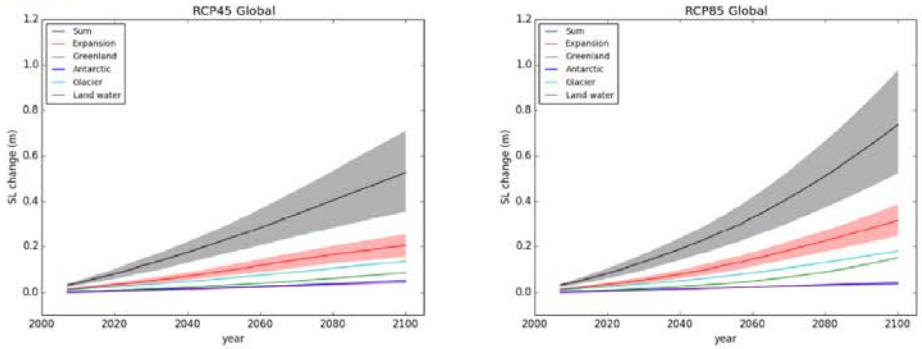
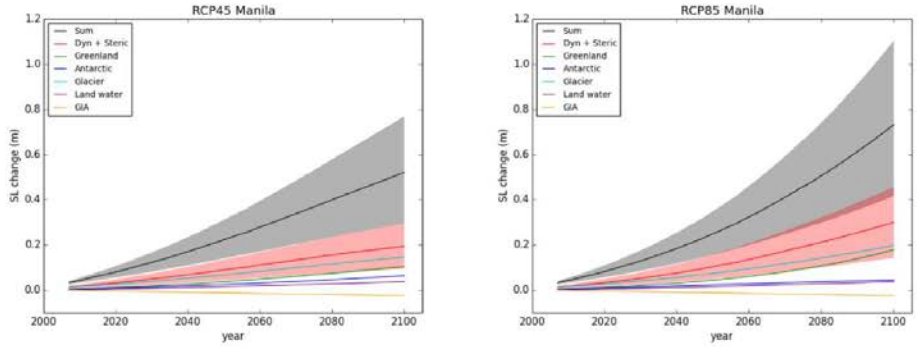
[4] Church, J., Clark, P., Cazenave, A., Gregory, J., Jevrejeva, S., Levermann, A., Merrifield, M., Milne, G., Nerem, R., Nunn, P., Payne, A., Pfeffer, W., Stammer, D. and Unnikrishn, A. (2013a), Sea level change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA chapter 13, pp. 1137–1216.

Exhibit 5 Time Series of the Global Mean Sea Level Change Projections Under RCP4.5 and RCP8.5



Source: DFID. 2016. Projections of mean sea level change for the Philippines, p.23.
Note: The solid line represents the central estimate and shaded area represents the uncertainty of the likely range.

Exhibit 6 Time Series of the Mean Sea Level Change for Manila



Source: DFID. 2016. Projections of mean sea level change for the Philippines, p.24.
Note: The solid line represents the central estimate and shaded area represents the uncertainty of the likely range.

4 CONCLUSION

Following the SROCC projection (of AR5) that the sea level rise is likely to be in the range of 0.80 to 1.60 m by 2130, the BCIB Project proposes that the design should consider accommodating a sea level rise of 1.20 m in 2130. This recommendation is based on the global sea level rise experience demonstrating that the Asian-Pacific International engineering community (based on Cadangan Project Jambatan Temburong in Brunei and Hongkong) comfortably relies on the medium confidence line which indicates a central estimate of a 1.2 m SLC in Manilla Bay by 2130. The BCIB design team considered a 1.2 m rise by 2130 during its project engineering design. Also, the BCIB design team (TYLI, PEC, DCCD) found that

current the BCIB Project design already accommodates the most conservative projection of 1.6 m by 2130.