Program Commissioned by the Ministry of the Environment
FY2021

FY2021 City-to-City Collaboration Programme for Zero-Carbon society (Support project for the achievement of SDGs and developing a sustainable decarbonized society: City-to-City Collaboration between Ehime Prefecture and Gorontalo Province)

Report

March 2022

Japan NUS Co., Ltd.

Ehime Prefecture

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List of Abbreviations

略語	英語・インドネシア語	和訳
BAPPEDA	Badan Perencanaan Pembangunan Daerah	地方開発計画局
BAU	Business as usual	成り行きシナリオ
COP26	The 2021 United Nations Climate Change Conference	国連気候変動枠組条約第 26 回締約国会議
DLHK	Dinas Lingkungan Hidup dan Kebersihan	環境衛生局
DPRD	Dewan Perwakilan Rakyat Daerah	地方国民代表評議会
ESDM	Ministry of Energy and Mineral Resource	エネルギー鉱物資源省
FACT 対話	Forest, Agriculture and Commodity Trade Dialogue	森林・農業・コモディティ貿易対話
GSS	Gas Solid Separator	三相分離装置
JCM	Joint Crediting Mechanism	二国間クレジット制度
KLHK	Kementerian Lingkungan Hidup dan Kehutanan	環境林業局
NDC	Nationally Determined Contribution	自国が決定する貢献
PLN	Perusahaan Listrik Negara	インドネシア電力公社
POME	Palm Oil Mill Effluent	パーム油排水
PUPR	Pekerjaan Umum dan Perumahan Rakyat	公共事業・国民住宅局
RAD-GRK	Rencana Aksi Daerah Penurunan Emisi Gas Rumah Kaca	地方温室効果ガス排出削減行動計画
RAN-GRK	Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca	国家温室効果ガス排出削減行動計画
REDD	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries	途上国の森林減少・劣化に由来する排出の削減
RKPD	Rencana Kerja Pemerintah Daerah	地方作業計画
RPJMD	Rencana pembangunan jangka menengah daerah	地方中期開発計画

RPJMN	Rencana pembangunan jangka menengah nasional	国家中期開発計画
RUED	Rencana Umum Energi Daerah	地方エネルギー総合計画
RUEN	Rencana Umum Energi Nasional 2015-2050	新国家エネルギー政策
RUPTL	Rencana Usaha Penyediaan Tenaga Listrik	インドネシア電力供給事業計画
SDGs	Sustainable Development Goals	持続可能な開発目標
JANUS	Japan NUS Co., Ltd.	日本エヌ・ユー・エス株式会社（本都市間連携提案事業者）

Chapter1 Purpose and background of the program

1.1. Purpose

The Paris Agreement, which entered into force in November 2016 and moved into the implementation stage in 2020, aims to accelerate climate change countermeasures by local governments and cities in addition to countermeasures by the central government. Additionally, at the Online Platform ministerial meeting held in September 2020 on climate actions and environmental protection measures as part of the recovery from the COVID-19 pandemic, Japanese government officials confirmed the need for decarbonization measures by local governments that conduct activities directly linked to the community, and the importance of a development approach led by the local community. Japan has also declared that it will aim for a decarbonized society by reducing greenhouse gas emissions as a whole to zero by 2050. Furthermore, the number of local governments in Japan that have declared their aim for essentially zero CO_2 emissions has increased rapidly to more than 300.

Accordingly, the role of cities and local governments is becoming more important when considering and implementing specific regional climate change countermeasures and projects. In order to realize a global decarbonized society, we must accelerate the movement toward building a sustainable decarbonized society, especially in Asia, where economic growth is remarkable. The movement to support the decarbonization and low-carbonization efforts of cities, which are places for activities that support socio-economic development, is being strengthened internationally.

Furthermore, in the midst of the current COVID-19 pandemic, cities are under pressure to address issues related to the spread of infection, while at the same time readjusting and considering new measures to achieve sustainable development. It is vital to establish new methods for collaboration among cities and to build new cities.

Based on the above, the purpose of this research project was defined as formulating a plan to realize both decarbonization and development and to disseminate technology in Gorontalo Province, where economic growth is remarkable, in cooperation with Ehime Prefecture.

1.2. Background

Gorontalo Province is a region of Indonesia that has experienced particularly remarkable economic growth in recent years. However, it also faces various environmental and social issues such as underdeveloped infrastructure, water pollution, and deforestation. In order to resolve these issues, Gorontalo Province recognizes the necessity of formulating a plan for decarbonization due to the need for climate change

mitigation. Nevertheless, although the province implemented such a plan, it has been unable to enter the implementation stage. Moving forward, although there are plans for incorporating the perspective of decarbonization in various measures—the development plan for Gorontalo Province is one such plan—it is still necessary to take measures that will lead to effective efforts. Gorontalo Province expects Japan's support and cooperation in order to utilize the precedent cases and knowledge in such efforts, and is particularly interested in deriving solutions in collaboration with Ehime Prefecture.

In Gorontalo Province and Ehime Prefecture, starting with academic exchanges between Gorontalo State University and Ehime University in 2007, a delegation from Gorontalo Province visited Ehime Prefecture in 2016 and laid the foundation for industry-academia-government collaboration; for example, interaction with Ehime Prefecture, Ehime University, and private companies.

Against this background, Ehime Prefecture received a request for support in deriving solutions based on the formulation of decarbonization policies to address environmental and social issues such as underdeveloped infrastructure, water pollution, and deforestation in Gorontalo Province, which led to the start of the city-to-city collaboration project.

1.3. Implementation system

Figure 1-1 shows the work implementation system for the current fiscal year. Under the framework of city-to-city cooperation, Ehime Prefecture and Gorontalo Province signed a cooperation agreement in which the Regional Development Agency of Gorontalo Province (Badan Perencanaan Pembangunan Daerah: hereinafter, “BAPPEDA”) will serve as the contact point. The parties held discussions on sharing knowledge and supporting policymaking related to decarbonization policies and planning that promotes projects such as regional water infrastructure development project using decarbonized energy, sustainable forest utilization through cacao cultivation, and other projects under consideration for this survey.

When considering commercialization, we cooperated with corporations based in Ehime Prefecture; specifically, Daiki Axis Co., Ltd., which possesses experience in the installation and maintenance of septic tanks, and Aiken Kakoki K.K., possesses experience in wastewater treatment and in the design and construction of methane fermentation facilities for sludge, etc. Moreover, in the project for sustainable forest utilization, we collaborated with Kanematsu Corporation, which has been engaged in Reducing Emissions from Deforestation and Forest Degradation in Developing Countries project (hereinafter: “REDD + project”) in the western part of Boalemo

Regency since 2011. JANUS managed the entire project, including information gathering related to city-to-city collaboration, support for various surveys, and liaison and coordination of related organizations and companies.

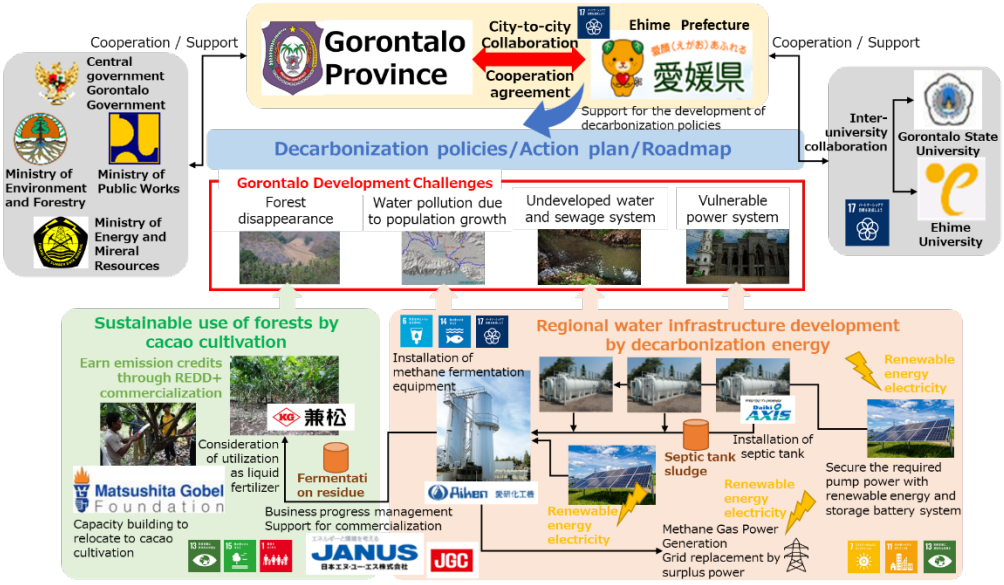

Figure 1-1 Work overview and implementation system

Chapter 2 Overview of Gorontalo Province

2.1. Basic information

Gorontalo Province is located in the northern part of Sulawesi Island. Gorontalo Province became independent from North Sulawesi in 2000, and is composed of five regencies (Boalemo, Bone Bolango, Gorontalo, North Gorontalo, and Pohuwato) and one city (Gorontalo). Approximately 70% of the entire province is composed of hills ranging from 884 to 2,100 m above sea level, and there is little flat land. The population of Gorontalo Province is currently 1.17 million, and the average population has increased by 1.56% each year from 2010 to 2020. When looking at the population distribution by municipality, Gorontalo Regency has the highest population of 390,000, but the city of Gorontalo has the highest population density of about 2,500 per km^2.[1]

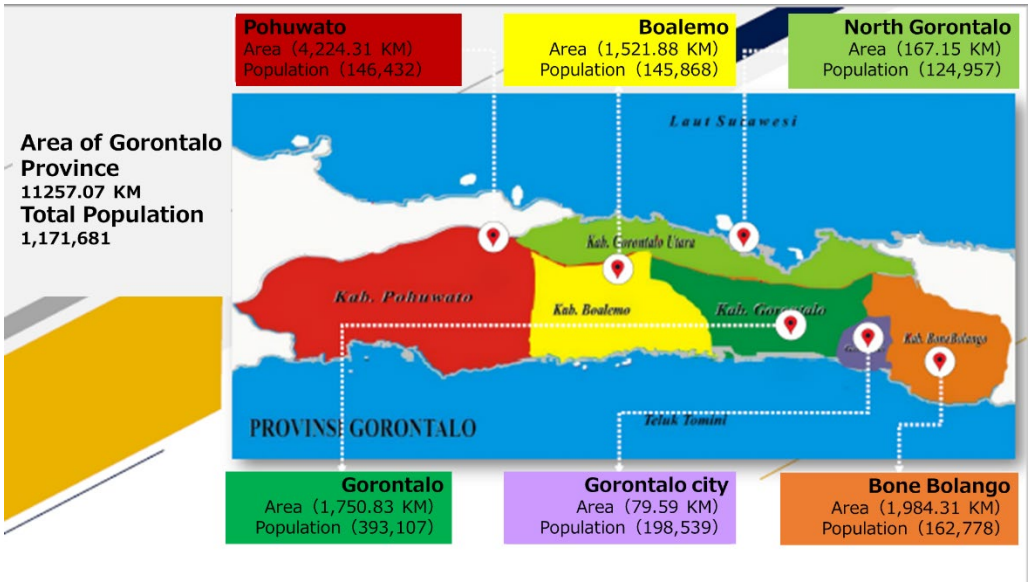

Figure 2-1 Location of Gorontalo Province[2]

In terms of the economic conditions on Sulawesi Island (which includes Gorontalo), the regional real GDP growth rate from 2014 to 2018 has ranged from 6.7% to 8.2% (when referencing 2010), a level which exceeds the national average.[3] This shows remarkable economic growth in the region. The main industry is agriculture, forestry and

[1] BADAN PUSAT STATISTIK PROVINSI GORONTALO (September 2021), Regional Statistics of Gorontalo Province 2021 (https://gorontalo.bps.go.id/publication/2021/09/27/c7f09b2c19efb8efde4f5221/statistik-daerah-provinsi-gorontalo-2021.html)

[2] Materials provided by BAPPEDA, Gorontalo

[3] JBIC (December 2019), Investment Environment of Indonesia 2019 (https://www.jbic.go.jp/ja/information/investment/images/inv_indonesia201912.pdf)

fisheries, and the ratio of primary industry to the regional nominal GDP in 2018 was 24.9%, which was twice the national average (12.5%). Among the primary industries, the ratio of agriculture and fisheries is particularly high. Rice and corn are actively grown in the agriculture industry. Plantation crops are also actively grown, including sugar cane, coconut, cacao, coffee, and cloves.

Since Gorontalo Province is located near the equator, it has a warm climate with an average annual temperature of 26 to 28 degrees Celsius and an average annual rainfall of 29.6 mm. The month with maximum precipitation is November, and the month with minimum precipitation is May.

2.2. Government of Gorontalo Province

Gorontalo Province became independent of North Sulawesi Province on December 5, 2000. At the beginning of its independence, the province was composed only of Gorontalo Regency, Boalemo Regency, and the city of Gorontalo. However, in conjunction with regional development, Pohuwato Regency and Bone Bolango Regency were established in 2003, and North Gorontalo Regency was established in 2007. The development of the new regencies and the revitalization of the region have progressed rapidly, and Gorontalo Province is currently composed of five regencies, one city, 77 counties, 72 districts, and 684 villages.

Since 2017, the governor of Gorontalo Province has been Drs. H. Rusli Habibie MAP and the vice-governor has been DR. Drs. H. Idris Rahim, MM. After assuming office, espoused his vision for the province as “realizing an advanced, outstanding, and prosperous society in Gorontalo.” A regional secretariat serves under the governor and vice-governor. Under the regional secretariat there are three assistants and seven bureaus on politics, economics, and other administration.

The organizational structure of the Gorontalo Province government is shown below.

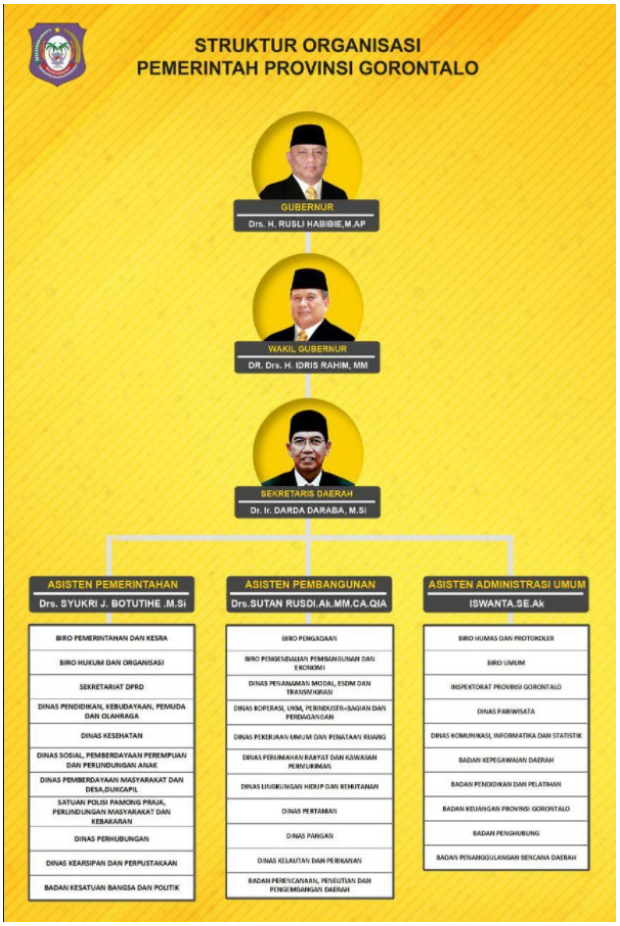

Figure 2-2 Organizational structure of Gorontalo Province government[4]

In addition to the regional secretariat, the provincial government agencies include the secretariat of the Regional People's Representative Council (Dewan Perwakilan Rakyat Daerah: DPRD), as well as ten regional technical agencies, twelve administrative agencies, and five regional organizations based on statutory rules and regional needs. These agencies are responsible for the administration in Gorontalo Province[5].

2.2.1. Main policies and guidelines

The main policies and guidelines in Gorontalo Province are formulated in the Regional Long-Term Development Plan (Rencana pembangunan jangka menengah daerah: hereinafter, “RPJMD”). The period of the latest RPJMD is 2017 to 2022. Local governments are required to formulate the RPJMD in accordance with the National

[4] Website of the Gorontalo Province government (https://gorontaloprov.go.id/pemerintahan_provinsi/)

[5] DINAS KOMINFO DAN STATISTIK PROVINSI GORONTALO (November, 2019) “BUKU PROFIL PROVINSI GORONTALO 2019”

Medium-Term Development Plan (Rencana pembangunan jangka menengah nasional: hereinafter, "RPJMN") for Indonesia. The latest RPJMN for Indonesia will be explained in detail in the next section.

2.2.1.1. National Medium-Term Development Plan (RPJMN)

The Indonesian government announced the new RPJMN in January 2020. In the plan, the average annual growth rate of real GDP is expected to be 5.7% to 6.0%. It is estimated that investment of about 35,000 trillion rupiah will be required to achieve the growth target. The plan also sets the goal of raising gross national income per capita from $5,810 to $6,000 by 2024.[6]

The RPJMN sets the president's nine missions and five directives. Moving forward, the seven development agendas listed below will be demonstrated. The development agendas pursue development that is environmentally-friendly, improves disaster resilience, and takes measures against climate change.

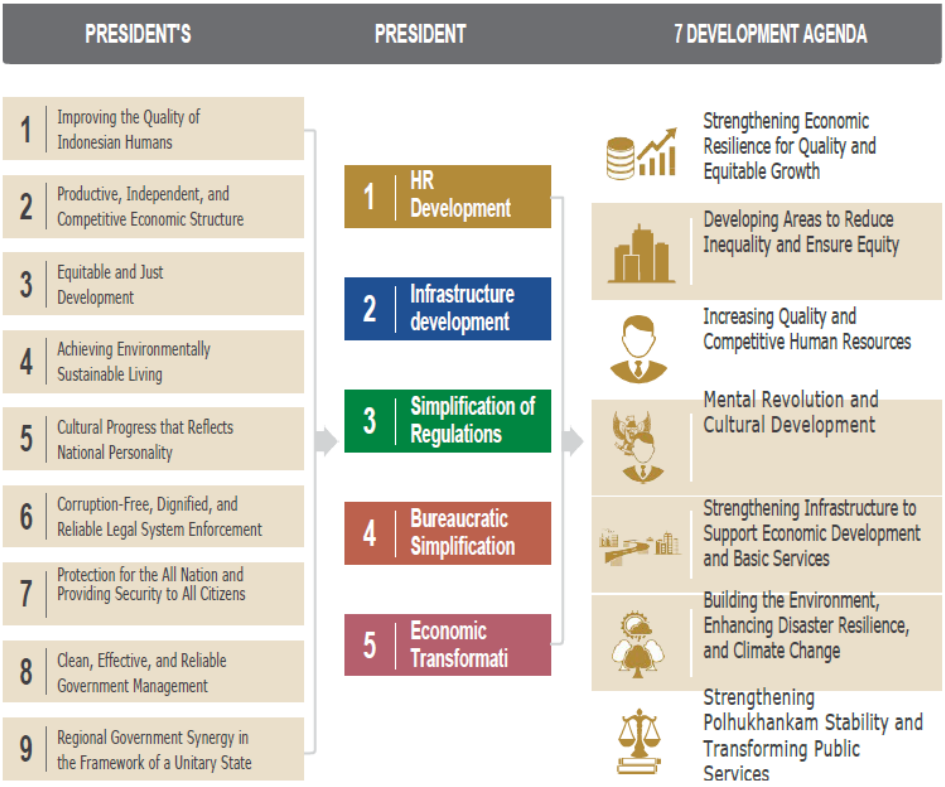

Figure 2-3 President's directives and seven development agendas in the

[6] Ministry of National Development Planning of Indonesia, National Medium-Term Development Plan 2020-2024

National Medium-Term Development Plan (RPJMN)

The macro development targets of the RPJMN also mention the GHG emissions reduction target. In order to achieve the 29% reduction compared to BAU by 2030 as listed in the NDC, the target GHG reduction amount is 27.3% by 2024.

Figure 2-4 Macro development targets in the National Medium-Term Development Plan (RPJMN) 2020-2024[6]

Energy development plans in Indonesia continue to rely on fossil fuels. The country's energy self-sufficiency rate, which was 75% in 2018, is expected to drop to 28% by 2045. To cover this, the country's goal is to promote the spread of renewable energy as set forth in the General Plan for National Energy (Rencana Umum Energi Nasional 2015-2050: hereinafter, "RUEN") that was formulated in 2015, and to increase the ratio of renewable energy to 23% by 2024.

RUEN states the following policy in regards to energy development.

(1) Accelerate the development of renewable energy
(2) Increase the amount of biofuel supplied
(3) Secure energy and promote energy conservation
(4) Increase the supply of energy to industry
(5) Develop NRE (New Renewable Energy) and support industry

When working to achieve the target for increased renewable energy, RUEN also clearly states that focus will be placed on the development of renewable energy derived from oil palm. The related investment amount is expected to be 32 trillion rupiah by 2024.

Furthermore, RUEN clearly states that the target for water infrastructure development is to increase the number of households that can use wastewater treatment facilities to 90%. The related investment amount is expected to be 140 trillion rupiah by 2024.

Regarding decarbonization, the trend of NDC based on the Paris Agreement is also important, as well as the RPJMD mentioned above. As will be described later in section 4.1, in July 2021, Indonesia announced the latest version of the NDC in accordance with the Paris Agreement and declared its aim for carbon neutral (the reduction of greenhouse gas emissions to virtually zero) by 2060. Therefore, it is necessary to pay close attention to how the latest trends will impact the policies and guidelines of the Indonesian central government, including the current RPJMN.

2.2.1.2. Gorontalo Province Regional Long-Term Development Plan (RPJMD)

As mentioned above, the RPJMN is formulated by the Indonesian national government, and a provincial RPJMD is formulated by each province accordingly.

The Gorontalo Province RPJMD (2017-2022) has the following five development missions, which are in line with the RPJMN for 2015 to 2019.

(1) Realize healthy and sustainable tourism, and management of natural resources: While upholding the principle of protecting the environment and forest areas, maintain the safety of energy and water by targeting the management of natural resources, especially tourism, agriculture, fishing, and marine issues.
(2) Ensure the availability of regional infrastructure: Technology that enhances the availability of basic infrastructure equipment, telecommunications equipment, and transportation and shipping equipment, and which includes the provision of infrastructure equipment in strategic regions, urban areas, and farming villages.
(3) Improve even more fair and equitable regional welfare: Improve regional welfare by increasing per capita GDP, per capita spending, and income distribution, and guarantee the comprehensiveness and sustainability of that regional welfare.
(4) Improve the quality of human resources: Improve the quality of education, health, and regional cultural development in order to cultivate high quality human resources, reduce poverty, and realize the basic rights of regional society in Gorontalo Province.
(5) Creation of good governance and even more services: Develop creative, innovative, and competitive professional government agencies and maintain regional security, order, and political stability.

The following is a table summarizing the development missions, vision, targets set under the missions, and indicators of target achievement for the RPJMD of Gorontalo Province.

Table 2-1 Vision, missions, and targets for the RPJMD of Gorontalo Province

No.	Mission	Objective	Target	Indicator	Initial Status (2016)	Target (2022)
Vision: Realizing an advanced, outstanding, and prosperous society in Gorontalo						
1.	Realize management Environmentally-friendly and sustainable tourism and natural resources	Tourism	Increase in tourists	Number of Japanese and foreign tourists	5,923	7,937
				Number of island tourists	566,398	759,023
				Average stay period of tourists	1.52	4
		Strengthen Manage Natural resources for social welfare	Increase contribution of agriculture / plantation sector GDP	Contribution rate in agriculture sector GRDP (trillion rupiah)	11,916.05	14,228.39
			Increase availability and consumption of food supplied by agriculture and marine fisheries that affect the welfare of farmers and fishermen	Exchange rate of farmers	105.63	106.40
				Exchange rate Fishermen/cultivator equipment (NTNP)	101.37	102.1
				Availability of PPH score	65.27	66.89
				Consumption PPH score	76.3	85.5
				Exchange rate of farmers Livestock sub-sector (NTPT)	102.62	104.42
		Maintain the carrying capacity	Forest resources Land	Quality indicator Environment	71.06	73.61

		Sustainable natural resources	Sustainable marine/coastal areas and disaster mitigation	Important land area	706,930 ha	700,930 ha
				Disaster risk indicator	0.66 – 1	0.3 – 0.65
2.	Secure the availability of regional infrastructure	Strengthen Regional infrastructure for sustainability and economic activities	Improve the quality and amount of regional infrastructure	Stable road status (%)	41.15%	70%
				Percentage of length of local road network in good condition (km)	209	278
				Digital government indicator	3.75	3.85
3.	Improve even fairer and more equitable regional welfare	Strengthen Happiness Public	Increase Comprehensive and fair regional welfare	Economic growth	6.52	7.27
				Gini coefficient	0.42	0.36
				Inflation rate (%)	1.30	3.30
				Gross capita GRDP	27,654,339.50	28,155,865.91
				Unemployment rate	3.88	2.86
				Income	1.58	2.99
				Undeveloped villages	103	88
4.	Improve the quality of human resources	Quality reform Personnel	Improve access and quality of education	Human development indicator	66.29	69.62
				Participation rate SMA/MA/SMK	76.13	78.00
				Literacy rate	99.81	100
				Average score	7.12	7.9
			Improve health and nutrition	Average lifespan	66.59	68
				Total fertility rate	2.60	2.40

			Growth culture and Imtaq	Acquired cultural heritage Domestic and international recognition	3	15
				Ratio of places of worship (mosques) per population unit	0.23	0.25
		Reduce poverty	Reduce poverty rate	Poverty ratio	17.63	14.69
				Residents in poverty (people)	203,831	185,391
			Increased access to drinking water, proper hygiene, and residential areas	Cover ratio for access to proper drinking water	71.59%	83.02%
				Ratio of access to proper hygiene	56.27%	69.41%
				Ratio of reduction for slum regions	-	0%
5.	Outstanding governance and even more services	Even better and more services	Maintenance reform	Reform indicator	CC	B
				Value of evaluation results Government performance	CC	BB

2.2.2. Environmental issues in Gorontalo Province

In Gorontalo Province, although the economy is growing remarkably, the underdeveloped infrastructure is an issue. In particular, development of the water and sewage infrastructure is lagging behind, and the population increase is causing increasingly serious pollution of rivers and lakes. As of 2018, Manado is the only city on Sulawesi that has a sewage system, and then for only part of the city. Furthermore, according to the PLN Statistics 2019 that were issued by the State Electric Company (Perusahaan Listrik Negara: hereinafter, "PLN"), the electrification rate by province is reported to be 97.1%.[7] However, this rate excludes electric companies other than PLN, and there are still non-electrified areas. Also, in electrified areas, the fragile power infrastructure is a barrier to development; for example, there are frequent power outages.

When the government Gorontalo Province became independent from North Sulawesi, it adopted a policy of making corn agriculture the province's main industry and implemented a subsidy policy for farmers. Consequently, cultivation has expanded not only to plains but also to areas that are unsuitable for corn cultivation, such as steep slopes in hills and mountainous areas. Moreover, slash-and-burn cultivation has progressed in mountainous areas and caused rapid deforestation. As a result, in addition to the disappearance of CO_2 sinks, the decline in the water holding capacity of forests is leading to landslides and frequent floods in urban areas. In particular, the densely-populated city of Gorontalo is located in the central basin and is surrounded by hills and mountainous areas, so the terrain is vulnerable to floods and the accompanying impact is enormous. Additionally, it is estimated that 1,500,000 m^3 of sediment flows into Lake Limboto (located in Gorontalo Regency and the city of Gorontalo) every year due to erosion of agricultural land and riverbanks. Some people predict that the lake will disappear in 2030 due the lake bottom being buried in sediment. The impact of sediment inflow is also seen on the coast, where the sediment flowing from slopes pollutes seawater and kills coral reefs[8]. The influx of sediment is also affecting the ecosystem, for example, the water hyacinth, which is thought to have been carried from rivers, has rapidly propagated in Lake Limboto since around 2000. This sudden proliferation of the water hyacinth is viewed as a problem because it hinders the fishing industry and the growth of other plants.

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[7] PLN (June 2020), PLN STATISTICS 2019 (https://web.pln.co.id/statics/uploads/2020/11/Statistik-Inggris-2019.pdf)

[8] Kasamatsu et al., 2020 "Prior Study for the Biology and Economic Condition as Rapidly Environmental Change of Limboto Lake in Gorontalo, Indonesia" (https://iopscience.iop.org/article/10.1088/1755-1315/536/1/012005/pdf)

Slash-and-burn agriculture in mountainous regions

Lake Limboto is becoming shallower due to inflow of sediment

Rapid propagation of water hyacinth in Lake Limboto

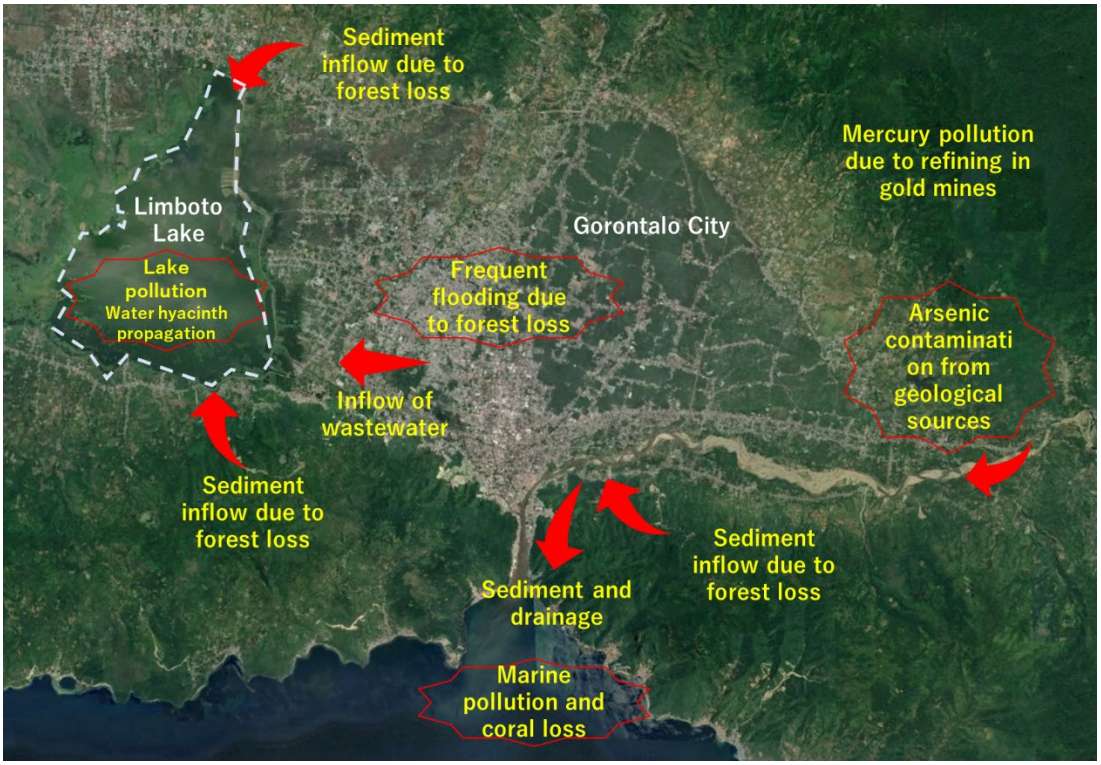
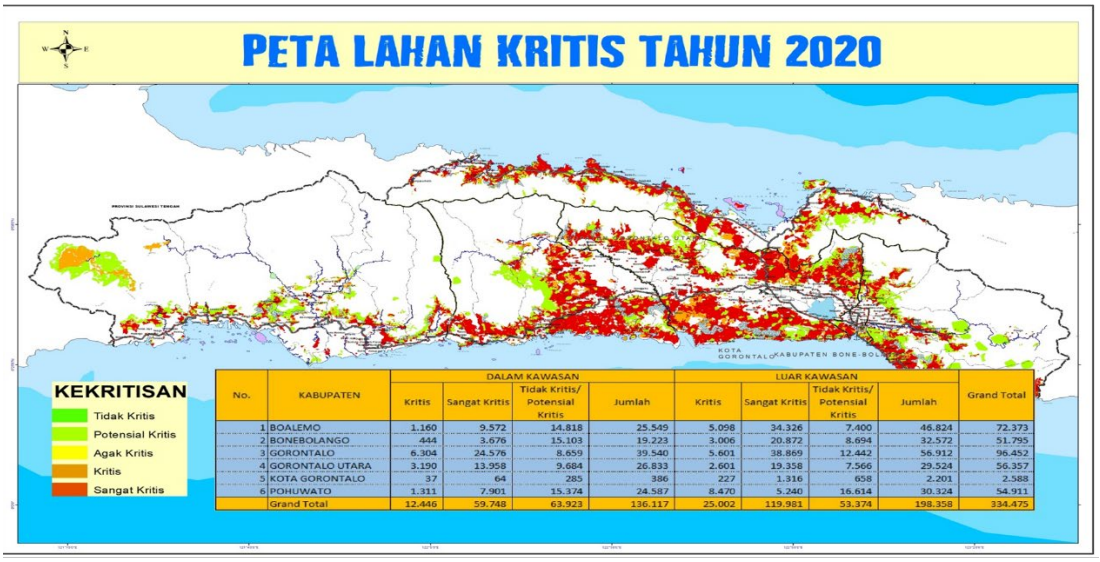


Figure 2-5 Environmental issues and geographic conditions in Gorontalo Province

Gorontalo Province is also concerned about this situation. Figure 2-5 shows only the area around Gorontalo City, but as shown in Figure 2-6, the areas with the above-mentioned problems are spread throughout the state. In the workshop described in detail in section 5.2, Gorontalo Province mentioned that deforestation and other factors have reduced forest water retention capacity and reduced the size of Lake Limboto due to sediment influx, and that the number of critical areas in the province is increasing. Also, the following four major environmental issues were identified and Ehime Prefecture was requested to support the resolution of these issues based on decarbonization.



No.	KABUPATEN	DALAM KAWASAN				LUAR KAWASAN				Grand Total
		Kritis	Sangat Kritis	Tidak Kritis/ Potensial Kritis	Jumlah	Kritis	Sangat Kritis	Tidak Kritis/ Potensial Kritis	Jumlah	
1	BOALEMO	1.160	9.572	14.818	25.549	5.098	34.326	7.400	46.824	72.373
2	BONEBOLANGO	444	3.676	15.103	19.223	3.006	20.872	8.694	32.572	51.795
3	GORONTALO	6.304	24.576	8.659	39.540	5.601	38.869	12.442	56.912	96.452
4	GORONTALO UTARA	3.190	13.958	9.684	26.833	2.601	19.358	7.566	29.524	56.357
5	KOTA GORONTALO	37	64	285	386	227	1.316	658	2.201	2.588
6	POHUWATO	1.311	7.901	15.374	24.587	8.470	5.240	16.614	30.324	54.911
	Grand Total	12.446	59.748	63.923	136.117	25.002	119.981	53.374	198.358	334.475

*Sumber: BPDASHL Provinsi Gorontalo-2020

Figure 2-6 At-risk areas in Gorontalo Province[2]

Figure 2-7 Priority environmental issues in Gorontalo Province[2]

2.3. Background of collaboration with Ehime Prefecture

The relationship between Ehime Prefecture and Gorontalo Province has been promoted since Ehime University and Gorontalo State University entered into an academic exchange agreement in 2007. In 2013, Ehime Prefecture entered into an "Agreement for Joint Research and Human Resource Cultivation Through Three-Party Collaboration" with Gorontalo State University and North Gorontalo Regency, and then entered into a similar agreement with Gorontalo State University and Gorontalo Province in 2016. In this way, Ehime Prefecture has fulfilled a role in promoting inter-regional collaboration in industry, academia, and government. In 2016, a delegation from Gorontalo Province paid a courtesy call on the deputy governor of Ehime Prefecture. The visit led to deepened mutual understanding between the two regions and confirmation of the cooperative relationship that contributes to development of both regions.

Moreover, significant efforts were made by Mr. Rachmad Gobel, an expert on Japan who currently serves as the vice-chairman of the People's Representative Council of the Republic of Indonesia and the chairman of the Indonesia and Japan Friendship Association. Mr. Gobel's family is from Gorontalo Province, which is also his base of support. Furthermore, after graduating from Chuo University where he studied abroad, Mr. Gobel underwent practical training in Ehime Prefecture at the Toon Plant of Matsushita Kotobuki Electronics Industries. He also met with the current governor of Ehime Prefecture for seven times, exchanging opinions on how to use technology held by corporations in Gorontalo Prefecture to improve the environment and industry in Gorontalo Province. Mr. Gobel's strong interest in the environmental technology of corporations in Ehime Prefecture led to the realization of presentations on environmental technology being given to the Minister of Environment and Forestry by corporations in Ehime Prefecture, and to business coaching between Ehime corporations and Indonesian corporations. In terms of this project, Mr. Gobel has requested support for the realization of a carbon-free society in Gorontalo Province, and he has promised full support for the implementation of the project.

At the start of this project, we have exchanged opinions twice with the government of Gorontalo Province and received agreement on project contents aimed at solving environmental issues based on decarbonization. The second meeting to exchange opinions featured participation by officials from Gorontalo State University and Ehime University, who agreed to implement the project through industry-government-academia collaboration. Regarding efforts for decarbonization, we have confirmed that each department has plans but lacks effective implementation ability, and that there is

strong interest in including a development plan for decarbonization in the next Regional Long-Term Development Plan (RPJMD). Additionally, it was commented that there are great expectations for the technology of corporations in Ehime Prefecture in regards to water pollution, which is one of the serious environmental issues of Gorontalo Province. Accordingly, Ehime Prefecture has stated that it is possible to provide support for decarbonization policies and technical cooperation for water treatment. Since COVID-19 has made travel difficult, an agreement was reached to continue the frequent exchange of opinions, including discussions held online.

Figure 2-8 Entering into the Three-Party Agreement in 2016

2.3.1. Agreement for city-to-city collaboration and cooperation

In 2020, the Indonesian Ministry of Interior issued the "Minister of Interior Ordinance 2020 (No. 25) of the Republic of Indonesia: Procedures for Regional Cooperation with Overseas Local Governments and Regional Cooperation with Overseas Organizations (PERATURAN MENTERI DALAM NEGERI REPUBLIK INDONESIA NOMOR 25 TAHUN 2020) "TENTANG TATA CARA KERJA SAMA AERAH DENGAN PEMERINTAH DAERAH DI LUAR NEGERI DAN KERJA SAMA DAERAH DENGAN LEMBAGA DI LUAR NEGERI"). Consequently, when cooperating with overseas local governments, it is now required to perform various procedures such as submitting a plan, entering into an MOU, and receiving approval from the Indonesian Minister of the Interior.

BERITA NEGARA
REPUBLIK INDONESIA

No.513, 2020 KEMENDAGRI. Kerja Sama Daerah. Pemerintah Daerah di Luar Negeri. Lembaga di Luar Negeri. Tata Cara. Pencabutan.

PERATURAN MENTERI DALAM NEGERI REPUBLIK INDONESIA
NOMOR 25 TAHUN 2020
TENTANG
TATA CARA KERJA SAMA DAERAH DENGAN PEMERINTAH DAERAH
DI LUAR NEGERI DAN KERJA SAMA DAERAH
DENGAN LEMBAGA DI LUAR NEGERI

DENGAN RAHMAT TUHAN YANG MAHA ESA

MENTERI DALAM NEGERI REPUBLIK INDONESIA,

Menimbang : bahwa untuk melaksanakan ketentuan Pasal 35 dan Pasal 42 Peraturan Pemerintah Nomor 28 Tahun 2018 tentang Kerja Sama Daerah, perlu menetapkan Peraturan Menteri Dalam Negeri tentang Tata Cara Kerja Sama Daerah dengan Pemerintah Daerah di Luar Negeri dan Kerja Sama Daerah dengan Lembaga di Luar Negeri;

Mengingat : 1. Pasal 17 ayat (3) Undang-Undang Dasar Negara Republik Indonesia Tahun 1945;
2. Undang-Undang Nomor 39 Tahun 2008 tentang Kementerian Negara (Lembaran Negara Republik Indonesia Tahun 2008 Nomor 166, Tambahan Lembaran Negara Republik Indonesia Nomor 4916);
3. Undang-Undang Nomor 23 Tahun 2014 tentang Pemerintahan Daerah (Lembaran Negara Republik Indonesia Tahun 2014 Nomor 244, Tambahan Lembaran

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Figure 2-9 PERATURAN MENTERI DALAM NEGERI REPUBLIK INDONESIA NOMOR 25 TAHUN 2020

Chapter 2, Paragraph 6-(1) of this law specifies the scope of coverage as follows.

a. Cooperation with sister provinces
b. Cooperation sister cities/districts
c. Other cooperation

Paragraph 6-(2) states that cooperation undertaken by Indonesian local governments with overseas local governments in order to focus on cooperation in a specific field falls under category c. as listed above. Based on that classification, Section 9 requires cooperation in the following procedures.

> The inter-regional cooperation (omitted) referenced in Paragraph 6-(1) must be implemented in the following stages.
>
> a. Concept
> b. Survey
> c. Declaration of intention to cooperate
> d. Creation of cooperation plan
> e. Approval of DPRD (Regional People's Representative Council)
> f. Verification
> g. Creation of cooperation document draft
> h. Discussion of cooperation document
> i. Approval by minister
> j. Signing of cooperation document
> k. Implementation of cooperation

In our project, at the kick-off meeting with Gorontalo Province after adoption of the project, the MOU with Ehime Prefecture in regards to this project was referenced. The decision was made to enter into an agreement in order to comply with laws and regulations, and to ensure smooth implementation of the project in the future. As shown below, the agreement was signed on December 15, 2021 by the governor of Gorontalo Province and the governor of Ehime Prefecture. Additionally, a plan to be submitted to the Ministry of Home Affairs is scheduled to be prepared together with Gorontalo Province and submitted from Gorontalo Province together with the original MOU for approval. The created plan is shown in Reference Material 1 and the detailed work plan is shown in Reference Material 1-2.

Chapter 3 Regional water infrastructure development field using carbon-free energy

In most areas of Gorontalo Province, human waste and domestic wastewater flow untreated into rivers through gutters, causing water pollution in rivers, lakes, and oceans. As discussed later in this report, although there are plans to develop water and sewage infrastructure throughout Indonesia and Gorontalo Province, the progress of said development is unknown.

This project will focus on wastewater treatment technology and consider the introduction of septic tanks for the purpose of improving water pollution. The project will also consider power generation using the biogas obtained by fermenting the generated septic tank sludge with methane. In Gorontalo Province, we have confirmed the intention of incorporating a decarbonization viewpoint into the development plan, so we will select decarbonization technology for equipment to be introduced in the future and consider the realization of carbon-free water infrastructure at the development stage. Therefore, we will consider the use of solar power generation, etc., to generate the electricity required for operating the septic tank and methane fermentation equipment, thus achieving zero emissions. The following diagram shows the currently envisioned flow of regional water infrastructure development using decarbonized energy.

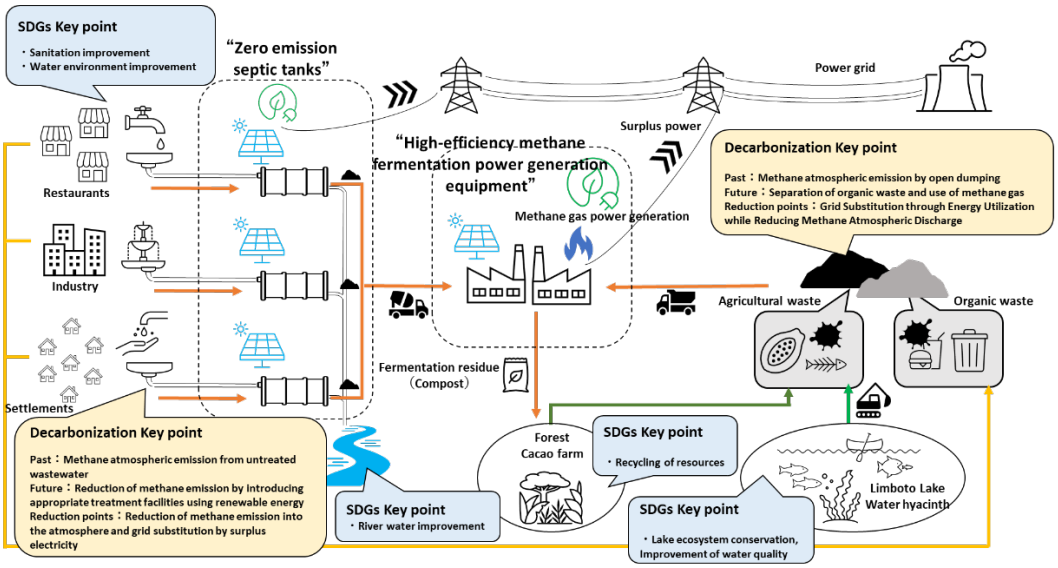

Figure 3-1 Regional water infrastructure development using carbon-free energy: Image of reducing CO2 emissions

Since water infrastructure is a public infrastructure, we expect that water infrastructure will be developed based on the budgets of the national and local governments. This is

because water infrastructure is a public infrastructure, and because such budgeting will facilitate the authority and involvement of the state in technology selection and planning. Therefore, in this fiscal year's work, we investigated the policies and plans in Gorontalo Province, Indonesia, which is the basis of water infrastructure development, and examined the feasibility of septic tanks and methane fermentation equipment scheduled for introduction.

3.1. Trend analysis of related policies and systems

3.1.1. Policies and systems related to the development of water and sewage infrastructure

3.1.1.1. Positioning of the infrastructure development plan in the Gorontalo Province RPJMD

As discussed in 2.2.1.2, the development targets of RPJMD in Gorontalo Province are set based on the RPJMN of the Indonesian central government. Furthermore, as summarized in Table 2-1, for Mission 4 "Improvement of Human Resources," a goal has been set to increase the ratio of access to proper hygiene from 56.27% to 69.41% by 2022. Additionally, in the 2021 Regional Work Plan (Rencana Kerja Pemerintah Daerah: RKPD), which is prepared annually based on the RPJMD, "uniform infrastructure development" is given the third highest priority following "quality education" and "excellent health." The theme of "access to proper hygiene" is included within "uniform infrastructure development," which suggests that the state continues to be interested in water infrastructure development.[9]

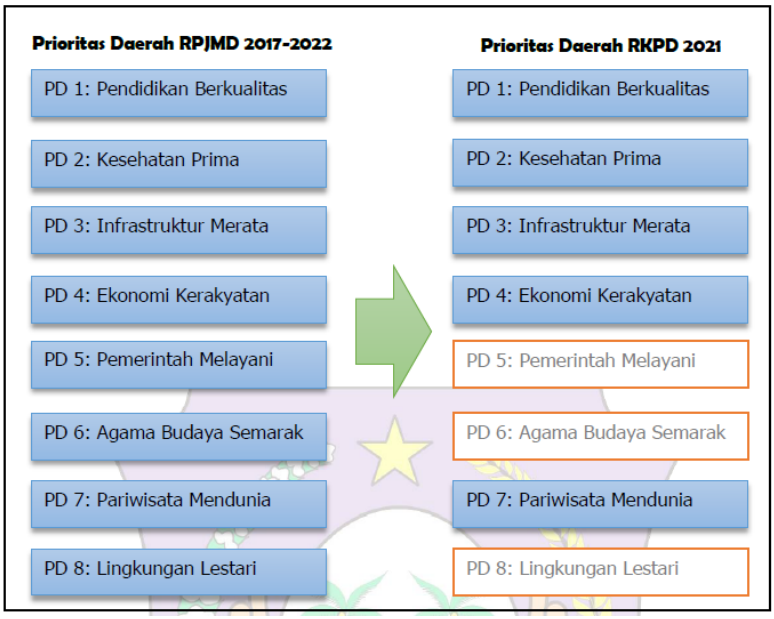

Figure 3-2 Priority items for strengthening in 2021 (from among development themes of RPJMD)

Also, during the workshop held as part of this year's project, BAPPEDA, Gorontalo,

[9] PROVINSI GORONTALO (2021 Regional Work Plan) (https://gorontaloprov.go.id/wp-content/uploads/2021/06/RKPD-Final-Bab-IV-Sasaran-dan-Prioritas-Pembangunan-Daerah-FIX.pdf)

mentioned water pollution as a major environmental issue and informed us that they have selected Gorontalo Regency, Bone Bolango Regency, and Gorontalo City as municipalities to implement a drinking water management system. We have just learned about the need and plans to promote the development of water infrastructure, including not only sewage but also drinking water.

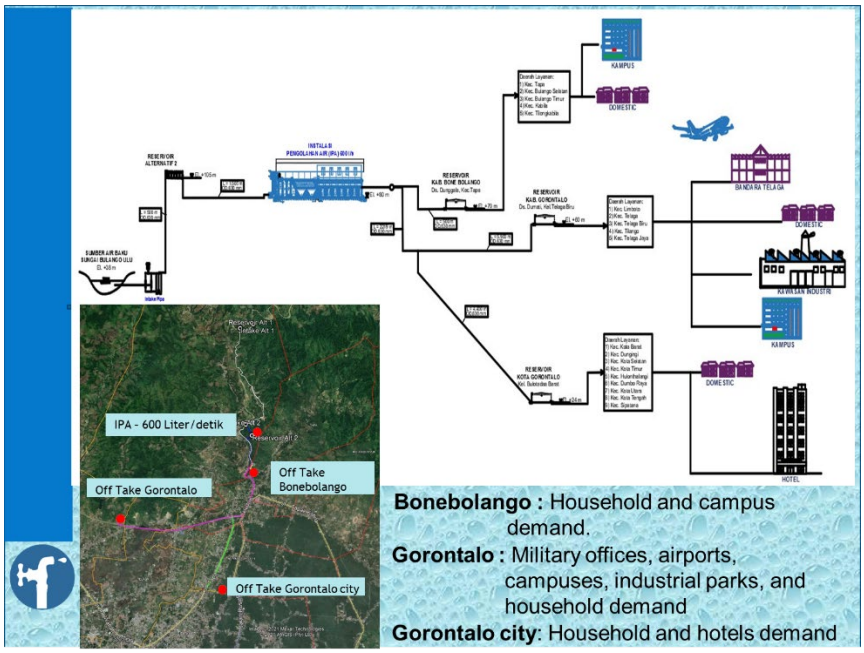

Figure 3-3 Plan for Drinking Water Management System of Gorontalo Province[2]

After exchanging opinions with Gorontalo Province, we have confirmed that the Gorontalo provincial government is currently formulating an RPJMD for 2023 and beyond, and that it intends to incorporate the perspective of decarbonization into the development plan based on the plans and policies of this project. Moving forward, we plan to confirm the priority of water infrastructure development after 2022, conduct hearings on regions and places with a high need for specific sewage treatment, and proceed with detailed examination for the introduction of septic tanks.

3.1.1.2. Domestic wastewater standards in Indonesia

The sewerage penetration rate in Indonesia is less than 5%. This is the lowest level among ASEAN countries. On the other hand, the goal in the field of "water and hygiene" in Indonesia's National Long-Term Development Plan RPJPN (2005 to 2025; Law No. 17, 2007) is to ensure that all citizens have access to sewage treatment facilities by 2019. The Ministry of Public Works and Housing (Pekerjaan Umum dan Perumahan Rakyat: hereinafter, "PUPR"), which is the authority in charge, is aiming to achieve the above-

mentioned goals from both aspects of basin sewerage development and decentralized wastewater treatment facility development. Specific approaches and dissemination targets are separately set for urban areas and rural areas. The targets for urban areas are to treat human waste at a rate of 15% for sewerage and 85% for distributed wastewater treatment facilities. In rural areas, the target is 100% for distributed wastewater treatment facilities. Although the PUPR stipulates the development of decentralized wastewater treatment facilities such as septic tanks, untreated wastewater flows in to rivers in most areas of Gorontalo Province.

In consideration of these serious water pollution conditions in Indonesia, the Ministry of Environment and Forestry (Kementerian Lingkungan Hidup dan Kehutanan: hereinafter, "KLHK") promulgated a ministerial ordinance on new domestic wastewater standards in August 2016 (Ministry of Environment and Forestry Ordinance No. 68 (p. 68; Menlhk, Setjen, Kum; January 8, 2016)[10]). The standard value of ammonia is stricter than that of Japan, and advanced treatment including denitrification is required. Additionally, the "homes" listed as the target facilities in these standards refers to housing complexes such as apartments, and there is currently no standard for drainage from a single house.

Table 3-1 Ministry of Environment and Forestry Ordinance No. 68: Domestic wastewater standards

Parameters	Units	Maximum allowance*
pH	-	6 to 9
BOD	mg/L	30
COD	mg/L	100
TSS	mg/L	30
Oil & Grease	mg/L	5
Ammonia	mg/L	10
Total Coliforms	Total/100 mL	3,000
Discharge	L/person/day	100

* Target facilities are as follows: apartments, lodges, lodgings, hospitals, educational institutions, offices, markets, restaurants, conference halls, leisure facilities, homes, industrial facilities, distributed wastewater

[10] MENTERI LINGKUNGAN HIDUP DAN KEHUTANAN REPUBLIK INDONESIA P.68/Menlhk/Setjen/Kum.1/8/2016 (https://sustainability.ipb.ac.id/wp-content/uploads/2020/01/Permen-LHK-No-68-tahun-2016-tentang-Baku-Mutu-Air-Limbah-Domestik.pdf)

treatment facilities, sludge treatment facilities, collective wastewater treatment facilities, airports, stations, and prisons

In addition, some regions have stricter regulations than the wastewater standards shown in Table 3-1. For example, in Bali, lower standards have been set for BOD and COD at 28 mg/L and 50 mg/L, respectively, and an administrative order to stop drainage is issued to facilities that exceed the administrative standards [11]. Therefore, moving forward, through discussions with Gorontalo Province, we will confirm the existence of Gorontalo Province's own treatment standards and grasp the current situation regarding wastewater treatment in detail. Furthermore, when considering the problem that drainage from single homes cannot be covered within the scope of the current standard, it is possible to work with the central government through Gorontalo Province to revise regulations so that drainage from single homes is also covered.

3.1.2. Policies and systems regarding the spread of renewable energy

In 2012, Gorontalo Province formulated the National Action Plan for Greenhouse Gas Emission Reduction (hereinafter, "RAD-GRK") of Gorontalo Province 2018-2030. The target value for greenhouse gas emission reduction in RAD-GRK is in accordance with the National Action Plan for Greenhouse Gas Emission Reduction (Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca: hereinafter, "RAN-GRK") that was formulated in 2011 in Indonesia through Presidential Decree No. 61; specifically, to reduce GHG by 26% by 2020. RAN-GRK and RAD-GRK will be discussed in detail in the next section.

3.1.2.1. National Action Plan for Greenhouse Gas Emission Reduction (Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca: RAN-GRK)

The National Action Plan for Greenhouse Gas Emission Reduction (Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca: RAN-GRK) was formulated in 2010 in the form of a Presidential Decree and is a pillar of the policy position regarding low carbonization in Indonesia.

RAN-GRK states the national commitment of working to reduce greenhouse gas emissions with a target of reducing emissions by 26% business as usual (hereinafter, "BAU") by 2020. However, if international support can be obtained, the target of reducing greenhouse gas emissions by 41% has also been stated, so there have been expectations

[11] JICA (January 2018) Survey on Water Environment Improvement Projects by Building a Comprehensive Maintenance System for Septic Tanks in Bali, Indonesia: Work Completion Report (https://openjicareport.jica.go.jp/pdf/12302378.pdf)

for the use of the Joint Crediting Mechanism (hereinafter, “JCM”). Under these circumstances, Japan and Indonesia signed a JCM in October 2013, making it the eighth JCM target country for Japan.

The 2010 Action Plan was announced during the term of former President Yudhoyono. Then, at the COP Summit held in Paris on December 21, 2015 the current President Joko Widodo made a declaration regarding Indonesia’s nationally determined contribution (hereinafter, “NDC”). Specifically, he declared that Indonesia will reduce GHG emissions by 29% in 2030 compared to BAU in accordance with the RAN-GRK target, and further reduce GHG emissions to 41% through international support such as JCM. Since the aforementioned RAN-GRK was a GHG emission reduction target for achievement by 2020, the RAN-GRK secretariat held workshops throughout Indonesia in 2017 after submitting the NDC and consulted with each local government prior to reexamining the target value so that it is in line with the NDC[12].

Although the NDC was scheduled to be revised in 2020, the revision work was significantly delayed due to the impact of the COVID-19 pandemic. The latest version of the NDC (submitted in July 2021[13]) maintains the previous goals of reducing GHG emissions by 29% in 2030 compared to BAU and 41% through international support such as JCM. It also goes one step further to declare that GHG emissions will be reduced to essentially zero (carbon neutral) by 2060.[14]

As for Indonesia's domestic system, the rapid conversion of renewable energy is said to face many challenges due to how cheap energy supply for low-income groups is an important element of the administration's support base. The new General Plan for National Energy (Rencana Umum Energi Nasional 2015-2050: hereinafter, “RUEN”), which was formulated in 2015, has set the target of reducing the ratio of oil among all types of energy in Indonesia from 49% to 22% by 2025. By the same year, the Plan also sets the targets of increasing the ratio of natural gas from 20% to 22%, coal from 24% to 32%, and renewable energy from 6% to 23%.

Moreover, nuclear power is positioned as the final option. This will promote the transition from direct use of fossil fuels to electricity and will increase the power generation facility capacity from the current 44 GW to 115 GW in 2025.

The Plan also sets the following national energy policy goals:

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[12]https://energypedia.info/wiki/Indonesia:_From_Mitigation_Action_Plans_To_Integrated_Low_Carbon_Development_Planning

[13] UNFCCC Secretariat “Submission Status for NDC of Each Country”https://www4.unfccc.int/sites/NDCStaging/Pages/LatestSubmissions.aspx

[14] NNA ASIA Asia Economic News (https://www.nna.jp/news/show/2227984)

(a) Energy elastic value (growth in energy consumption/economic growth rate):
Reduce the elastic value of energy to 1 or less by 2025 in order to conform with the economic growth target.
(b) Energy intensity (amount of energy used per GDP):
Improve by 1% each year until 2025.
(c) Electrification rate:
Approach 85% by 2015 and 100% by 2020.
(d) Usage rate of household gas:
Reach 85% by 2015.
(e) Ratio of new/renewable energy in primary energy:
Increase to 23% by 2025 and 31% by 2050.

The National Energy Policy (RUEN) has a structure that includes low-carbon measures using natural gas and renewable energy power. A commitment to low-carbon measures can be inferred from the Policy. Table 3-2 summarizes the overall image of the policy and the low-carbon measures using natural gas and renewable energy.

Table 3-2 Position of natural gas renewable energy in the National Energy Policy[15]

Item	Contents
Target	・ Promote the role of business that leads market economization toward efficient operation of the economy ・ Develop energy for exporting; strengthen the energy usage foundation for domestic consumers ・ Strengthen strategic partnerships in Indonesia and in foreign countries ・ Reduce dependence on foreign countries and strengthen local content
Strategy	・ Correct price differences between domestic prices and export prices ・ Support the formulation of an energy master plan ・ Introduce market mechanisms from producer to consumer ・ Allocate the roles of the private sector and government

[15] "PERATURAN PRESIDEN REPUBLIK INDONESIA NOMOR 22 TAHUN 2017 TENTANG RENCANA UMUM ENERGI NASIONAL" (https://www.esdm.go.id/assets/media/content/content-rencana-umum-energi-nasionalruen.pdf)

Item	Contents
	through large-scale development ・ Support energy development by the private sector ・ Promote the development of technology and the cultivation of human resources ・ Establish a collaborative system for parties related to energy ・ Cultivate business management ability in departments related to energy
Action Plan (Gas)	・ Strengthen access to domestic and overseas gas resources in order to secure energy supply ・ Enhance the deposit amount and production amount of gas by granting incentives ・ Increase the amount of gas supplied by constructing LNG terminal, CNG shipping facilities, and gas shipping networks ・ Research and technology development in new fields such as compact LNG, liquefaction technology, etc. ・ Application of gas prices to achieve economic prices appropriate for the construction of a gas supply system ・ Require domestic corporations to supply to domestic markets ・ Optimize the domestic supply priority ranking (fertilizer usage, power generation usage, government-operated gas companies, industry usage) for gas ・ Optimally use flare gas through compact LNG/LPG
Action Plan (Gas Pipeline)	・ Continue the construction of pipelines for establishing a domestic gas shipping system ・ Increase the amount of gas supplied by constructing LNG terminals, CNG shipping facilities, and gas shipping network ・ Use CNG for response in regions where it is not possible to construct a pipeline ・ Set prices for gas shipping and wheeling fees via pipelines in accordance with economic principles ・ Construct LNG terminals and terminals for receiving LNG in regions of Java with high gas demand ・ Promote ASEAN gas pipeline plans

Item	Contents
Action Plan (Natural Gas/LPG)	・ Strengthen the supply of LG in regions where natural gas cannot be supplied ・ Establish a government quality control system for LPG ・ Promote products such as LPG, DME, GTL, etc. ・ Suppress oil consumption and promote the use of LPG/natural gas in the shipping sector ・ Develop standards for product gas; accelerate competition in natural gas and LPG transactions
Action Plan (Electricity/ Electrification)	・ Enhance power plants using natural gas and LPG through a pipeline network ・ Enhance power generation using renewable energy, diversify power generation fuel, and reduce oil consumption ・ Enhance power generation using low-grade coal ・ Export power generation capability in remote areas to neighboring countries ・ Develop compact gas power generation equipment ・ Develop new power generation technology usages such as cogeneration, fuel cells, etc. ・ Establish power generation operation methods with the objective of environmental protection
Action Plan (Private Commercial Sector)	・ Promote the usage of natural gas and coal ・ Construct shipping roads and repositories for coal and briquettes ・ Recommend energy-saving devices ・ Transmission of information on energy-saving devices to consumers ・ Development of shipping technology, compact repositories, etc., for promoting the transition to natural gas consumption
Action Plan (Industrial Sector)	・ Promoting the switch from home generation to purchase of energy from electric utility companies ・ Support for plants using gas ・ Research, develop, and promote gas usage with the aim of switching from oil ・ Promote the usage of co-generation power generation equipment

Item	Contents
	・ Promote the usage of local energy in non-electrified regions ・ Use briquettes in compact plants such as tea processing, rubber plants, greenhouse farms, etc.
Action Plan (Shipping Sector)	・ Promote land-based transportation systems using CNG and LPG ・ Promote the usage of energy for transitioning from oil; for example, LNG, DME, gas, and hydrate ・ Develop biodiesel fuel ・ Develop EV systems for public transportation in cities ・ Establish fuel mileage standards for automobiles

3.1.2.2. Regional Action Plan for Greenhouse Gas Emission Reduction (RAD-GRK) in Gorontalo Province (2018 to 2030)

As mentioned above, RAD-GRK was enacted in Gorontalo Province in 2012. The greenhouse gas emission reduction target value for RAD-GRK is in line with RAN-GRK in Indonesia, which was formulated as a presidential directive in 2010. Similar to RAN-GRK, the target is to reduce GHG by 26% by 2020. Furthermore, reviews are required to enhance the effectiveness of GHG emission reduction measures even after the formulation. The contents described in this section are the contents that were reviewed in 2018.

According to an analysis of GHG emission factors, the majority of emissions are due primarily to five sectors: forestry, agriculture, energy, industry, and waste management. For these five sectors, policy frameworks are being strengthened and an action plan is being formulated. This action plan in the energy sector introduced in this section will be discussed later in this report.

Estimates of GHG emissions from energy expenditures in each field of the energy sector show that land transportation and power generation are the main sources of emissions in the province. The following table below shows the GHG emissions profile for the energy sector in Gorontalo Province in 2010.

Table 3-3 GHG emissions profile for energy sector in Gorontalo Province

Field	GHG emissions (t-CO_2)
Home	4.0
Commercial	9.9

service	
Social welfare	6.2
Product industry	4.9
Textile industry	0
Lumber industry	0.4
Paper manufacturing industry	0.1
Non-metals industry	0.3
Metals industry	0.1
Machine industry	0
Land shipping	272.1
Marine shipping	7.1
Farming	9.8
Mining	2.8
Construction	8.8
Power generation	186.5

Based on the data collected to create the GHG emission baseline scenario as of 2011 and the related assumptions, the projected GHG emissions in Gorontalo Province are as shown in the figure below. By 2030, total GHG emissions from the energy sector are projected to be 2,640,000 t-CO_2, which would be five times that of 2010.

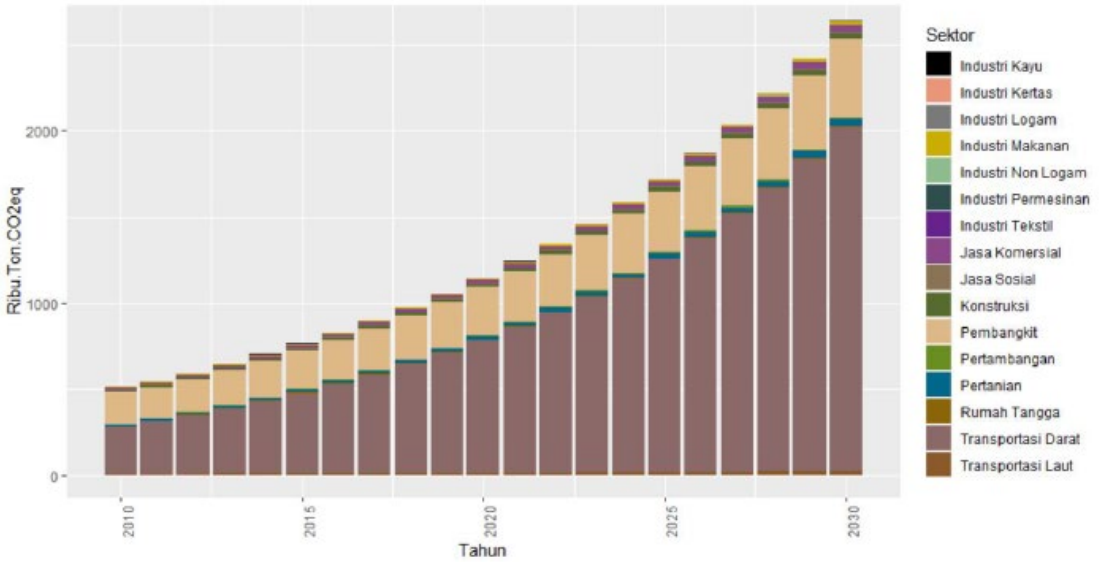


Figure 3-4 Projected GHG emissions in the energy sector in Gorontalo Province

Based on these current main emission sources and baseline scenario, we have formulated an action plan up to 2030. In addition to the above data, we also referenced the following documents.

(1) Gorontalo Province National Long-Term Development Plan (Rencana Pembangunan Jangka Panjang (RPJP) Provinsi Gorontalo 2007 to 2025)
(2) Regional Long-Term Development Plan (RPJMD 2017 to 2022)
(3) Gorontalo Province Energy SKPD Strategic Plan (2017 to 2022)
(4) (Rencana Strategis (Renstra) Dinas Perhubungan Provinsi Gorontalo (2017 to 2022))
(5) Strategic Plan (Renstra) of the Gorontalo Province Transportation Service (Rencana Tata Ruang Wilayah (RTRW) Provinsi Gorontalo 2010 to 2030)
(6) National Electricity Supply Business Plan (Rencana Umum Penyediaan Tenaga Listrik Indonesia 2019 to 2028)[16]

The action plan of the energy sector formulated based on the above regional plans is shown below.

[16] PT. PLN (PERSERO) (February 2019) RENCANA USAHA PENYEDIAAN TENAGA LISTRIK 2019-2028 (https://web.pln.co.id/statics/uploads/2021/08/5b16d-kepmen-esdm-no-39-k-20-mem-2019-tentang-pengesahan-ruptl-pt-pln-2019-2028.pdf)

Table 3-4 Alleviation Action Plan in Energy Sector

Document	Policy	Program	Alleviation Activities	2030 Targets	GHG emissions reduction ($t\text{-}CO_2$)
RUPTL 2019 to 2028	Sustainable energy supply	Use new energy and renewable energy	Solar power	10 MW	24,002
			Water power	9.9 MW	47,525
RPJMD	Regional infrastructure development for sustainability and economic activities	Improve the quality and quantity of regional infrastructure	Maintenance of roads and bridges	Not a priority item RAD GRK	Not a priority item RAD GRK
			Construction service coaching	Not a priority item RAD GRK	Not a priority item RAD GRK
			Improve shipping service performance		
			Improve safety capability	Construction of 15 roads	Not a priority item RAD GRK
Rencana Strategis (Renstra) Dinas Perhubungan Provinsi Gorontalo 2017-2022	Realize shipping facilities and infrastructure equipment for supporting	Improve shipping services	Pioneer transport	5 buses	Not a priority item RAD GRK
			Develop type B terminals in	5 terminals	Support activities

	sustainability		districts/cities		
			Public transportation	800 people	Support activities
			BRT	45 buses	52,505
			School bus	27 buses	5,434
			Transport control engineering research	Support activities	Support activities
			ATCS	9 transportation points	255,722
			Smart driving	50 people/year	10,719.85
	Improve shipping safety performance	Improve safety capability	Procure and install safety facilities	13 roads	Not a priority item RAD GRK
			Maintenance of medical facilities		Not a priority item RAD GRK
			Socially implement shipping safety	No target	Not a priority item RAD GRK
			Socially implement KKOP	1,200 people	Not a priority item RAD GRK

			Socially implement transportation safety		
			Car Free Day	1 place	5,096.6
Total					401,004.45

Additionally, the implementation schedule is being formulated in stages while considering the economic and social conditions of Gorontalo Province. The following table shows the schedules for the energy sector and shipping sector.

Table 3-5 Schedule of alleviation action plan for energy sector in Gorontalo Province (2020 to 2030)

Alleviation policy	2020	2022	2024	2026	2028	2030	Total (MW)
Solar power		5		5			10
Compact water power			5		4.9		9.9

Table 3-6 Schedule of alleviation action plan for shipping sector in Gorontalo Province (2020 to 2030)

No.	Action plan	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	ATCS	3			3					3		
2	Car Free Day (place)	1	1	1	1	1	1	1	1	1	1	1
3	BRT (number of vehicles)	15			5	5	5			5	5	5
4	Smart driving	50	50	50	50	50	50	50	50	50	50	50

	(people)											
5	School buses (number of buses)	3	3	3	2	2	2	2	1	3	3	3

3.2. Basic survey for formulating a commercialization plan

3.2.1. Assessing the potential of septic tank installation

3.2.1.1. Mechanism of septic tanks

A septic tank is a decentralized (on-site type) domestic wastewater treatment technology/facility developed in Japan. It is a machine that uses a solid-liquid separation function and a microbial treatment function to purify human waste and domestic wastewater.

The general treatment flow of a septic tank is as follows. First, the supernatant and solid matter in influent sewage is settled in a sedimentation separation tank. Next, a portion of organic matter is decomposed by anaerobic microorganisms in an anaerobic filter bed tank and nitrified water returned from the moving bed biofilm tank is denitrified. Then, air is blown in by a blower in the carrier flow tank. The organic substances are decomposed by aerobic microorganisms, and ammonia is nitrified, then the treated water is solid-liquid separated into the sludge and supernatant liquid in the settling tank. Finally, the treated water is disinfected with chlorine in the disinfection tank and then released. The basic structure of a septic tank is shown below.

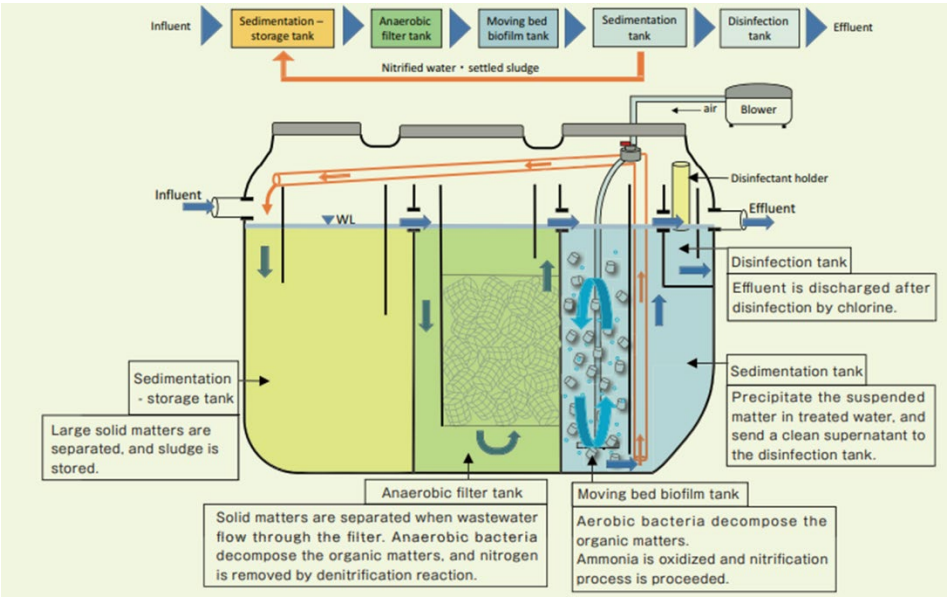


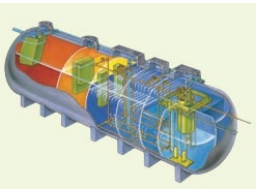
Figure 3-5 Structure and treatment principle of a septic tank[17]

Furthermore, the size, treatment method, and the material of the septic tank body, etc.,

[17] Ministry of Environment Japan (March, 2019)「Urine Treatment and Decentralized Domestic Wastewater Treatment Systems in Japan」
（http://www.env.go.jp/recycle/jokaso/basic/pamph/pdf/wts-jp_full.pdf）

can be selected for the septic tank according to the construction application of the building structure, the quantity and quality of the sewage to be treated, and the water quality regulation status of the discharge destination, etc. Septic tanks are classified as follows depending on the size of their treatment capacity.

Table 3-7 General classifications of septic tanks[17]

Classification	Appearance	Overview
Compact septic tank		Used for detached houses and small-scale wastewater treatment by tanks for 50 or fewer people (10 m^3 per day for daily average sewage amount). The tank is normally manufactured at a factory from the plastics FRP (fiber reinforced plastic) or DCPD (dicyclopentadien).
Mid-size septic tank		Used for medium-scale wastewater treatment by tanks for 51 to 500 people (100 m^3 per day for daily average sewage amount). The tank is normally manufactured at a factory from the plastic FRP, or installed on-site using reinforced concrete (RC).
Large septic tank		Used for large assembly processing by tanks for 501 people or more. Then tank is usually installed on-site using reinforced concrete (RC).

In Japan, Article 3 of the Purification Tank Act requires that human waste and domestic wastewater be treated by a septic tank if a sewerage system or human waste treatment facility is not used. As of the end of 2019, about 7.6 million septic tanks have been installed throughout Japan.[18] Also, in the Export Strategy for Infrastructure Systems 2025[19] formulated in 2020, septic tanks are listed as one of the actions by field. We are supporting the overseas deployment of septic tanks (including SMEs) for public health and water environment conservation in the Southeast Asian region.

[18] Ministry of the Environment (February 2021) "Press Release Materials" (https://www.env.go.jp/press/109154.html)
[19] Prime Minister's Official Residence (June 2021) "Export Strategy for Infrastructure Systems 2025" (revised in June 2021) (https://www.kantei.go.jp/jp/singi/keikyou/pdf/infra2025.pdf)

3.2.1.2. Overview of septic tank manufactured by Daiki Axis Co., Ltd.

In our project, we are considering the introduction of a septic tank manufactured by Daiki Axis Co., Ltd.

Ever since it developed the industry's first lightweight and durable FRP septic tank, Daiki Axis has been developing low-cost and efficient products. For example, in January 2014, at the Eco Mark Award 2013 sponsored by the Eco Mark Office of the Japan Environment Association, the company's XE household septic tank became the first septic tank to obtain Eco Mark certification. In addition to achieving the target value of minus 46% as set by the Ministry of the Environment, it realized power saving performance and stable wastewater treatment capacity, and reduced the total capacity to about 85% compared to the conventional product by using recyclable polypropylene. In this way, the XE household septic tank contributes to on-site work reduction and cost reduction. The structure and functions of the company's FRP septic tanks are shown below.

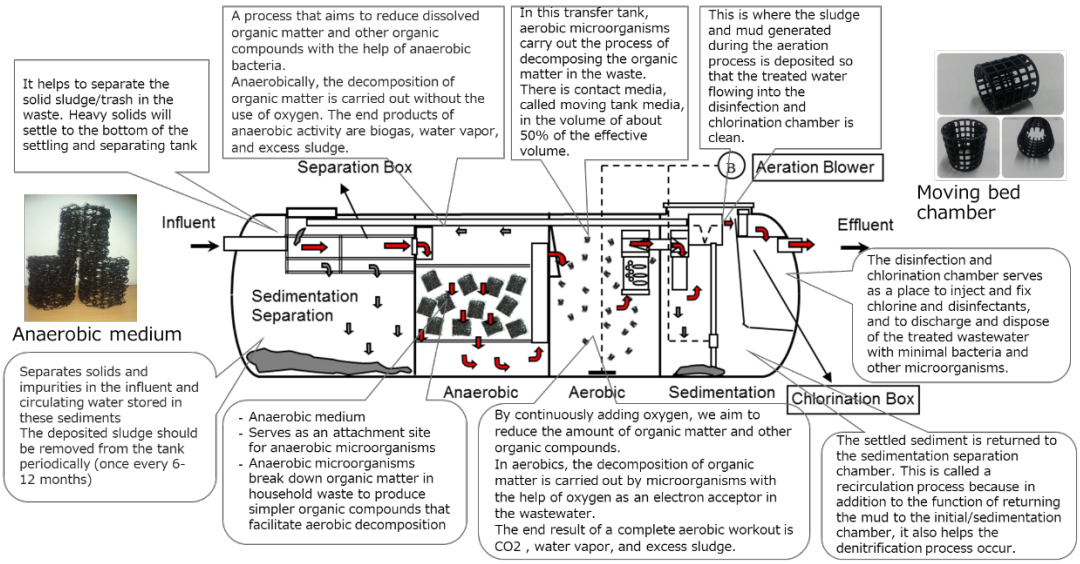


Figure 3-6 Structure and Functions of Daiki-Axis' FRP Septic Tanks[20]

Moreover, since Daiki Axis has an affiliated company in Indonesia and is developing (mainly in Jakarta) a septic tank installation business in accordance with the aforementioned Indonesian laws and regulations, the company has a strong technical advantage in introducing septic tanks that meet local issues. Table 3-1 shows the Indonesian domestic wastewater standards and the treatment performance of the company's septic tanks.

[20] Materials provided by Daiki-Axis

Table 3-8 Treatment Performance of Daiki Axis' Septic Tanks and Indonesian Domestic Wastewater Standards[20]

parameter	Unit	Input	Output BA	Output BJ	Standard*
pH	[-]	6 – 9	6 – 9	6 – 9	6 – 9
BOD	[mg / L]	300	20	20	30
COD	[mg / L]	400	100	80	100
TSS	[mg / L]	240	30	20	30
Ammonia	[mg / L]	50	-	10	10
Fats and oils	[mg / L]	40	10	5	5
Total coliform bacteria	【count/ 100ml】	-	3000	3000	3000

*） Permen LHK no . P.68_MenLHK_Setjen_Kum.1_8_2016

These achievements in Indonesia were reported at the Indonesia-Japan Environmental Week hosted by Japan and the Ministry of Environment and Forestry of the Republic of Indonesia in January 2021.[21] Daiki Axis Co., Ltd. has a track record of installing its products in facilities of various sizes, some of which are listed below.

[21] Presentation Materials from Indonesia-Japan Environmental Week (January 2021) “Introduction of Decentralized Small Scale Waste Water Treatment Technology in Indonesia” (https://www.oecc.or.jp/jprsi/event/envweek/program/files/20210114_sem_2-6_pt_daiki_axis.pdf)

Figure 3-7 Examples of Product Introduction in Indonesia[20]

	
Compact septic tank (for use by up to ten people)	Large septic tank (for use at offices, apartments, hotels, etc.)

Figure 3-8 Septic tanks installed in Indonesia by Daiki Axis Co., Ltd.

Furthermore, from the viewpoint of decarbonization, this project considers a system

that uses solar power to obtain the power required for the operation of septic tanks. Regarding the solar power system, we will procure solar panels in Indonesia and consider an integrated introduction format in which Daiki Axis handles all stages from construction to management. Since this project has a public nature, there is a high possibility that the equipment will be procured publicly. Although price issues exist, it is possible to create a favorable competitive environment for installation based on the utilization of the JCM facility investment subsidy and Daiki Axis's experience in batch contracting and construction. The company also possesses in the design and construction of septic tanks using solar power generation equipment in mountainous areas in Japan.

3.2.1.3. Review items for installation

When installing a septic tank, it is necessary to clearly ascertain and set the inputs and outputs, to use the set values for selecting products of appropriate size, and to verify the feasibility of installing a system. We will review requirements for each of the three stages as follows:[22]

- Input (conditions for acceptance of domestic wastewater)

  At the time of installing facilities, acceptance conditions are set by considering the actual conditions, process, and output of wastewater treatment. Examples of conditions include wastewater discharge status, wastewater properties, identification of substances for which treatment is inappropriate, and acceptance form.

- Process conditions (conditions for setting treatment technology)

  These are specific conditions necessary when reviewing the size and installation of the product. These conditions determine the basic performance of facilities that satisfy conditions for input and output, and also considers regulatory standards and emergency response.

- Output (conditions for using septic tank sludge)

  These are conditions necessary for utilizing the septic tank sludge generated as a result of the treatment. In addition to the properties and amount of septic tank sludge, these conditions also include the transportation method to the destination, the transportation route, and seasonal variation in the amount.

The following table summarizes the specific contents of the three stage listed above.

[22] Supervised by Toru Furuichi, edited by the Organic Waste Recycling Association (OWRA) (March 2006) *Biogas Technology and Systems*, p. 76

Table 3-9 Specific contents of requirements for septic tank installation

Requirement category	Requirement contents	
Input (conditions for acceptance of domestic wastewater)	Discharge status of wastewater	Discharge amount and characteristics of wastewater (daily fluctuations, seasonal fluctuations, discharge types by region), Emission sources (general households, commercial facilities, etc.)
	Properties of wastewater	pH, TSS, BOD, CODcr, NH4-N , TN, TP, N-Hex （or Oil & Grease）etc. Presence or absence of fluctuation in properties (seasonal fluctuations, etc.)
	Identification of substances for which treatment is inappropriate	Type, mixing ratio (%), concentration (mg/L)
	Acceptance form	Method of receipt: Method of piping from homes, etc.
Process conditions (conditions for setting treatment technology)	Conditions of location scheduled for construction	Distance from the main source and difference in height Distance and height difference from treated water discharge destination Site area, topography, geology, climatic conditions Legal regulations, surrounding environment, access Conditions for receipt of electricity, water services, etc.
	Processing capability	Processing capacity (m^3 per day) Annual working days (days per year) Capacity of receiving and storing equipment (corresponding to the maximum receipt amount)
	Pollution control standards, etc.	Regulatory standards Existence/absence of requested criteria from local residents, etc.
	Pre-treatment	Necessity of pre-treatment equipment and

		treatment method
	Treatment method	Separated contact aeration method, anaerobic filter floor contact aeration method, denitrification filter floor contact aeration method, phosphorus removal/denitrification floor contact aeration method, etc. Necessity and quantity of treatment auxiliary materials
	Wastewater treatment	Discharge destination Properties of discharged water: BOD, nitrogen concentration, salt concentration
	Electrical instrumentation specifications	Central monitoring control items (type and number of items), field operation items (type and number of items) Contents of automatic operation control for labor-saving
Output (conditions for using septic tank sludge)	Sludge Generation	Amount generated (m^3 per day or m^3 per month)
	Properties of sludge	pH, TSS, BOD, COD, NH4-N , TN, TP, etc. Apparent specific density (t/m^3), moisture content (%) Presence or absence of fluctuation in properties (seasonal fluctuations, etc.)
	Transportation method for sludge	Sludge carry-out: frequency, quantity, transportation route, distance Annual carry-out plan, management/maintenance system, etc. Carry-out method, carry-out vehicle specifications
	Destination for sludge usage	Usage conditions: Usage destination, usage form, demand amount, properties, seasonal fluctuations in quantity, purchase price (paid or free)

3.2.1.4. Potential site candidates

As mentioned above, water and sewage infrastructure are underdeveloped in Gorontalo Province. In most regions, untreated wastewater flows into rivers and causes water pollution. When exchanging opinions with the government of Gorontalo Province, it was pointed out that water pollution is caused by domestic wastewater and waste from buildings along rivers.

On the other hand, since the water and sewage systems are not yet developed, we expect that time will be required to construct a system for collecting wastewater from multiple households in a single location. Gorontalo Province also raised the issue of treating wastewater from facilities such as student dormitories and hospitals. Therefore, we have decided to also extract such single large facilities as potential sites.

Regarding student dormitories, we have confirmed that there are three student dormitories in Gorontalo City at the Gorontalo State University, with which we are collaborating in this project. According to BAPPEDA in Gorontalo, there are 8 student dormitories in need of wastewater and waste treatment: 3 in Bone Bolango, 2 in Gorontalo, and 3 in Gorontalo City. Currently, organic waste and wastewater from these dormitories are treated on a site-by-site basis, but in discussions with BAPPEDA, we confirmed that they would like to consider using Japanese technology for centralized treatment and energy recovery in the future. The following is a detailed list of student dormitories with high needs for wastewater treatment, etc., as provided by BAPPEDA in Gorontalo Province.

SMA TERPADU WIRA BHAKTI GORONTALO 	MAN INSAN CINDEKIA GORONTALO 	MA SWASTA HUBULO GORONTALO 
371 students	346 students	467 students
Water source: Tap water, well water	Water source: Well water	Water source: Well water
Waste management: Environmental services in Bone Bolango and incineration	Waste management: Environmental services in Bone Bolango	Waste management: Environmental services in Bone Bolango
Water Sanitation Management: Inflow into irrigation canals	Water Sanitation Management: Inflow into irrigation canals	Water Sanitation Management: Inflow into rivers

MADRASAH ALIYAH AL-ISLAM	MADRASAH ALIYAH AL-FALAH
	
108 students	187 students
Water source: Well water	Water source: Tap water
Waste management: Environmental services in Gorontalo	Waste management: Independently managed
Water Sanitation Management: Inflow into irrigation canals	Water Sanitation Management: Inflow into irrigation canals

PONDOK PESANTREN ALKHAIRAAT	PONDOK PESANTREN AT TANWIR MUHAMMADIYAH	MADRASAH ALIYAH AL-HUDA
		
966 students	172 students	265 students
Water source: Well water	Water source: Tap water	Water source: Well water
Waste management: Incineration and direct disposal	Waste management: Environmental services in Gorontalo city	Waste management: Incineration and direct disposal
Water Sanitation Management: Breaking	Water Sanitation Management: Inflow into irrigation canals	Water Sanitation Management: Inflow into irrigation canals

Figure 3-9 Overview of student dormitories with wastewater treatment needs in Gorontalo Province[2]

Furthermore, according to the Stetoskoop website that summarizes medical services throughout Indonesia, the following 14 general hospitals exist in Gorontalo Province.

Moving forward, we will hold discussions with Gorontalo Province and Gorontalo State University, conduct hearings in regards facilities with high wastewater treatment needs, consider the requirements listed in 3) for each candidate site, and select the installation site.

Table 3-10 General hospitals in Gorontalo Province[23]

Name of regional government where hospital is located	Name of hospital	URL
Boalemo Regency	RUMAH SAKIT UMUM DAERAH TANI DAN NELAYAN	-
	RUMAH SAKIT UMUM DAERAH DR. IR. IWAN BOKINGS KAB. BOALEMO	-
Bone Bolango Regency	RUMAH SAKIT UMUM DAERAH TOMBULILATO	http://rstombulilato.weebly.com/
	RUMAH SAKIT UMUM DAERAH TOTO KABILA	-
City of Gorontalo	RUMAH SAKIT BUNDA - GORONTALO	-
	RUMAH SAKIT UMUM DAERAH OTANAHA	-
	RUMAH SAKIT UMUM DAERAH PROF. DR. H. ALOEI SABOE	http://rsasaleoisaboe.wordpress.com
	RUMAH SAKIT UMUM DAERAH DR. ZAINAL UMAR SIDIKI	-
	RUMAH SAKIT MULTAZAM	-
	RUMAH SAKIT UMUM DAERAH BOLIYOHUTO	-
Gorontalo Regency	RUMAH SAKIT UMUM DR. M. MOHAMMAD DUNDA	-
	RUMAH SAKIT UMUM DAERAH DR. HASRI AINUN HABIBIE	-
	RUMAH SAKIT UMUM BIOKLINIK	-
Pohuwato Regency	RUMAH SAKIT UMUM DAERAH POHUWATO	http://rsud-pohuwato.com/

[23] Webpage of Stetoskoop (http://stetoskoop.com/)

3.2.2. Ascertaining the potential for installing methane fermentation equipment

3.2.2.1. Mechanism of methane fermentation equipment

The main purpose of the methane fermentation process is to recover methane safely and efficiently from waste biomass such as organic wastewater, sewage sludge, livestock waste, kitchen waste, etc. This is done using an anaerobic microbial reaction. The process is also intended to reduce the volume of waste sludge.

In general, in order to use methane fermentation equipment, it is necessary to remove foreign substances that are not suitable for fermentation from the received material. It also requires a sorting process by manual sorting, mechanical crushing and sorting, or a combination of both.

Next, a solubilization process may be performed as a pre-treatment to promote fermentation. The post-treatment process requires a methane fermenter for fermenting organic substances, a desulfurization device necessary for power generation and utilization of the generated biogas, a gas holder, a power generation facility, a boiler, a surplus gas combustion device, and other equipment. The type of equipment to be installed will differ depending on the purpose of use for the fermentation residue.

For example, there is a case in which the fermentation residue is sprayed as a whole liquid fertilizer. The equipment assumed to be required in that case includes a liquid fertilizer storage tank, a liquid fertilizer carrier, and a sprayer for when the business operator itself sprays the liquid fertilizer. For some other facilities, solid-liquid separation treatment is performed and the solid part is composted, converted to solid fuel, or dried and then incinerated as industrial waste. The liquid part is treated as wastewater and then discharged into sewage. In this way, the installed equipment will differ depending on the method for treating the fermentation residue. The following diagram shows the basic structure of the methane fermentation process.

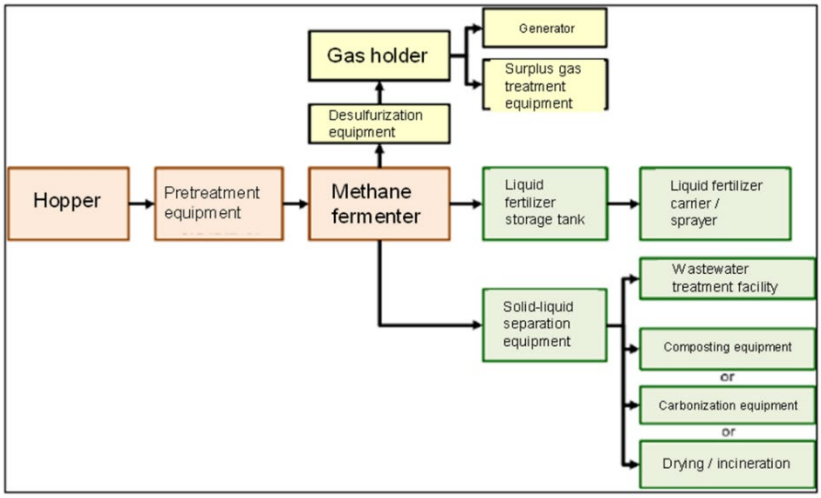


Figure 3-10 Basic structure of the methane fermentation process[24]

Moreover, the type of methane fermentation process differs depending on the use of solid waste treatment wastewater treatment which mainly targets soluble components or which mainly targets solids. Depending the dry method is divided into the horizontal type and vertical type, both of which are high-temperature fermentation techniques. Wastewater treatment is classified according to treatment in the methane fermentation tank; for example, returning concentrated sludge to the methane fermentation tank (anaerobic contact method, ABR method), using biofilm (anaerobic filter bed method, anaerobic fluidized bed method), or immobilizing bacterial cells.[25] On the other hand, the sludge concentration in the formation tank, solid waste treatment is roughly classified into two types: the "wet method" and "dry method." The wet method is divided into a two-phase method and a one-phase method which conducts treatment by suspending methane bacteria at a low sludge concentration, with two types of medium-temperature fermentation and high-temperature fermentation. The following tables summarizes an overview of the UASB method, EGSB method, wet method, and dry method techniques.

[24] Japanese Ministry of the Environment "FY2017 Report on Regional Circulation Area and Eco-Town Low Carbon Promotion Project," Okinawa Prefecture, Japan NUS Co., Ltd., p. 101.
[25] Edited by Tatsuya Noike (May 2019), "Methane Fermentation", p. 85

Table 3-11 Comparison of methane fermentation technology[26]

	Wastewater	Solid waste	
Item	UASB method/ EGSB method	Wet method	Dry method
Raw material concentration	5 to 8%	2 to 10%	15 to 30%
Treatment overview	Methane bacteria is granulated, fixed and low SS concentration wastewater is treated	Methane bacteria is suspended and treated at low sludge concentration	Treated at high sludge concentration using methane bacteria
Characteristics	・ High efficiency ・ EGSB method: Highly additive operation is possible compared to UASB method (the fluidized bed type UASB method is the EGSB method)	・ Easy operation management ・ Treatment using digestive solution is unnecessary (when using liquid fertilizer)	・ Treatment of solids is possible ・ Increased gas generation amount per raw material unit weight
Main applications	・ Food wastewater	・ Business/household garbage ・ Food processing residue ・ Livestock manure ・ Sewage sludge	・ Municipal solid waste ・ Solid waste
Implementation record	Large number in Japan (UASB method)	Large number in Japan	Very small number in Japan
Tolerance for non-conforming	Small (Liquid waste treatment with low SS concentration)	Small	Large

[26] NEDO (April 2021), "Part 3: Fundamentals Related to Methane Fermentation Technology." (https://www.nedo.go.jp/content/100932093.pdf)

mix			
Wastewater treatment	Some discharge standards require aerobic treatment	Required (when not performing liquid fertilizer treatment)	Unnecessary (differs depending on material conditions)
Maintenance of fermentation tank	Not necessary with proper operation and management	Periodic maintenance required	Almost unnecessary
Contact method for methane bacteria and organic material	Contact depending on wastewater velocity	Agitate the inside of the fermentation tank	Mix raw materials with drawn sludge and insert into the fermentation tank

The target raw material in this project is the plan to target the sludge discharged from the septic tank mentioned above. On the other hand, when considering economic efficiency, it is desirable to increase the amount of power generation by methane fermentation gasification by using food waste, etc., with higher fermentation efficiency as the main raw material. Therefore, this project will target biomass resources such as food waste as raw materials for methane fermentation equipment, obtain profits from selling electricity, and consider treatment of septic tank sludge by mixing septic tank sludge as raw materials.

We will consider introducing methane fermentation technology from Aiken Kakoki K.K. The company is located in Ehime Prefecture and conducts methane fermentation using solid waste such as agricultural products at domestic food factories. Also, in Indonesia, Aiken Kakoki conducts a pilot test of methane fermentation using wastewater palm oil factories operated by the Indonesian government (Palm Oil Mill Effluent: POME) and confirms performance (recovered energy amount, methane concentration) as part of the JICA project in FY 2020. Aiken Kakoki's methane fermentation technology is more competitive than other companies' technologies in stirring method, a high gas recovery rate, and a track record of stable removal. The technology will be discussed in detail in the next section.

3.2.2.2. Overview of methane fermentation technology at Aiken Kakoki K.K.

Through wastewater treatment by the EGSB method described above, Aiken Kakoki K.K. has succeeded in developing a self-contained circulating drainage system that dramatically improves the stability, efficiency, and economic efficiency of wastewater treatment, and does not require any external energy. As a result, this wastewater treatment system is capable of generating profits while treating factory wastewater, and possesses a high advantage as optimal wastewater treatment equipment for emerging countries where effective use of biomass and energy is scarce. Specifically, the system price and investment recovery period have been reduced to about two-thirds compared to the conventional EGSB method.[27] An overview of the system developed by Aiken Kakoki K.K. is shown below.

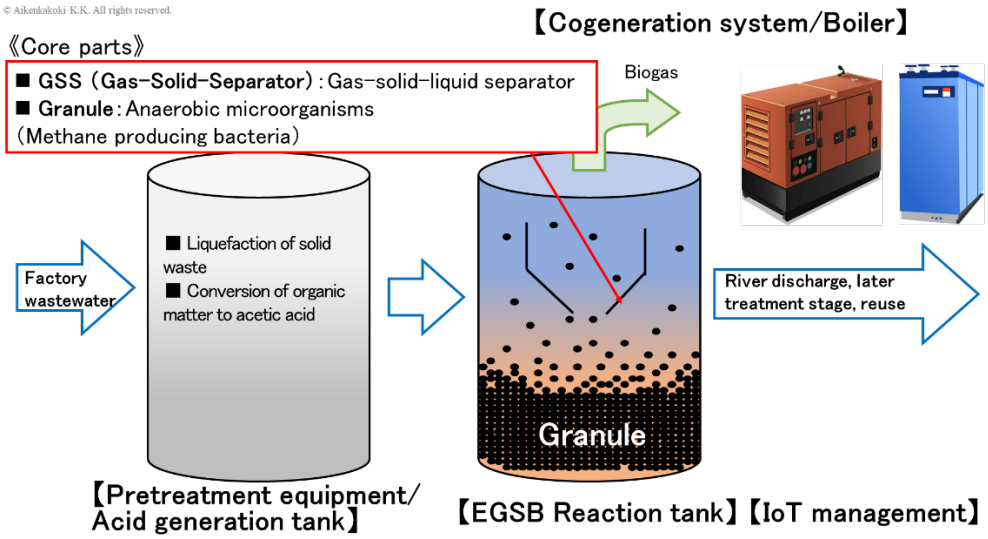


Figure 3-11 Overview of EGSB method system[28]

In the EGSB method, the wastewater treatment capacity and the biogas recovery capacity differ greatly depending on the structure of the three-phase separator (Gas Solid Separator: GSS) in the reaction tank. Although many companies outsource the design of GSS, Aiken Kakoki develops it in-house. Therefore, it has accumulated GSS design knowledge, and it is possible to base the design on the specifications of the entire reaction tank. As a result, Aiken Kakoki has succeeded in increasing the recovery rate of biogas, and it is possible to recover the investment faster than the products of other companies[29].

[27] NEDO (November 2021), "Materials from NEDO Venture and Emerging Business Matching Meeting" (https://www.nedo.go.jp/content/100939230.pdf)
[28] Materials provided by Aiken Kakoki
[29] JICA (June, 2020) Feasibility Survey for Treatment System of Highly Concentrated Effluent with Biogas Recovery at Palm Oil Mill in Indonesia Work Completion Report, Aiken Kakoki K.K., p, 8

Additionally, Aiken Kakoki is highly competitive in terms of price because it can handle everything from design to sales and maintenance. After delivering the first unit to a major food factory in 2005, the company has installed a total of 21 units as of 2021. The company's EGSB process results are shown below.

Table 3-12 Installation results of EGSB method at Aiken Kakoki[28]

	Water volume	Input	Output	Amount of recovered energy		Target wastewater
	(m3/day)	COD (mg/l)	COD (mg/l)	(Nm3/day)	(kwh/day)	
1	600	5,800	580	1,378	3,740	Agro-processing
2	1,000	8,000	1,200	2,992	8,120	Wastewater from cotton manufacturing
3	650	4,300	430	1,107	2,817	Prepared food and confectionery production

Aiken Kakoki also possesses experience in energy recovery (methane fermentation by digestion tank method) equipment using factory residues such as food waste, based on customer needs. By utilizing knowledge in areas such as energy efficiency accumulated through wastewater treatment, Aiken Kakoki operates a miniaturized and highly efficient demonstration facility and conducts technical evaluation. The following photograph shows methane fermentation equipment using the digestion tank method at a food factory in Japan.

Methane fermentation system using POME at a palm oil mill in Indonesia

Methane fermentation system using food residues at a domestic food factory

Figure 3-12 Methane fermentation equipment using the digestion tank method[28]

Moving forward, Aiken Kakoki will consider the treatment technology and optimal system design according to the properties of biomass resources that are the raw materials.

3.2.2.3. Review items for installation

When installing a septic tank, it is necessary to clearly ascertain and set the inputs and outputs, to use the set values for selecting products of appropriate size, and to verify the feasibility of installing a system. As discussed above, we will review requirements for each of the three stages as described below, based on the assumption that other organic waste will be used as fermentation raw materials in addition to septic tank sludge.[30]

- Input (conditions for acceptance of organic waste)

At the time of installing facilities, acceptance conditions are set by considering the actual conditions, process, and output of wastewater treatment. Examples of conditions include waste discharge status, waste properties, identification of substances for which treatment is inappropriate, and collection form.

- Process conditions (conditions for setting treatment technology)

These are specific conditions necessary when reviewing the equipment design. These conditions determine the basic performance of equipment that satisfies conditions for input and output, and also considers regulatory standards and emergency response.

- Output (conditions for using recycled resources)

These are conditions necessary for utilizing the recycled materials and energy (electricity/heat) generated as a result of the treatment. In addition to the shape, properties, and amount required of recycled materials, these conditions also include items such as the transportation method to the usage destination, the transportation route, and seasonal variation in the demand amount.

The following table summarizes the specific contents of the three stage listed above.

Table 3-13 Specific contents of requirements for methane fermentation tank installation

Requirement category	Requirement contents	
Input (conditions for acceptance of domestic waste)	Discharge status of waste	Discharge amount and characteristics of septic tank sludge and organic materials (daily fluctuations, seasonal fluctuations, discharge form by region) and emission sources (general households, commercial facilities, etc.)
	Properties of	【Septic tank sludge】

[30] Supervised by Toru Furuichi, edited by the Organic Waste Recycling Association (OWRA) (March 2006) *Biogas Technology and Systems*, p. 76

	waste	pH, TSS, BOD, CODcr, NH4-N , T-N, T-P, T-K, VS, C/N ratio, nutrients, N-Hex (or Oil & Grease) etc. 【Organic waste】 Apparent specific density (t/m^3), moisture content (%), pH, TSS, BOD, CODcr, NH4-N, T-N, T-P, T-K, VS, C/N ratio, nutrients Presence or absence of fluctuation in waste quality (seasonal fluctuations, etc.)
	Identification of substances for which treatment is inappropriate	Type, mixing ratio (%), concentration (mg/L)
	Collection form	Collection container/bag type: Bag, bucket/container Number of collection days/delivery days (tons per week), annual delivery plan, etc. Specifications of collection vehicles and vehicles that carry in waste
Process conditions (conditions for setting treatment technology)	Conditions of location scheduled for construction	Distance from the main source and distance and height difference from treated water discharge destination Site area, topography, geology, climatic conditions Legal regulations, surrounding environment, access Conditions for receipt of electricity, telephone, water services, etc.
	Processing capability	Processing capacity (tons per day) Annual working days (days per year) Capacity of receiving and storing equipment (corresponding to the maximum receipt amount)
	Operating time by process	Pre-treatment, fermentation equipment, etc. (hours per day)
	Pollution control standards, etc.	Regulatory standards Existence/absence of requested criteria from

		local residents, etc.
	Pre-treatment	Necessity of pre-treatment equipment and treatment method
	Treatment method	EGSB, UASB, Anaerobic fermentation (methane fermentation: high-temperature method, medium-temperature method) Necessity and quantity of processing auxiliary materials
	Number of treatment equipment series	Single series, multiple series
	Use of treatment products (resources)	Properties, usage method, and usage amount of products (biogas, compost, livestock feed, carbide) Treatment of surplus products
	Disposal of substances for which treatment is inappropriate	Method of disposal of substances for which treatment is inappropriate
	Digested liquid treatment	Use or non-use as liquid fertilizer; discharge destination in the case of discharge Properties of discharged water: BOD, nitrogen concentration, salt concentration
	Electrical instrumentation specifications	Central monitoring control items (type and number of items), field operation items (type and number of items) Contents of automatic operation control for labor-saving
Output (conditions for using septic recycled materials)	Biogas usage	Use of power generation: Power supply destination, power supply method, power supply capacity, power sale (power sale unit price, etc.) Heat utilization: Usage destination, usage conditions, heat supply amount, supply medium (hot water, steam) Direct usage: Supply conditions, degree of

		purification, supply method, supply amount, supply unit price
	Digested liquid usage (liquid fertilizer usage)	Usage destination conditions: Usage destination, usage form, demand amount, properties, seasonal fluctuations in demand amount, purchase price (paid or free)
	Distribution of recycled materials	Sales channels, transportation routes, transportation methods, etc., for recyclable materials

Moving forward, after selecting candidate sites for equipment installation, the installation site will be selected based on the above requirements. The current candidate sites for installation will be described in detail in the next section.

3.2.2.4. Potential site candidates

As mentioned above, our policy is to review organic waste other than septic tank sludge as a raw material for methane fermentation equipment. Therefore, in this section, we investigated the available biomass resources in Gorontalo.

As for the needs from Gorontalo Province, as detailed in section 5.2, support for the establishment of a waste management system and the use of waste as an energy source are also expected. As of 2020, the amount of waste generated in Gorontalo Province is estimated to be 543 tons per day, reaching 198,032 tons per year. The following table shows the amount of waste generated by each municipality in the state and the waste categories for the state as a whole.

name	Total amount of waste/day	Total amount of waste/year
Gorontalo	157t	57,408t
Gorontalo city	143t	52,320t
Bone Bolango	67t	24,379t
Pohuwato	64t	23,208t
Boalemo	60t	22,035t
North Gorontalo	51t	18,682t

Household waste	75%	148,524t/year
Organic waste	65%	128,721t/year
Inorganic waste	35%	69,311t/year
Plastic waste	11%	21,783t/year
Office waste	1%	1,980t/year

Figure 3-13 Volume and type of waste generated in Gorontalo Province[2]

The annual production of organic waste, which is used as raw material for methane

fermentation facilities, is 128,721 tons, and we plan to collect information on the locations and properties of this organic waste in the next fiscal year and beyond.

Also, according to the 2021 Regional Work Plan (Rencana Kerja Pemerintah Daerah: RKPD) in Gorontalo Province, the following industries are listed for each municipality in the province.[31]

Table 3-14 Industry in Gorontalo Province

Name of municipality	Type of industries
Gorontalo Regency	Coconut processing, sugar production, seaweed processing
North Gorontalo Regency	Seashell crafts, fish processing, bamboo work, embroidery, palm fiber
City of Gorontalo	Food processing, handicrafts, apparel

Among these, regarding coconut processing and sugar production, company names are also listed for particularly developed industries in Gorontalo Regency. Considering that sugar cane and coconut are listed as plantation crops with a high amount of production in Gorontalo Province, it can be surmised that Gorontalo Province is focusing on both the agriculture and processing industries. Therefore, collaboration and support from Gorontalo Province can be expected when installing methane fermentation equipment. An overview and location of each factory are shown below.

[31] PROVINSI GORONTALO (September 2021), "BAB II GAMBARAN UMUM KONDISI DAERAH" (https://bappeda.gorontaloprov.go.id/institution/file_share/BAB-II_179_637.pdf)

Figure 3-14 Location of coconuts processing factory and sugar production factory

Table 3-15 Overview of coconuts processing factory and sugar production factory

Name of factory	Tri JayaTangguh	PT. PABRIK GULA TOLANGOHULA
External appearance		
Handled products	・ Coconut powder ・ YAMACOCO coconut water ・ Coconut cream	・ Sugar
Biomass resources expected to be generated	・ Coconut shells ・ Coconut powder residue ・ Wastewater when manufacturing coconut water	・ Molasses *Annual production of 35,000 to 39,000 tons of sugar[19]

		
URL	https://trijayatangguh.com/	https://www.facebook.com/ptpgg

Another reason for the high potential of introducing methane fermentation equipment in these factories is the suitability of raw materials. Since the wastewater generated during the process of coconut processing and sugar production has a high sugar content, fermentation by microorganisms becomes active, a large amount of methane gas is generated, and a greater amount of electricity can be obtained. Even in Japan, at a food factory that has been shut down due to the COVID-19 pandemic, the above-mentioned methane fermentation equipment of Aiken Kakoki K.K. was introduced for treating the stored wastewater with high sugar content in order to generate and sell electricity, thus generating profit and assisting in management while the income of the main business is decreasing. It is possible to review the system listed above, although installation depends on electricity demand and power grid in Gorontalo Province.

Next fiscal year, in discussions with Gorontalo Province, we will confirm the needs of the province to determine if there are any factories with high potential for installing methane fermentation equipment other than the above factories, and then select several candidate factories. Next, through the government of Gorontalo Province and the local counterpart company DKM, we will contact corporations, conduct hearings on detailed information, and then conduct a detailed review of installation.

3.2.3. Formulation of business model proposal

This project is modeled in Gorontalo City, where wastewater treatment issues are particularly serious, and aims to introduce wastewater treatment using septic tanks and methane fermentation facilities for organic waste, with a view to spreading the project throughout the entire state in the future. On the other hand, in Gorontalo Province, where the sewage system is not yet well developed, it is not practical to introduce septic tanks on a large scale. So, the process of gradual spread will be considered and starting with single or multiple facilities. The situation is similar for methane fermentation facilities, as it is impractical to recover all the 128,721 tons of organic waste generated

annually and utilize it as an energy source, and therefore, as discussed in section 3.2.2.4, the introduction of the system will be first considered for factories that can supply a certain amount of organic waste stably.

In addition, as mentioned above, in consideration of economic efficiency, the methane fermentation facility will use biomass resources such as food waste as feedstock for the methane fermentation facility, which will generate profit from power sales, and will also consider treatment of septic tank sludge by mixing septic tank sludge as feedstock, thus combining wastewater treatment using septic tanks and waste treatment using methane fermentation facilities as one proposed business model.

In this section, based on the results of the previous sections, the following assumptions are made regarding the introduction of septic tanks and methane fermentation facilities, and the implementation system of the project is discussed.

- Location of septic tanks to be installed

  The project will consider installing two septic tanks at two student dormitories in Gorontalo Province, among the student dormitories with high wastewater treatment needs, for which information was provided by the Province of Gorontalo.

- Location of methane fermentation facilities to be installed

  The project will consider installing methane fermentation equipment in a coconut processing factory located in Gorontalo Province. The factory processes coconuts into various products such as flour, cream, juice, etc., and has acquired various certifications such as HACCP certification and FSSC 22000. The company's mission is to "give back to the environment," and it is likely that the company is highly interested in wastewater and waste treatment[32].

Considering the transportation of septic tank sludge to the methane fermentation facility, the distance between the septic tank installation facility and the methane fermentation facility installation facility should be close. The two student dormitories and the coconut processing plant are located on the main road that runs through Sulawesi island, and the distance from the first student dormitory to the coconut processing plant is approximately 20 km.

[32] Webpage of PT TRI JAYA TANGGUH (https://trijayatangguh.com/)

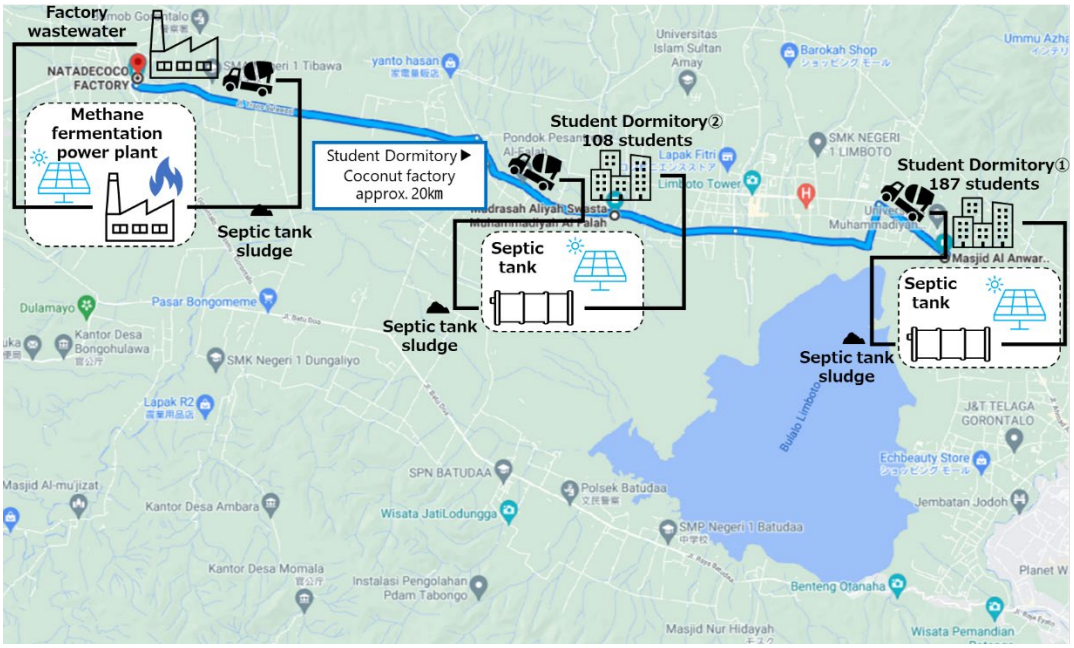


Figure 3-15 Location of septic tanks and methane fermentation facilities in the proposed project model

The following implementation structure will be considered.

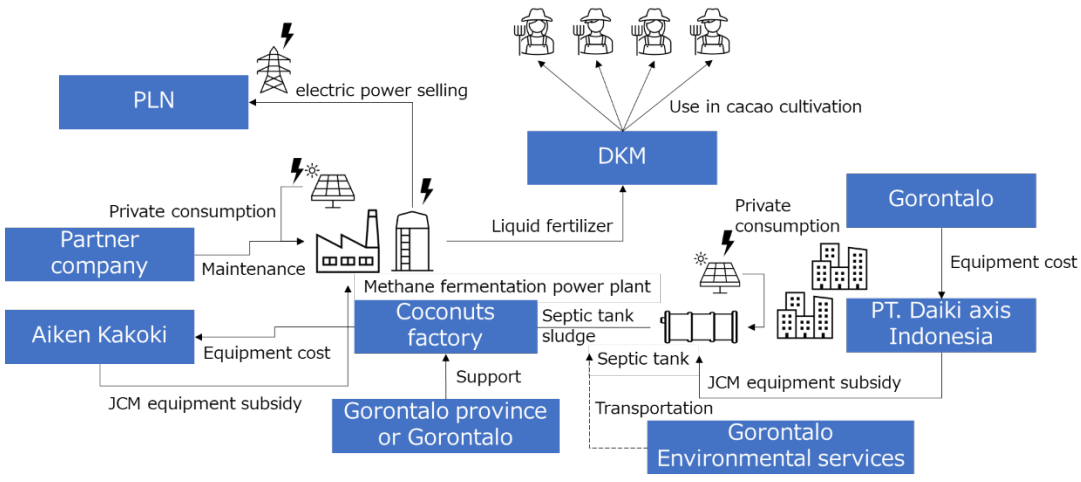


Figure 3-16 Project Implementation Structure

PT. DAIKI AXIS INDONESIA (the local subsidiary of Daiki Axis) will be the representative operator for the installation of septic tanks, and since this is a public infrastructure, it is assumed that the installation will be based on the budget of Gorontalo Province. Aiken Kakoki will be the representative operator for the installation of methane

fermentation power plant, and an international consortium will be formed with PLN, which will sell electricity generated by methane gas, and a coconut processing factory, which will install the methane fermentation facilities and use them as boiler fuel. In Gorontalo Province, there are many areas with weak electric power infrastructure, but Isimu area in Gorontalo, where the coconut processing plant is located, is well served by the PLN grid, so it is possible to consider selling electricity to PLN[33]. In addition, the liquid fertilizer generated will be considered for use in the REDD+ project, and will be distributed to cacao farmers through DKM, which is responsible for capacity building for farmers together with Kanematsu Corporation.

In addition, from the viewpoint of decarbonization, we will consider using solar power generation to supply electricity for methane fermentation facilities and septic tanks, respectively. In this regard, PT. DAIKI AXIS INDONESIA will be responsible for procurement, installation, and management of the panels.

In the future, we will conduct hearings with Gorontalo Province and local governments regarding the possibility of budget measures and coordinate with local businesses such as the coconut processing factory in the proposed implementation system, in order to establish the project implementation system and to develop a plan to implement the project as described in section 3.2.1.3 and 3.2.2.3.

The EPC and on-site construction system will be discussed with JGC Global Corporation and equipment manufacturers. For the overall operation, the project will be conducted with advice from PT. DAIKI AXIS INDONESIA for the septic tanks and Aiken Kakoki for the methane fermentation facilities. The tentative schedule is as follows.

[33] PT. PLN (PERSERO) (2021) “RENCANA USAHA PENYEDIAAN TENAGA LISTRIK (RUPTL) 2021-2030” (https://web.pln.co.id/statics/uploads/2021/10/ruptl-2021-2030.pdf)

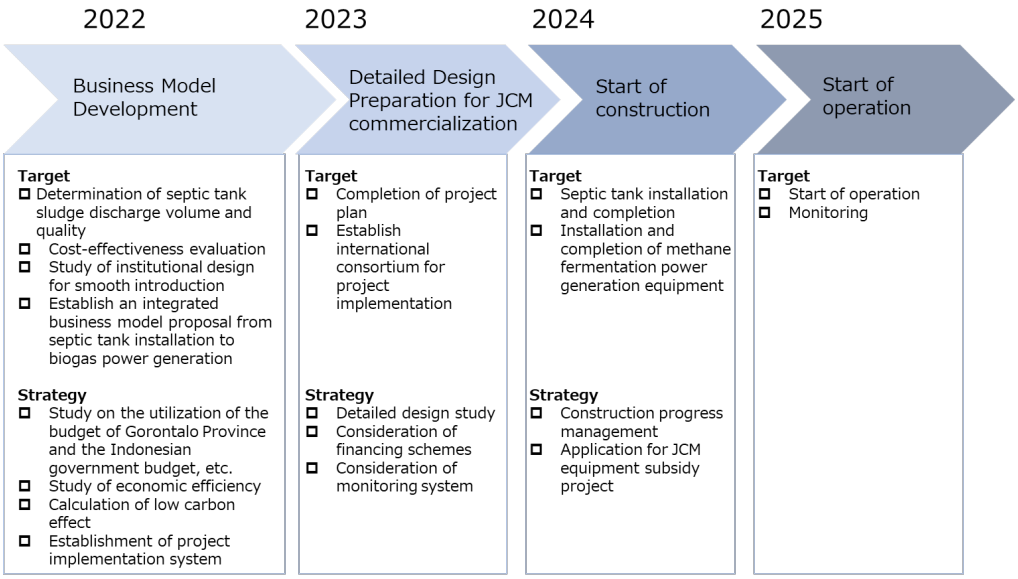


Figure 3-17 Project schedule

Chapter 4 Field of sustainable forest utilization by cocoa cultivation

In Gorontalo Province, rapid deforestation is progressing due to reclamation by excessively shifting cultivation to areas other than areas suitable for cultivation, coupled with the growth of agricultural GDP. Analysis of the LANDSAT images from 1991, 2000, and 2010 confirm deforestation at an annual rate of 0.68% (2000 standard). As shown by the brown areas in the following photographs, it can be confirmed that deforestation is expanding from 2010 to 2018. According to the Gorontalo Province Regional Action Plan (RAD), the current deforestation rate is about 13,216 ha per year. This is 1.6% of the total forest area (826,000 ha), and the rate of decrease is increasing. Deforestation creates concern not only for a decrease in CO_2 absorption, but also for a decrease in the water holding capacity of forests, which will cause landslides and frequent floods in urban areas.

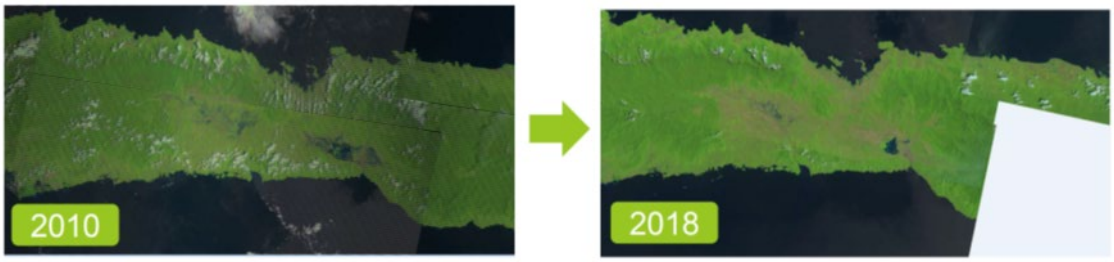


Figure 4-1 Satellite image showing reduction in forest

Kanematsu Corporation, a co-operator of this program, has been promoting cacao cultivation in the western region of Boalemo Regency since 2011. This cacao cultivation is an alternative to corn cultivation, which is a type of slash-and-burn agriculture. Through these activities to suppress the expansion of agricultural land through slash-and-burn agriculture and to conserve forests, Kanematsu Corporation has been involved in the REDD+ project aimed at establishing sustainable agriculture by forming bilateral credits and earning revenue from the sales.

This project aims to expand the REDD+ business implemented by Kanematsu Corporation throughout all of Gorontalo Province. This fiscal year, we conducted a survey on policies and plans in Gorontalo Province, Indonesia, which is the basis of forest conservation, and selected candidate areas for REDD+ projects.

4.1. Trend analysis for related policies and systems

Prior to discussing trends in policies and systems related to forest conservation in Indonesia and Gorontalo Province, this section will describe the international background of forest conservation as a measure against climate change and the related policy by Japan.

In November 2021, the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (The 2021 United Nations Climate Change Conference : hereinafter, “COP26”) was held in Glasgow, England. At COP26, leaders from more than 100 countries and regions announced the Glasgow Leaders' Declaration on Forests and Land Use (hereinafter, “Glasgow Declaration”), which states that each country will cooperate to stop deforestation by 2030. Since then, the number of signatures for the Glasgow Declaration has increased, exceeding 140 countries by the end of November.

The Glasgow Declaration defines the following six specific steps for realizing forest conservation.

(1) Conserve forests and other terrestrial ecosystems and accelerate their restoration;
(2) Facilitate trade and development policies, internationally and domestically, that promote sustainable development, and sustainable commodity production and consumption, that work to countries’ mutual benefit, and that do not drive deforestation and land degradation;
(3) Reduce vulnerability, build resilience and enhance rural livelihoods, including through empowering communities, the development of profitable, sustainable agriculture, and recognition of the multiple values of forests, while recognizing the rights of Indigenous Peoples, as well as local communities, in accordance with relevant national legislation and international instruments, as appropriate;
(4) Implement and, if necessary, redesign agricultural policies and programmes to incentivize sustainable agriculture, promote food security, and benefit the environment;
(5) Reaffirm international financial commitments and significantly increase finance and investment from a wide variety of public and private sources, while also improving its effectiveness and accessibility, to enable sustainable agriculture, sustainable forest management, forest conservation and restoration, and support for Indigenous Peoples and local communities;
(6) Facilitate the alignment of financial flows with international goals to reverse forest loss and degradation, while ensuring robust policies and systems are in place to accelerate the transition to an economy that is resilient and advances forest,

sustainable land use, biodiversity and climate goals.

Phrases such as “support for local communities,” “sustainable agriculture,” “securing funds,” etc., are mentioned as keywords. The REDD + project to be considered in Gorontalo Province for this program matches these three keywords. Accordingly, the project is expected to contribute to the Glasgow Declaration.

Additionally, the government of Japan has participated in a joint statement on the Forest, Agriculture and Commodity Trade Dialogue (Forest, Agriculture and Commodity Trade Dialogue : hereinafter, “FACT Dialogue”), and has stated the policy of cooperating to build a sustainable crop supply chain that does not involve deforestation. This policy is in line with this program’s aim of promoting cocoa cultivation and reviewing the construction of an appropriate value chain for increasing the added value of agricultural products. Therefore, we also intend to implement policy in Gorontalo Province which is in accordance with the policy of the Japanese government.

The REDD+ project which is being considered for implementation in Gorontalo Province is a measure for mitigating climate change. Specifically, it aims to suppress deforestation and deterioration in developing countries through sustainable forest management and appropriate forest conservation, thereby reducing greenhouse gas emissions and increasing absorption. REDD is an acronym for “Reducing Emissions from Deforestation and Forest Degradation in Developing Countries.” It provides economic incentives such as funds to control deforestation and deterioration in developing countries and reduce greenhouse gas emissions through forest conservation, thereby reducing emissions. A project is called REDD+ if it includes efforts for forest conservation, sustainable forest, management and increased deforestation carbon reserves.[34] A “reference emission level” is set based on past deforestation and associated changes in emissions. Then, emissions when deforestation and deterioration are suppressed are evaluated with respect to that reference level.

[34] Webpage of Carbon Markets Express (https://www.carbon-markets.go.jp/mkt-mech/climate/redd.html)

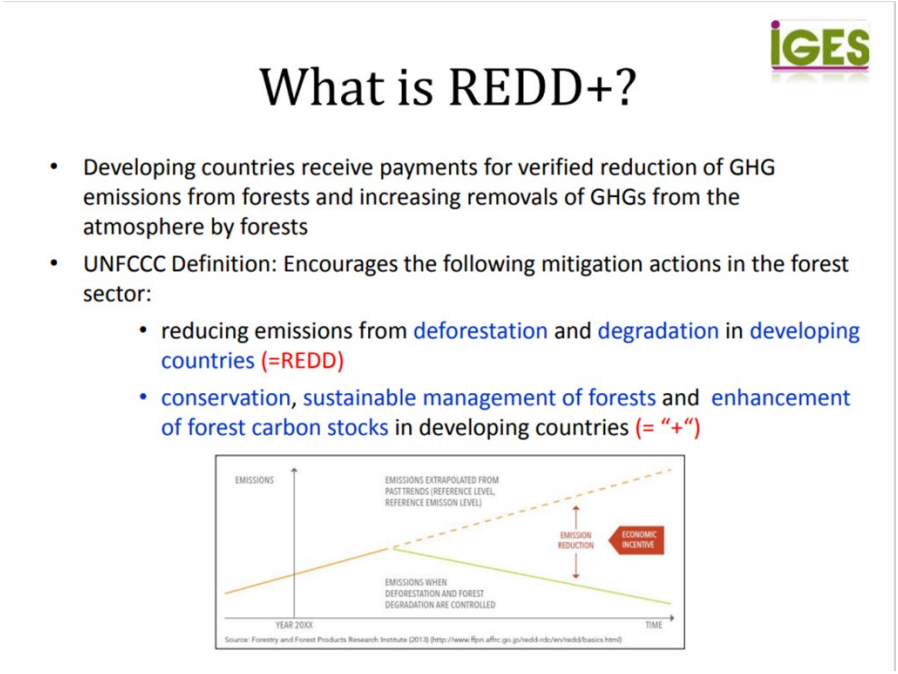


Figure 4-2 Overview of REDD+

Discussions on REDD + began at COP11 in 2005. At COP21 in 2015, Article 5 of the Paris Agreement stipulated the following about REDD +.

Article 5, Paragraph 2: Parties are encouraged to take action to implement and support, including through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention for: policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries; and alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing, as appropriate, non-carbon benefits associated with such approaches.

In addition, Article 6 also has provisions related to the forestry sector. Our programs also require us to proceed with the formulation of business plans while considering the following points and supporting reports by the Indonesian government to the international community.

Article 6, Paragraph 2: Cooperative approach (related to market mechanisms such as JCM, etc.) In addition to the initial report, each nation that is party to the Agreement should present robust and transparent mitigation results in the Biennial Transparency Report (BTR) as

periodic information, minimize the risk of non-persistence, and, if a reversal occurs, ensure that all appropriate references are made, etc., thus securing environmental integrity.

4.1.1. Policies and systems related to forest conservation and forest management

As described in section 3.1.2.2, the Regional Action Plan for Greenhouse Gas Emission Reduction (RAD-GRK) in Gorontalo Province (2018 to 2030) was formulated in 2012. Section 3.1.2.2, focused on describing the action plan for reducing GHG emissions in the energy sector. This section discusses the forestry sector.

4.1.1.1. Regional Action Plan for Greenhouse Gas Emission Reduction (RAD-GRK) in Gorontalo Province (2018 to 2030)

As discussed above, the five sectors of GHG emissions in Gorontalo Province are forestry, agriculture, energy, industry, and waste management. However, the forestry sector was determined as the source of the largest emissions based on estimates from the BAU scenario. The reasons for GHG emissions in the forestry sector include changes in land use for regional development, deforestation for agricultural reasons in the community, and illegal logging in the forestry sector in Gorontalo Province.

The following table shows changes in land cover and usage from 2000 to 2011.

Table 4-1 Changes in land cover and usage in Gorontalo Province (2000 to 2011)

No.	Land cover/usage	Change in area (ha)			
		2000 to 2003	2003 to 2006	2006 to 2009	2009 to 2011
1	Primary dry land forest	-58,760	-3,548	-10,296	-248
2	Secondary/logged arid forest	49,476	-41,012	6,028	-2,140
3	Primary mangrove forest	-2,108	-856	-1,920	0
4	Secondary mangrove forest	2,024	-2,316	404	-164
5	Plantation	432	160	-2,240	0
6	Bushes	4,120	26,512	-7,312	2,332
7	Wetland bushes	252	-336	664	0

8	Dryland agriculture	604	3,736	7,584	-228
9	Dryland agriculture mixed with shrubs/gardens	4,528	12,648	5,304	-160
10	Paddy fields	-432	1,488	-6,812	444
11	Ponds	0	3,300	1,344	0
12	Residential	0	216	7,536	0
13	Open cultivated land	40	4	144	164
14	Bodies of water	0	0	-428	0
15	Airports	0	44	0	0

As a result of estimating CO_2 emissions from changes in land cover and usage, the highest estimated emissions were found in Pohuwato Regency, and the total estimated emissions from 2000 to 2011 were 8,703,463.13 t.

Table 4-2 Estimated GHG emissions in the forestry sector by region

No	Kabupaten	Emisi (ton CO2 eq/tahun)			
		2000-2003	2003-2006	2006-2009	2009-2011
1	BOALEMO	323.290,01	3.109.787,42	1.969.942,96	329.581,27
2	BONE BOLANGO	4.078.056,14	2.884.775,02	202.415,47	107.630,53
3	DANAU LIMBOTO	0	0	176,16	0
4	GORONTALO	699.085,97	2.530.189,31	677.690,46	113.359,84
5	GORONTALO UTARA	3.914.745,55	2.344.516,08	274.206,55	101.092,94
6	POHUWATO	1.720.245,56	3.937.657,21	2.940.664,13	104.896,23

The following table shows the formulated action plan for mitigation and the estimated reduction in emissions.

Table 4-3 Action plan for mitigation and estimated reduction in emissions in the forestry sector

No.	Mitigation measures	Region	Estimated target area (ha)	Total reduction in GHG emissions CO_2 (2016 to 2030)	
				%	t
1	Forest and land restoration	Bone Bolango District Boalemo District Goruto District Gorontalo District Pohuwato Regency Boalemo Regency Bone Bolango Regency	10,845	9.77	1,551,517
2	Development of agroforestry and community forest models	Bone Bolango District Gorontalo District North Gorontalo District	835	1.04	165,939
3	Social forestry	6 districts/cities	2,600	4.57	725,526
4	Development of non-timber forest products	6 districts/cities	300	0.32	51,739
5	Protection and conservation of forest resources	Pohuwato Regency Boalemo Regency Bone Bolango Regency	11,200	10.14	1,610,245
6	Forest management and use of forest land	6 districts/cities	15,000	-	-
				Total	1,661,984

The following table shows the schedule of the forestry sector.

Table 4-4 Schedule of mitigation action plan in Gorontalo Province forestry section (2020 to 2030)

No.	Action plan	2016	2017	2018	・・・	2030
1	Forest and land restoration	✓	✓	✓	✓	✓
2	Development of agroforestry and community forest models	✓	✓	✓	✓	✓
3	Social forestry	✓	✓	✓	✓	✓
4	Development of non-timber forest products	✓	✓	✓	✓	✓
5	Protection and conservation of forest resources	✓	✓	✓	✓	✓
6	Forest management and use of forest land	✓	✓	✓	✓	✓

With reference to Table 4-3, a quantitative target area is described for each action plan set in the RAD-GRK and the estimated GHG emission reduction amount is calculated. However, there is no supporting information, and these efforts can be seen as ineffectual even when considering the scheduled listed in Table 4-4.

On the other hand, the RAD-GRK mentioned in this section was formulated in 2012. Although it was reviewed in 2018, a majority of the data cited is from before 2011, and it is necessary to understand the current situation of items such as the GHG emissions status and major emissions sources. Since experts at Gorontalo State University have knowledge on estimating the current status and future status of greenhouse gases based on the organization of current issues, we expect to proceed in collaboration with the university.

As discussed above, Indonesia has set the goal of “carbon neutral” aiming for virtually zero greenhouse gas emissions in 2060 in accordance with the Paris Agreement. Accordingly, it is expected that plans for decarbonization in Indonesia will proceed in the future. Moreover, since Indonesia is participating in the Glasgow Declaration detailed in 4.1, it is expected that the plan will be reviewed and countermeasures will be examined immediately in regards to forest conservation and sustainable forest use.

In this program, while considering the current situation, we will engage in discussions with Gorontalo State University and conduct review while ascertaining the latest trends in decarbonization policies and plans in Gorontalo Province.

4.2. Basic survey for formulating a commercialization plan

4.2.1. Ascertaining the forest usage potential

In the survey for this fiscal year, we selected candidate regions for the REDD+ project after ascertaining the status of deforestation and deterioration in Gorontalo Province.

In order to ascertain the status of deforestation and deterioration, we used the website Global Forest Watch.[35] This website was established by the World Resources Institute (WRI), an international environmental NGO, and is used for the joint provision of information by Google, the United States Agency for International Development (USAID), universities, and other institutions. The following figure shows the degree of deforestation in Gorontalo from 2001 to 2020, with the location of deforestation shown by the red plot. According to this data, 127 kha of forest disappeared from Gorontalo Province from 2001 to 2020, emitting 84.5 Mt of CO_2.

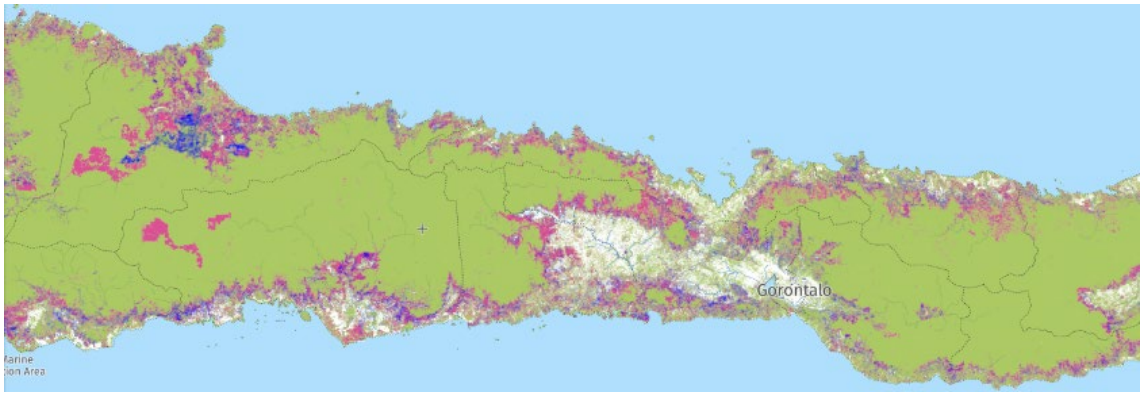


Figure 4-3 Deforestation in Gorontalo Province (2001 to 2020)

The green areas indicate forest coverage. Many red plots are located at the boundary between white and green areas. This means that there are almost no cases where logs are being logged in the depths of the forest. It is expected that deforestation will be carried out for the purpose of expanding farmland at boundaries between communities where residents live and the forests. In addition, in Gorontalo Province, it can be seen that deforestation is remarkable in Pohuwato Regency, Boalemo Regency, and Gorontalo Regency, which are located on the west side. Consequently, we decided to target these three regencies.

Next, the following figure shows the results of confirming the land use situation in Gorontalo Province on the Global Forest Watch. Colored areas should be excluded from the REDD+ project because they indicate land usage for purposes such as palm

[35] Global Forest Watch webpage (https://www.globalforestwatch.org/)

plantations and wood pellet production, or protected areas for national parks. For example, the areas shown in pink are used as palm oil plantations, and the areas shown in brown are protected for the production of wood pellets.

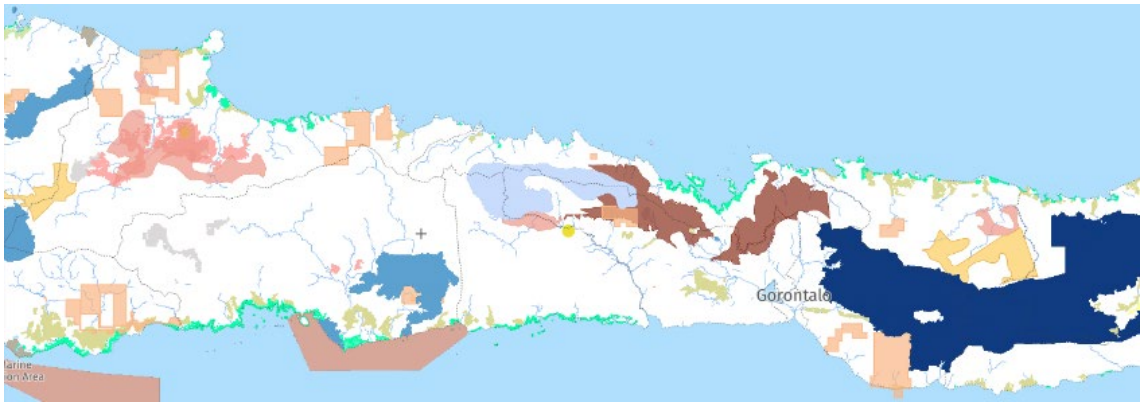


Figure 4-4 Land usage status and protected areas in Gorontalo Province

Furthermore, when excluding the land use status and protected areas shown in Figure 4-4 from the surveyed local governments, we extracted the areas with a forest coverage ratio of 70% or higher as of 2018. These areas are shown in light blue color in Figure 4-5 below.

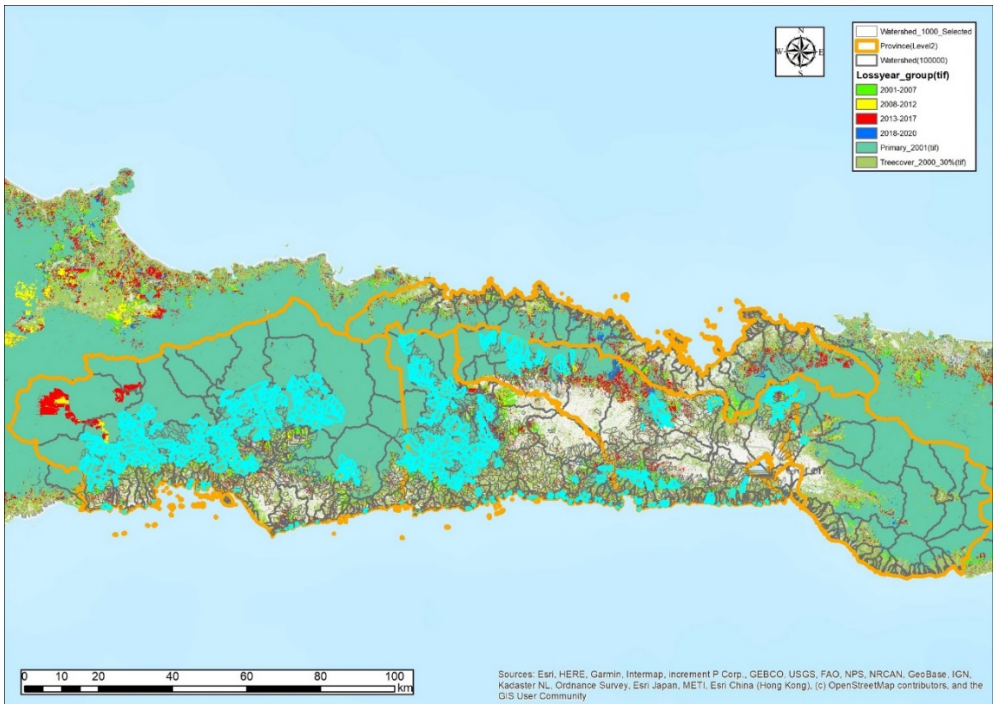


Figure 4-5 Areas with a forest coverage ratio of 70% or higher in Gorontalo Province (as of 2018)

Therefore, in this project, the watershed areas including areas where the forest coverage rate is 70% or higher as of 2018 and areas where deforestation has not progressed are the target areas of the REDD+ project. For communities located around these target areas, we will carry out activities such as raising awareness toward forest conservation, improving productivity by increasing the added value of agricultural products, and developing the capacity (capacity building, empowerment) of local residents. Figure 4-6 below shows the target areas of the REDD+ project in Gorontalo Province as a whole. The areas are shown in light blue in Pohuwato Regency, pink in Boalemo Regency, and light orange in Gorontalo Regency.

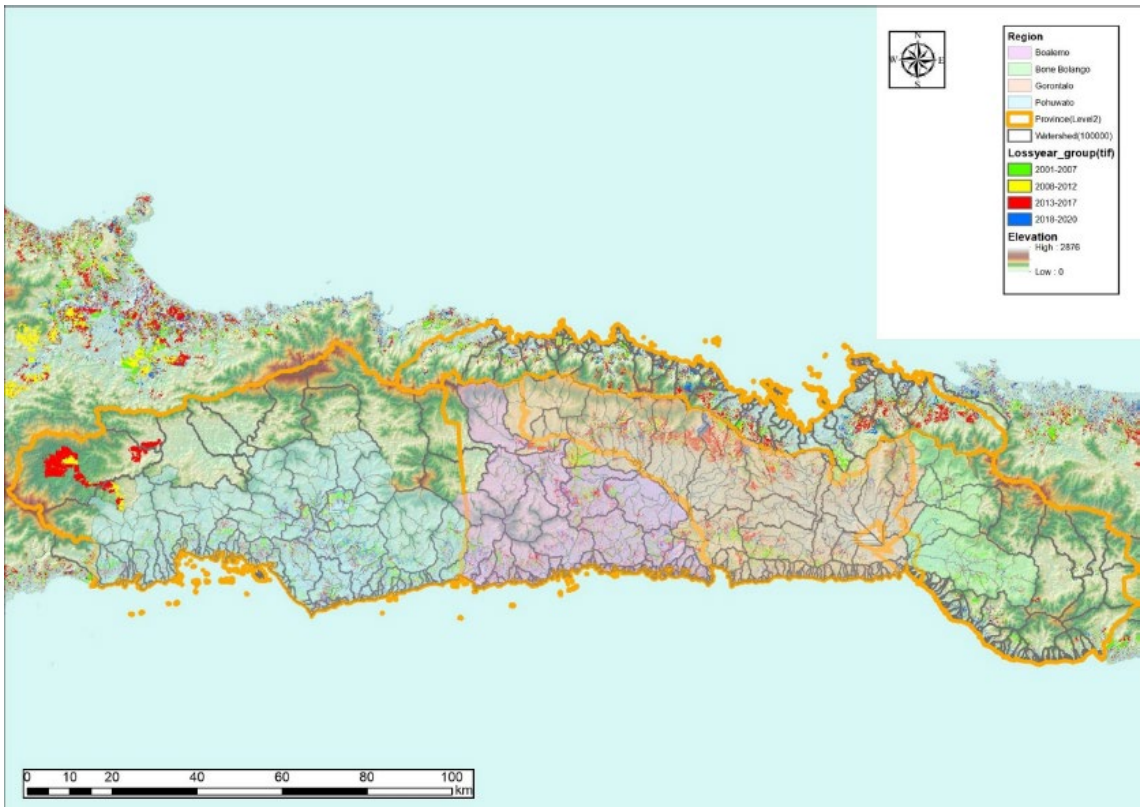


Figure 4-6 Target areas of REDD+ project including watershed areas in all of Gorontalo Province

For reference, the target areas in each regency are also shown below.

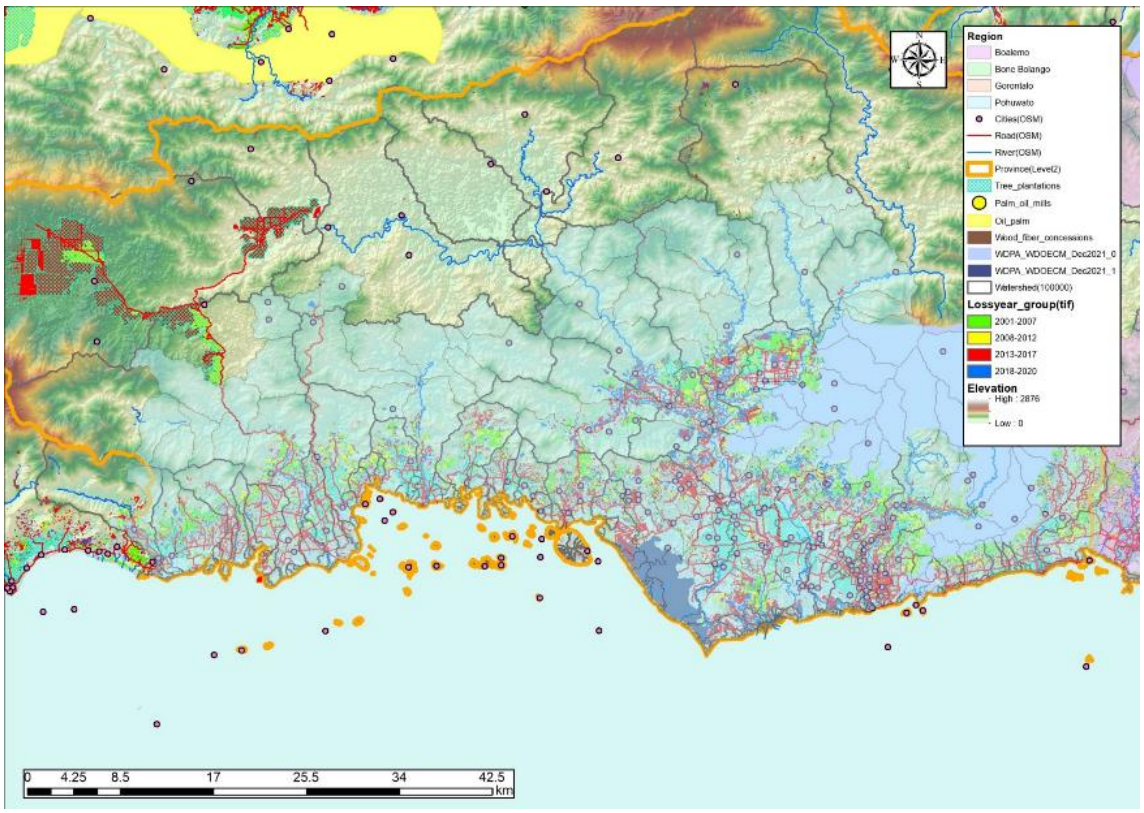


Figure 4-7 Target areas in Pohuwato Regency

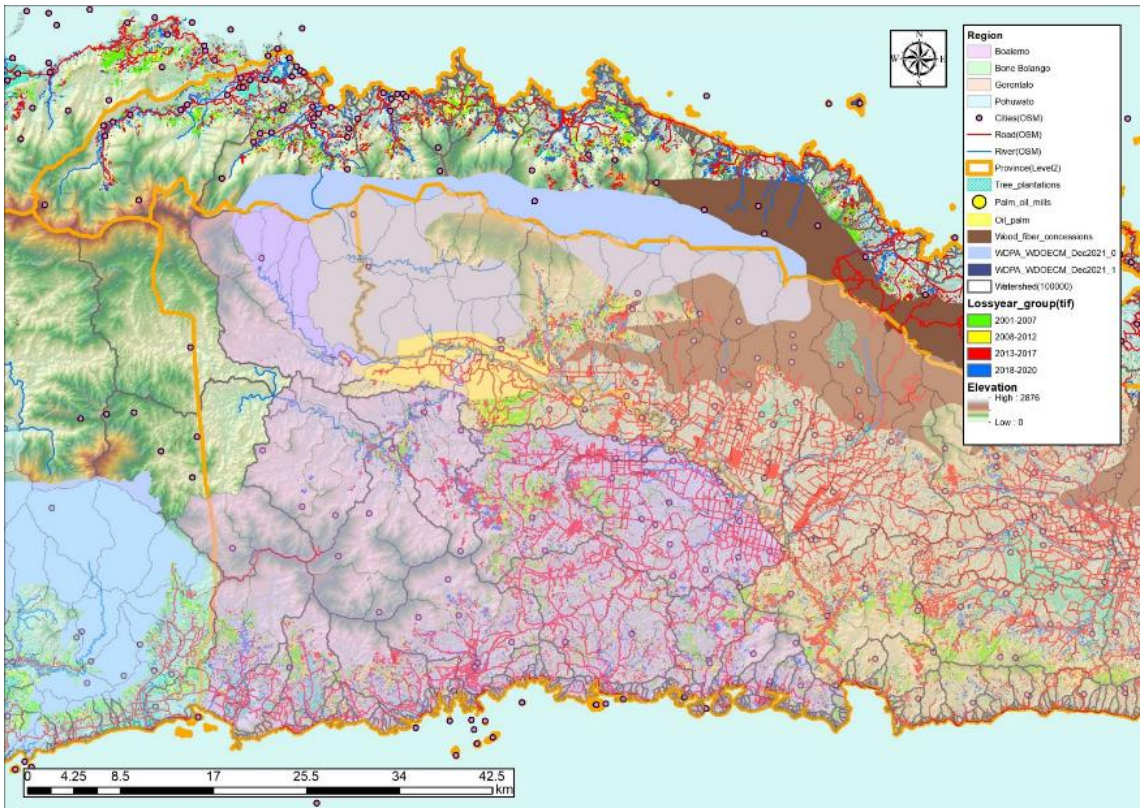


Figure 4-8 Target areas in Boalemo Regency and Gorontalo Regency

Next fiscal year, we will formulate a business plan to promote the REDD+ project. We will begin by promoting understanding for the program through discussions with Gorontalo Province BAPPEDA, and the forest bureaus and agricultural bureaus of the three target regencies. Next, in collaboration with the above-mentioned related parties and our local counterpart DKM, after substantiating the information obtained from this fiscal year's survey and grasping local needs, we will conduct enlightenment activities and support activities for farmers through staff such as agricultural instructors of the regency. In the program plan, we will aim to construct a system that promotes forest conservation over the long term, including consideration of measures such as patrols to prevent unnecessary deforestation.

Chapter 5 City-to-city collaboration activities

5.1. Overview of city-to-city collaboration activities

The COVID-19 pandemic made it impossible to perform field surveys or to invite related parties when conducting the city-to-city collaboration project for this fiscal year. Instead, we used remote meetings and e-mails to explain the survey contents and the status of activities, and to gain understanding from local stakeholders. We also worked to collect information through cooperation from the government of Gorontalo Province, Gorontalo University, and DKM. This was the basis of our review.

The main activities are summarized below.

Table 5-1 Overview of city-to-city collaboration activities

Date	Contents of activities	Participating organizations
October 19, 2021	Pre-kickoff meeting	Ministry of the Environment, Ehime Prefecture, JANUS
November 11, 2021	Discussion on conducting an MoU between Ehime Prefecture and Gorontalo Province	DKM, Kanematsu Corporation, JANUS
November 12, 2021	Discussion on the division of roles for this fiscal year's survey	Daiki Axis, JANUS
November 12, 2021	Discussion on the division of roles for this fiscal year's survey	Aiken Kakoki, JANUS
November 16, 2021	Discussion on the division of roles for this fiscal year's survey	Kanematsu Corporation, JANUS
November 19, 2021	Kickoff meeting	Gorontalo Province BAPPEDA, Gorontalo University, DKM, Ehime Prefecture, Kanematsu Corporation, JANUS
December 20, 2021	Discussion on the division of roles for this fiscal year's survey	Kanematsu Corporation, JANUS
December 27, 2021	Midterm report session	Ministry of the Environment, Ehime Prefecture, Aiken Kakoki,

		Daiki Axis, Kanematsu Corporation, JANUS
January 19, 2022	Discussion regarding workshop	Ehime Prefecture, JANUS
January 28, 2022	Discussion regarding workshop and this fiscal year's survey	Daiki Axis Co., Ltd., JANUS
January 31, 2022	Discussion on the division of roles for this fiscal year's survey	Kanematsu Corporation, JANUS
February 1, 2022	Discussion regarding workshop and this fiscal year's survey	Aiken Kakoki, JANUS
February 14, 2022	Workshop	Ministry of the Environment, Ehime Prefecture, Ehime university, Aiken Kakoki, Daiki Axis, Kanematsu Corporation, Gorontalo province, Gorontalo University, DKM, JANUS

From among these activities, an outline of proceedings at the kick-off meeting is shown in the following table.

Table 5-2 Outline of proceedings at the kick-off meeting

Time & date	Friday, November 19, 2021 11:00 to 12:15 (Japan) 10:00 to 11:15 (Gorontalo) 9:00 to 10:15 (Jakarta)	
Place	Online meeting (Zoom)	
Participants	Gorontalo Province BAPPEDA	Mr. Budiyanto Sidiki, Ms. Titi Datau, Mr. Idris
	Gorontalo University	Dr. Yahya
	Regional bureaus in Gorontalo Province	
	DKM	Mr. Wenny John Jassin, Mr. Didi Darmanto, Mr. Hendrico Tanjung
	Ehime Prefecture	Kishimoto, Suga

	Kanematsu	Yazaki, Yamaoka
	JANUS	Ishiguro, Yamase, Seki
Order of proceedings	1. Greeting 2. Explanation of program overview 3. Discussion of MoU between Ehime Prefecture and Gorontalo Province 4. Introduction of activities contents in this fiscal year 5. Closing	
Photograph		
Contents of minutes	<u>Regarding the MOU</u> JANUS explained an outline of this fiscal year's city-to-city collaboration project and preparations for signing an MOU between Ehime Prefecture and Gorontalo Province. An outline of the questions and discussions is as follows. ● Thank you for proceeding with preparations for the MOU, which is required by the Ministry of Home Affairs and Ministry of Foreign Affairs. We would appreciate it if you could prepare the draft by the end of November. Since the new BAPPEDA plan will start from 2022, we would like to consider the implementation contents of the city-to-city collaboration project and incorporate it into the plan. If you have a draft of the MOU, I would like to consider the data and place for signing. (BAPPEDA: Mr. Budiyanto) ➢ We intend to take action to send a draft of the MOU as soon as possible. However, unless the COVID-19 pandemic subsides, it	

	is quite difficult to make on-site visits. Do you have any particular desires? For example, enabling the exchange of electronic files or holding online meetings? (Ehime Prefecture: Kishimoto) ➢ Currently, there are few people infected with COVID-19 in Gorontalo. Of course, it is also possible to enter into an MOU online. The most important thing is to move forward quickly. (BAPPEDA: Mr. Budiyanto) ● Is signing by the vice governor acceptable? (Ehime Prefecture: Kishimoto) ➢ We would also like to discuss the signing of the MOU. Specifically, we want to confirm that Ehime Prefecture, Gorontalo Province, and Gorontalo University will sign the MOU. (BAPPEDA: Mr. Budiyanto). ● Based on our consultation with the government of Gorontalo Province, we understand that the previous MOU is a tripartite collaboration among Gorontalo Province, Gorontalo University, and Ehime University. We would like to confirm who will sign the current MOU. (Gorontalo State University) ➢ We understand that moving forward quickly is a point of emphasis for the current MOU. If the MOU is focused on the city-to-city collaboration project of the Ministry of the Environment, an agreement can be made immediately. If the target is expanded, it will be necessary to prepare while promoting more exchanges, which will be a time-consuming process. First of all, we would like to consider entering into an MOU between Ehime Prefecture and Gorontalo Province. I would like to consider measures such as expanding the scope of the MOU when the number of parties involved increases and exchanges progress in conjunction with the project moving forward. (Ehime Prefecture: Kishimoto) ➢ We agree with Kishimoto's opinion. As soon as the MOU draft from Ehime Prefecture is completed, we would like to consult and adjust within our government. (BAPPEDA: Mr. Budiyanto) ● While preparing to enter into an MOU, we would like to proceed with the survey at the same time. The Ministry of the Environment's

	city-to-city collaboration project is scheduled to continue for three years, but there will be a break in March of the next year. Therefore, we would like to proceed with the survey in conjunction with the preparation of the MOU. (JANUS: Ishiguro) ● Is the Japanese side directly in contact with the Ministry of Foreign Affairs and the Ministry of Home Affairs regarding entry into the MOU? (BAPPEDA: Mr. Budiyanto). ➢ We think it would be smoother to have response taken on the Indonesian side. (JANUS: Ishiguro) ➢ Communication with the Ministry of Foreign Affairs and the Ministry of Home Affairs must be performed from Gorontalo Province. (DKM: Mr. Jassin) ● We would like to communicate with the central government as soon as the MOU draft is completed. We are considering going to the Ministry of Home Affairs with Jassin to explain the project. (BAPPEDA: Mr. Budiyanto). ● We would like to prepare a cover letter and the MOU. Is it OK to proceed with the investigation in parallel? (JANUS: Ishiguro) ➢ We understand how to proceed going forward. We want to share this information with other stakeholders, including the project coordination. (BAPPEDA: Mr. Budiyanto) <u>Contents of activities in this fiscal year</u> JANUS explained the contents of this fiscal year's activities. An outline of the questions and discussions is as follows. ● We understand the data required for the program. If there are requests for more detail, we will prepare to provide information moving forward. (BAPPEDA: Mr. Budiyanto) ● Is there a target area for the program to be implemented? (BAPPEDA: Mr. Budiyanto). ➢ A water infrastructure development project is being considered for the city of Gorontalo. There are target areas for forest conservation projects in Kanematsu, and we would like further information on these areas. (JANUS: Ishiguro) ● For example, we would appreciate it if you could write in more detail regarding the kind of data that you require. In the case of a student

	dormitory, we would like you to break down how many people live in the areas and how much wastewater is generated. (BAPPEDA: Mr. Budiyanto) ➢ We still do not know the basic information such as what kind of facilities are in Gorontalo Province. We would like to collect detailed data while conducting field surveys. (JANUS: Ishiguro) ● Until it is possible to make on-site visits, I would like to collect information while holding a web conference. Please start by providing us with general information. We will then consider what kind of survey will be conducted. (JANUS: Ishiguro). (End)

5.2. Workshop

As mentioned above, in this fiscal year's project, we were unable to travel on-site due to the impact of COVID-19. Therefore, we held an online workshop seminar as follows.

In this workshop, we created an understanding in Gorontalo Province for the policies and plans for decarbonization of Ehime Prefecture, and Ehime Prefecture also aimed to understand the development and environmental issues of Gorontalo. Furthermore, Gorontalo Province and Ehime Prefecture mutually shared information on policies and plans for decarbonization in Gorontalo Province and Ehime Prefecture, as well as on development plans including decarbonization from Gorontalo Province. Additionally, in terms of technical support for Ehime Prefecture, corporations from the prefecture introduced an outline of their own technology. Finally, we shared the results of this year's survey and the survey plans for the next year and beyond, requested cooperation, and exchanged opinions. In the Q&A session and exchange of opinions, we received comments that Gorontalo Province would like to make use of the prefecture's corporate technology after defining specific issues in the province (Director of the Gorontalo Province Environmental Bureau). We also received a comment from Gorontalo State University indicating interest in cooperating with Ehime University and providing support as a university (Gorontalo State University: Professor Yahya). The Gorontalo BAPPEDA announcement introduced four potential greenhouse gas emissions sources: agriculture, energy and transportation, waste management, and forestry and peatland.

In addition, as a result of Gorontalo's efforts toward low carbonization since 2010, it was introduced that conducted of 259 climate change activities/projects and the emission reduction potential of about 3.3 million tons have been grasped.

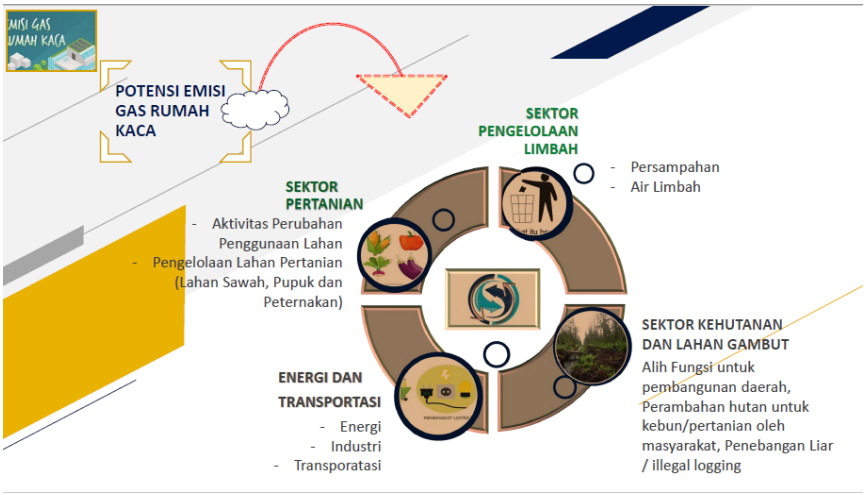


Figure 5-1 Potential greenhouse gas emissions in Gorontalo [2]

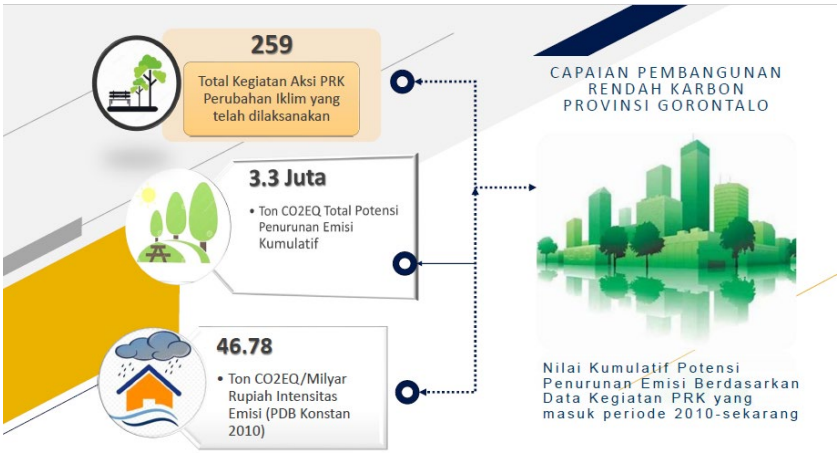


Figure 5-2 Results of low carbonization activities in Gorontalo [2]

In addition, the following five points were identified as the needs for cooperation in the City-to-city collaboration project with Ehime Prefecture.
Furthermore, the intention toward carbon neutrality in Gorontalo was confirmed, and the direction of support for the formulation of decarbonization policies by Ehime Prefecture and the suitability of the prefecture's corporate technology and REDD + projects were confirmed.

✧ Policy for Carbon Neutral Declaration in Gorontalo (Review of RAD-GRK, Gorontalo)
✧ Feasibility study on the use of hazardous waste (B3) and waste as an energy source in Gorontalo

- ✧ Study of important land management models in Gorontalo
- ✧ Land-use feasibility study for coconut and cashew nut cultivation in Gorontalo
- ✧ Technology transfer for waste management from student dormitories

Figure 5-3 Contents of Ciry-to-city collaboration project and cooperation needs for Ehime prefecture [2]

Below is a list of Gorontalo participants and an outline of the proceedings at the workshop.

Table 5-3 List of participants on the Gorontalo side of the workshop

Name	Title・Organization
Tim Koordinasi Kerjasama Daerah Provinsi Gorontalo dan DPRD Provinsi Gorontalo	
Dr.Ir. Darda Daraba, M.Si	Ketua Komisi II DPRD Provinsi Gorontalo
Mr. Budiyanto Sidiki, S.Sos. M.Si	Kepala Bapppeda Provinsi Gorontalo
	Kepala Badan Keuangan Provinsi Gorontalo
	Kepala Biro Hukum Setda Provinsi Gorontalo
	Kepala Biro Pemerintahan dan Kesra Setda Provinsi Gorontalo
Organisasi Perangkat Daerah	
	Kepala Dinas Lingkungan Hidup Provinsi Gorontalo
	Kepala Dinas PU Provinsi Gorontalo
	Kepala Dinas Pertanian Provinsi Gorontalo
	Kepala Dinas ESDM Provinsi Gorontalo

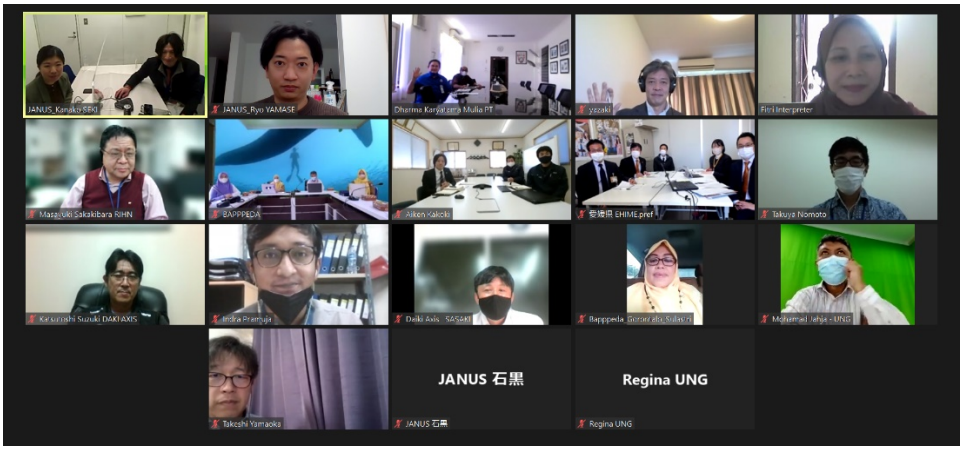
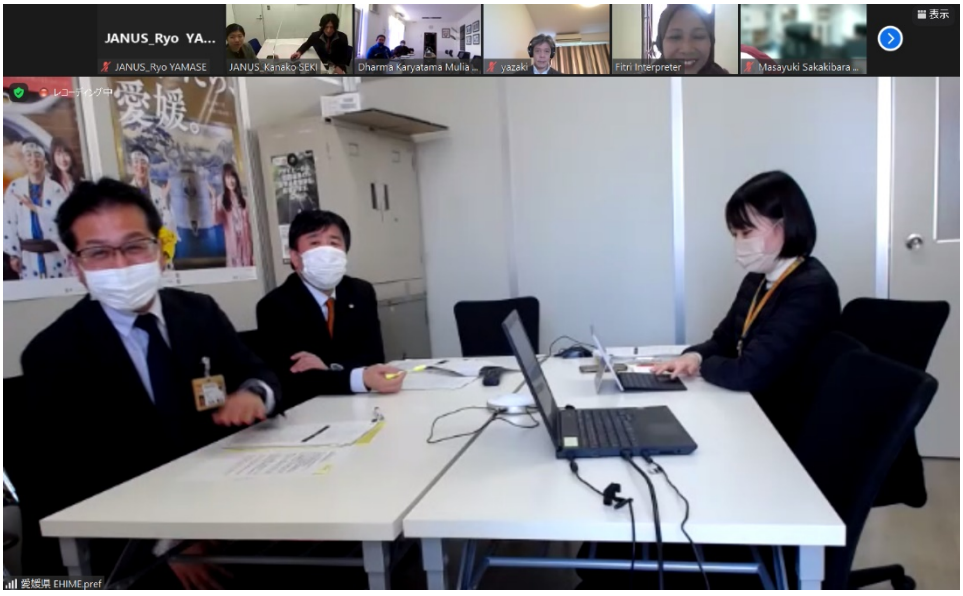
	Kepala Bidang Perkebunan Dinas Pertanian Provinsi Gorontalo
	Kepala Bidang Penataan dan Pengkajian Lingkungan Hidup DLHK Provinsi Gorontalo
	Kepala Bidang Litbang Bapppeda Provinsi Gorontalo
	Kepala Bidang Infrastruktur dan Kewilayahan Bapppeda Provinsi Gorontalo
	Kepala Bidang Perencanaan, Pengendalian dan Evaluasi Pembangunan Daerah Bapppeda Provinsi Gorontalo
	Kepala Bidang Perekonomian dan SDA Bapppeda Provinsi Gorontalo
Ivana Butolo	Pejabat Fungsional Peneliti
Mahyudin Humalanggi	Pejabat Fungsional Peneliti
Nancy Lantapon	Pejabat Fungsional Peneliti
Fidyawati Abdullah	Pejabat Fungsional Perencana
Nursyahadah Syarif	Pejabat Fungsional Perencana
Nurayin Tuna	Pejabat Fungsional Perencana
Irwan	Pejabat Fungsional Pengawas Lingkungan
Yusdin Danial	Pejabat Fungsional Pengendali Dampak Lingkungan
State University of Gorontalo	
DR. rer.nat. Mohamad Jahya, M.Si	Rektor Universtas Negeri Gorontalo/Pejabat Yang menangani Kerjasama
	Pusat Studi ESDM dan Geopark UNG
PT. Dharma Karyatama Mulia	
Mr. Wenny John Jassin	

Table 5-4 Minutes of meeting

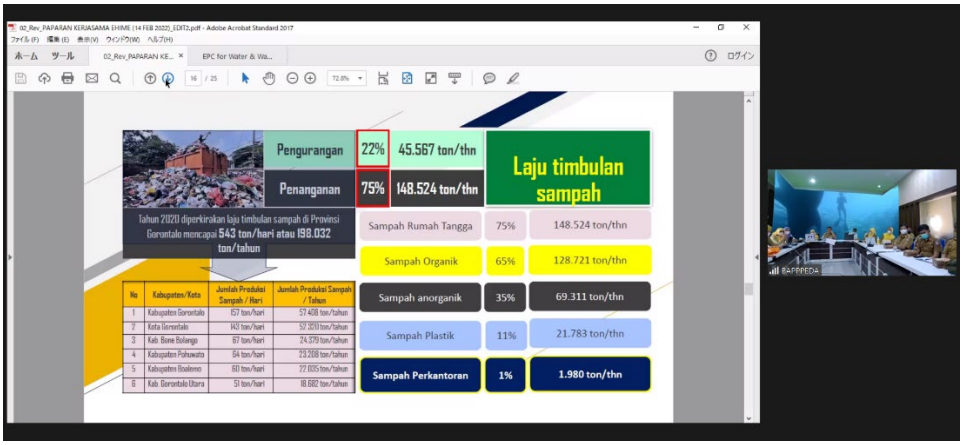
Time and date	Feburary14（Mon）2022: 15:15～17:15（Japan） 14:15～16:15（Gorontalo） 13:15～15:15（Jakarta）	
Place	Web（Zoom）	
Japanese participant	Embassy of Japan in Indonesia	Mr.Nomoto

s	Ehime prefecture	Mr.Oouchi、Mr.Nomoto、Mr.Kishimoto、Ms.Kan
	Ehime University	Dr.Sakakibara
	Aiken Kakoki	Mr.Iwata, Mr.Iwata, Mr.Taniguchi
	PT. DAIKI AXIS INDONESIA	Mr.Suzuki, Mr.Sasaki,Mr. Indra Pramuja
	Kanematsu	Mr.Yazaki, Mr.Yamaoka
	JANUS	Ishiguro, Seki, Yamase
	通訳	Ms. Fitria Yuanita
Agenda	1. Opening remarks – Ehime Prefecture 2. Opening remarks – Gorontalo BAPPEDA 3. Introduction of the plans and initiatives for decarbonization in Ehime Prefecture 4. Introduction of the plans and initiatives for decarbonization in Gorontalo Province 5. Introduction of companies in Ehime Prefecture 6. Study Report 7. Comment and discussion 8. Closing	
議事内容	**1. Opening remarks – Ehime Prefecture** Mr. Ouchi, Chief of the Industrial Policy Division, Ministry of Economy, Trade and Labor, Ehime Prefecture, gave a greeting including the history of city-to-city cooperation with Gorontalo, an introduction to Ehime Prefecture, and the history of the development of environmental technology in Ehime Prefecture. **2. Opening remarks – Gorontalo BAPPEDA** On behalf of BAPPEDA's Director General Budiyanto, Gorontalo officials thanked the people involved in the city-to-city collaboration project and said that they would like to clarify future business plans. **3. Introduction of the plans and initiatives for decarbonization in Ehime Prefecture** Mr. Kishimoto from Ehime Prefecture introduced Ehime Prefecture, the differences in local autonomy between Japan and Indonesia, and the outline of Japan's Global Warming Countermeasures Promotion Law. He also introduced the global warming countermeasure implementation plan of Ehime Prefecture and the efforts for decarbonization in the prefecture.	

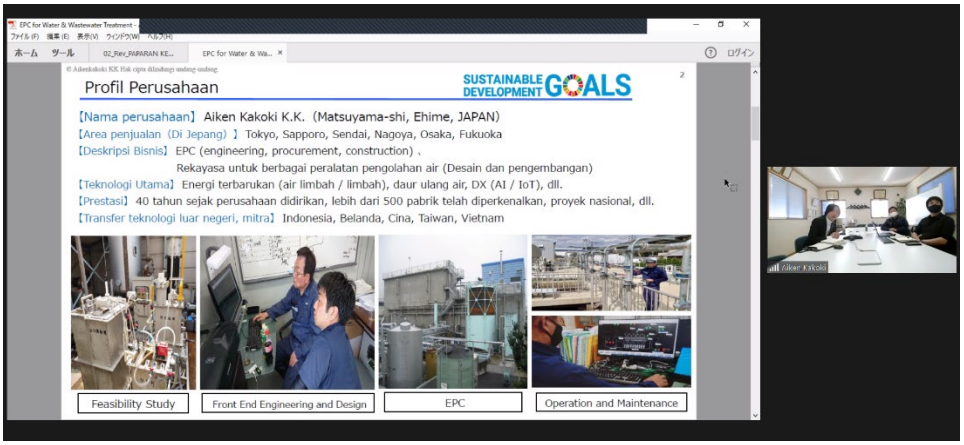
	4. Introduction of the plans and initiatives for decarbonization in Gorontalo Province Mr. Budiyanto, Director General of BAPPEDA, Gorontalo, explained the environmental issues of Gorontalo, the introduction of the development plan, and the expectations for the city-to-city collaboration project with Ehime Prefecture. **5. Introduction of companies in Ehime Prefecture** Mr. Indra of PT. DAIKI AXIS INDONESIA introduced the technology including the company profile and the mechanism of the septic tank. Mr. Iwata, Managing Director of Aiken Kakoki Co., Ltd., introduced the technology, including the company profile and past achievements in Indonesia. **6. Study Report** JANUS Seki explained the results of this year's project and future project plans. **7. Comment and discussion** ● Of the four sectors of Gorontalo's presentation 6p, which sector has the largest greenhouse gas emissions (Ehime Prefecture: Mr. Kishimoto)? ➢ We believe that the sector with the highest emissions is waste treatment and water treatment. The next largest is the agricultural sector (fertilizer) and the livestock sector (BAPPEDA, Gorontalo: Director of Budiyanto).。 ➢ As a supplement to the above answer, we believe that methane gas is a problem at waste treatment plants. Until now, methane gas was simply burned, but in the future, we intend to make effective use of it by using technology that uses methane gas as energy. In addition, wastewater from student dormitories is currently being treated for each facility, but we would like to collect these wastewaters and use it as energy by utilizing Japanese technology (Gorontalo). DLHK: Director Nasruddin). ● Through today's workshop, I learned a lot about the technologies of Daiki Axis and Aiken Kakoki. In the future, we would like to provide various support for the realization of the project (Gorontalo University: Professor Jahya). **8. Closing** Mr. Budiyanto, Director General of BAPPEDA, Gorontalo, thanked the

	workshop and requested that he give detailed information on future business plans and funding sources as the next step in concluding the MoU. In addition, Mr. Kishimoto of Ehime Prefecture requested the support of continuous cooperation from next year onward while touching on the significance of the city-to-city cooperation project between Gorontalo and Ehime Prefecture and closed the workshop.
Photo	 Participant group photo  Opening remarks by Ehime prefecture

Introduction of Ehime Prefecture Global Warming Countermeasures Implementation Plan by Ehime Prefecture



Introducing the state's waste disposal challenges by BAPPEDA, Gorontalo



Introduction of company profile from prefecture company (Aiken Kakoki Co., Ltd.)

Japan NUS Co., Ltd. explains support for decarbonization of Gorontalo

Closing remarks by Gorontalo

Chapter 6 Conclusion

6.1. Results of city-to-city collaboration projects in the current fiscal year

Although we were unable to conduct on-site surveys this fiscal year due to the spread of COVID-19, we used frequent remote meetings, e-mails, and other web communication tools in order to successfully acquire information and data necessary for consideration and to conduct hearing surveys. Additionally, an MOU will be signed between Ehime Prefecture and Gorontalo Province. Moving forward, our policy is to apply to the Indonesian Ministry of Home Affairs for the activities of this program and the collaboration between Ehime Prefecture and Gorontalo Province. We worked to prepare for the promotion of activities from next year onward.

This city-to-city collaboration project is expected to be implemented for three years. In this fiscal year, which is the first year, we were able to hold basic review for future survey policies and commercialization. Additionally, as an city-to-city collaboration project, we were able to introduce and exchange opinions on the policies of Ehime Prefecture, which is promoting efforts toward decarbonization. The following is a summary of the results.

Table 6-1 Summary of results of city-to-city collaboration projects in the current fiscal year

Project	Results
Regional water infrastructure	・ Confirmed the province's policy position on water infrastructure development ・ Understood the province's renewable energy introduction plan ・ Organized corporate technology in Ehime Prefecture ・ Organized considerations for future introduction
Sustainable forest usage	・ Ascertained international trends in forest conservation, forest conservation in Indonesia, and the position of REDD+ projects ・ Understood the province's forest conservation plans ・ Identified potential areas ・ Organized future survey policies
Other	・ Entered into an MOU between Ehime Prefecture and Gorontalo Province for this program ・ Prepared to apply for approval to cooperate with the Indonesian Ministry of Home Affairs

City-to-city collaboration activities	・ ・ ・	Introduced efforts for decarbonization of Ehime Prefecture Introduced plan for decarbonization of Gorontalo Province Ascertained issues for policy formulation in Gorontalo Province

6.2. Guidelines for city-to-city collaboration projects in the next fiscal year

The implementation contents and plans for each future review theme are assumed as follows.

Table 6-2 Implementation contents and plans by future review themes

Project	2021	2022	2023	2024
(1) Regional water infrastructure development				
Septic tank	Summary of technologies Identification of issues for consideration	Effectiveness verification Business model development	Decision-making Project making	Project for equipment subsidy
Methane Fermentation Facility	Summary of technologies Identification of issues for consideration	Effectiveness verification	Decision-making Project making	Project for equipment subsidy
(2) Sustainable Forest Management System	Identification of potential areas	Effectiveness verification System construction	Business realization	
(3) Support for developing a decarbonization plan	Workshop for policy sharing Identification of local issues	Sharing of more detailed policies Ehime Prefecture Online Tour	Planning support	Decarbonization Declaration

It is undeniable that the COVID-19 pandemic limited on-site confirmation and discussions with stakeholders, which are indispensable for project implementation. Particularly, in the search for potential sites for the introduction of septic tanks and methane fermentation equipment, there is a lack of specific information necessary for effect verification and system studies for installations. Our policy is to conduct an early field survey when it becomes possible to travel on-site. However, at the same time, in order to proceed with decision-making and project development that are indispensable for commercialization, it is necessary to review various measures including further utilization of online tools and appointment of local coordinators.

After formulating survey options on the premise that travel restrictions will continue from the next fiscal year onward, we will work to create projects for each theme while deepening relationships with local stakeholders such as our relationship with the government of Gorontalo Province, which was established this year.

Moreover, based on the latest NDC submitted by Indonesia in July 2021, it is expected that plans and efforts for decarbonization in Indonesia will accelerate in the future. In regards to the latest trends, it is necessary to continually consider the construction of a system that simultaneously realizes the development and decarbonization of Gorontalo Province while collecting information in collaboration with the government of Gorontalo Province and Gorontalo State University.

Additionally, as an city-to-city collaboration project, our policy is to make proposals

after considering the possibility of expanding into Gorontalo Province with regards to the efforts and plans for decarbonization of Ehime Prefecture.

At the workshop held this year, it was confirmed that Gorontalo is expecting to the decarbonization declaration, and from next year onward, it is a policy to take more concrete actions toward the realization of the declaration together with Ehime prefecture. In addition, based on policy formulation issues that we grasped in Gorontalo Province this fiscal year, and after organizing information that will be useful for Gorontalo Province, we will consider the provision of opportunities to share the flow of planning formulation, the contents of the plan, etc., in detail. Furthermore, it may take some time to invite people from Gorontalo Province to Ehime Prefecture in order to introduce conditions in Ehime Prefecture, as well as the technology of corporations in Ehime Prefecture. Accordingly, we will also consider the holding of online tours for introducing Ehime Prefecture and the technology of corporations in Ehime Prefecture via video.

(End)