



ESIA for Petrochemical Complex, PT Lotte Chemical Indonesia

Executive Summary



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1. Introduction

PT Lotte Chemical Indonesia (hereafter referred to as 'LCI') is planning to develop a vertically integrated petrochemical plant and its supporting facilities (hereafter referred to as 'Petrochemical Complex', or 'the Project') in Indonesia. The Project aims to improve the availability of raw materials such as Ethylene and Propylene for companies within the LOTTE Group, and for the broader plastic industry market in Indonesia, which currently largely relies on imported polymer products.

LCI has conducted AMDALs (Analisis Mengenai Dampak Lingkungan, translating as Environmental Impact Analysis) for the Project, with the first AMDAL (Analisis Dampak Lingkungan, translating as Environmental Impact Analysis Report i.e., the document of the AMDAL) approved and Environmental Permit issued in September 2018.

In 2019 LCI commissioned a 'LOTTE Chemical Environmental and Social Gap Analysis Report' (Gap Analysis Report) of the local AMDAL against Equator Principles 4 (EP4) and International Finance Corporation Performance Standards (IFC PS). The resulting Gap Analysis Report identified a number of gaps, including lack of sufficient reporting greenhouse gas emissions, sampling and modelling of Air, Water, and Noise, assessment of impacts on biodiversity and others, Project alternative analysis, and development of stakeholder engagement plan (SEP) and Grievance Mechanism and included a recommendation to conduct a full Environmental and Social Impact Assessment (ESIA) in order to align with international standards.

This document is the resulting ESIA Report and aims to close relevant gaps identified in the Gap Analysis Report. The Report is structured as followed:

- **Chapter 1:** Introduction;
- **Chapter 2:** Project Description and Project Alternatives;
- **Chapter 3:** Policy and Legal Framework;
- **Chapter 4:** Impact Assessment Methodology;
- **Chapter 5:** Scoping;
- **Chapter 6:** Environmental and Social Baseline;
- **Chapter 7:** Environmental Impact Assessment;
- **Chapter 8:** Social Impact Assessment;
- **Chapter 9:** Unplanned Events Assessment;
- **Chapter 10:** Environmental and Social Management Plan;
- **Chapter 11:** Cumulative Impact Assessment; and
- **Chapter 12:** Stakeholder Engagement.
- **Annexes:**
 - Annex A: Project Specific Numerical Standards and Guidelines;
 - Annex B: Supplementary Biodiversity Data;
 - Annex C: AMDAL Measures;
 - Annex D: Stakeholder Engagement Minutes of Meetings and Photos;
 - Annex E: Community Grievance Card and Grievance Log Form;



- Annex F: Human Rights Impact Assessment;
- Annex G: Climate Change Risk Assessment;
- Annex H: Air Quality Modelling Methodology;
- Annex I: Contour Plots for Operational Phase Air Quality Impact Assessment; and
- Annex J: Thermal Recirculation Study Report
- Annex K: Sediment Dispersion Study Report.

2. Project Description

The Project will be located on industry designated land in the villages of Rawa Arum and Warnasari, Cilegon City (refer to Figure. 1). LCI plans to develop the Project in two phases:

- Phase 1, including some reclamation work – this phase is confirmed; and
- Phase 2, expansion – land for Phase 2 is reserved for future development.

Table. 1 summarizes the overview of project plan and capacity.

Table. 1 Overview of Project Plan and Capacity

Unit	Product	Capacity
Phase 1		
Ethylene Unit (NCC Unit)	Ethylene	1,000 Kilo Ton Annum (KTA)
	Propylene	690 KTA
Benzene-Toluene-Xylene Unit (BTX Unit)	Benzene	260 KTA
	Toluene	90 KTA
	Xylene	50 KTA
Butadiene Unit (BD Unit)	1,3-Butadiene	140 KTA
Polypropylene Unit (PP Unit)	Polypropylene	250 KTA
Major Supporting Facilities of Phase 1		
Jetty	-	One existing berth and three new berths for Phase 1
Gas turbine generator (GTG) set to support petrochemical complex operation		55 megawatts (MW)
Seawater intake station		<ul style="list-style-type: none"> ■ Two seawater intake pipes and seawater screening packages ■ Five seawater pumps and seawater filter packages
Wastewater treatment plant		430 tonne/hour (t/h)
Water treatment system		1,300 t/h
Storage tanks	-	A total of 33 storage tanks

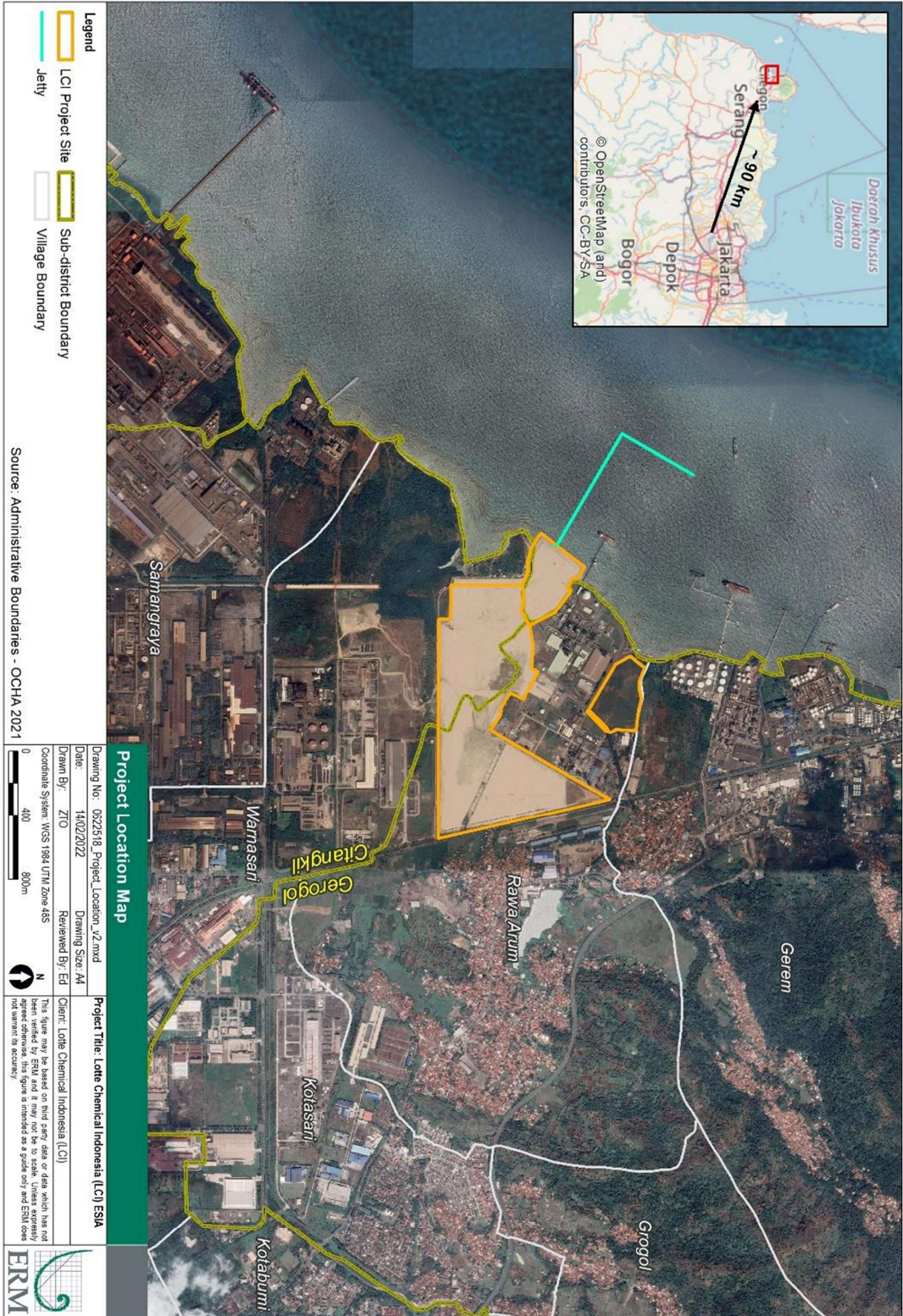


Figure. 1 Project Location



3. Policy and Legal Framework

The regulatory framework that applies to the Project comprises national legislation, company-specific policies, and guidelines, as well as international standards and guidelines, given the involvement of international lenders. The key policy and legal frameworks are listed below:

- National Administrative Requirements:
 - Noting the Government Regulation No. 22 of 2021, which has amended provisions of the previous Indonesian Environmental Law, and was enacted in February 2021.
- International Standards and Guidelines, including:
 - Equator Principles 4;
 - International Finance Corporation Performance Standards; and
 - World Bank Group Environmental Health and Safety Guidelines.

4. Scoping

A scoping exercise and identification of the Project activities and their key issues and potential benefits was carried out. The Project and receptor interactions that were likely to lead to significant impacts formed the focus of the detailed impact assessment in the ESIA. They are discussed in Chapter 7 Environmental Impact Assessment, Chapter 8 Social Impact Assessment, and Chapter 9 Unplanned Events.

5. Baseline

5.1 Environmental Baseline

5.1.1 Geology and Soil Quality

The Project Site is located on relatively flat, coastal area, with the land ranging from between +0 – +20 m above Principal Datum (mPD). The land portion can be divided into three distinct geological strata:

- **Area close to the shoreline:** occupied by Gede volcanic rock layer (Qpg) with lava flows and which provides a very high bearing capacity and resistance to tidal wave erosion;
- **Intermediate area:** occupied by an alluvium layer (Qa) consisting of pebble, sand, silt and mud; and
- **Farthest area from the shoreline:** occupied by the upper Banten tuff layer (Qvtb)¹.

Indonesia is prone to earthquakes due to its geographical position in an active tectonic zone. The closest fault line to the Project is Meramang Fault, which is approximately 11 km away from the Project Site. Although a number of earthquakes have occurred in the area, none have reached the Project Site. The most recent earthquake occurred in 2020, with a magnitude less than 4.5 MMI (Modified Mercalli Scale; scale level from I to XII, with Degree I (not felt) to Degree XII (extreme)).

Soil sampling was carried out in May 2022 across the Project Site and showed that national (Government Regulation No. 22 Year 2021 or GR 22/2021) and/or international standards were exceeded for the soil in some sampling locations for arsenic, barium and copper.

¹ Soil Investigation Report (After Construction) for Land Preparation of Line Project. PT Tigenco Graha Pesada (2020)



The national GR 22/2021 regulations have three levels of contaminated soil criteria, A, B and C, with Level A being the most significant and soil being managed as hazardous waste, whereas if detection is equal to or less than Level C standard values, the soil can be used as base soil or backfilling. Arsenic and barium detected in various, but not all, soil sampling locations for the Project were greater than the Level C values but less than the Level B standard values of GR 22/2021. Based on the regulation, such soils “can be managed using non-hazardous waste management techniques.”

While it is also noted that arsenic in various, but not all, soil sampling locations were greater than the US EPA RSL for industrial soils, given that the detected concentrations are almost of similar magnitude across the Site, with no detections exceptionally higher than the others, it is more likely that the detected concentrations are naturally occurring background levels. Additionally, the US EPA notes that some heavy metals, including arsenic, aluminium, iron and manganese, ‘are common elements in soils that have background levels that may exceed risk-based screening levels’ (US EPA, 2021). Its presence in most of the soil bore locations indicate that the Site is not an exception and the US EPA does not recommend performing response actions to go below the background levels.

5.1.2 Surface and Groundwater Quality

In general, the Project Site has a relatively flat topography with several river flows and overland flow in the Project Site will directly lead to the sea. Lelean River is located in the north perimeter of the Project Site and flows from east to west towards Sunda Strait. Another existing surface waterbody surrounding the site is a man-made channel located in the southern perimeter of the Project Site. According to the Regional Disaster Mitigation Agency (BPBD), Citangkil and Grogol District have six and three points respectively that are prone to flooding.

Surface water quality sampling was conducted at two sampling points in 2017 for the AMDAL Report, prior to site formation or any Project works, and identified several exceedances compared to national regulations (GR 22/2021) which classifies water into four standards from Class I water that can be used for drinking to Class IV water that can be used for irrigation or similar. The 2017 results indicated some organic pollution but no parameters with concentrations of environmental concern and water quality meeting Class IV water standards. Surface water sampling was later carried out at four stations in June 2022 and certain exceedances found at the sampling stations, with certain parameters exceeding standards for Class IV waters. Interviews with the local community surrounding the Lelean River in 2022 also indicated that local communities do not use its water for consumption nor daily needs because the water quality is low and other data also indicated the majority of people in the Cilegon area use bottled water and other sources of clean and drinkable water.

In 2020, LCI carried out groundwater sampling within the Project Site and found values for salinity, chloride and sulphate decreased for most points after the land reclamation. When compared with national standards (Minister of Health Regulation No. 32/2017), chloride values in 2020 were exceeding standards for the majority of samples. Additional groundwater sampling at 17 stations was carried out in June 2022 and found some exceedances compared to national standards in several sampling locations.

Arsenic, barium and boron were detected at various locations across the site and exceeded one or more adopted standards. It is noted that the same parameters were detected in the soil samples collected, and due to the shallow and unconfined nature of the aquifer, it is currently inferred that the presence of these elements in groundwater is a result of direct soil leaching, a transport mechanism that is facilitated by tidal fluctuations (which is expected to be prominent in the site setting). A majority of the onsite samples have arsenic concentrations (nine of 14 samples were in 10^{-2} mg/L range), barium concentrations (eight of 14 samples were in 10^{-1} mg/L range), and boron concentrations (11 of 14 samples were in 10^0 mg/L range) falling within the same order of magnitude thus indicating that



their presence in groundwater is likewise naturally occurring, with slight deviations accounted to tidal variability.

5.1.3 Ambient Air Quality

Data collected for AMDAL suggested that the air quality at the six sampled stations complied with the national standard (Annex VII of GR 22/2021). The principal sources of air emissions at the time (pre-Project) were likely to be the existing industry and exhaust emissions from road transportation in the area.

Two rounds of ambient air quality sampling were completed in 2022 – one in the wet and one in the dry season. The wet season sampling was carried out at four stations during January and February 2022, and no exceedance was found. Dry season sampling was carried out in May and June 2022, and the SO₂ level in one sampling location during dry season exceeded the national standard.

5.1.4 Noise Quality

Data collected for the AMDAL Report suggested that the 12 sampled stations complied with the national noise standard (KepMen LH No 48/1996).

Monitoring to international standards was conducted at three sampling points in January 2022. The three sampling points were selected because they represent the residential area closest to the Project Site. PS-01, PS-02 and PS-03 are 195m, 150m, and 181m respectively east of the Project Site boundary. The background noise levels in general exceeded both the noise limits set out in national standards and IFC guidelines, except for the background noise levels in sampling location PS-01, which comply with both noise limits during daytime period, and in sampling location PS-01 and PS-03, which comply with national KepMen LH No 48/1996 Noise Standard during night-time period.

5.1.5 Seawater Quality

Seawater quality sampling was conducted at ten stations for the AMDAL Report and compared to the Appendix VI of GR22/2021. Sampling location SW4's coliform level and sampling locations AL-1 to AL-4's copper level exceeded the national standard. Apart from the above, the other sampling points complied with the national standard.

Seawater quality monitoring was conducted every six months in four sampling locations during 2018 – 2021. Several parameters exceeded the Appendix VIII of GR22/2021 for marine biota, including total hydrocarbon and oil and grease.

Seawater quality monitoring was carried out in six locations at three elevations in June 2022. Total Petroleum Hydrocarbons were in exceedance at six locations at three elevations.

5.1.6 Marine Sediment Quality

Marine sediment sampling was carried out in 13 locations in June 2022. Sediment quality results were compared against Australian and New Zealand sediment quality guidelines ('SQG')² and it was found there were no exceedances of ISQG-Low values. Based on the collected samples, sediment within the proposed dredging area is characterised as composed of uncontaminated sediment.

² Simpson SL, Batley GB and Chariton AA (2013). Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines. CSIRO Land and Water Science Report 08/07. CSIRO Land and Water.
<<https://publications.csiro.au/rpr/download?pid=legacy:965&dsid=DS1>>



5.2 Biodiversity Baseline

The Project Site sits within the terrestrial Western Java Rainforest Ecoregion and on the marine ecoregion of Southern Java, as well as being within the Coral Reefs, Fisheries, and Food Security (CTI-CFF) Implementation Area (although outside the scientific boundary of the Coral Triangle). In addition, the Project falls within the Javan Coastal Zone Endemic Bird Area (EBA).

There are also six locally designated Protected Areas (PAs) found near the Project Site, both terrestrial and marine, but all further than 10 km away. The closest PA is a Marine Nature Recreation Park 12 km to the west, Pulau Sangiang (Sangiang Island).

5.2.1 Terrestrial Biodiversity

Eight terrestrial habitats/land cover types were identified within the Study Area: mangroves and wetlands, shrubland/grassland, mixed plantation/ agricultural area, freshwater body, forest area, bare land, residential area, and industrial area. Overall, the Project Site lies within an area that is reasonably developed already, adjacent to an existing industrial site and with predominantly modified habitats in the vicinity and limited areas of natural habitats close by.

Baseline information was collected for biodiversity for the AMDAL but with limited information and was then supplemented by baseline biodiversity surveys in June 2022, which took place after the land reclamation and site clearance had occurred. The 2022 surveys identified 147 plant species from 41 different families. Fabaceae was the predominant family of plants with 21 species, followed by Poaceae family with 19 species, and Cyperaceae family with 11 species. No flora species of potential conservation significance were identified and a relatively high number of invasive and potentially invasive flora species were also recorded, reflecting the relatively modified setting of the Project.

The 2022 baseline surveys also identified 166 fauna species across 69 families from the following taxa: birds, mammals, herpetofauna, and insects. Of these, 14 species were considered to be of conservation significance, including 12 bird species and two mammal species listed either under the IUCN Red List of Threatened Species, or under Government Regulation 7/1999. No reptile/ herpetofauna or insect species of conservation significance have been identified for this Project.

5.2.2 Marine Biodiversity

Remote sensing analysis was used to help direct survey locations (details in Annex B1) and corals were identified in five out of eight survey locations within the Study Area, however these were found to be of mixed value. Coral areas comprised largely of hard coral (species belonging to *Acropora*, *Melliphora*, *Tubipora* genera), dead coral, and algae, with the dominating hard coral types across sites being massive corals, foliose corals, and encrusting corals.

The 2022 baseline surveys also did not identify any seagrass species at the eight sampling locations within the Study Area.

Plankton, zooplankton, and macrobenthos sampling from the 2018 AMDAL and the RKL RPL Monitoring Reports (2018-2021) has shown that there are mostly common and widespread species that occur in the Study Area, which should not be adversely affected by Project activities. Marine invertebrates like marine molluscs and crustaceans are also included in the macrobenthos category and are of limited conservation significance and will not be significantly impacted by Project activities.

Pelagic fish around the Study Area have been identified through secondary data during the AMDAL as well as primary data from interviews with fishermen. Many common species of Tuna, Mackerel, and Sardinellas have been noted, which have different fishing seasons and abundances. A few shark and fish species have been highlighted as potentially but generally unlikely to occur in the Study Area.



Marine mammals such as dugongs are unlikely to occur as seagrass habitats (used by dugongs for foraging) are absent. The 2022 baseline surveys recorded one marine mammal species around the Project Site - the common bottlenose dolphin (*Tursiops truncatus*) (LC).

No sea turtles were recorded during the 2022 baseline surveys. No species of seabirds were recorded during the 2022 baseline surveys, including the seabird species highlighted from desktop review as being found in Important Bird and Biodiversity Areas (IBAs), EBAs and PAs around the Project Site (for example, Christmas Frigate bird *Fregata andrewsi*, CR; and Milky Stork *Mycteria cinerea*, EN).

5.2.3 Critical Habitat Assessment

As outlined in Annex B2 Critical Habitat Assessment, no Critical Habitat has been identified for this Project, as per IFC PS6.

5.3 Social Baseline

The social baseline is based on primary and secondary data from the Project Site and additional baseline studies. The information collected are based on the engagement with the communities from Rawa Arum Village and Gerem Village in Grogol District, and Warnasari Village in Citangkil District and concerned government departments. Rawa Arum Village and Warnasari Village are considered to be primarily affected by the construction of plant and jetty, while Gerem Village will be affected by the process of mobilization of heavy equipment during the construction phase.

5.3.1 Administrative Divisions, Demographics and Population

Indonesia's territorial administration is divided by province, followed by regency/municipality (city), district, and sub-district/village. Districts (urban village) and villages are the lowest government administration. To ease the coordination within the administrative area, each sub-district village is divided into hamlets called Rukun Warga (RW) and further broken down into neighbourhoods called Rukun Tetangga (RT), typically consisting of 30-100 households depending on the size and density of the area. Heads of village or sub-district are central figures in the study area, i.e., Warnasari, Rawa Arum and Gerem Villages. They are responsible for implementing government development programs, for example by distributing social assistance, selecting participants to receive social programs, etc. The village/sub-district heads also have a role in conflict resolution involving community members. Usually, community conflicts will be escalated to the police authority only if not solved by the village/sub-district head. Another central role played by the village/sub-district head is leading the decision-making process during the village development planning (Musrenbangdes).

The three (3) villages near the Project Site are some of the most populous in Grogol and Citangkil Districts. The population in Rawa Arum, Gerem and Warnasari is generally gender balanced, with a gender ratio of 105 in Rawa Arum, and 103 in Gerem and Warnasari. The population in Banten Province is primarily Bantenese (47 %), Other ethnic groups include Sundanese (23 %) Javanese (12 %), Betawi (10 %), and Chinese (1 %)³. Most of the people in northern Banten are Javanese and have previously migrated from the central and eastern part of Java. Based on the observation and community interviews during the Scoping Site Visit in January 2022, local communities in Rawa Arum, Warnasari and Gerem village belong to the Java-Banten ethnic group.

³ Suryadinata et al. (2003). Indonesia's Population: Ethnicity and Religion in a Changing Political Landscape. Institute of Southeast Asian Studies.



The Central Bureau of statistics has classified religions into six (6) categories; Islam, Christianity, Catholicism, Buddhism, Hinduism, Konghucu, and others⁴. Though secondary village data collection and KIIs, ERM identified that people residing within the study area are predominantly Muslim, with a small percentage of Christians, Catholics, Buddhists, and Hindus.

With the strong influence of Islam, prolonged ancient cultural activities/ceremonies are not commonly practiced for people within the study area. For example, the fishers and farming communities do not practice “*sedekah laut/bumi*”, traditional feast rituals during certain seasons that are commonly practiced by fishers and farming communities in other parts of Indonesia. Community members often consider these practices to be against their religious beliefs.

Cultural practices in affected villages are strongly related to Islam. During the annual commemoration of the birth of Muhammad (“*Mauludan*”), the community prepares decorated foods such as cone-shaped rice and distributes them to Islamic boarding schools.

5.3.2 Land Use and Land Ownership

The industrialisation process in the area began in the 1980s. The planned Project Site is within an industrial complex that belongs to the state-owned enterprise, PT. Krakatau Sarana Infrastruktur (KSI) under state land. LCI (the Project proponent) has obtained Building Right Title (*Hak Guna Bangunan*) in 2021 from PT. KSI. With the Building Right Title, LCI has the right to use the land for 80 years.

Adjacent areas include community housing predominantly belonging to individual landowners, social infrastructures belonging to local government, agricultural areas, and fishers’ dwellings. In Rawa Arum, some parts of the agricultural land near the Project belongs to PT KSI and the Highway Development Project. Some farmers still use their former land for agricultural activities with permits from land owners. Two fishing locations, namely Tanjung Peni (Warnasari) and Lelean (Rawa Arum), are also owned by PT KSI.

Land acquisition was carried out through an agreement with the landowner to buy and sell industry designated land. There was one land dispute within the Project Site, which has been resolved as of August 2022.

5.3.3 Livelihood and Economic Activities

The workforce participation level represents labour supply available to produce goods and services in Cilegon City. At the level of Cilegon City, 9.68 % of the total active workforce was unemployed in 2019. The total workforce participation in 2019 reached about 62.74 %, although the female participation rate was 33.6 % for women. A large portion of women in Cilegon City do not take part in the workforce, with 45.1 % of women being housewives.

Provincial and regency/city minimum wage is regulated through Government Regulation no. 36 of 2021 on wages. The provincial and regency/city minimum wage is determined by few contributing economic factors such as purchasing power parity, employment, wages, economic growth and inflation. It is stated under the regulation that regency/city minimum wage must be higher than the provincial minimum wage.

The provincial government of Banten has determined the provincial minimum wage for Banten Province in accordance with the Governor of Banten Decree. The provincial minimum wage for Banten in 2022 is IDR 2,501,203, while the provincial minimum wage in 2021 was IDR 2,460,996⁵,

⁴ Central Bureau of Statistics. Glossary. Retrieved from: https://www.bps.go.id/istilah/index.html?Istilah_sort=keyword_ind [Accessed February 2022]

⁵ Kompas. (2021). Daftar UMK Banten 2022: UMK Cilegon 2022 Ungguli Tangerang dan Tangsel. Retrieved from: <https://money.kompas.com/read/2021/12/02/121309526/daftar-umk-banten-2022-umk-cilegon-2022-ungguli-tangerang-dan-tangsel?page=all> [Accessed February 2022]



showing an increase of 1.63 % in the current year. The minimum wage for Cilegon City in 2022 has been fixed at IDR 4,340,254.18, making it the highest in Banten province.

The majority of people within Cilegon city are working in agriculture, manufacturing industry and services. As of 2020, a majority of female workers (87 %) are working within the service sector, and about 12 % and 1 % of female workers are working in the manufacturing industry and agricultural sectors respectively. Male workers are predominantly in the service sector and manufacturing industry, while a smaller percentage works in the agricultural sector.

The agricultural sector remains the main activity of local people in most of Indonesia. The shift from agricultural sector to manufacturing and services in Cilegon City shows that the local economy has already shifted towards an urban and industry-driven economy.

Farming activities within the study area are not the primary income-generating activities for the community. Farming activities in the affected villages are mainly seasonal agriculture which depend on rainfall. The majority of land in the vicinity of the Project Site is used for manufacturing, leaving a small percentage of land for agriculture.

Fishing is one of the local livelihoods in the area, although not the primary source of income of the community. Fishing sites in Citangkil and Grogol are among the closest fishing areas to the Project and access to fishing grounds may be impacted during construction and operation phases of the Project however the impact will be quite limited due to the wide alternative locations for fishers. Two fishing sites, namely Tanjung Peni and Lelean, are situated close to the Project Site. The Project construction activities as well as operational phase and post operational phase will overlap with fishing activities carried out by the fishers from those areas but impacts will be localized and temporary, and expected to occur mainly during Jetty construction and dredging activities. As of January 2021, there are 186 fishers registered in the community-based cooperative unit of Tanjung Peni, and 136 fishers in Lelean. According to FGDs with Lelean fishers, fishing is not the primary source of income for the community in Lelean. The participants have other jobs such as helpers, and non-permanent jobs such as labourers in industrial sector and small traders.

Based on the survey conducted by the Statistical Bureau, there were 133 companies registered in Cilegon City as of 2018⁶. Chemical companies dominate the industrial sector followed by primary metal companies, non-metal mining, metal goods, foods, engine and equipment repair and installation as the top five industries. According to data from Gerem Village Office, a total of 34 companies including LCI⁷ are located in Gerem Village, Grogol District⁸.

The poverty level in Cilegon in 2021 was 4, 24 %, which is lower than the poverty level in Banten Province. According to the village profile data, a total of 575 people in Rawa Arum are characterized as people living below the poverty line, amounting to 3.45 % of the village population.

5.3.4 Social Infrastructure and Services

Health facilities in the vicinity of the Project Site include maternity hospitals, community health centres, integrated healthcare centres, pharmacy, and clinics. According to the data from Site, as of 2021, a total of 15 health facilities existed in Warnasari area and 14 health facilities in Rawa Arum area, one health centre (*Puskemas*) in Grogol district and two health centres in Citangkil. Based on the data in Health Profile of Cilegon City (2021), several communicable diseases have been observed in the area categorised as direct infectious diseases (i.e., tuberculosis, pneumonia, HIV-AIDS and

⁶ Statistics Office of Cilegon City (2018). Cilegon Municipality in Figures, 2018. Retrieved from: <https://cilegonkota.bps.go.id/publication/2018/08/16/16e6cbe31ff8ca9b02b71055/kota-cilegon-dalam-angka-2018.html> [Accessed February 2022]

⁷ Although the Project Site is located in Warnasari and Rawa Arum village, LCI office is registered in Gerem Village.

⁸ Gerem Village Office, 2022 (Unable to physically retrieve or take digital documentation for this data).



syphilis, and leprosy). Acute upper respiratory infections of multiple and unspecified sites are the most common health issue in Grogol and Citangkil districts. It is noted that female have more health issues than male in general except injury and skin related health problems in Citangkil District.

The literacy rate is the proportion of people aged 15 and above who can read and write, and is an important indicator to assess how open a society is to education. It is noted that the literacy rate in Cilegon City is higher than national and province levels and there is a 100 % school participation rate for 7-12 years old children. There are a total of 8,835 school facilities in Banten Province. It is noted that Warnasari has a limited education infrastructure compared to Gerem and Rawa Arum although the populations in those three villages are similar.

Besides the formal education, the Government of Indonesia has also established vocational training centres to provide job-specific technical training. These programs generally focus on providing hands-on instruction, and can lead to certification. Vocational training programs are usually preferred by community members who wish to work directly after graduating from secondary school.

There are six (6) vocational training centres in Banten Province and they are located in the areas with high potential for industrial sectors.

As of 2016, 81.3 % of households had access to a proper source of drinking water in Grogol and Citangkil District, forming the highest percentage of Cilegon City.

88.3 % of Cilegon City's population has access to proper sanitation and Grogol District is one of the districts with the best access to proper sanitation, with 93.5 % of the population having access. Citangkil District remains above Cilegon City's average, reaching a proportion of 91.3 %. It was reported that some household still do not have lavatory system in Gerem.

In general, domestic waste management awareness is considerably low in the villages near the Project Site. Based on desktop research, there are three waste facilities in Cilegon City, two of which are in Warnasari⁹. It is noted that waste segregation is not commonly practiced and there are no waste collection services for domestic waste from the community. There is an informal service to collect the waste but there is no information on the final location of the collected waste disposal point and the waste treatment. Community members usually throw waste on vacant land surrounding their houses and burn it, or dispose waste into the river.

According to the field visit information, local communities have access to electricity and all areas within Warnasari, Rawa Arum, Gerem are connected to the national grid facilities provided by PLN (National Electricity Provider Company). It is noted that 98 % of household have an access to state electricity company in Cilegon City.

Cilegon City has a high connectivity and it connects Java Island and Sumatera Island through Merak Port; and it is also well-connected to Jakarta through Merak-Jakarta toll road. According to Cilegon 2020 data, 52.89 km out of 384.858 km of road in Cilegon City are in good condition, 273.140 km of road are in moderate condition, 38.276 km are damaged and 20.582 km are heavily damaged in 2019. During holiday seasons such as Ramadan and Christmas, the traffic in the port area is particularly high, causing heavy traffic jams.

In terms of sea transport, Merak port is located approximately 16 km from the Project Site. Port of Merak is a major service provider for passenger and commercial ferry from Merak to Bakauheni. The Roll on Roll off (Ro-ro) ferry is operated to transport passengers, cars, trucks, motorcycle from Merak to Bakauheni. The port is also serving petrochemicals facilities, which are located in Cilegon City.

⁹ <https://wastecinternational.com/en/facilities>



There are several active civil society organizations and non-governmental organizations (NGOs) in villages near the Project Site particularly women and youth associations.

5.3.5 Preliminary Indigenous People and Cultural Heritage Screening

According to ERM's a preliminary screening of potential (IP) and Cultural Heritage (CH) near the Project location, there is no finding on potential indigenous people and nationally recognized cultural heritage sites within and near the Project Site. There is no indication that the community living near to the proposed Project around Gerem, Rawa Arum, and Warnasari villages display the characteristics of IP. There are religious monuments and burial sites in the villages around the Project Site.

5.3.6 Stakeholder Engagement

Stakeholder engagement was conducted across different administrative levels, subject to permissions of responsible authorities. Scoping and ESIA engagement were undertaken in two phases in January 2022, and May, June 2022. ERM consultation team and LCI representatives conducted meetings and consultations at the administrative levels and the village level.

Consultation involved face-to-face meetings with a range of stakeholders including a representative for the Health Department, Environmental Protection Department, Head of Citangkil District, Village leaders, fishers from two fishing pools, women, youth and community representatives from the Project Area. The date, location, stakeholders of each meeting and engagement activities is summarised in Table. 2.

Table. 2 Consultation Activities Undertaken during Scoping and ESIA phases

Date, time	Location	Stakeholders and engagement activities
Scoping Stage		
17 January, 2022; 11:00am	Warnasari Village, Citangkil District	■ FGD with youth association and youth representatives
17 January, 2022; 13:00pm	Gerem Village, Grogol District	■ KII with head of Gerem Village
17 January, 2022; 15:00pm	Gerem Village, Grogol District	■ KII with head of Citangkil District
18 January, 2022; 09:30am	Warnasari Village, Citangkil District	■ FGD with community leader and other figures from Warnasari Village, including fishers' representatives
18 January, 2022; 11:00am	Rawa Arum Village, Grogol District	■ FGD with Tanjung Peni fishers
18 January, 2022; 14:00pm	Gerem Village, Grogol District	■ KII with fishers' formal representative
19 January, 2022; 10:00am	Rawa Arum Village, Grogol District	■ FGD with community figures from Rawa Arum Village
19 January, 2022; 12:00pm	Rawa Arum Village, Grogol District	■ FGD with women from Rawa Arum Village
19 January, 2022; 14:00pm	Gerem Village, Grogol District	■ FGD with community and youth leaders as well as local residents in Gerem Village
10 March, 2022; 14:00pm	Rawa Arum Village, Grogol District	■ Consultation with residents of Rawa Arum



Date, time	Location	Stakeholders and engagement activities
11 March, 2022; 10:00am	Gerem Village, Grogol District	■ Consultation with residents of Gerem Village
11 March, 2022; 14:00pm	Warnasari Village, Citangkil District	■ Consultation with residents of Warnasari Village
ESIA Stage		
24 May, 2022; 10:30am	Warnasari Village, Citangkil District	■ Consultation with residents of Warnasari Village
21 June, 2022; 13:00pm	Gerem Village, Grogol District	■ FGD with Lelean fishers
21 June, 2022; 14:30pm	Gerem Village, Grogol District	■ FGD with women from Gerem Village
21 June, 2022; 19:00pm	Gerem Village, Grogol District	■ KII with informal leader of Gerem Village
22 June, 2022; 9:00am	Health Department Office, Cilegon City	■ KII with representative of Health Department Officer
22 June, 2022; 17:00pm	Tamansari Village, Citangkil District	■ KII with Village Chiefs of Gerem Village, Warnasari Village and Rawa Arum Village
23 June, 2022; 9:00am	Rawa Arum Village, Grogol District	■ FGD with youth from Rawa Arum Village
23 June, 2022; 16:00pm	Rawa Arum Village, Grogol District	■ FGD with women from Rawa Arum Village
23 June, 2022; 19:00pm	Gerem Village, Grogol District	■ FGD with youth from Gerem Village
24 June, 2022; 10:00am	Gerem Village, Grogol District	■ Consultation with residents of Gerem Village
24 June, 2022; 13:00pm	Environmental Protection Office, Cilegon City	■ KII with Environmental Protection Officer
24 June, 2022 16:00pm	Rawa Arum Village, Grogol District	■ Consultation with residents of Rawa Arum Village
25 June, 2022; 14:00pm	Warnasari Village, Citangkil District	■ FGD and KII with farmers from Gerem, Rawa Arum and Warnasari villages
25 June, 2022; 15:30pm	Warnasari Village, Citangkil District	■ FGD with women from Warnasari Village

The major concerns of the local communities regarding the Project among the population of the Project Area are:

- Flood and Dust;
- CSR program;
- Employment, Training Support and Business Opportunities;
- Fisheries Activities Impact;
- Health Impact; and
- LCI communications.



Key questions raised during stakeholder engagement activities are described in Chapter 12. All stakeholder concerns were used to inform this ESIA Study.

6. Impact Assessment

LCI developed a list of mitigation measures in the AMDAL (2022) (see Annex C). It is considered that the mitigation measures listed in Annex C are existing embedded / in-place measures for the current ESIA report. The ESIA has assessed the potential impacts and proposed additional mitigation measures to reduce the level of the impact where necessary. Significance of impact refers to the impact with existing embedded / in-place measures, while residual impact refers to the impacts after implementing both existing embedded / in-place measures and the additional mitigation, management and monitoring measures identified within this ESIA. These potential impacts are summarised in Table. 3 (Environmental) and Table. 4 (Social).

In terms of environmental impacts, the residual impacts range from negligible to minor.

In terms of social impacts, managing community expectations is one of the key issues. Communities have expressed their interest in the potential employment, training support and business opportunities offered by LCI.



Table. 3 Summary of Environmental Impacts

Project Phase	Significance of Impact	Significance of Residual Impact
Climate Change and GHG Emissions		
Refer to the standalone Climate Change Risk Assessment (Annex G)		
Air Quality		
Site preparation and construction – Construction Dust	Moderate at worst (depending on the type of construction activities)	Minor at worst
Site preparation and construction – Vehicular Emission from Induced Traffic	Negligible	Negligible
Operations	NO _x : Negligible to Minor SO ₂ : Negligible PM ₁₀ : Negligible PM _{2.5} : Negligible VOCs/Benzene: Negligible (Normal Operation), Negligible to Moderate* (RTO Bypass) * For short-term VOCs impact under “RTO Upset” scenario only	Minor at worst
Noise		
Site preparation and construction	Moderate	Minor
Pre-commissioning and commissioning, operations, and decommissioning	Negligible	Negligible
Surface Water		
Site preparation and construction – Silt Laden Run-off	Minor	Negligible
Site preparation and construction – Domestic Wastewater from Workforce	Negligible	Negligible
Pre-commissioning and commissioning - Hydrotesting and Flushing	Negligible	Negligible
Pre-Commissioning and Commissioning - Chemical Cleaning and Passivation of Equipment and Piping	Negligible	Negligible
Soil and Groundwater		
Site preparation and construction	Minor	Negligible
Pre-commissioning and commissioning	Minor	Negligible
Operations	Moderate	Minor
Decommissioning	Minor	Negligible
Waste		
Site preparation and construction	Moderate	Minor
Pre-commissioning and commissioning	Minor	Negligible
Operations	Moderate	Minor
Seawater and Marine Sediment		



Project Phase	Significance of Impact	Significance of Residual Impact
Site preparation and construction - Reclamation	Minor	Minor
Site preparation and construction - Jetty Construction	Minor	Minor
Site preparation and construction - Dredging	Moderate	Minor
Operational - Wastewater Treatment Plant Discharge	Minor	Minor
Operational - Cooling Water Discharge	Minor	Minor
Terrestrial Biodiversity		
Site Preparation and Construction Phase – Employment of Labour and Presence of Workforce	Minor	Negligible
Site Preparation and Construction Phase – Transportation of Manpower, Equipment, Materials to / from Site	Minor	Negligible
Site Preparation and Construction Phase – Land Clearance (Soil and Vegetation) and Site Levelling	Moderate	Minor
Site Preparation and Construction Phase – Construction of Land Based Infrastructure and Establishment of Supporting Facilities	Minor	Negligible
Pre-Commissioning and Commissioning Phase – Flaring and Venting	Negligible	Negligible
Operational Phase - Transportation of Manpower, Equipment, Materials to / from Site	Minor (for any potential invasive species)	Negligible
	Negligible (for noise disturbance)	
Operational Phase - Flaring and Venting	Minor	Negligible
Marine Biodiversity		
Site Preparation and Construction Phase – Reclamation of Coastal Land	Minor	Minor
Site Preparation and Construction Phase – Construction of Seawater Intake and Cooling Discharge Channel	Negligible	Negligible
Site Preparation and Construction Phase – Construction of Marine Based Infrastructure (Underwater Piling and Marine Vessel Use)	Minor	Minor
Site Preparation and Construction Phase – Dredging Activity (Direct loss)	Negligible	Negligible
Site Preparation and Construction Phase – Dredging Activity (Dispersion and	Minor	Minor



Project Phase	Significance of Impact	Significance of Residual Impact
deposition of suspended sediments during dredging)		
Site Preparation and Construction Phase – Dredging Activity (Collision risk from marine vessel use)	Negligible	Negligible
Operational Phase – Marine Transportation of Equipment and Materials To and From Site (Underwater noise during transport of materials and equipment)	Negligible	Negligible
Operational Phase – Marine Transportation of Equipment and Materials To and From Site (Shading of seabed by constructed jetty)	Negligible	Negligible
Operational Phase – Marine Transportation of Equipment and Materials To and From Site (Collision risk of marine vessels with marine fauna)	Negligible	Negligible
Operational Phase – Marine Transportation of Equipment and Materials To and From Site (Introduction of invasive species)	Minor	Minor
Operational Phase – Operation of Cooling System	Negligible	Negligible



Table. 4 Summary of Social Impacts

Potential Impact / Issue	Significance of Impact	Significance of Residual Impact
Social and Cultural Structure		
Presence of non-local workers and off-site housing – Construction	Moderate	Minor
Presence of non-local workers and off-site housing – Operations	Negligible	Negligible
Local Economy, Livelihood and Employment		
Managing community expectations – Construction	Major	Minor
Managing community expectations – Operation	Moderate	Minor
Employment opportunities – Construction and operation	Positive	Positive
Economic opportunities for local suppliers and indirect employment – Construction and operation	Positive	Positive
Opportunities to develop work skills and experience – Construction and operation	Positive	Positive
Disturbance to fishing activities and fishers' loss of income – Construction	Moderate	Minor
Disturbance to fishing activities and fishers' loss of income – Operation	Minor	Negligible
Disturbance to Transportation		
Road traffic – Construction and operation	Moderate	Minor
Marine traffic – Construction and operation	Minor	Negligible
Infrastructure and Public Services		
Presence of non-local workers – Construction	Moderate	Minor
Presence of non-local workers – Operation	Negligible	Negligible
Off-site housing – Construction	Moderate	Minor
Off-site housing – Operation	Negligible	Negligible
Waste generation and disposal – Construction and operation	Minor	Negligible
Occupational Health and Safety		
Health and safety of workers for all Project activities – Construction and operation	Moderate	Minor
Community Health, Safety and Security		
Increased exposure to hazardous materials – Construction and operation	Moderate	Minor
Security personnel attitude and use of force – Construction and operation	Minor	Negligible



Potential Impact / Issue	Significance of Impact	Significance of Residual Impact
Perceptions about flood risk – Construction and operation	Moderate	Minor
Potential risk to fishers' safety – Construction and operation	Moderate	Minor
Increased risk of GBV - Construction	Moderate	Minor
Increased risk of GBV – Operation	Negligible	Negligible
Presence of non-local workers – Construction	Moderate	Minor
Presence of non-local workers – Operation	Negligible	Negligible
Indirect health impacts from Project activities – Construction and operation	Minor	Negligible
Spread of COVID-19 – Construction	Moderate	Minor
Spread of COVID-19 – Operation	Negligible	Negligible
Increased transmission of STIs, including HIV/AIDS – Construction	Moderate	Minor
Increased transmission of STIs, including HIV/AIDS – Operation	Minor	Negligible



7. Cumulative Impact Assessment

One project, i.e., Warnasari Terminal and Supporting Facilities was identified in vicinity of the Project Site. Since the details are limited, and the implementation of this project is yet to be confirmed at the time of preparing this Report (October 2022), it will not be further assessed in the cumulative impact assessment. AMDAL / ESIA of the other projects in vicinity of the Project are also unavailable. Overall, it is concluded that no projects are eligible to be considered for cumulative impacts.

8. Environmental and Social Management Plan

Table. 5 summarises the mitigation measures for environmental and social aspects, as well as unplanned events. For further details on the environmental and social management plan (ESMP), refer to Chapter 10.

Table. 5 Summary of Mitigation Measures

Potential Impact / Issue	Existing Controls Identified	Additional Mitigation and Management Measures	Monitoring Required#	Design Changes Recommended
Environmental Aspects				
Climate change – physical climate change	✓	✓	X	X
Climate change – transition risk	X	✓	X	X
Air quality	✓	✓	✓	X
Noise	✓	✓	✓ (change of monitoring locations)	X
Surface water	✓	✓	✓	X
Soil and groundwater	✓	✓	✓	X
Waste	✓	✓	X	X
Seawater and marine sediments	✓	✓	✓ (sample at three depths; additional parameters)	X
Terrestrial biodiversity	✓	✓	✓	X
Marine biodiversity	✓	✓	✓	X
Social Aspects				
Social and culture structure	✓	✓	✓	X
Local economy, livelihood and employment	✓	✓		X
Disturbance to transportation	✓	✓		X
Infrastructure and public services	X	✓		X
Occupational health and safety	✓	✓		X



Potential Impact / Issue	Existing Controls Identified	Additional Mitigation and Management Measures	Monitoring Required#	Design Changes Recommended
Community health and safety	✓	✓		X
Unplanned Events				
Loss of primary containment (resulting in release of toxic gas)	✓	✓	X	X
Fire and explosion	✓	✓	X	X
Loss of primary containment (spills and leaks)	✓	✓	X	X



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