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9. SOCIAL ENVIRONMENT

This chapter describes the existing social environment within the Project area and its surroundings. The information in the chapter is based primarily on the findings of the Papua Liquefied Natural Gas (LNG) Project – Downstream Social Baseline prepared by Tetra Tech Coffey and presented in Appendix C Social Baseline.

9.1 CHARACTERISATION METHOD

This section describes the method used to characterise the existing social environment. The approach comprised:

- Defining the study area based on the expected geographic area of influence of the Project and the social characteristics of communities residing in these areas
- Reviewing previous studies undertaken for the PNG LNG Project
- Reviewing publicly available literature related to the study areas
- Collecting primary data through field investigations
- Developing social values for the study areas.

9.1.1 Defining the study area

The Social Baseline (Appendix C) defined two study areas based on the Project's expected geographic area of influence. These study areas are:

- The National study area. This area includes the Independent State of Papua New Guinea, focusing on the National Capital District (NCD), including Port Moresby.
- The LNG Plant study area. This area includes land, infrastructure and communities expected to experience change from the construction and operation of the Project. The study area begins at the north-western boundary of the NCD and extends north into Central Province to Lea Lea village. The eastern boundary of the study area is located 3 km inland from the LNG Plant and extends to the west to encompass Caution Bay. Villages in the study area include Porebada, Boera, Papa and Lea Lea. The study area also includes Edai Town, a gated community located approximately 3 km east of Boera.

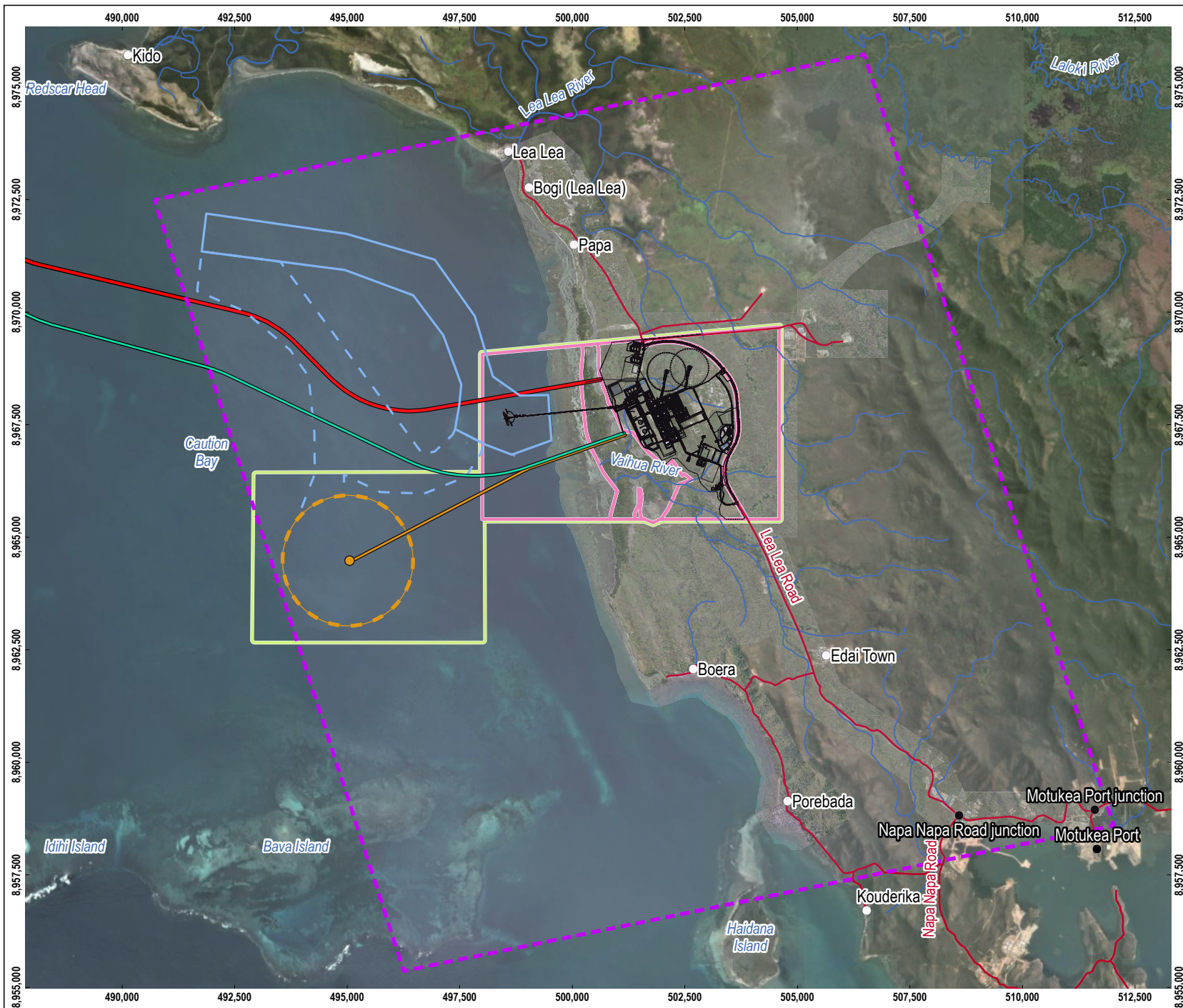
As defined in Chapter 2, Section 2.1.3.1, the construction component of all the offshore pipelines associated with the Papua LNG Project (that is, both the Upstream and Project component operated pipelines) will be assessed under a forthcoming addendum to the 2019 Papua LNG Project – Upstream EIS.

Figure 9.1 shows the LNG Plant study area.

9.1.2 Previous studies

The following studies from the PNG LNG Project were reviewed to inform the characterisation of the social environment:

- The PNG LNG Project Environment Impact Statement (EIS) (Coffey Natural Systems 2009) and supporting social impact assessment (Goldman 2008)
- The Partnership in Health Project, which included surveys and investigations as part of an Integrated Health and Demographic Surveillance System covering a range of demographic indicators and focus areas (e.g., NewFields 2022; PNG IMR 2018)
- LNG Plant Community Profile (EMPNG 2014).



LEGEND

- Village
- Point of interest
- Road
- Watercourse
- PNG LNG pipeline
- Proposed Papua LNG pipelines route
- Existing and proposed plant layout
- PPFL2 boundary
- APPFL boundary
- Current navigational channel
- Proposed navigational channel
- LNG Plant study area
- Proposed CALM buoy components
- CALM buoy
- Naphtha and condensate pipelines
- CALM buoy navigational area

SOURCE

Study area from Tetra Tech Coffey.
Infrastructure, roads, watercourses and lease boundary from EMPNGA.
Imagery from EMPNGA and Planet Labs.



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EXXONMOBIL PNG ANTELOPE LIMITED

PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 9.1

LNG Plant study area



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Other specialist studies used to inform the social baseline study include:

- Cultural Heritage Impact Assessment (Appendix A)
- Community Health Baseline (Appendix B)
- Traffic and Land Use (Appendix D)
- Caution Bay Fisheries Resource Use Study (Appendix F).

9.1.3 Literature review

The following publications were reviewed to inform the social baseline:

- Papua New Guinea 2011 National Report, which includes a summary of the key statistical indicators from the 2011 Census (NSO 2014)
- National government development plans, such as Papua New Guinea Development Strategic Plan 2010-2030 (DNPM 2010), Papua New Guinea Medium Term Development Plan III 2018-2022 (DNPM 2018) and National Capital District Division of Education: Education Plan 2006-2015 (DoE 2007)
- Various online media articles that include demographic and economic indicators for each study area. For example, Trading Economics (2019), Miae (2010) and The National (2010).

A review of available information was used to develop social values for the Project, including:

- Partnership in Health Project Progress Reports, 2011 to 2018 (PNG IMR, various dates)
- Available media articles on issues within the study areas
- Available academic literature
- Non-government organisation reports on issues stemming from the PNG LNG Project.

9.1.4 Field investigation

The field investigations comprised a household survey, a village survey and focus group discussions in 2019, and key informant interviews and a rapid livelihood appraisal in 2022. Project awareness sessions were completed at each village before the commencement of the social surveys.

The investigations were completed by social researchers from Tetra Tech Coffey with support from the EMPNG community affairs team and village residents employed through Laba Holdings, the umbrella landowner company for the LNG Plant area. Figure 9.2 shows the location of the social field surveys completed.

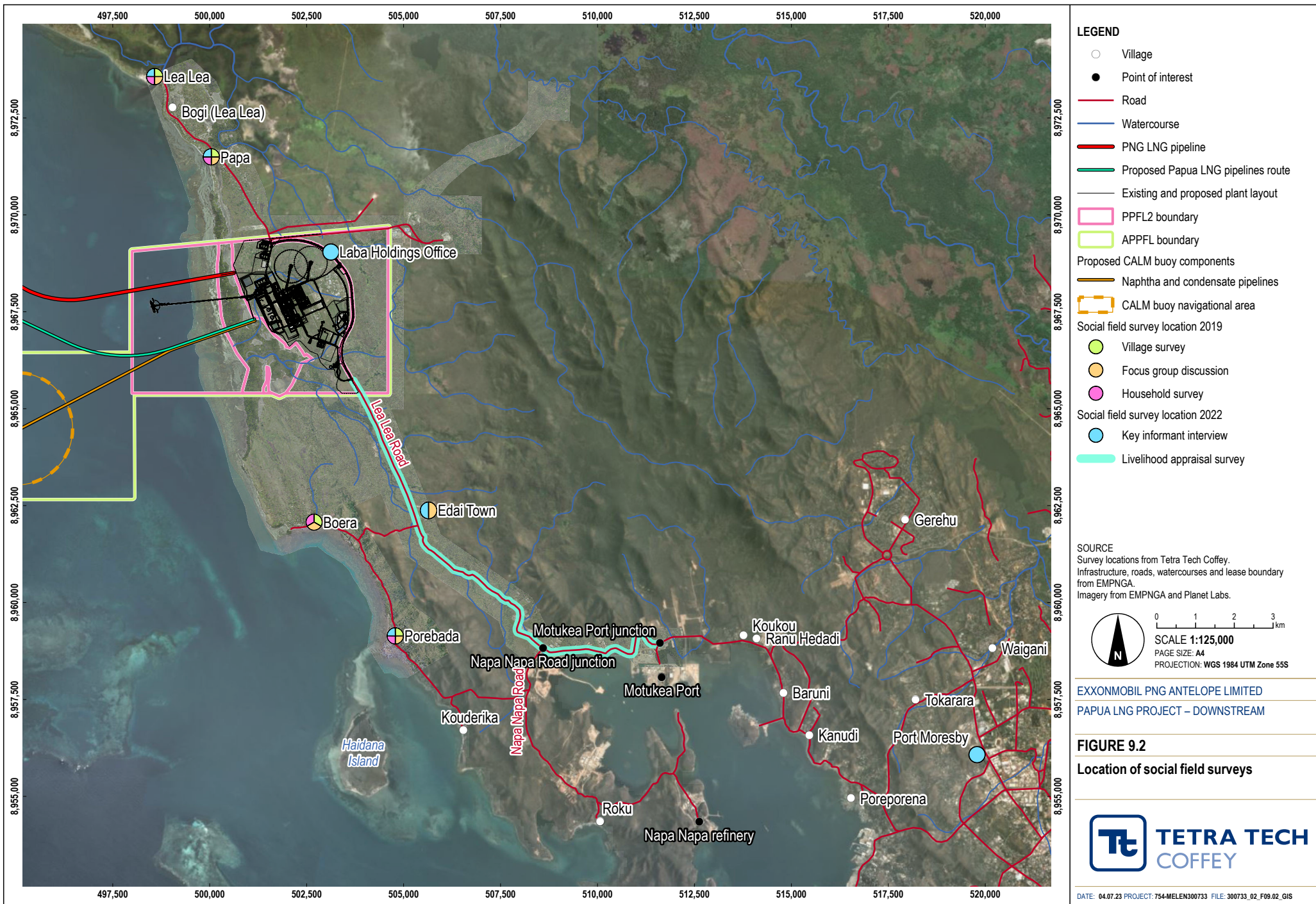
9.1.5 Social values

A social value is a quality of the social environment that is conducive to people's wellbeing (economic, social and spiritual) for which people in the study area have high regard. Wellbeing is a broad concept perceived by individuals differently and can be affected in complex ways by many factors (e.g., health, beliefs, social relationships, access to services, cultural identity).

Five social values were identified for the Project and these values were grouped into three overarching themes, comprising:

Livelihood

- Social value 1: the capacity to support livelihoods based on the harvest of natural resources.
- Social value 2: formal wage employment opportunities.



Culture

- Social value 3: the ability to sustain cultural identity and traditions.

Personal and community wellbeing

- Social value 4: an environment supportive of personal, family and community health, safety, security and social wellbeing.
- Social value 5: the ability of services and institutions supportive to community wellbeing.

9.2 EXISTING SOCIAL ENVIRONMENT

9.2.1 National study area

This section describes the characteristics of the existing social environment of the National study area, including a high-level overview of the Papua New Guinean social and economic context, and a summary of the National study area, followed by a summary of conditions within the NCD, which is expected to be the main entry point for Project personnel, and internationally imported goods and materials.

9.2.1.1 National overview

The Independent State of Papua New Guinea occupies the eastern half of the island of New Guinea and its offshore islands in the south-west Pacific. Port Moresby, the capital, is located on the south-eastern coast.

Social overview

The 2020 population of Papua New Guinea is estimated to be between 8.9 to 9.6 million persons (Bourke and Allen 2021). Population density varies greatly across the country, with very low levels of population density of one to two people per square kilometre (km²) in the Western Province and over 800 people per km² on some smaller islands (Bourke 2020). The average annual population growth in Papua New Guinea from 2000 to 2011 was approximately 3.1% (NSO 2014).

Males comprise 53% of the population, while females comprise 47%. More than 75% of Papua New Guinea's population is below 35 years, known as a 'youth bulge', which can indicate high potential unrest when coupled with limited job opportunities (McPhee and McLachlan 2017; Wilson 2020; Stewart 2018).

In 2020, life expectancy at birth in Papua New Guinea was estimated to be 63 years for males and 66 for females (World Bank 2022). The main causes of death in Papua New Guinea include upper-respiratory infection, heart disease, stroke, diabetes and diarrhoeal diseases (CDC 2019). In addition, communicable diseases, such as tuberculosis and malaria, remain a major cause of death and illness.

Achieving universal education is a challenge for Papua New Guinea. The median years of schooling for women was 5.5 years compared to 6.8 years for men. The literacy rate for women was 66.4% compared to 79.9% for men.

Challenges for delivering health and education services in Papua New Guinea include:

- Poor access to educational and medical supplies
- Issues with the management of health and education staff
- Closure of facilities
- Varying levels of community engagement with local health facilities (Wiltshire et al. 2021; Honga 2020; Nunn and Nelson 2019).

Economic overview

In 2021, Papua New Guinea had a gross domestic product (GDP) of PGK 91 billion (US\$26.59 billion) and an inflation rate of 4.5% (World Bank 2021). Papua New Guinea has a dual economy, comprising a formal economy based on resource extraction, commercial agriculture, Government administration and private sector provision of goods and services, and an informal economy, which includes workers and small enterprises that are not covered by formal legal and financial arrangements, in that they are not paying tax and are not protected by formal contracts, awards, nor are protected by labour laws.

In 2020, approximately 2.7 million people were estimated to be in the labour force (World Bank 2021), approximately 11% are involved in formal wage employment (16% male and 6.5% female) (NSO 2014). In 2020, petroleum gas represented 31.5% of total exports, followed by gold (25.1%), copper concentrate (7.4%), and rough wood (5.4%) (OEC 2020). Other export items such as palm oil accounted for 4.6%, coffee for 1.3%, frozen fish for 1.3% and vanilla for 0.4% (OEC 2020).

The informal sector in Papua New Guinea revolves around subsistence farming employment (50% male and 67% female) (NSO 2014). The informal economy is estimated to be worth PGK 12 billion per year, approximately 20% of the country's GDP (Kenneth 2019). The informal economy employs 80% of adults who are typically aged between 35 and 54 years old (Luluaki 2018).

Employment and livelihood activities in Papua New Guinea are highly gendered, with women being three times more likely than men to be in the informal economy (FAO 2019). Participation of women in formal employment is constrained by cultural expectations and legal restrictions on their engagement in work that involves night-time hours or is physically difficult (World Bank Group 2018a).

Based on the outcomes of the 2010 Household Income and Expenditure Survey (Gibson 2013), Papua New Guinea has some of the highest poverty levels in the Asia Pacific. Approximately 40% of the population live under the extreme poverty line of USD 1.90 or PGK 6.7 per day (World Bank Group 2018a). An analysis of impoverished households in Papua New Guinea identified indicators of socioeconomic vulnerability, the indicators include:

- Lack of engagement in the cash economy
- Low education
- Single female-headed households
- Households with high levels of dependency from children and elderly persons
- Households with people with one or more disabilities
- Households without tenure rights (FAO 2019; World Bank Group 2018a; Bourke 2020).

Governance

Papua New Guinea has three levels of government: national, provincial, and local. The national parliament comprises members elected from 111 single-member electorates. Government agencies at provincial and local levels include:

- The Provincial level of government, consisting of:
 - Provincial Assembly
 - Provincial Executive Council
 - Joint Provincial Planning and Budget Priorities Committee
 - Provincial Administration.
- Local level government, which includes:
 - District Administration

- Wards, which are made up of representatives from between four to five villages.

Papua New Guinea was rated 138 out of 180 countries as part of the 2018 Corruption Perceptions Index (Transparency International 2019). Papua New Guinea's Prime Minister, James Marape, elected in 2019 and re-elected in 2022, identified corruption as a major issue in Papua New Guinea and pledged to establish a new anti-corruption body (Financial Review 2019; Xinhua 2019).

9.2.1.2 National Capital District

This section characterises the social environment of the NCD, including Port Moresby. Port Moresby is the largest city in the Pacific region and was originally an administrative centre for a colonial government and developed an urban form to suit this purpose. Most of the city's population is comprised of Melanesian people, with a small minority of expatriates. Port Moresby has a complex social environment which is attributable to many factors including the city's colonial legacy, wealth inequalities, high rates of formal unemployment and occasional ethnic tensions between groups (Global Cities Research Institute 2019).

The NCD is governed by the NCD Commission and the Motu-Koitabu Assembly, representing the customary landowners of the area. The Motu and Koita are two ethnic groups that comprised Hanuabada ('big village'), the Indigenous settlement in the Port Moresby area first visited in 1873 by the Europeans. Reflecting their long and shared history, the two ethnic groups are known as the Motu-Koitabu people (Rooney 2017).

Population and settlements

The 2011 National Census reported that the NCD had a population of 364,125 (5% of the national population), an average population density of 1,366 persons per km² and an average household size of 7.7 persons (NSO 2014). The 2011 National Census also reported an annual population growth rate of 3.3% since the 2000 Census, noting there is a reasonable degree of uncertainty around the current population (Jones 2012; ADB 2018). Future population growth is predicted to be significant as urbanisation continues. For example, in 2018 the World Bank stated that if Papua New Guinea reached the current average Pacific urbanisation rate of 50% by 2050, it would result in a population of 9 million, and the population of Port Moresby would exceed 3 million people (World Bank 2018).

Population growth has driven the establishment of settlements in and around Port Moresby, which are estimated to house approximately 50% of Port Moresby's total population (UN Habitat 2010). In 2010, the number of settlements was increasing at a rate of approximately 5 to 20 settlements per year and were expected to continue growing due to inadequate supply of housing (Jones 2012). The provision of services and infrastructure across the settlements was summarised by Jones (2012) as:

In the older established settlements, there are churches, community halls and recreation areas. Water is supplied to those who can afford a connection fee by Eda Ranu, the NCD water supplier. Other households break water pipes and make their own connection, while others share a standpipe, also through illegal connection. As most of the settlements are outside of the NCD sewerage system, settlers use pit latrines, septic styled systems, or where location allows, the sea or bush. Only a few have flush toilets. All settlements have roads, mainly unsealed, and a reliable system of Public Motor Vehicles—small buses—that ensure ready access to all parts of the city, including markets. Where space and land suitability allows, gardening activities supplement household diets. Approximately one third of settlements have access to reticulated electricity, with EasiPay (prepaid electricity) being common in the settlements.

Access to land for housing development remains an issue. Within the NCD, 40% of the land area remains customary land, with 60% being alienated or State land. Approximately 40% of the land area within the NCD is estimated to not be suitable for residential development due to physical and environmental constraints (UN

Habitat 2010). The Social Baseline (Appendix C) notes that among the Motu-Koitabu people there is concern that urbanisation poses a threat to land ownership rights and cultural heritage.

The COVID-19 pandemic had a deflationary effect on the housing market due to the drop in demand from overseas workers being repatriated during 2020 and 2021. As a result, property prices have fallen in line with rental values, which has meant the market is beginning to become moderately affordable with several housing projects being realised (Hausples 2022).

Access to housing was an issue in the period following the development of the PNG LNG Project, discussed further in Section 9.2.5.

Livelihoods

The formal sector wage employment in the Port Moresby area is centred on four main industry groups (ADB 2012):

- Services (e.g., finance, business, tourism, information and accommodation)
- Transport and communication
- Industry, processing of goods and construction
- Public administration.

Formal employment in the private sector in Port Moresby is believed to have peaked in 2012 at the height of the construction of the PNG LNG Project. Following this, the non-mining economy suffered a downturn following the end of the mining boom, with private sector employment falling by 20% from 2012 to 2016 in Port Moresby. This was mainly due to declines in the trade, construction and wholesale industries (World Bank 2019).

In addition to formal sector employment, the informal sector sustains the livelihoods of most urban residents. Many formal sector employees also engage in informal economic activity to generate supplementary income. These activities are diverse and include the sale of consumables, surplus crops and animals, handmade goods, second-hand provisions (e.g., clothes, food and goods) and stolen goods and services (e.g., illegal connections to water and power).

A 2018 audit of the informal economy in Papua New Guinea found that the informal sector was valued at PGK 12 billion (US\$3.5 billion) per year, which equated to approximately 20% of GDP. The participants were found to be better educated (less than 20% having no education) than participants in a previous survey in 2001 and were comprised of an older cohort (over 35 years old) (Luluaki 2018).

As a result of the high price of fresh fruit and vegetables, the production of food for sale is an important informal sector activity. Household gardens are important however the lack of land tenure, cultivation on steep slopes, poor topsoil and lack of water are common challenges.

The volume of fresh food supply in the central Province and NCD is increasing, with production from peri-urban areas vastly improving Port Moresby's capacity to feed itself (Wilson 2012). This can be attributed to the involvement of experienced farmers from the highlands, the availability of off-farm income and chemical fertiliser, and the establishment of commercial vegetable farms (Wilson 2012). The COVID-19 pandemic resulted in reductions in the volume of fresh food shipped to Port Moresby and significant disruption to local livelihoods in the sector (Unicef, World Bank Group, and UN Papua New Guinea 2021).

Livelihood options for youth are a significant issue in Port Moresby. Few opportunities exist in the formal sector. The challenge is compounded by the limited places available in post-school training institutions, the ability to gain skills being constrained and the oversupply of low skilled labour competing for the limited places available (NSO 2014; World Bank 2019).

Infrastructure and services

Port Moresby's suburban areas are characterised by inconsistent access to basic infrastructure such as roads, water and power. However, there remains a significant lack of water, power and sewerage services in settlement areas.

In suburban areas of Port Moresby, there is typically adequate provision of education and training infrastructure. However, approximately 80% of the population in NCD reported in the 2011 Census that they have never attended school, significantly higher than the national average of 60% (NSO 2014). Men and women in NCD who did attend school reported having completed more schooling years (a median of 9.2 years for women and 9.7 for men) compared to the national median (5.5 years for women and 6.8 for men). Education and training infrastructure in Port Moresby include:

- Universities: The University of Papua New Guinea, the Pacific Adventist University, and a campus of the Divine Word University.
- Post-school training institutions: Port Moresby Technical College, Don Bosco Technical Institute, the Port Moresby Business College, the International Education Agency TAFE college at Ela Beach, the Australia Pacific Training Coalition campus and a Site Skills Training facility (which includes a mock gas process plant).
- Secondary schools: The Port Moresby National School, the Port Moresby International School, Gordon Secondary School and several church-managed schools such as Marianville and De La Salle secondary schools.
- Primary school facilities run by the government or faith-based organisations. These facilities are located throughout major catchment areas and are often not well maintained, lack resources, and are overcrowded (UN Habitat 2010). Existing facilities lack land to expand and difficulties in obtaining land prevents new establishments (DoE 2007).

Port Moresby residents have access to some of the best healthcare facilities in the country, including:

- The publicly funded Port Moresby General Hospital, with 24-hour accident and emergency facilities.
- Private service providers:
 - Pacific International Hospital
 - Paradise Private Hospital
 - Port Moresby Medical Service
 - Aspen Medical Harbour City.

Hotel accommodation in Port Moresby grew rapidly at the start of the construction of the PNG LNG Project in 2011 and as result of Papua New Guinea hosting the APEC Leader's Summit in 2018. Accommodation developed during this period includes (Oxford Business Group 2018):

- Opening of new hotels (e.g., Stanley, Grand Papua)
- Expansion of existing hotels (e.g., Airways, Holiday Inn)
- The PGK 1.5 billion Star Mountain Plaza including a Hilton Hotel (currently being expanded) and the Kutubu Convention Centre
- The PGK 120 million APEC Haus, which hosted the APEC Summit.

Upgrades to the Jacksons International Airport in Port Moresby and other infrastructure upgrades (e.g., new retail facilities, public parks, walkways, commercial facilities, and road and transport infrastructure) were completed to support the APEC Leader's Summit.

Ports in Port Moresby include the Port Moresby Port and the Motukea Port, which includes a mobile crane, bulk handling and passenger handling facilities. Motukea Port is located 12 km southeast of the LNG Plant.

Crime and security

Although the available data on crime is limited, the data that is available indicates that there is a high level of unreported crime and victimisation in Papua New Guinea (Walton and Dinnen, 2022). For example, the homicide rate in Port Moresby in 2010 (33 per 100,000 persons) was three times the global homicide rate (Craig and Porter 2018). The crime crisis in urban Papua New Guinea during the late 1980s and 1990s began to pass as the resource boom began in the 2000s and early 2010s, potentially due to:

- Urban gangs failing to institutionalise during the recent decades and ‘growing out of crime’.
- Urbanisation bringing diverse people together, creating powerful incentives for investment in security and safety.
- An increase in available alternative pathways for settlement youth to seek education and employment during the resource boom of 2003 to 2015.

However, in general crime in Port Moresby is high and often involves a high level of violence (comprising 38% of offences). Craig and Porter (2018) indicated that violence and insecurity remained pronounced for women, youth, marginal ethnic groups, informal traders (such as market vendors) and residents in informal settlements.

Cultural and governance

Port Moresby is a ‘melting pot’ with extreme diversity and ethnic heterogeneity. The combination of cultures has led to the emergence of forms of social organisation and solidarity, for example pidgin English (Tok Pisin) has been adopted as a common language allowing the formation of labour and ethnic movements. The Motu-Koita are the traditional owners of Port Moresby. The Motu people were traditionally coastal dwellers, while the Koitabu (also referred to as Koita) lived inland. The Motu-Koita established major villages within Port Moresby including the villages of Baruni, Tatana, Vabukori, Kilakila, Pari, Korobosea, and Hanuabada (ADB 2016). The interests of the Motu-Koita are represented by the Motu-Koitabu Council, which is administered by the NCD Commission.

Port Moresby consists of 12 wards in three electorates: Port Moresby North-east, Port Moresby North-west and Port Moresby South-east. The NCD is an Urban Local Level Government and differs from provincial government systems. The broad structure of governance in the NCD is discussed in Section 9.2.1.1. The Motu-Koitabu Assembly is the locally elected government in Port Moresby. It represents the interests of the seven traditional villages within the NCD which are represented by councillors, a chairman, 14 ward members and two women’s representatives. The representatives are voted for by traditional owners. The unit operates under the *National Capital District Commission Act 2001*, the administrative authority responsible for municipal services, and recognises the traditional landowners of Port Moresby in a formal local level government (UN Habitat 2013).

9.2.2 LNG Plant study area

The section characterises the social environment of the LNG Plant study area. Information on Edai Town is presented separately to the landowner villages and provided in Section 9.2.3.

9.2.2.1 Place and population

The LNG Plant study area is comprised of four coastal villages nearest to the LNG Plant (see Figure 9.1). This includes Lea Lea and Papa to the north-west and Boera and Porebada to the south-west of the LNG Plant. Edai Town, discussed in Section 9.2.3, has been included as it is along the 16-km-long project logistics route between Motukea Port and the LNG Plant. The LNG Plant communities are peri-urban coastal villages surrounded by savannah or denser vegetation where there are steeper slopes and watercourses or drainage

areas. The coast is typically fringed by dense stands of mangroves. The communities are outlined in Table 9.1.

Table 9.1 LNG Plant communities

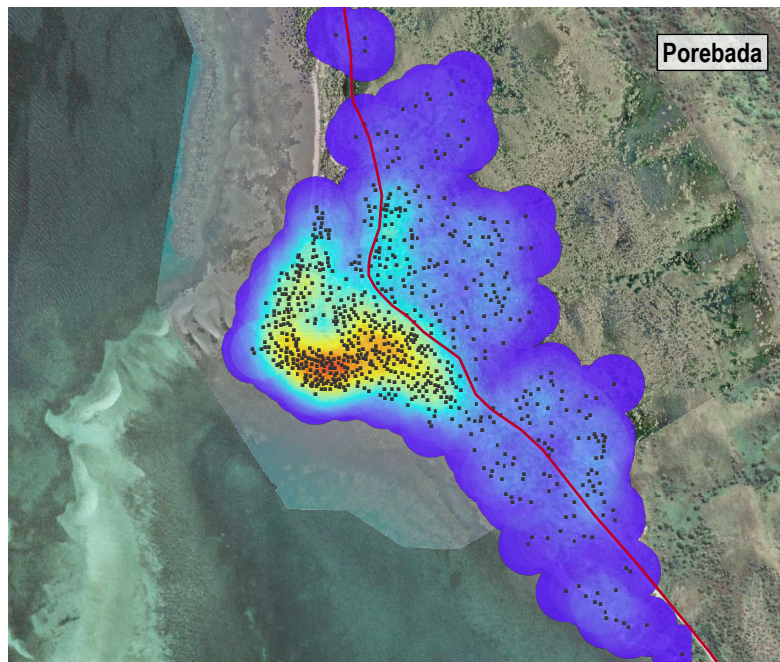
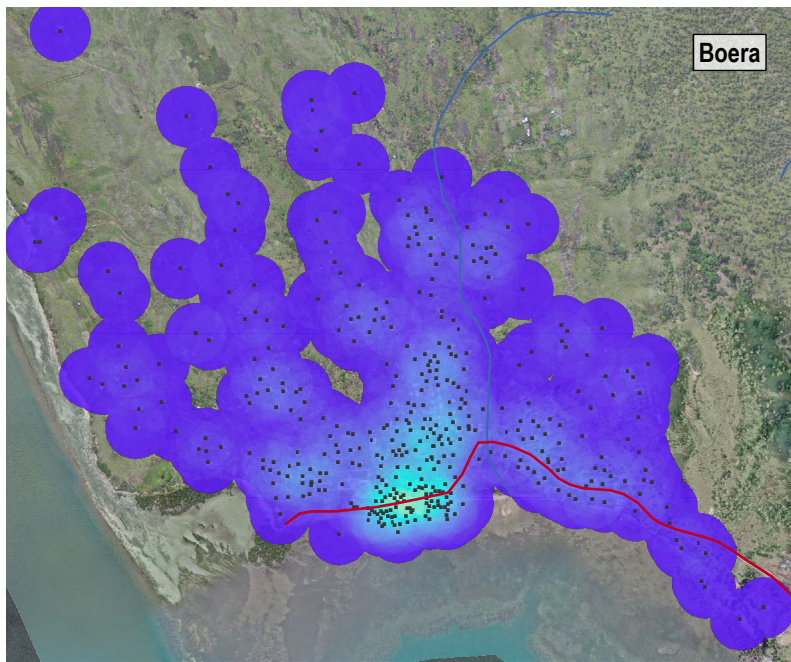
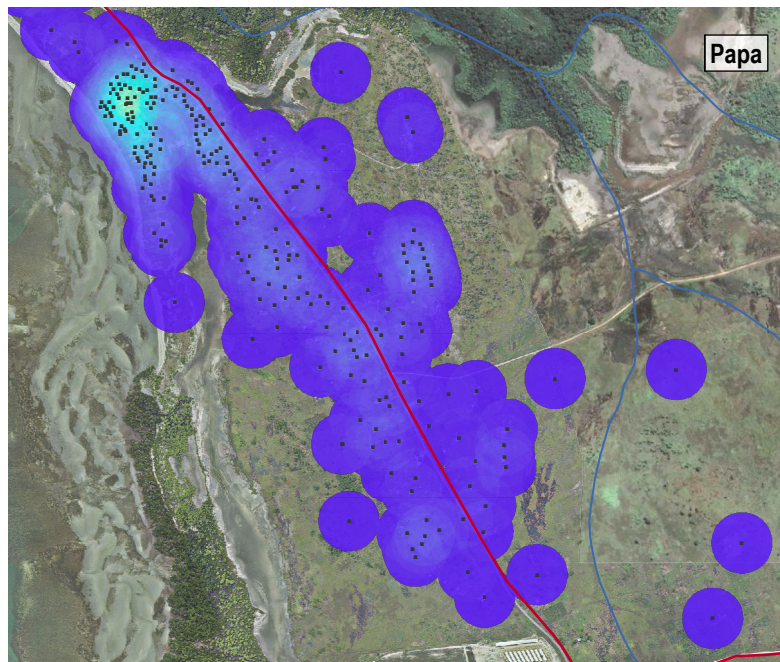
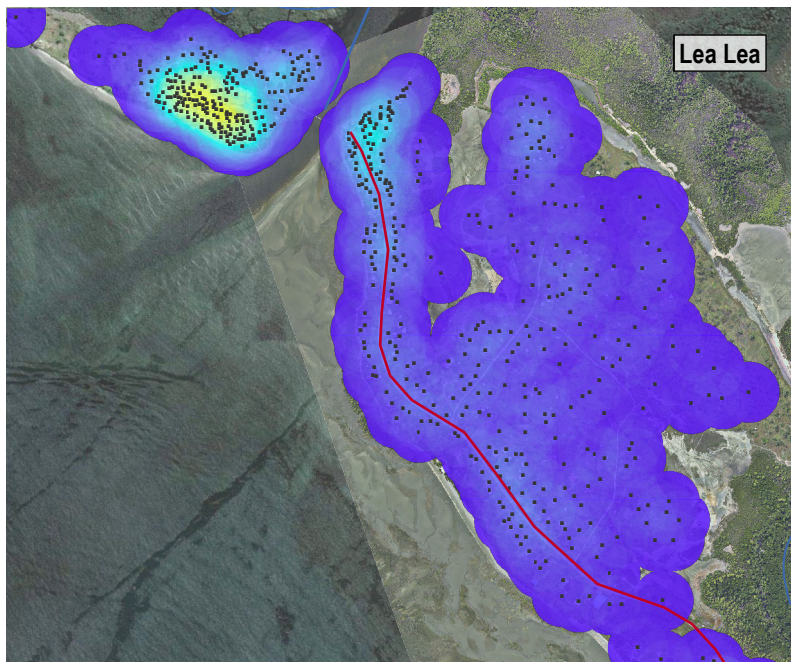
Village	Description of village
Lea Lea village	- Located approximately 4 km north-west of the LNG Plant boundary. - The village is located on both sides of the Kido River, with residential areas focused along the coast. - Accessed via road travel through Papa, and sea when required.
Papa village	- Located approximately 1.5 km north-west of the LNG Plant boundary, adjacent to Lea Lea. - Karuka Creek is east of the village. - Residences are located on the coast and further inland towards the LNG Plant site. - A small group of houses occurs near Metago United Church Training Institute, accessible by road approximately 2 km east from Papa.
Boera village	- Located approximately 3 km south-west of the LNG Plant boundary along the coast of Caution Bay. - The village is concentrated along the coast, with some dwellings built of raised stilts on the beach. - Residential areas extend north from the coast further inland along small tracks. - Accessible by bitumen road off the Lea Lea Road and by sea when required.
Porebada village	- Located approximately 8 km south-west of the LNG Plant boundary and is the closest to Port Moresby. - Densely populated, with most dwellings occurring along the coast and some houses built on stilts over the water. - Primary access is by road from Via Junction and by a small coastal track connected to Boera.

The population of each LNG Plant community was estimated based on the surveys undertaken by the Papua New Guinean Institute of Medical Research (PNG IMR). The total population of the LNG Plant study area in 2017 was estimated to be 16,647. Porebada has the largest population with 5,915 residents, followed by Lea Lea (4,400 residents), Boera (2,574 residents) and Papa (1,741 residents) (PNG IMG 2018).

Population density is shown on Figure 9.3. The population density in Porebada is much higher than other villages, possibly due to less land being available for housing around the village and/or the practice of building houses close together over water.

Table 9.2 shows the compound annual population growth rate between 2011 and 2017 for LNG Plant villages.¹ As shown, Boera was the fastest-growing village, followed by Lea Lea. Population growth in Boera and Lea Lea using the PNG IMR data is substantially higher than that demonstrated in Porebada and Papa. Further, these levels are significantly above that of the most recent national inter-census periods of 3.1%, particularly in Boera and Lea Lea (NewFields 2017). The level of growth reported between 2015 and 2017 is at rates that appear indicative of notable population growth. The data may warrant additional analysis to confirm population growth rates, noting that the small size of the communities may result in what appears to be large fluctuations in growth rates.

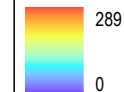
¹ There is no recent and reliable data available on population dynamics within the LNG Plant villages, a situation that is replicated across Papua New Guinea and has encouraged a number of commentators to note that 'no one knows the size of Papua New Guinea's population' (Laveil 2023; also see: Bourke and Allen 2021). The national census that was scheduled for 2021 has been delayed several times and is now scheduled for 2024.



LEGEND

- Household
- Road
- Watercourse

People per hectare



NOTE

The mean number of residents per household specific to the village have been used for households that were not surveyed.

SOURCE

Households and population density from Tetra Tech Coffey.
Infrastructure, roads and watercourses from EMPNGA.
Imagery from EMPNGA and Google Earth.



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m

SCALE 1:25,000

PAGE SIZE: A4

PROJECTION: WGS 1984 UTM Zone 55S

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PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 9.3

Population density - LNG Plant villages



TETRA TECH
COFFEY

Table 9.2 Compound annual population growth rate between 2011 and 2017 - LNG Plant villages

Village	2000 to 2011	2011 to 2013	2013 to 2015	2015 to 2017	2011 to 2017	2013 to 2017
Papa	5.2%	1.6%	-1.8%	2.2%	0.6%	0.2%
Boera	2.6%	1.4%	-0.3%	20.6%	6.8%	9.6%
Lea Lea	3.9%	1.6%	4.2%	14.1%	6.5%	9.1%
Porebada	1.1%	4.0%	-1.4%	4.9%	2.5%	1.7%
Total	2.5%	2.6%	0.2%	16.9%	6.3%	8.2%

Source: NewFields (2017); and PNG IMR (2018).

Project-induced in-migration was identified as a potential impact in the PNG LNG Project Social Impact Assessment (Goldman 2008). A Project-Induced In-Migration Monitoring report (IESC 2015) found that some project-induced in-migration occurred, although the scale and rate of in-migration did not overwhelm communities or the services provided, and that the movement was gender balanced and often included whole families.

Across the villages, there are more male than female residents, with approximately 53% of the population being male. The villages are characterised by a young population, with the average age in each village below 26.5 years. This indicates the importance of the provision of education and training and employment initiatives to future livelihoods.

Social vulnerability indicators relevant to the LNG Plant study area include:

- Unemployed households or households completely reliant on subsistence agricultural and fishing activities with few cash income avenues.
- Households with illiterate adults.
- Single female-headed households.
- Households with a high dependency ratio.

Vulnerability presented differently in each village:

- Lea Lea had the highest proportion of single female-headed households (23%). As noted in the Community Health Baseline Report prepared by NewFields (2022), a concern raised by women in Lea Lea during the 2019 focus group discussions included “young girls having babies outside marriage”. Lea Lea also had the highest number of households that included illiterate adults (6%).
- Porebada had the highest proportion of households that had few cash income earning avenues (10%), followed by Papa (7%).
- The proportion of households with high dependency ratios was generally consistent, at around half of the households surveyed.

9.2.2.2 Livelihoods

The overarching theme of livelihoods considers how people secure the necessities of life to sustain themselves and their families. The principal elements supporting livelihoods in the LNG Plant study area are natural capital, human resources (or labour) and hard and soft infrastructure and services supporting engagement in marketing activity. The status of indicators of these elements is described in the following section.

Natural capital use

Traditional livelihoods in the LNG Plant study area are based on the use of natural resources. Motu people are highly dependent on the nearshore zone and the marine area for harvesting food and sourcing material for

traditional hunting and housing. Natural capital use in the LNG Plant study area is related to the provisioning of services (e.g., wild-caught fish) and supporting services (e.g., land supporting gardening).

Fishing

Fishing and the gleaning of marine resources (e.g., shells, mud crabs, sea cucumber) is an important activity across the LNG Plant villages (Table 9.3). As summarised in Table 9.3, upwards of 82% of households across the LNG Plant study area undertake fishing at least once per week, and upwards of 77% of households undertake gleaning at least once per week.

Table 9.3 Frequency of households that fish and glean weekly or more frequently

Village	Fishing frequency	Seafood gleaning frequency
Porebada	93%	83%
Boera	89%	86%
Papa	82%	77%
Lea Lea	88%	91%

The household survey indicated that the consumption of fresh fish remains important in household diets. Table 9.4 outlines responses to the fresh fish consumption question in the household survey. In Porebada and Lea Lea, approximately 40% to 50% of households indicated consuming fresh fish three to four days per week. In Papa, 45% of households indicated consumption of fresh fish five to six days per week. In Boera, 27% of households consume fresh fish every day, consistent with a higher level of fishing effort recorded in that village. All villages consume tinned fish on more days per week than fresh fish, except for Papa, which consumes more fresh fish than tinned (Table 9.5).

Table 9.4 Household fresh fish consumption

Consumption frequency	Porebada	Boera	Papa	Lea Lea
Every day	9%	27%	10%	10%
5 to 6 days per week	20%	19%	45%	14%
3 to 4 days per week	39%	28%	26%	47%
1 to 2 days per week	29%	26%	19%	27%

Source: Appendix C Social Baseline.

Table 9.5 Household fish consumption frequency (mean number of days per week)

Fish type	Porebada	Boera	Papa	Lea Lea
Fresh	3.5	4.2	4.4	3.4
Tinned	4.8	4.8	3.7	3.9

Source: Appendix C Social Baseline.

Most households rely on household members to catch fish. The household survey indicated that 31% of households' most common source of fish was "caught by household members". Households indicated that a proportion of people purchase fish (9%), generally at a village market rather than in Port Moresby market. Gifting or exchange of fish remains an important mechanism for household protein intake, with 6% of households indicating their most common source of fish is "given by someone else (no payment)".

Both the household survey and surveys in 2008 indicated that fishing is a male-orientated activity (more than 95% of households surveyed in 2019 and 129 male lead fishers in 2008), with a small input of labour by women (14 female fishers were recorded in the 2008 survey).

The areas fished by each village are shown in Figure 9.4. There is a safety exclusion zone around the LNG Plant jetty, where fishing is prohibited. Fishing occurs across the following locations:

- Caution Bay and barrier reefs, with between 50% and 60% of households targeting reef areas.
- Open ocean, with surveyed households in Porebada and Boera (30% to 40%, respectively) fishing in the open sea.
- Rivers and creeks, with surveyed households in Papa and Lea Lea targeting these areas (34% to 11%, respectively).
- Beach, with beach fishing mainly carried out by Papa residents.

The Caution Bay fisheries resource use study indicated that from 2012 to 2019, the most common fishing locations shifted from beach to barrier reef and open ocean sites. Fishing in fringing reefs declined while fishing in the open ocean has become more frequent (Coffey 2020). However, fishing in the open sea was not uncommon as at the 2008 field investigations, and stocks were reported to have been depleted at this time due to overfishing. The stock depletions were attributed to the adoption of plastic fishing nets and the increase in the availability of motorised boats. This indicates a longer-term change in fishing practices in the area that pre-dates the PNG LNG Project.

The household survey completed in 2019 found that across all villages the highest indicated frequency for fishing was 'several times per week' (Porebada: 63%, Lea Lea: 59% and Papa: 39%), except for Boera which indicated a frequency of fishing 'daily' (33%). The most common frequency of seafood gleaning across the households was 'several times per week', except Papa where it was indicated 37% of households glean 'daily'.

The most caught fish during the fisheries survey were long toms and garfish, jacks and scad, emperors and breams, snapper, mackerels and tunas, sea bass and grouper, tilapia, mullet, goatfish and rabbitfish.

The household survey found that the use of spears or spear guns is the most common fishing method, while trolling is the least common. Both the 2008 and 2019 field investigations found dynamite is not commonly used in the outer reef area (Coffey 2020). Dinghies are the most used vessels by fishers from Boera, Porebada and Lea Lea, while canoes were the most used vessel by fishers from Papa.

The household survey asked how current fish catches compare with five years ago. Most households (65%) in all villages (particularly in Boera and Lea Lea) indicated the current fish catch was less than caught previously.

There is a perception within the fishing community that existing marine project infrastructure (e.g., LNG Plant jetty) is attracting fish that cannot be targeted due to the safety exclusion zone, which is increasing the required effort to maintain catch levels, and potentially reducing fish stocks in other areas.

The findings of the Nearshore Marine Baseline (Appendix E) report that the establishment of the LNG Plant jetty has over time provided a relatively protected artificial habitat that currently supports several fish species (e.g., trevally and surgeonfish) likely to be targeted by local fishing activity. However, improvements in habitat within one area of Caution Bay are not likely to reduce the overall fish stock within Caution Bay but are likely to support the overall fish stock in Caution Bay.

Mangroves are commonly used for firewood and posts for building houses, with 38% to 71% of houses in all villages having been made using mangrove posts. Mangrove posts are more common in Porebada (71%) and Lea Lea (59%) than other villages.



Gardening and hunting

Traditional use of land and other terrestrial resources, particularly subsistence gardening, is important to LNG Plant study area residents. Cassava, bananas and yams are the dominant staples grown in all villages. Cassava is the most important (main staple crop grown by 80% to 90% of surveyed households), while yams are the least important in Porebada, possibly due to limited gardening land. Bananas supplement cassava and yams in Lea Lea. Across all villages, the main vegetable grown are greens (aibika and pumpkin tips) and corn.

The main constraints to gardening staples or vegetables are poor soil fertility, lack of water during Port Moresby's dry seasons and limited time availability, which is indicative of households where wage employment has become the main livelihood activity. Poor soil and lack of water are well-known characteristics of the Motu coastal villages and being time-poor is a characteristic of the transition from a subsistence to a peri-urban economy. Common gardening issues discussed in the household survey include:

- Gardening is not a priority when cash is available through wage employment.
- Land disputes affect both the suitability and availability of land for gardening. This arises due to compensation and royalty distribution from the PNG LNG Project and population growth.
- Garden security, where stealing and vandalism occur when the garden is distant from the gardening household.

The household survey indicated households generally have sufficient land available for gardening and that land availability aligns with population density (90% of residents in Lea Lea and 88% of residents in Papa have sufficient land available for gardening); that is, the perception of having sufficient land availability decreases as the population density increases. For example, Porebada has the highest population density (Figure 9.3) and had the lowest proportion of households that stated they had sufficient land for gardening (69%). The garden land is also of lower quality than other villages, with 22% indicating land was poor quality compared to 5% to 9% of respondents from other villages.

The household survey responses indicated that none of the surveyed residents from Porebada or Boera and a small proportion (6% to 7%) of the surveyed residents from Lea Lea and Papa ate bushmeat in the two weeks prior to the survey. The food frequency survey results were similar and indicated that Papa residents ate bushmeat on average 46 days per year (i.e., a little less than once per week), while the other villages ate bush meat on average 8 to 18 days per year (i.e., about once per month). These results indicate hunting does not provide a significant source of food for villages in the study area, aside from Papa. This is consistent with the cultural context, as residents from Papa are from the Koitabu ethnic group, and traditionally incorporate hunting for protein, whereas other villages are Motuan and traditionally rely on fishing for protein. Papa residents mentioned the importance of hunting to their livelihoods during focus group discussions, particularly the hunting of deer, pig and wallabies for household consumption and market sales.

9.2.2.3 Cash economy activity

Employment and income

Due to the limited responses to the survey questions on the household survey, limited analysis was possible, and observations should be regarded as indicative only. The proportion of surveyed households receiving income from different sources over the past year included:

- Approximately 30% of households received income from work through the LNG Plant, with half of that being through Laba Holdings² compared to direct employment at the LNG Plant.

² Laba Holdings is the umbrella landowner company representing the LNG Plant site villages that was established in 2009 to support with the supply of local labour hire during the construction phase of the PNG LNG Project (PNG LNG n.d.).

- Boera has the highest proportion of households receiving income from Laba Holdings (22%) or another landowner company (16%), possibly due to a close association with Laba Holdings and employment from the Boera Landowner company (Boera Holdings).
- Porebada, Papa and Lea Lea households received limited income from local landowner companies other than Laba Holdings.
- Approximately 20% of households in all villages received income from other private sector employment, excluding Boera (9%).

Overall, around half of surveyed households in all villages receive income from wage employment, except for Papa where only 36% of households reported receiving income from wage employment. The studies undertaken in 2008 for the PNG LNG Project recorded that 25% of the study area households received income from employment (Coffey Natural Systems 2009). When compared to the findings of the 2019 household surveys, this indicates the level of formal employment has doubled over the past 11 years. Weekly household income from wage employment was in the order of PGK 250 to PGK 500.

Households across the study area received income from fishing, notably in Boera where around half (48%) earned income from fishing. Fishing for catch and sale is practised in all villages, with weekly household income ranging from PGK 52 to PGK 125. The focus group discussions indicate income is generated through operating market stalls and trade stores (i.e., informal economic activities). Income is also generated through the sale of:

- Betel nut (*buai*)
- Cooked food, including baked goods
- Garden produce (e.g., yam, cassava, coconut, mango, sugar cane and watermelon)
- Tailoring and sewing services
- Firewood
- House posts
- Bush meat (e.g., wallaby, pig and deer).

Household expenditure

Results from the household survey indicate that households mainly spend money on food, fuel and mobile phone credit. As detailed in Table 9.6, households spent the largest weekly amount purchasing food (between PGK 120 and PGK 175), followed by fuel (between PGK 30 to PGK 75) and maintaining credit on mobile phone (between PGK 15 to PGK 25). Consistent with these results, responses to the household survey and comments made during the focus group discussions indicated food is the main daily expenditure for all villages. Water was the next most reported main daily expenditure by households in Boera and in Porebada where it was indicated that purchasing water costs some houses PGK 20 to PGK 30 per week. A 200 litre drum costs PGK 20 and lasts up to four days. Porebada also reported fishing items as a daily expenditure, with dinghies being hired out for fishing trips for PGK 10 per person. Fuel was indicated as a daily expenditure by households in Boera and utilities (power and phone) by households in Lea Lea.

A high cost of living was raised as a concern across the villages in the household survey. In Porebada, households raised both water costs and the significant expense of medical care. The households also noted there is some level of labour exchange for food within Porebada and that short-term borrowing at exorbitant rates occurs to tide households over periods of cash shortages. In Boera, where there is a high number of dependents per wage earner, there was a significant number of comments made on the high cost of living (e.g., 'high cost of living is really draining families like mine'). High medical expenses were also indicated, as well as the cost of power (between PGK 6 to PGK 7 per day). The high cost of living was also noted by households in Papa, influenced by many persons depending on the wage earner and obligations for the care of disadvantaged persons. It was indicated that households collaborate to overcome regular cash shortages

and some households must make provisions for debt repayment. Households in Lea Lea did not note the cost of living, but indicated many people rely on loans from relatives and that there is a general reliance on extended families.

Table 9.6 Household expenditure on food, fuel and mobile phone credit

Village	Statistic	Food	Fuel
Porebada	Average surveyed household weekly amount spent (PGK)	125	30
	Number and % of surveyed households responding	139 (95%)	36 (24%)
Boera	Average surveyed household weekly amount spent (PGK).	175	40
	Number and % of surveyed households responding	82 (95%)	28 (33%)
Papa	Average surveyed household weekly amount spent (PGK)	130	40
	Number and % of surveyed households responding	69 (97%)	11 (15%)
Lea Lea	Average surveyed household weekly amount spent (PGK)	120	75
	Number and % of surveyed households responding	97 (98%)	19 (19%)

Source: Appendix C Social Baseline.

Asset ownership

Assets ownership provides insights into the affordability and importance of material goods to residents of the study area. The proximity of the LNG Plant study area to Port Moresby and accessibility to shopping areas and goods means that most goods are readily available.

Table 9.7 summarises household survey responses on the ownership of assets. The most common assets owned in 2019 included mobile phones, televisions, fishing nets and fridges or freezers. Overall, Porebada had the lowest level of asset ownership across the five most common assets.

Table 9.7 Five most common assets (% of surveyed households)

	Porebada	Boera	Papa	Lea Lea
1st	Mobile phone (85%)	Mobile phone (94%)	Mobile phone (96%)	Mobile phone (94%)
2nd	Television (37%)	Television (54%)	Fishing nets (58%)	Television (52%)
3rd	Freezer (28%)	Fishing nets (44%)	Television (45%)	Fishing nets (40%)
4th	Washing machine (21%)	Fridge (37%)	Fridge (30%)	Fridge (40%)
5th	Fishing nets (20%) Sewing machine (20%)	Freezer (33%)	Car (23%) Canoe (23%) Sewing machine (23%)	Freezer (31%)

Source: Appendix C Social Baseline.

9.2.2.4 Culture

Governance

The study area is in the new Koiari-Hiri district of Central Province and is divided into four local governments and 18 ward areas, represented by elected ward members. The study area villages are represented by 6 of the 18 ward members. The study area villages are within the Hiri Rural local level government area.

The social structure within the study area villages is based on patrilineal descent (i.e., the male line) groups (iduhu). Business success, high rank in public service employment, success in national and/or provincial politics and land ownership are key functions that bring recognition, authority and power within village society (Coffey Natural Systems 2009).

Local churches are central to the social lives of communities in the study area and are involved in daily governance. Churches serve as meeting places and the centre of village life where conflicts in communities can be brought before the village court.

The Buria Police provides services to the nine Hiri west communities, including the LNG Plant villages. Consultation with the Police Post in 2022 indicated key issues include alcohol violence and conflict between landowners and settlers, particularly in Porebada and Lea Lea. Similarly, the focus group discussions undertaken for this Project indicated that the PNG LNG Project indirectly contributed to ongoing land disputes within the LNG Plant villages through in-migration and reduced land availability, in addition to the ongoing dispute regarding ownership of land within the Lea Lea Road corridor (Wu 2020), which indicates that this is an ongoing and sustained issue. Incorporated land groups support the distribution of royalties and equity payments, while landowner companies provide business and employment and provide opportunities for landowners to share profits. Laba Holdings was established as the umbrella company for the LNG Plant area and each LNG Plant village established landowner companies, of which only Boera Holdings is operational as of 2022 consultation.

The household survey indicated considerable community concern over the distribution of employment opportunities by landowner companies during the construction of the PNG LNG Project. There is historical dissatisfaction with landowner groups in the LNG Plant villages due to a lack of community consultation and feedback, financial misappropriation, distribution of equities and leadership problems. Consultation undertaken in 2019 and in 2023 indicated that some of these concerns remain for the LNG Plant communities.

Religious and traditional practice adherence

The main religion practised is Christianity (Uniting Church), representing 82% of households. Other Christian religious adherence includes Seventh Day Adventists (8%), Catholic (1%) and Pentecostal (1%). All villages surveyed had a functioning church, with Lea Lea having four church facilities.

Most villages receive community support from the churches through community development programs, such as youth and women's support programs.

Communities indicated that traditional activities (e.g., fishing and canoe making) still occurred but were declining due to increasing reliance on wages, reduced time and need to undertake the activities and a lack of clarity regarding land ownership boundaries. Traditional practice and cultural knowledge are in decline due to population growth and marriages between different cultures. Communities indicated their cultural identity was strongly linked with access to land and marine resources.

9.2.2.5 Personal and community wellbeing

Built environment

Table 9.8 provides a summary of the status of the built environment of the LNG Plant study area.

Table 9.8 Summary of the built environment in the LNG Plant study area

Built environment	Status in the LNG Plant study area
Housing	• Kapa sheeting for cladding and roofing and mangrove timber for house posts are the most common housing materials. • Most houses are built on land. However, Porebada and Boera have many houses built over the water in traditional Motuan style. • On average, houses have two or three bedrooms and between eight and nine residents per household. • There is a low level of insect screen ownership (less than 50% of surveyed households). • Cooking mostly occurs in internal kitchens (46%), followed by external kitchens (40%) and sometimes both (13%). • The most common fuel for cooking includes wood, kerosene, electricity and gas.
Infrastructure	
Water	• Villages rely on several water sources including piped water supply taps, rainwater tanks and tube wells. Water access is a noted and long-standing concern in all communities. • In Papa, 83% of people indicated they had access to water. In 2022, three 9,000 L water tanks were installed within the community as part of NiuPower's Community Investment Program. However, the piped water supply had not been functioning for three months due to poor water pressure. • In Lea Lea, 47% of people indicated they had access to water throughout the year. In 2022, three 9,000 L water tanks were installed. People continue to utilise the well accessible only by foot 2.5 km north of the village. Water access during the dry period is a noted issue and was reported during consultation to contribute to intra-village conflict. • In 2019 it was reported that Porebada village relied on two water sources (a water tank and a spring), both of poor quality and unreliable. Local residents reported that these sources were only used for washing due to poor quality. As discussed in Section 9.2.2.3, water was the second largest main daily expenditure of households in Porebada reported during the household survey. Three 9,000 L water tanks have since been installed as part of the Community Investment Program. However, the capacity of these tanks and the existing water source were reported to be unreliable, and as a result water carts were used to top up supply. Community access to water is a recognised community priority as at consultation undertaken in 2023. • In 2019, two tube wells were observed to be the primary water source for Boera village. Both sources were considered to be poorly maintained but reliable for 50% of the year. The water quality was poor and required filtering or treatment before use. Additional private sources may have been present. As discussed in Section 9.2.2.3, water was the second largest main daily expenditure of households in Boera reported during the household survey. Three 9,000 L water tanks were also installed in 2022. However, rain collection is reported to be insufficient to provide for village water demand, and as a result water collection is often undertaken at a household level and is reported to be a significant time burden.

Built environment	Status in the LNG Plant study area
Sanitation	- Households in Porebada (61%) and Lea Lea (45%) reported the highest levels of use of mangroves and/or the sea for human waste disposal. - Households in Boera (64%) and Papa (66%) reported the highest use of pit toilets. - Households in Lea Lea (14%) and Papa (11%) reported the highest use of communal toilets.
Electricity	- Between 64% and 87% of people indicated they had access to mains electricity, significantly higher than the national average of 23% (ADB 2019). - Reliability of electricity varies between villages; higher reliability was reported in Papa (57%) and Porebada (57%) compared to Boera (47%) and Lea Lea (33%). - Papa and Porebada had the highest number of households stating that the cost of electricity is high. - Between 32% and 58% of surveyed households indicated the use of solar panels, mainly used for lighting purposes and phone charging.
Roads	- Lea Lea Road, a dual lane bitumen sealed road with unsealed shoulders, services the study area, providing access to Port Moresby and other villages. - Mainly used for shopping, market trading, employment and social engagements, as well as supporting small-scale roadside markets and stalls trading goods. - During the 2019 and 2022 field investigations it was noted that the road condition has deteriorated with some sections heavily potholed.
Community and recreation	- Community and recreation facilities observed were limited. - Playing fields and basketball courts were observed in Lea Lea and Boera. - Trade stores have been anecdotally reported as being operational in each village; however, these were not recorded during the village surveys.
Amenity	The LNG Plant is visible to Papa and Lea Lea villages. Approximately 60% of respondents from Papa and Lea Lea villages report high-level effect on environmental amenity due to flaring effects (e.g., noise, light, odour, and heat). A lower percentage of households in Porebada and Boera (40%) reported a high-level effect on environmental amenity.

9.2.2.6 People's productive capacities and access to functioning services

Education

Status

Literacy levels within the study area are consistent with that of the Central Province, with the 80% of the population aged 10 years and over being literate. The villages with the highest level of literacy were Boera (86%) and Porebada (85%).

Table 9.9 outlines the number of enrolments across the education facilities in the LNG Plant study area. The gender ratio of students has evened out over time, and the mean number of students per teacher has increased considerably over the period from 2007 to 2019. During consultation undertaken in 2023, it was reported that student enrolment numbers in schools in the LNG Plant study area have increased significantly, with student teacher ratios between 60 to 90 students for each teacher.

Access to functioning services

The provision of educational services in the LNG Plant study area is limited due to a lack of facility maintenance and shortages of teachers. As of 2019 there were 11 schools in the study area, including elementary, primary and secondary facilities. Attendance, condition, and resources vary for each facility.

Porebada is the only village with a secondary school facility, which has approximately 300 students including those from surrounding villages that must travel to attend. The PNG LNG Project recently funded the construction of additional classrooms, the refurbishment of existing facilities and donated desk and chairs.

Table 9.9 Education facilities enrolments

Village	School type	2007					2019				
		Student enrolment			No. of teachers	Average students per teacher	Student enrolment			No. of teachers	Average students per teacher
		M	F	Total			M	F	Total		
Porebada	Secondary	180	113	293	14	21	153	145	298	16	19
	Primary	319	286	605	23	26	600	500	1,100	25	44
	Elementary	186	174	360	14	26	326	304	630	4	158
Boera	Primary	105	97	202	9	22	120	140	260	10	26
	Elementary	42	22	64	5	13	NA	NA	NA	NA	NA
Papa	Primary	73	67	140	4	35	257	320	577	7	82
	Elementary	43	21	64	3	21	107	120	227	5	45
Lea Lea	Primary	160	155	315	12	26	200	300	500	14	36
	Elementary	136	76	212	9	24	184	183	367	9	41

NA: Data not available at time of village survey.

Source: Coffey village surveys, 2019 and Coffey Natural Systems (2009)

Table 9.10 provides a summary of educational facilities in the study area.

Table 9.10 Summary of education facilities within the study area

Village	Grades taught	Number of classrooms	Number of teachers	Village survey comments
Porebada	Elementary	13	Information not available	The elementary school requires first aid kit, water tanks, chairs, and teacher accommodation.
	Elementary	1	1	-
	Elementary	1	3	-
	Primary	8	25	-
	Secondary	8	16	Five classrooms and teacher accommodation need renovation.
Boera	Primary	5	10	-
Papa	Primary	6	7	-
	Elementary	3	3	-
	Elementary	1	2	-
Lea Lea	Elementary	3	9	Three classrooms and five teacher housing require maintenance. In addition, 50 desks and fencing.
	Primary	8	14	-

Source: Coffey village survey 2019.

Food and nutrition

Food shortages were reported in many households during the household survey period. Table 9.11 provides a summary of reported food shortages within the previous 24 hours in each of the study area villages. Porebada had the highest number of households reporting food shortages (23% of households), which indicates a severe deficit in food consumption in the village. Common reasons cited for the shortage of food include:

- Seasonal shortages or gardens not being planted
- Lack of money to purchase store bought goods
- Obligations to share food with family members or visitors.

The COVID-19 pandemic has also resulted in increased food insecurity across Papua New Guinea due to increased transport costs, reduced availability of agri-inputs, closure of markets and an increase in the price of fresh food (Bourke 2020).

Results from the food frequency and 24-hour food recall surveys indicated a high level of uniformity in food consumption patterns across all study area villages. Rice is the dominant source of carbohydrates, followed by sweet potato and cassava. The primary source of protein was fresh and tinned fish, followed by chicken and tinned meat. The high consumption of rice, tinned fish, flour and other store foods across all village households confirms the transition from a purely subsistence to an urban diet dependent on processed foods.

Table 9.11 Summary of food shortages within study area villages in the previous 24 hours

Village	Percentage of households reporting food shortage	Main food types in short supply	Reasons for shortage
Porebada	23%	• Garden produce • Rice • Flour • Protein • Sugar	• Not planted, or seasonal shortage • Shortage of money to buy • Sharing with extended family or friends.
Boera	4%	• Garden produce • Rice • Flour • Protein	• Not planted, or seasonal shortage • Shortage of money to buy • Sharing with extended family or friends.
Papa	15%	• Rice • Protein • Staples	• Not planted, or seasonal shortage • Shortage of money to buy.
Lea Lea	11%	• Garden produce • Rice • Flour • Protein	• Not planted, or seasonal shortage • Shortage of money to buy • Sharing with extended family or friends.

Source: Coffey household surveys 2019

Health

This section summarises the findings of the Community Health Baseline (Appendix B) prepared by NewFields.

Burden of disease

Clinic data from 2018 show that pre-COVID-19 illness pattern is dominated by respiratory and skin infections. The household survey reported fever, diarrhoea, malaria, respiratory diseases, and skin diseases being common in the study area. Eye and ear infections, and diarrhoea are also common. The top five causes of adult death across the LNG Plant study area from 2010 to 2016 were tuberculosis, cancer, diabetes, malaria, and HIV/AIDS. Health services and facilities across the study area are indicated as limited and lacking in basic equipment and resources. Table 9.12 summarises the health status of people in the study area.

Table 9.12 Summary of the health status of people in the LNG Plant study area

Health aspect	Summary
Communicable respiratory diseases	• Prior to COVID-19, communicable respiratory diseases were the most common diseases across the LNG Plant area. • The infection rate for tuberculosis were approaching endemic levels. Other communicable respiratory diseases of concern are measles and chicken pox due to low (less than 80%) vaccination rates for these diseases. • Papua New Guinea experienced three distinct waves of COVID-19 between 2021 and 2022. The LNG Plant study area experienced a rise in suspected and confirmed COVID-19 cases during the March/April 2021, October 2021, and February 2022. COVID-19 confirmed case and death data was not available for study area communities. • As of 28 November 2022, Papua New Guinea had officially reported a total of 45,819 confirmed cases of COVID-19, including 668 COVID-19 confirmed deaths. • As of 11 September 2022, the Central Province had reported 1,302 cumulative cases and six overall deaths. • Transmission of communicable respiratory diseases, such as COVID-19, in Papua New Guinea is strongly associated with overcrowding in households; cooking/heating with wood as a primary fuel source; low immunisation levels in children and adults; and poor hygiene, particularly hand washing practices.
Vector-borne disease	• Malaria infection rates are low. Porebada Sub Health Centre recorded 2% positive and Papa recorded 8% positive cases in 2021. The Community Health Baseline (Appendix B) notes that many of these cases may be 'visitor malaria', as there is a strong interaction between Lea Lea and the Gulf Province where higher levels of positive malaria exist (3% of children under age 5 according to a PNG IMR 2019–2020 malaria indicator survey). Bed net distribution efforts have been successful across the study area, with 88% of households using treated nets. However, household members believe that malaria is common and a significant source of fever. • Viral vector-borne diseases (e.g., dengue, zika and chikungunya) are uncharacterised and the underlying potential burden of disease is unknown.
Sexually transmitted infections	• According to Sector Performance Annual Review (SPAR) national antenatal clinic data, HIV prevalence for women aged 15 to 24 years old remained at 1% between 2016 and 2020. This is consistent with past PNG IMR surveys from 2013 to 2014, which found a HIV infection rate of 1.3%. • Between 2019 and 2021, Papa and Porebada Sub Health Centres reported a 3% and 2% HIV positive rate for women seen at their antenatal clinics. • In 2021, SPAR data reported no positive cases of HIV at either the Porebada Sub Health Centre or the Papa Sub Health Centre. Anecdotaly, the Boera Aid Post reported four cases of people who were under HIV treatment in 2019.

Health aspect	Summary
	• Past PNG IMR surveys from 2013 to 2014 suggest a HIV infection rate of 1.6% among patients of Porebada Sub Health Centre and Papa Sub Health Centre. • The PMG IMR survey in 2013 and 2014 at antenatal clinics in the study area found high infection rates for chlamydia (24%), gonorrhoea (25%) and trichomonas (33%). • Local clinics have low capability to assess and diagnose sexually transmitted infections. There is likely a large burden of sexually transmitted infections across the LNG Plant study area villages that is not diagnosed.
Water- and sanitation-related diseases	• Diarrhoea is a common cause of morbidity in the study area. • The 2021 diarrhoeal disease incidence rates in children (<5 years old) indicate that Papa Sub Health Centre has eight times higher incidence rates (353 per 1,000 children) than the Porebada Sub Health Centre (44 per 1,000 children).
Non-communicable diseases	• Non-communicable diseases are typically related to a change from consumption of subsistence foods to consumption of store brought processed foods, as well as the use of alcohol and tobacco. • Previous PNG IMR surveys indicated that there is a substantial level of undiagnosed non-communicable diseases across the LNG Plant study area in the general adult male population. The report indicated this is likely this is due to the extremely high levels of tobacco and alcohol usage. • Rates of tobacco and alcohol use are high and have been identified as a significant concern during health discussions.
Zoonotic diseases	• Animal husbandry is widespread across the LNG Plant study area. • The prevalence of animal husbandry means there is likely to be a high burden of zoonotic disease in the study area villages. • There is no available zoonotic disease data for the study area; however, it is likely a percentage of the diarrhoea cases are caused by zoonotic disease. • A PNG IMR study (PNG IMR 2015) found a clear link between diarrhoeal illness across the LNG Plant study area village surveillance sites and animal husbandry (e.g., pigs and chickens).

Access to functioning services

There are five health facilities located across the LNG Plant study area. Health services and facilities across the study area are limited, with the condition of existing facilities being generally poor and lacking in basic equipment and resources. Facilities often lack supplies and equipment, which limits the ability to provide medical treatment (EMPNG 2014). According to the household survey, 45% of households indicated they had travelled to Papa for health care services, likely due to the Papa Sub Health Centre's ability to provide better quality treatment. Participants of focus group discussions expressed the need for improved health facilities and support for the delivery of health services. There is also no functioning emergency medical response system across the study area.

Table 9.13 summarises the status of health facilities within the LNG Plant study area as reported during the 2019 field investigation.

Table 9.13 LNG Study area health facility and services status

Village	Current status	Village survey comments
Porebada	Operational aid post with two staff members. Non-operational health centre with five staff members.	Aid post currently has no medicine. The health centre has recently been built but not currently operational due to a lack of medically trained staff and medicine. The centre has an ambulance.
Boera	Operational aid post with one staff member.	Facility only has basic equipment, such as beds, chairs, and tables. The facility has limited health care capabilities.
Papa	Operational health centre with four staff members.	The health centre has more specialised equipment, such as blood pressure machines, portable oxygen cylinders and electric suction machine.
Lea Lea	Non-operational aid post.	The aid post is non-operational due to a lack of medicine and staff.

Source: Coffey village surveys 2019.

9.2.2.7 Social cohesion

Law, law enforcement and order

Formal law and order services and facilities in the LNG Plant study area are historically limited. The Buria Police provides services to the nine Hiri west communities, including the LNG Plant villages. The Kairuku-Hiri district has no Law and Order Committee to oversee issues, and consequently the Village Court operates in isolation and not in partnership with other line agencies (EMPNG 2014).

Consultation completed in 2022 identified the following issues in the study area:

- Disputes between settlers and landowners, particularly in Porebada and Papa where ongoing in-migration has been reported.
- Family and sexual violence, which is reportedly highly associated with alcohol consumption.
- Alcohol-related public violence, particularly on Friday nights.

Family relationships

During consultation undertaken in 2022, key informants reported that issues regarding family formation were one of the primary issues dealt with by village courts, with the courts responding to issues regarding young unwed mothers seeking marriage or compensation from fathers.

A high level of disruption to family relationships was reported in all study area villages during the construction phase of the PNG LNG Project. Family relationship issues are generally related to incidences of adultery, marital tension, and domestic violence. These issues were a major concern in Papa, where 31% of respondents experienced some form of disruption. The main cause of these issues was reported to be alcohol and drug abuse.

9.2.3 Edai Town

Edai Town is a gated housing estate located on the Lea Lea Road, 3 km east of Boera. It is relatively newly developed and was established by the customary landowners of Boera Village (through Boera Holdings Limited), who have partnered with a Malaysian company (JC-KRTA Consulting Group (PNG) Ltd). The town is a mixed-use development with residential, commercial, and industrial uses.

Phase 1 of Edai Town was complete by mid-2017, with 161 houses and a population of approximately 600. Phase 2 has been completed as of October 2022, and there are 400 houses with a population of 1,500 people. The development is expected to house approximately 10,000 people (Oxford Business Group 2018).

Edai Town has access to reticulated potable water, sewerage connection, a good road network and electric power from the main grid (NRI 2017b). Residents also have access to household waste collection services and public transport to and from Port Moresby (NRI 2017b).

Most of the current households reportedly own a motor vehicle, indicating residents of Edai Town have a much greater level of asset ownership than much of the population within the LNG Plant villages. Transport services (e.g., a shuttle to and from Port Moresby) are provided by Edai Town management with an associated fee. There are plans for a maternity centre and clinic, that will also be available to Boera residents, and the construction of a school (elementary to Grade 12). There are plans for a training centre to be built and operated under the auspices of the Australia Pacific Training College.

9.2.4 Development needs and issues

A topic discussed during focus group discussions was development issues facing LNG Plant villages. Discussions were facilitated based on two questions:

1. In your opinion, what are priority village development needs?
2. In your opinion, what are the best ways to help the community develop and improve villager wellbeing?

Table 9.14 summarises the outcomes of the focus group discussions.

Table 9.14 Community development issues raised in focus group discussions

Village	Participants	Discussion outcomes
Porebada	One focus group discussion with 39 participants (13 males; 16 females; 10 youths).	- There was a need for significant infrastructure upgrades (notably for water supply and housing). - Lack of wage employment was seen as serious, and a desire was expressed for fairness in recruitment for PNG LNG Project employment. - A general need was identified for training and the establishment of skills registers. - There was a general concern with respect to what are seen as land ownership anomalies in the area from Napa Napa to Edai Town, which affects the sharing of benefits. - The 'narrow' focus of benefit distribution, and the associated exclusion of neighbouring Motu-Koitabu communities, is a source of social tension.
Boera	Two focus group discussions; one for women (80 participants) and one for other leaders with 45 participants (15 males; 14 females; 16 youths).	- Priority needs identified were water, power, and all services. - The women's group expressed needs associated with undertaking small-scale village projects.
Papa	Two focus group discussions; one for women (40 participants) and one for other leaders with 10 male participants.	- Priority needs identified were water, power, and village planning. - Training was seen as a foundation for community development, with women also nominating support for law and order as a requirement.

Village	Participants	Discussion outcomes
Lea Lea	One focus group discussion with 40 female participants.	There were general statements of the need for health, law and order, training, and banking services.
Edai Town	One focus group discussion with 8 participants (3 males; 5 females).	- The discussion focussed on the community development issues the Edai Town residents perceived the landowner villages to be facing and suggestions for improvement. - Priority needs identified were upgrades to existing health centres (e.g., at Papa), road maintenance, upgrades to schools and provision of buses to transport students to/from Redscar High School in Porebada. - Local business opportunity suggestions were provided, including the establishment of a new common marketplace where all village residents can sell fish and garden produce, PMV service for Edai Town residents and establishing tourist areas along the beach.

Source: Coffey focus group discussions 2019.

9.2.5 Experience of the PNG LNG Project

This section provides a summary of the impacts and issues experienced in the study areas as a result of the PNG LNG Project to date, including the construction and operations phases.

9.2.5.1 National study area

Access to housing was an issue in the period following the development of the PNG LNG Project. During this period, the formal Port Moresby housing market was characterised as a high-priced market stimulated by activity in the extractive industry and major events (e.g., the APEC Leader's Summit in 2018), which imposed affordability constraints on a significant portion of Port Moresby residents. The supply response to the PNG LNG Project demand saw an increase in housing construction in areas with high residential prices. These higher prices have been reported to encourage residents within formal housing estates to migrate to settlements, leading to an increase in demand and prices in these areas. As a result of this, a well-established population of salaried wage earners from the lower middle class exists within settlements (Cox et al. 2022).

In 2013, the First Home Owners Scheme was introduced to support the growth of the housing market. As a result of the First Home Owners Scheme there was a significant jump in the development of housing subdivisions and in the number of residential house building contractors. However, despite these developments, it is viewed that there is still a major shortage of affordable housing for the average low-income residents in Port Moresby (Oxford Business Group 2018; Ezebilo 2021).

Additionally, there is concern among Motu-Koitabu people that the urbanisation process poses a threat to land ownership rights and cultural heritage. Within the NCD, 40% of the land area is customary land with 60% being alienated or State land. Approximately 40% of the land in the NCD is also not suitable for residential development due to physical and environmental constraints (UN Habitat 2010).

9.2.5.2 LNG Plant study area

Table 9.15 summarises the feedback received on the study area communities' experience of the PNG LNG Project.

Table 9.15 Summary of feedback received on the LNG Plant study area communities' experience of the PNG LNG Project

Source of information	Issue	Description
2019 Household Survey	Intra-village conflict experienced	- Between 50% and 70% of surveyed households reported a high level of disruption, mainly due to discrimination in employment, alcohol and drug abuse and relationship issues. - Other issues included anti-social behaviour by young workers, which led to women in the village having heightened safety concerns.
	Disruption to household livelihood activities during construction	50% of households in Porebada, Boera and Papa reported a high level of disruption to livelihood activities. - Around 70% of households in Lea Lea reported a high level of disruption, possibly due to the prevalence and reliance on fishing and the associated marine construction work (e.g., for the jetty and pipeline). - Around 10% of households in all villages (except for Porebada (22%)) reported no change in livelihood activity. - Disruptions in the marine environment (e.g., restrictions, mangrove disturbance and lower fish catches) were prominent responses (between 40% to 50%). 19% to 32% of households reported reduced time availability for gardening and fishing (due to involvement in wage employment). 15% to 17% of households reported that environmental changes on land areas (e.g., reduction in the area available for gardening and hunting). - Several respondents reported that they experienced a shortage of planting material following their period of employment due to not maintaining gardens during their employment. - Others indicated that stealing from established gardens became more prevalent during construction.
	Villages' perceived effects on environmental amenity during PNG LNG Project operations	- The LNG Plant is visible to Papa and Lea Lea villages and as a result more households (approximately 60%) reported: - A high level of perceived negative effect on environmental amenity, primarily (approximately 40%) from the LNG Plant flare (light, noise and odour) - Perceived flow-on effects to gardens, rain water in tanks and personal health (40% to 46%). - A lower percentage of households in Porebada and Boera reported a perceived high level of negative effect on environmental amenity (40%), with 30% of households in Porebada indicating no change in environmental amenity from the LNG Plant. - Households in Porebada and Boera that stated that they experienced environmental amenity affects from the LNG Plant flare indicated flare effects were half of that recorded for Papa and Lea Lea with a total of 20% of responses.
	Perceived village benefits derived from PNG LNG Project construction and operation	- The most common response of households in Porebada, Boera and Papa (35% to 50%) indicated a low level of perceived village benefit. - Between 10% and 20% of households in those villages also reported no apparent benefits being received. - Approximately 40% of households in Lea Lea indicated a high level of benefit has been derived, with only 4% of households indicating no benefit being received. - A high proportion of households (25% to 33%) in all villages indicated that short-term construction employment was a benefit.

Source of information	Issue	Description
		- While 14% to 20% of households indicated that there were long-term village benefits, many noted that benefits were limited. 22% to 32% of households noted improved village infrastructure (health and school) as being a benefit derived from the LNG Plant. - Between 18% and 27% of households indicated that they received State royalty and/or company compensation payments as a benefit.
	Perceived disruption to family relations	A high level of disruption of family relations was perceived during the construction phase of the PNG LNG Project across the study area. These issues are generally related to adultery, marital tension and domestic violence. Such issues were a major concern in Papa, where 31% of households experienced some form of perceived disruption, mainly from alcohol and drug abuse.
Other sources	Information from other published reports and media sources was sought to support findings from the household surveys and focus group discussions.	
LNG Impact Listening Project Oxfam (2011)	- Employment and training were identified as the main benefit. But there were concerns expressed with pay rates, the short-term nature of the employment, and dissatisfaction with recruitment practices. - The PNG LNG Project stirred division in communities and dysfunction due to alcohol abuse and the disruption to the 'rhythm' of village life. - Disappointment was felt by villagers in the LNG Plant site communities as expectations for employment and other benefits were raised, but not met. - Land ownership issues have not been resolved, and there is lingering animosity between villagers. - There were significant challenges with community engagement and information dissemination by the developer.	
Local media and academic literature	- Several reports and newspaper articles suggested there was intra-village conflict at LNG Plant villages and Hela during the construction phase of the PNG LNG Project. - Disputes surrounding landholder identification and the associated distribution of benefits to clan members. Individual landholders were not identified prior to the PNG LNG Project's development, which resulted in the royalty and equity benefits being held in government trust accounts for eight years after the umbrella benefit agreement was signed (Filer 2019). In February 2017, protestors blocked access to the LNG Plant (Kinkin 2020). - Support for community initiatives such as sports associations and domestic violence support services. The PNG LNG Project supported the development of village infrastructure, such as the support provided by EMPNG for the provision of classrooms and teacher housing, as well as health facilities. However, some landowners have argued that expected benefits (e.g., road improvements) have not materialised (EMTV Online 2020). - The PNG LNG Project resulted in significant growth in the formal economy from the number of jobs available. However, much of the skilled employment was seen to have been taken up by Papua New Guineans who already had the required skill sets or through the employment of foreign workers (Voigt-Graf and Odhuno 2019). - Skills shortages were noted in the mining and manufacturing sectors, and there was a clear draw of the workforce from the public sector (Voigt-Graf and Odhuno 2019).	

9.2.6 Social values

The focus group discussions were held in each village to determine the study area residents' views on social values. Table 9.16 provides a summary of the findings as they relate to the social values for each study area.

Chapter 13 Social and Cultural Impact Assessment identifies the potential social impacts of the Project on the five social values discussed in Section 9.1.5.

Table 9.16 Social values

Social value	National study area	LNG plant study area
Livelihood		
<i>Social value 1: the capacity to support livelihoods based on harvest of natural resources.</i>	• Livelihoods in Port Moresby are based on government and private service enterprise participation. • Formal employment is nominally secure, but remuneration levels are not high. Many formal sector workers participate in the informal sector. • Livelihoods are highly precarious and made only viable by corporations with extended family or clan units.	• Most of the study area residents rely (not exclusively) on the harvest of natural resources for their livelihood. • Marine resources are relied upon but are under pressure from lack of resource management, and the capacity of marine resources to support livelihoods is perceived to be decreasing. • Gardening is practised; however, soil quality and land availability are limited. • Population growth and demand for land for housing is likely to reduce the ability of the study area to rely on gardening to support their livelihoods.
<i>Social value 2: availability of opportunities for participation in the cash economy.</i>		• The study area's proximity to industrial areas (e.g., LNG Plant, Motukea Port and Napa Napa Refinery) and the city of Port Moresby provides opportunities for formal employment. • The proximity to population centres provides opportunities for the establishment of small businesses. • The sale of natural resources (e.g., fish and garden produce) provides opportunities to generate cash income.
Culture		
<i>Social value 3: ability to sustain community identity and traditions, including rights and obligations pertaining to resource use and management.</i>	• Port Moresby is an urban domain, with an inland peri urban fringe. Motu-Koitabu villages are present along the fringe of the NCD. • The city has a distinct and proud 'modern PNG culture', where people across the country co-exist despite ethnic conflict.	• There is an ongoing cultural transition occurring in the study area as the local communities become increasingly urbanised and transition to a modern outlook. • Drivers include: ○ population growth ○ marriages across groups ○ land disputes ○ an increase in wage employment. • Traditional activities (e.g., fishing and gardening) still occur in the study area; however, increasing reliance on wage income and store-bought foods is likely to decrease the importance of these traditional means of livelihood support.
Personal and community wellbeing		

Social value	National study area	LNG plant study area
<i>Social value 4: an environment supportive of personal and family health, safety, and security.</i>	- Communities in Port Moresby experience deficits in service provision, particularly in settlement areas (UN Habitat 2010). - Where available, effectiveness is impaired by personnel under-resourcing, poor maintenance, and lack of input (e.g., medicines). - Significant health issues (e.g., respiratory illnesses, sexually transmitted infections, HIV) are exacerbated by poor living conditions.	- Existing infrastructure and services within the study area are moderately supportive of personal and family health, safety, and security. - During and following the construction of the PNG LNG Project, pressures on the social environment resulted from population increase, rising personal conflict and alcohol and drug abuse. - Improvement of infrastructure and services (e.g., health and education) are contributing to the development of favourable living standards.
<i>Social value 5: the availability of services and institutions supportive of community wellbeing.</i>	The level of crime is high, although it has improved over the last 10 to 15 years.	- LNG Plant study area communities have moderate access to facilities and services which support community wellbeing. - The condition of existing facilities varies between villages and is characterised by a lack of equipment, supplies and staff. - The need for improved services and infrastructure was expressed across all villages.