Papua LNG Project – Downstream

Social Baseline

ExxonMobil PNG Antelope Limited

Reference: 754-MELEN300733_R04

28 June 2023

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EXECUTIVE SUMMARY

Tetra Tech Coffey has been engaged by ExxonMobil PNG Limited Antelope (EMPNGA) to prepare an environmental impact statement (EIS), including a supporting social baseline study, for the Papua Liquified Natural Gas Project - Downstream (the Project). The proposed Project intends to expand the capacity of the existing Papua New Guinea Liquefied Natural Gas Plant (LNG Plant) located in Caution Bay (Central Province), approximately 20 km north-west of Port Moresby. The LNG Plant is a component of the Papua New Guinea Liquefied Natural Gas Project (PNG LNG Project).

This report provides the baseline against which the potential social impacts of the Project will be assessed. The study area includes:

- National study area. This area includes the Independent State of Papua New Guinea, focusing on the National Capital District (NCD), including Port Moresby.
- 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 kilometres (km) inland from the LNG Plant and extends to the west to encompass Caution Bay. Landowner 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.

Five social values were identified for the Project and were grouped into three overarching themes. These comprise:

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

National study area

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

Livelihood

Livelihoods in Port Moresby are based on participation in the formal and informal sectors. Formal sector employment is centred on services (e.g., finance, tourism, accommodation), transport, industry, and public administration. In addition to formal sector employment, the urban informal sector sustains the livelihoods of most urban residents, especially the poor. The two sectors are not mutually exclusive, with many formal sector employees also engaging in informal economic activity to generate supplementary income. Informal sector income-producing and entrepreneurial activities are diverse and include the sale of prepared and unprepared food products, and handmade and bought goods.

Culture

Port Moresby is a 'melting pot' with extreme diversity and ethnic heterogeneity. 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) people lived inland. The Motu-Koita established major villages within Port Moresby including the villages of Baruni, Tatana, Vabukori, Kilakila, Pari, Korobosea, and Hanuabada. The interests of the Motu-Koita are represented by the Motu Koitabu Council, which is administered by the NCD Commission. Motu-Koitabu villages are present along the fringe of the NCD. The city has a distinct and proud 'modern PNG culture', where people from across the country co-exist despite ethnic conflict.

Personal and community wellbeing

Port Moresby's suburban areas are reasonably well-serviced with basic infrastructure such as roads, water and power. However, there remains a significant lack of water, power and sewage services in settlement areas. Where services are available in settlements, effectiveness is impaired by personnel under-resourcing, poor maintenance and lack of input (e.g., medicines). Significant health issues (e.g., tuberculosis, sexually transmitted infections, HIV, tuberculosis) are exacerbated by poor living conditions. There is typically adequate provision of education and training infrastructure. In general, crime in Port Moresby is high and often involves a high level of violence (comprising 38% of offences), although it has improved over the last 10 to 15 years. Violence and insecurity remain pronounced for women, youth, marginal ethnic groups, informal traders (such as market vendors) and residents in informal settlements.

LNG plant study area

Livelihood

Social value 1: the capacity to support livelihoods based on the harvest of natural resources.

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. Most of the study area residents rely (not exclusively) on the harvest of natural resources for their livelihood. Marine resources are relied upon and are traditionally and culturally significant for Motuan people in particular, 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 is limited. 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 reducing the ability of the study area to relay on gardening to support their livelihoods.
- Garden security, where stealing and vandalism occur when the garden is distant from the gardening household.

The household survey results indicate hunting does not provide a significant source of food for villages in the study area, aside from Papa. Hunting as a social value is consistent with the cultural context, as residents form Papa are from the Koitabu ethnic group, and traditionally incorporate hunting for protein.

Social value 2: formal wage employment opportunities.

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 establishment of small businesses. The sale of natural resources (e.g., fish and garden produce) provides opportunities to generate cash income.

A high cost of living was raised as a concern across the villages in the household survey:

- Porebada households raised the high water costs and the significant expense of medical care. The households also noted there is some level of labour exchange for food and that short-term borrowing at exorbitant rates occurs during periods of cash shortages.
- Boera households made a significant number of comments on the high cost of living, raising high medical expenses and the cost of power.
- Papa households noted the high cost of living is influenced by many people depending on the wage earner and obligations for the care of disadvantaged persons.
- Lea Lea households 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.

Culture

Social value 3: ability to sustain community identity and traditions, including rights and obligations pertaining to resource use and management.

The main ethnic groups in the LNG Plant study area are the Western Motu and Koita people. While all four study area villages have mixed Motu-Koitabu inhabitants, Motu is the dominant language, but Koita is regularly spoken in Papa Village. A defining tradition of the LNG Plant study area villages was involvement in the regional Hiri system of trading Motuan ceramic pots for sago, canoe logs and artefacts with villages in the Gulf of Papua and to the east. Today, the annual Hiri-Morale festival celebrates the historic Hiri trade.

There is an ongoing cultural transition occurring in the study area as the local communities become increasingly urbanised. This cultural transition is driven by several factors including, population growth, marriages across groups, land disputes and an increase in wage employment. Elements of traditional activities, such as fishing and gardening, still occur in the study area; however, increasing reliance on wage income and store-bought foods is likely to facilitate further diminution in the importance of these traditional means of livelihood support. However, and importantly, some of these practices may lose their everyday importance – but that is not to say that they are discarded altogether, as their maintenance may be important to maintaining cultural identity.

Personal and community wellbeing

Social value 4: an environment supportive of personal and family health, safety and security.

The existing infrastructure and services within the LNG Plant study area are moderately supportive of personal and family health, safety and security. 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 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. The PNG LNG Project recently funded the construction of additional classrooms, the refurbishment of existing facilities and donated desks and chairs. There are five health facilities located across the LNG Plant study area although the health services and facilities are limited, with the condition of existing facilities being generally poor and lacking in basic equipment and resources. 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.

Social value 5: the availability of services and institutions supportive of community well-being.

The LNG Plant study area communities have moderate access to facilities and services which support community well-being. 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.

Development needs

A topic discussed during focus group discussions was development issues facing LNG Plant villages. Key issues raised during these sessions included:

- The need for infrastructure upgrades (water supply, housing, power, roads, schools and transport) and services (health, law and banking).
- The women's group expressed needs associated with undertaking small-scale village projects.
- A lack of wage employment and the need for training and establishment of skill registers.
- 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.
- The need for a new common marketplace in Edai Town.

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GLOSSARY AND ABBREVIATIONS

The following words and abbreviations are defined in the context of their use in this social baseline report. Some definitions have been adapted from the Macquarie dictionary, online dictionaries and encyclopaedias, and relevant specialist studies.

Units and symbols

PGK *abbr*. Papua New Guinean kina.

toea equal to one hundredth of a kina.

A

ADB *abbr*. Asian Development Bank.

AIDS *abbr*. acquired immune deficiency syndrome.

APEC *abbr*. Asia-Pacific Economic Cooperation.

B

BTEX *abbr*. Benzene, toluene, ethylbenzene, and xylenes.

C

CDC *abbr*. Centre for Disease Control.
CEPA *abbr*. Conservation and Environment Protection Authority.
cassava *n*. the starchy tuberous root of a tropical tree, used as a food source.
cholera *n*. a bacterial disease of the small intestine, usually contracted from infected water supplies, and is infectious, causing diarrhoea and severe vomiting, often lethal.

D

demographics *n*. statistical data detailing a population including particular groups within it.
DFAT *abbr.* Department of Foreign Affairs and Trade (Australian).
diabetes *n*. a disease which impairs the body's ability to produce or respond to the hormone insulin.
diarrhoeal disease *n*. caused by multiple bacterial, parasitic and viral organisms to form a collection of diseases sharing the diarrhea symptom.

E

EMPNGA *abbr*. ExxonMobil Papua New Guinea Antelope Limited.

EMPNG *abbr*. ExxonMobil Papua New Guinea Limited.

enumerator *n*. someone employed to conduct the surveys.
EP IV *abbr*. Equator Principles IV.

F

FAO *abbr*. Food and Agriculture Organization.

FHOS *abbr*. first home owners scheme.

flare *n*. an elevated vertical chimney found on oil rigs, wells and refineries and used for burning off unwanted gas or flammable gas and liquids released by pressure relief valves during unplanned over-pressuring of plant equipment. See flaring.
flaring *v*. burning off unwanted flammable gas and liquids through a gas flare.
FSV *abbr*. Family and sexual violence.

G

GIS *abbr*. geographic information system.

gross domestic product *n*. a country's total value of goods and services produced and provided over the duration of a year.
GDP *abbr*. gross domestic product.

H

heterogeneity *n*. an area rich in diversity of people from all different cultures and places.
HIV *abbr*. human immunodeficiency virus.

I

IFC *abbr*. International Finance Corporation.

Indigenous *adj*. native. Originally from a particular place or occurring naturally there.

L

landowner company *n*. representing different geographic areas are selected to provide business operations support and local knowledge.
liquefied natural gas *n*. the state of natural gas when it is refrigerated to below -160°C. Liquefied natural gas (LNG) is typically transported by special tankers to overseas markets, where it is

regasified and transported by pipeline to industrial and domestic customers.

littoral zone *n*. the area in the sea that is close the shore.

LNG *abbr*. see liquefied natural gas.

M

malaria *n*. transmitted by an infected mosquito bite, a disease that is caused by a parasite (plasmodium).

morbidity *n*. the amount of people with diseases within a population.

N

NCD *abbr*. National Capital District.

NCDC *abbr*. National Capital District Commission.

P

patrilineal descent *n*. based on the male ancestry.

peri-urban *adj*. the area immediately next to a city/urban area.

PIIM *abbr*. project-induced in-migration.

PMV *abbr*. public motor vehicles.

PNG IMR *n*. Papua New Guinea Institute of Medical Research.

PNG LNG Project *abbr*. Papua New Guinea Liquefied Natural Gas Project.

polio *n*. an infectious disease (poliovirus) which is spread through contaminated food and/or water and results in paralysis and possible death.

PS *abbr*. Performance Standards on Environmental and Social Sustainability

Q

QA/QC *abbr*. quality assurance/quality control.

R

RPNGC *abbr*. Royal Papua New Guinean Constabulary.

S

sago *n*. edible starch extracted from the pith of tropical plant stems.

SIA *abbr*. social impact assessment.

stroke *n*. blockage or rupture of a brain artery restricting blood flow, causing the sudden death of brain cells from lack of oxygen.

subsistence *n*. supporting yourself. i.e., subsistence farming includes growing your own food and not relying on other means.

T

taro *n*. a tropical Asian plant of that has edible starchy corms and fleshy leaves.

TotalEnergies *abbr*. Total E&P Papua New Guinea Limited.

tuberculosis *n*. a bacterial disease, infectious in nature, consisting of nodule (tubercles) growth in tissues, particularly in the lungs.

TVET *abbr*. technical and vocational education and training.

U

UN *abbr*. United Nations.

UNDP *abbr*. United Nations Development Programme.

UNESCO *abbr*. United Nations Educational, Scientific, and Cultural Organization.

upper-respiratory infection *n*. a viral infection that directly impacts the airways, throat and nose.

W

WHO *abbr*. World Health Organization.

Y

yams *n*. the starchy tuberous root of a perennial herbaceous vine, used as a food source.

1. INTRODUCTION

Tetra Tech Coffey has been engaged by ExxonMobil PNG Limited Antelope (EMPNGA), to prepare an environmental impact statement (EIS), including a supporting social baseline study, for the Papua LNG Project - Downstream (the Project). This report provides the baseline against which the potential social impacts of the Project will be assessed.

1.1 PROJECT OVERVIEW

ExxonMobil PNG Limited (EMPNG) is the operator of the PNG LNG Project, an integrated development that is commercialising the gas resources of Papua New Guinea. The Papua LNG Project is a gas development project for the Papua LNG Project Joint Venture participants, which at the date of the EIS are:

- TotalEnergies EP PNG Limited (TotalEnergies, an affiliate of TotalEnergies SA)
- ExxonMobil PNG Antelope Limited (EMPNGA) and ExxonMobil PNG Elk Limited
- Pac LNG Assets Limited, Pac LNG International Limited, Pac LNG Investments Limited, Pac LNG Overseas Limited and Pac LNG Holdings Limited (affiliates of Santos Limited)
- JX Nippon Oil and Gas Exploration Pty Ltd.

ExxonMobil PNG Antelope Limited is the Project proponent and the ExxonMobil affiliate responsible for the construction of the Project. Niugini LNG Operating Company Limited (NLOC) is the ExxonMobil affiliate responsible for the Project once it has been constructed and commissioned.

The Papua LNG Project will involve producing and processing the gas and condensate from the Elk and Antelope gas reserves in Petroleum Retention License 15 (PRL-15), located in Gulf Province, Papua New Guinea and piping them overland, then offshore in the Gulf of Papua, to the existing Papua New Guinea Liquefied Natural Gas Project (PNG LNG Project) producing and exporting facility (LNG Plant) located in Caution Bay (Central Province) approximately 20 km north-west of Port Moresby.

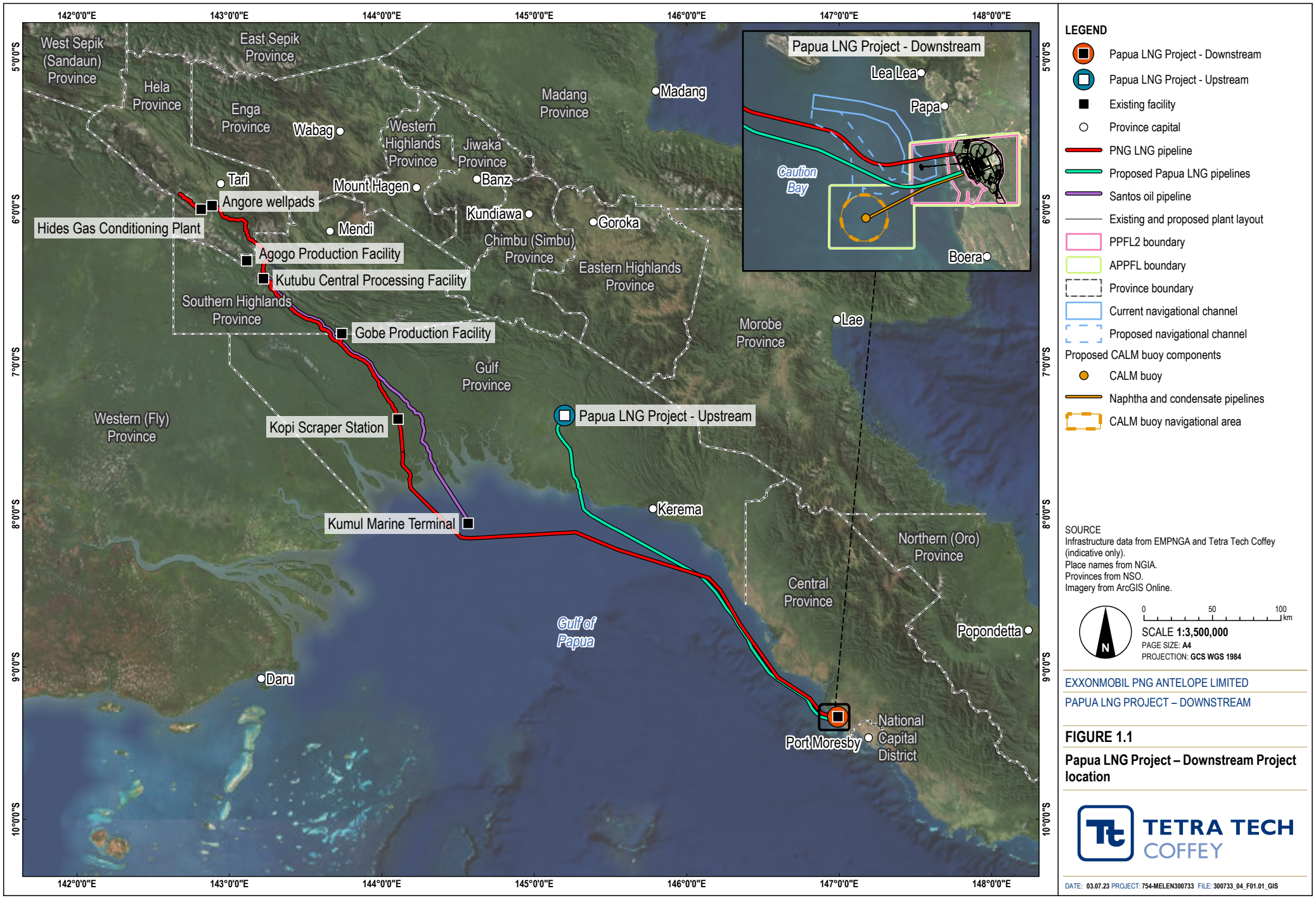
The existing PNG LNG Project commercialises gas reserves in the Hela, Western and Southern Highlands provinces of Papua New Guinea. The gas is transported to the LNG Plant via pipeline, where it is liquefied and exported by ship to international gas markets.

The Papua LNG Project involves two components:

- The Papua LNG Project – Upstream (referred to as the Upstream component)
- The Papua LNG Project – Downstream (referred to as the Downstream component, hereafter referred to as ‘the Project’ and the component addressed in this document).

Execution of the Upstream component and the Project is delimited in Caution Bay, with the approximate boundary (i.e., the scope break) between the components located near the fence of the LNG Plant, south of the existing jetty.

A summary of the components of the Project is provided in Table 1.1. The Project location is shown in Figure 1.1.



LEGEND

- Papua LNG Project - Downstream
- Papua LNG Project - Upstream
- Existing facility
- Province capital
- PNG LNG pipeline
- Proposed Papua LNG pipelines
- Santos oil pipeline
- Existing and proposed plant layout
- PPFL2 boundary
- APPFL boundary
- Province boundary
- Current navigational channel
- Proposed navigational channel

Proposed CALM buoy components

- CALM buoy
- Naphtha and condensate pipelines
- CALM buoy navigational area

SOURCE
Infrastructure data from EMPNGA and Tetra Tech Coffey (indicative only).
Place names from NGIA.
Provinces from NSO.
Imagery from ArcGIS Online.

0 50 100 km

SCALE **1:3,500,000**
PAGE SIZE: **A4**
PROJECTION: **GCS WGS 1984**

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PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 1.1

Papua LNG Project – Downstream Project location

TETRA TECH COFFEY

DATE: **03.07.23** PROJECT: **754-MELEN300733** FILE: **300733_04_F01.01_GIS**

Table 1.1 Project components at the LNG Plant

Component	Description
Additional LNG trains	New LNG processing trains and supporting systems including: • Inlet gas receiving and treatment • Dehydration/mercaptan removal • Mercury removal • Heavy-hydrocarbon separation (which contains benzene, toluene, ethylbenzene, and xylenes (BTEX)) • Liquefaction • Stabilisation • Refrigeration system • Fractionation system (naphtha)
Expansion of existing utilities	Existing LNG Plant shared utilities to be expanded include: • Hot oil system • Service and instrument air system • Nitrogen system • Fresh water system • Desalinated water system • Potable water system • Diesel oil storage and distribution system • Open and closed drain systems • Sanitary wastewater treatment systems
New utilities	Options for new separate utilities may include: • Integrated fuel gas system • Power generation system • Tempered water system • Highly demineralised water system for the Heat Recovery Steam Generators • Flare system (wet and dry gas) • Thermal oxidizer.
Product storage	Product storage will include: • New condensate storage tanks with a total storage capacity of up to 110,000 m^3.
New marine facilities	Marine facilities will include: • CALM buoy and associated exclusion zones • Pipeline end manifold (Upstream construction component, Project operations component) • Naphtha and condensate pipelines (Upstream construction component, Project operations component) • New feed pipelines including a gas pipeline and a condensate pipeline (Offshore: Upstream construction and operations; Nearshore Project construction component and Upstream operations component), with landfall and tie-in to the pipelines at the LNG Plant. The pipelines will be located south of the existing LNG Plant jetty. • Alternate shipping channel • Navigation and monitoring systems
Temporary facilities	Temporary construction facilities will be located within the PNG LNG Project's lease boundaries and will include laydown areas, offices, workshops and concrete batching plants.

Component	Description
Waste	Options for waste facilities and management being assessed may include: • Temporary onsite storage and segregation of waste, with transport to and disposal at third party waste management facility • New engineered solid waste landfill within existing LNG Plant fence for disposal of non-restricted waste, with limited disposal of restricted waste by specialised service.
Logistics route	Most construction materials will be transported by truck from Motukea Port in Port Moresby to the LNG Plant site via the Lea Lea Road. Repairs or upgrades to the road, or relocation of overhead cables may be required to allow transport of large, heavy loads.
Workforce	Construction: Approximately 5,000 to 7,000 personnel at peak. Operation: Increase of approximately 50 operations and maintenance technicians with support staff anticipated to increase.
Accommodation	Construction: Up to 6,000 bed construction camps. Operation: Up to 500 beds at the existing operations camp.

1.2 REPORT PURPOSE

The purpose of this report is to characterise the existing social environment prior to the execution of the Project. Specifically, this report:

- Describes the socioeconomic status and social values of communities likely to be influenced by the Papua LNG Project – Downstream.
- Identifies and describes how the construction and operation of the PNG LNG Project has affected communities in the study area to assist in assessing the potential social impacts of the Project (as part of the EIS) and provide focus for impact avoidance, mitigation, and management.

2. LEGISLATIVE REQUIREMENTS, INTERNATIONAL STANDARDS AND COMPANY POLICIES

This section provides an overview of the legislative requirements, international standards and company policies relevant to establishing a social baseline to support identifying and assessing the Project's potential social impacts.

2.1 PAPUA NEW GUINEA LEGISLATIVE REQUIREMENTS

The following sections outline the PNG regulatory context for establishing a social baseline for the Project, including the *Environment Act 2000* (Environment Act) and the *Oil and Gas Act 1998* (Oil and Gas Act).

2.1.1 Environment Act 2000

The Environment Act is the principal legislation regulating the environmental and social effects of projects in PNG. The Act aims to promote sustainable development by minimising adverse impacts of projects on the environment and people of PNG. The Act is administered by the Conservation and Protection Authority (CEPA). Two sections of the Act have informed this social baseline:

- Section 2 of the Act, which defines the 'environment' as including social and cultural values. The Act defines environment as:
  - *Ecosystems and their constituent parts including people and communities and including human-made or modified structures and areas; and*
  - *All natural and physical resources; and*
  - *Amenity values; and*
  - *The qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony, and sense of community.*
- Section 5 of the Act, which identifies matters of national importance, which includes the:
  - *Preservation of Papua New Guinean traditional social structures; and*
  - *Maintenance of sources of clean water and subsistence food sources to enable those Papua New Guineas who depend on them to maintain their traditional lifestyles; and*
  - *Protection of areas of significant biological diversity and the habitat or rare, unique or endangered species; and*
  - *Recognition of the role of landowners in decision-making about the development of resources on their land; and*
  - *Responsible and sustainable economic development.*

2.1.2 Oil and Gas Act 1998

The Project also requires approval under the Oil and Gas Act. The Act governs petroleum exploration, development, processing and transportation in PNG. A petroleum processing facility licence is required under the Act to develop the new LNG trains at the LNG plant. The Department of Petroleum & Energy administers the Act. Section 49(c) of the Act requires the submission of a socioeconomic impact study. This social baseline has been prepared to support the development of a socioeconomic impact study.

2.2 INTERNATIONAL STANDARDS AND GUIDELINES

Table 2.1 summarises the international standards and guidelines that have informed the development of this baseline.

Table 2.1 International standards and guidelines

Standard or guideline	Relevance to the social baseline
Equator Principles IV (EP IV) (2020)	EP IV provides a framework for financial institutes to assess and manage the environmental and social impacts of projects seeking funding. The EP IV require appropriate environmental and social standards to be applied through the guidance provided by the International Finance Corporation's (IFC) Performance Standards (PS) for Environmental and Social Sustainability (2012).
IFC PS (2012)	This social baseline collates data to inform the assessment of potential social impacts in line with the requirements of the following PS: • PS 1: Assessment and management of environmental and social risks and impacts. PS 1 requires the risks and impact identification process to be based on recent social baseline data (IFC 2012a). • PS 7: Indigenous Peoples. PS 7 requires proponents to anticipate and avoid adverse impacts from their projects on Indigenous peoples and promote sustainable development benefits and opportunities for Indigenous peoples (IFC 2012b). Construction of new Project facilities and associated impacts will be assessed against PS 7 to determine potential requirements relating to free, prior, and informed consent.
International Principles for Social Impact Assessment	The *International Principles for Social Impact Assessment* were prepared for the International Association of Impact Assessment (Vanclay 2003). The document is a recognised statement of the core values of the social impact assessment community. The document states that baseline data collection is conducted to enable the evaluation and audit of the impact assessment process.
Social Impact Assessment: Guidance for assessing and managing the social impacts	The *Social Impact Assessment: Guidance for assessing and managing social impacts of projects* (Vanclay, Esteves and Franks 2015) provides guidance on good practice for undertaking social impact assessments for the development of large projects, including mining projects. The document states that a necessary requirement for undertaking social impact assessments is the collation of baseline conditions in a project's social area of influence. The collation of baseline conditions also provides a basis for subsequent monitoring programs.

2.3 CORPORATE POLICY

ExxonMobil has human safety, health, environmental and product safety policies that outline commitments to conducting business in a manner that considers the needs of the communities in which it operates. These policies are complemented when implementing projects through the *Socioeconomic Management Standard*[1], which provides guidance on identifying socioeconomic issues. Requirements relevant to the social baseline include:

- Consult with relevant communities, government officials and appropriate stakeholder organisations or individuals to identify and understand issues, concerns, grievances, needs, ideas and values, areas of mutual interest and potential conflicts with the company's goals.
- Identify potential socioeconomic impacts and/or risks, including the management of cultural heritage properties, interaction with Indigenous and/or vulnerable populations, land access, and local economic

[1] https://corporate.exxonmobil.com/-/media/global/files/newsroom/publications-and-reports/socioeconomic-management.pdf

development through employment, training, the procurement of goods and services, and making investments in communities.

3. METHOD

The method used to characterise the existing social environment comprised:

- Defining the study areas
- Reviewing previous studies undertaken for the PNG LNG Project
- Reviewing publicly available literature related to the social environment of the study areas
- Collecting primary data through field investigations
- Developing social values for the study areas.

Specialists were also engaged to prepare reports on health, cultural heritage, marine resource use, land use and road traffic, which have been used to inform this report.

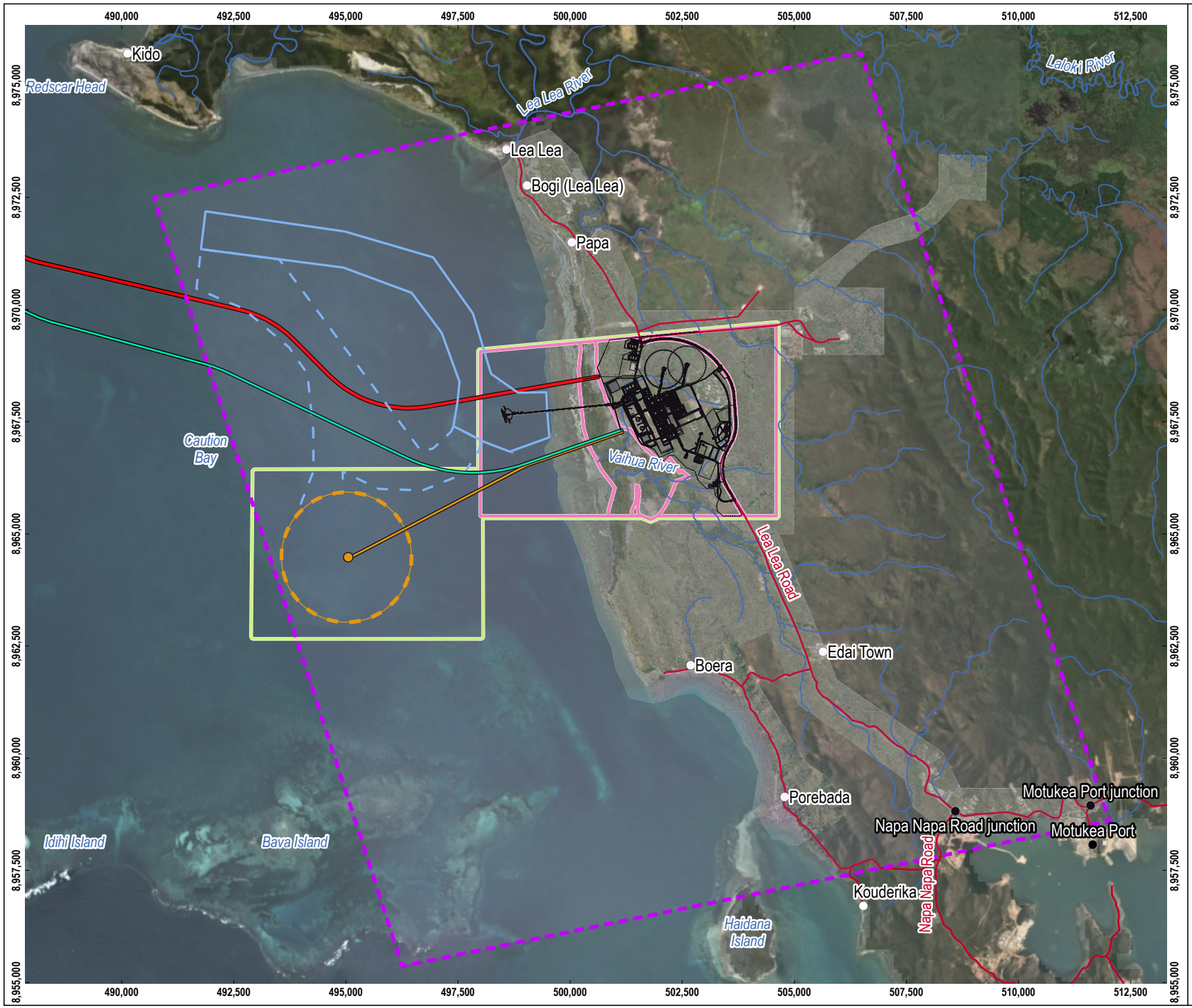
Details of the method and sources of information are provided in the following sections.

3.1 DEFINING THE STUDY AREA

Study areas were established based on the expected geographic area of influence of the Project and considering the social and cultural characteristics of communities residing in these areas. The study areas are:

1. **National study area:** This area encompasses the Independent State of Papua New Guinea, with a focus on the National Capital District (NCD), including the capital, Port Moresby. This study area may be influenced by Project-derived revenue flows (taxes and royalties) to the Government of Papua New Guinea, economic growth-induced changes to the gross domestic product, business development, and employment opportunities, particularly within the NCD.
2. **LNG Plant study area:** This area encompasses land, infrastructure and communities expected to experience change from the construction and operation of the Project. The study area commences in the south at the north-western boundary of the NCD, extending north into Central Province to Lea Lea village. The eastern boundary is located approximately 3 km inland from the LNG Plant and extends to the west to encompass Caution Bay, which is used by communities for marine resource harvesting. Landowner villages in the study area include Porebada, Boera, Papa and Lea Lea[2]. Edai Town, a gated community approximately 3 km east of Boera, is being developed as a residential area for owner occupiers. As part of its previous commitments, PNG LNG established an employment recruitment process that is geographically preferential to residents of Project-affected communities over communities further away and has worked with landowner companies to provide them with work streams that they can feasibly and plausibly undertake. The LNG Plant Study Area is shown on Figure 3.1.

[2] A portion of Lea Lea (also known as Lealea) is often referred to as Bogi. This report includes Bogi as part of Lea Lea.



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.

0 1 2 3 km

SCALE **1:120,000**
PAGE SIZE: **A4**
PROJECTION: **WGS 1984 UTM Zone 55S**

EXXONMOBIL PNG ANTELOPE LIMITED

PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 3.1

LNG Plant study area

TETRA TECH COFFEY

DATE: **03.07.23** PROJECT: **754-MELEN300733** FILE: **300733_04_F03.01_GIS**

3.2 PREVIOUS ASSESSMENTS AND MONITORING

The following studies undertaken as part of the PNG LNG Project were reviewed in the preparation of this report:

- PNG LNG Project Environmental Impact Statement (EIS) (Coffey Natural Systems 2009) and supporting social impact assessment (Goldman 2008).
- Partnership in Health Project, which included ongoing 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 2017; PNG IMR 2018).
- LNG Plant Community Profile (EMPNG 2014).

3.3 LITERATURE REVIEW

The following publications were reviewed in the preparation of this report:

- 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).

3.4 FIELD INVESTIGATIONS

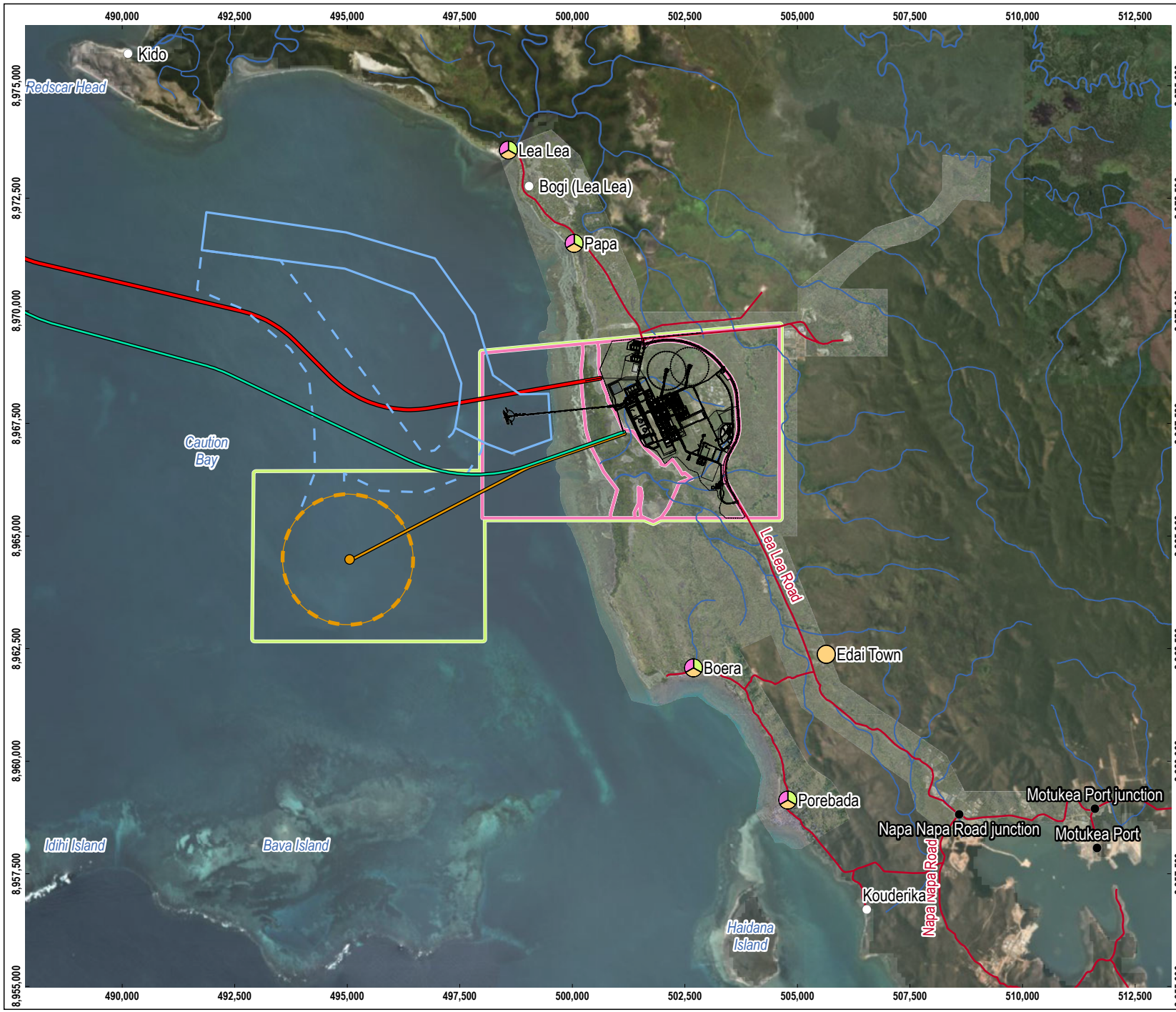
The field investigations comprised a household survey, a village survey and focus group discussions in 2019, key informant interviews and a rapid livelihood appraisal in 2022.

The investigations were undertaken 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. The 2019 fieldwork was undertaken between 27 March and 11 May 2019 in the communities around the LNG Plant shown on Figure 3.2. The 2022 fieldwork was undertaken on 2 December 2022.

Focus group discussions and key informant interviews were held within each LNG Plant community in March and May2023. Where collected data updated the social baseline understanding, the relevant data has been incorporated into this report.

3.4.1 Awareness

Project awareness sessions were undertaken at each village before the commencement of the social surveys. These sessions were facilitated by ExxonMobil's Community Affairs team and provided the community with information about the proposed Project and field investigations (including social and environmental surveys) that would be undertaken as part of the environmental and social impact assessment process.



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

Proposed CALM buoy components

- CALM buoy
- Naphtha and condensate pipelines
- CALM buoy navigational area

Social field survey location

- Village survey
- Focus group discussion
- Household survey

SOURCE
Survey locations from Tetra Tech Coffey.
Infrastructure, roads, watercourses and lease boundary from EMPNGA.
Imagery from EMPNGA and Planet Labs.

0 1 2 3 km

SCALE **1:120,000**
PAGE SIZE: **A4**
PROJECTION: **WGS 1984 UTM Zone 55S**

EXXONMOBIL PNG ANTELOPE LIMITED

PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 3.2

Location of social field surveys

TETRA TECH COFFEY

DATE: **03.07.23** PROJECT: **754-MELEN300733** FILE: **300733_04_F03.02_GIS**

3.4.2 Survey design and data collection

Household survey

The household survey was designed to collect information from individual households on demographics, housing and assets, income and expenditure, health, terrestrial resource harvest and diet, marine resource use, and experiences during PNG LNG Project construction and operation phases. A questionnaire was prepared with questions covering these topics and formatted for upload to iPads to enable direct electronic recording of data and upload to a webmap for subsequent analysis.

Training was provided to the village residents hired as enumerators on asking questions and engaging with people appropriately. Each village resident enumerator paired up with a social researcher on their first day in the field undertaking the household surveys to develop their understanding of how to do the surveys and record the information.

Households were sampled by mapping household structures identified in each village within the study area through the analysis of recent aerial photographs and Pleaides satellite imagery[3]. Approximately 30% of structures were then randomly selected in each village. Additional houses for inclusion in the survey sample were identified in the event a household was unable or unwilling to participate. The survey target coverage was 20% of households in each village.

The number of households surveyed in each village is shown in Table 3.1.

Table 3.1 Number of households surveyed in each village

Village	Total households	Households surveyed	
		Number	Percentage of total
Porebada	781	150	19%
Boera	410	93	23%
Papa	291	73	25%
Lea Lea	565	107	19%
Total	**2,047**	**423**	**21%**

Source: Tetra Tech Coffey household surveys 2019.

Quality assurance and quality control

Household survey responses were recorded digitally using iPads and GIS-based electronic survey forms. The collected data was reviewed, and preliminary quality assurance and quality control (QA/QC) was done on the evening of the recording day by a senior social researcher. Missing or inconsistencies detected in the data were communicated to respective field teams for rectification or recollection on the following day. On completion of all surveys, further batch QA/QC was performed on the full dataset to check the integrity of the survey data. For example, erroneous duplicate households were identified and removed.

Village surveys

The village survey was designed to record the location and status of communal infrastructure within each of the four villages (including water source and supply points, electricity distribution, schools, churches, health clinics, retail outlets, community halls and recreation facilities, etc.). The village survey template was formatted for upload to an iPad to enable direct electronic data collection and georeferencing of infrastructure locations.

[3] Imagery captured in Lea Lea and Papa in December 2017 and January 2018. Imagery captured in Boera and Porebada in August 2017 and July 2018.

A social researcher from Tetra Tech Coffey completed the village survey. The village survey was completed concurrently with the household surveys.

Focus group discussions

The focus group discussions were designed to discern development aspirations and concerns (including impacts from the PNG LNG Project) held by different stakeholder groups, including women, youth and ward councillors. Focus group discussions do not follow a set list of questions and are instead led by an experienced facilitator employing an enquiring approach to probe important issues. The ExxonMobil Community Affairs team advised on existing established groups in each village and organised additional groups to participate in the discussions. The groups that participated in the focus group discussions in 2019 included:

- The Papa leaders
- The Papa women's group
- The Lea Lea women's group
- The Porebada leaders
- The Boera leaders
- The Boera women's group
- Edai Town residents.

The groups that participated in the focus group discussions in March 2023 included:

- LLG Councillors and Ward Development Committee members from each LNG Plant community
- Representatives from the village courts from each LNG Plant community
- Representatives from health centres / clinics from each LNG Plant community[4]
- Representatives from churches within each LNG Plant community
- The Buria Women's Group
- The Buria Women in Agriculture Group
- The Veadi Koita Association
- The Boera Hahine Group
- The Porebada Besena Association
- The Helaro Hope Association
- Representatives from Laba Holdings
- Representatives from Gas Resources PNG LNG Limited.

The focus group discussions were led by a social researcher from Tetra Tech Coffey.

Key informant interviews

The key informant interviews were designed to capture baseline data and views on the impacts of the PNG LNG Project that may be relevant to the development of the Project. Key informant interviews were conducted by a Tetra Tech Coffey social researcher between 20 and 30 September 2022. Key informants were identified

[4] The exception to this is in Lea Lea, where there is no health centre or clinic established.

by Tetra Tech Coffey and EMPNG's Community Affairs and Government Affairs team. Key informants included:

- Laba Holdings and the four landowner companies
- LNG Plant Landowners Association[5]
- Four Hiri West Ward Members
- Buria Village Court
- Buria Police Post
- Edai Town Management
- Disability Sector – Kapi Foundation & Helaro Hope Association
- Central Provincial Government Fisheries and National Fisheries Authority
- IBBM Enterprise Centre.

Rapid livelihoods appraisal survey

A rapid livelihoods appraisal survey was undertaken to understand the effect of COVID-19 and other global market changes (such as impacts to supply chains) on livelihoods within LNG Plant communities. The survey instrument was designed to collect high-level indicators of livelihood status, with a focus on understanding socioeconomic hardship. The survey was carried out with 15 market stallholders along the Napa Napa Road from Motukea to Gate 1 of the LNG plant on 2 December 2022. The survey was carried out by a team of Tetra Tech Coffey social researchers.

3.4.3 Limitations

The social survey was subject to the following limitations:

- **Security requirements:** Health, safety and security requirements constrained household interviews to be held in daylight hours between 9:00 a.m. and 4:00 p.m. This limited direct engagement with members of households who participate in wage employment outside of the village.
- **Schedule constraints:** Completing the required number of household interviews in the allotted time required the use of enumerators recruited from the surveyed village. While efforts were made to recruit persons with previous experience with survey work, the survey coordinator had no ability to enforce this requirement. Some of the potential consequences of this could include:
  - Enumerators misunderstanding survey questions, or not able to phrase questions in response to queries from those being interviewed.
  - Interviewees either not being willing to respond to potentially sensitive issues (such as income) or giving misleading answers to potentially sensitive questions.
  - Interviewees placing undue significance on responses that had a local political dimension (e.g., recruitment selection by a landowner company).
- **Local socio-political environment:** The construction and operation of the PNG LNG Project have had an influence on the local socio-political environment both directly (e.g., employment) or indirectly (e.g., State benefit payments). These influences may affect the nature of the responses to some survey questions.

[5] Tetra Tech Coffey notes that the LNG Plant is located on State-owned land. The LNG Plant Landowners Association represents landowners from Papa, Lea Lea, Porebada and Boera communities. The LNG Plant Landowners Association was established to address indirect social impacts on these communities.

- **Timing of field work:** The primary fieldwork that informed the development of this social baseline was undertaken in 2019, prior to the advent of the COVID-19 pandemic and changes to the global commodity market, which has resulted in a number of socioeconomic changes in PNG. A rapid livelihood assessment was therefore undertaken in December 2022 to provide a high-level indication of changes to livelihoods within the area. In addition, focus group discussions were held in March and May 2023. These discussions included topics addressed in the social baseline study and this report includes these results where appropriate.
- **Project disclosure:** the household surveys and key focus group discussions were informed by a project design that differs from the current Project design. The project design that was disclosed to communities did not include a laydown area outside of the existing LNG Plant fence but was still within the lands leased from the State. Other project details, such as employment or technical design components were not disclosed during the 2019 fieldwork. Regardless, it is not expected that changes in project design would have had a material effect on the responses provided by participants in the household surveys and focus group discussions.

3.5 SOCIAL VALUES

A social value is regarded as a quality of the social environment that is conducive to people's well-being (economic, social and spiritual) now and into the future, and for which people have a high regard. Well-being is a broad ranging concept that is perceived differently by individuals as it relates to their goals, expectations, standards and concerns. It can be affected in a complex way by a range of factors such as a person's health status, beliefs, social relationships, access to services, their relationship to the physical environment, to less tangible aspects such as cultural identity.

The social values in the study areas were developed inductively, based on a review of available information, including:

- PNG LNG Project Social Impact Assessment (Goldman 2009).
- PNG LNG Project Environmental Impact Assessment (Coffey Natural Systems 2009).
- Partnership in Health Project Progress Reports, 2011 to 2018 (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.
- Findings from household surveys and focus group discussions undertaken for the Project.

Five identified social values were grouped into three overarching themes, namely:

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 well-being:

- Social Value 4: An environment supportive of personal, family and community health, safety, security and social wellbeing.
- Social Value 5: The availability of services and institutions supportive of community well-being.

3.6 OTHER SPECIALIST STUDIES

This section outlines a summary of the study methods for other specialist studies used to inform the social baseline study. The specialist studies that have informed this social baseline study include:

- Cultural heritage assessment (Appendix A)
- LNG Plant community health baseline (Appendix B)
- Traffic and land use study (Appendix D)
- Caution Bay fisheries resource use study (Appendix F).

3.6.1 Health baseline

The LNG Plant community health baseline was prepared by NewFields (NewFields 2022), with community health data collected in 2019 through:

- Dedicated key informant interviews with health workers where a health facility or health worker was present in the village (e.g., Porebada, Boera and Papa).
- Semi-structured discussions on health issues with community members.
- Discussions with stakeholders about health service provision (e.g., government and health centre staff).
- Inclusion of health-related questions in the household survey implemented by the social team (see Section 0). The survey questions were developed to update the existing database developed by PNG IMR from 2013 to 2017.

The data collected in 2019 was supplemented with recent scientific and health studies, along with other available literature, such as Papua New Guinea National Department of Health Electronic Health Information System (eNHIS) and COVID-19 data from the Papua New Guinea Joint Agency Taskforce National Control Centre for COVID-19. Where possible, recent data was compared with previous data to identify trends.

3.6.2 Cultural heritage assessment

Extensive cultural heritage field surveys and salvage programs have been undertaken within much of the Project's potential disturbance footprint. Consequently, the cultural heritage baseline assessment comprised a review of existing information, including the PNG LNG EIS (Coffey Natural Systems 2009), and post-approvals salvage investigations. The exception to this is the proposed laydown area situated east of the LNG Plant security fence. A cultural heritage survey of this area was undertaken by Social Research Institute Limited and Eco Logical Australia in 2019.

3.6.3 Caution Bay fisheries resource use study

The Caution Bay fisheries resource use study comprised of fish catch, vessel inventory and market surveys that were conducted from 11 June to 1 July 2019 at the LNG Plant villages.

Fish catch data included fishing effort and individual and group catches from each village over four days. Data was acquired by voluntary interviews with individual/group fishers for catch from both the sea and inland waterbodies, after the fishers returned to the land.

The vessel inventory was compiled on vessels returning to land from fishing and those that were moored, by interviewing individuals/groups of people in each village and recording details of the vessel use, including where it is usually used and for what purpose, as well as the type of fishing gear on board the vessel.

The market surveys were conducted in Port Moresby at Ranaguri market and Lawes Road market on 27 and 28 June 2019, and Koki market on 1 July 2019. Additional markets near Papa and Lea Lea were surveyed

between 24 and 28 June 2019. The market survey gathered information through observation and interviews on the species and sale price for fish on sale. With permission from the vendors, photos of fish for sale were also taken (Tetra Tech Coffey 2020).

3.6.4 Traffic and land use study

The traffic and land use study considered traffic and land use along the logistics route (Papa-Lea Lea Road) between Motukea Port and the LNG Plant. The study was based on:

- A traffic and pedestrian use survey, which recorded traffic and pedestrian volumes at key points along Papa Lea-Lea Road. Two surveys were undertaken; the first survey was undertaken in March 2019 and the second survey was conducted in 2022.
- A land use assessment, which identified land uses and sensitive receptors through a desktop review of aerial imagery and through field observations. Additionally, individual sensitive receptors, such as schools and churches, and activities that take place within or alongside the road (e.g., roadside markets) were identified. A land use field survey was conducted to confirm the sensitive receptors and land use area identified during the desktop review.
- Interviews undertaken with stallholders at the Napa Napa Road junction in 2019.

4. NATIONAL STUDY AREA

This chapter 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 (Section 3.1), 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.

4.1 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 southwest Pacific. The capital, Port Moresby, is located along the south-eastern coast. This section provides the context of the existing social environment in Papua New Guinea.

4.1.1 Social overview

Recent estimates place the 2020 population at between 8.9 to 9.6 million persons (R. M. (Mike) Bourke and Allen 2021). Population density varies considerably across the country, with very low levels of population density (1 to 2 people per square kilometre (km^2)) in much of the Western Province and over 800 people per km^2 on some small islands (Bourke 2020). Males comprise 52% of the population, with females making up 48%. Between 2000 and 2011, the average annual population growth in Papua New Guinea was approximately 3.1%.

The population distribution of Papua New Guinea is similar to other developing nations in the Pacific region with approximately 35% of the population younger than 15 years, 62% between 15 and 64 years and 3% over the age of 65 years (NSO 2014). More than 75% of Papua New Guinea's population is below the age of 35 years, which is commonly referred to as a 'youth bulge', which can indicate a high potential for civil unrest, particularly 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 infant mortality rate in Papua New Guinea was estimated to be 35 per 1,000

births in 2022 (WHO 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. Health infrastructure in Papua New Guinea includes around 1,800 aid posts, which provide primary health care services, which are supported by approximately 800 health centres (Wiltshire et al. 2021). Secondary health care is provided by 22 provincial hospitals, including the national referral hospital in Port Moresby.

The PNG education system involves three years of elementary school, six years of primary school, and four years of secondary school. The Government of PNG introduced a commitment to free education through the *Tuition Fee Free Policy* in 2012, which provides a subsidy to reduce household education costs. A recent evaluation of the program indicates there are issues with policy implementation, particularly in remote provinces, with educators reporting that subsidies are not received on time; consequently, parents either pay education fees themselves or do not send their children to school (Nunn and Nelson 2019).

Table 4.1 summarises key indicators of educational achievement at the national level. As shown, the median years of school was 5.5 years for women compared to 6.8 years for men. The literacy rate was 66.4% for women compared to 79.9% for men. Overall, these data indicate that achieving universal education remains a challenge for PNG.

Table 4.1 Median years of schooling and literacy rate

Area	Median years of schooling – women	Median years of schooling – men	Literacy rate – women	Literacy rate – men
PNG	5.5	6.8	66.4	79.9

Source: NSO and IFC (2019).

There are challenges in delivering health and education services in Papua New Guinea. These challenges include:

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

In general, residents in urban areas have better access to services than those in remote and rural areas, which contributes to rural-urban migration to areas such as Port Moresby and Lae.

4.1.2 Economic overview

In 2021, Papua New Guinea had a gross domestic product of PGK 91 billion (US$26.59 billion) and an inflation rate of 4.5% (World Bank 2021). In 2020, total exports were valued at PGK 31 billion (US$9.34 billion), while the value of imports was estimated to be PGK 13 billion (US$3.75 billion) (OEC 2019). Between 2004 and 2012, the Papua New Guinea economy grew by an average of 6.5% per year, slowing from late 2012 as the construction phase of the PNG LNG Project neared completion.

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 described as small-scale enterprises selling, producing or manufacturing goods regularly in prescribed or un-prescribed areas, such as streets or roadsides (Kavan 2010).

In 2020, petroleum gas represented 31.5% of total exports, followed by gold (25.1%) and copper concentrate (7.4%), rough wood (5.43%) (OEC 2020). Other export items such as palm oil accounted for 4.64%, coffee for 1.25%, frozen fish for 1.25% and vanilla for 0.43% (OEC 2020).

In 2020, approximately 2.7 million people were estimated to be in the labour force (World Bank, 2021). Approximately 60% of the total population is involved in subsistence employment (50% male and 67% female), while approximately 11% are involved in formal wage employment (16% male and 6.5% female) (NSO 2014).

Informal economic activity in Papua New Guinea predominantly revolves around subsistence farming and small-scale markets. The informal economy in Papua New Guinea is estimated to be worth PGK 12 billion per year, which is approximately 20% of the country's GDP (Kenneth 2019) and is estimated to employ 80% of adults who are typically aged between 35 and 54 years old (Luluaki 2018). Employment and livelihood activities in PNG are highly gendered, with women being three times more likely than men to work in the informal sector (FAO 2019). Women's participation in formal employment is constrained by cultural expectations and legal restrictions on women's engagement in work that involves night-time hours is physically arduous or involves working underground (World Bank Group 2018a).

Physical infrastructure and services in Papua New Guinea is limited, particularly in relation to the road network, transport, electricity and water supply. In 2018, Papua New Guinea was ranked 144 out of 160 countries (with 160 being the lowest ranked country) in terms of physical infrastructure (World Bank 2018). In 2016, an estimated 23% of Papua New Guinean households had access to electricity, with most of these located in Port Moresby, provincial capitals or close to large resource projects (ADB 2019). Most rural people, including some of those living within the study area, do not have access to electricity and rely predominantly on kerosene and wood fires for lighting and cooking.

Papua New Guinea has a network of commercial ports which support freight and passenger services, with the largest ports located in Port Moresby and Lae. Papua New Guinea has a reasonably well-developed system of air services, although 70% were reported to not meet international standards (DNPM 2010). The main international airport is located in Port Moresby and acts as the main entry point to the rest of Papua New Guinea.

Poverty and socioeconomic vulnerability

There is limited up-to-date and reliable statistical information on poverty in Papua New Guinea, with the latest reliable data collected at a national scale being the 2010 *Household Income and Expenditure Survey* (Gibson, 2013). Based on the outcomes of this survey, Papua New Guinea has among the highest levels of poverty within the Asia Pacific, with around 40% of the population under the extreme poverty line of US$1.90 or PGK6.7 per day (World Bank Group 2018a). This equates to a household income[6] of PGK 829 per month.

Analysis of impoverished households in PNG has identified the following indicators of socioeconomic vulnerability:

- Lack of engagement in the cash economy, or more simply, households that rely solely on subsistence gardening for their livelihoods, indicates that these households have no capacity to engage in the cash economy.
- Low education, with a higher incidence of poverty in households where no one had attended school.
- Single female-headed households.
- Households with high levels of dependency from elderly persons and children
- Households with people with one or more disabilities.
- Households with insecure tenure rights, e.g., settlers, and people living in informal settlements (FAO 2019; World Bank Group 2018a; Bourke 2020).

[6] Calculated as a household with two adults and three children (Anker Research Network 2020).

4.1.3 Governance

For governance and administration purposes, Papua New Guinea is divided into provinces, districts, local-level government areas and wards. A ward is the lowest-level political representation in Papua New Guinea and generally comprises four or five villages.

A description of government agencies at the provincial and local levels is provided in Table 4.2.

Table 4.2 Government agencies at the provincial and local levels

Level of Government	Agency	Role and description
Provincial	Provincial Assembly	Debates and passes legislation relating to the province.
	Provincial Executive Council	Implements laws and policies adopted by the Provincial Assembly and National Government.
	Joint Provincial Planning and Budget Priorities Committee	Oversees, coordinates and makes recommendations concerning overall planning in the province. Prepares rolling five-year plans for the province in consultation with district and local-level government plans. Determines and controls budget allocation for the province. Is accountable to the Provincial Executive Council.
	Provincial Administration	Provides a range of services. Portfolios include health, education, agriculture, lands, sports, local government and other support services. Joint District Planning and Budget Priorities Committee oversees, coordinates and makes recommendations concerning the overall planning in the district. Determines and controls budget allocation for the district, including funds from the national government's District Services Improvement Program and the Local-level Government Improvement Program.
Local Level Government	District Administration	Coordinates the implementation of district plans.
Wards	Local-level governments	Prepares annual and five-year development plans and associated budgets. Responsible for constructing and maintaining local infrastructure and facilities and initiating and implementing programs for youth and women. Members comprise elected ward representatives, known as 'councillors'.
	Ward Development Committee	Prepares five-year rolling development plans for the ward, which contributes to the Local-level Government Development Plan.

4.2 NATIONAL CAPITAL DISTRICT

4.2.1 Overview

The primary focus of this section is to characterise the existing social environment of the NCD, which includes Port Moresby (see Figure 3.2).

Port Moresby, the largest city in the Pacific Region, is the capital city of Papua New Guinea and is located within the administrative area of the NCD. The city was originally an administrative centre for a colonial government and developed an urban form to suit this purpose. Following independence in 1975, Melanesian people now comprise most of the city's population, with expatriates only comprising a small minority. The

NCD is governed by the National Capital District Commission (NCDC) and the Motu-Koitabu Assembly, representing the customary landowners of the area.

When Europeans first visited the Port Moresby area in 1873, the largest Indigenous settlement was called Hanuabada ('Big Village'), which was comprised of five villages and two distinct ethnic groups, these being the Motu and the Koita (Rooney 2017). While there are variations in the history of these two groups of people, there is consensus that the Motuans were the original coastal people, while the Koita came from the hills inland, but they have inter-married with the Western Motu and lived together along the coastline of what is now Port Moresby for generations. Reflecting this long and shared history, the Western Motu and Koita people together are now known as the Motu-Koitabu people and live within and beyond the boundary of the city as it is known today (Rooney 2017).

Port Moresby is a complex social environment that is attributable to numerous factors, including the historical colonial legacy, vast wealth inequalities, large movements of people, high rates of formal unemployment and a variably sustaining informal sector, ongoing destabilisation of cultural values and traditional ways of life, as well as occasional tensions between ethnic groups (Global Cities Research Institute 2019).

4.2.2 Population and settlements

At the time of the 2011 National Census, the NCD had a population of 364,125 (5% of the total national population), with an average population density of around 16 persons per hectare and an average household size of 7.7 persons (NSO 2014). This is a relatively low density in global terms but is unevenly made up of densely packed urban villages and dispersed administrative offices set in sprawling fenced spaces.

The 2011 National Census reported an annual growth rate in the NCD of 3.3% since the 2000 Census; however, there is a reasonable degree of uncertainty around the current population. Conflicting reports indicate that the population could be between 450,000 and 800,000 people, with the majority living in settlements (Jones 2012; ADB 2018). Most of the population in Port Moresby is relatively young, with 70% of the population aged under 29 years of age (NSO 2014).

Future population growth is expected to be significant as urbanisation continues. A recent World Bank report (2018) stated that if Papua New Guinea reached the current average Pacific urbanisation rate of 50% by 2050, the total urban population would be 9 million, and the population of Port Moresby would exceed 3 million people[7].

Housing in Port Moresby has predominately been established for the development of residential areas for expatriate administrators and national employees. A key driver of change in housing development has been the rapid urban growth experienced since the country's independence in 1975, due to rural-urban migration (UN Habitat 2013). For example, in 2011, 58% of the population was comprised of in-migrants born outside of the NCD (NSO 2014).

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). Table 4.3 provides a classification of the different settlement types in the NCD and the estimated number of settlements by type. 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 an inadequate supply of housing (Jones 2012). As a consequence, the *National Capital District Commission Urban Development Plan* (2020) estimated that 23,000 new buildings were established in settlements between 2010 and 2020, compared to 6,500 in formal residential areas, resulting in around 50% of the population in Port Moresby residing in settlements as at 2020 (Kutan and Nao 2022).

[7] Assuming the current population of Port Moresby is approximately 750,000 people (Craig and Porter 2018).

Table 4.3 Settlement types in the National Capital District

Category	Key features	Number of settlements	Main land type
Formal settlements	• Low-cost self-help housing on State land. • Basic services and infrastructure provided by the Papua New Guinean government, including water, power, and sanitation infrastructure. • The National Housing Corporation holds the head lease and sub-leases to settlers.	20	State land
Informal settlements	• Spontaneous community or cluster of families, which settle an area without landowner consent. • Little enforcement by State authorities. • Disregard of planning and building rules and regulations.	44	State land
Motu-Koitabu settlements	• Landless migrants permitted to settle on customary land held by the Motu and Koita clans.	37	Customary land

Source: Jones (2012); UN Habitat (2010).

The provision of services and infrastructure in settlements was summarised by Jones (2012) as the following:

> *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.*

However, settlement living remains difficult for many residents, and there is little opportunity to escape urban hardship. In many settlements, kinship systems play a critical support role for people and households experiencing hardship and poverty (ADB 2018).

The formal Port Moresby housing market in the period following the development of the PNG LNG Project was characterised as a high-priced market stimulated by activity in the broader extractive industry (Rooney 2017), and major events, such as the APEC Leader's Summit in 2018, imposing serious affordability constraints on a significant proportion of Port Moresby residents (Oxford Business Group 2018). These projects required both foreign and interprovincial workers, stimulating a rapid rise in demand and property prices due to a demand/supply imbalance. Property demand from the PNG LNG Project fell following the end of construction in 2014, with subsequent flow-on falls in house price and rental levels, although not to pre-construction levels (Ezebilo 2017). The supply response to the PNG LNG Project demand saw an increase in housing construction in areas already linked to high residential prices, possibly due to a lack of land serviced by existing trunk infrastructure and less security concerns in these areas (Ezebilo 2017). It is understood that there is capacity within this end of the market in Port Moresby. The higher prices is reported to have encouraged residents within formal housing estates to migrate to settlements, thereby increasing demand and prices in these areas; consequently, there is a well-established population of salaried wage earners from the lower middle class within settlements (Cox et al. 2022).

In 2013, the First Home Owners Scheme (FHOS) was introduced to support the growth of the housing market. The FHOS is funded through an annual PGK 200 million (US$58 million) budget allocation that is managed by the Bank South Pacific. It provides low interest loans (4% per annum) to approved first-home buyers (with 10% equity) over a 40-year term, with a maximum loan amount of PGK 400,000 (US$116,380). By April 2017, the Bank South Pacific had approved 534 loans, and there was a significant jump in the development of housing sub-divisions (including Kennedy Estate, Skyview Estate, Nasfund Estate (9-Mile), Duran Farm (National Housing Corporation)) and in the number of residential house building contractors. Notwithstanding these developments, there remains a view 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).

Access to land for housing development remains an important 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). Noting that concern exists among the Motu-Koitabu people that the urbanisation process poses a threat to land ownership rights and cultural heritage.

The COVID-19 pandemic has had a deflationary effect on the housing market, due to a drop in demand that is attributed to overseas workers being repatriated during 2020 and 2021. As a result property prices and rental values have reduced, which has meant the market is beginning to become more affordable, although the market is still seen to be expensive (Hausples, 2022).

4.2.3 Livelihoods

Within the Port Moresby urban area, formal sector wage employment is centred on four main industry categories (ADB 2012). These are:

- Services, including 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 PNG LNG Project construction. Following the economic downturn in 2012, formal employment declined by 20%, particularly in the construction and wholesale trade industries (World Bank 2019).

In addition to formal sector employment, the urban informal sector sustains the livelihoods of most urban residents, especially the poor. The two sectors are not mutually exclusive, with many formal sector employees also engaging in informal economic activity to generate supplementary income. Informal sector income-producing and entrepreneurial activities are diverse and include the sale of (ADB 2012):

- Cooked food, sweets and drinks
- Surplus crops and animals, such as vegetables, fruit, peanuts, chickens and ducks
- Handmade goods such as coconut brooms, handicrafts and bilums
- Second-hand clothing and store food and goods
- Gambling cards, stolen goods, and services, such as illegal connections to water and power.

A recent audit of the informal economy in Papua New Guinea made the following findings (Luluaki 2018):

- The output of the sector was valued at PGK 12 billion (US$3.5 billion) per year, which is approximately 20% of the GDP.
- Participants were much better educated than in a previous survey in 2001, with less than 20% having no education.
- Participants comprise a much older cohort, with half of those surveyed being over 35 years old.

- Young people under 25 years comprise about 15% of participants, which was lower compared to the 2001 baseline of 25%.

Recent statistics on the labour force in Port Moresby are generally unavailable; however, the *2016-2018 Papua New Guinea Household Income and Expenditure Survey* (NSO 2019) found that 50.0% of working-aged people in the NCD had not been employed in the previous 12 months.

The production of food for sale, both within and on the fringe areas of Port Moresby, comprises an important informal sector activity that is stimulated by the high price of fresh fruit and vegetables. The importance of household gardens is widely recognised (Vasey 1985); however, challenges such as lack of land tenure, cultivation on steep slopes, poor topsoil, and lack of water are common in Port Moresby.

In 2008, the total supply of fresh food to Port Moresby was estimated to be 57,780 tonnes annually, comprising of 50,350 tonnes sourced from local production and 7,430 tonnes from other provinces and international imports (Wilson 2012). The volume of fresh food supplied from Central Province and the NCD is increasing, with production from peri-urban areas vastly improving Port Moresby's capacity to feed itself (Wilson 2012). This could be attributed to the involvement of more experienced farmers from Highland areas who are better informed of market requirements and who use better horticultural techniques; the availability of off-farm income supporting equipment and chemical fertiliser purchase; and a weak Papua New Guinea currency increasing the price of imported food (Wilson 2012).

A more recent development in food production has been the establishment of commercial vegetable farms, such as the 9 Mile Vegetable Farm. This farm utilises more advanced technology, such as drip irrigation, improved seeds and greenhouse growing systems, improved post-harvest handling and distribution and employs a significant number of local community members, often women from settlement areas (Wilson 2012).

The COVID-19 pandemic resulted in reductions in the volume of fresh food shipped to Port Moresby with, for example, a reduction from 1,200 tonnes per week in January / February 2020 to 120 to 150 tonnes per week in April / May 2020 (Davila et al. 2021), and resulted in significant disruptions to local livelihoods in the informal sector (Unicef, World Bank Group, and UN Papua New Guinea 2021).

Livelihood options for youth pose a significant issue in Port Moresby, where the World Bank (2019) estimates that there is at least 40,000 unemployed youth pursuing livelihoods from non-monetary activities. Few opportunities exist in the formal sector for youth; in 2011 only 8% of people aged between 15 to 24 years had a wage-paying job (NSO 2014). Individuals aged between 15 and 29 years old represent 35% of the population in Port Moresby (the so-called "youth bulge"). This age group is expected to grow by an additional 13% in the coming years due to natural increase and in-migration from rural areas (World Bank 2019). With limited places in post-school training institutions, the ability to gain skills is constrained, and there is an oversupply of low-skilled labour competing for limited employment opportunities.

4.2.4 Infrastructure and services

Port Moresby suburban areas are reasonably well-serviced with basic infrastructure such as roads, water and power. However, the accelerated development of housing areas, following the demand induced by the PNG LNG Project and the introduction of the FHOS, has sometimes seen delays in the provision of trunk infrastructure (Kora 2017). Over the past five years, there has been significant investment in roads, and the NCD water supplier, Eda Ranu, has been implementing water and sewerage upgrade projects, including the development of a sewage treatment plant and ocean outfall at Kila Kila on the southern outskirts of the town.

However, there remains a significant lack of water, power and sewage services in settlement areas. In suburban areas of Port Moresby, there is generally adequate provision of education and training infrastructure, and ongoing public and private sector investment in this area. At the time of the 2011 Census, approximately 80% of the population in the NCD reported ever attending school, which is significantly higher

compared to the national average of 60% (NSO 2014). A more recent survey found that women in the NCD reported a median of 9.2 years of schooling compared to the national average of 5.5 years, and men reported 9.7 years of schooling, compared to the national average of 6.8 (NSO and IFC, 2019). Port Moresby hosts three university campuses: The University of Papua New Guinea, the Pacific Adventist University and a campus of the Divine Word University. In addition, there are post-school training institutions such as the Port Moresby Technical College, the Port Moresby Business College, and the International Education Agency TAFE college at Ela Beach. There is an Australia Pacific Training Coalition campus in Port Moresby meeting a key gap in Papua New Guinea's technical and vocational education and training (TVET) sector. The campus provides internationally recognised trade qualifications to Papua New Guineans in important areas of demand, such as metal fabrication and welding, and hospitality. Site Skills Training is another provider of internationally recognised training in Port Moresby and their training facility includes a mock gas processing plant (Site Skills Training 2019).

Secondary schools include 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 are run by the government or faith-based organisations and are located throughout major catchment areas; however, these facilities are often not well maintained, lack resources and are overcrowded (UN Habitat 2010). In addition, existing school facilities in Port Moresby often lack enough land to expand and have difficulty obtaining land for new establishments (DoE 2007).

Should they be able to afford it, Port Moresby residents have access to some of the best healthcare facilities in the country. The publicly funded Port Moresby General Hospital has an accident and emergency facilities and is open 24 hours; however, it is reported to be supporting a population significantly larger than its capabilities (WHO 2012). Private service providers also exist, including the Pacific International Hospital, Paradise Private Hospital, Port Moresby Medical Service and Aspen Medical at Konedobu.

The most common diseases in Port Moresby are malaria, tuberculosis and sexually transmitted infections (UN Habitat 2010). In 2018, after 18 years of being polio-free, Port Moresby reported its first case of polio in September, a six-year-old boy from 5-Mile Settlement (WHO 2018). Based on a risk assessment, an emergency vaccination plan was quickly implemented in the settlement, followed by a province-wide polio vaccination campaign in the NCD and a nationwide campaign in October where teams of polio workers were tasked to vaccinate 170,195 children under 15 years old during a two-week period (WHO 2018).

The 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 (NewFields 2022). Papua New Guinea experienced three COVID-19 waves during 2021 and 2022 (NewFields 2022). As of 28 November 2022, Papua New Guinea had officially reported a cumulative total of 45,819 confirmed cases of COVID-19, including 668 COVID-19 confirmed deaths (NewFields 2022). As of 11 September 2022, the Central Province has reported 1,302 cumulative cases and 6 overall deaths (NewFields 2022).

COVID-19 vaccination roll-out has occurred across all provinces. Eligibility for vaccination is open to all adults 18 years and older but with an emphasis on health care workers, adults over 45 years of age, and adults with comorbidity (NewFields 2022). Table 4.4 presents COVID-19 vaccination accumulation coverage for the Central Province with comparison to National Capital District and national. Poor environmental health conditions in settlements, such as lack of clean water, poor sanitation, overcrowding, in houses, also leads to high morbidity due to diarrhoea and upper respiratory tract infections including pneumonia (WHO 2019). Tuberculosis is among the top five causes of death and hospital admissions in Papua New Guinea (WHO 2019). Papua New Guinea and Cambodia have the highest tuberculosis burden in the Western Pacific Region with case notification rates of more than 200 per 100,000 population (WHO 2019).

Table 4.4 Papua New Guinea COVID-19 vaccination accumulation coverage (as of 20 November 2022)

Province	2022 target	Cumulative at least one dose received	At least one dose received	Fully vaccinated	Fully vaccinated coverage
Central	172,997	9,337	5%	6,773	4%
National Capital District	278,463	127,842	46%	117,340	42%
National	5,124,530	364,090	7%	303,884	6%

Source: NewFields 2022

Whilst tuberculosis control activities have expanded slowly due to a number of challenges, the occurrence of the human immunodeficiency virus (HIV) and the rapid rise of multi-drug resistant (MDR) tuberculosis have increased the burden of tuberculosis (WHO 2019).

In April 2010, a cholera outbreak in Papua New Guinea moved towards the southern part of the country where the first case of cholera was reported in Port Moresby (WHO 2010). In the following month, cases were also reported in the nearby Central Province. Prior to 2009, cholera had never been reported in Papua New Guinea (WHO 2010). Data from the Port Moresby General Hospital also indicate that so-called lifestyle diseases, including diabetes and hypertension, are becoming more prevalent, with AIDS-related illness being a leading cause of adult death at the hospital (WHO 2019).

Tingim Laip (2012) reported that the construction and operation of the PNG LNG Project increased people's access to the cash economy and increased the number of young women engaged in transactional sex and sex work. There is reportedly some level of condom use amongst sex workers; however, inconsistent use increases HIV transmission risk (Tingim Laip 2012).

The hotel accommodation sector in Port Moresby grew rapidly at the start of the construction of the PNG LNG Project in 2011, with the opening of new hotels (e.g., Stanley Hotel, Grand Papua) and expansion of existing hotels (e.g., Airways, Holiday Inn). The number of rooms increased from 700 to 2,000 between 2011 and 2017 (Oxford Business Group 2018). Port Moresby's hosting of the APEC Leaders' Summit in November 2018 also resulted in a number of infrastructure upgrades in the city, including road and transport, accommodation and commercial facilities. Developments included the PGK 1.5 billion Star Mountain Plaza, which includes a Hilton Hotel and the Kutubu Convention Centre, and the PGK 120 million APEC Haus, which hosted the APEC Summit (Oxford Business Group 2018).

Jackson's International Airport in Port Moresby was also upgraded in preparation for hosting the APEC Leader's Summit. Infrastructure upgrades included the construction of new retail facilities, public carparks and walkways (Oxford Business Group 2015). It was reported that the airport handled 1.6 million passengers in 2013, despite that maximum capacity being 400,000 at the time (Oxford Business Group 2015).

The Port Moresby Port was moved from its original location near the city centre to Motukea Port, which is across Fairfax Harbour to the northeast of Port Moresby in 2018. The upgraded Motukea Port has a mobile crane, bulk handling and passenger handling facilities. Motukea Port is located 12 km southeast of the LNG Plant and was used by the PNG LNG Project during construction, negating the need for a materials off-loading facility to be constructed at the LNG Plant site.

4.2.5 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, Port Moresby is often ranked by the Economist Intelligence Unit (despite considerable challenges with data availability and reliability) as one of the least liveable cities in the world, beset by crime and violence (Economist Intelligence Unit 2017). As indicated by Hukula (2017):

> *The growing middle-class including business people and white-collar workers and the educated elite of Port Moresby continually condemn settlements as crime invested locales', thereby stereotyping them as 'the breeding grounds for anti-social behaviour'.*

However, while the homicide rate in Port Moresby in 2010 (33 per 100,000 persons) was three times the global homicide rate, property crime and repeat victimisation declined during the 2000s (Craig and Porter 2018). Across urban Papua New Guinea, the crime crisis of the late 1980s and 1990s began to pass as the resource boom began in the 2000s and early 2010s (Craig and Porter 2018).

Potential reasons for this include (Craig and Porter 2018):

- Papua New Guinean urban gangs failing to institutionalise during recent decades and "growing out of crime".
- Urbanisation processes bringing together diverse peoples and 'creating powerful incentives for everyday investments in safety and security'.
- The multiplication of alternative pathways for settlement youth to move into education and formal or informal 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 (38%). 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. A 2009 survey in the NCD noted that women were five times more likely to be victimised at home than on the street and were generally victims of men known to them (Lakhani and Willman 2014b).

4.2.6 Culture and governance

While the original inhabitants of the area were the Motu-Koitabu people, Port Moresby is considered to be a 'melting pot' with extreme diversity and ethnic heterogeneity (Craig and Porter 2018). The combination of cultures has led to the emergence of other forms of social organisation and solidarity, such as pidgin English (Tok Pisin) spoken as the lingua franca which enabled the formation of labour and ethnic welfare movements, in addition to inter-ethnic associations (Craig and Porter 2018).

The 'melting pot' effect, plus the loss of land to urban development, has accelerated change to Motu-Koitabu culture and traditions which have been undergoing change since initial contact in colonial times (Craig and Porter 2018). Today, the Hiri Moale Festival (celebrating the Hiri trading voyages) is a public expression of Motu-Koitabu cultural pride held annually in Port Moresby, though occasionally conflict between different Motu-Koitabu villages prevents a unified cultural display. Other events, such as the Papua New Guinean Independence Day celebrations in September, serve to celebrate aspects of regional culture and their contribution to an overarching Papua New Guinea culture.

The only recognised locally elected government in Port Moresby is the Motu-Koitabu Assembly, which represents the interests of the seven traditional villages within the NCD. The seven villages, with a total population of 30,000, are represented by their councillors, including a chairman, 14 ward members and two women's representatives. This political unit operates under the National Capital District Commission Act and recognises the traditional land owners of Port Moresby in a formal system of local-level government. The Assembly's chairman and members are voted for by the traditional land owners and the Motu-Koitabu Assembly chairman automatically becomes the deputy governor of the NCD (UN Habitat 2013).

Port Moresby is divided into three electorates: Port Moresby North East; Port Moresby North West; and Port Moresby South East, and 12 wards (UN Habitat 2013). While the NCD is classified as an Urban Local-Level Government and differs from provincial government systems, for electoral purposes, it is classified as the equivalent of a province with a governor and chair of the NCDC (UN Habitat 2013).

Under the *National Capital District Commission Act 2001*, the NCDC is the administrative authority responsible for providing municipal services such as urban planning and regulation, roads and waste management (UN Habitat 2013). The NCDC is supervised by the Ministry of Inter-Government Relations and is guided by the National Capital District Urban Development Plan 2006, in accordance with the Physical Planning Act 1989 (UN Habitat 2013). The NCDC employs approximately 700 staff, and the Commission Board is comprised of 11 members, with the governor as the chairman (UN Habitat 2013).

4.2.7 Experience of PNG LNG Project

The most significant impacts of the PNG LNG Project experienced in Port Moresby included (Oxford Business Group 2018; NRI 2017a; Ezebilo 2017):

- Increases in the purchase and rental prices for housing (over an extended period). Specifically, the construction phase of the PNG LNG Project resulted in an increased expatriate population within the NCD; however, there was insufficient supply to meet this demand, which contributed to increases in the cost of housing. Although housing costs decreased following the completion of the construction phase, the decrease was not proportional to the increases experienced.
- Increased construction activity in the city and suburbs as the development of offices and accommodation struggled to overcome supply shortfalls. It was noted that construction activity focused on medium to high-cost housing, which experienced relatively high levels of vacancy following the completion of the construction phase of the PNG LNG Project.
- Higher levels of business activity due to PNG LNG Project expenditure.

4.3 STATUS OF SOCIAL VALUES

Informed by the material in the previous sections compiled through research, the status of social values (as described in Section 3.5) have been inferred and are provided as follows.

4.3.1 Livelihood

Status of social values 1 and 2

> *The capacity to support livelihoods based on harvest of natural resources and; availability of opportunities for participation in the cash economy.*

Livelihoods in Port Moresby on the surface are based on participation in government and private sector service enterprises, with the majority of participation in informal economic activity. While formal wage employment is nominally secure, remuneration levels are not high and many formal sector workers also participate in the informal sector. The existence of up to 40,000 low-skilled young people with little prospect of formal sector employment indicates livelihoods that are highly precarious and only made viable by cooperation with extended family or clan units.

4.3.2 Culture

Status of social value 3

> *The ability to sustain community identity and traditions.*

Port Moresby is an urban domain with an inland peri-urban fringe and Motu-Koitabu villages along the coastal fringe of the NCD. The city has a distinct and proud ‘modern Papua New Guinean culture’ (accommodating of expatriate residence), where people from across the country co-exist despite ethnic conflict from time to time.

4.3.3 Personal and community well-being

Status of social values 4 and 5

> *An environment supportive of personal and family health, safety and security and; the availability of services and institutions supportive of community well-being.*

Communities in Port Moresby are subject to deficits in service provision, particularly in settlement areas, with consequent impacts on morbidity (UN Habitat 2010). Where service provision is available, effectiveness is impaired by personnel under-resourcing for the service population level, and often poor maintenance of facilities and lack of inputs such as medicines. Significant health issues, such as tuberculosis, malaria, sexually transmitted infections and HIV, are often exacerbated by poor living conditions. The level of crime in Port Moresby, including violent crime, is high, although it has improved over the last 10 to 15 years.

5. LNG PLANT STUDY AREA

This section describes the characteristics of the existing social environment of the LNG Plant study area. Information on Edai Town is presented separately to the landowner villages and provided in Section 0. This section also presents an assessment of the social values of the LNG Plant study area.

5.1 PLACE AND PEOPLE

5.1.1 Place

The LNG Plant study area comprises the four coastal villages nearest to the LNG Plant (which is located 20 km north-west of Port Moresby), specifically Lea Lea and Papa to the north-west and Boera and Porebada to the south-west of the LNG Plant. The portion of the Port Moresby to Lea Lea Road that will form the Project's logistics route between Motukea Port and the LNG Plant is approximately 16 km long and is also part of this study area. Edai Town is along this route and is also included in the study area.

The LNG Plant communities are peri-urban, predominantly coastal villages surrounded by either savannah or denser vegetation where there are steeper slopes and watercourses or drainage areas. The coast is generally fringed by dense stands of mangroves.

Lea Lea village is located approximately 4 km north-west of the LNG Plant boundary at the end of the Port Moresby to Lea Lea Road (see Figure 3.1). The village occurs on both sides of the Kido River, with the residential areas mostly focused along the coast. Lea Lea can be accessed via road travel through Papa, as well as sea access where required. Dwellings in Lea Lea are generally accessible via established tracks and roads. Papa village is adjacent to Lea Lea and is approximately 1.5 km north-west of the LNG Plant boundary (see Figure 3.1). Karuka Creek occurs to the east of the village and is associated with denser vegetation. Residences are located on the coast as well as further inland travelling along the Port Moresby to Lea Lea Road towards the LNG Plant. A small group of housing also occurs near the Metago United Church Training Institute, which is accessed by road approximately 2 km east from Papa village.

Boera village is located approximately 3 km south-west of the LNG Plant boundary along the coast of Caution Bay (see Figure 3.1). The village is generally concentrated along the coast with some dwellings built on raised stilts on the beach. Residential areas within the village extend north from the coast further inland along established and smaller tracks. A steep plateau occurs to the east of the village with elevation increasing up to 130 m in some areas. Boera village can be accessed by bitumen road off the Lea Lea Road and by sea access as required.

Porebada village is located approximately 8 km south-west of the LNG Plant boundary and is located closest to Port Moresby (see Figure 3.1). The village is densely populated with the majority of dwellings occurring along the coast with some houses built on stilts over the water. Primary access to the village is through road access from Via Junction as well as a small coastal track that connects to Boera.

5.1.2 Population

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).

The population density of the LNG Plant villages is shown on Figure 5.1. The population density in Porebada is much higher than the other villages as reflected in the higher number of residents per household in Table 5.1. The reason for the higher density in unclear but maybe due to less land being available for housing around this village and/or the current practice of building houses close together over the water (see Section 4.1.1).

Table 5.1 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%
Lealea	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).

Analysis of previous population estimates provides insight into the population growth in these villages. PNG National Census data is available for 2000 and 2011, and the population of the study area villages was estimated in 2011, 2013, 2014, 2015 and 2017 as part of monitoring undertaken by the PNG IMR (NewFields 2017; PNG IMR 2018). This data, along with the 2018 population estimates determined from the 2019 household survey are provided in Figure 5.2. It is difficult to assess population trends using all datasets as the method for estimating population is not consistent across datasets, which is evident from the differences in the 2011 National Census and 2011 PNG IMR results.

Table 5.1 shows the compound annual population growth rate between 2011 and 2017 for LNG Plant villages[8]. 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. Population growth was reported to be an issue during consultation undertaken in 2023 and was stated to have resulted in additional pressure on already inadequate community infrastructure and services.

[8] 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.

During consultation, population growth was attributed to the following processes:

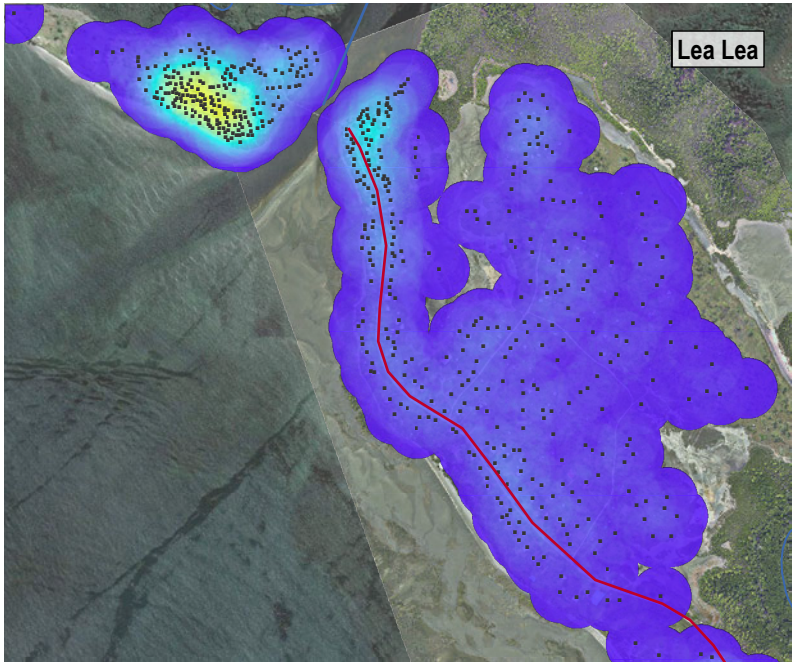
- Natural growth.
- A reported disruption to traditional out-migration processes. For example, as land is passed down patrilineally in LNG Plant communities, it was common for women to out-migrate and patri-locate following marriage. However, for a variety of reasons, there has been a disruption to this process, with the new family seeking to locate on the women's clan land. During consultation, this was attributed to access to amenities (e.g., schools, health centres), employment in the region, and in some cases, attributed to a perceived effort to establish future access to future royalty / benefit streams.
- In-migration from other areas in Papua New Guinea through marriage.
- In-migration from other areas in Papua New Guinea through land rental and other informal land arrangements with customary owners. For example, during consultation, it was noted that an area in Lea Lea has been informally provided for settlers by community agreement, which preceded the PNG LNG Project. In-migrants that fall under this category were noted during consultation to primarily be from the Papua New Guinean highlands, which reiterates the findings of in-migration monitoring undertaken for the PNG LNG Project (NewFields 2017).

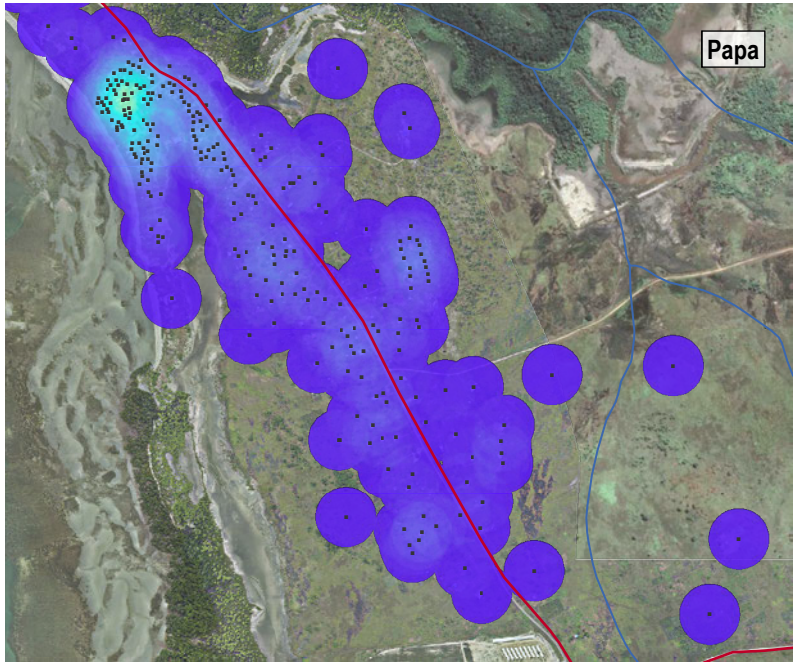
Consultation with LNG Plant communities and the Lands Department confirmed that there had not been any formal land tenure granted to in-migrants. These land dealings were reported to have resulted in conflict in some LNG Plant communities.

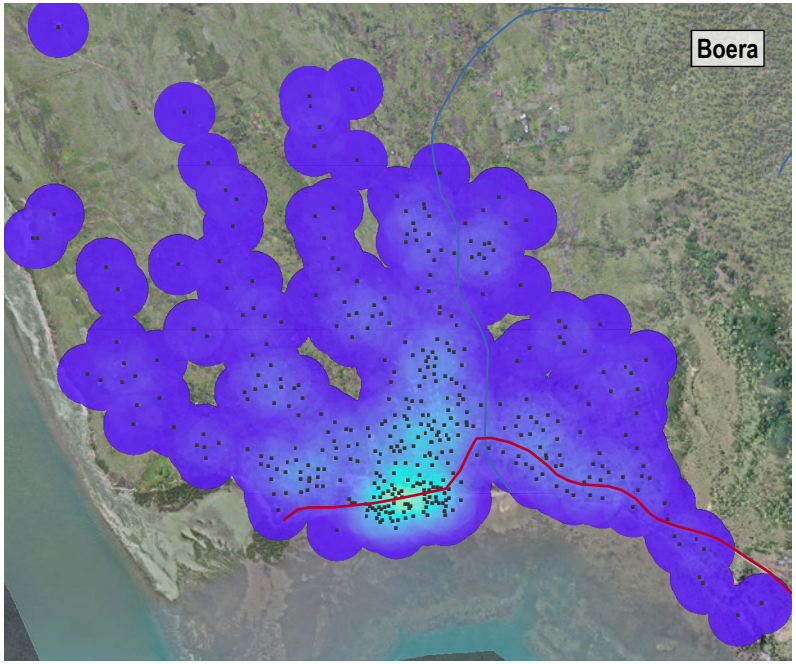
As noted in the Chapter 13 Social and Cultural Impact Assessment, in-migration into the LNG Plant communities has been characterised as being driven by the following social processes:

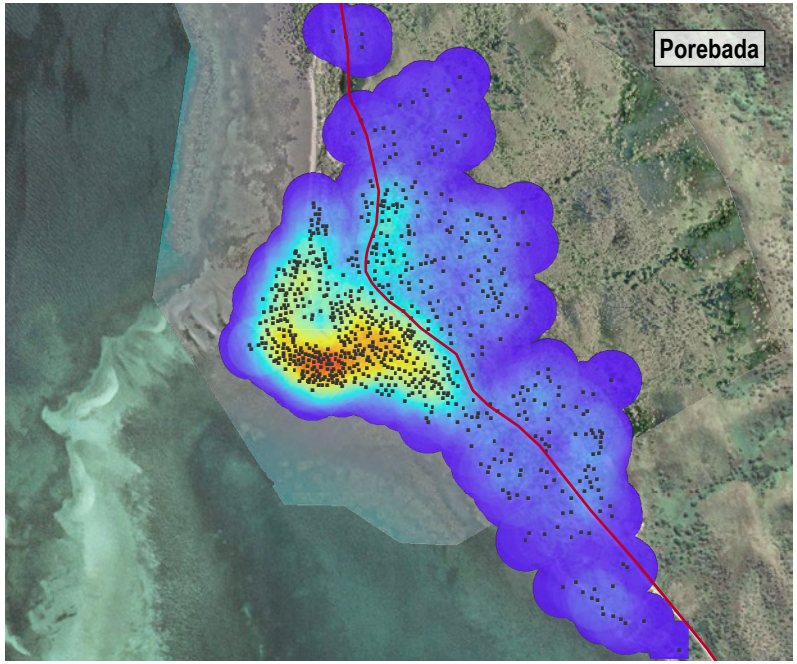
- Broader development of the area around the LNG Plant, of which the PNG LNG Project was a catalyst (see Appendix D Traffic and Land Use); the development of the area along with its proximity to Port Moresby was noted by participants during consultation to have made the LNG Plant communities more attractive to in-migrants.
- Employment at the LNG Plant.
- Amenity and services and perceived potential for improvement of these is associated with the presence of the LNG Plant.

Analysis of in-migration data collected during the PNG LNG Project found that in-migration in the LNG Plant communities was not solely work-related and that population growth was driven by numerous factors including the accessibility of community infrastructure and services (particularly a relatively functioning school system), along with the in-migration of households in order to 'claim future royalty streams' (PNG IMR 2014). PIIM monitoring during the PNG LNG Project noted that the primary PIIM occurred during the PNG LNG Project's pre-construction period (i.e., it was anticipatory) (NewFields 2017). This is indicated by the data collected by the PNG IMR (Table 5.1), where the compound annual growth rate is generally higher between 2000 and 2011 compared to the rates presented between 2011 to 2013 and 2013 to 2015, after which construction had ceased. The compound growth rates have since increased, although monitoring undertaken of the PNG IMR concluded that the net migration rates were below 0.0% across all communities in 2014 and 2017 (PNG IMR 2015; 2018).









LEGEND

- Household
- Road
- Watercourse

People per hectare

289

0

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.

N

0 500 m

SCALE **1:25,000**
PAGE SIZE: **A4**
PROJECTION: **WGS 1984 UTM Zone 55S**

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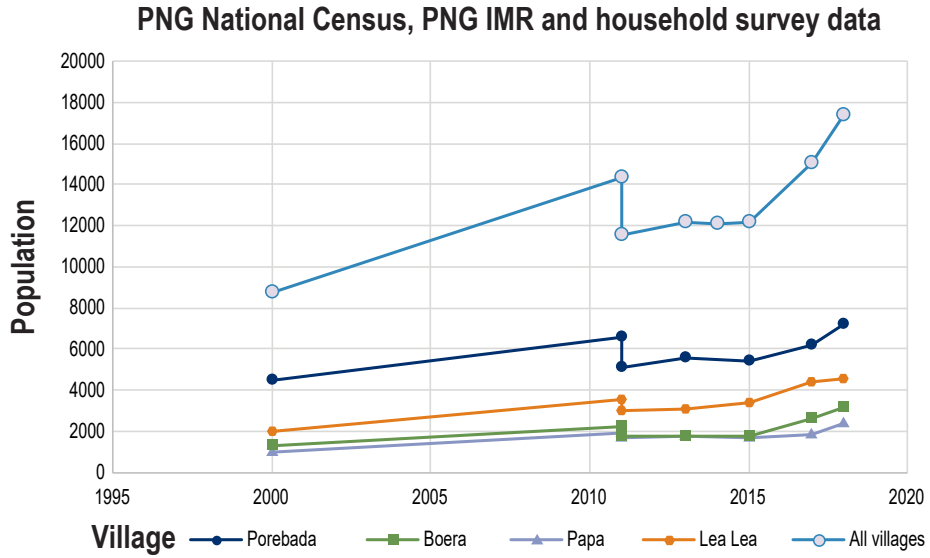
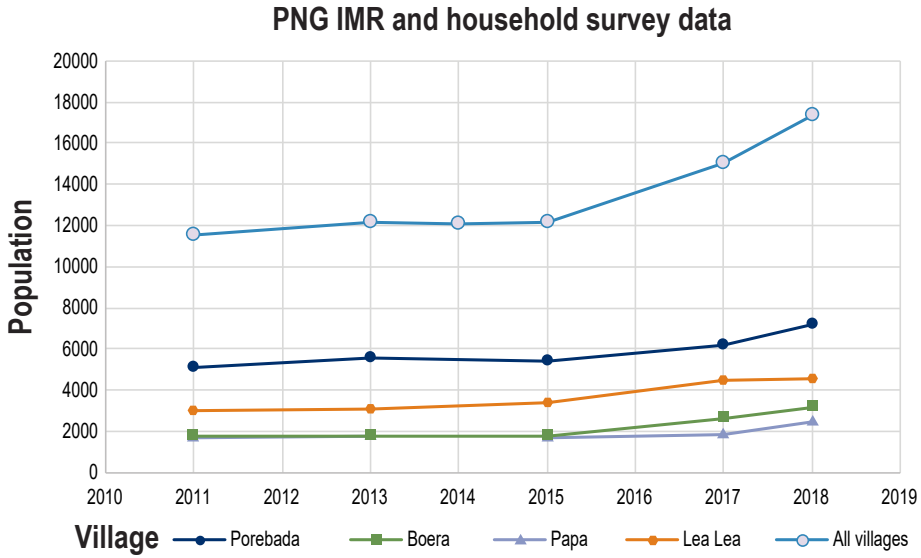
FIGURE 5.1

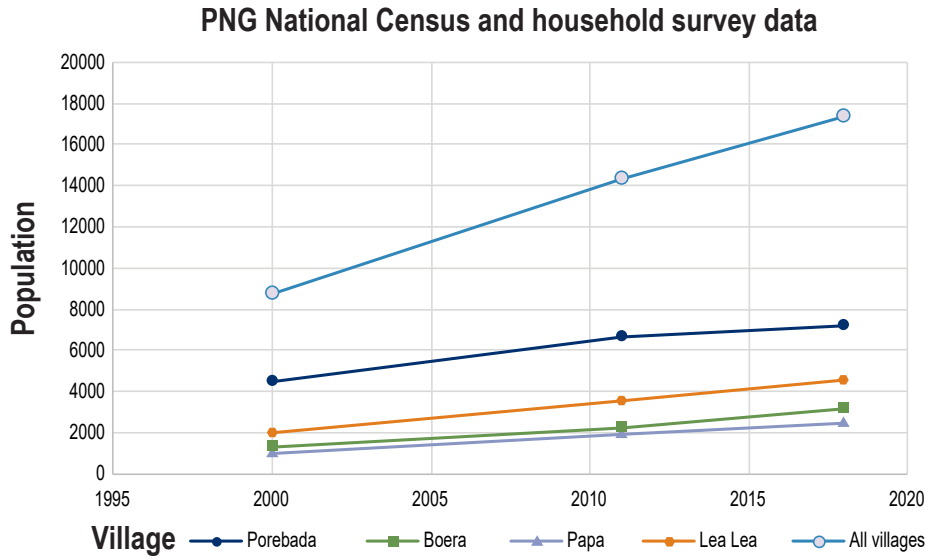
Population density - LNG Plant villages

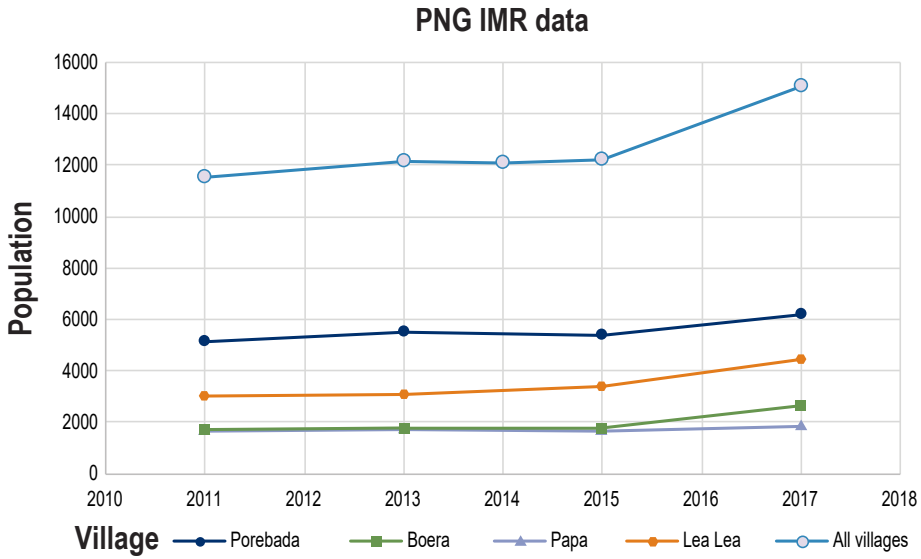
TETRA TECH COFFEY

DATE: **03.07.23** PROJECT: **754-MELEN300733** FILE: **300733_04_F05.01_GIS**









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PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 5.2

Population over time - LNG Plant villages

SOURCE:
Newfields 2017; PNG IMR 2018;
Tetra Tech Coffey household survey, 2019.

TETRA TECH COFFEY

5.1.2.1 Demographics

Population pyramids are provided in Figure 5.3. There are more male than female residents in the LNG Plant villages, with approximately 53% of the population being male. Across the study area the population exhibits a 'youth bulge', characteristic of a young population with future high rates of population growth (having yet to pass through a 'demographic transition') as well as indicating the importance of the provision of education and training and employment initiatives to future livelihoods. Further observations on the population pyramids include:

- For the combined villages, the female population in the 35 to 49-year cohort is less than the representation in the PNG population as a whole.
- In the 15 to 29 age cohort, females outnumber males in Boera, Papa and Lea Lea, while males outnumber females in Porebada.
- In the 60+ cohort, males outnumber females in Boera and Lea Lea, but population numbers are reasonably similar in Porebada and Papa.

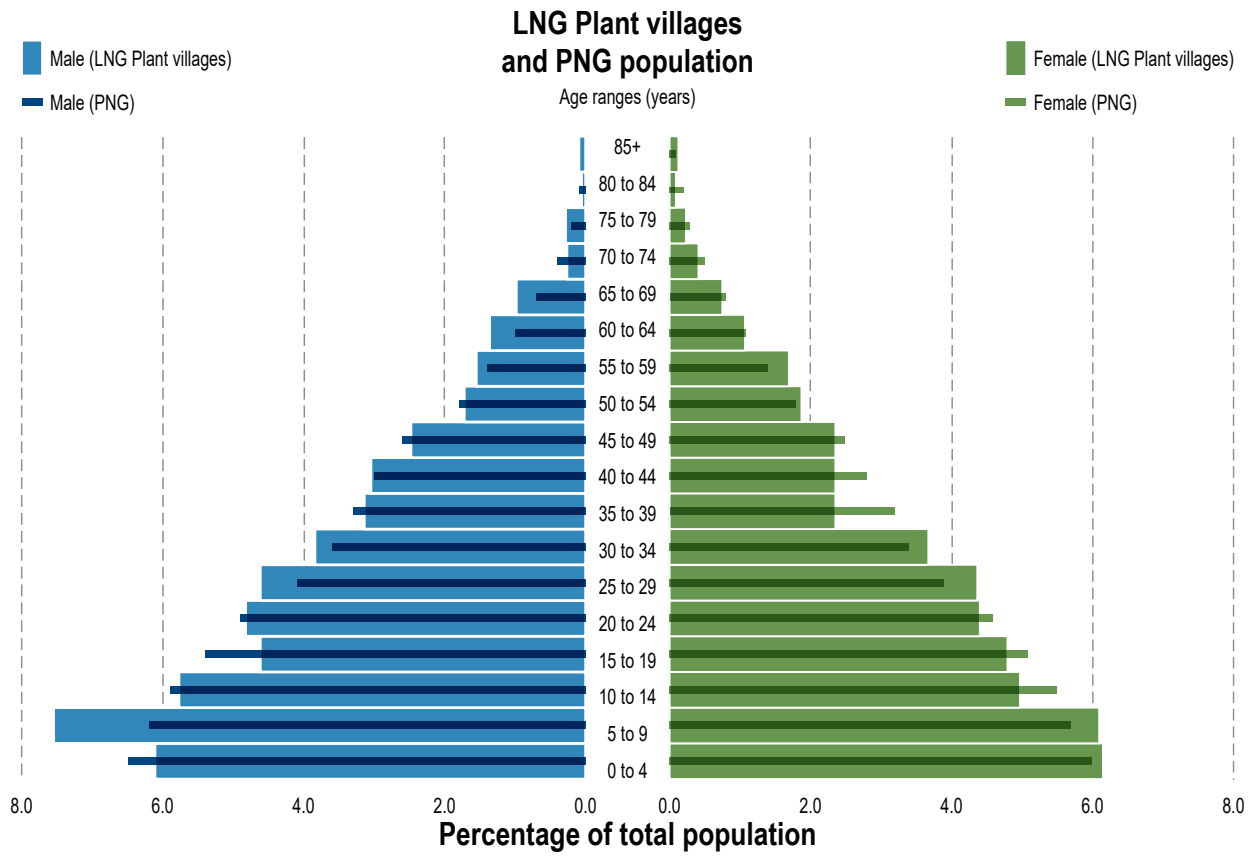
The reasons for these characteristics, as well as the significant excess of females over males in the 45 to 49-year cohort in Boera, are unclear and beyond the scope of this study to investigate further.

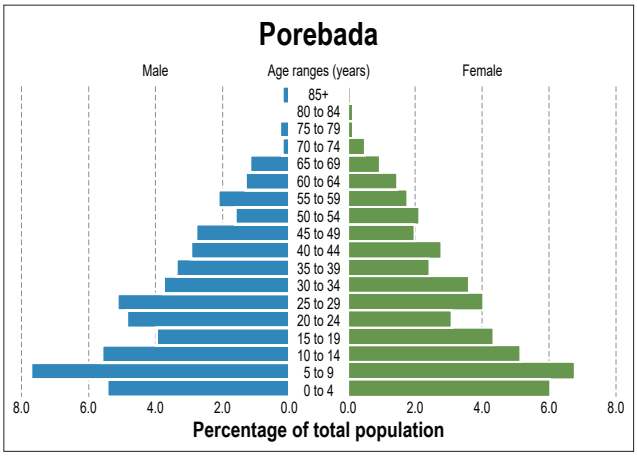
Other demographic indicators for the LNG Plant villages are presented in Table 5.2. The median age (combined genders) is similar across villages, varying between 24.6 years and 26.4 years. The sex ratio (number of males per 100 females) is 106 in Lea Lea and between 110 and 111 in the other villages. The sex ratios of the NCD and Central Province are 115 and 112, respectively. The dependency ratio in Porebada was higher than the other villages at 76.2 as compared to 70.3 to 73.9 recorded in the other villages, likely due to an older population in Porebada as demonstrated by a higher average age and aging index as compared to the other villages. Figure 5.4 shows the composition of population by gender and percentage of dependants.

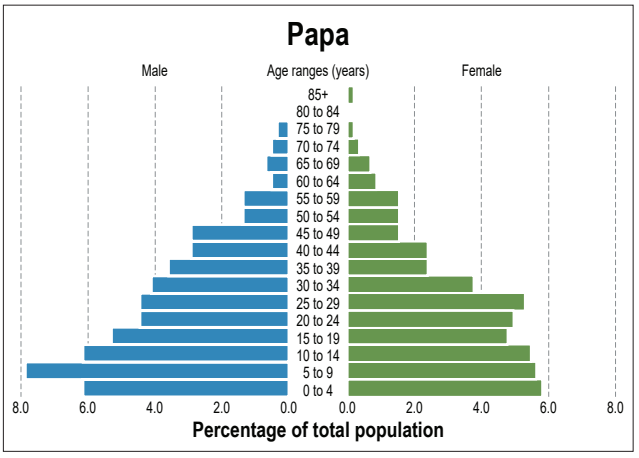
Table 5.2 Demographic summary data - LNG Plant villages

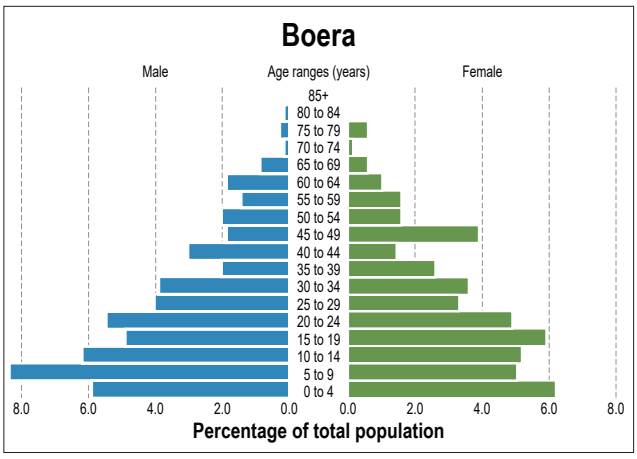
Statistic	Porebada	Boera	Papa	Lea Lea
Mean age total	26.4	25.2	24.6	25.1
Mean age male	26.6	24.8	24.5	25.0
Mean age female	26.3	25.5	24.8	25.2
Median age total	23.2	21.1	21.5	22.1
Median age male	23.7	20.8	21.0	21.7
Median age female	22.3	21.5	22.0	22.5
Sex ratio[(a)]	111	110	111	106
Dependency ratio[(b)]	76.2	73.9	70.6	70.3
Ageing index[(c)]	6.54	5.60	4.27	5.22

[(a)] Number of males per 100 females.
[(b)] Number of dependents aged 0 to 15 and over the age of 60, compared with the total population aged 15 to 60.
[(c)] Number of people over the age of 60, compared with the total population.
Source: Tetra Tech Coffey household survey 2019.









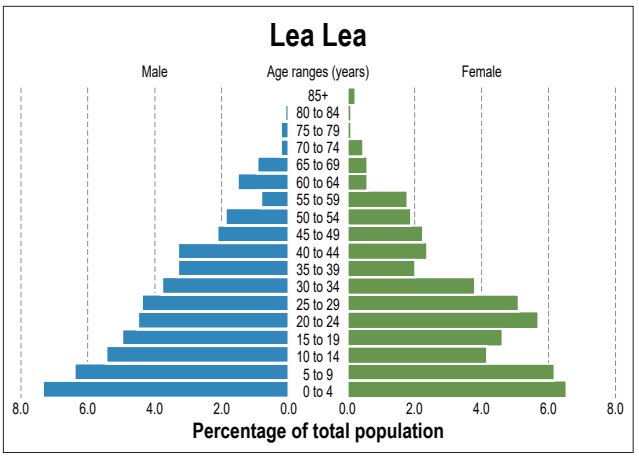


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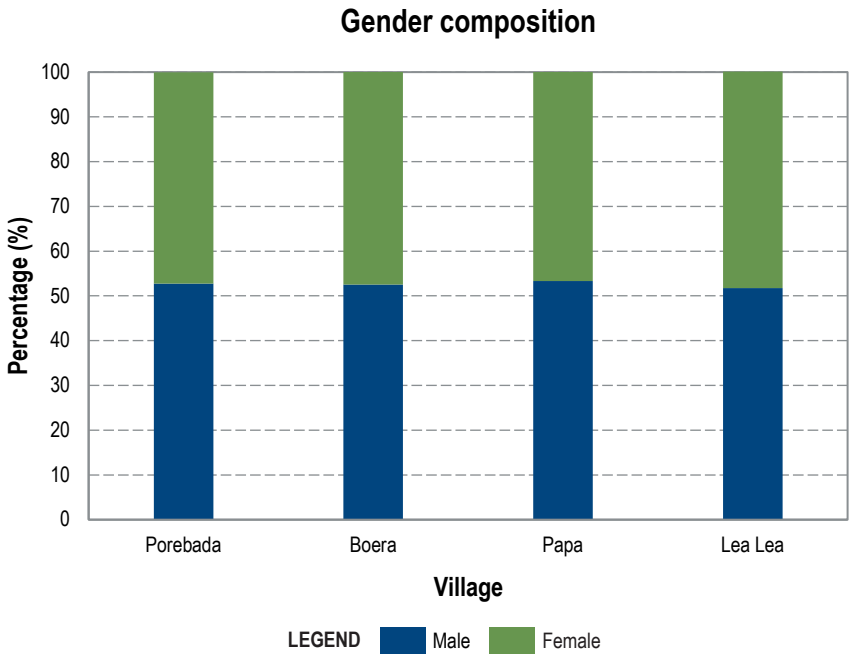
FIGURE 5.3

Population pyramids - LNG Plant villages

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

DATE: 03.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.03_GRA DOC REFERENCE: \\ETSS72GISFS1\DATA$\GIS\300733_EMPNG_PAPUALNGDOWNSTREAM\2_GRAPHICS\04_SOCIAL_BASELINE\300733_04_GRA003.AI_3



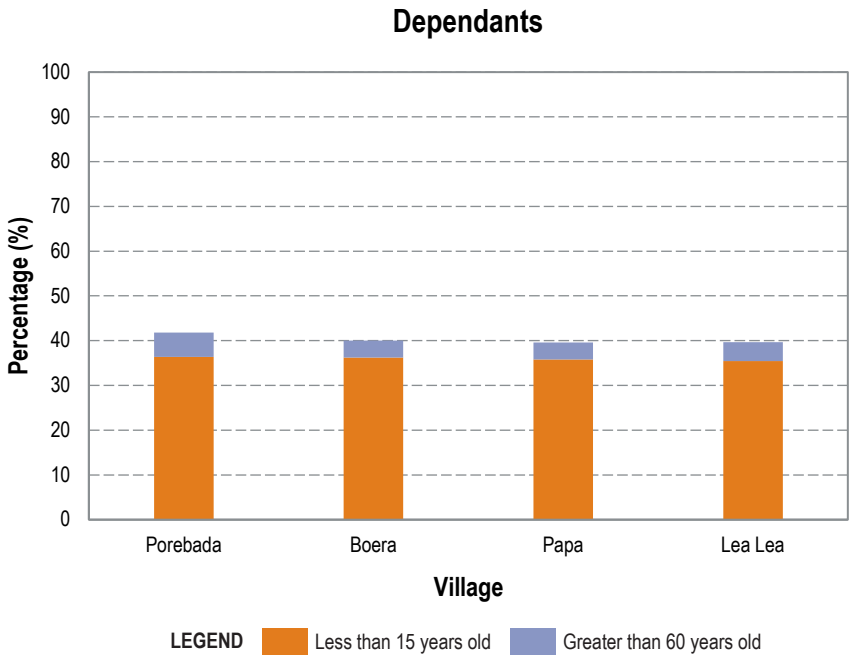


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FIGURE 5.4

Composition of population by gender and percentage of dependants

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

5.1.2.2 Vulnerability

As noted in Section 4.1.2, there are a range of indicators that may indicate social vulnerability. Table 5.3 summarises the indicators of vulnerability for households within the LNG Plant study area based on the available indicators of vulnerability within the household survey data. These include:

- Unemployed households or households completely reliant on subsistence agriculture with few avenues for cash income
- Households with illiterate adults (i.e., persons aged over 15 years old)
- Single female-headed households
- Households with a high dependency ratio (i.e., number of dependents aged 0 to 15 years and over the age of 60 years, compared with the total population aged 15 to 60 years).

Based on this data, vulnerability presented differently in each village, with:

- Lea Lea having the highest proportion of single female-headed households at 23% of households sampled within the household survey. 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 having the highest proportion of households that had few avenues for earning cash incomes, followed closely by Papa at 7% of households.
- The proportion of households having high dependency ratios generally stable, at around half of the households surveyed.

Table 5.3 Potentially vulnerable households - LNG Plant villages

Vulnerable group	Porebada	Boera	Papa	Lea Lea
Single female-headed household	12%	14%	9%	23%
Unemployed households/low cash income (fishing/subsistence)	10%	3%	7%	2%
Illiterate adults	2%	1%	5%	6%
Households with a dependency ratio higher than the national dependency ratio (63 per 100)	52%	49%	54%	49%

Source: Tetra Tech Coffey household survey 2019.

5.2 LIVELIHOODS

The livelihoods theme considers how people secure the basic necessities of life to sustain themselves and their families. In the LNG Plant study area, this theme is defined by social values and indicators as shown in Table 1.1, encompassing the use of natural resources to provide for the essentials of life, as well as engagement in the formal economy to acquire cash to procure livelihood needs. The principal elements supporting livelihoods 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 sections.

5.2.1 Natural resource use

Across the LNG Plant study area, traditional livelihoods were based on the use of natural resources. Motu people were highly dependent on the littoral zone and the marine area for harvesting food (through fishing and gleaning for shellfish) and for sourcing housing material such as mangrove timber for house posts.

Trees from inland areas were selected for constructing sea-going canoes used for 'traditional trading expeditions known as hiri, in which Motuans sailed west to the Gulf of Papua to trade Motu-made pots for sago' (Goddard 2011).

Natural capital also provides ecosystem services, defined by the International Finance Corporation (IFC 2012) as:

> *The benefits that people, including businesses, derive from ecosystems. Ecosystem services are organized into four types: (i) provisioning services, which are the products people obtain from ecosystems; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the nonmaterial benefits people obtain from ecosystems; and (iv) supporting services, which are the natural processes that maintain the other services.*

Examples of these services, other than food, for Motu people included potable water, clay material for the making of pottery, and shoreline protection provided by mangrove forests.

The following sub-sections discuss the utilisation of natural capital related to provisioning services (e.g., wild-caught fish) and supporting services (e.g., land supporting gardening) by the study area residents. The cultural importance of land and marine resources are discussed in Section 4.3.2.

Fishing

Fishing and the gleaning of other marine resources (e.g., gathering of shells, mudcrabs, sea cucumber) remains an important activity across all the LNG Plant villages, as indicated by the fishing and gleaning frequency of households surveyed (Table 5.4 and Table 5.5). In all villages, the highest proportion of households' fish several times per week, with Boera indicating the highest proportion of households who fish daily (33%). More than 60% of households in each village fish at least several times per week and 82% of households in Porebada fish at least several times per week. Commonly, village households will glean several times per week, except for Papa where it was indicated by 37% of households that some gleaning was undertaken daily. The social baseline studies undertaken in 2008 for the PNG LNG Project recorded that the study area households used the reefs for fishing and collection of other marine resources on average 3.9 times per week (Coffey Natural Systems 2009). This is consistent with the 2019 household results and does not indicate significant changes in fishing and gleaning effort over this period.

Table 5.4 Fishing frequency

Village	Daily	Several times per week	Weekly	Monthly
Porebada	19%	63%	11%	7%
Boera	33%	34%	22%	11%
Papa	24%	39%	19%	18%
Lea Lea	16%	59%	13%	13%

Source: Tetra Tech Coffey household surveys, 2019.

Table 5.5 Seafood gleaning frequency

Village	Daily	Several times per week	Weekly	Monthly
Porebada	9%	55%	19%	17%
Boera	25%	36%	25%	14%
Papa	37%	32%	8%	24%
Lea Lea	8%	50%	33%	8%

Source: Tetra Tech Coffey household surveys, 2019.

For each village, the annual average daily household fishing and gleaning effort was calculated (derived through consideration of average fishing trip duration and number of gleaning trips per year for each household) and is shown in Figure 5.5. The highest daily effort for fishing is expended by households in Boera, with the highest daily effort for shellfish gleaning evident in Boera and Papa. Overall, households in Boera expend the highest average daily effort in harvesting marine resources (4.8 hours), with households in Lea Lea expending the least effort (3.4 hours). The Caution Bay fisheries resource use study (Coffey 2020) also found that, as a proportion of the population, residents of Boera fish more than residents of the other villages.

Fishing occurs across Caution Bay and out to the barrier reefs and open ocean (Table 5.6). Between 40% and 60% of surveyed households in all villages target reef areas, while Porebada and Boera are the main villages fishing in open seas (30% to 40% of surveyed households, respectively). Papa and Lea Lea are the main villages targeting fishing in rivers and creeks (34% and 11% of surveyed households, respectively). Beach fishing is carried out by Papa residents more than residents of Lea Lea and Boera and Porebada. Results from the Caution Bay fisheries resource use study (Coffey 2020) show that between 2012 and 2019, the most common fishing location (aggerated for all villages) has shifted from the beach to the barrier reef and open sea. Fishing in fringing reefs has also declined and fishing in the open sea has become more frequent.

This may indicate that fish stocks around the inner reef areas are declining, with fishers needing to travel further to other fishing grounds to maintain catch rates. 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 areas fished by each village (as recorded by the Caution Bay fisheries resource use survey) is shown on Figure 5.6. There is a safety exclusion zone around the LNG jetty as fishing in this zone is prohibited.

Mangrove areas are also commonly used for harvesting wood for use as firewood and posts for building houses. A significant portion of houses in all villages (38% to 71%) are made using mangrove posts Plate 5.1), including houses built within the last five years (33% to 67%). Mangrove post houses are more common in Porebada and Lea Lea than in the other villages.

Table 5.6 Main areas fished

Village	Beach	Mangroves	Open sea	Reef areas
Porebada	2%	5%	34%	59%
Boera	6%	7%	43%	44%
Papa	14%	11%	1%	40%
Lea Lea	8%	17%	13%	51%

Source: Tetra Tech Coffey household surveys, 2019

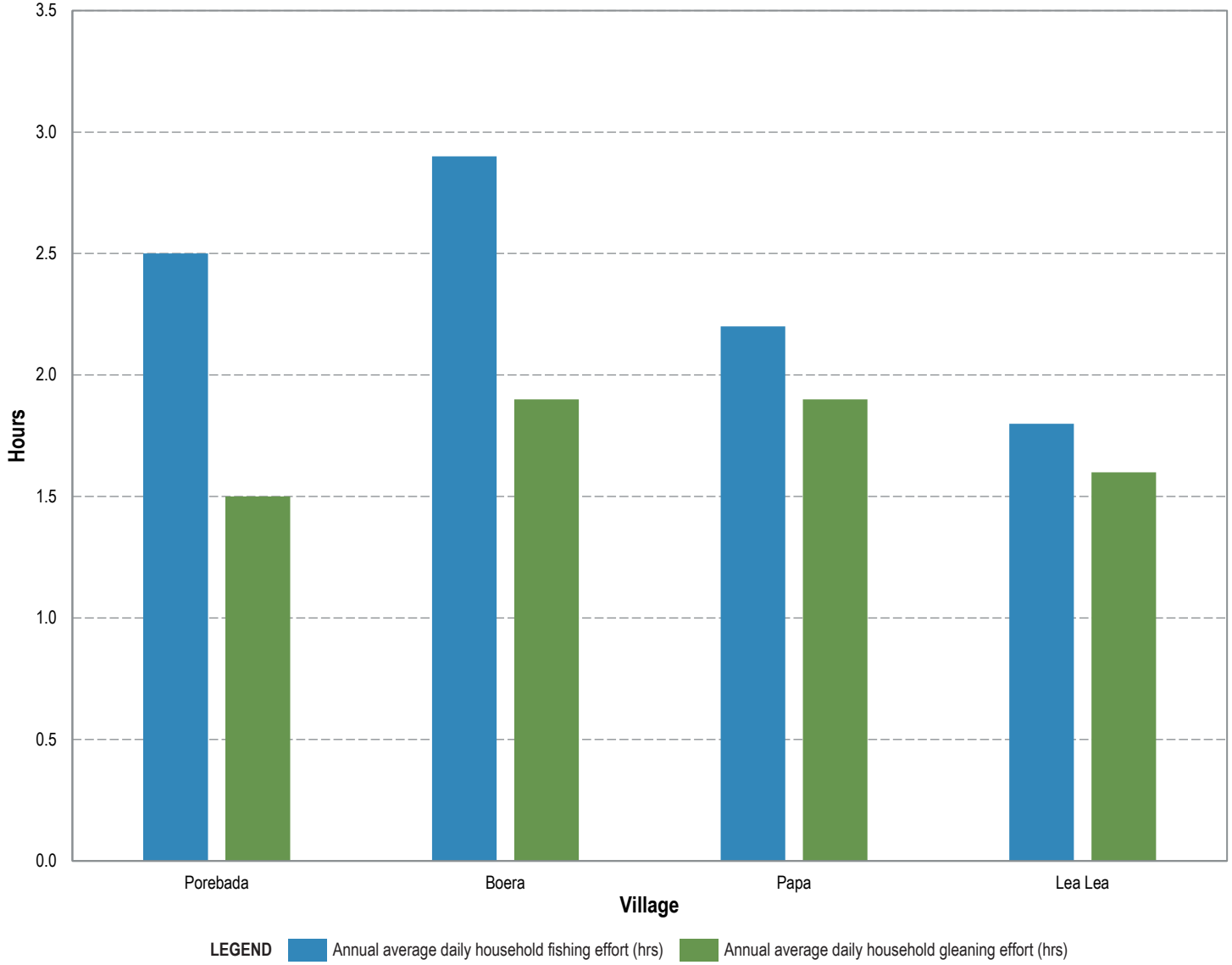

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FIGURE 5.5

Annual average daily household fishing and gleaning effort

SOURCE
Tetra Tech Coffey household survey, 2019

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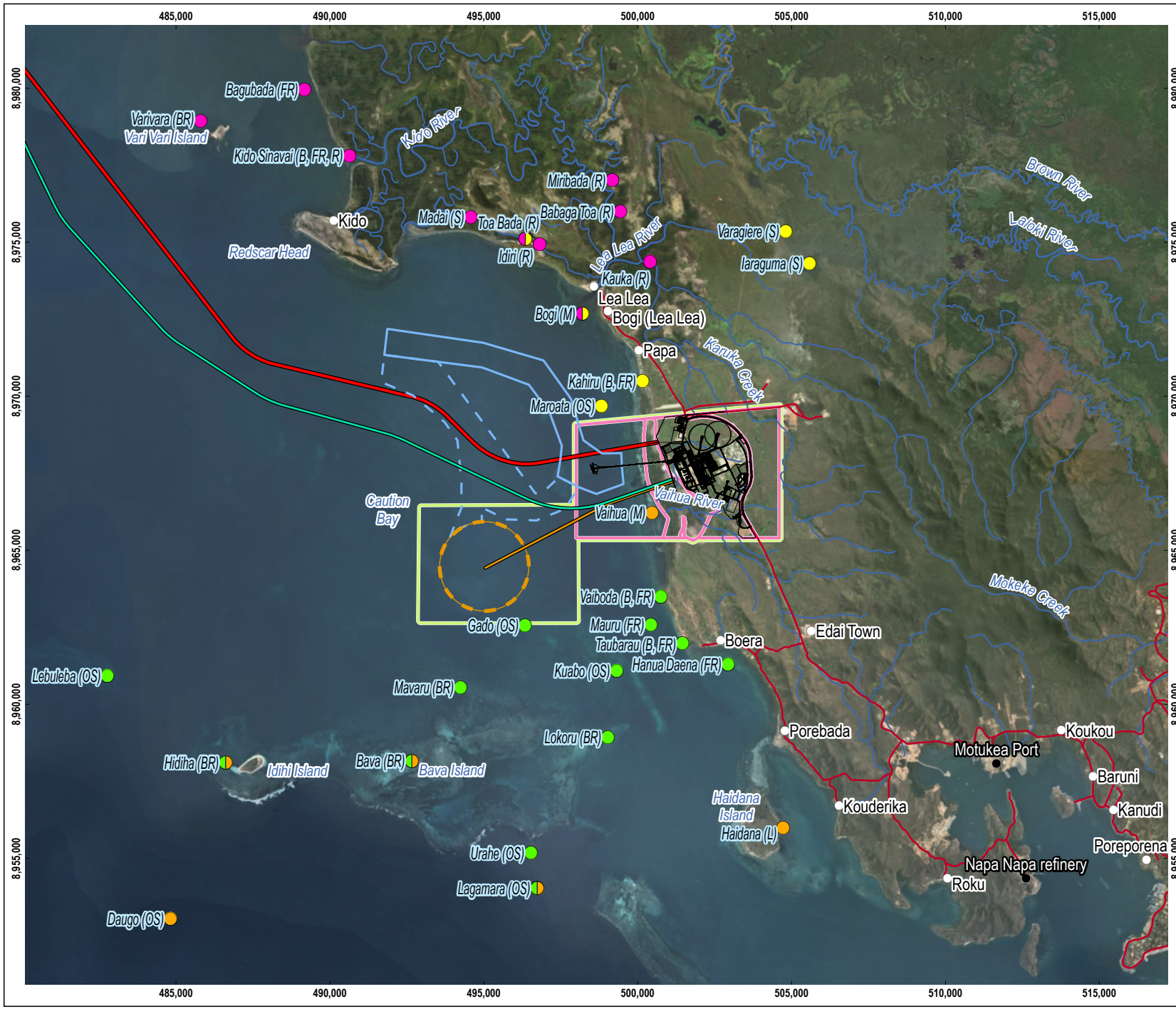

LEGEND

- 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

Proposed CALM buoy components

- Naphtha and condensate pipelines
- CALM buoy navigational area

Fishing site

- Boera
- Lea Lea
- Papa
- Porebada

Location type

BR	Barrier reef
B	Beach
FR	Fringing reef
L	Lagoon
M	Mangrove
OS	Open sea
R	River
S	Swamp

SOURCE
Fishing sites, infrastructure, roads, watercourses and lease boundary from EMPNGA.
Imagery from Planet Labs.

0 5 km

SCALE **1:175,000**
PAGE SIZE: **A4**
PROJECTION: **WGS 1984 UTM Zone 55S**

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FIGURE 5.6

Fishing grounds

TETRA TECH COFFEY

DATE: 04.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.06_GIS

The most common fish families caught by local fishers during the fisheries survey (Tetra Tech Coffey 2020) were Belonidae (e.g., long toms and garfish (Plate 5.2)), Carangidae (e.g., jacks and scad), Lethrinidae (e.g., emperors and breams), Lutjanidae (e.g., snapper), Scombridae (e.g., mackerels and tunas), Serranidae (e.g., sea bass and grouper), Cichlidae (e.g., tilapia), Mugilidea (e.g., mullet (Plate 5.3), Mullidae (e.g., goatfish) and Siganidae (e.g., rabbitfish).

Fish are caught using nets, hand lines, trolling lines and spears/spear guns (Table 5.7). The household survey indicated that the use of spears/spear guns is the most common fishing method and trolling is the least common fishing method. This is consistent with the catch-landing survey which recorded the use of spear/spear gun as the most common fishing method, followed closely by gillnet and handline (Tetra Tech Coffey 2020). The 2008 field investigations found that the use of dynamite was not uncommon in outer reef areas, which was reiterated in the 2019 field investigations.

Table 5.7 Main fishing gear used

Village	Gill net	Hand line	Trolling line	Spear/spear gun
Porebada	15%	31%	13%	39%
Boera	23%	24%	23%	29%
Papa	32%	25%	4%	37%
Lea Lea	25%	27%	14%	34%

Source: Tetra Tech Coffey household surveys, 2019.

Papa households reported the highest level of boat ownership (92%, with 38% owning a dinghy with motor), while Lea Lea had the highest level of households (46%) owning a dinghy with motor (Table 5.8). A vessel inventory survey (Coffey 2020) showed that dinghies are the most common vessels used by fishers from Boera, Porebada and Lea Lea, and canoes were the most common type of vessel used by fishers from Papa. See Plate 5.1 for example of typical vessels owned by study area residents.

Table 5.8 Boat ownership

Boat type	Porebada	Boera	Papa	Lea Lea
Boat ownership	36%	46%	92%	66%
Dinghy with motor	29%	37%	38%	46%
Canoe (paddle or sail)	7%	2%	54%	12%

Source: Tetra Tech Coffey household surveys, 2019.

Responses to the food frequency questions in the household survey indicate that the consumption of fresh fish remains important in household diets (Table 5.9). In Porebada and Lea Lea, approximately 40% to 50% of households indicated consuming fresh fish three to four days per week, while in Papa 45% of households indicated consumption of fresh fish five to six days per week. In Boera, 27% of households reported consuming fresh fish every day, which aligns with the higher level of fishing effort recorded in that village. Tinned fish is also consumed.

Table 5.9 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%

Consumption frequency	Porebada	Boera	Papa	Lea Lea
1 to 2 days per week	29%	26%	19%	27%

Source: Tetra Tech Coffey household surveys, 2019.

The results for fresh fish consumption and tinned fish consumption have been aggregated across all surveyed households and provided in Table 5.10. Except for Papa, all villages consume tinned fish on more days per week than fresh fish. Most households rely on household members to catch fresh fish. The household survey in 2019 indicated that 61% of households' most common source of fresh fish was "caught by household members".

Table 5.10 Household fish consumption frequency (mean number 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: Tetra Tech Coffey household surveys, 2019.

Households indicated that a small proportion of people purchase fresh fish (25%), generally at a village market rather than in Port Moresby market (Figure 5.7). Gifting or exchange of fresh fish is the other mechanism for household protein intake, with 14% of households indicating their most common source of fish is "given by someone else (no payment)".

Over the survey period for the fisheries resource use study (Coffey 2020) most of the catch from Porebada and Lea Lea fishers was sold (83% and 76%, respectively), whereas most of the catch from Boera and Papa fishers was consumed (64% and 55%, respectively). The household survey indicates that the sale of fish provides between PGK 50 and PGK 125 per week in income for households that sell fish.

Most fish sold by the study area residents is sold at small markets in Lea Lea and Papa or at larger markets in Port Moresby (Coffey 2020). Following the lifting of the nationwide moratorium on sea cucumber fishing (Hair et al. 2018), sea cucumber is also caught and sold to exporters by households in the study area (The National 2018) and was specifically mentioned by residents from Papa as an income source during the focus group discussions.

The sale price of fish, catch per unit effort, the portion of fish sold and gross income per unit effort recorded during the fisheries resource use study is provided in Table 5.11. This data shows that Papa fishers received considerably more gross income per hour compared to the other villages, despite only selling 45% of their catch, as they caught more fish per hour and were able to sell their catch at higher prices. Further investigations would be needed to determine the reasons for the catch sale price and would need to account for the species caught (and subsequently sold) and where the fish are sold (with different markets potentially attracting different prices).

Table 5.11 Sale price of fresh fish caught by study area residents

Village	Catch sale price (PGK per kg)	Gross expected income per unit effort (PGK per hour per fisher)[(a)]
Porebada	2.63	0.88
Boera	6.53	1.14
Papa	14.30	3.94
Lea Lea	8.80	1.30

Source: Tetra Tech Coffey (2020). [(a)] Does not include fish that was caught and kept for consumption.

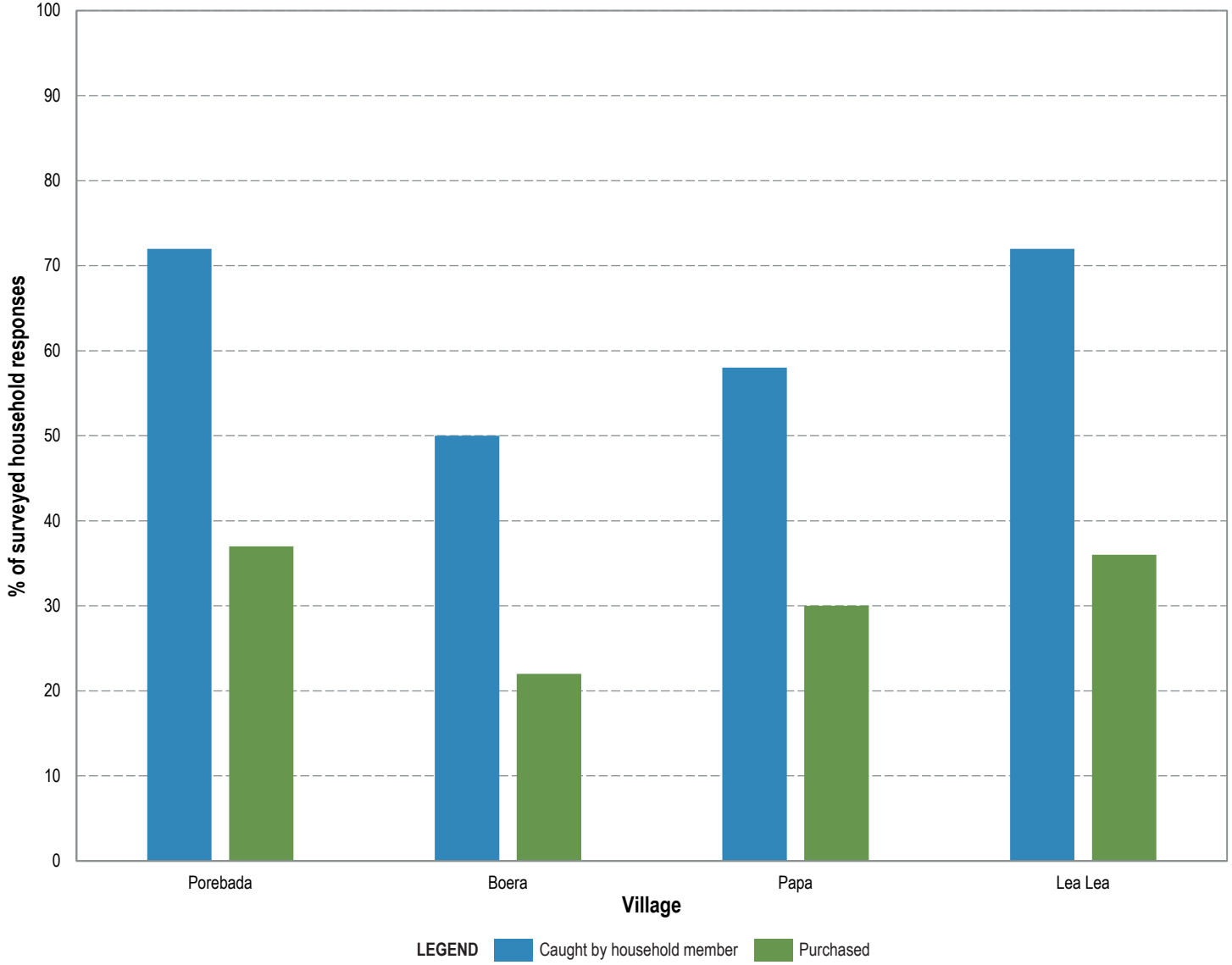

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FIGURE 5.7

Main sources of fresh fish

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

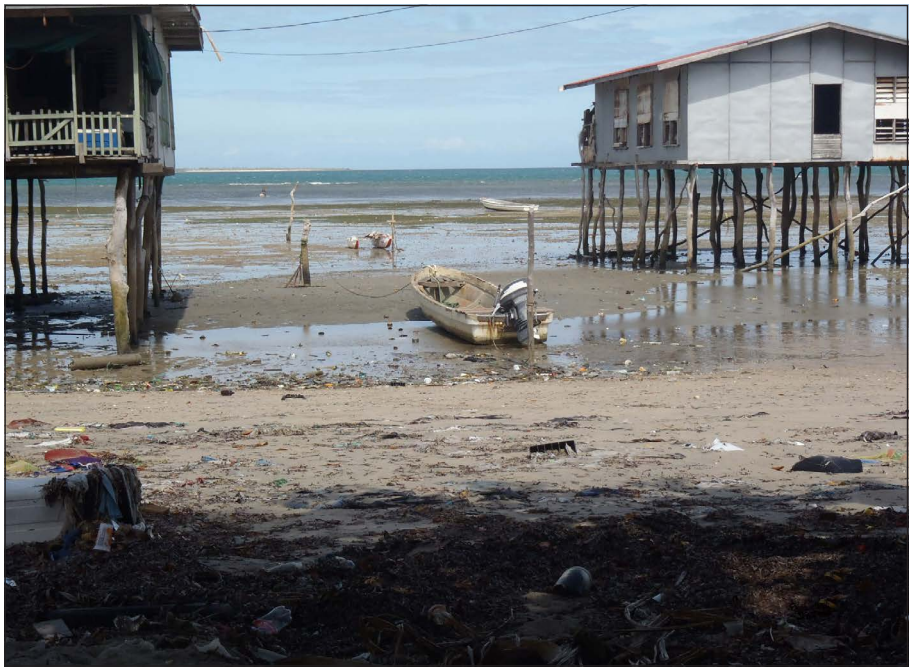


Photo credit: Tetra Tech Coffey

Plate 5.1
Fishing vessels next to houses built using mangrove posts

Photo credit: Tetra Tech Coffey

Plate 5.2
Garfish

Photo credit: Tetra Tech Coffey

Plate 5.3
Mullet

The household survey results indicate that fishing is a male-orientated activity, being done always or mostly by men (more than 90% of surveyed households in all villages), with a small input of labour by women (Figure 5.8). This reflects the findings of earlier surveys in 2008 (Goldman 2008) and is reiterated by the catch-landing surveys, which recorded 129 male lead fishers and 14 female lead fishers over the survey period (Tetra Tech Coffey 2020). The women typically take the fish to be sold to the market via public motor vehicles.

For gleaning, 60% of Porebada surveyed households indicated an equal contribution of labour by men and women, while there was a predominance of male labour input in Boera, Papa and Lea Lea (around 50%) (Figure 5.8). Lea Lea had the highest level of households reporting the collection of shellfish either mostly or always by women (29%).

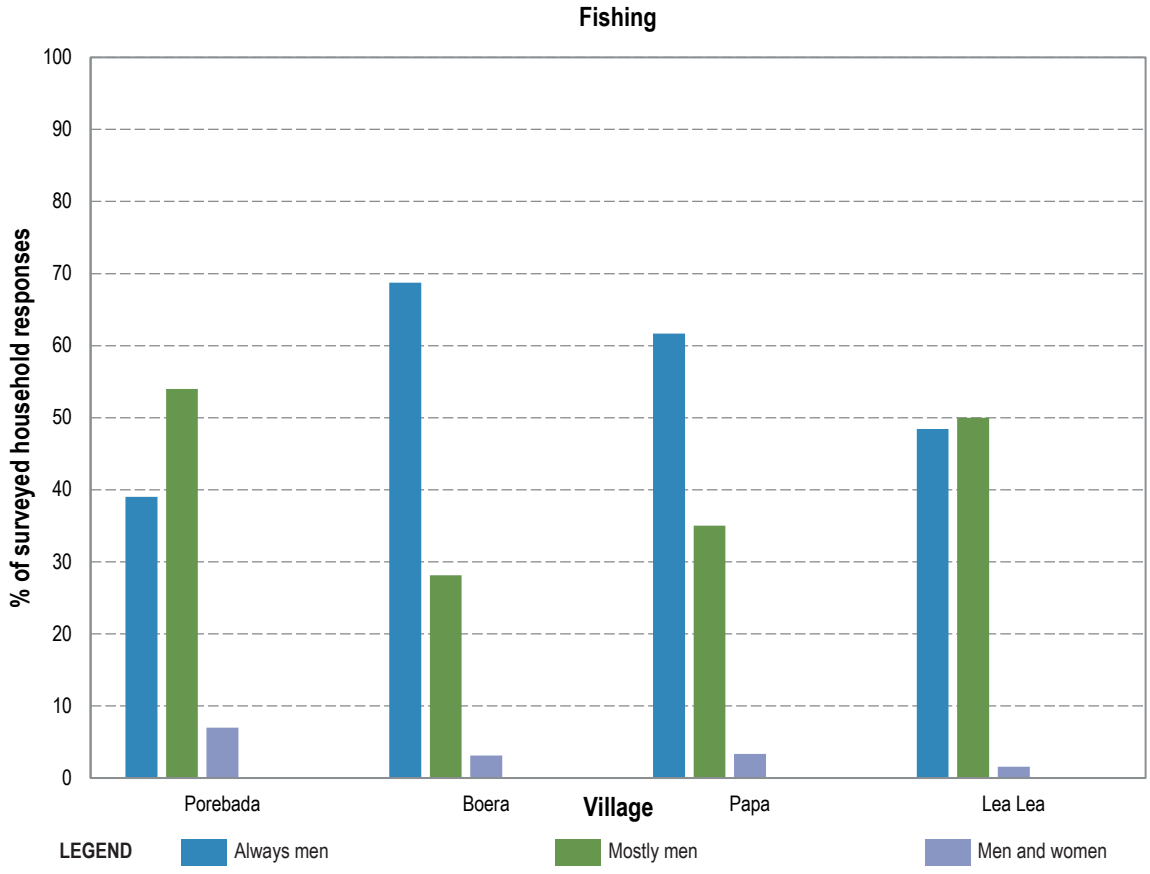
The household survey asked participants how the current fish catches compared with five years ago (Table 5.12). Most surveyed households (approximately 65%) in all villages (but particularly in Boera and Lea Lea) indicated that the current fish catch was less than the fish catch five years previously. In Porebada, 55% of households indicated that the current catch was either the same or more compared to five years previously. The Caution Bay fisheries resource use study (Tetra Tech Coffey 2020) reports that catch rates (i.e., catch per unit effort[9]) was generally consistent over the monitoring period of 2012 to 2014 and 2019 (Figure 5.9). In 2013, the catch rate for Porebada spiked due to much larger individual fish being caught. For example, the catch rate in the first quarter of 2013 was influenced by four species of shark which were caught at a combined weight of 115 kg. There is a perception within the fishing community that the existing marine project infrastructure (e.g., LNG Plant jetty) is attracting fish to an area that cannot be targeted by fishers due to the safety exclusion zone and therefore increasing the required fishing effort to maintain catch levels, and potentially reducing fish stocks in other areas. The findings of the nearshore marine characterisation (Appendix E) indicate that the establishment of the LNG Plant jetty has, over time, provided a relatively protected artificial habitat that presently supports several fish species that are likely to be targeted by local fishing activity, such as trevally, and surgeonfish. However, improvements in habitat within one area of Caution Bay are unlikely to reduce the overall fish stock within Caution Bay and are instead likely to support the overall fish stock in the Caution Bay.

Table 5.12 Perceived fish catch compared to five years previously

Village	More	The same	The same or more	Less	Much less
Porebada	10%	45%	55%	32%	14%
Boera	9%	20%	29%	47%	24%
Papa	6%	35%	41%	55%	4%
Lea Lea	3%	18%	22%	57%	22%

Source: Tetra Tech Coffey household surveys, 2019.

[9] As defined as catch (in weight) per hours of fishing per fishing trip (i.e., kg/h/trip).



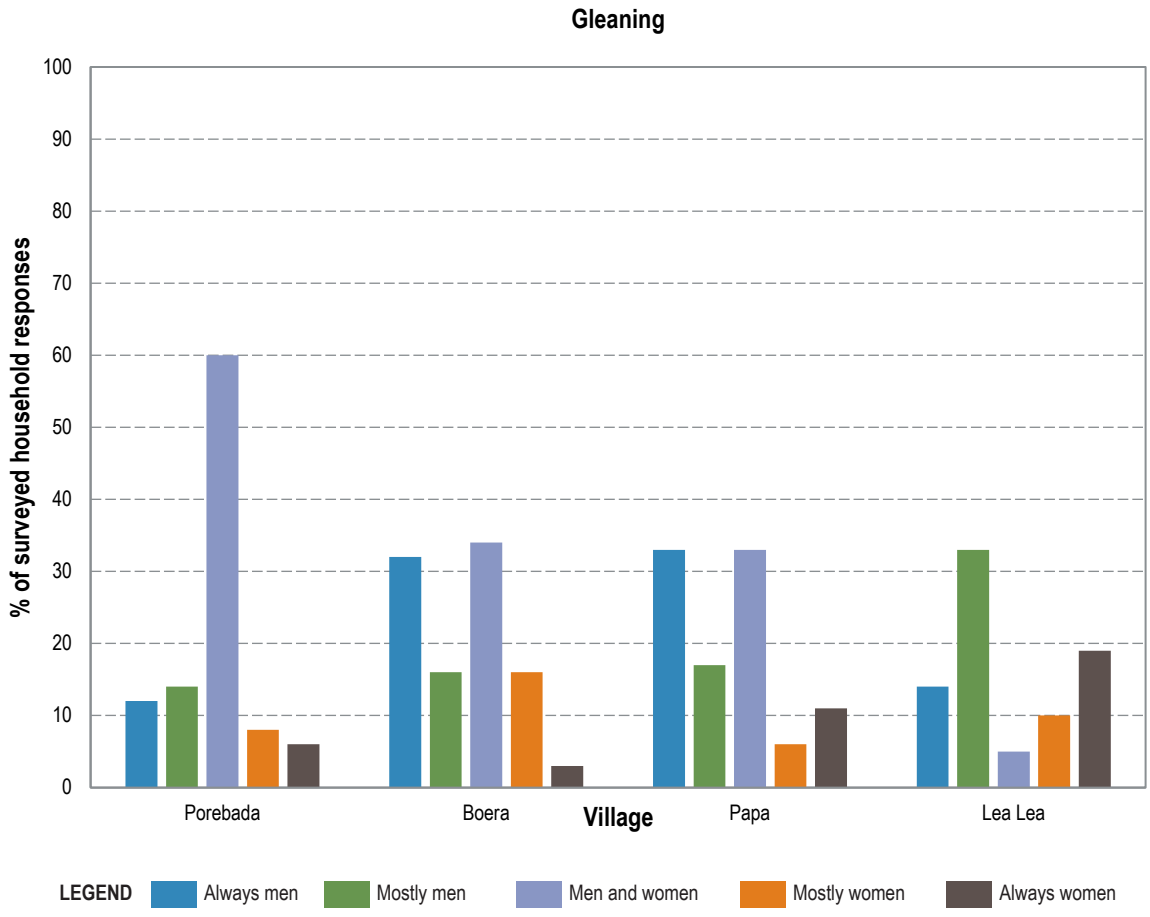


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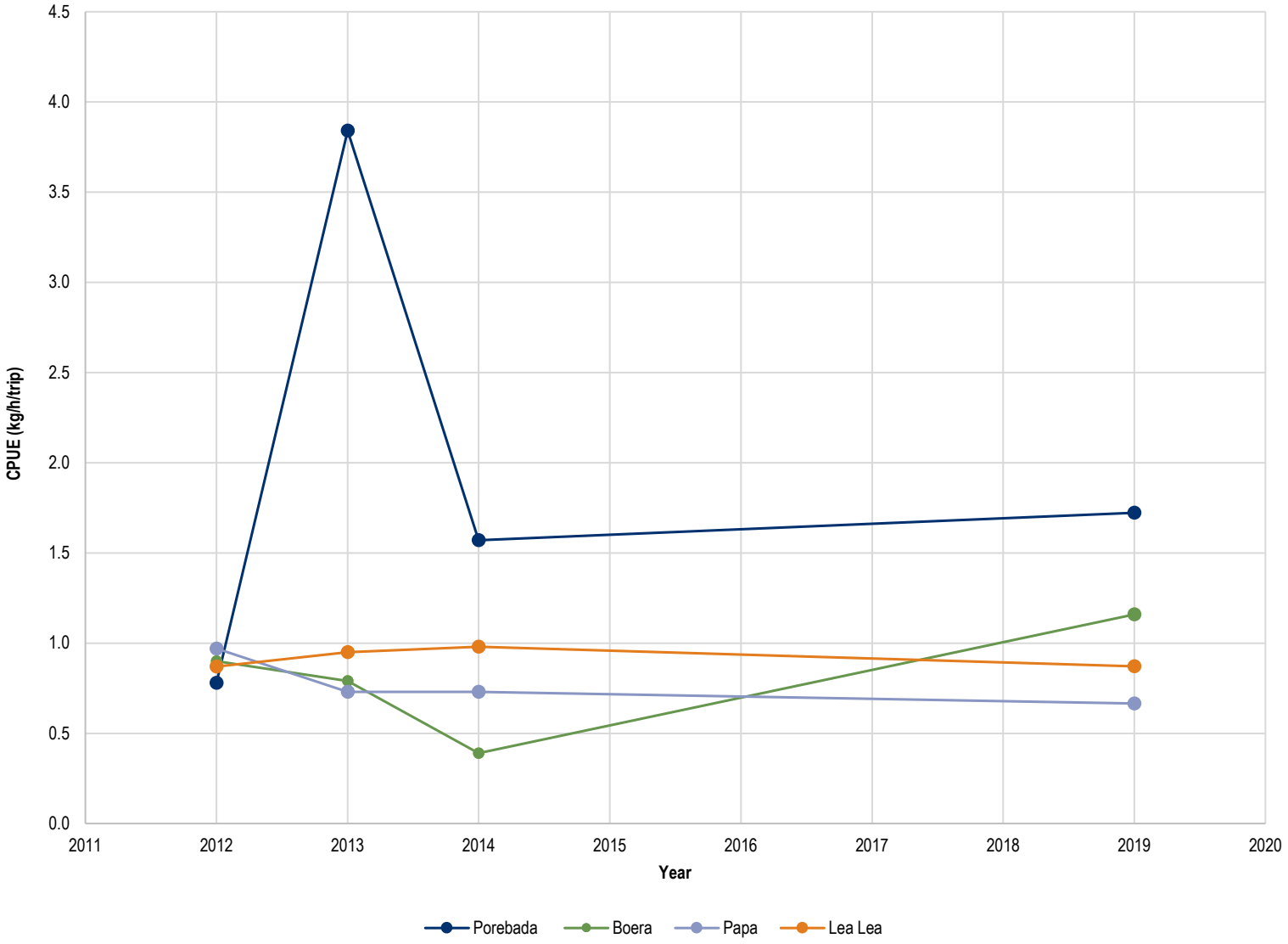
FIGURE 5.8

Division of labour for fishing and gleaning of other marine resources

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY



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PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 5.9

Catch per unit effort over the monitoring period of 2012 to 2014 and 2019

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

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Gardening and hunting

Traditional use of land and other terrestrial resources is important, although it is noted that poor soils and water scarcity constrain the provision of staples. Responses to the family nutrition questions in the household survey indicate that subsistence gardening remains important to the study area residents, though highly dependent on seasonal factors.

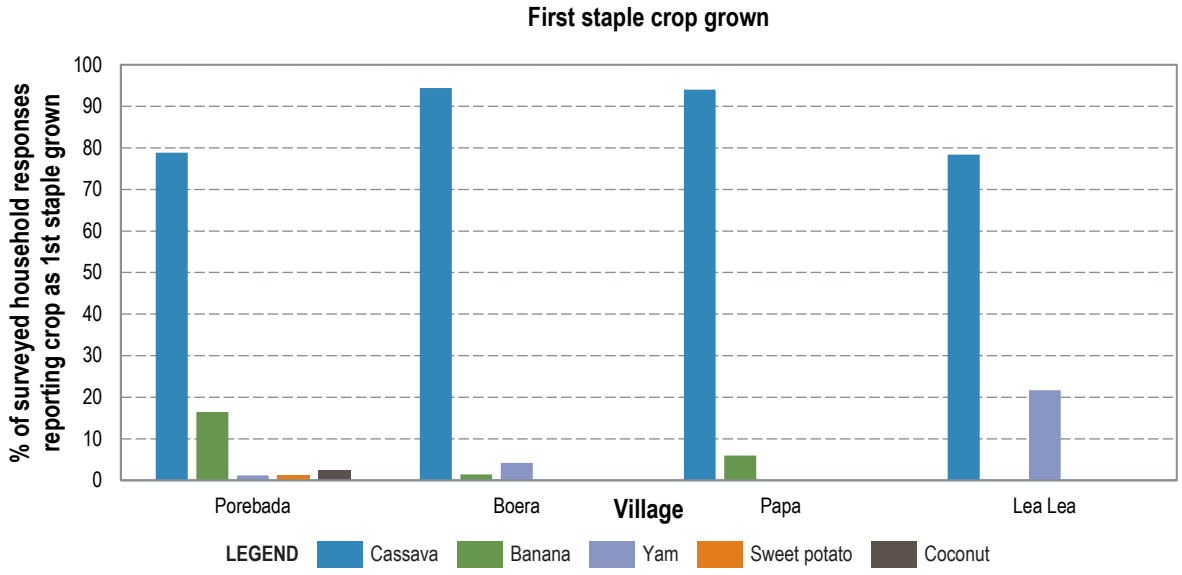
- Cassava, bananas and yams are the dominant staples grown in all villages, with cassava being the most important (Figure 5.10).
- Yams are least important in Porebada (possibly due to limited gardening land) while bananas supplement cassava and yams in Lea Lea.
- Sweet potato and coconut were indicated as a staple food by a small percentage of surveyed households (less than 10%).
- Cassava was nominated as the main staple crop grown by most surveyed households (approximately 80% to 95%) in all villages.
- In Boera, bananas and yams are equally important as the second main staple crop grown.
- For all villages, greens (aibika and pumpkin tips), and corn are the main vegetables grown, with snake beans being reported by around 10% of households in Boera, Papa and Lea Lea.

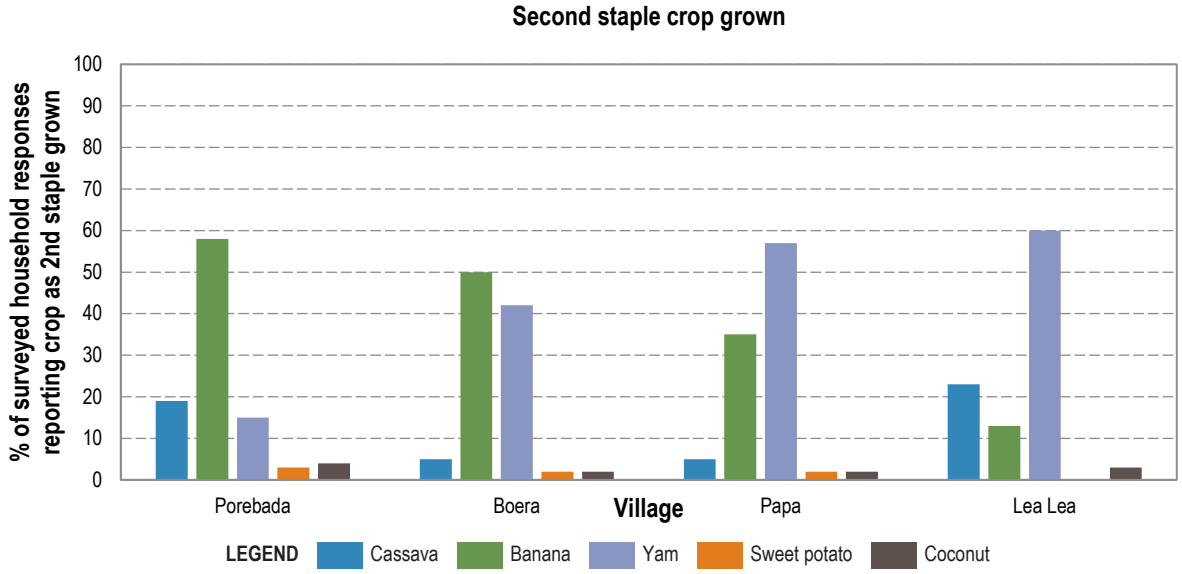
The main constraints to gardening for staples or vegetables (indicated by surveyed households across all villages) are poor soil fertility, lack of water during Port Moresby's dry season, and limited time availability (indicative of households where wage employment has become the main livelihood activity) (Figure 5.11). The cost of seed stock does not appear to be an issue except for Boera. Poor soil and lack of water are a well-known characteristic of the Motu coastal villages and being time-poor is a characteristic of the transition from purely subsistence to a peri-urban economy. Common gardening issues that were mentioned in question responses included:

- Gardening no longer being a priority where people are able to support their household through employment or other cash generating activities.
- Land disputes (arising due to positioning for compensation and royalty distribution from the PNG LNG Project, as well as population growth) affecting both the availability and suitability of available land for gardening.
- Garden security, where produce is subject to stealing and vandalism when the garden is distant from the gardening household.

Responses from the household survey indicate that households typically have sufficient land available for gardening (Figure 5.12), particularly in Lea Lea and Papa, with 90% and 88% of residents indicating that they have enough land. The responses were less for Boera at 79% and the lowest for Porebada respondents, with only 69% indicating that they have sufficient land for gardening. Land availability for gardening aligns with the population density (see Section 4.1), with Porebada being the most densely populated of the LNG Plant villages. Specific questioning around gardening land quality reveals that the quality of land used for gardening by residents of Porebada is generally of lower quality than the other villages, with 22% of respondents indicating the land was of poor quality as compared to 5 to 9% of respondents from other villages.

The household survey responses from the food and diet questions reveal that none of the surveyed residents from Porebada or Boera ate bushmeat in the two weeks prior to the survey and very few (6% to 7%) of surveyed residents from Lea Lea and Papa ate bushmeat in the two weeks prior to the survey. The food frequency survey results are similar and show that Papa residents eat bush meat on average 46 days per year and the residents of the other village eat bush meat on average 8 to 18 days per year.





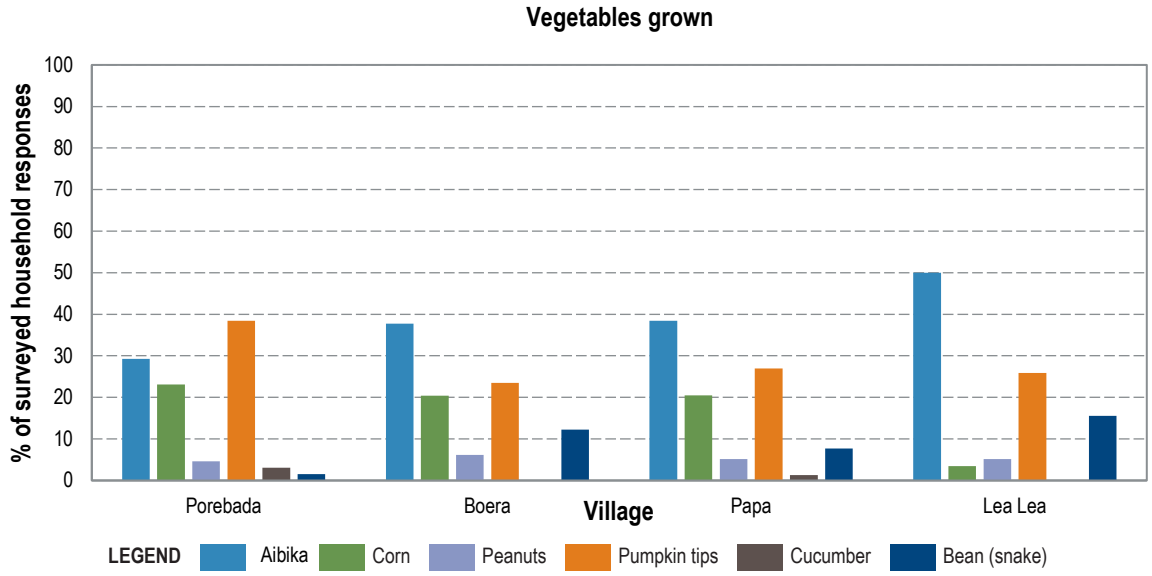


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FIGURE 5.10

Crops and vegetables grown

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

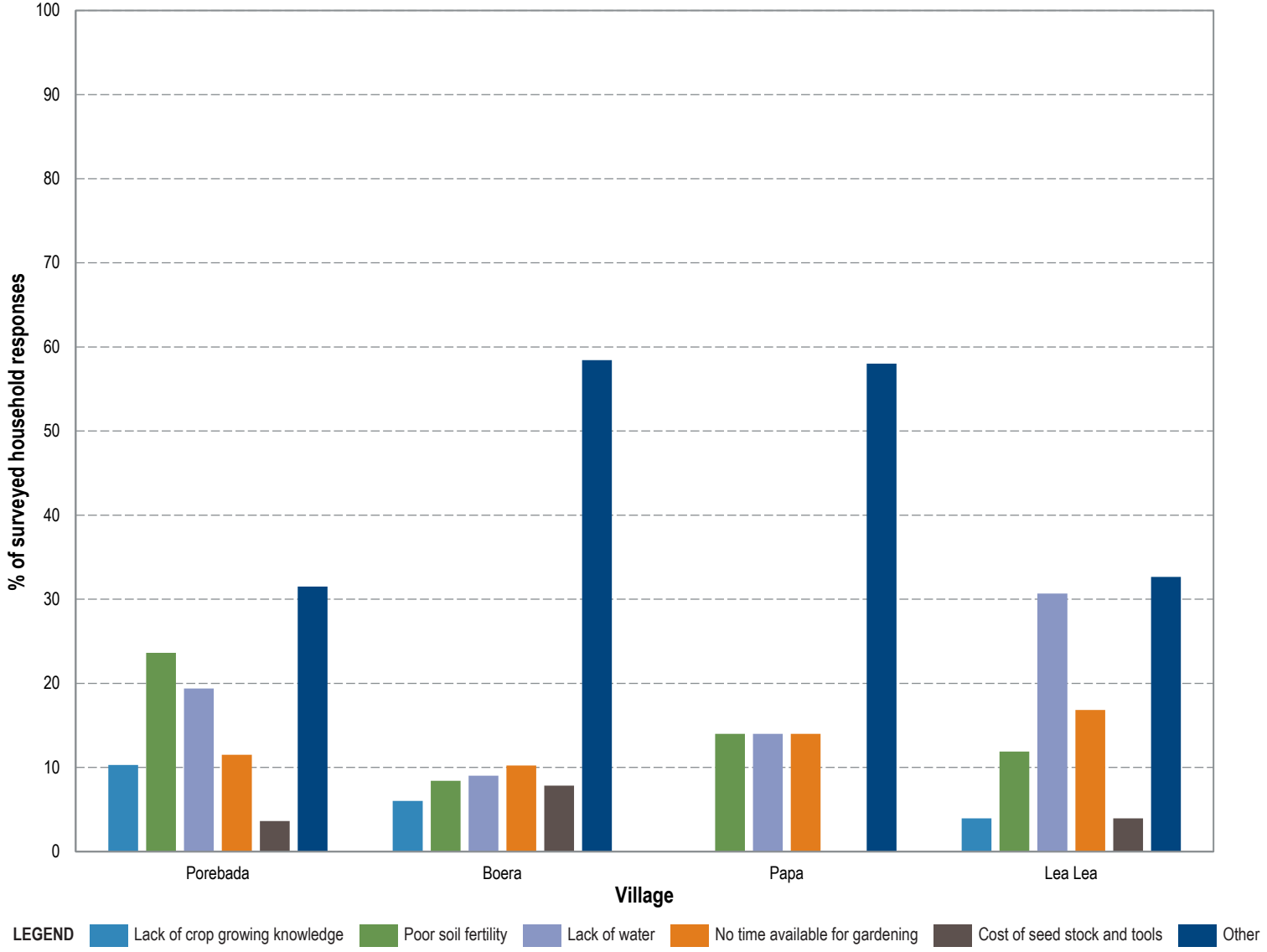

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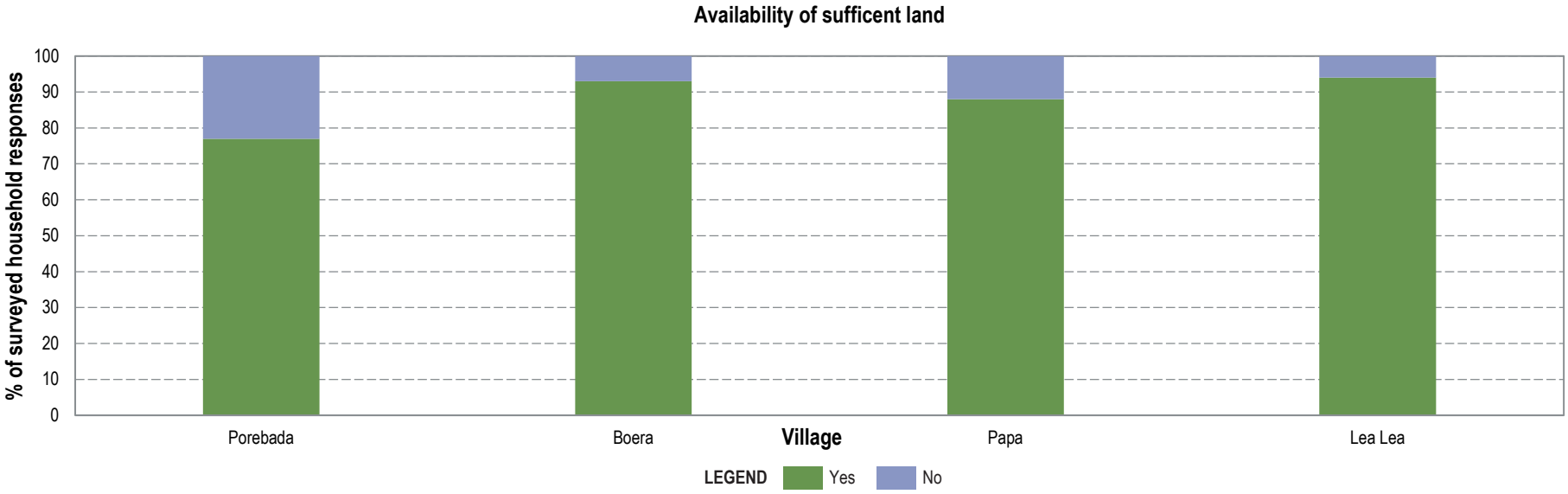
FIGURE 5.11

Main constraints to gardening

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY



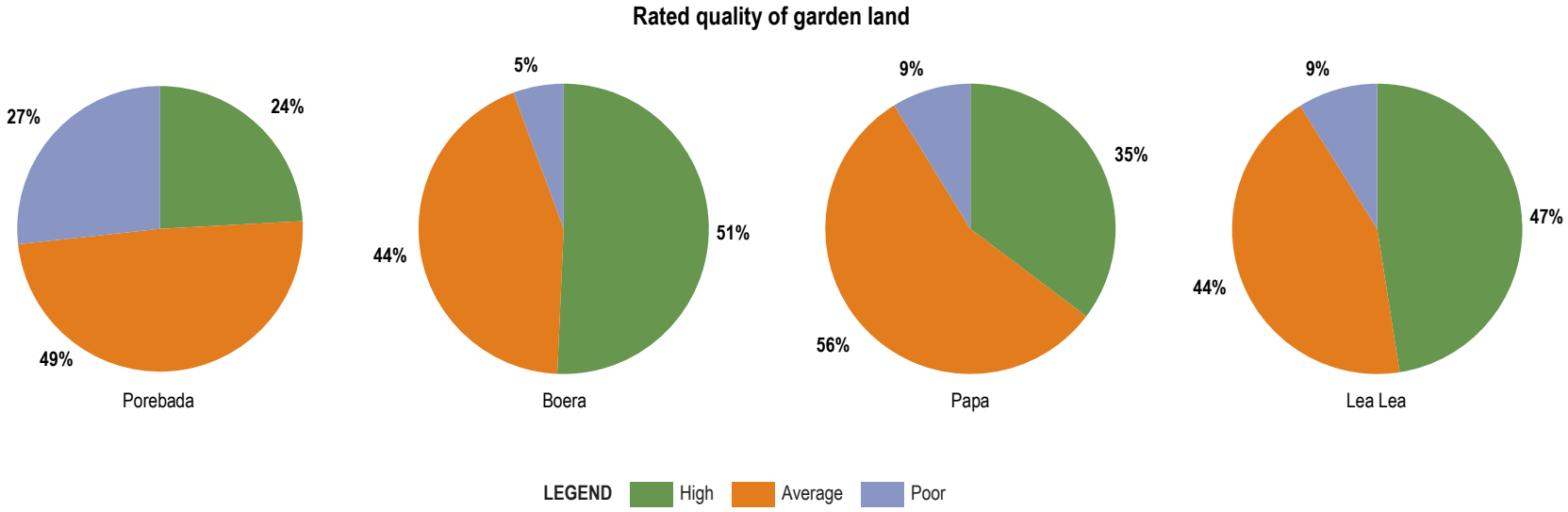


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FIGURE 5.12

Gardening land availability and quality

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

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These results indicate that hunting does not provide a significant source of food for villages in the study area aside from Papa. This makes sense in a cultural context, as the residents of Papa are from the Koitabu ethnic group, who are traditionally land-based people, whereas the other villages are Motuan and traditionally rely on fishing for protein. Papa residents also mentioned the importance of hunting to their livelihoods during the focus group discussion held in the village and specified that they hunt deer, pig and wallabies, both for household consumption and market sales.

5.2.2 Cash economy activity

As indicated previously, the LNG Plant site villages are regarded as peri-urban, being relatively close (between 16 km (Porebada) and 25 km (Lea Lea) to the Port Moresby urban area. Peri-urban villages show distinct traditional village character (such as housing organisation and configurations, the centrality of a communal building such as a meeting house or church), receive some level of external infrastructure servicing (e.g., the provision of mains water and power), avail themselves of services available in urban areas (e.g., health and business services, such as banks), provide goods to urban markets (e.g., fish and garden produce), and engage in urban-based employment (either public or private sector). The following sections describe the level of participation in the cash economy, and the characteristics of the villages that enable that participation.

Employment and income

Responses to the household survey questions regarding income were limited, indicating either a lack of knowledge of respondents regarding sources of household income, or a reluctance to disclose income sources and levels to survey enumerators, perhaps in particular to enumerators from their own community. Accordingly, limited analysis was possible, and observations should be regarded as indicative only.

Several observations can be made from Table 5.13 and Figure 5.13, which show the proportion of surveyed households receiving income from different sources over the past year, including:

- Around 30% of surveyed households have received income from work associated with the presence of the LNG Plant (Row 3), with approximately half of that being through Laba Holdings[10] (Row 2) compared to direct employment (Row 1).
- Boera has the highest proportion of surveyed households receiving income from Laba Holdings (22%) or another landowner company (16%), possibly indicative of a close village association with Laba Holdings, and the employment resulting from the Boera landowner company (Boera Holdings Limited) investment in the development of Edai Town (Rows 2 and 4).
- For Porebada, Papa and Lea Lea, surveyed households in receipt of income from local landowner companies (other than Laba Holdings) is limited (Row 4).
- The proportion of surveyed households in receipt of income from government work is most significant in Porebada and Lea Lea (approximately 16%), around twice the level of households in Boera and Papa (Row 5).
- Around 20% of surveyed households in all villages receive income from other private sector employment, except for Boera where the figure is 9% (Row 6).
- A significant proportion of surveyed households in all villages have received some income from fishing in the past year, notably in Boera where around half of surveyed households earned income from fishing (Row 7).

[10] Laba Holdings is 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.).

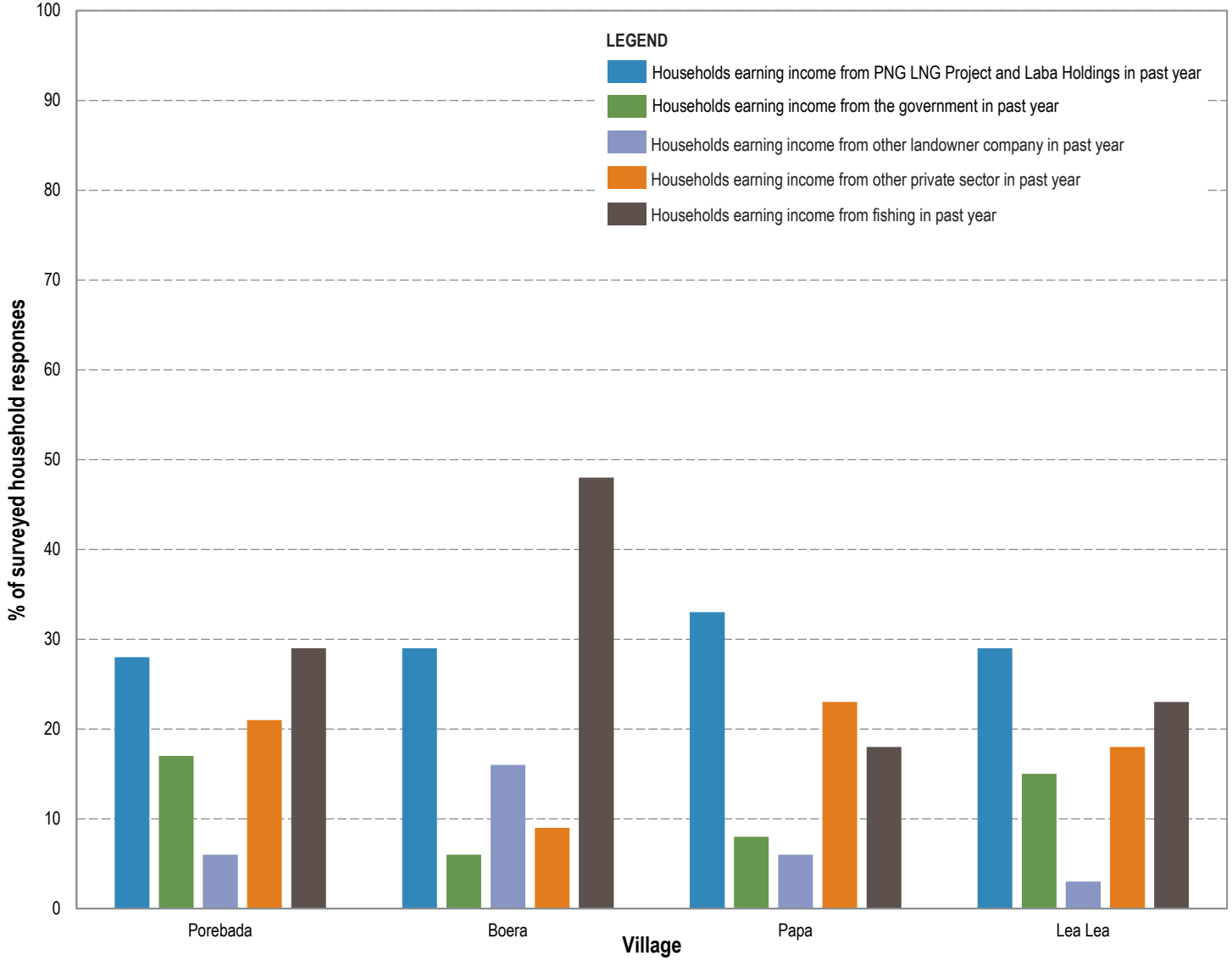

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FIGURE 5.13

Sources of household income over the past year

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

Table 5.13 Sources of household income over the past year

Row	Income source	Porebada	Boera	Papa	Lea Lea
1	Households earning income from the PNG LNG Project in past year.	15%	7%	20%	14%
2	Households earning income from Laba Holdings in past year.	13%	22%	13%	15%
3	Households earning income from PNG LNG Project and Laba Holdings in past year.	28%	29%	33%	29%
4	Households earning income from other landowner company in past year.	6%	16%	6%	3%
5	Households earning income from the government in past year.	17%	6%	8%	15%
6	Households earning income from other private sector in past year.	21%	9%	23%	18%
7	Households earning income from fishing in past year.	29%	48%	18%	23%

Source: Tetra Tech Coffey household surveys, 2019.

Some of the responses to receiving income from other private sector employment included a description of the employment industry type. These were grouped into five categories and assessed (Table 5.14). These employers are generally distributed between the Napa Napa to Motukea Port area and Port Moresby City.

Table 5.15 presents indicative information on the sources of income for livelihoods in the LNG Plant villages. Around half of surveyed households in all villages receive income from wage employment, except for Papa where the level is 36%. Weekly household income from wage employment is in the order of PGK 250 to 500. The social baseline 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).

Comparison with the data recorded during the 2019 household surveys indicates that the level of formal employment has doubled over the past 11 years.

Fishing for catch sale and income generation is practised in all villages, most extensively in Boera (39% of surveyed households in the past two weeks) and least extensively in Papa (where 8% of surveyed households received income from sale of fish in the two weeks prior to the survey). The weekly household income from sale of fish ranges from PGK 52 to 125.

Table 5.14 Other private sector employment type

Category	Number of responses	% of responses
Construction / engineering / mining / industrial	29	38%
Hospitality / security / public motor vehicle operations	17	22%
Retail / trade stores / wholesale / distribution / marketing	16	21%
Administration	10	13%
Edai Town employment	5	6%

Source: Tetra Tech Coffey household surveys, 2019.

Information received through focus group discussion also indicates that income is generated through operating market stalls and trade stores; operating pubic motor vehicle transport services and establishment of loan businesses. 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 meat).

Table 5.15 Indicative importance of income sources

Statistic	Porebada	Boera	Papa	Lea Lea
Surveyed households in receipt of income from wages in past two weeks.	53%	59%	36%	57%
Average weekly household income from wages (of household in receipt of income from wages).	PGK 499	PGK 311	PGK 503	PGK 262
Surveyed households in receipt of income from fishing in past two weeks.	23%	39%	8%	16%
Average weekly household income from fish sales (of household in receipt of income from fish sales).	PGK 125	PGK 65	PGK 52	PGK 95

Source: Tetra Tech Coffey household surveys, 2019.

Household expenditure

Results from the household survey show that all the surveyed households spent the largest weekly allocation on purchasing food (between PGK 120 and PGK 175) with Boera households spending the highest amount (Table 5.16 and Figure 5.14). Between 15% and 33% of surveyed households incurred fuel expenses (between PGK 30 to PGK 75 per week) in the two-week period prior to the survey, with surveyed households in Lea Lea spending the highest average weekly amount. Maintaining credit on mobile phones costs surveyed households between PGK 15 to PGK 25 per week, with around 60% to 70% of surveyed households buying credit in the two-week period prior to the survey.

Interpretation of the expenditure results from the household survey and comments made during the focus group discussions are provided below for each village:

- **Porebada:**
  - The main daily expenditure is on water, food and items for fishing.
  - Purchasing water costs some houses in the order of PGK 20 to 30 per week. A 200 litre drum costs PGK 20 (or 10 toea per litre), lasting up to four days depending on usage.
  - Some owners hire out their dinghy for fishing trips at PGK 10 per person. This is said to be a common means of accessing fishing grounds for village residents.
  - There is some level of labour exchange for food within the village, as well as short-term borrowing (at exorbitant rates) to tide households over periods of cash shortage.
  - There are significant medical costs incurred from time to time, particularly if a person requires hospitalisation or surgery.

- **Boera:**
  - The main daily expenditure is on food, transport (fuel) and water.
  - There were significant levels of comment on the high cost of living (e.g., 'high cost of living is really draining families like mine'). There is a high number of dependents per wage earner.
  - Power costs cited as being in the order of PGK 6 to 7 per day (or PGK 50 per week).
  - Retired/aged persons experience difficulty, as do households that incur high medical costs (high cost of medicine indicated).
  - The main capital items purchased include freezers, washing machines, house building materials, dinghies and outboard motors.
- **Papa:**
  - Money mainly spent on food, with a high cost of living noted, influenced by many persons depending on the wage earner, and obligations to care for disadvantaged persons in the village (orphans and widows).
  - Households must collaborate to overcome regular cash shortages, and some households must make provision for debt repayments.
- **Lea Lea:**
  - Food and utilities (power and phone) are main items of expenditure.
  - Many rely on payday loans from relatives, for example,
    - get loan from relative → buy food (rice, flour, salt, cooking oil) → go fishing → sell fish → repay loan → get another loan from relative
  - There is a general reliance on extended families (colloquially termed as 'social security').

Table 5.16 Household expenditure on food, fuel and mobile phone credit

Village	Statistic	Food	Fuel	Mobile phone credit
Porebada	Average surveyed household weekly amount spent (PGK).	125	30	15
	Number and % of surveyed households responding.	139 (95%)	36 (24%)	95 (65%)
Boera	Average surveyed household weekly amount spent (PGK).	175	40	25
	Number and % of surveyed households responding.	82 (95%)	28 (33%)	63 (73%)
Papa	Average surveyed household weekly amount spent (PGK).	130	40	18
	Number and % of surveyed households responding.	69 (97%)	11 (15%)	43 (61%)
Lea Lea	Average surveyed household weekly amount spent (PGK).	120	75	20
	Number and % of surveyed households responding.	97 (98%)	19 (19%)	63 (64%)

Source: Tetra Tech Coffey household surveys, 2019.

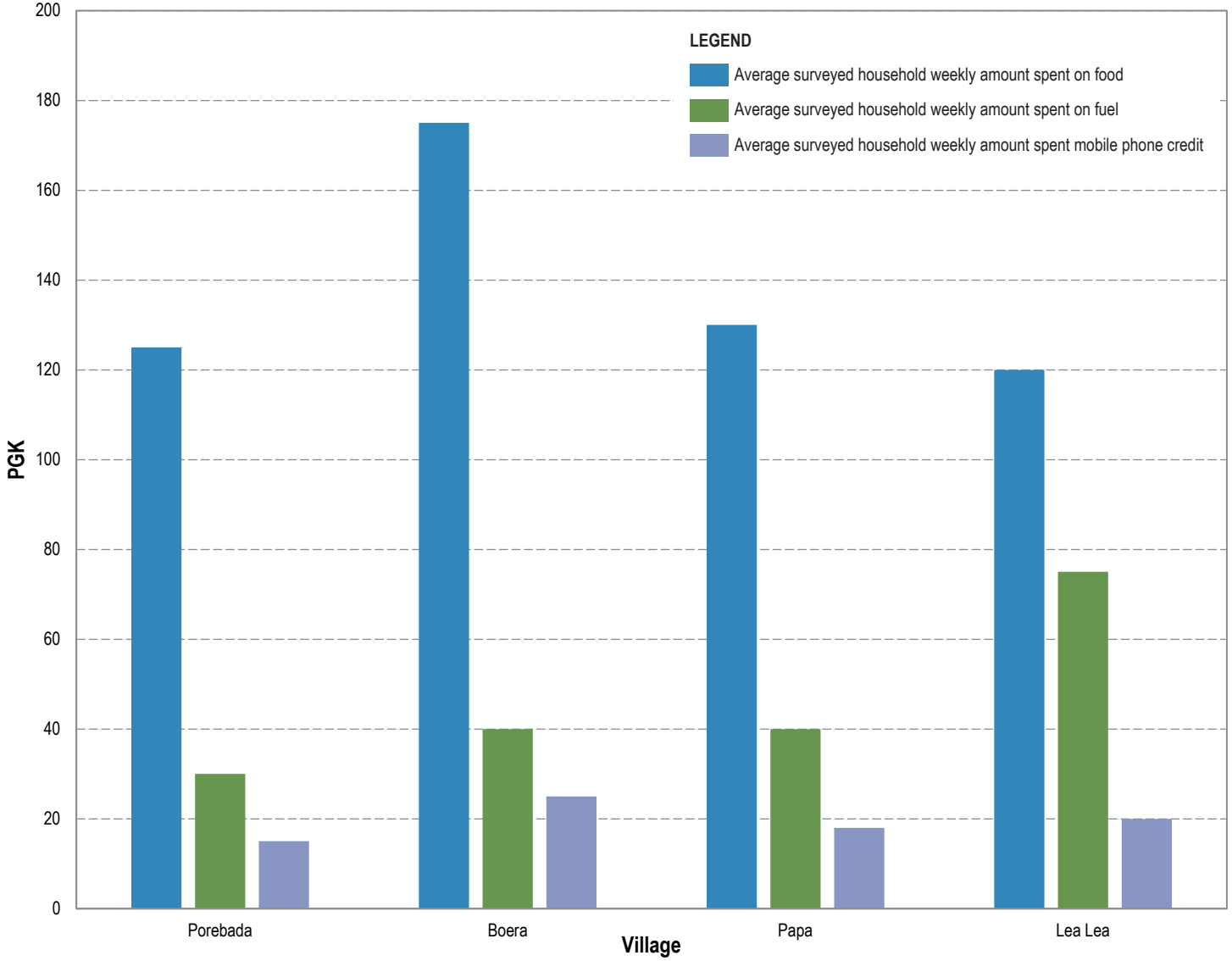

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FIGURE 5.14

Household expenditure on food, fuel and mobile phone credit

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

Asset ownership

The analysis of asset ownership provides insight into the affordability and importance of various material goods to the study area residents. The proximity of the study area to Port Moresby and accessibility to shopping areas means that most goods are readily available for purchase.

The household survey questioned households on the ownership of various assets and the results are presented as in Table 5.17. The most common assets owned by households in 2019 include mobile phones, televisions, fishing nets and fridges/freezers. Around 15% of surveyed households own a banana boat and outboard motor, except for Papa where the ownership of both is lower. Papa and Lea Lea reported a higher level of car ownership than the other villages, with 23% and 18% of surveyed households owning a car, respectively.

Table 5.17 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: Tetra Tech Coffey household surveys, 2019.

5.3 CULTURE

Economic development is an inevitable driver of social and cultural change, which influences both individual and community perceptions of well-being and sense of self. Generally, these change processes also generate tensions in community life and social relationships as development aspirations are questioned, refined and either achieved or not. Elements of cultural practice and traditions that do not support modernisation trends may lessen in everyday importance but not be discarded altogether, as their maintenance may be important to maintaining cultural identity.

The main ethnic groups in the LNG Plant study area are the Western Motu and Koita people (Groves, 2011). The Motu and Koita people are estimated to have migrated to the coastline between 200 and 300 years ago (Coffey Natural Systems 2009). The Koita people are technically the original ‘landowners’ of the village area; however, the coastal area remained uninhabited until the Motuans arrived (Coffey Natural Systems 2009).

The Motu domain consisted of ‘reefs, sandspits, pockets of coastal land and nearby waters’ (Groves 2011). While all four study area villages have mixed Motu-Koitabu inhabitants, Motu is the dominant language, but Koita is regularly spoken in Papa Village. A defining tradition of the LNG Plant study area villages was involvement in the regional Hiri system of trading Motuan ceramic pots for sago, canoe logs and artefacts with villages in the Gulf of Papua and to the east (Coffey Natural Systems 2009). Lagatois (double-hulled canoes) would travel from Bootless Bay and Caution Bay to the east and west of Port Moresby on the southeast trade winds (typically October or November) and return with the monsoons in January. Today, the annual Hiri-Morale festival celebrates the historic Hiri trade.

For a detailed description of the study area’s ethnography, refer to the PNG LNG Environment Impact Statement (Coffey Natural Systems 2009) and PNG LNG Social Impact Assessment (Goldman 2008).

The cultural change process commenced in the late 19th century for the Motu-Koitabu from contact with missionaries, who had three main aims: 'to make people literate, to convert them to church membership and to suppress what were thought to be heathen customs, especially dancing' (Groves 2011). Prior to the Second World War, traditional economies remained intact, though a proportion of younger Port Moresby men entered urban employment. Following the war, Port Moresby continued to develop as an administrative centre (resulting in many Port Moresby village men engaging in wage employment), while up to half of the men in Porebada engaged in wage employment, with the remainder fishing commercially.

For Motu-Koitabu people, urban growth in Port Moresby before and especially following Independence has led to loss of land, overcrowding in villages and marginalisation of their traditional land.

A Motu-Koitabu Development Summit held in 1999 (UNESCO 2001) identified critical issues in the NCD as:

- Loss of access to land.
- Environmental impacts of urban and industrial development (particularly in marine areas including areas reclaimed for development).
- In-migration, inter-marriage and the retention of cultural identity.
- Within the LNG Plant study area, land is increasingly being alienated for commercial and residential development in a process that is expected to continue, placing further strain on traditional livelihood and customary practices, often invoking a sense of loss within segments of the community (James et al. 2012).

5.3.1 Governance

Governance refers to the political and administrative framework at a provincial level, along with community roles and respect for customary leadership.

The study area is in the new Koiari-Hiri district of Central Province and is divided administratively and politically into four local-level governments and 18 ward areas. The elected ward members (often referred to as councillors) are the government representatives in Lealea (2 wards), Porebada (2 wards), Papa and Boera. The study area villages lie within the Hiri Rural local-level government area and are represented by 6 of the 18 elected ward councillors. Political leadership at the district level includes an elected member of the National Parliament, representatives for the four local-level governments and the members for the 18 ward areas. Refer to Section 4.1.3 for additional detail on the government system in Papua New Guinea.

The social structure within the study area villages is predominately based on patrilineal descent groups (iduhu), referring to both ascribed and achieved leadership (Coffey Natural Systems 2009). In modern society, business success, high rank in public service employment and success in national and/or provincial politics can also bring recognition and deference in village society. Land ownership was also highlighted as key function of authority and power within the village (Coffey Natural Systems 2009).

Daily governance within the study area villages also involves the local churches, which are central to the social lives of the community. Church contributions (boubou) are often reported to take precedence over school fees. Church facilities can serve as both a meeting place and the centre of village life (Coffey Natural Systems 2009). When conflicts in the communities cannot be solved at the family level, issues may be brought before the village court. The peace officers at the village court level attend to this through a customary system of mediation and conflict resolution to reach a consensus.

The Buria Police Post provides policing services to the nine Hiri west communities, including the LNG Plant villages. Consultation with the Police Post in 2022 indicated that LNG Plant communities' primary law and order issues include alcohol-related 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 (see Section 5.4.3) (Wu 2020), which indicates that this an ongoing and sustained issue.

Incorporated land groups (ILGs) have been established under the *Land Groups Incorporation Act 1974* and support the distribution of royalties and equity payments, while landowner companies provide business and employment opportunities and the chance for landowners to share in the profits they generate from these activities.

Laba Holdings was established as the umbrella landowner company for the LNG Plant area, and each LNG Plant village established landowner companies. The responses to household survey indicate considerable community concern regarding the distribution of employment opportunities by landowner companies during the construction of the PNG LNG Project. During consultation undertaken in 2022, key informants reported that all but one landowner company (Boera Holdings) was still in operation.

There has been considerable dissatisfaction historically with landowner groups in the LNG Plant communities, with consultation undertaken for the PNG LNG Project SIA (Goldman 2008) reporting that the reasons included a lack of community consultation and feedback, financial misappropriation, unpaid and unequal distribution of royalties and equities, and leadership problems. Consultation undertaken in 2019 indicated that some of these concerns remain for the LNG Plant communities.

5.3.2 Religious and traditional practice adherence

The main religion practised is Christianity (Uniting Church), representing 82% of households. Other Christian religious adherence includes Seven Day Adventists (8%), Catholic (1%) and Pentecostal (1%). All villages surveyed in the study area had a functioning church, with Lea Lea having four church facilities. Additionally, the Metago Bible College, located 2 km east of Papa and operated under the auspices of the United Church of Papua New Guinea and Solomon Islands, trains young pastors prior to their engagement in the community.

Most of the villages receive community support from local churches through church-funded community development programs, including youth and women's support programs. However, anecdotal evidence indicates that religious practice and adherence within the younger population have declined.

Communities within the study area villages indicated that traditional activities, such as fishing and canoe making, still occurred but were declining. This decline was attributed to increasing reliance on wages and therefore reduced time and need to undertake traditional activities, along with a lack of clarity regarding land ownership boundaries. Population growth and marriages between different cultures were also highlighted as factors contributing to a decline in traditional practice and cultural knowledge.

The Motu and Koita people have a long history of subsistence activity, including gardening and fishing, in the region (Goldman 2008). Local people in the study area indicated that their cultural identity was strongly linked with access to land and marine resources; however, the increasing prevalence of wage employment is reported to be the cause of a decline in gardening and fishing activities within the study area, particularly within the younger population.

As described in Section 4.2.1, two traditional language groups are regularly spoken across the study area: Motu and Koita. However, an increasing number of people within the villages are moving towards speaking Tok Pisin and English.

5.4 PERSONAL AND COMMUNITY WELL-BEING

Housing in the LNG Plant study area is basic and limited sanitation and waste disposal services exist within the villages. Education attainment is generally limited to the completion of schooling years and school attendance varies across the study area. Public infrastructure and services are generally poorly maintained and lack the equipment and supplies necessary to function adequately. Health services likewise lack

adequate medical supplies, equipment, funding and staff. The health status of people across the LNG Plant area is consistent with those experienced across Central Province and Papua New Guinea (NewFields 2020). Figure 5.15 to Figure 5.17 provide an overview of the location of key infrastructure for each study area village.

5.4.1 Built environment

Housing and infrastructure

Housing

The most common housing construction material in the study area is a combination of kapa sheeting for wall cladding and roofing, and mangrove timber for house posts (Plate 5.4 and Plate 5.5). Porebada and Lea Lea have the highest proportion of sampled households using mangrove timber for posts, at 71% and 59%, respectively. A survey of the mangroves adjacent to the LNG Plant also observed evidence of prior and recent mangrove harvesting (Vision Environment 2019). This indicates reliance on mangrove resources in the area. Most houses in the study area are built on land; however, Porebada and Boera have a significant number of houses built over the water in traditional Motuan style (Plate 5.6).

On average, houses within the study area have two or three bedrooms and generally between eight and nine residents per household. All households across the study area had a low level of insect screening; less than 50% of surveyed households indicated they had insect screening on their windows. Cooking activities mostly occur in internal kitchens (46%), followed by external kitchens (40%) and sometimes both facilities (13%). The most common fuel used for cooking includes wood, kerosene, electricity and gas.

Infrastructure

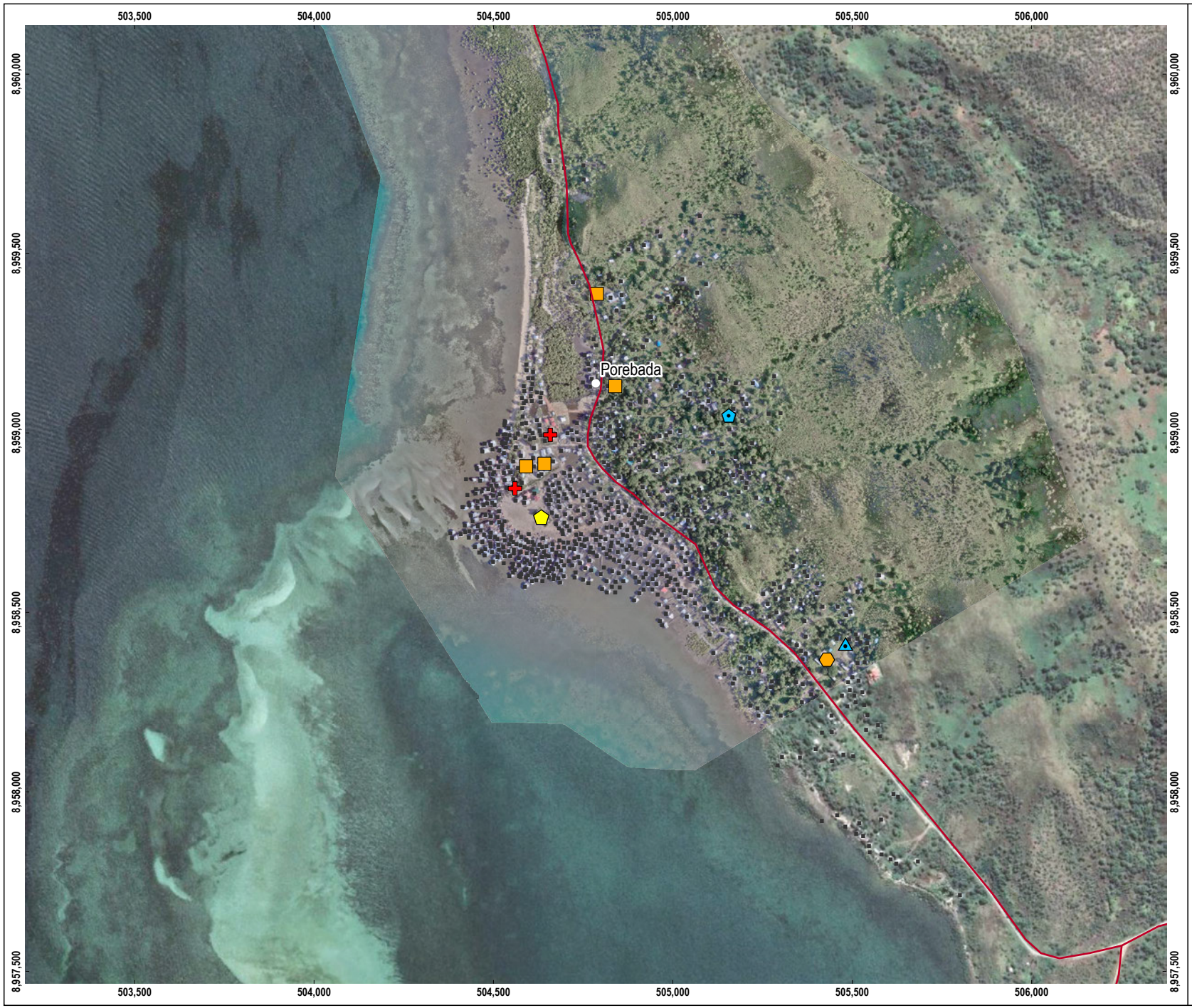
Villages within the study area rely on several water resources including piped water supply taps, rain water tanks and tube wells. The water supply sources in each study area village are summarised in Table 5.18, along with information on water supply from social baseline studies undertaken in 2008 for the PNG LNG Project (Coffey Natural Systems 2009). Water supply infrastructure in Papa and Lea Lea appears to have improved following the provision of a piped supply by Water PNG in 2017 (Loop PNG 2017). There are no discernible improvements to water supply in Porebada or Boera, despite a 2012 report indicating that Boera residents had a good level of access to fresh water (James et al. 2012). However, during consultation undertaken in 2023, all LNG Plant communities reported that water access is a community priority.

Households surveyed in Porebada and Lea Lea reported the highest levels of use of mangroves and/or the sea for human waste disposal, 61% and 45%, respectively. Households in Boera and Papa reported the highest use of pit toilets, 64% and 66%, respectively. The highest level of communal toilet use was reported in Lea Lea (14%) and Papa (11%), which also had a major outbreak of cholera in 2010 linked to poor sanitation due to the absence of proper toilets (The National 2010).

Within the study area villages, between 64% and 87% of people indicated that they had access to mains electricity (Figure 5.19). This is significantly higher than the national average of 23%, as reported by the Asian Development Bank (ADB 2019). Reliability of electricity appears to vary between the villages, with higher reliability reported in Papa (57%) and Porebada (57%) compared to Boera (47%) and Lea Lea (33%). Papa and Porebada also had the highest number of households expressing the cost of electricity as being high.

Between 32% and 58% of surveyed households indicated the use of solar panels, mainly used for lighting purposes and phone charging. Across the study area, over 85% of people indicated that they owned and used a mobile phone.

In comparison, Edai Town, a modern gated housing estate east of Boera, 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).



LEGEND

- Village
- Road

Social field survey

- Household
- Church building
- School (Elementary/Primary)
- School (Secondary)
- Health facility
- Water source (spring)
- Water source (pump to supply tank)

SOURCE
Survey data from Tetra Tech Coffey.
Infrastructure, roads, watercourses and lease boundary from EMPNGA.
Imagery from EMPNGA and Google Earth.

0 100 200 300 m

SCALE **1:15,000**
PAGE SIZE: **A4**
PROJECTION: **WGS 1984 UTM Zone 55S**

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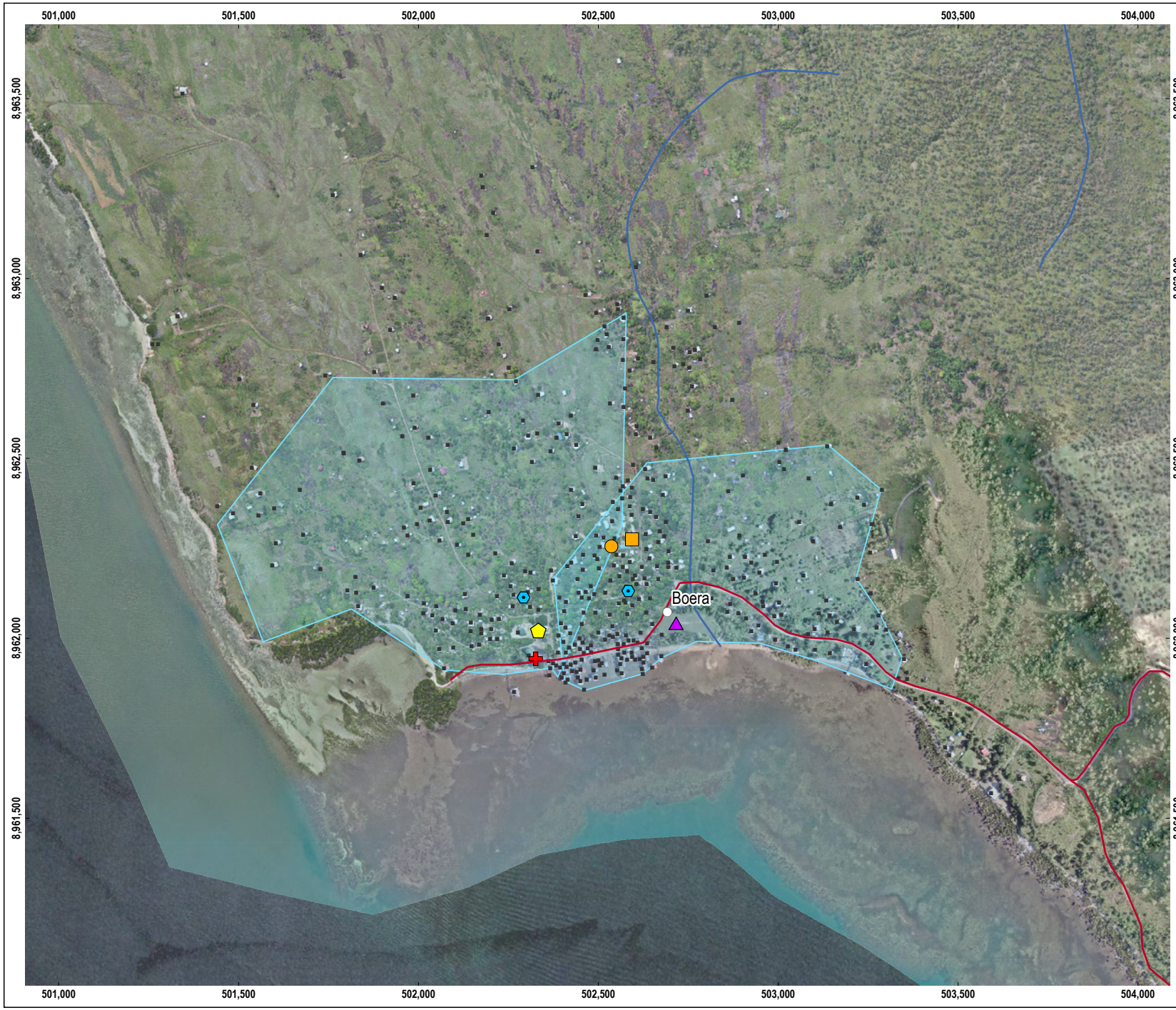
FIGURE 5.15

Porebada village overview

TETRA TECH COFFEY

DATE: **04.07.23** PROJECT: **754-MELEN300733** FILE: **300733_04_F05.15_GIS**



LEGEND

- Village
- Road
- Watercourse

Social field survey

- Household
- Church building
- School (Elementary/Primary)
- Teaching accommodation
- Health facility
- Sport facility
- Water source (tube well)
- Area of water source supply

SOURCE
Survey data from Tetra Tech Coffey.
Infrastructure, roads, watercourses and lease boundary from EMPNGA.
Imagery from EMPNGA and Google Earth.

0 100 200 300 m

SCALE **1:15,000**
PAGE SIZE: **A4**
PROJECTION: **WGS 1984 UTM Zone 55S**

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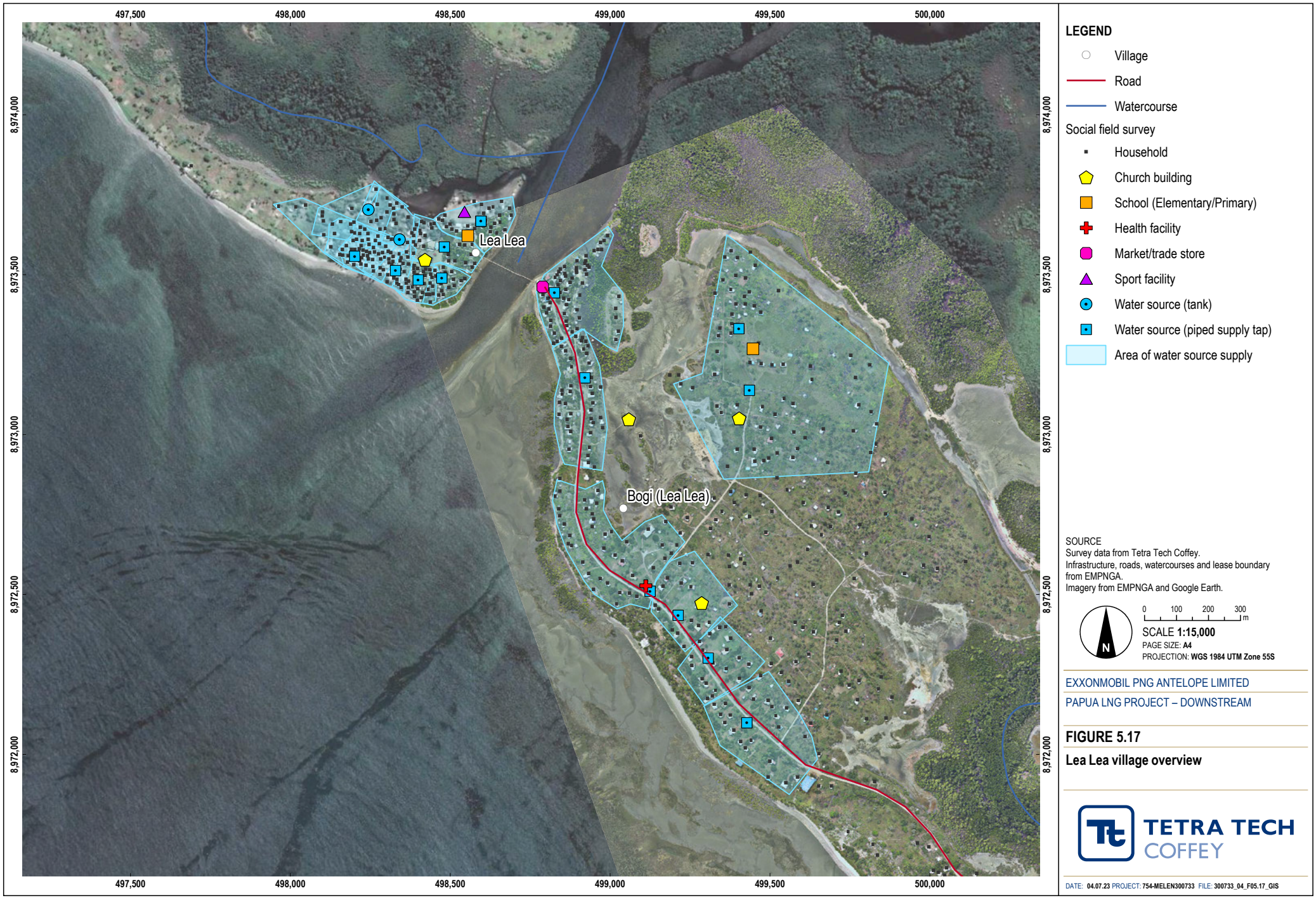
PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 5.16

Boera village overview

TETRA TECH COFFEY

DATE: **04.07.23** PROJECT: **754-MELEN300733** FILE: **300733_04_F05.16_GIS**



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LEGEND

- Village
- Road
- Watercourse

Social field survey

- Household
- Church building
- School (Elementary/Primary)
- Health facility
- Market/trade store
- Sport facility
- Water source (tank)
- Water source (piped supply tap)
- Area of water source supply

SOURCE
Survey data from Tetra Tech Coffey.
Infrastructure, roads, watercourses and lease boundary from EMPNGA.
Imagery from EMPNGA and Google Earth.

0 100 200 300 m

SCALE **1:15,000**
PAGE SIZE: **A4**
PROJECTION: **WGS 1984 UTM Zone 55S**

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PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 5.17

Lea Lea village overview

TETRA TECH COFFEY

DATE: **04.07.23** PROJECT: **754-MELEN300733** FILE: **300733_04_F05.17_GIS**

LEGEND

- Village
- Road
- Watercourse

Social field survey

- Household
- School (Elementary/Primary)
- Teaching accommodation
- Health facility
- Market/trade store
- Water source (tube well)
- Water source (piped supply tap)
- Water source (pump to supply tank)
- Area of water source supply

SOURCE
Survey data from Tetra Tech Coffey.
Infrastructure, roads, watercourses and lease boundary from EMPNGA.
Imagery from EMPNGA and Google Earth.

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SCALE **1:15,000**
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PROJECTION: **WGS 1984 UTM Zone 55S**

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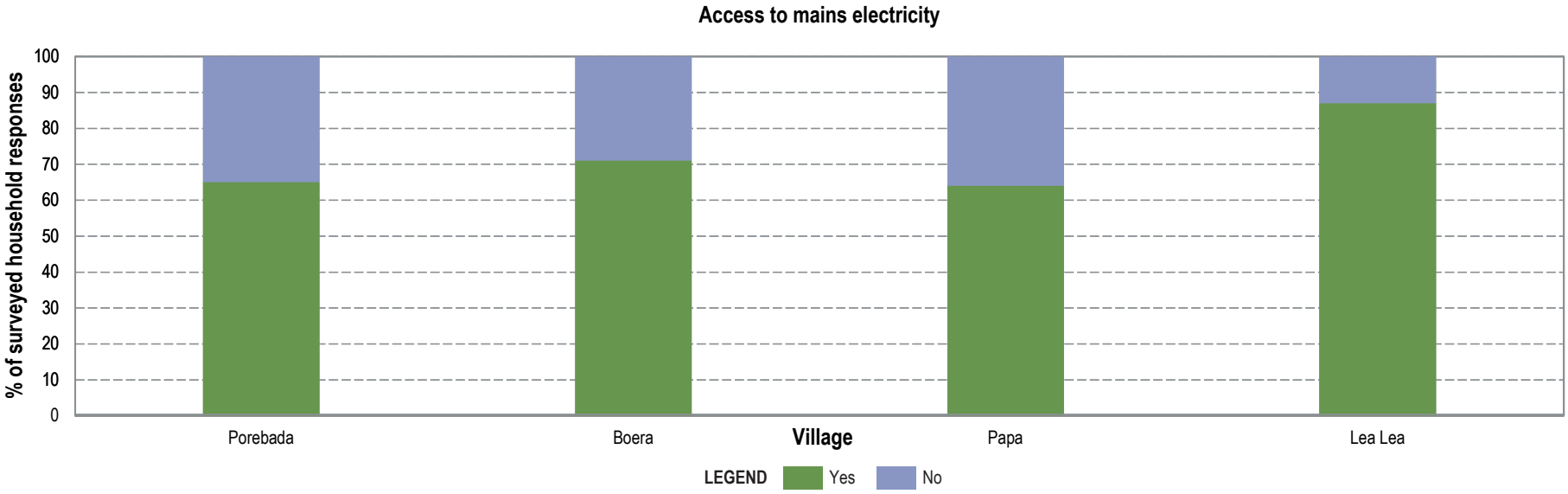
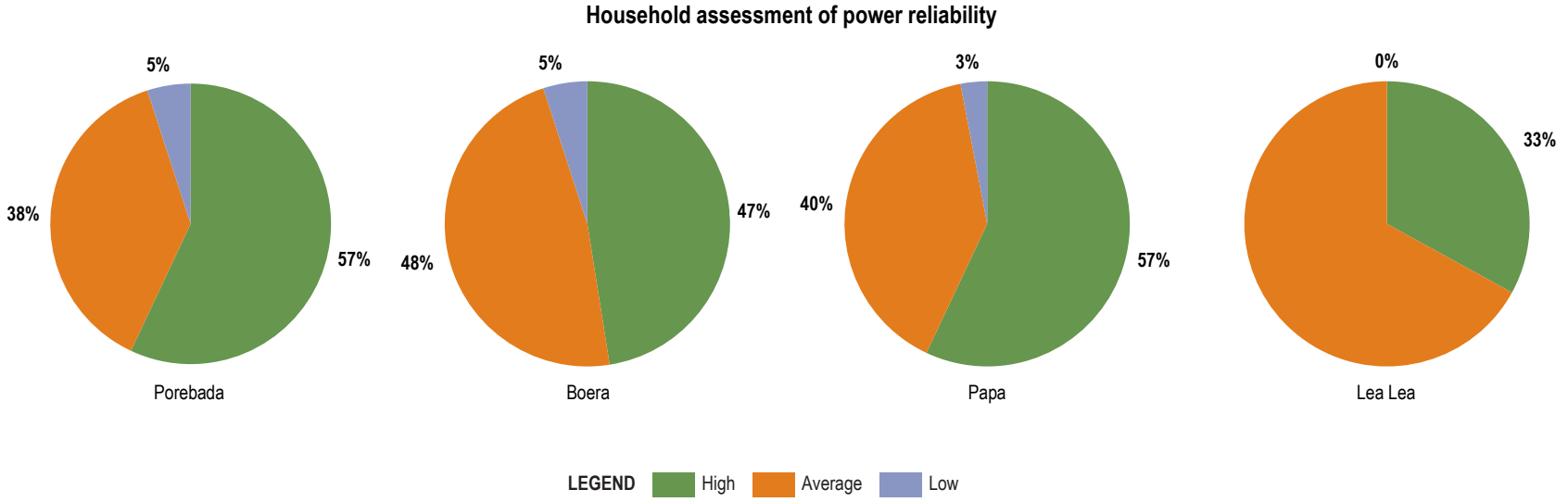
FIGURE 5.18

Papa village overview

TETRA TECH COFFEY

DATE: **04.07.23** PROJECT: **754-MELEN300733** FILE: **300733_04_F05.18_GIS**





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PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 5.19

Household power supply infrastructure

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

DATE: 03.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.19_GRA DOC REFERENCE: \\ETSS772GISFS1\DATA$\GIS\300733_EMPNG_PAPUALNGDOWNSTREAM\2_GRAPHICS\04_SOCIAL_BASELINE\300733_04_GRA004.AI_2

Photo credit: Tetra Tech Coffey

Plate 5.4
House with kapa sheeting and mangrove posts in Lea Lea

Photo credit: Tetra Tech Coffey

Plate 5.5
Wooden house in Papa

Photo credit: Tetra Tech Coffey

Plate 5.6
Wooden house with mangrove posts elevated over water in Boera

Table 5.18 Water supply infrastructure

Village	Water source status (2008)	Water source status (2019)	Water source status (2022)
Porebada	Port Moresby mains water is available via 12 taps in the village at a cost of 10 toea for 5 L.	Porebada Village primarily relies on two water sources – one pump to supply water tank facility and one spring. Both are noted to be of poor quality and reliability. Local residents reported that the pump system is only used for washing due to the poor quality (Plate 5.7).	Three 9,000 L water tanks have been installed within the community as part of Niupower's Community Investment Program. However, the capacity of these tanks and the existing water source is unreliable. Consequently, water carts were reported to be used to top up supply. Community access to water is a recognised community priority as at consultation undertaken in 2023.
Boera	Water from the Port Moresby mains is available four days a week via 12 standpipes. Houses over the sea require the women to collect water from the standpipes. Some houses pipe water at a cost of PGK 5 per week; water in containers costs from 10 to 20 toea per litre.	Two tube wells located in central Boera were observed to be the primary water sources, however, additional private sources may also be present. The tube wells are noted to be poorly maintained and reliable for 50% of the year. Water quality is reported to be poor, requiring filtering and/or treatment before use (Plate 5.8).	Three 9,000 L water tanks have been installed within the community as part of Niupower's Community Investment Program. 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.
Papa	There are four wells (two with water limits), and many women will rise at 4:00 a.m. to avoid carrying their household's water (typically two 20-litre containers) during the heat of the day. The bores are fed by underground springs and dry up between May and November, when water must be trucked from Port Moresby. The bore water is reported to cause skin rashes on children.	Papa water sources include piped supply taps, tube wells and rainwater tank supply. Most water sources (90%) were reported to be well-maintained, reliable and of good quality. The tube well located in the north of the village supplies most of the village, with approximately 60 households drawing from it twice a day as a primary water source.	Three 9,000 L water tanks have been installed within the community as part of Niupower's Community Investment Program. The piped water supply has not been functioning for three months, which was reported to be due to poor water pressure.
Lea Lea	There is one well 2.5 km north of village and only accessible by foot. Women take four trips a day averaging 10 to 20 km on foot each. In the dry season, water is trucked from Port Moresby at a cost of PGK3 per 20-litre container.	Lea Lea Village relies primarily on piped water from the Taba River and two water tanks in the north. Approximately 80% of water sources are reported to be of good quality, however some pipes and/or taps are not well-maintained and result in water being of poor taste and quality (Plate 5.9).	Three 9,000 L water tanks have been installed within the community as part of Niupower's Community Investment Program. The well located 2.5 km north of the village continues to be utilised. Consultation undertaken in March 2023 found that water scarcity is an existing and long-term issue for the community, which has been exacerbated through population increase over the last decade. Specifically, it was noted that water supply in the dry season is insufficient to meet community needs, and the lack of water availability has resulted in intra-community dispute, particularly among women.

Source: Tetra Tech Coffey village surveys 2019 and Coffey Natural Systems 2009.

Photo credit: Tetra Tech Coffey

Plate 5.7
Water pump facility in Porebada

Photo credit: Tetra Tech Coffey

Plate 5.8
Tube well water source in Boera

Photo credit: Tetra Tech Coffey

Plate 5.9
Water tank in Lea Lea

The Lea Lea Road services the LNG Plant study area villages. It provides access to Port Moresby and other villages, mainly for shopping, market trading, employment and social engagements. As with most roads in rural areas of PNG, it also supports small-scale roadside markets and individual stalls trading various goods. The road is a dual-lane bitumen-sealed road with unsealed shoulders. In 2009, several sections of the road were widened or resurfaced as part of PNG LNG Project construction works. However, during 2019 and 2022 field investigations, it was noted that the condition of the road has deteriorated, with some sections heavily potholed.

In the 2019 traffic survey, traffic along Lea Lea Road, between the Napa Napa Junction and Lea Lea on weekdays, found that traffic levels on Lea Lea Road to and from Port Moresby and to and from Napa Napa were similar, with around 130 vehicles per hour (vph) to 160 vph during the morning and 110 to 140 vph during the afternoon.

The average daily traffic in 2022 on Lea Lea Road averaged between 160 vph in the morning and 190 vph to and from Napa Napa, and 49 vph in the morning and 79 vph in the afternoon to and from Port Moresby. This indicates that significantly more traffic is being generated on the Lea Lea Road generated by the industrial development around Napa Napa Road between 2019 and 2022. Traffic on Lea Lea Road to and from the LNG Plant and beyond was lower than that generated by Napa Napa, with an average of 104 vph in the morning and 88 vph in the afternoon.

Amenity

The main noise sources in the study area communities are natural, such as wind noise in foliage, insects, birds and domestic animals, in addition to typical village noises (SLRb 2023). Operational noise from the LNG Plant, such as emergency flaring, occurs sporadically.

Table 5.19 summarises background noise levels for daytime, evening and night-time periods, as well as the LA_{10} and LA_{eq} noise levels, recorded in 2019. Based on the measured noise monitoring results and the noise level time traces, noise emitted by the normal operation of the plant is not identified at these receptors during the monitoring period, and the cause of ambient noise levels above the noise limit is believed to be attributed to local noise sources. The noise levels during the evening and night are higher than during the day, which was attributed to elevated insect noise, a common feature of the ambient environment throughout Papua New Guinea.

Table 5.19 Background noise levels in study area

Ambient noise level (dBA)										Noise Environment Permit criteria External one hour L_{Aeq} (dBA)	
Location	Day (7:00 to 18:00)			Evening (18:00 to 20:00)			Night (22:00 to 7:00)			Day (7:00 to 22:00)	Night (22:00 to 7:00)
	LA_{90}[1]	LA_{10}[2]	LA_{eq}[3]	LA_{90}[1]	LA_{10}[2]	LA_{eq}[3]	LA_{90}[1]	LA_{10}[2]	LA_{eq}[3]	55	45
Metago	32	45	53	43	51	52	39	44	46		
Papa	34	49	49	45	51	52	46	50	57		
Boera	34	51	55	44	52	51	45	51	49		
Lea Lea	37	50	53	43	51	49	40	44	44		

[1] L_{A10} and L_{A90} levels are the arithmetic average of the hourly data for each day / evening / night.
[2] L_{eq} levels are the logarithmic average of the hourly data for each day / night / evening.
[3] At perimeter fence line; excludes background noise levels.
Bold text indicates exceedances of noise permit criteria.
Source: SLRb (2023).

Emissions from the LNG Plant are the main source of air pollutants in the study area. The NuiPower 58 MW gas-fired Power Station and Dirio Gas-based 54 MW power plant are also sources of air emissions. Other potential sources of air emissions in the area include domestic and agricultural activities, as well as road traffic, in the villages surrounding the LNG Plant including Lea Lea, Papa, Boera and Porebada. Minor emissions of particles, NO_x, SO_2 and hydrocarbons would contribute to air quality in the vicinity of the Project and surrounds. Other sources of particulate matter, such as sea salt and smoke from local and remote fires, would also be present intermittently (SLRa 2023).

The existing LNG Plant occupies a substantial area, with its presence and operations visible to both Papa and Lea Lea villages. During the household surveys, approximately 60% of respondents in those villages reported a high level of perceived negative effect on environmental amenity primarily due to flaring effects. Common flaring effects reported by respondents included noise, light, odour and heat. A lower percentage of households in Porebada and Boera (approximately 40%) reported a high level of effect on environmental amenity from the LNG Plant.

Community and recreational facilities observed in the study area villages were limited. Recreational facilities such as playing fields and basketball courts were observed in Lea Lea and Boera. Anecdotal information indicates that trade stores are operational in each study area village; however, these were not recorded during the village surveys.

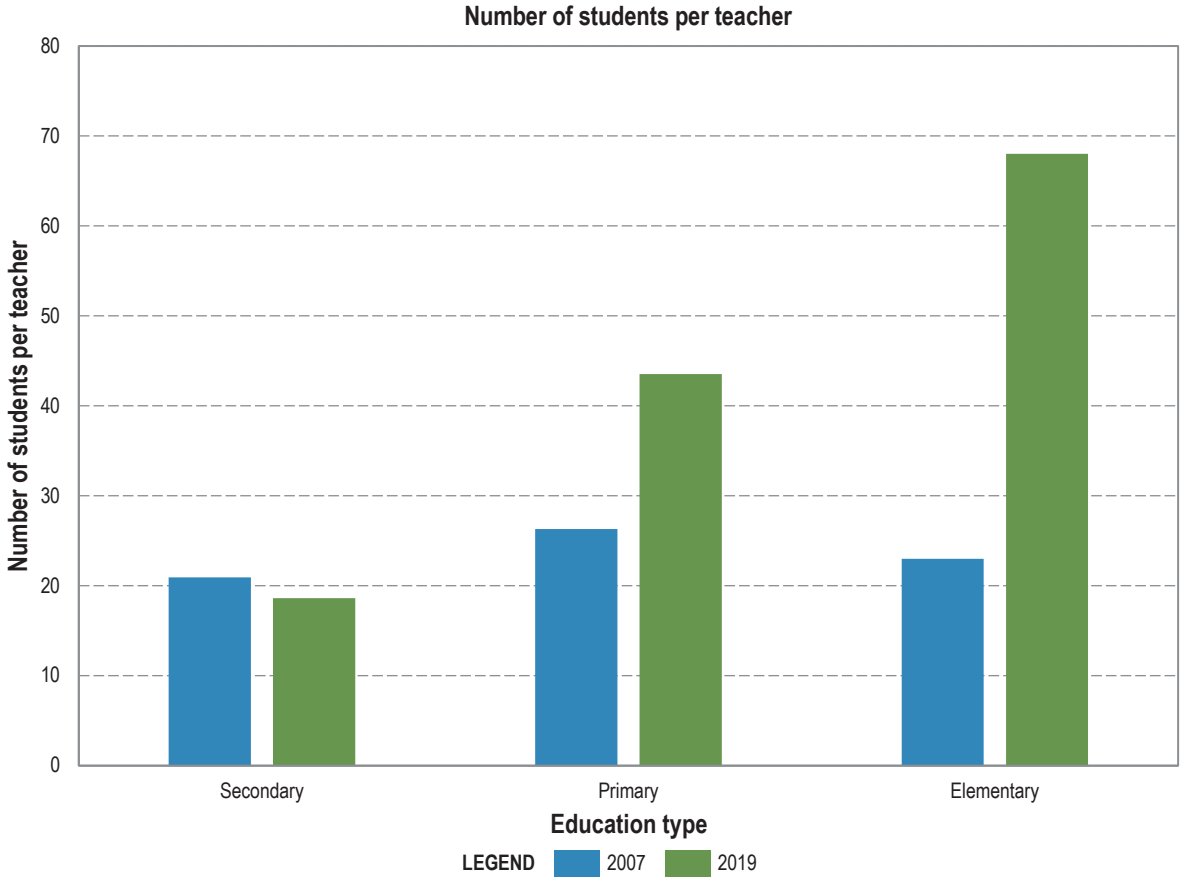
5.4.2 People's productive capacities – education and community health status

5.4.2.1 Education status

At the 2011 Census, 80% of the Central Province population aged 10 years and over were recorded as being literate. The level of literacy across the study area is consistent with this value, with Boera and Porebada having the highest level of literacy, 86% and 85%, respectively. The provision of educational services in the study area is reported to be limited due to a lack of facility maintenance and shortages of teachers. Education facilities within each of the study area villages are shown on Figure 5.15 to Figure 5.17. Access to education facilities is discussed further in Section 5.4.4. Education facility enrolment statistics for communities within the study area in 2007 and 2019 are provided in Table 5.20 and a subset of this data is presented graphically in Figure 5.20. The results show that the gender ratio of students has evened out over time, and the mean number of students per teacher has increased considerably over this period.

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. This was attributed to population growth, along with the 2021 introduction of the *Tuition Fee Free policy,* which has resulted increased attendance.

Table 5.21 summarises the level of educational attainment within the LNG Plant villages. Papa and Porebada had the highest percentage of people completing primary and secondary schooling (82%), while Lea Lea had the lowest proportion of people (72%). This is significantly higher than the overall Central Province level of 5% recorded in the 2011 Census. The PNG LNG Project recently funded the construction of additional classrooms and the refurbishment of existing facilities at schools, as well as donating desks and chairs.



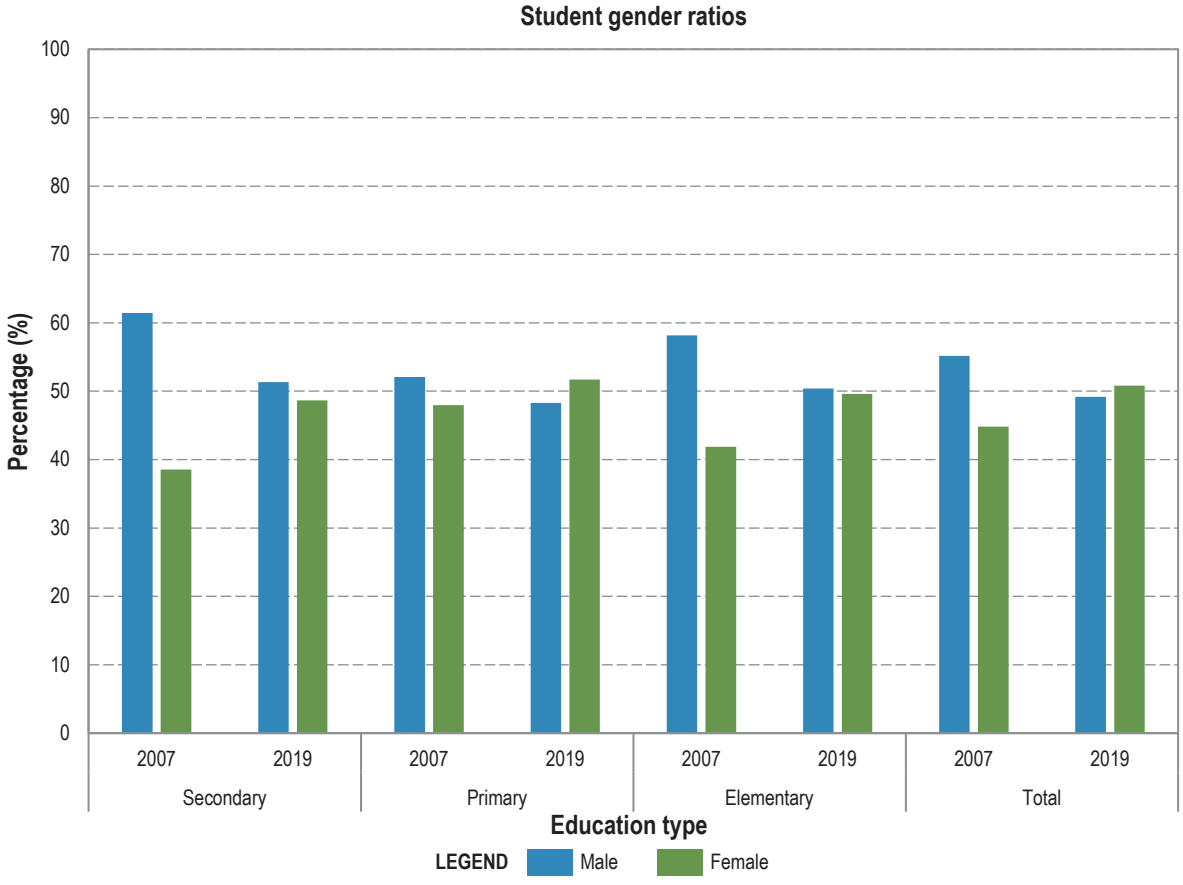


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FIGURE 5.20

Student gender and student teacher ratios at schools in the LNG Plant study area

SOURCE
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

Table 5.20 Education facilities enrolments

Village	School type	2007					2019				
		Student enrolment			Number of teachers	Average students per teacher	Student enrolment			Number 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	NA
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: Tetra Tech Coffey village surveys, 2019 and Coffey Natural Systems 2009

Table 5.21 Highest education level attainment

Village	None	Primary and secondary school	Tertiary / trade certificate / vocational certificate / education diploma	Postgraduate
Porebada	8.0%	82%	7.5%	0.2%
Boera	5.5%	77%	14%	0.5%
Papa	7.0%	82%	8.0%	1.0%
Lea Lea	12%	72%	14.5%	0.2%

Source: Tetra Tech Coffey household surveys 2019.

5.4.2.2 Health status

This section summarises the findings of the draft Community Health Baseline Report prepared by NewFields (NewFields 2022).

Health services and facilities across the study area are indicated as limited and lacking in basic equipment and resources. Figure 5.15 to Figure 5.17 show the distribution of health facilities within the study area villages. Access to health services across the study area is described further in Section 5.4.4.

Burden of disease

The clinic data from 2018 show that pre-COVID-19 illness pattern is dominated by respiratory and skin infections. Eye and ear infections, and diarrhoea are also common. This is consistent with the common illnesses reported in the study area villages as part of the household survey, which include fever, diarrhoea, malaria, respiratory diseases and skin diseases. The Partnership in Health Program 5-Year Review Report (NewFields 2017) also indicated similar results.

Adult mortality data from verbal autopsies[11] over the period 2010 to 2016 show that the top five causes of adult death across the LNG Plant study area were tuberculosis, cancers, diabetes, malaria and HIV/AIDS.

[11] A method of obtaining data about cause of death at a population level.

Recent adult mortality data was not available. The children under-five mortality rate[12] for the LNG Plant study area were estimated by PNG IMR to be 22 per 1,000 live births (in 2015) and 55 per 1,000 live births (in 2016), which is generally consistent with the overall children under-five mortality rate for Papua New Guinea which was 49 per 1,000 live births over the period 2016 to 2019. Causes of child mortality and recent child mortality rates were not available.

Communicable respiratory diseases

Prior to COVID-19, communicable respiratory diseases were already the most common diseases across the LNG Plant study area and the infection rate for tuberculosis were approaching endemic levels. High risk factors, such as high housing occupancy rates, are likely a driver in the study area, where occupancy rates typically range from seven to nine per household. Tuberculosis knowledge, attitude and practice levels in the study area has opportunities for improvement but are better than levels in other areas of Papua New Guinea.

Non-government organisation tuberculosis programs in the villages in the study area over the last 12 to 18 months has been basic. An analysis of available caseload data for Porebada and Papa found that:

- There is a significant tuberculosis caseload present.
- The management and control of the caseload is variable.
- An active case detection process is not being implemented.
- Case contact training is not consistently being implemented.

Other communicable respiratory diseases of concern are measles and chicken pox due to low (less than 80%) vaccination rates for these diseases.

As described in Section 4.2.4, Papua New Guinea experienced three distinct waves of COVID-19 between 2021 and 2022. Based on discussions with the ExxonMobil LNG Medicine and Occupational Health Department, communities in the LNG Plant study area experienced a rise in suspect and confirmed COVID-19 cases during the March/April 2021, October 2021, and February 2022 (NewFields 2022). COVID-19 confirmed case and death data was not available for study area communities.

Vector-borne diseases

Malaria infection rates are extremely low. Porebada sub health centre recorded 2% positive and Papa recorded 8% positive cases in 2021. The community health baseline (NewFields 2022) 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. Bed net distribution efforts have been successful across the study area, with 88% of households using treated nets (NewFields 2022). The level of recorded malaria is mismatched with household perceptions of malaria (i.e., household members believe that malaria is common and a significant source of fever). Viral vector-borne diseases, including dengue, zika and chikungunya, are uncharacterised and the underlying potential burden of disease is unknown.

Sexually transmitted infections

In 2020, the Joint UN Program on HIV/AIDS reported the Papua New Guinea national HIV prevalence rate to be 1.1% for women aged between 15 and 49 years old and 0.7% for men aged between 15 and 49 years old (NewFields 2022). This is consistent with past PNG IMR surveys from 2013 to 2014 which found a HIV infection rate of 1.3% (NewFields 2022).

Between 2019 and 2021, the Papa and Porebada sub health centres reported an overall 3% and 2% positive HIV test rate respectively (NewFields 2022). Data for HIV prevalence rates for the other study area villages is not available. Local clinics have low capability to assess and diagnose sexually transmitted infections, as such there is likely a large burden of sexually transmitted infections across the LNG Plant study area villages that is not diagnosed.

[12] The probability of dying between birth and the fifth birthday.

The PMG IMR survey in 2013 and 2014 (most recent data available) at antenatal clinics in the study area found high infection rates for chlamydia (24%), gonorrhoea (25%) and trichomonas (33%). However, given the cultural stigma associated with sexually transmitted infections, the actual prevalence of infections is likely substantially higher across the study area villages (NewFields 2022).

Water- and sanitation-related diseases

As stated in the burden of disease section, diarrhoea is common amongst residents of the study area.

The 2021 diarrhoeal disease incidence rates in children (under five years old) per 1,000 children for health centres in the study area found that the Papa Sub Heath Centre reported substantially higher rates of diarrhoeal disease (353 per 1,000 children) compared to Porebada Sub Health Centre (44 per 1,000 children) (NewFields 2022).

Food and nutrition

Food shortages were reported in many households during the household survey period. Table 5.22 summarises reported food shortages within the previous 24 hours in each of the study area villages. Papa and Porebada had the highest number of households reporting food shortages, with 23% of households in Porebada reporting a shortage of food, which indicates a severe deficit in food consumption in the village.

Shortage of garden produce was generally due to seasonal shortages or gardens not being planted, while shortages of store-bought foods was due to a lack of money to purchase goods. Obligations to share available food with extended family members or visitors was also a common reason for citing a shortage of food.

The COVID-19 pandemic is understood to have resulted in increased food insecurity across Papua New Guinea due to increased transport costs, reduced availability of agricultural inputs (e.g., fertilisers, seedlings), closure of markets, and an increased 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. Table 5.23 provides a summary of food types consumed in the previous 24 hours, presented as percentage of households in each village.

Rice is the dominant source of carbohydrates, followed by sweet potato and cassava. Cassava appears to be of most importance in Papa, where 62% of households had consumed it during the previous day. Consumption of green leafy vegetables, such as aibika and kumu, was limited to around 30% of households, except for Porebada where they were consumed in 12% of households.

The primary sources of protein across all study area villages were fresh and tinned fish, followed by chicken and tinned meat. Papa appears to consume the highest amount of bush and pig meat (combined), indicating the continued importance of hunting in that village. Papa also had a higher level of consumption of garden produce (combined), which includes cassava, sweet potato and greens, compared to the other villages. This would indicate that Papa is still relatively reliant of subsistent activities such as gardening and hunting.

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.

Malnutrition and food security issues are present across the LNG Plant villages. Available health facility data (e.g., Papa Sub Health Centre) demonstrated the presence of potentially significant nutritionally-related problems in some households.

Table 5.22 Summary of food shortages within study area villages in 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: Tetra Tech Coffey household surveys 2019.

Table 5.23 Summary of 24-hour food recall in study area households*

Food type	Porebada	Boera	Papa	Lea Lea
Rice	91%	93%	93%	**96%**
Sugar	55%	57%	66%	**71%**
Tinned fish	**61%**	52%	44%	44%
Flour	45%	46%	58%	**59%**
Fish and shellfish (fresh, smoked or dried)	38%	57%	**67%**	40%
Bread and other cereal products	34%	37%	33%	**46%**
Cassava	15%	21%	**62%**	27%
Vegetable oils and dripping	25%	**36%**	21%	32%
Aibika, kumu and other greens	12%	27%	**30%**	26%
Banana	16%	21%	**23%**	18%
Chicken	12%	**25%**	22%	18%
Tinned meat	**20%**	14%	18%	17%
Snack foods	17%	**21%**	15%	14%
Sweet potato	10%	13%	11%	**14%**
Coconut	6%	13%	**18%**	15%
Milk (liquid, powered or canned)	7%	**12%**	8%	9%
Lamb and mutton	5%	6%	**11%**	5%
Pig meat	2%	**6%**	5%	2%

Food type	Porebada	Boera	Papa	Lea Lea
Fresh fruit	3%	**14%**	5%	4%
Irish potato	1%	**14%**	3%	2%
All other meats including bush meats	0%	0%	**7%**	6%
Sago	2%	0%	5%	**8%**
Sugar cane	0%	0%	**12%**	2%
Taro	**1%**	**1%**	0%	0%
Yam	**1%**	**1%**	**1%**	0%
Kapiak (Breadfruit)	0%	1%	0%	**2%**
Eggs (chicken and wild)	1%	0%	**4%**	2%
Nuts	1%	1%	**3%**	0%
Sweet corn	0%	2%	**4%**	3%
Pumpkin fruit, cucumber and squash	**3%**	1%	1%	**3%**

Source: Tetra Tech Coffey household surveys, 2019.
*Note: highest percentage shown in **bold**.*

*Table 5.25 key	
	Over 90%
	71 to 90%
	51 to 70%
	31 to 50%
	10 to 30%
	Less than 10%

Non-communicable diseases

The community health baseline report (NewFields 2022) found that adult mortality in the LNG Plant study area is dominated by infectious diseases; however, data indicates that non-communicable diseases such as cardiovascular disease, diabetes, obesity, and cancer are increasing.

Non-communicable diseases are typically related to a change from consumption of subsistence foods to consumption of store brought processed foods. The use of alcohol and tobacco products also increases the risks of non-communicable diseases.

Previous PNG IMR surveys indicated that there is substantial level of undiagnosed non-communicable diseases across the LNG Plant study area. The rates of tobacco and alcohol use are high and have been identified as a significant concern during health discussions.

Zoonotic diseases

Animal husbandry is significant across the LNG Plant study area, with many households raising chickens. It is likely due to close interaction between households and their animals that there is a real burden of associated, and undiagnosed, zoonotic diseases. For example, there is a relationship between cases of diarrhoeal illness and infectious agents associated with animals. Hunting is another potential source for zoonotic illness.

5.4.3 Social cohesion

Law and order

Law and order have been reported to be a challenge across the LNG Plant study area. A lack of police presence attributed to a lack of accommodation has led to an increase in criminal activity and public disturbances (EMPNG 2014). Access to law and order services and facilities is described further in Section 5.4.4.

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).

The household surveys sought insight on the level of intra-village conflict experienced during the construction phase of the PNG LNG Project, as several reports (e.g., Oxfam 2011) and newspaper articles inferred substantial disruption during this period. Between 50% and 70% of surveyed households reported a high level of disruption, mainly attributed to discrimination in employment; alcohol and drug abuse; and relationship issues, including division between ‘haves’ and ‘have-nots’. Other common issues related to anti-social behaviour by younger workers which often led to heightened concern for safety by women in the village.

Households in Porebada reported the highest number of alcohol and drug abuse incidences, which may reflect the proximity to Port Moresby and weekend visitation by relatives and friends following pay days. Land issues and disputes were reported more in Boera compared to other villages, which may indicate divisions along clan lines. This was evident in 2010 when clashes between men from Boera and Porebada over land disputes led to the death of four men and several properties being damaged (Oxfam 2011).

During consultation undertaken in 2022, stakeholders reported that the following issues are reported within the LNG Plant study area:

- Disputes between settlers and landowners, particularly in Porebada and Papa, where ongoing in-migration has been reported.
- Family and sexual violence, which was reported to be highly associated with alcohol consumption.
- Alcohol-related public violence, which was noted to primarily be an issue 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.

5.4.4 Access to functioning services

Health

Access to health facilities and services across the study area is limited, and the condition of existing facilities, such as aid posts and health centres, is generally poor. There are five health facilities located across the study area, as shown in Figure 5.15 to Figure 5.17. Facilities in the study area often lack basic medical supplies and equipment which limits the ability to provide medical treatment (EMPNG 2014). Participants of

focus group discussions expressed the need for improved health facilities and support needed for service delivery across the study area. Table 5.24 summarises the status of health facilities within the study area.

During household surveys, 45% of respondents (across all villages) indicated that they had travelled to Papa for health care services. This is likely due to the Papa Sub Health Centre's ability to provide a better quality of treatment. Several respondents also reported travelling to Port Moresby for specialised health services. These findings are consistent with the key findings of the health baseline report (NewFields 2022), which found that the delivery of services to the community is not meeting the National Department of Health program standard requirements, with staffing and funding constraints impacting health centre performance. For example, aid posts have staffing constraints and Porebada Sub Health Centre has either closed or has irregular hours of operation. As a result, the burden of health care service and program delivery has primarily fallen on Papa Sub Health Centre which, together with the Boera Aid Post, is the critical health facility for the LNG Plant villages.

The local clinics generally lack basic medical supplies and equipment such as dengue fever kits. Additionally, they have a marginal capability to assess and diagnose sexually transmitted infections. Boera, Lea Lea and Papa also lack enough medical supplies (e.g., medicine) to meet patient volume and requirements due to inadequate timing of supply delivery. The Boera Aid Post takes supplies from the Porebada Sub Health Centre and uses a boat to travel and retrieve supplies. Papa has experienced a waiting period of six months (post-request) for medicines and supplies. There is also no functioning emergency medical response system across the study area.

Table 5.24 Study area health facility and services status

Village	Current status	Village survey comments
Papa	Operational health centre with four staff members (Plate 5.10).	The health centre has more specialised equipment, such as blood pressure machines, portable oxygen cylinders and electric suction machine.
Porebada	Operational aid post with two staff members (Plate 5.11). Non-operational health centre with five staff members (Plate 5.12).	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.
Lea Lea	Non-operational aid post.	The aid post is non-operational due to a lack of medicine and staff.

Source: Tetra Tech Coffey village surveys 2019.

Education

In 2019, there were 11 schools within the study area including elementary, primary and secondary facilities (Figure 5.15 to Figure 5.17). However, attendance, condition and resources vary for each facility. Table 5.25 provides a summary of school attendance to elementary, primary and secondary schools in villages across the study area. School attendance within the study area across the different age cohorts was consistently higher compared to that reported for urban areas across Papua New Guinea and Papua New Guinea as a whole. School attendance for primary education (children aged 9 to 14 years) was substantially higher compared to elementary and secondary education. Attendance within the LNG Plant villages was approximately double the reported attendance for Papua New Guinea as a whole and substantially greater than the urban average (see Table 5.25). Similarly, attendance at secondary school (15 to 18 years) in the

study area range from 63% in Lea Lea to 81% in Boera, which again was over double the level reported across all urban areas in Papua New Guinea (36%) and almost four times the level reported for Papua New Guinea as a whole.

Table 5.25 School attendance across the study area

Village	Elementary school (6 to 8 years)	Primary school (9 to 14 years)	Secondary school (15 to 18 years)
Porebada	69%	96%	69%
Boera	77%	96%	81%
Papa	85%	96%	79%
Lea Lea	75%	97%	63%
Urban residence*	59%	64%	36%
PNG total *	44%	50%	21%

Source: Tetra Tech Coffey household surveys 2019
* Source: NSO, 2019

Table 5.26 provides a summary of the education facilities within the study area (Plate 5.13 to Plate 5.15).

Porebada is the only village in the study area with a secondary school facility, Redscar High School. This school has approximately 300 students, with students from surrounding villages expected to travel to attend school there.

There is one post-school training facility within the study area, namely the Metago Bible College, which primarily operates to train missionaries and pastors. The proximity to Port Moresby provides the opportunity for LNG Plant communities to access other tertiary institutions and colleges (refer to Section 4.2.4 for additional detail). It is planned to establish a technical college at Edai Town to capture training opportunities associated with constructing housing in the future.

Table 5.26 Summary of education facilities within the study area

Village	Grades taught	Number of classrooms	Number of teachers	Village survey comments	2023 consultation summary
Porebada	Elementary	13	Information not available	The elementary school requires first aid kit, water tanks, chairs, and teacher accommodation.	School infrastructure and staff accommodation expansion is required to cater to the school population.
	Elementary	1	1	-	
	Elementary	1	3	-	
	Primary	8	25	-	
	Secondary	8	16	Five classrooms and teacher accommodation need renovation.	
Boera	Primary	5	10	-	Existing accommodation is at a high standard relative to other areas. However, there is a need for additional staff accommodation.

Village	Grades taught	Number of classrooms	Number of teachers	Village survey comments	2023 consultation summary
Papa	Primary	6	17*	-	School infrastructure and staff accommodation expansion is required to cater to the school population.
	Elementary	3	3	-	
	Elementary	1	2	-	
	Junior High*		6	-	
Lea Lea	Elementary	3	9	Three classrooms and five teacher housing require maintenance. In addition, there is a need for 50 desks and fencing.	Additional infrastructure is required to cater for the school population.
	Primary	8	14	-	

Source: Tetra Tech Coffey village survey 2019.
* Information collected during consultation undertaken in 2023.

Law enforcement

Formal law and order services and facilities in the study area has historically been limited. The Buria Police Post provides policing services to the nine Hiri west communities including the LNG Plant villages. During consultation undertaken in March 2023, it was noted that the police post was unmanned due to vandalism rendering the post unsuitable for use in early 2023.

In instances where large-scale law and order issues occur, the Royal PNG Constabulary (RPNGC) will be engaged. The use of excessive force and human rights abuses by the RPNGC are well documented. In particular, mobile squads have an ‘acquired notoriety for rough justice’ (Dinnen 2020).

Photo credit: Tetra Tech Coffey

Plate 5.10
Health centre in Papa

Photo credit: Tetra Tech Coffey

Plate 5.11
Aid post in Porebada

Photo credit: Tetra Tech Coffey

Plate 5.12
Porebada health centre

Photo credit: Tetra Tech Coffey

Plate 5.13
Boera Primary School

Photo credit: Tetra Tech Coffey

Plate 5.14
Papa Elementary School

Photo credit: Tetra Tech Coffey

Plate 5.15
Redscar High School in Porebada

5.5 EDAI TOWN

Edai Town is an urban development located on the Port Moresby-Lea Lea Road 3 km east of Boera. It is a relatively new development established by the customary landowners of Boera Village (through Boera Holdings Limited, a landowner company) who have partnered with a Malaysian company (JC-KRTA Consulting Group (PNG) Ltd). The land area is 155 ha for which Boera Holdings was granted an Urban Development Lease. The town is a mixed-use development that includes commercial, residential, and industrial components. It is a gated and security-protected community where house buyers also receive secure land title and is seen as a model that may be suitable for implementation in other areas of Papua New Guinea (Patjole 2017).

By mid-2017, Phase 1 of Edai Town was complete with 161 houses and a population of around 600. As at October 2022, Phase 2 has been completed and there are 400 houses with a population of 1.500 people. At completion, the development is expected to house approximately 10,000 people (Oxford Business Group 2018). During consultation with Edai Town Management, it was reported that the town is planned to comprise three residential estates, and two industrial and commercial estates.

The following challenges occurred during the development of Edai Town (Ezebilo and Hamago 2017):

- Shortages of skilled labour
- High cost of house-building materials (largely imported)
- Delays in the approval of building plans by the Building Board
- Lack of trunk infrastructure, such as water, sewerage and electricity
- Difficulty for home buyers accessing loans from financial institutions.

Edai Town developers have provided water and sewerage infrastructure under a private license issued by Water PNG, with a sewage discharge permit from the Conservation and Environmental Protection Authority. Connection to the electricity grid was undertaken by PNG Power with funding advanced from the developers. Residents pay a ‘corporate service fee’ to pay for the maintenance of infrastructure and the provision of services such as refuse collection and disposal.

The majority of current households within Edai Town were reported to own a motor vehicle indicating that the residents of Edai Town have a much greater level of asset ownership than much of the population within the LNG Plant villages (Section 5.2.2). Transport services, such as a shuttle to and from Port Moresby, are provided by Edai Town management on a fee for service basis. There are also plans for a maternity centre and clinic that will 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.

5.6 DEVELOPMENT NEEDS AND ISSUES

As part of focus group discussions in each study area village, general development issues facing the village were explored, as well as views on potential issues (both positive and negative) foreseen with the expansion of the LNG Plant. Discussions were facilitated based on the following four questions:

- In your opinion, what are priority village development needs?
- In your opinion, what are the best ways to help the community develop and improve villager well-being?

This discussion was facilitated and informed by an examination of the footprint of the proposed expansion, both within the current plant boundary on the landward side, and the additional marine loading infrastructure footprint. The outcomes of the focus group discussions are provided in Table 5.27.

There were no clear differences in the views of male and female focus group discussion participants, with substantive agreement on both issues and development needs. There were no general environmental impact issues raised in discussions, indicating limited direct impact is experienced from LNG Plant operations.

Table 5.27 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 seen as serious. • 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. • Focus group discussions with the leaders broke down due to tension between meeting participants and village councillors and leaders.
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.
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: Tetra Tech Coffey focus group discussions 2019.

5.7 EXPERIENCE OF THE PNG LNG PROJECT

This section summarises the feedback received on the study area communities' experience of the PNG LNG Project to date, including the construction and operations phases. Understanding the issues and impacts, either perceived or real, from the construction and operation of the PNG LNG Project will inform the assessment of potential issues that may arise as part of the Papua LNG Project – Downstream.

The information has been compiled through:

- Assessing the responses to relevant questions in the 2019 household survey conducted by Tetra Tech Coffey.
- Reviewing publicly available literature on project effects (e.g., Oxfam 2011; Ezebilo 2017; Ezebilo and Hamago 2017).
- Reviewing local and foreign media reports and commentary.

5.7.1 Results from the 2019 household survey

The household survey sought the opinion of respondents on their experiences of the construction and early operation of the PNG LNG Project. Qualitative responses were examined to identify the most common themes across the LNG Plant villages.

Intra-village conflict experienced

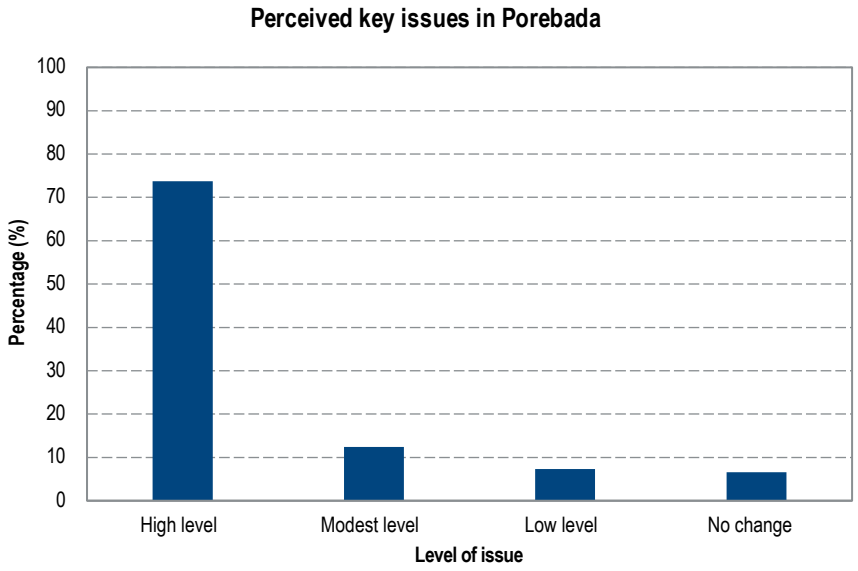
The views on the level of intra-village conflict experienced during the construction phase were sought, as several reports (Oxfam 2011; Tingim Laip 2012) and newspaper articles inferred substantial disruption to village social cohesion during this period, though the reasons for this were not entirely clear. Most households in all four villages (between 50% and 70%) perceived a high level of conflict, with the main drivers being perceived discrimination in employment recruitment by land owner companies; alcohol and drug abuse predominantly by those in receipt of wages from construction employment; and family relationship issues (such as infidelity, marriage breakdown and divisions between 'haves' and 'have nots').

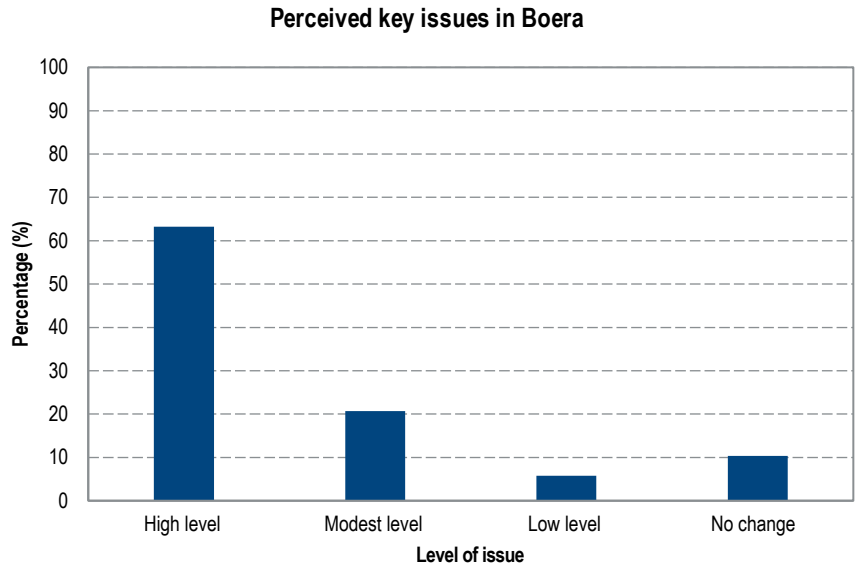
Households in Papa and Lea Lea were most concerned with perceived employment discrimination of the existing landowner companies, which comprised approximately 50% of household responses. Family relationship issues were a concern in Papa, accounting for 31% of household responses. Porebada had the highest level of household responses related to alcohol and drug abuse (which may reflect proximity to Port Moresby and weekend visitation by relatives and friends following pay days). Land issues were higher in Boera (25% of household responses) than elsewhere, which may reflect historical and ongoing internal divisions along clan lines. Other issues were varied, though anti-social behaviour by younger workers was a common complaint. The perceived levels and causes of intra-village conflict as determined by interview response rates for each village are summarised in Figure 5.21 and Figure 5.22.

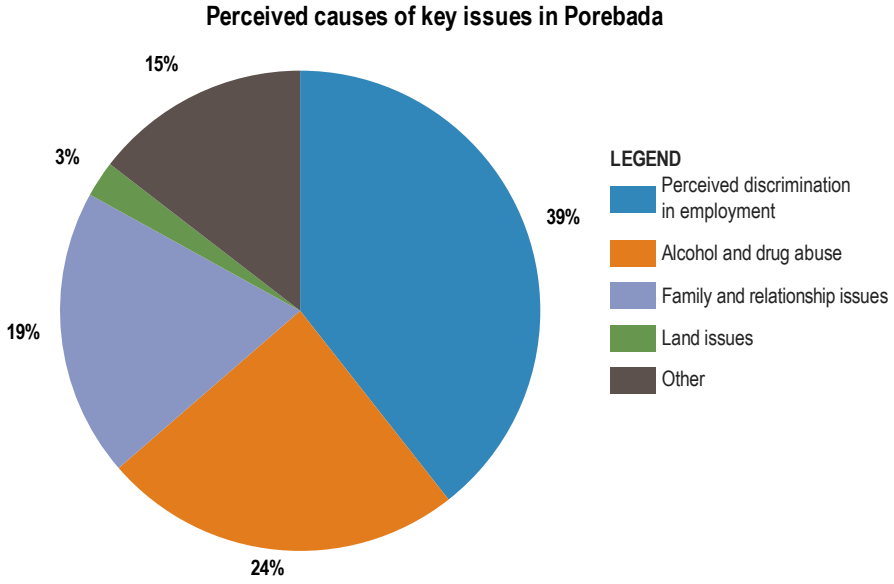
Disruption to household livelihood activities during construction

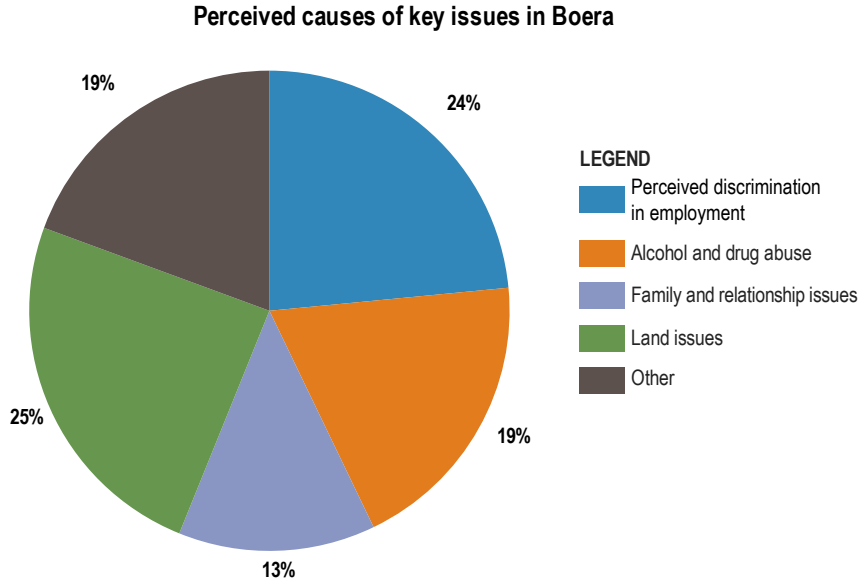
The household survey sought views on perceived disruptions to livelihoods that were experienced during the construction of the PNG LNG Project.

Around 50% of households in Porebada, Boera (Figure 5.23) and Papa (Figure 5.24) reported a high level of disruption to livelihood activities, while in Lea Lea (see Figure 5.24) around 70% of households reported a high level of disruption, possibly due to the prevalence and reliance on fishing for households in this village. Around 10% of households in all villages (except for Porebada where the level was 22%) reported no change in livelihood activity.









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PAPUA LNG PROJECT – DOWNSTREAM

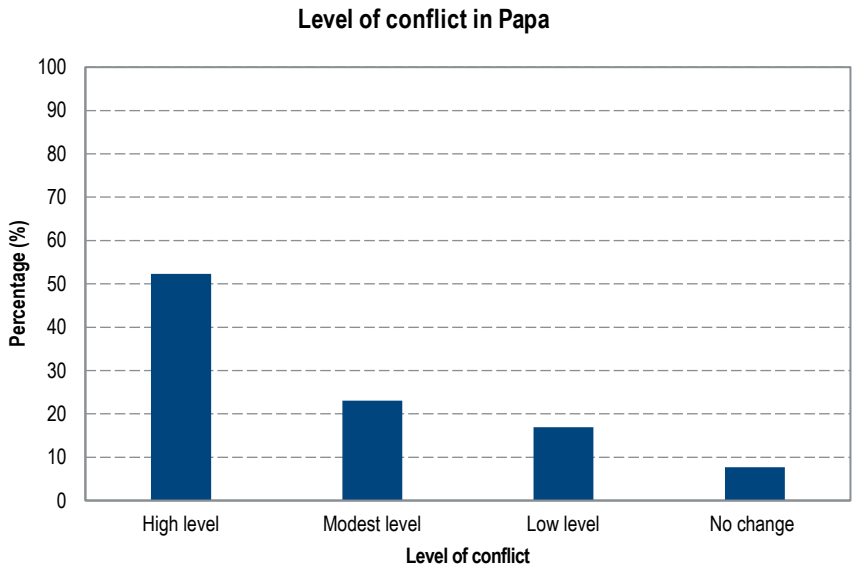
FIGURE 5.21

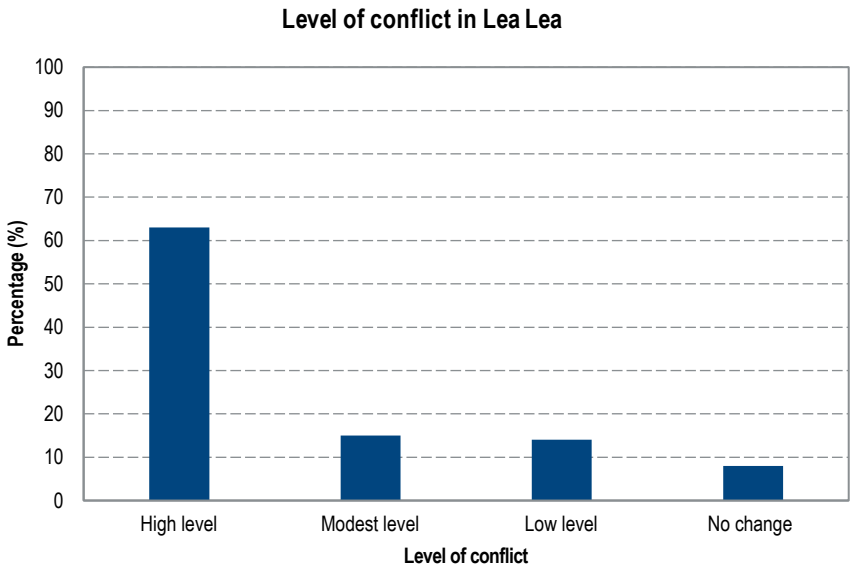
Household experience of the PNG LNG Project - reported level of issues experienced and their causes (Porebada and Boera)

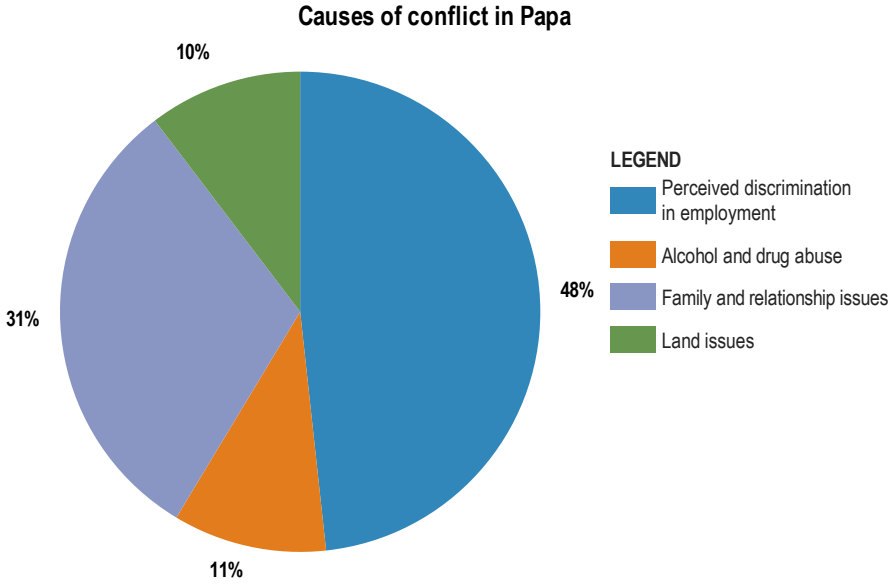
SOURCE:
Tetra Tech Coffey household survey, 2019

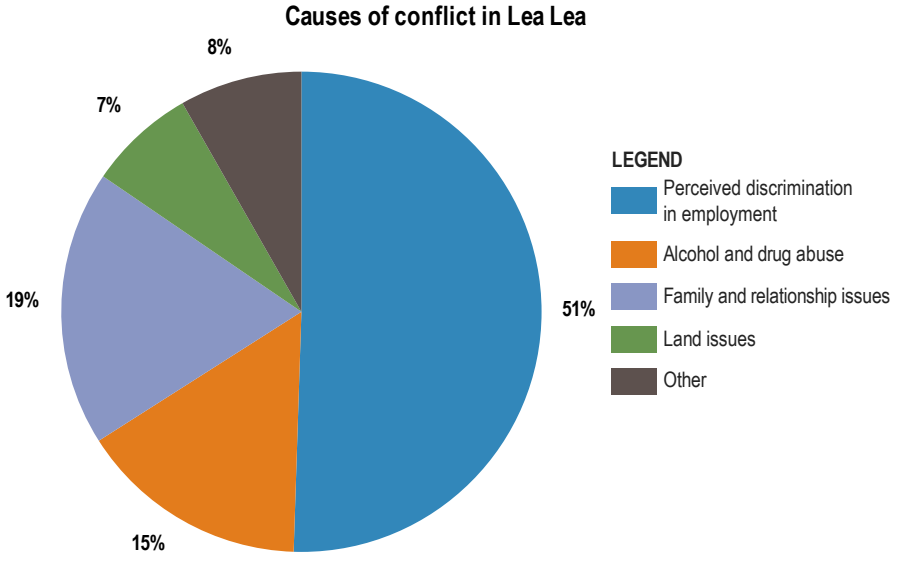
TETRA TECH COFFEY

DATE: 04.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.21_GRA DOC REFERENCE: \\ETSS772GISFS1\DATA$\GIS\300733_EMPNG_PAPUALNGDOWNSTREAM\2_GRAPHICS\04_SOCIAL_BASELINE\300733_04_GRA002.AI_4









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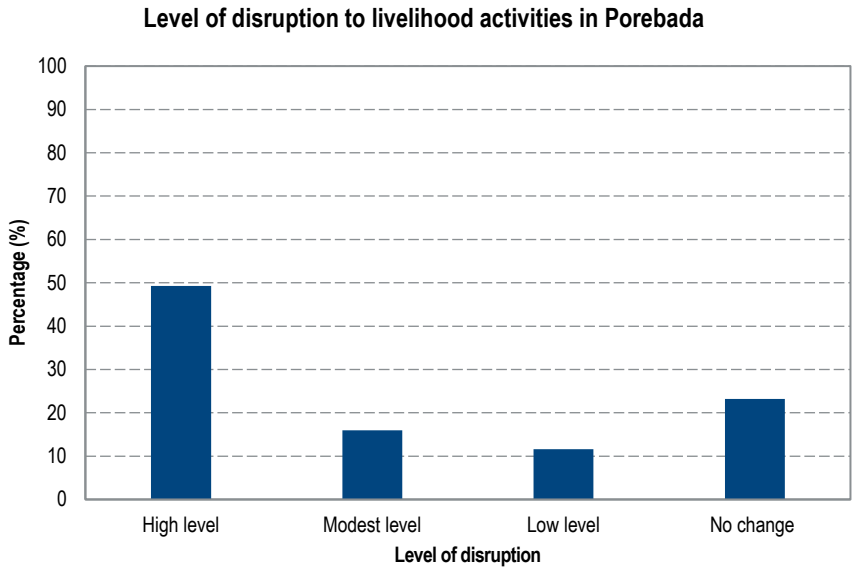
PAPUA LNG PROJECT – DOWNSTREAM

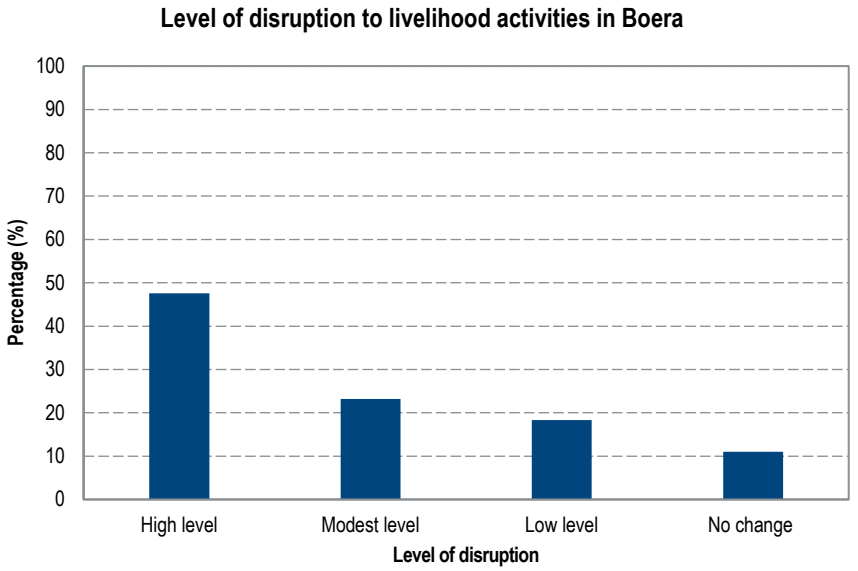
FIGURE 5.22

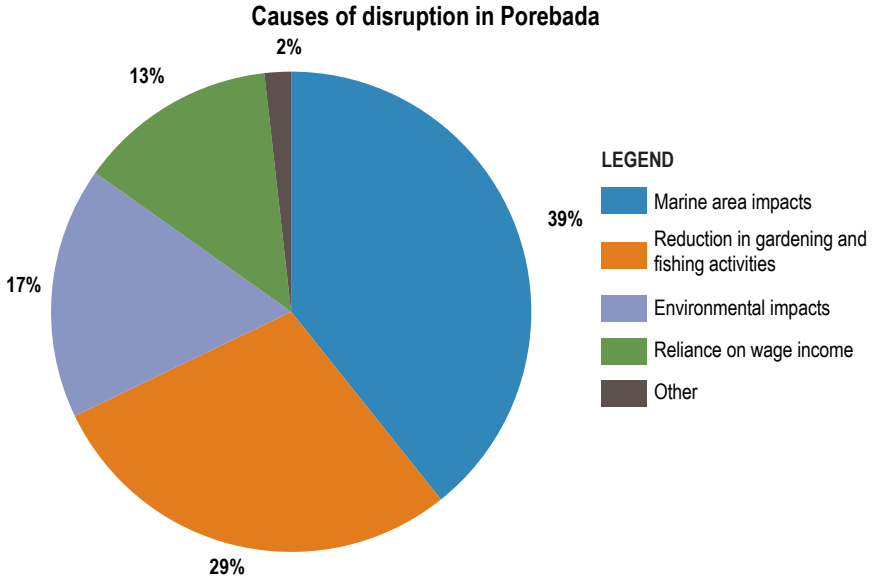
Household experience of the PNG LNG Project - reported level of issues experienced and their causes (Papa and Lea Lea)

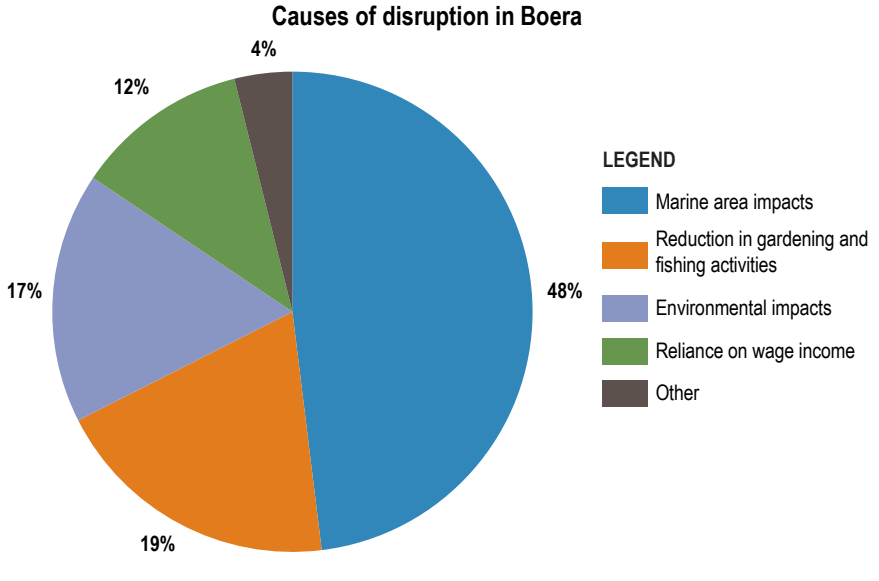
SOURCE:
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY









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PAPUA LNG PROJECT – DOWNSTREAM

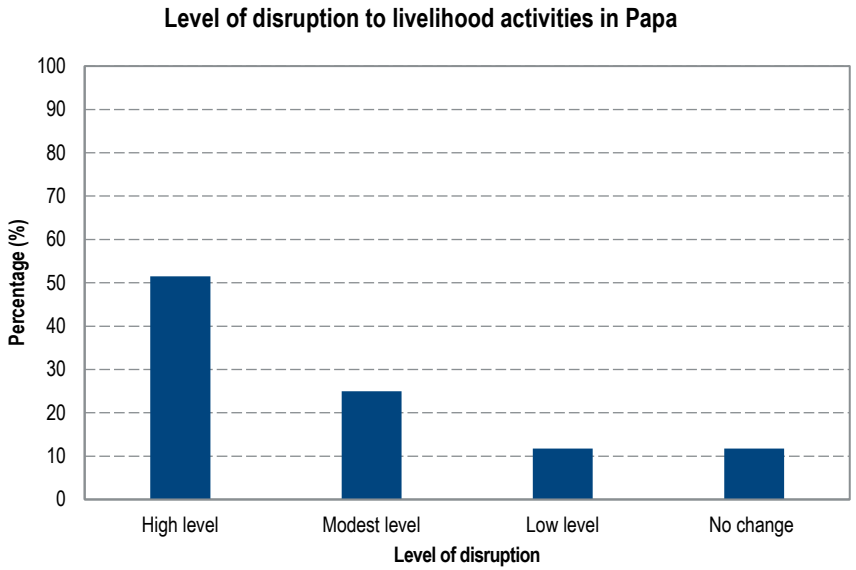
FIGURE 5.23

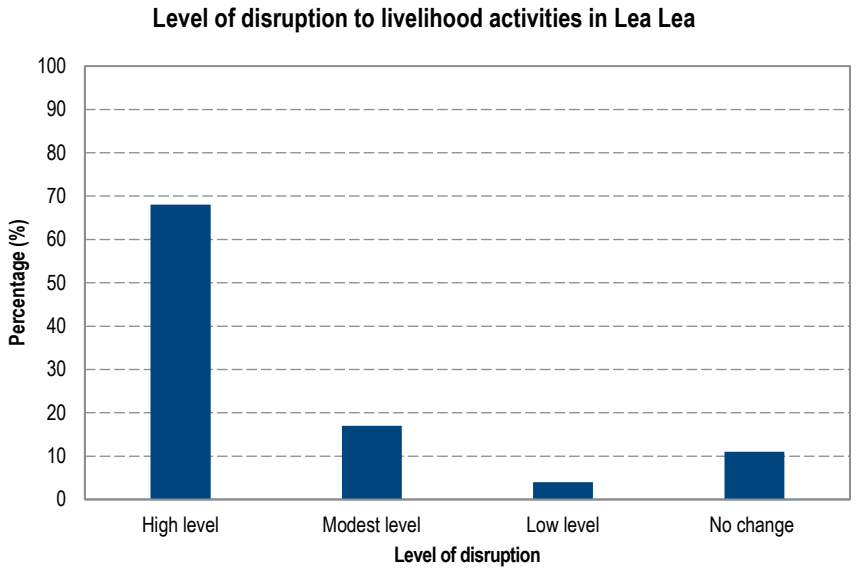
Household experience of the PNG LNG Project - reported level of disruption to livelihoods and the identified causes (Porebada and Boera)

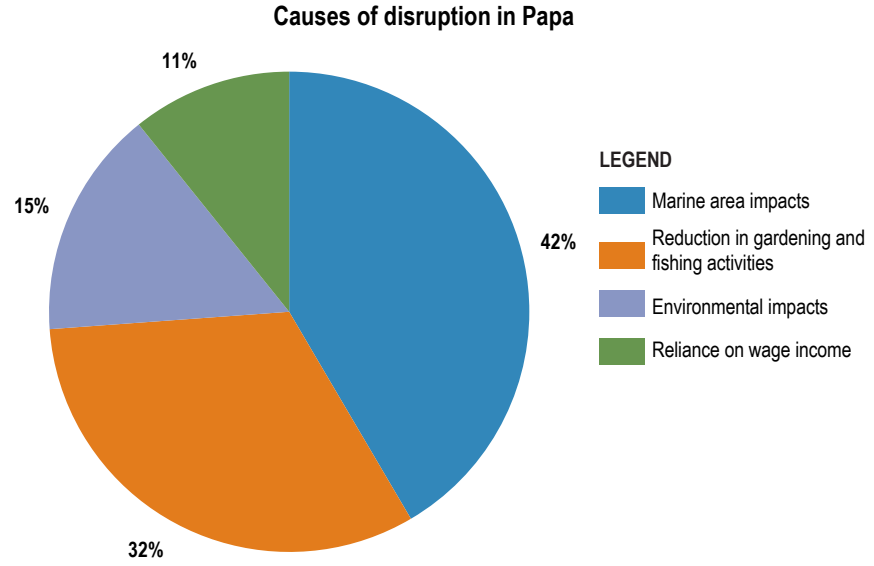
SOURCE:
Tetra Tech Coffey household survey, 2019

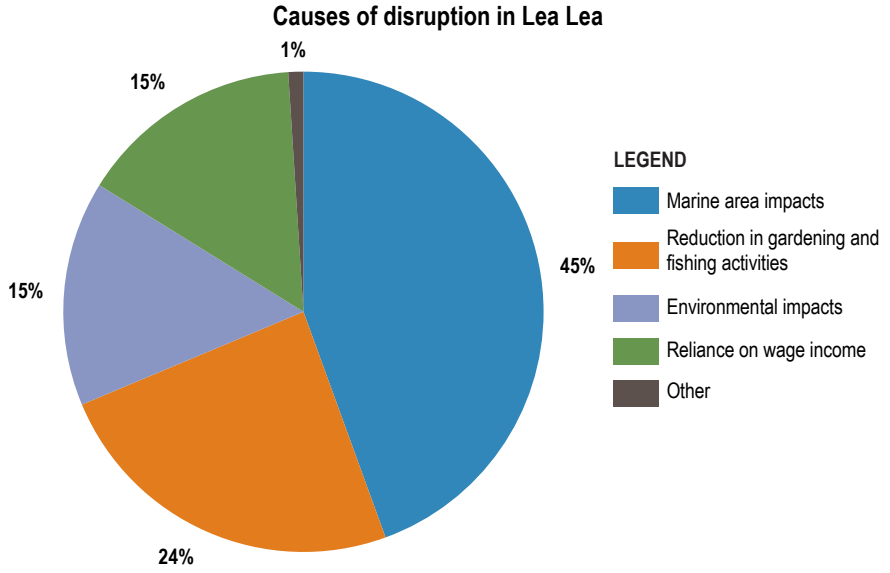
TETRA TECH COFFEY

DATE: 04.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.23_GRA DOC REFERENCE: \\ETSS772GISFS1\DATA$\GIS\300733_EMPNG_PAPUALNGDOWNSTREAM\2_GRAPHICS\04_SOCIAL_BASELINE\300733_04_GRA002.AI_4









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PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 5.24

Household experience of the PNG LNG Project - reported level of disruption to livelihoods and the identified causes (Papa and Lea Lea)

SOURCE:
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

DATE: 04.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.24_GRA DOC REFERENCE: \\ETSS772GISFS1\DATAS\GIS\300733_EMPNG_PAPUALNGDOWNSTREAM\2_GRAPHICS\04_SOCIAL_BASELINE\300733_04_GRA002.AI_4

Disruptions in the marine environment such as area restrictions, mangrove disturbance and lower fish catches were prominent responses (between approximately 40% to 50% of household responses). Reduced time availability for gardening and fishing (due to involvement in wage employment) comprised 19% to 32% of responses, while 15% to 17% of responses indicated that environmental changes on land areas (such as a reduction in the area available for gardening and hunting as a result of the areas being disturbed (e.g., by noise) or destroyed for the construction of infrastructure) were a perceived disruption to household livelihood activity.

Several respondents indicated that they experienced a shortage of planting material following their period of employment, due to not maintaining gardens during their employment. In contrast, others indicated that stealing from established gardens had become more prevalent during construction.

Perceived effects on village environmental amenity during PNG LNG Project operations

The LNG Plant is visible to both Papa and Lea Lea villages. As such, more households in these villages reported a high level of effect (approximately 60% of respondents) on environmental amenity, primarily from the flare (light, noise, and odour, approximately 45% of responses), and perceived flow-on effects to gardens, rain water in tanks and personal health (40% to 46% of responses). A minimal proportion of households indicated no change in environmental amenity.

A lower percentage of households in Porebada and Boera reported a perceived high level of perceived negative effect on environmental amenity (approximately 40%), with approximately 30% of households in Porebada indicating no change in environmental amenity. The percentage of responses indicating flare effects (20%) was around half of that recorded for Papa and Lea Lea, though responses indicating environmental harm were higher at around 55%.

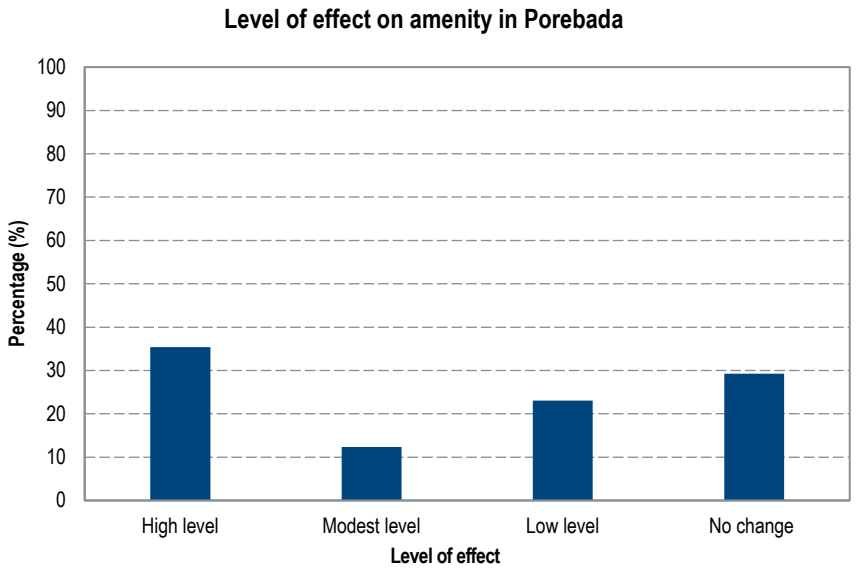
The level and type of adverse effect on village amenity from the PNG LNG Project, expressed by households in each village, are summarised in Figure 5.25 (Porebada and Boera) and Figure 5.26 (Papa and Lea Lea)

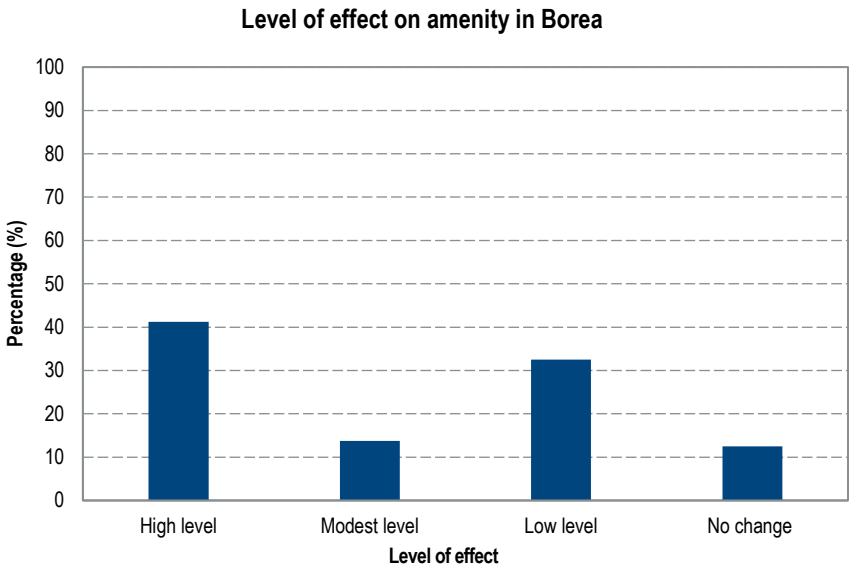
Perceived village benefits derived from PNG LNG Project construction and operation

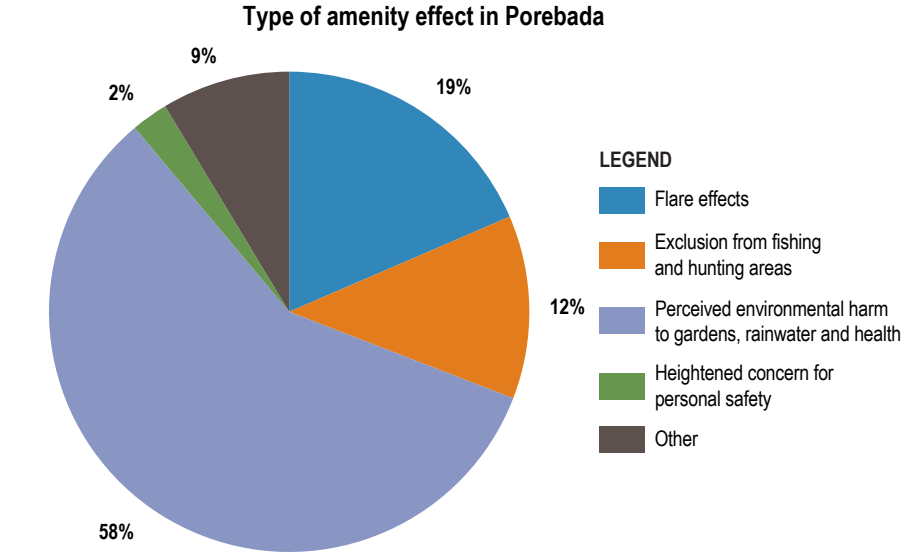
The most common response of households in Porebada, Boera (Figure 5.27) and Papa (Figure 5.28); between 35% and 50% of households) indicated a low level of perceived village benefit from PNG LNG Project construction and operations. Between 10% and 20% of households in those villages also reported no apparent benefits being received. The exception to these results was Lea Lea (see Figure 5.28) where approximately 40% of households indicated a perceived high level of benefit has been derived from the PNG LNG Project construction and operation, with only 4% of households indicating no benefit being received. This may be due to the level of employment drawn from the village or associating the implementation of a piped water supply to the village (opened in December 2017; Wavik 2017) with the presence of the LNG Plant.

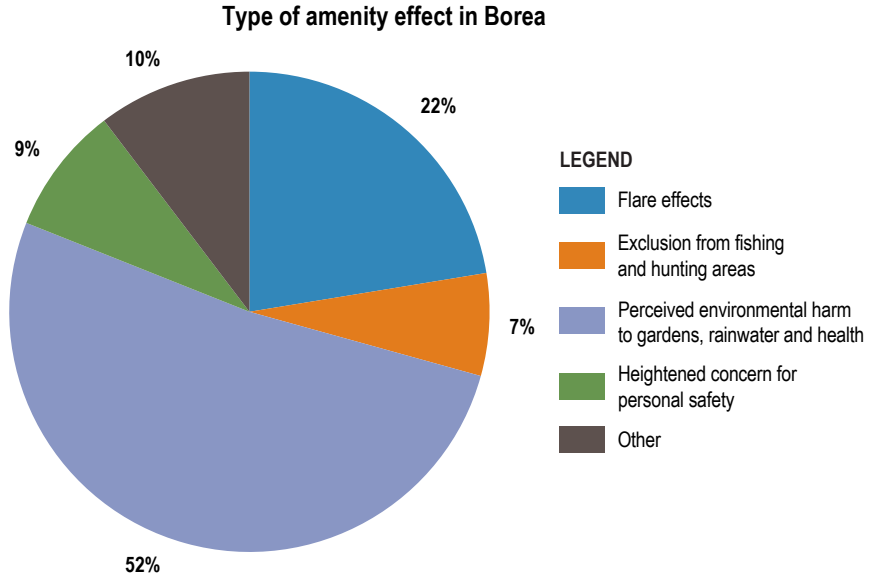
A high proportion of responses (25% to 33%) in all villages indicated that short-term construction employment was a benefit during the construction of the PNG LNG Project. While 14% to 20% of responses indicated that there were long-term village benefits, many noted that benefits were limited. However, 22% to 32% of responses noted improved village infrastructure as being a benefit derived from the presence of the LNG Plant, nominating improvements to health and school infrastructure. Many of these improvements were made through the PNG LNG Project's community development support activities. Examples of support provided in 2018 include the construction of a new health centre at Porebada, new school buildings (at Papa Community Preschool and Boera Elementary School) and the provision of computers and other equipment to schools in the study area (ExxonMobil PNG Limited 2019).

Between 18% and 27% of households indicated that they received State royalty and/or company compensation payments received as a benefit.









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PAPUA LNG PROJECT – DOWNSTREAM

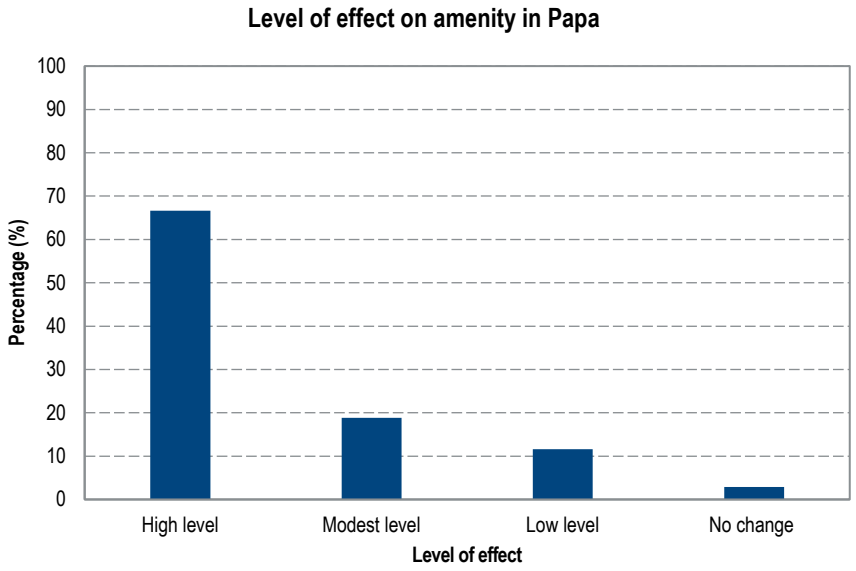
FIGURE 5.25

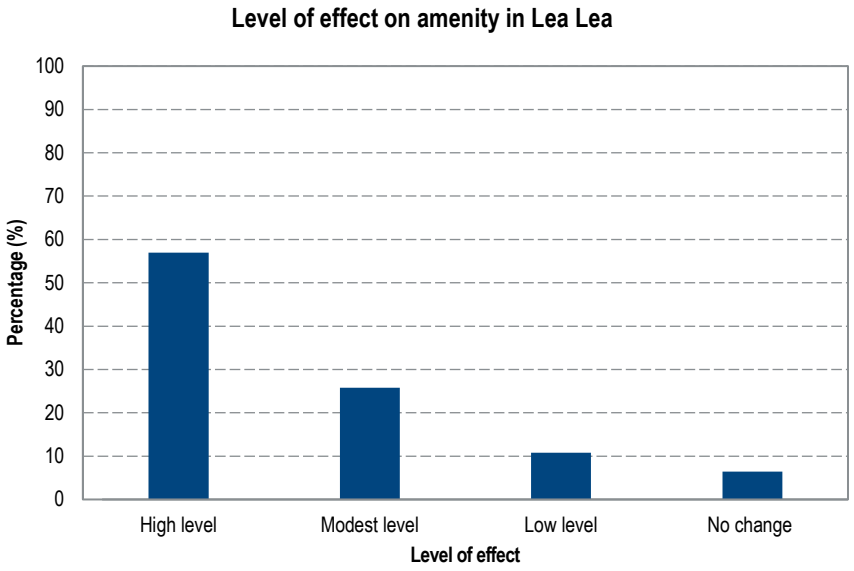
Household experience of adverse amenity from the LNG Plant reported level and type of adverse effect (Porebada and Boera)

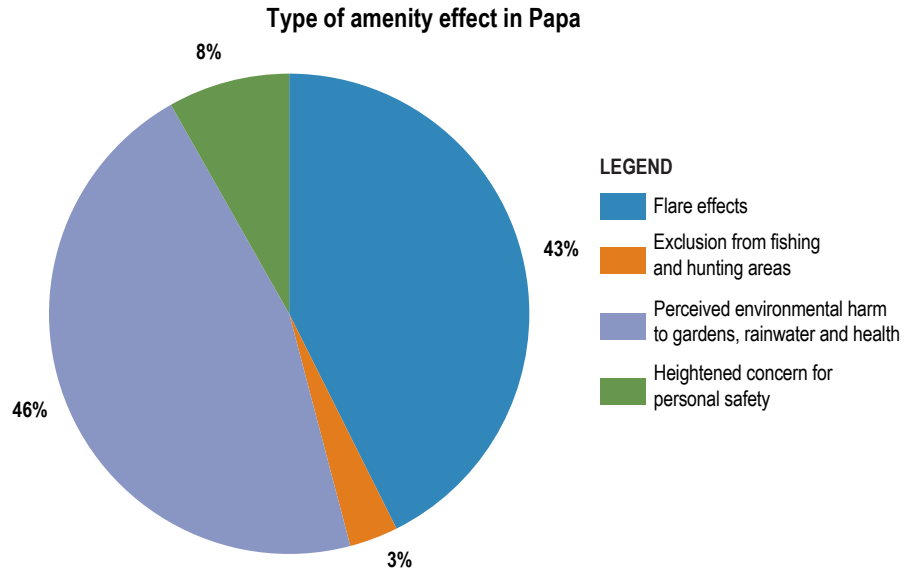
SOURCE:
Tetra Tech Coffey household survey, 2019

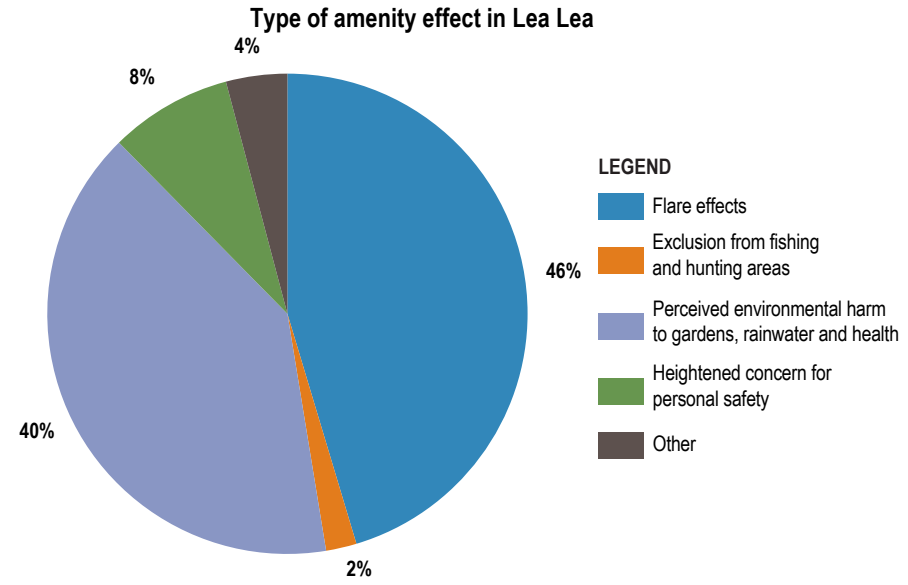
TETRA TECH COFFEY

DATE: 04.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.25_GRA DOC REFERENCE: \\ETSS772GISFS1\DATA$\GIS\300733_EMPNG_PAPUALNGDOWNSTREAM\2_GRAPHICS\04_SOCIAL_BASELINE\300733_04_GRA002.AI_4









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PAPUA LNG PROJECT – DOWNSTREAM

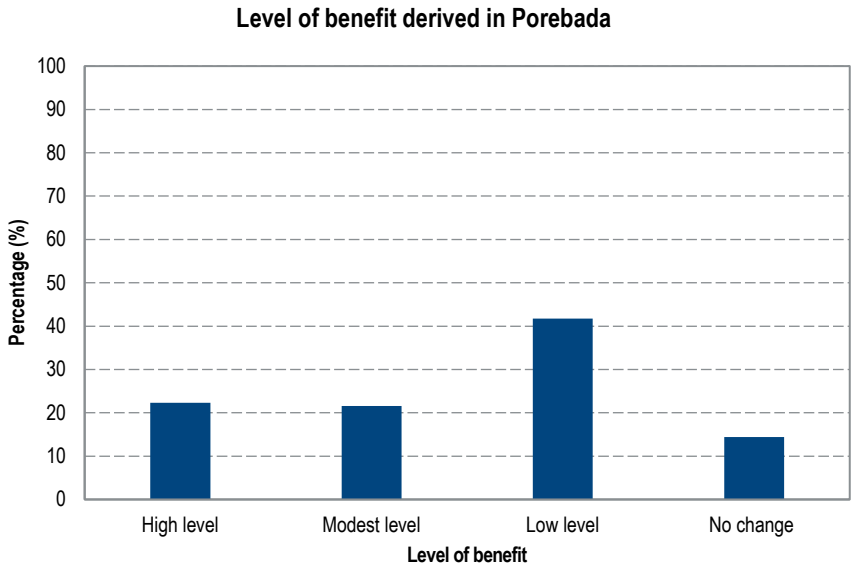
FIGURE 5.26

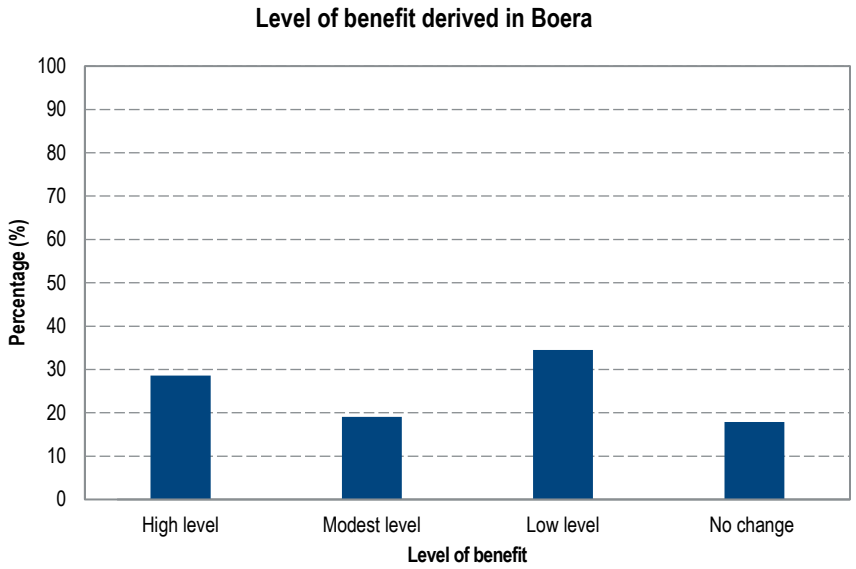
Household experience of adverse amenity from the LNG Plant reported level and type of adverse effect (Papa and Lea Lea)

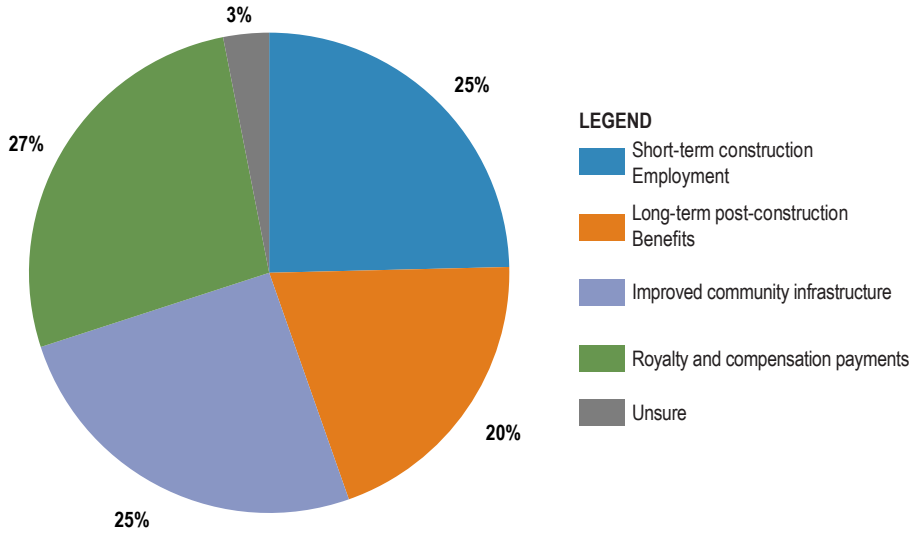
SOURCE:
Tetra Tech Coffey household survey, 2019

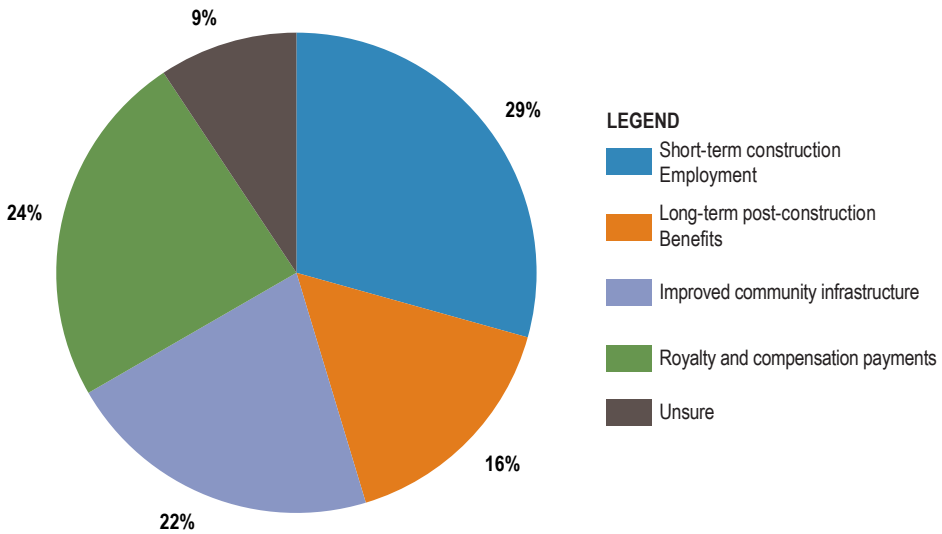
TETRA TECH COFFEY

DATE: 04.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.23_GRA DOC REFERENCE: \\ETSS772GISFS1\DATA$\GIS\300733_EMPNG_PAPUALNGDOWNSTREAM\2_GRAPHICS\04_SOCIAL_BASELINE\300733_04_GRA002.AI_4









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PAPUA LNG PROJECT – DOWNSTREAM

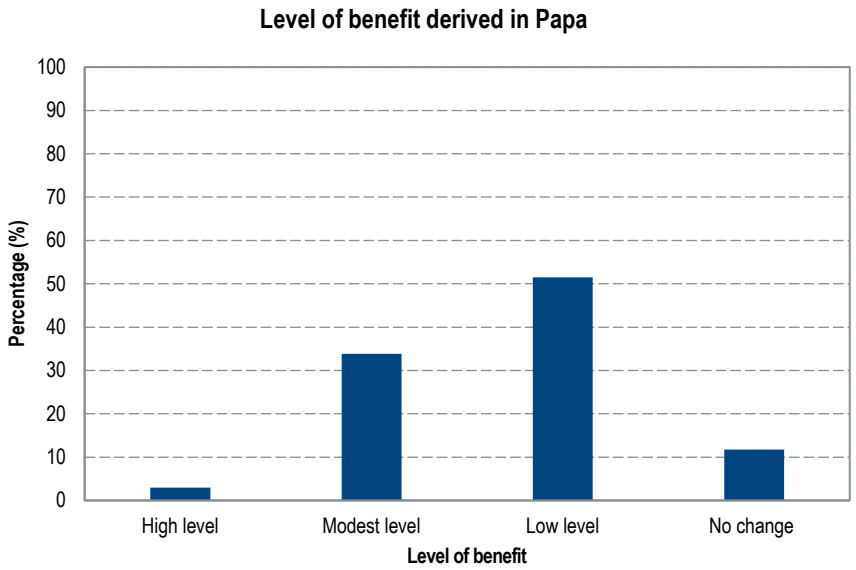
FIGURE 5.27

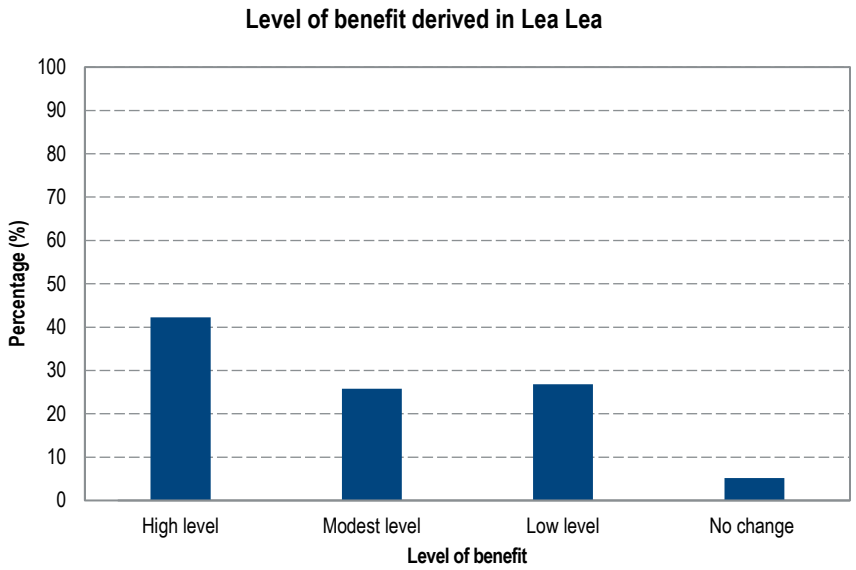
Level and type of benefits derived from PNG LNG Project construction (Porebada and Boera)

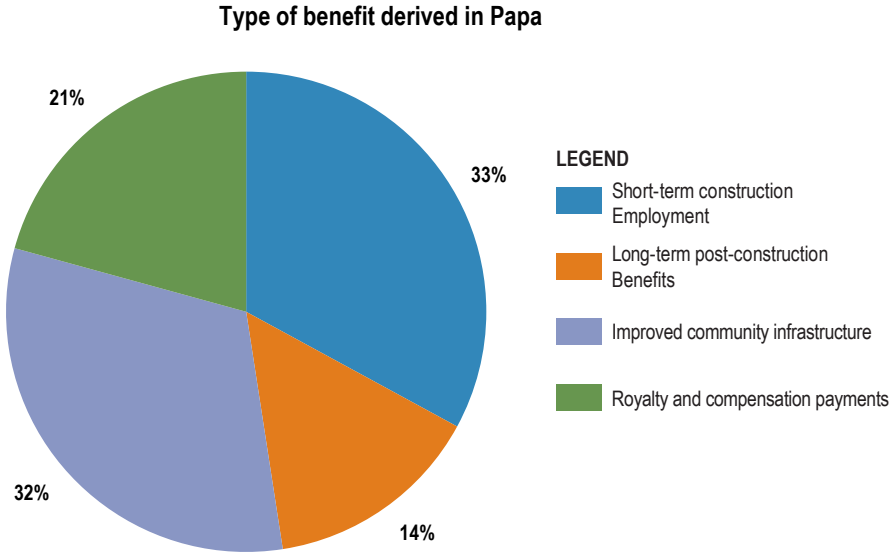
SOURCE:
Tetra Tech Coffey household survey, 2019

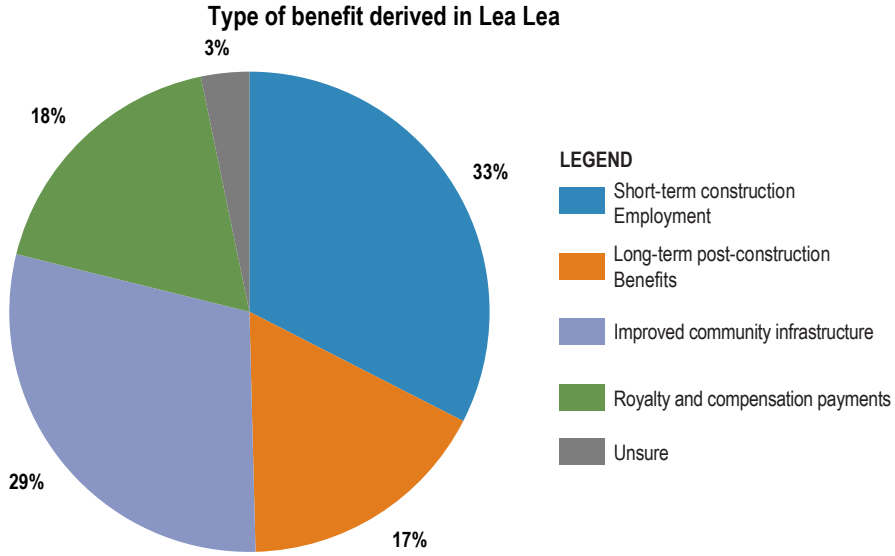
TETRA TECH COFFEY

DATE: 04.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.27_GRA DOC REFERENCE: \\ETSS772GISFS1\DATA$\GIS\300733_EMPNG_PAPUALNGDOWNSTREAM\2_GRAPHICS\04_SOCIAL_BASELINE\300733_04_GRA002.AI_4









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PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 5.28

Level and type of benefits derived from LNG Plant construction (Papa and Lea Lea)

SOURCE:
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

DATE: 04.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.28_GRA DOC REFERENCE: \\ETSS772GISFS1\DATA$\GIS\300733_EMPNG_PAPUALNGDOWNSTREAM\2_GRAPHICS\04_SOCIAL_BASELINE\300733_04_GRA002.AI_4

Possible adverse effects from the Project

Householders were asked to nominate what they expected to be potential Project adverse effects after examining a map outlining the proposed expanded footprint of the LNG Plant[13]. In all villages, apart from Porebada, responses indicated a concern with continued and possible expanded marine area restrictions on fishing (22% to 26% of respondents). There was also concern with the potential for social issues (marital tensions, alcohol and drug abuse) to return to levels experienced during the construction of the PNG LNG Project. Responses indicating concerns with the potential effects of flaring were 12% or under in all villages, except for Lea Lea where the response level was 24%. All villages indicated concerns with royalty and/or compensation payments, particularly in Boera where there appear to be strongly held views on village leadership and the approach to village development and use of payments.

Figure 5.29 summarises the potential impacts from the Project expansion nominated by household responses.

Possible benefits of the Project

Household respondents were asked to nominate what they saw as potential benefits of the Project based on a high-level understanding of the project scope[14]. All villages overwhelmingly see short-term construction employment as the major benefit, particularly for Porebada, where this response comprised 60% of total responses (compared to approximately 40% for Boera, Papa and Lea Lea). This perception of benefit is also associated with a level of dissatisfaction that the benefit was only short-term.

The expectation of future State benefits was also high for all villages, apart from Porebada, which may indicate a lower level of membership of landowning clans in that village.

There was a significant level of responses indicating either uncertainty or the expectation of limited benefits from the Project (Porebada 21%; Papa 22%; Lea Lea 19%; and Boera 30%). The higher level in Boera may indicate a higher level of division in the village.

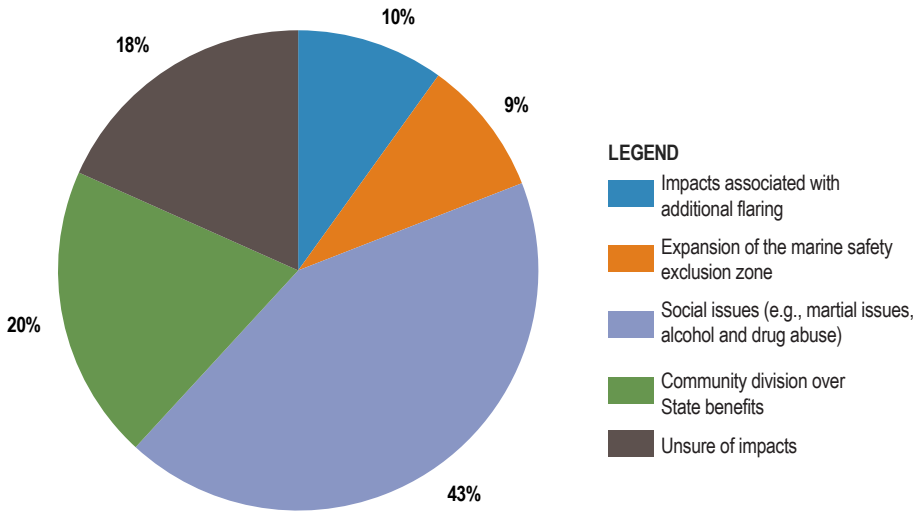
Figure 5.30 presents the household responses to potential benefits from the Project.

Examples of responses to the qualitative questions of the household survey

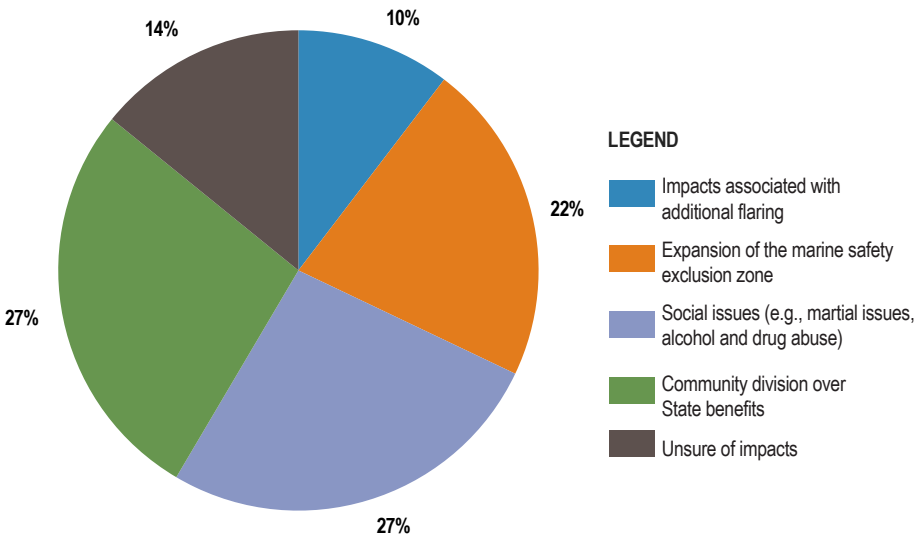
To understand the nature of the responses to the qualitative questions of the household survey, Table 5.28 presents three randomly selected responses to all six questions of the household survey for each village.

[13] At the time of the social surveys, the proposed footprint of the Project did not include a laydown area outside the existing LNG Plant fence.
[14] At the time of the social surveys, the proposed footprint of the Project did not include a laydown area outside the existing LNG Plant fence.

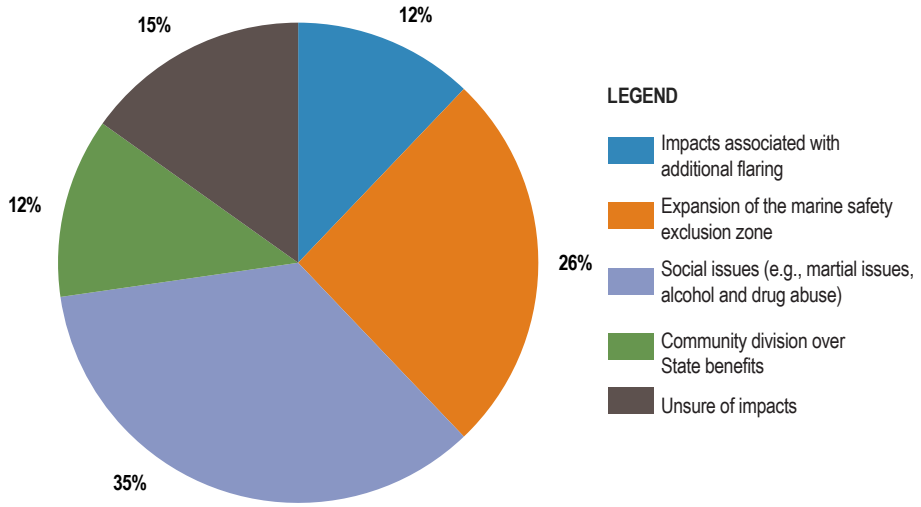
Potential impacts nominated in Porebada



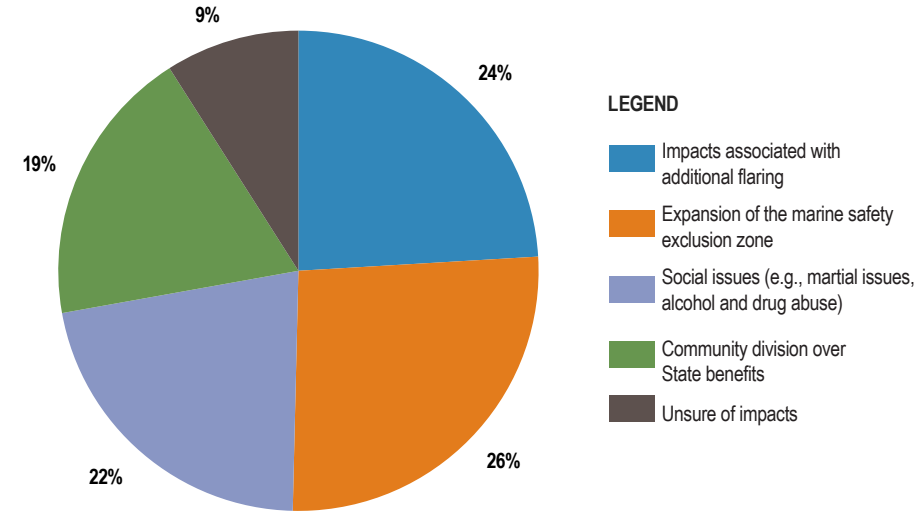
Potential impacts nominated in Boera



Potential impacts nominated in Papa



Potential impacts nominated in Lea Lea



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PAPUA LNG PROJECT – DOWNSTREAM

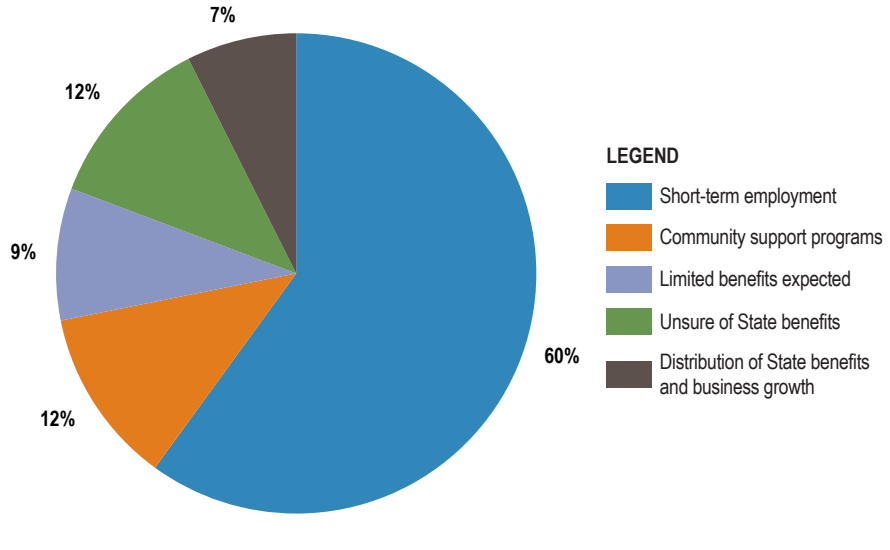
FIGURE 5.29

Potential impacts of the Project identified by households

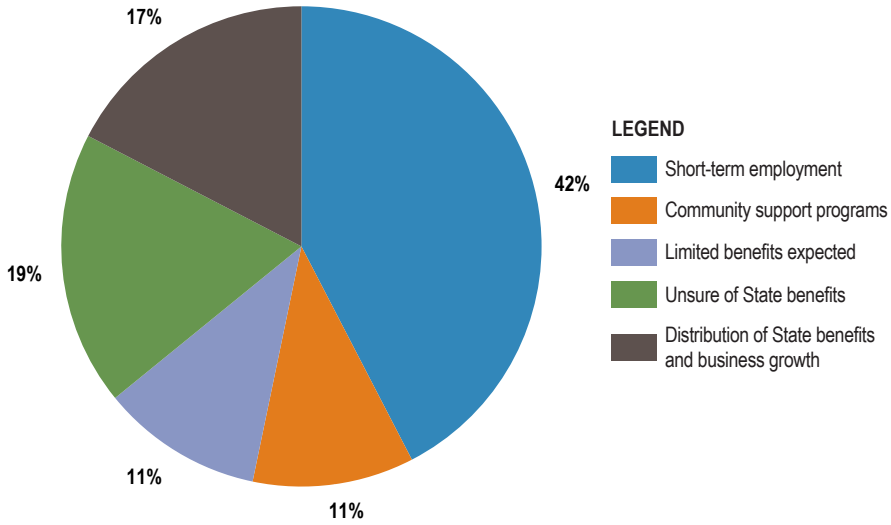
SOURCE:
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

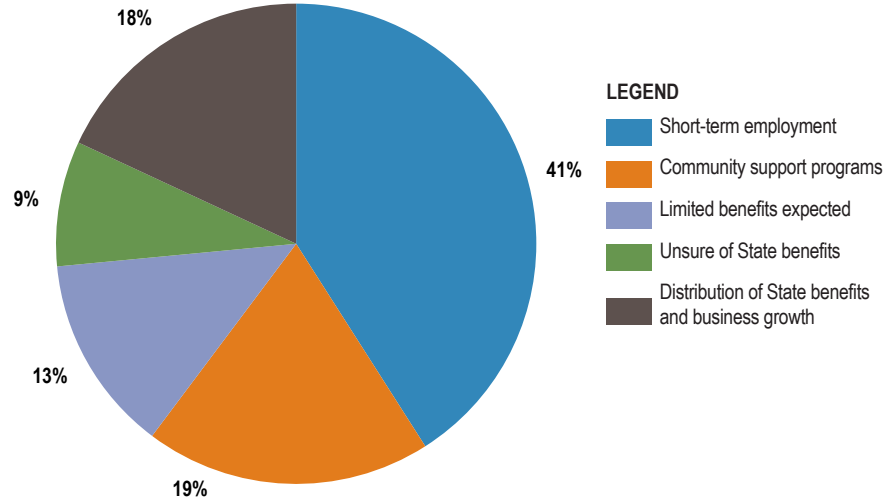
Potential benefits nominated in Porebada



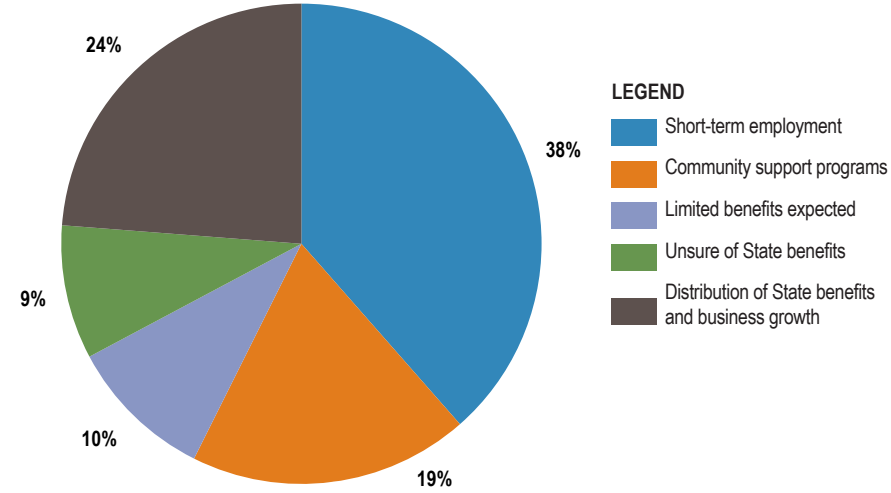
Potential benefits nominated in Boera



Potential benefits nominated in Papa



Potential benefits nominated in Lea Lea



EXXONMOBIL PNG ANTELOPE LIMITED

PAPUA LNG PROJECT – DOWNSTREAM

FIGURE 5.30

Potential benefits of the Project identified by households

SOURCE:
Tetra Tech Coffey household survey, 2019

TETRA TECH COFFEY

DATE: 04.07.23 PROJECT: 754-MELEN300733 FILE: 300733_04_F05.30_GRA DOC REFERENCE: \\ETSS772GISFS1\DATA$\GIS\300733_EMPNG_PAPUALNGDOWNSTREAM\2_GRAPHICS\04_SOCIAL_BASELINE\300733_04_GRA002.AI_4

Table 5.28 Randomly selected responses to qualitative household survey questions

Porebada	Boera	Papa	Lea Lea
Question: Nature and reasons for trouble between residents in the village during PNG LNG Project construction			
• Hatred because of favouritism in job employments and marriage problems, etc. • Some arguments over employment only. • Even today and still employed but very hard, depend on paying loans. Look after extended family and cannot depend on regular income. Prices have gone up. Short term employment, demobilisation resulted in outstanding loans not paid. Such things were not considered. Practices were unsustainable. Nepotism is high, statistics should be provided, employment during production phase not balanced. Community affairs staff of Exxon misinterpret concerns raised by locals. There has also been a lot of adultery and an increase in unplanned pregnancies especially during construction phase. Communication especially during awareness should be translated into Motu.	• They fought over land in the village where Exxon Mobil built the LNG Plant. There were two main groups. • Disagreements on issues concerning Laba Directors in unwise sharing of benefits, causing divisions among villagers. • Yes, it made the community confused.	• A lot of social issues especially in terms of adultery, polygamy and break down in marriages. Increase in consumption of alcohol, home brew, drugs. Destroyed social stability and created division. • Drinking and swearing causing disturbance in the neighbourhood. • People did miss out on employment opportunities but did not create any trouble.	• Arguments relating LNG employment issues. • Nepotism, employment opportunities not distributed evenly in Laba, applications sent several times to no effect. Vulnerable groups especially poor families should be considered fairly in terms of casual labour job opportunities to support some families. Assets distribution program - not evenly distributed and were resold. Containers of assets misused. Laba directors paid PGK10,000 every year for festive celebrations however no one knows what happens to those monies. • No response provided.
Question: Nature of disruption to household livelihood activity from PNG LNG Project			
• The waste of gas changes the nature oxygen that we breathe. • Affected hunting, fishing, gardening activities. • No response provided.	• All the fish went further away from our traditional fishing grounds where jetty is built. • Before our sea waters were very calm, unlike now because of gas shipments moving in and out its disturbing our fishing areas, chasing the fish out. Plenty noise in the sea as well.	• Tips of all cassava plants die and there is less harvest compared to before. These changes occurred during the PNG LNG construction phase. • Too much noise/movement caused disturbance in and	• I have a full-time job, so I don't have time to garden or go fishing. So now my extended family depend on my father and my wages. • Only fishing restrictions. • No response provided.

Porebada	Boera	Papa	Lea Lea
	• We need better business partnership opportunities that take care of us and other vulnerable minority groups like widows. A lot of our young, qualified men died during this project life leaving family members, so we have a lot of widows.	around the mangroves therefore when fishing we don't catch much like we do before the LNG came. • In the first few years it was ok but after that our garden produce yields started declining.	
Question: Nature of adverse effects on village amenity from PNG LNG Project			
• Too bright. • More effect on Papa, less rain. • No response provided.	• Noise at the plant and flare stack gives off odour. It's noisy when the winds carry the noise our way. • Caused plenty noise in the community, consuming alcohol and many of the young women were left with babies with no fathers. • Noise pollution sea fishing. For fishing to sell, men only go out to catch fish. There is not enough fish as they used to catch prior to the PNG LNG project. Noise pollution under the sea and on top of the sea contributes to this. Particularly for the noise of the Exxon Mobil contractor tug boat that provides security of the beach front shoreline near the jetty. It goes to and from 3 times a day. Exxon Mobil should replace them with dingy and have people stationed at locations on the shoreline. Less noise so we can catch some fish when we go out. There's too much noise.	• Can smell gas from. Fish migrating away due to too much light from plant site. Noise chases fish away, so fishermen have to go fishing further away. • Flare emission is possibly polluting the air and water. • No response provided.	• Noise pollution, light and bad odour. Employed young people were causing social problems like alcohol abuse, marital problems. • The flare stack at the Plant gives off a lot of smoke that blows to Lea Lea. The smell is bad. The smoke can last and hover over the village for a day. So, when it rains, we think it the smoke particles hanging over us falls as rain and contaminates our drinking water sources and we're afraid to drink it. • Only light brightness seen but not much.

Porebada	Boera	Papa	Lea Lea
Question: Nature of benefits to village development and livelihoods from PNG LNG Project			
• Little payments on royalties and equities. • Royalties and equities, job employments. • Very low quality of life, struggle to survive looks after extended family. Increase in social issues especially home brew consumption among youths and leadership tussles. School buildings funded by member not Exxon.	• I don't know how to tell the change. • We did receive some shares from our land compensation, equity and dividends. • Not everyone knows the benefits including myself. A lot of the Kokopo UBSA agreement was not honoured.	• Royalties paid however very inconsistent. Short term employment benefits only. Electricity subsidy promised but nothing. • Not much of the benefits. • Yes, in terms of school infrastructure, pipe water installation. These are per request from women fellowship group. Christmas gifts to the sick patients at village aid post. SDA pre-school infrastructure.	• Many young people were employed, and some unskilled people were trained. • I have a full-time job. And the people I work with a good. • Very little.
Question: Potential adverse effects needing to be addressed during construction and operations of the Project			
• Wantok system will appear in job employments. • Wantokism must not happen during job employments, equities and royalties must be bigger now. • There should not be a repetition of past issues from PNG LNG project.	• Yes, the race to get employment will start and fights between those working and unemployed will arise again like the 2014 construction time. • Our pay rates were not enough, we would like to be looked at as land owners. • Suspected cases of HIV and AIDS wiping out the workforce in the impact villages. There are many widows in Boera. The strong young men who worked with Laba and others including Exxon Mobil including Boera men have died over the LNG project life post construction time. Currently Tahuni said there were 3 sick men in the	• Repetition of same issues, hope the four impact communities learn from past mistakes. • No idea. • The jetty area is on customary land per the SABL. We will lose our main fishing grounds if the jetty is extended per the LNG Plant proposed expansion plan.	• Same as the first construction phase, more pollution, more light and more odour. • Very low income from PNGLNG compensation, so far only equity paid, no royalties. So far, their household received only PGK150. • No response provided.

Porebada	Boera	Papa	Lea Lea
	village who were seriously ill. They all worked for Laba.		
Question: Potential benefits that may result from the Project			
• Some employment opportunities. • People staying in the village will be employed both man and women. • Job employment, repetition should be avoided, should improve in upcoming project.	• There will be a lot more work for us but not enough for everyone. • More employments for our landowners and more benefit sharing. • Two things: one, have HIV and AIDS testing services available for those who want to access services. Too many young men in Boera have lost the lives over the years. Second, have deals detailed and plans of action for incentives that cover vulnerable marginalised groups such as retired seniors, food security, care giving and those persons with special needs (disabled). This includes women, youth young girls and boys. There would be more job opportunities if the PNG JDD happens.	• No idea. • Not too sure, maybe the same as the current project. • No response provided.	• The Expansion will again provide more employment opportunities for the locals and hopefully there will be equal and frequent distribution of benefits. • Construction time there will be more money so more jobs, more on the job learning opportunities. Production work is repetitive, but construction work will be exciting. More jobs for all and many currently employed with PNG LNG am sure will apply for construction work. More working hours, good rates good pay. • No response provided.

Source: Tetra Tech Coffey household survey 2019.

5.7.2 Information from other reports and media

Information from other published reports and media sources was sought to support the understanding of baseline conditions derived from the household surveys and focus group discussions.

Oxfam (2011) undertook what it termed a 'LNG Impact Listening Project' in 2011, with three days of field work in each LNG Plant site village and other stakeholder consultation between April to June 2011, with a report published in November 2011. While attempts were made to achieve a balance between negative impacts and positive benefits, the report makes it clear that the overwhelming response of those being listened to was to primarily express negative sentiment. This is not surprising, especially when the distribution of benefits (such as employment) was perceived as uneven (see Figure 5.21 and Figure 5.22), and there were persons not receiving benefits but experiencing negative consequences (such as anti-social behaviour when wages were being spent on excessive alcohol consumption). Key points raised in the report included:

- Employment and training were seen as the main benefit (notwithstanding concerns expressed with pay rates, the short-term nature of the employment, and dissatisfaction with recruitment practices).
- The PNG LNG Project stimulated division in communities and dysfunction due to alcohol abuse and the disruption to the perceived 'rhythm' of village life.
- Disappointment was felt by villagers in the LNG Plant site communities as expectations for employment and other benefits were raised and subsequently not met.
- Land ownership issues have not been resolved, and there is lingering animosity between villagers.
- At the time, there were significant challenges with community engagement and information dissemination by the developer.

A review of local media (Post-Courier and National newspapers) and academic literature highlights the following key social impacts:

- Disputes surrounding landholder identification and the associated distribution of benefits to clan members. Individual landholders were not identified prior to the PNG LNG's 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). The delay in the distribution of benefits resulted in a series of protests, which at times became violent, particularly in the highlands (Main and Fletcher 2018). Specific to the LNG Plant study area, protestors blocked access to the LNG Plant in February 2017 (Kinkin 2020).
- Support for community initiatives such as sports associations and domestic violence support services. Similarly, the PNG LNG Project was understood to have 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 in terms of the number of jobs available. However, much of the skilled employment has been argued to have either been taken up by Papua New Guineans who already had the required skill-sets who were often employed within the industry or in adjacent sectors, or through the importation of foreign workers (Voigt-Graf and Odhuno 2019).
- Skills shortages were noted in the mining and manufacturing sectors, along with clear workforce draw from the public sector (Voigt-Graf and Odhuno 2019).

5.8 SOCIAL VALUES

The focus group discussions in each village sought to ascertain the study area residents' views on social values. A summary of these discussions as they relate to the social values defined in Section 3.5 is provided in Table 5.29. These views, along with information from the household surveys and literature, have guided the summary status of the social values provided in the following sections.

Table 5.29 Focus group discussion notes – social values

Views of male residents	Views of female residents
Social value 1 - The capacity to support livelihoods based on harvest of natural resources	
• Indicated overuse of the (marine and fresh water) fisheries, with more common and indiscriminate use of nets and the harvesting of juveniles. • Other issues mentioned that affected resource exploitation included land disputes and drought, and the high cost of fuel needed to use boats to access more distant (and less harvested) reefs. • While still some reliance on resource harvest, there is little interest in agriculture due to poor soil fertility and lack of water, and a general declining interest in resource harvest due to other sources of livelihoods, as well as laziness.	• Women generally were more positive/upbeat regarding maintaining resource exploitation along traditional lines, mentioning the importance of shellfish, sea cucumbers and terrestrial harvest of pigs and deer. • Specific mention was made of using the proceeds of sale of marine harvest to fund education. • Concerns related to loss of mangroves, environmental damage from dynamite fishing, and the inconvenience to fishing and hunting due to the LNG Plant.
Social value 2 - Availability of opportunities for participation in the cash economy	
• Felt that there were good natural resources (such as tilapia and cassava), but that there was a limited market for the products gained through harvesting. • Suggestions that people from the highlands now out-compete local people with small business and the informal economy. • Non-agricultural opportunities were available, but access to capital was difficult, business regulations were complex to understand and implement and people lacked appropriate skills. • Potentially better income and higher security in wage labour employment.	• Women asserted that there were numerous opportunities for income generation (indicating the importance of the informal economy) but were concerned with constraints in the marine and terrestrial areas due to the LNG Plant, and a lack of finance for inputs.
Social value 3 - The ability to sustain cultural identity and traditions, including rights and obligations pertaining to resource use and management	
• Asserted that traditions were declining (such as canoe making), as was cultural knowledge including land boundaries. This was linked to a lack of clarity on customary ownership of the LNG Plant site.	• Women asserted that cultural changes (including transition to a more western outlook) were affecting women with weakening of cultural norms (such as sharing), and lack of clarity around land rights. • Women linked cultural identity strongly with access to resources (including land for agriculture), asserting that children in wage employment neglect skills such as

Views of male residents	Views of female residents
• Other drivers undermining cultural identity include the on-going move to modernity (characterised by money, and conflict between individualism and group membership), population growth and resulting land pressure, and marriage to partners of different cultures.	gardening and fishing and were developing a dependence on store-bought foods. This is compounded when there is exclusion from resource areas, either by industry or land conflict, as well as resource depletion (such as mangroves).
Social value 4 – An environment supportive of personal and family health, safety and security	
• Noted in-migration causing village conflict, with daughters not willing to leave on marriage (leading to pressure on housing), and pressure on all services and infrastructure (such as waste disposal), meaning local villagers miss out on accessing services, housing and infrastructure. • Village was safer prior to the PNG LNG Project, with restrictions now on movement at night due to strangers, significant alcohol sales and abuse, and a weekend influx of outsiders from Port Moresby. • The population pressure is also eroding land rights.	• Women noted safety issues due to the presence of strangers. • Also indicated that health was better, though there was a need for more support with provision of drugs and other supplies. • Lea Lea women were positive about the role of women in sustaining village life, and noted better incomes, improved living standards, better awareness of health, and some infrastructure upgrades (such as for schools). • There was a recognised need for better infrastructure (such as a seawall), and a view that fishing areas had been impaired by the PNG LNG Project. • 'Development' was seen to be bringing negative aspects such as an increase in adultery, environmental impact and changed (poor) personal behaviours.
Social value 5 – The availability of services and institutions supportive of community well-being	
There was general agreement among women and men, and high expectations, on the need for improved services and infrastructure. **Porebada** • Water supply and other infrastructure. **Boera** • Water supply and electricity infrastructure, services and medical supplies. **Papa** • School upgrade to secondary, power, water, sewerage and sanitation. • Health services. **Lea Lea** • Health services (particularly for tuberculosis).	

Source: Tetra Tech Coffey focus group discussions 2019.

5.8.1 Livelihood

Status of social value 1

The capacity to support livelihoods based on harvest of natural resources.

Most of the study area residents rely, although not exclusively, on the harvest of natural resources for their livelihood. Marine resources are widely relied upon; however, they 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 is 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.

Status of social value 2

Availability of opportunities for participation in the cash economy.

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 also provides opportunities for the establishment of small businesses offering goods and services. The sale of natural resources (e.g., fish and garden produce) also provides opportunities to generate cash income.

5.8.2 Culture

Status of social value 3

Ability to sustain community identity and traditions, including rights and obligations pertaining to resource use and management.

There is an ongoing cultural transition occurring in the study area as the local communities become increasingly urbanised and transition to a modern outlook. This cultural transition is driven by a number of factors including, population growth, marriages across groups, land disputes and an increase in wage employment. Elements of traditional activities, such as fishing and gardening, still occur in the study area; however, increasing reliance on wage income and store-bought foods is likely to facilitate further diminution in the importance of these traditional means of livelihood support.

5.8.3 Personal and community well-being

Status of social value 4

An environment supportive of personal and family health, safety and security.

The 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, pressure was added to the social environment due to population increase, rising personal conflict and alcohol and drug abuse. However, improvement of infrastructure and services, such as health and education facilities, are contributing to the development of favourable living standards.

Status of social value 5

The availability of services and institutions supportive of community well-being.

The LNG Plant study area communities have moderate access to facilities and services which support community well-being. 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.

6. REFERENCES

A

ADB 2012. *The state of Pacific towns and cities: urbanisation in ADB's Pacific developing member countries*. A WWW publication accessed on 22 July 2019 at https://www.adb.org/publications/state-pacific-towns-and-cities-urbanization-adbs-pacific-developing-member-countries. Asian Development Bank. Mandaluyong City, Philippines.

ADB 2018. *Voice, choice and wash: a household survey of water, sanitation and hygiene in a Port Moresby settlement*. A WWW publication accessed on 22 July 2019 at https://www.adb.org/publications/voice-choice-wash-png-water-survey. Asian Development Bank. Mandaluyong City, Philippines.

ADB 2019. *Basic Statistics 2019*. A WWW publication accessed on 8 July 2019 at https://www.adb.org/publications/basic-statistics-2019. Asian Development Bank. Mandaluyong City, Philippines.

Amnesty International 2009. *Women killed for witchcraft in PNG*. A WWW publication accessed on 1 July 2019 at http://www.amnesty.org.au/svaw/comments/20139/.

Anker Research Network 2020. *Anker Living Income Reference Guide - Rural Papua New Guinea 2020*. A WWW publication accessed on 10 November 2022 at https://globallivingwage.org/wp-content/uploads/2021/01/Rural-PNG-LI-Reference-Value-1.pdf. Global Living Wage Coalition, 2020.

B

Bourke, M 2020. *6. COVID-19 and Food Systems in Papua New Guinea*. COVID-19 and Food Systems in the Indo-Pacific. 2020. A WWW publication accessed on 10 November 2022 at https://www.aciar.gov.au/publication/covid-19-and-food-systems-indo-pacific/6-covid-19-and-food-systems-papua-new-guinea.

Bourke, R., & Allen, B 2021. Estimating the population of Papua New Guinea in 2020.

C

CDC 2019. CDC in Papua New Guinea. *Centres for Disease Control and Prevention*. A WWW publication accessed on 1 July 2019 at https://www.cdc.gov/globalhealth/countries/papua-new-guinea/pdf/Papau_New_Guinea_Factsheet.pdf.

Tetra Tech Coffey 2020. *Niugini LNG Operating Company Limited PNG Joint Downstream Development Project Caution Bay fisheries resource use study*. A report prepared for Niugini LNG Operating Company Limited.

Coffey Environments 2015. *P'nyang Project Environmental Impact Statement*. A report prepared for Esso PNG P'nyang Limited.

Coffey Natural Systems 2009. *PNG LNG Project Environmental Impact Statement*. Report prepared for Esso Highlands Ltd. Melbourne, Victoria.

Cox, John, Grant W. Walton, Joshua Goa, and Dunstan Lawihin. *Uneven Development and Its Effects: Livelihoods and Urban and Rural Spaces in Papua New Guinea*. Government, Economy and Society, 2022, 193.

Craig, D and Porter, D 2018. *Safety and security at the edges of the state: Local regulation in Papua New Guinea's urban settlement*. World Bank Justice for the Poor Research Report.

D

DFAT 2019. *Papua New Guinea*. Department of Foreign Affairs and Trade. A WWW publication accessed on 28 June 2019 at https://dfat.gov.au/trade/resources/Documents/png.pdf.

Dinnen, S 2020. Insecurity, policing and marketisation: Papua New Guinea's changing security landscape. In *Mapping Security in the Pacific* (pp. 186–198). Routledge.

DNPM 2010. *Papua New Guinea Development Strategic Plan 2010-2030*. Department of National Planning and Monitoring. Port Moresby, Papua New Guinea.

DNPM 2018. *Papua New Guinea Medium Term Development Plan III 2018-2022*. A WWW publication accessed on 18 February 2020 at https://png-data.sprep.org/system/files/MTDP-III-Book-1_Final-Proof-Web-compressed.pdf.

DoE 2007. *National Capital District Division of Education: Education plan 2006 - 2015*. Department of Education. Port Moresby, Papua New Guinea.

DOE 2016. *National Education Plan: 2015-2019*. Department of Education. Port Moresby, Papua New Guinea.

E

Economist Intelligence Unit 2017. *The Global Liveability Report 2017*. A WWW publication accessed on 22 July 2019 at http://pages.eiu.com/rs/753-RIQ-438/images/Liveability_Free_Summary_2017.pdf.

EMTV Online 2020. *Porebada Landowners Demand Review of PNG LNG Project Benefits Agreement*. https://www.youtube.com/watch?v=aJ4fcX9Nu-Y.

Esso Highlands Limited 2013. Papua New Guinea LNG Project Stakeholder Engagement Management Plan – Production [PGGP-EH-OPZZZ-000004-010]. A WWW publication accessed on 3 November 2022 at https://pnglng.com/media/PNG-LNG-Media/Files/Environment/Construction%20ESMP/Stakeholder_Engagement_Management_Plan_FINAL_Rev_0_PUBLIC.pdf.

ExxonMobil PNG Limited 2014. *LNG Plant Community Profile*.

ExxonMobil PNG Limited 2019. *PNG LNG Environmental and Social Report – Annual Report 2018*.

Ezebilio, E 2021. *Government interventions are needed for house rent to be affordable.* The National Research Institute.

Ezebilo, E and Hamago L 2017. *Prospects and challenges in private sector provision of housing in Papua New Guinea: Lessons from Edai Town development*. The National Research Institute. No. 157.

Ezebilo, E 2017. *Evaluation of House Rent Prices and their Affordability in Port Moresby, Papua New Guinea*. Buildings, Vol. 7.

Ezebilo, E 2017. *Potential impacts on development projects on house sales and rent prices must be considered before implementation in Papua New Guinea*. The National Research Institute. Vol. 10; No. 9.

F

FAO 2011. *AQUASTAT Country Profile - Papua New Guinea*. Food and Agriculture Organisation of the United Nations. Rome, Italy.

FAO 2019. *Country Gender Assessment of Agriculture and the Rural Sector in Papua New Guinea*. A WWW publication accessed on 10 November 2022 at http://www.fao.org/publications/card/en/c/CA6308EN/. Port Moresby, Papua New Guinea: FAO.

Filer, Colin. 2019. *Methods in the Madness: The 'Landowner Problem'in the PNG LNG Project.* Development Policy Centre Discussion Paper, no. 76.

Financial Review 2019. *PNG PM James Marape puts foreign companies on notice*. A WWW publication accessed on 2 August 2019 at https://www.afr.com/policy/foreign-affairs/png-pm-james-marape-puts-foreign-compavows-to-stamp-out-corruption-20190725-p52amn.

G

Gibson 2013. *Two Decades of Poverty in PNG*. A WWW publication accessed on 10 November 2022 at https://devpolicy.crawford.anu.edu.au/department-news/1579/two-decades-poverty-png.

Global Cities Research Institute 2019. *Port Moresby - Papua New Guinea*. A WWW publication accessed on 22 July 2019 at http://global-cities.info/placemarks/port-moresby-papua-new-guinea.

Goddard, M 2011. Historicizing Edai Siabo: A Contemporary Argument about the Pre-colonial Past among the Motu-Koita of Papua New Guinea. Oceania 81(3).

Goldman, L 2008. *Papua New Guinea Liquefied Natural Gas Project Social Impact Assessment 2008*. Report prepared for Esso Highlands Ltd.

Groves, M 2011. *The Motu of Papua-Tradition in a time of change*. Webzines of Vancouver.

H

Hair, C, Kinch, J, Galiurea, T, Kanawi, P, Mwapweya, M and Noiney, J 2018. Re-opening of the sea cucumber fishery in Papua New Guinea: A case study from the Tigak Islands in the New Ireland Province. SPC Beche-de-mer Information Bulletin, No. 38.

Honga, T. 2020. *Benefits of the Tuition Fee Free Policy as Percieved by Port Moresby Residents*. https://pngnri.org/images/Publications/Benefits_of_the_Tuition_Fee_Free_policy_as_perceived_by_Port_Moresby_residents_.pdf. The National Research Institute Papua New Guinea.

HRW 2019. Papua New Guinea. *Human Rights Watch*. A WWW publication accessed on 18 July 2019 at https://www.hrw.org/world-report/2019/country-chapters/papua-new-guinea.

Hukula, F 2017. *Urban development in the Pacific. Development Studies Network*. A WWW publication accessed on 23 July 2019 at https://crawford.anu.edu.au/rmap/devnet/devnet/db-78.pdf.

Hausples 2022. Papua New Guinea Residential Real Estate Survey 2022.

I

International Financial Corporation 2012. *IFC Performance Standards on Environmental and Social Sustainability*. World Bank Group.

International Financial Corporation 2012a. *Performance Standard 1 Assessment and Management of Environmental and Social Risks and Impacts*. World Bank Group.

International Financial Corporation 2012b. *Performance Standard 7 Indigenous Peoples*. World Bank Group.

J

James, P., Nadarajah, Y., Haive, K., and Stead, V 2012. *Sustainable communities, sustainable development – Other paths for Papua New Guinea*. University of Hawaii Press, Honolulu.

Jones, P 2012. *Pacific urbanisation and the rise of informal settlements: Trends and implications from Port Moresby*. Urban Policy and Research, 30:2, 145-160.

K

Kavan, P. S 2010. *Informal Sector in Port Moresby and Lae, Papua New Guinea*. The International Journal of Interdisciplinary Social Sciences: Annual Review. Vol. 5; no. 8.

Kavan, P. S 2013. *Informal Sector in Port Moresby and Lae, Papua New Guinea: Activities and Government Response*. University of Canberra. Canberra, Australia.

Kenneth, G 2019. *Global Audit Reveals Informal Economy Worth K12 Billion*. Post Courier. A WWW publication accessed on 3 July 2019 at https://postcourier.com.pg/global-audit-reveals-informal-economy-worth-k12-billion/.

Kinkin, E. 2020. *Managing the Natural Resource Sector: A Case Study of the Liquefied Natural Gas (LNG) project in Papua New Guinea*.

Kora, A 2017. *Lessons taken from the Duran Farm Housing Project*. A WWW publication accessed on 22 July 2019 at http://www.looppng.com/community/lessons-taken-duran-farm-housing-project-67878.

Kutan LP and Nao L 2022. *Initiatives to Address the Emergence of Informal Settlements in Urban Areas of Papua New Guinea*. Spotlight July 2022.

L

Lakhani, S and Willman, A. L 2014. *Trends in Crime and Violence in Papua New Guinea*. World Bank Group. Paper No. 1. Washington, DC.

Loop PNG 2017. *Water project to benefit villagers*. A WWW publication accessed on 3 March 2020 at http://www.looppng.com/community/water-project-benefit-villagers-71379.

Luluaki, I 2018. *National Informal Economy Audit Survey Project 2018*. Department for Community & Religion. Port Moresby, Papua New Guinea.

M

Miae, E 2010. *Health authorities expect more cases from Lealea*. The National publication accessed on 9 July 2019 at http://www.thenational.com.pg/health-authorities-expect-more-cases-from-lealea/.

Main, M., and Fletcher, L 2018. *On Shaky Ground: PNG LNG and the consequences of development failure*. A WWW publication accessed on 3 November 2022 at https://www.jubileeaustralia.org/resources/publications/shaky-ground-report-png..

McPhee, L., and McLachlan, S. 2017. *The Youth Bulge in Papua New Guinea: Challenges and Opportunities. Oaktree Foundation. A WWW publication accessed on 3 November 2022 at* https://devpolicy.org/Events/2017/PNG%20Update%20Conference/Presentations/PS3_Oaktree_report.pdf.

N

NewFields 2017. *Partnership in Health Program 5-Year Review*. Report prepared for ExxonMobil PNG Ltd.

NewFields 2022. *Baseline Community Health*. Papua New Guinea Joint Downstream Development Project.

NRI 2017a. Potential Impacts of Development Projects on House Sales and Rent Prices Must Be Considered Before Implementation in Papua New Guinea. National Research Institute.

NRI 2017b. *Prospects and Challenges in Private Sector Provision of Housing in Papua New Guinea: Lessons from Edai Town Development*. The National Research Institute.

NSO 2011. 2009-2010 *Papua New Guinea Household Income and Expenditure Survey*. National Statistical Office. Port Moresby, Papua New Guinea.

NSO 2014. *Papua New Guinea 2011 National Report*. National Statistical Office. Port Moresby, Papua New Guinea.

NSO 2019. *Household And Income Expenditure Survey*. A WWW publication accessed on 10 November 2022 at https://www.nso.gov.pg/census-surveys/household-and-income-expenditure-survey/.

NSO and IFC 2019. Papua New Guinea Demographic and Health Survey 2016-18. A WWW publication accessed on 10 November 2022 at https://dhsprogram.com/publications/publication-fr364-dhs-final-reports.cfm.

Nunn R.M and Nelson G 2019. *PNG: Has education policy reform worked?* The ambition to improve the quality of teaching and provide free education has not entirely matched reality. A WWW publication accessed on 10 November 2022 at https://www.pressreleasepoint.com/png-has-education-policy-reform-worked-rachel-mason-nunn-genevieve-nelson-ambition-improve-quality.

O

OEC 2019. *Papua New Guinea*. The Observatory of Economic Complexity. A WWW publication accessed on 28 June 2019 at https://oec.world/en/profile/country/png/.

OEC 2020. Papua New Guinea. A WWW publication accessed on 3 November 2022 at https://oec.world/en/profile/country/png/.

Oxfam 2011. *Listening to the impacts of the PNG LNG Project*. Central Provence, PNG.

Oxford Business Group 2015. *International events in PNG spur airport expansion*. A WWW publication accessed on 7 August 2019 at https://oxfordbusinessgroup.com/analysis/international-events-png-spur-airport-expansion.

Oxford Business Group 2018. *Major construction projects in PNG ahead of APEC 2018*. A WWW publication accessed on 1 July 2019 at https://oxfordbusinessgroup.com/overview/playing-host-major-developments-undertaken-ahead-2018-apec-leaders%E2%80%99-summit-taking-place-port-moresby.

P

PNG IMR 2018. *Partnership in Health Project Report: Population Census and Demographic Changes*. Papua New Guinea Institute of Medical Research. Papua New Guinea.

Patjole, C 2017. *High demand, more homes to be built*. A WWW publication accessed on 1 July 2019 at http://www.looppng.com/business/%E2%80%8Bhigh-demand-more-homes-be-built-66256.

PNG LNG 2015. PNG LNG - Project Induced In-migration. ExxonMobil PNG Limited.

PNG LNG n.d. Opportunities*. Laba Holdings Limited. ExxonMobil*. A WWW publication accessed on 19 July 2019 at https://pnglng.com/Opportunities/Working-with-local-businesses/Laba-Holdings-Limited.

Putt & Dinnen 2020. Reporting, investigating and prosecuting family and sexual violence offences in Papua New Guinea.

R

Rooney, M. N 2017. *There's nothing better than land: A migrant group's strategies for accessing informal settlement land in Port Moresby*. In Kastom, Property and Ideology, Land Transformations in Melanesia, Edited by S. McDonnel, M. Allen and C. Filer. Australian National University Press. Canberra, Australia.

S

Sharp, T, Cox, J, Spark, C, Lusby, S and Rooney, M 2015. *The formal, the informal and the precarious: Making a living in urban Papua New Guinea*. Australian National University.

Site Skills Training 2019. *Process Plant*. A WWW publication accessed on 8 August at http://siteskillstraining.com/services/process-plant/.

SLRa 2023. *PNG Joint Downstream Development Project Air Quality and Plume Rise Assessment*. SLR Consulting Australia Pty Ltd. A reported prepared for Tetra Tech Coffey. Brisbane, Australia.

SLRb 2023. *PNG Joint Downstream Development Project Noise Impact Assessment*. SLR Consulting Australia Pty Ltd. A reported prepared for Tetra Tech Coffey. Victoria, Australia.

Stewart, F 2018. *Instability in the Pacific Islands: A status report. Lowy Insitute*. A WWW publication accessed on 3 November 2022 at https://www.lowyinstitute.org/publications/instability-pacific-islands-status-report.

T

The National 2010. *Disease claims life at Lea Lea*. The National Newspaper. A WWW publication accessed on 8 July 2019 at https://www.thenational.com.pg/disease-claims-life-at-lealea/.

The National 2018. *Delay in buying, exporting of beche-de-mer worries locals*. The National Newspaper. A WWW publication accessed on 15 July 2019 at https://www.thenational.com.pg/delay-in-buying-exporting-of-beche-de-mer-worries-locals/.

Tingim Laip 2012. *Social Mapping Report: Towns affected by the LNG Project (Hela and Central Provinces)*. Madang, Papua New Guinea.

Trading Economics 2019. *Papua New Guinea GDP Annual Growth Rate: Summary*. A WWW publication accessed on 28 June 2019 at https://tradingeconomics.com/papua-new-guinea/gdp-growth-annual.

Transparency Internationa. 2019. *Corruptions Perceptions Index 2018*. A WWW publication accessed on 28 June 2019 at https://www.transparency.org/cpi2018.

U

UN Habitat 2010. *Papua New Guinea: Port Moresby Urban Profile*. United Nations Human Settlements Programme. Nairobi, Kenya.

UN Habitat 2013. *Port Moresby, Papua New Guinea - Climate Change Vulnerability Assessment*. United Nations Human Settlements Programme. Nairobi, Kenya.

UNDP 2019. *Gender Inequality Index. United Nations Development Programme*. A WWW database accessed on 1 July 2019 at http://hdr.undp.org/en/composite/GII.

UNESCO 2001. *Partners in coastal development - the Motu Koitabu people of Papua New Guinea*. Proceedings of and follow-up to the 'Inaugural Summit on Motu Koitabu Development, National Capital District, Papua New Guinea. United Nations Educational, Scientific and Cultural Organisation. Paris, France.

UN Women 2014. *Ensuring Safe Transport with and for Women and Girls in Port Moresby*. Papua New Guinea: UN Women. A WWW publication accessed on 21 November 2022 at https://unwomen.org.au/wp-content/uploads/2015/12/UNW_safe_public_transport.pdf.

V

Vanclay, Frank 2003. *International Principles for Social Impact Assessment. Impact Assessment and Project Appraisal.* 21 (1): 5–12.

Vanclay, Frank, Ana Maria Esteves, and Daniel M Franks 2015. *Social Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects*. A WWW publication accessed on 3 November 2022 at https://espace.library.uq.edu.au/view/UQ:355365/UQ355365.pdf.

Vasey, D.E 1985. *Household gardens and their niche in Port Moresby, Papua New Guinea*. Food and Nutrition Bulletin, Vol. 7; No. 3. The United Nations University Press. Accessed on 18 July 2019 at http://archive.unu.edu/unupress/food/8F073e/8F073E00.htm).

Vision Environment 2019. *PNG LNG Mangrove Monitoring 2011 to 2019*. Vision Environment, Gladstone Australia.

Voigt-Graf, C., & Odhuno, F. O 2019. A*ssessing the labour market impact of the PNG LNG project and implications for future projects*. Development Policy Centre Discussion Paper, 78.

W

Walton, G.W. & Dinnen, S. 2022. Crime and corruption. Papua New Guinea: Government, Economy and Society: 87–121.

Wavik, I 2017. *Water project to benefit villagers*. A LOOP publication accessed on 9 July 2019 at http://www.looppng.com/community/water-project-benefit-villagers-71379.

WHO 2010. *Cholera country profile: Papua New Guinea*. World Health Organisation. A WWW publication accessed on 23 July 2019 at https://www.who.int/cholera/countries/PapuaNewGuineaCountryProfile2010.pdf?ua=1.

WHO 2012. *Health service delivery profile: Papua New Guinea*. World Health Organisation.

WHO 2018. *Polio outbreak in Papua New Guinea. World Health Organization*. A WWW publication accessed on 22 July 2019 at https://www.who.int/westernpacific/emergencies/papua-new-guinea-poliovirus-outbreak.

WHO 2019. *Papua New Guinea. World Health Organization*. A WWW publication accessed on 17 July 2019 at https://www.who.int/countries/png/en/.

WHO 2022. *The Global Health Observatory. Explore a world of health data. Papua New Guinea*. A WWW publication accessed on 3 November 2022 at https://www.who.int/data/gho/data/countries/country-details/GHO/papua-new-guinea?countryProfileId=fc62a8f0-3ce0-4364-944f-c33d883f8d52.

Wilson, C 2012. *Papua New Guinea: Informal economy ensures equitable development*. A WWW publication accessed on 22 July 2019 at http://www.ipsnews.net/2012/01/papua-new-guinea-informal-economy-ensures-equitable-development/.

Wilson, C. 2020. *Demanding the Future: Navigating the Pacific's Youth Bulge*. A WWW publication accessed on 10 November 2022 at https://www.lowyinstitute.org/publications/demanding-future-navigating-pacific-youth-bulge.

Wiltshire, C, Watson A H.A, Lokinap D, Currie T 2021. *Papua New Guinea's Primary Health Care System: Views from the Frontline*. A WWW publication accessed on 10 November 2022 at https://dpa.bellschool.anu.edu.au/experts-publications/publications/7919/papua-new-guineas-primary-health-care-system-views-frontline.

World Bank 2018. *Connecting to compete 2018: Trade logistics in the global economy*. The World Bank Group. Washington, DC.

World Bank Group 2018a. Systematic Country Diagnostic: The Independent State of Papua New Guinea. Washington, DC: World Bank. https://doi.org/10.1596/30976.

World Bank 2019. *Papua New Guinea Urban Youth Employment Project: 2018 impact evaluation and results*. A WWW publication accessed on 24 July 2019 at http://documents.worldbank.org/curated/en/572021554967098779/Papua-New-Guinea-Urban-Youth-Employment-Project-2018-Impact-Evaluation-and-Results.

World Bank 2020. *Population, total - Papua New Guinea*. The World Bank. A WWW publication accessed on 3 March 2020 at https://data.worldbank.org/indicator/SP.POP.TOTL?end=2017&locations=PG&start=1960&view=chart.

World Bank 2021. GDP growth (annual %) – Papua New Guinea. A WWW publication accessed on 3 November 2022 at https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=PG.

World Bank 2022. Life expectancy at birth – Papua New Guinea. A WWW publication accessed on 3 November 2022 at https://data.worldbank.org/indicator/SP.DYN.LE00.FE.IN?locations=PG.

X

Xinhua 2019. *Newly-appointed PNG PM vows to tackle food security, corruption*. A WWW publication accessed on 2 August 2019 at http://www.xinhuanet.com/english/2019-07/25/c