

**ExxonMobil**

# PNG LNG Environmental and Social Report – **Annual 2021**



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For the purposes of this Report, the currency conversion rate used, between Papua New Guinea Kina (PGK) and United States Dollars (USD) is 0.2850 [PGK1 = USD0.2850]. This rate is as published by the Bank of Papua New Guinea as at 31 December 2021.

# TO OUR STAKEHOLDERS

As I complete my first year as Managing Director of EMPNG, I am extremely proud of the defining achievements of our organisation despite the persistent challenge of COVID-19.

This year has brought many highs for the EMPNG team. We continued to maintain industry-leading safety performance with more than eight years recorded without a Lost Time Incident at the LNG Plant, and four years without a Lost Time Incident in the Upstream area.

EMPNG continues to preserve the unique biodiversity values of Papua New Guinea through implementation of the Biodiversity Strategy, while mitigating environmental impacts associated with production activities by operating in accordance with our three Environmental Management Plans.

We achieved record levels of production for LNG, feed gas and naphtha due to optimising processes and improving efficiencies within our operations. This allowed us to consistently deliver energy to customers at a time when they needed it most.

We also maintained a highly skilled workforce of 3339 employees and contractors, with more Papua New Guineans appointed to senior leadership roles within the organisation during the year.

Working closely with local suppliers, we provided opportunities that helped grow the capacity of Papua New Guinean businesses, and the skills and knowledge of their employees.

Despite the logistical challenges of pandemic restrictions, we continued to deliver important community development and other social investment projects in collaboration with government, non-government organisations and international donors.

Unfortunately, 2021 was tinged with sadness. We lost highly respected and valuable members of our Papua New Guinean community, including members of our own EMPNG family, Papua New Guinea's founding Prime Minister, Sir Michael Somare, and Executive Chairman of Laba Holdings, Mr Raho Kevau. We honour and remember those people who passed during the year.

In challenging times, it's important to work together and support each other. This is what we are doing with our workforce as well as government, non-government and community partners to help sustain a path of social and economic development for the country.

It is these partnerships that helped us achieve outstanding performance across EMPNG's operations during 2021. For a project that is still in its relative infancy, our team can be proud of its defining achievements, which are particularly evident when PNG LNG is compared to other global LNG projects at the same stage of their lifecycles.



“

Looking forward, we aim to identify future possibilities that the next decade will provide for our organisation, and our workers, and partners. We will also continue to work with our stakeholders to capitalise on the opportunities that LNG production will continue to bring for the nation of Papua New Guinea and its people.

A handwritten signature in white ink that reads "Peter Larden". The signature is stylized and fluid, written in a cursive-like font.

Peter Larden, Managing Director,  
ExxonMobil PNG Limited

”



### *About this Report*

This PNG LNG Environmental and Social Report – Annual 2021 provides information about ExxonMobil PNG Limited’s safety, health, environment and social management performance during production. It forms part of PNG LNG’s commitment to keep the government and citizens of Papua New Guinea, interested non-government organisations and other stakeholders informed of production activities.

Printed copies are available.

# ExxonMobil

PNG LNG is operated by a subsidiary of ExxonMobil in co-venture with:

**Santos**



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# EXECUTIVE SUMMARY

Despite the ongoing global challenges of COVID-19, ExxonMobil PNG Limited continues to manage operations well and is sustaining its commitment to economic and social programs that are helping transform the lives of Papua New Guineans.

Papua New Guinea Liquefied Natural Gas (PNG LNG) achieved two milestones in 2021, with the 700<sup>th</sup> LNG cargo loaded in January and the 800<sup>th</sup> cargo loaded in December. Numerous production records were achieved during the year, including record levels of production for LNG, feed gas and naphtha.

A subsidiary of Exxon Mobil Corporation, ExxonMobil PNG Limited (EMPNG) manages the operation of PNG LNG facilities on behalf of co-venture partners: Santos Limited, Kumul Petroleum Holdings Limited, JX Nippon Oil and Gas Exploration Corporation, Mineral Resources Development Company Limited and their affiliates.

This Environmental and Social Report provides a progress update on EMPNG's environmental and social performance from 1 January to 31 December 2021.

## Production

As part of a new EMPNG 'Big Value, Small Changes' focus introduced in 2021, multiple production optimisation measures were implemented throughout the year. This included extending the LNG Plant's advanced process controls by recommissioning the fractionation system dynamic matrix controller, changing choke valves on the Hides producing wells, and cleaning the LNG Plant air coolers.

Through these optimisation efforts, PNG LNG achieved record monthly production levels that reached the equivalent of 9.0 million tonnes of LNG per year in August, with 1103 million standard cubic feet of gas produced per day and 579 cubic metres of naphtha per day on average.

By the end of the year, 8.4 million tonnes of LNG was produced and 110 cargoes loaded. Since the start of production in 2014, more than 60 million tonnes of LNG and 808 LNG cargoes have been loaded for customers in Asia.



**Long-term charter vessel *Gigira Laitebo* arrives at the LNG Plant Marine Terminal jetty to receive the 750<sup>th</sup> LNG cargo**

## National content

As part of its commitment to building national content and enabling the full contribution of the Papua New Guinean workforce, EMPNG updated reporting processes to include national content data from an additional 11 third-party contractor organisations. The categorisation of data was

also improved to gain better insights into workforce trends and contractor opportunities. These enhancements will help EMPNG and contractors optimise the tracking and stewardship of national content performance metrics and initiatives that are intended to support economic development in Papua New Guinea.

At the end of 2021, the PNG LNG workforce was 3339 workers, of which 2978 were Papua New Guinean citizens. This included EMPNG employees and personnel from 25 third-party contractor organisations working on production-related activities. Women comprised 19 percent of the Papua New Guinean workforce.

Some 45 percent of Papua New Guinean workers are of local origin proximate to PNG LNG facilities, while 25 percent are of regional origin from provinces where PNG LNG operates, and 30 percent originate from other areas of Papua New Guinea.

In 2021, two operations and maintenance technicians became the first Papua New Guineans to be appointed as Well Operations Technicians. They support Hides well diagnostics and preparations for Angore drilling activities. Eight EMPNG supervisory roles were nationalised during the year.



**HGCP Operations and Maintenance Technicians, Raymond Wesley, Firmin Lora, Simon Koila, Jefferson Francis, Robinson Kasisie and John Marabe**

The Operations and Maintenance training program continues to recruit and train new technicians for roles at PNG LNG facilities. In 2021, the seventh intake of 24 trainees, including six women, began their training through the Kumul Petroleum Academy. Trainees from the sixth intake began on-the-job training in June after completing their 12-month Junior Technician program at the Academy.

Papua New Guineans now comprise 82 percent of operations and maintenance technician roles with EMPNG. All operations lead roles at the LNG Plant are occupied by Papua New Guinean technicians.

Operations and maintenance technicians are offered opportunities to participate in assignments that extend their skills outside of the operations and maintenance discipline. In 2021, six technicians undertook broadening assignments in areas such as process safety, operations integrity management, contract administration, technical writing, and information technology.



**EMPNG Managing Director, Peter Larden (third from left), and EMPNG Operations Manager, Shameka Nelson (far right), with operations and maintenance trainees from the sixth intake at the LNG Plant site**

Four engineers were recruited during the year, including one Integrity Engineer, one Machinery Engineer, one Surveillance Engineer, and one Electrical Engineer. Five interns were also engaged through the internship program, which involves recruiting graduates in their third year of university study for on-the-job training at PNG LNG facilities.

Throughout 2021, EMPNG and its contractors delivered the equivalent of 117,785 hours of training to some 8840 participants through more than 2570 courses. Online courses continued, and face-to-face learning was reintroduced as pandemic restrictions eased.

In addition to creating employment opportunities and increasing the skills of the workforce, EMPNG contributes to the nation's economy by engaging the services of Papua New Guinean businesses and sourcing fresh produce from local markets for worker camp menus. For example, during 2021, more than 61,700 kilograms of fresh produce from local markets in the Upstream area was sourced through the Pajja Iba Women's Agri Business Group Inc. for Hides Gas Conditioning Plant (HGCP) Camp menus.

Ten Landowner Companies (Lancos) and 110 non-Lanco Papua New Guinean businesses were engaged in production-related activities during the year.

EMPNG's total in-country spend with Papua New Guinean businesses in 2021 was PGK645 million (USD183.8 million) including approximately 29 percent spent on Lanco services, which equates to PGK185 million (USD52.7 million). Since the start of production, EMPNG has spent PGK5.2 billion (USD1.5 billion) on Papua New Guinean services, of which PGK1.6 billion (USD456 million) was spent with Lancos.

To build the capacity of Papua New Guinean businesses, EMPNG provides relevant training and business development opportunities. In 2021, the contractor responsible for maintaining and repairing the marine loading arms at the LNG Plant Marine Terminal recruited three Papua New Guinean workers through Lanco, Laba Holdings Limited, with support from EMPNG. The new recruits are completing mechanical fitter training for ongoing employment with this contractor.

Lanco, Hides Security Services Limited was presented with the Best National Content Contribution of the Year Award at EMPNG's second annual Contractor National Content Awards. Papua New Guinean business FALCK PNG Limited was also honoured for achieving a 100 percent Papua New Guinean workforce, which included replacing non-national workers with local experienced workers in fire chief positions. EMPNG continues to encourage sustainable community and economic development through its strategic community investment programs. These programs encompass education, health, livelihood support, law and justice, environment awareness, key infrastructure improvements and community-based initiatives.

During 2021, a new three-bedroom teacher's house that was funded as part of EMPNG's earthquake response and recovery support program was handed over to Komo Seventh Day Adventist Primary School. The house was constructed by the Adventist Development and Relief Agency PNG.

A new Papa Community Resource Centre funded by EMPNG was officially opened during the year. The Centre was constructed by Lanco, Laba Holdings Limited. It includes a large conference room, office space, kitchen and restroom facilities. The Resource Centre has become a place where local community members conduct social events, meetings and training.

Porebada Elementary School received a new school building and classroom furniture also funded by EMPNG and constructed by Laba Holdings Limited. The building consists of eight student classrooms and a staff office, which are all fully furnished with desks and chairs. The new facility also has a 9000-litre water tank. It caters for more than 500 students from Porebada Village and nearby communities.

In partnership with the Hela Provincial Government, EMPNG launched a PGK2.5 million (USD712,500) Hela Education Program in 2021 to cover student tuition costs for more than 3000 secondary students in Hela. This helps keep students in school, as secondary student engagement became challenging due to the economic impacts on families following the 2018 earthquake and onset of COVID-19.

EMPNG continued to support the Papua New Guinean Government's COVID-19 emergency response throughout the year, with a PGK4.3 million (USD1.2 million) commitment for pandemic relief efforts across the National Coordination Centre, and provincial health authorities in the National Capital District, Hela and Central provinces. This provided much needed supplies and equipment to health authorities such as medical supplies, mobile clinics and vehicles for contact tracing. For example, a mobile health clinic and transport bus were donated for the Motu Koita Assembly's vaccination program in the National Capital District. Ten new vehicles, consisting of two 25-seater buses, six mini-vans and two station wagons, were donated to Papua New Guinea National Control Centre's COVID-19 response for contact tracing, community education, and the transportation of personal protective equipment and COVID-19 test samples. EMPNG also donated 1500 GeneXpert testing cartridges to the Hela Provincial Health Authority to boost COVID-19 testing capabilities across the province.

Twenty-three healthcare workers from Hela Province completed three days of intensive training on the diagnosis, treatment and management of tuberculosis, HIV and malnutrition in children during the year. The training was delivered in August through a partnership between EMPNG, the Paediatric Society of Papua New Guinea, Baylor College of Medicine and Texas Children's Hospital.

In 2021, 47 participants from Lae, Lorengau, Goroka, Alotau and Port Moresby attended Early Childhood Refresher Training delivered by Buk bilong Pikinini with funding support from EMPNG. The training covered topics such as class management and behaviour strategies, inclusive education and sign language, digital learning, early childhood development, child protection, library management, phonics, and first aid. Participants received tablets to help them deliver Buk bilong Pikinini's digital learning program in their local Library Learning Centre. Since 2011, EMPNG has donated more than 15,000 books, provided teacher training, delivered teaching resources and supported the development of Papua New Guinea's first early childhood learning app.

EMPNG funded community grants worth more than PGK385,960 (USD110,000) in 2021 to support the work of organisations including Cheshire disAbility Services, the Business Council of Papua New Guinea, the Institution of Engineers Papua New Guinea Inc., Femili PNG, St John Ambulance, and the Sir Theo Foundation, which provides financial support to Port Moresby General Hospital. The funding also included continued support for the Rotarians Against Malaria health program in the National Capital District.

## Environment

EMPNG has helped to enhance the management effectiveness of the Lake Kutubu Wildlife Management Area (WMA), which is managed by the Lake Kutubu WMA Committee. In 2021, an initial meeting was held with

Sanumahia clan members for a proposed new protected area in Kutubu.

During the year, one continuous stakeholder engagement was conducted over 20 days across 18 communities from the Lower Kikori Delta. The sustained engagement approach helped residents and local fishers gain a deeper understanding of the importance of conservation.

Communities also began driving their own conservation efforts. For example, Doibo community used their own resources to build a community conservation hall, and allocated land for a refuse centre for Kikori Station. Doibo community members continue to conduct environmental awareness raising activities with surrounding communities and businesses.

The biennial biodiversity survey was completed over 24 days in July by a field team of Papua New Guinean fauna experts. The survey included the collection of imagery from 80 camera traps placed in forest habitats on Hides Ridge and in the Moro area. An analysis of the data collected will be undertaken during 2022.

To support biodiversity restoration as part of EMPNG's commitment to 'Protect Tomorrow. Today', 57 LNG Plant site volunteers participated in mangrove planting at mudflats near the LNG Plant site in July.



**LNG Plant Camp Facilities Coordinator, Bart Kasen volunteers his time to plant mangroves at the mudflats near the LNG Plant site**

EMPNG aims to mitigate environmental impacts associated with production activities by operating in accordance with three Environmental Management Plans. These Plans outline EMPNG's approach to managing air, noise, water and waste impacts, as well as the company's commitment to

preserving cultural heritage, managing invasive plant and pest species, controlling access to sensitive areas and reinstating native vegetation.

During the year, 29 emissions sources were tested at the HGCP and LNG Plant site with 27 meeting emissions criteria. EMPNG's Engineering team and the equipment manufacturer are making corrective adjustments to the two low severity non-compliant HGCP gas turbine generators.

Biannual noise monitoring continued in the Upstream area and LNG Plant site during both daylight and evening hours. Baseline noise monitoring was also undertaken for pre-construction noise levels at Angore Wellpad C. All results were within Environment Permit criteria.

Approved third-party facilities are used to recycle operational waste, with reuse initiatives implemented wherever practicable, to reduce the amount of waste sent to a landfill. During the year, approximately 90 tonnes of operational waste from the Upstream area was sent to Total Waste Management's Roku facility for recycling and reuse. Approved facilities were also used to recycle 160 tonnes of waste from the LNG Plant site, including scrap metal, plastic and batteries. In 2021, an opportunity was identified to reuse waste oil from Upstream area operations. As a result, more than 10 tonnes of waste oil and fuel was processed on-site and reused during the year.

There was a 30 percent decrease in the number of spills, and an 89 percent reduction in spill volume in 2021 compared to 2020. This was due to EMPNG's ongoing commitment to spill prevention and response.

Long-term support continues to be provided for Upstream area communities and the Papua New Guinean Government with repairing roads, bridges and other critical infrastructure that was damaged by the 2018 earthquake. In 2021, earthquake repair works focused on erosion and sediment control measures including drainage and micropiling works along the pipeline Right of Way (ROW), and runway and infrastructure repairs at Komo Airfield.

EMPNG conducts biennial surveys to monitor the regeneration of plant species following temporary disturbance from construction activities. Surveys cover elevation zones from 24 to 2721 metres above sea level along the entire pipeline ROW. The 2021 survey was conducted between March and April covering low, medium and high elevation zones. An analysis of survey results was completed in December and showed that pipeline ROW vegetation regeneration had progressed well towards natural primary and secondary forest.

## Social

EMPNG maintained its industry-leading safety performance with no Lost Time Incidents recorded for more than four years at any PNG LNG operation. More than 85.9 million hours have been worked since the start of production, with 15.6 million hours worked during 2021.

The annual Contractor Safety Leadership Workshop was held in October. The workshop theme 'Connecting the DOTS for a Safe Future' highlighted the importance of understanding safety systems and tools, and how they worked together to keep personnel safe. It also emphasised process safety critical safeguards. At the workshop, Laba Security Services Limited, Smit Lamnalco and Baker Hughes PNG Limited received the Best Safety, Security, Health and Environment (SSHE) Performance Contractor of the year award 2021 for outstanding safety performance.

There was an increased focus on process safety as part of the Enhancing Process Safety framework during the year. Field teams were actively engaged in verifying and maintaining critical safeguards for higher consequence process safety scenarios. To further promote process safety, signs were installed at worksites to help workers identify and communicate the safeguards critical for continuing safe operations. EMPNG's broader safety programs continue to cover high severity near misses and learning opportunities from 2021.

Workplace screening for COVID-19 continues, with more than 25,500 test samples collected across worksites in 2021. Upstream and LNG Plant clinics received upgraded testing equipment to ensure the safe and timely processing of COVID-19 samples. This included new polymerase chain reaction (PCR) testing machines to detect COVID-19, and biosafety cabinets for safely preparing samples for testing. All site clinics also received oxygen concentrator machines to increase their capacity to manage COVID-19 cases.

Vaccination awareness was provided to workers and over 5000 vaccine doses delivered at EMPNG clinics throughout the year.



**EMPNG Public and Government Affairs Administrative Assistant, Stella Lamboku, after receiving her COVID-19 vaccination**

The Culture of Health program continued to focus on worker biometric screening at site clinics and the delivery of mental health and well-being programs. More than 1200 workers participated in biometric screening during the year, which involved blood pressure, weight and blood sugar testing to help identify and address any underlying health issues.

In 2021, EMPNG updated its Emergency Response Plans for all worksites. The updated Plans are consistent with ExxonMobil's 'One Plan' concept. This means that all Emergency Response Plans are now streamlined to only contain key information necessary for response teams. Common information in previous Plans is captured in the new EMPNG Emergency Reference Guide.

A total 7498 community engagements were conducted during 2021 with communities throughout the PNG LNG area of operations. These involved 2470 formal engagements and some 5028 informal engagements with nearly 38,000 stakeholders. Face-to-face engagements increased as pandemic restrictions eased and construction activities progressed in Angore and Hides.

In the Upstream area, engagements included Clan Caretaking Agreements, as well as engagements that led to the establishment of exclusion zones around areas identified during land access surveys as at risk of potential landslips. Other engagements addressed business participation and employment requests.

At the LNG Plant, engagements predominantly focused on community investment projects including donation and care pack deliveries, as well as awareness raising about marine safety exclusion zones, mangrove conservation, and grass fire risks. Ten billboards were erected by Lanco, Laba Holdings Limited along the beachfront at Caution Bay to educate local communities about marine safety exclusion zones.

Advocacy workshops were also held to share information about PNG LNG's operations, community development programs, biodiversity programs and national content initiatives. Due to pandemic restrictions, the advocacy program could not be conducted during the first half of the year. In the second half of the year, 15 advocacy workshops were held with more than 150 representatives from national government departments, as well as provincial and local-level governments. Attendees found the sessions informative and a good opportunity for relationship-building.

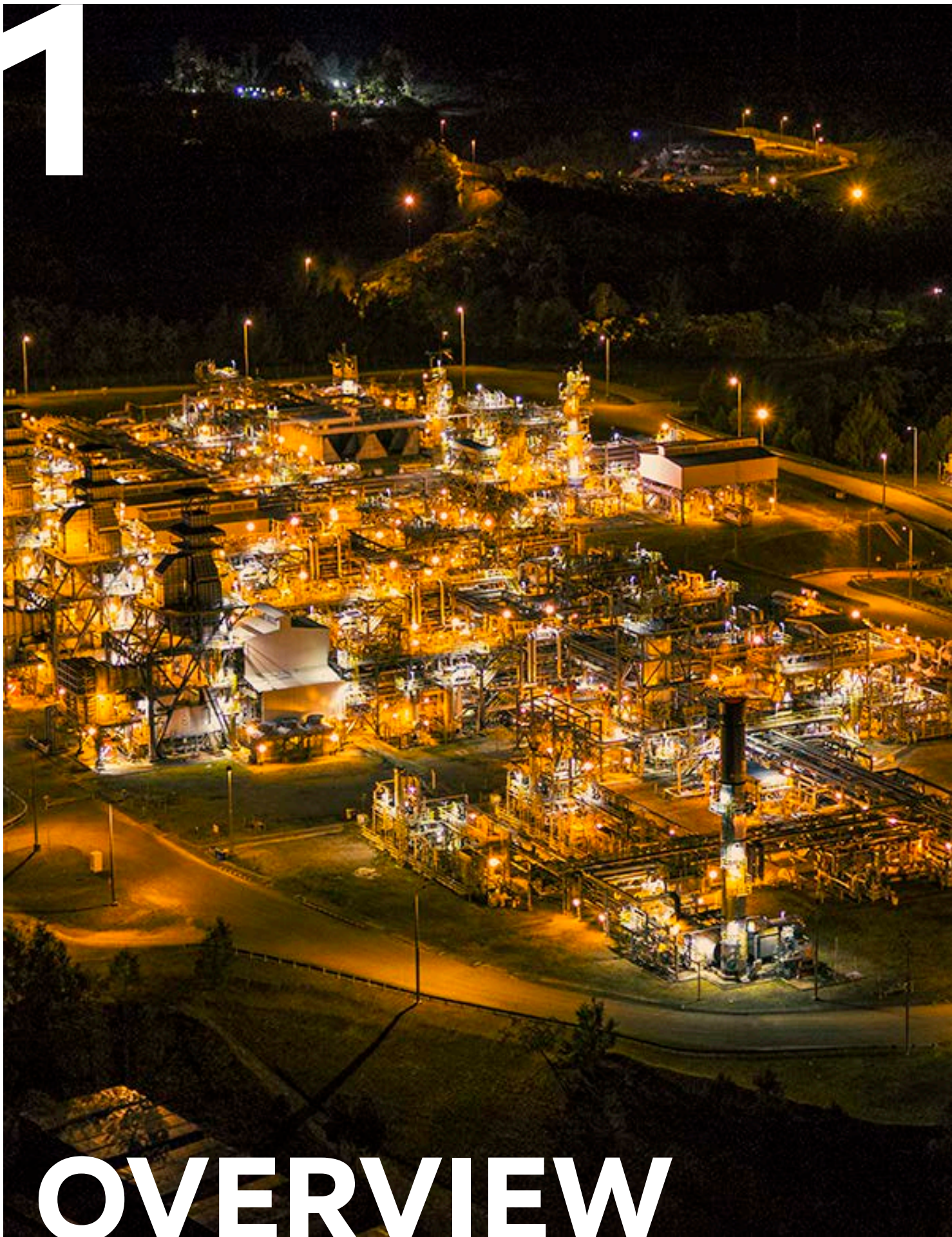
In early December, EMPNG Managing Director, Peter Larden, presented at the Papua New Guinea Chamber of Mines and Petroleum's annual conference. The conference theme was 'Resource Industry - Making it Work for PNG'. Mr Larden spoke about the benefits that PNG LNG brought to Papua New Guinea through workforce development and collaborative partnerships with government. He also outlined the work that EMPNG had done with government and community partners to combat COVID-19.

As EMPNG enters the next phase of operations, it maintains a firm commitment to maximising the benefits of LNG production for Papua New Guinean communities. This is being achieved by working closely with communities, government and non-government organisations to support social and economic growth and development for the nation.

2021 PERFORMANCE HIGHLIGHTS

EXECUTIVE SUMMARY





# OVERVIEW

EMPNG manages the operation of PNG LNG production facilities and associated gas resources to deliver affordable, reliable and sustainable energy to the Asia Pacific region.

ExxonMobil PNG Limited (EMPNG) operates the USD19 billion Papua New Guinea Liquefied Natural Gas (PNG LNG) facilities, which are located across Papua New Guinea’s Hela, Southern Highlands, Western and Gulf provinces, and in the Central Province and National Capital District. These facilities gather multiphase fluids from Hides wells and transport them through the Hides Spine to the Hides Gas Conditioning Plant (HGCP), where the fluids are stabilised and transformed into two streams – gas and condensate.

The dry gas from Hides, together with associated gas from the Kutubu and Gobe fields, is transported through more than 700 kilometres of pipeline to the LNG Plant, which is located northwest of Port Moresby in the Gulf of Papua. At the LNG Plant, the gas is liquefied so that it can be exported via ship to customers in Asia. Gas is also provided to the local NiuPower and Dirio Gas & Power companies to supply energy for Port Moresby businesses and communities. The condensate stream travels through the HGCP-Kutubu Condensate Pipeline to the Kutubu Central Processing Facility, and from

there, to the Kumul Marine Terminal in the Gulf of Papua for export.

Figure 1.1 shows the location and elements of PNG LNG facilities.

It is anticipated that more than 11 trillion cubic feet of natural gas will be produced over the life of the PNG LNG facilities to provide a long-term energy supply to customers such as: China Petroleum and Chemical Corporation (Sinopec), Osaka Gas Company Limited, JERA Company Inc. and CPC Corporation in Taiwan.

This Report can be accessed on the PNG LNG website, along with previous Environmental and Social Reports. Printed copies of the full Report and translated summaries are made available for Papua New Guinean citizens who may have limited access to the internet.



Visit the website at: [www.pnglng.com](http://www.pnglng.com)

**Figure 1.1 – PNG LNG facilities**



## 1.1 Production

PNG LNG achieved two milestones during 2021, with the 700<sup>th</sup> LNG cargo loaded in January and the 800<sup>th</sup> cargo loaded in December. For the month of August, a production record of 9.0 million tonnes per year equivalent was achieved at the LNG Plant, while the HGCP achieved a record of 1103 million standard cubic feet of gas produced per day. In October, the highest level of naphtha production was recorded at 579 cubic metres per day on average. Eleven naphtha cargoes were loaded during the year. The naphtha record was achieved following recommissioning of the fractionation system dynamic matrix controller (DMC) at the LNG Plant. A number of additional efforts helped optimise production as part of a new EMPNG 'Big Value, Small Changes' focus introduced in 2021.

A total 8.4 million tonnes of LNG was produced and 110 cargoes loaded during 2021, compared to 115 cargoes in 2020. The reduction was due to reliability events and major maintenance activities conducted in 2021. Maintenance activities were conducted to sustain high availability of equipment through planned maintenance, inspections, and repair.

Since the start of production in 2014, more than 60 million tonnes of LNG and 808 LNG cargoes have been loaded for customers in Asia.

### HIGHLIGHT

#### OPTIMISING PRODUCTION

In 2021, the LNG Plant Facilities Surveillance team led an effort to recommission the DMC for the LNG Plant fractionation system. The DMC is a type of advanced process control software that consistently improves operations and helps the LNG Plant efficiently produce naphtha. A DMC had been installed in 2016 but was never fully commissioned due to an unreliable analyser.

A team of Papua New Guinean technicians and engineers collaborated with ExxonMobil Research and Engineering to recommission the DMC. This involved designing an inference model to replace the unreliable analyser.

The successful DMC recommissioning optimised the naphtha production stream for PNG LNG. The increased throughput proved to be of high value for overall production optimisation, and a key achievement for EMPNG and ExxonMobil.



Operations and maintenance technicians working together during LNG Plant fractionation system DMC commissioning

## 1.2 Wells

As part of production optimisation efforts, EMPNG is changing choke valves on all eight HGCP producing wells, with seven completed during 2021. The changeout reduces the pressure drop across the choke valves, allowing more gas to flow from the wells to the HGCP.

## 1.3 Hides Gas Conditioning Plant

EMPNG safely completed a major maintenance activity with Level 1 servicing of the gas turbines and repair work on the HGCP stabiliser columns in 2021.



**HGCP stabiliser column**

This program of work was conducted concurrently with an Intelligent Pigging campaign. Intelligent Pigging was performed inside the pipeline using a pipeline inspection gauge (pig) to confirm pipeline integrity, internal corrosion rates, and to identify any anomalies. There were no major anomalies identified from the 2021 Intelligent Pigging campaign.

## 1.4 LNG Plant

The first Level 3 servicing on Train 1 gas turbines was completed concurrently with Level 1 servicing on Train 2 gas turbines at the LNG Plant in 2021.

Level 1 servicing is conducted every two years and includes a borescope inspection of gas turbines. Level 3 servicing is undertaken every eight years and involves a complete changeout of the gas generator and high-speed power turbine. Gas turbines drive the refrigeration compressors at the LNG Plant to compress the refrigerant gas. This gas is then cooled and condensed, and in turn is used to cool/liquefy the feed gas for efficient LNG production.

### HIGHLIGHT

## APPOLLONIA APPOINTED HGCP PRODUCTION OPERATIONS SUPERVISOR

Appollonia Nabo, from Manus Province, has been appointed as Production Operations Supervisor of the HGCP following a successful 11-year career with EMPNG.

Appollonia started her career in 2010 as part of the first intake of operations and maintenance trainees with PNG LNG. After completing her training, she joined the Operations team at the LNG Plant. In 2018, she was promoted to LNG Trains Control Room Technician, followed by a promotion to Operations Lead at the LNG Plant in 2020. In her new Production Operations Supervisor role, Appollonia is responsible for ensuring safe, reliable and efficient HGCP operations.

"My role focuses on managing risk, planning and scheduling maintenance work, and ensuring the safety of work teams," Appollonia said.

"I really enjoy the challenge of my new role. Production operations is at the forefront of the organisation. You have to keep yourself up to date with new technologies and ways of doing things to maintain your competitive edge in the industry.

"As a Papua New Guinean, I am very proud to have been part of PNG LNG from the days of its development through to commissioning and now production. I have watched the project being built, supported its progress and am now contributing to ensuring the safety of our wanwoks [or 'colleagues'] both on and off the job.

"Working for EMPNG has enhanced my career in the LNG industry and provided me with the skills to confidently carry out my job."

Appollonia said it was important for people to have an open mind and challenge themselves to grow their career skills and knowledge.

"Keep evolving, do better, be better. Develop a strong work ethic. With this skill you will likely perform high quality work, have strong relationships with colleagues and contribute toward achieving important tasks that add value to your team and organisation," she said.



**EMPNG Production Operations Supervisor, Appollonia Nabo, at the HGCP**

**HIGHLIGHT**

**BRINGING COMMUNICATIONS TO UPSTREAM AREAS**

EMPNG and Upstream area communities gained improved communications capabilities through 4G telecommunications antennas installed on the HGCP and Komo telecommunications towers during 2021.

The new antennas replace 3G infrastructure to provide more reliable telephone and internet services throughout Hides and Komo. The antennas were installed by third-party contractors with technical supervision and support from EMPNG.

The 4G capability supports digital transformation in EMPNG facilities and nearby Upstream area communities. This includes supporting trials and implementation of new RealWear headsets that remotely connect Upstream area workers with off-site teams. When users wear these headsets, they can work while communicating through voice and video in real-time with remote support teams.

An FM radio antenna was also installed on the communications tower in Hides to improve radio communications in the Upstream area, with EMPNG now re-broadcasting PNG NBC news to local communities.

In early 2022, construction is scheduled to begin on a new telecommunications tower for Angore. This tower will enhance phone and internet services for local communities and EMPNG facilities in Angore and surrounding areas.



**HGCP telecommunications tower**

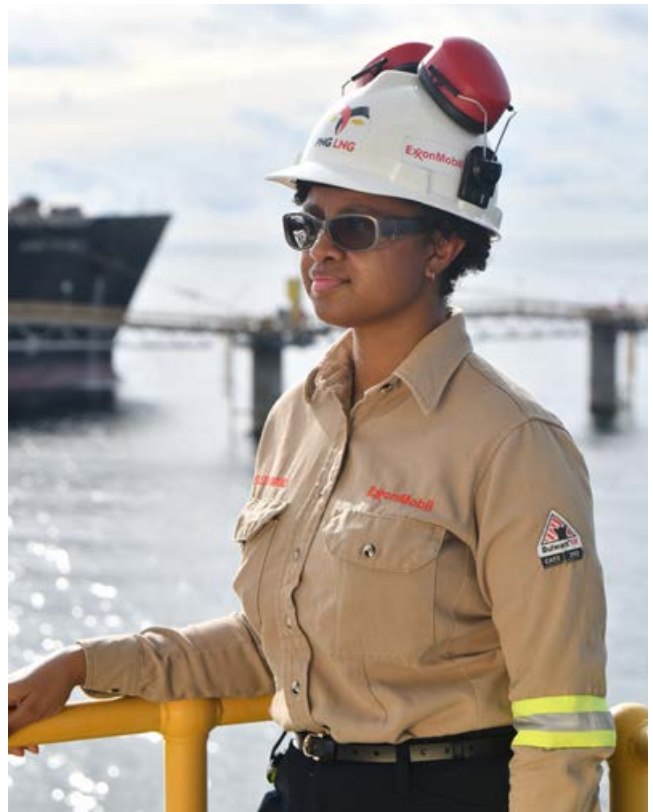
Other maintenance activities at the LNG Plant in 2021 included the change out of the dehydration bed molecular sieve unit on Train 1, and cleaning of the LNG Plant inlet air coolers. These works will optimise LNG production.



**Train 1 dehydration bed molecular sieve unit at the LNG Plant**

**1.5 Marine facilities and shipping**

EMPNG loaded the 700<sup>th</sup> LNG cargo in January and the 800<sup>th</sup> cargo in December. Major maintenance work was conducted on the marine loading arms during the year.



**EMPNG Integrity Engineer, Eileen Rawali at the LNG Plant Marine Terminal**

**1.6 Angore Gathering System**

Easing of some COVID-19 restrictions meant construction of the Angore Gathering System could restart in July, with drilling works planned in 2022.



The *Spirit of Hela* arriving at the LNG Plant Marine Terminal for loading of the 700<sup>th</sup> LNG cargo

2021 PERFORMANCE HIGHLIGHTS

OVERVIEW

**1103M**  
CUBIC FEET OF GAS  
PRODUCED PER DAY  
RECORD MONTH

**579m<sup>3</sup>**  
PER DAY NAPHTHA  
RECORD MONTH



**9.0M**  
TONNES PER  
YEAR EQUIVALENT  
LNG PRODUCTION  
RECORD MONTH



**8.4M**  
TONNES PER YEAR  
EQUIVALENT LNG  
PRODUCED IN 2021

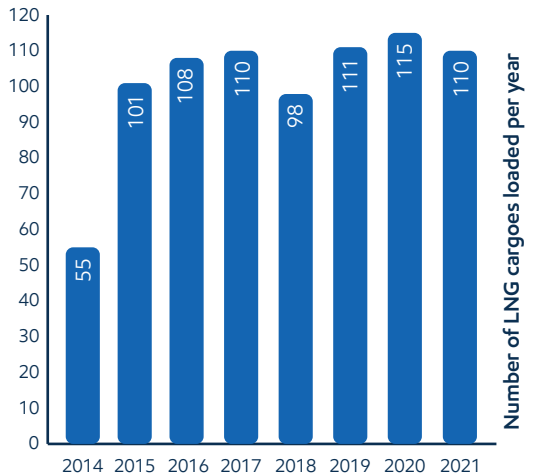
**110**  
LNG CARGOES  
LOADED  
IN 2021

**11**  
NAPHTHA  
CARGOES  
IN 2021

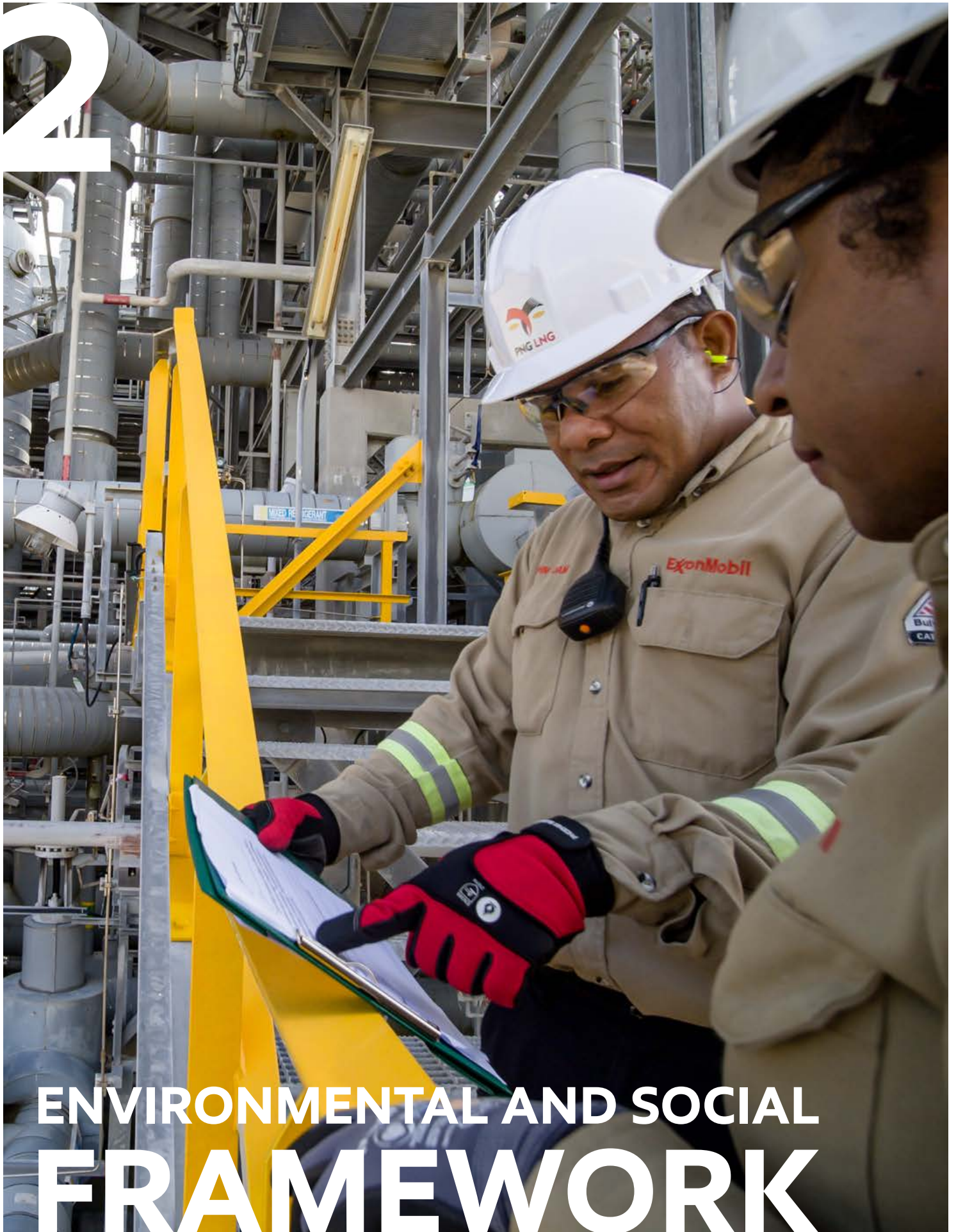
**60.7M**  
TONNES OF  
LNG PRODUCED  
TO DATE

**808**  
LNG CARGOES  
LOADED  
TO DATE

**74**  
NAPHTHA  
CARGOES  
TO DATE



# 2



## ENVIRONMENTAL AND SOCIAL FRAMEWORK

To sustain the well-being of workers, communities and the environment around production facilities, EMPNG operates in accordance with the Environmental and Social Management Plan.

EMPNG conducts operations in accordance with Papua New Guinean laws and regulations. This includes monitoring compliance with 1436 regulatory obligations and 2429 licenses, permits and certifications, while also meeting PNG LNG Lender Group commitments.

## 2.1 ExxonMobil Standards

EMPNG complies with ExxonMobil's Standards of Business Conduct, which require the company to conduct business in a manner that is compatible with the environmental, social and economic needs of the communities in which it operates. These Standards also aim to protect the safety and health of employees, those involved in operations, and members of the public.

In addition to the Standards, EMPNG manages its operations in accordance with a structured and disciplined risk management framework known as the Operations Integrity Management System (OIMS). This System identifies, evaluates and manages risks across all ExxonMobil exploration, construction and production activities.

## 2.2 Environmental and Social Management Plan

The Production Environmental and Social Management Plan (ESMP) requires EMPNG to mitigate and manage environmental, social, community health, safety and security impacts resulting from production activities. This includes meeting PNG LNG's obligations under Papua New Guinean legal and regulatory requirements.

The Production ESMP is the result of extensive stakeholder consultation and lessons learned from the PNG LNG construction phase. It includes environmental and social monitoring, mitigation and management measures that were determined as part of the PNG LNG Environmental Impact Statement, along with OIMS requirements, International Finance Corporation Performance Standards, and other international standards such as the Equator Principles.

The Production ESMP consists of three Environmental Management Plans, which cover all PNG LNG facilities, and seven Social Management Plans based on key social themes as shown in Figure 2.1. National content commitments are contained within each of the Social Management Plans. EMPNG is accountable for implementing requirements defined in the ESMP.

Production ESMP requirements apply across normal operating conditions and in reasonably foreseeable abnormal operating conditions or emergency situations.

In consultation with stakeholders, the Production ESMP is periodically reviewed to ensure it continues to meet current environmental, social and operational conditions. The current ESMP is published on the PNG LNG website.



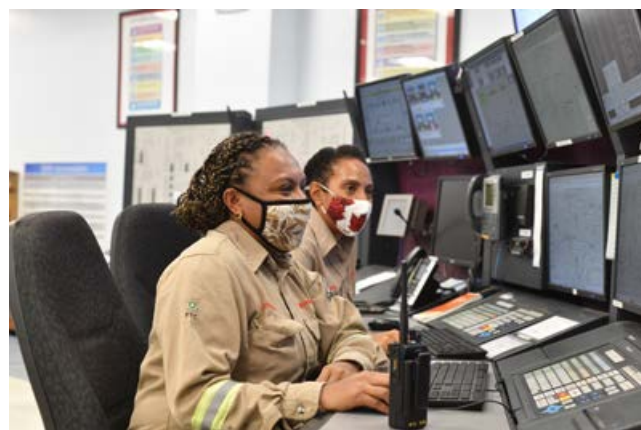
Visit the website at: [www.pnglng.com](http://www.pnglng.com)

## 2.3 Monitoring and assessment

EMPNG conducts regular monitoring and evaluation to confirm the effectiveness of the Production ESMP so that:

- mitigation measures designed to manage risks and impacts are being implemented
- mitigation measures are achieving their intended outcomes, or are on track to achieve intended outcomes
- actual impacts are identified and compared to predicted impacts, as described in the PNG LNG Environmental Impact Statement
- compliance with applicable laws and regulations is maintained.

As well as EMPNG's own monitoring and evaluation, the Lender Group engaged an Independent Technical Consultant and an Independent Environmental and Social Consultant (IESC) to monitor PNG LNG's performance against ESMP commitments.



**EMPNG Operations Technician, Lydia Tarabu with Control Room Technician, Isabella Mogia, in the LNG Plant Control Room**

### 2.3.1 Internal assessments

OIMS assessments are periodically conducted to determine the effectiveness of OIMS implementation and the Systems' health, which includes verification of ESMP implementation. EMPNG's annual OIMS assessment was conducted from October to November. The assessment involved a health check of selected process safety scenarios and the new OIMS Process Safety protocols. A detailed review of four high consequence scenarios was conducted through testing the health of critical safeguards and verifying their effectiveness.

An additional assessment team reviewed responses from OIMS System Owners and Administrators on the new OIMS Process Safety protocols. Eight EMPNG assessors, with the support of two ExxonMobil subject matter experts, participated in both the scenario and protocol assessments.

The EMPNG assessors represented Operations Technical, Maintenance, Safety, Health and Environment teams, as well as plant site Operators.

**HIGHLIGHT**

**A FOCUS ON PROCESS SAFETY**

More than 200 workers and contractors from the Upstream area and LNG Plant completed specialist process safety knowledge verification sessions as part of ExxonMobil’s Enhancing Process Safety framework in 2021.

The training commenced with an online course introducing process safety scenario management, followed by a series of workshops, with each focusing on a different process safety scenario. Training on the first two higher consequence scenarios commenced in 2021, and covered a producing well loss of containment scenario in the Upstream area and a marine loading loss of containment scenario at the LNG Plant.

Workshop participants found the training scenarios beneficial in improving their knowledge and skills around process safety.



**EMPNG Process Safety Technicians, Lance Ilaraki and Edna Maniot, with Process Safety Lead, Peter Pomeleu**

The suggested operational improvements will be stewarded by relevant EMPNG OIMS System Owners and Administrators.

**2.3.2 External monitoring**

Most external monitoring visits were conducted online during 2021 due to ongoing COVID-19 restrictions and associated travel impacts.

In February, the IESC, and Lender Group’s Independent Technical Consultant, conducted online desktop monitoring reviews using information provided electronically by EMPNG. This information was verified through follow-up video conference calls with EMPNG personnel. The 2021 IESC monitoring report was issued mid-2021.

In February and April, the Papua New Guinea Department of Petroleum and Energy conducted a monitoring review of

Angore drilling activities, along with an ExxonMobil Operated Annual Licences review. These meetings involved EMPNG engineers, the PNG LNG Exploration team, and EMPNG’s regulatory and public and government affairs personnel. The licence review aimed to provide the Department with an update on exploration licence activities including accomplishments, work program commitments, and the management of pandemic-related challenges.

Regular monitoring reviews were also conducted with the Papua New Guinea Conservation and Environment Protection Authority throughout the year.

In addition to scheduled reviews, EMPNG provided status updates to relevant Papua New Guinean Government agencies as required.

**2.4 Management of Change**

EMPNG applies a Management of Change (MOC) procedure for any temporary or permanent modifications to facilities, or to critical documents that impact the operation of facilities. This procedure aims to:

- manage permanent, temporary and urgent or emergency changes to integrity critical procedures, process equipment or operating conditions
- provide a thorough evaluation of the proposed change
- consider the identification and control of potential operations integrity risks associated with any proposed change.

Safety, security, health, environmental, social management, operability, maintenance, regulatory, cost and scheduling requirements are considered before any change is made.

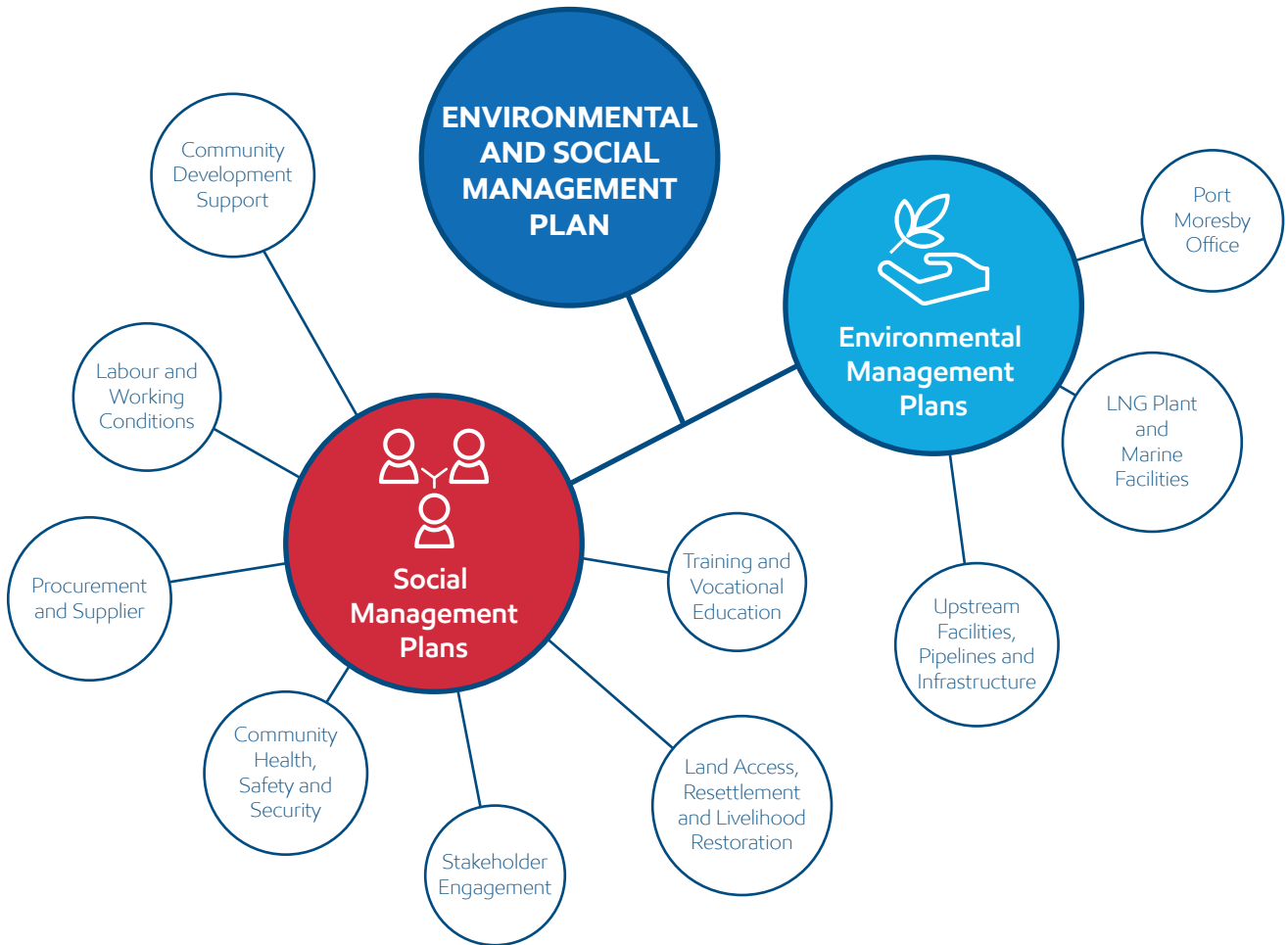
A proposed change is communicated to workers whose job tasks may be impacted and who may require training before the change is implemented.

Changes are classified and managed according to potential impacts and consequences. Classification also serves as the basis for determining Lender Group notification and/or review requirements. Class I changes require Lender Group review prior to implementation, Class II changes require Lender Group notification as part of the annual PNG LNG Environmental and Social Report, and Class III changes do not require notification to the Lender Group.

One Class II MOC that was approved in 2020 to move the LNG Plant incineration process off-site to the waste contractor’s incinerator was presented to the IESC in 2021.

During the year, one Class II MOC was completed to trial the treatment of wash water through the reedbed at the Hides Waste Management Facility (HWMF) in Kopeanda. This MOC will be presented to the IESC in early 2022. A second Class II MOC was raised regarding an extension of the Right of Way (ROW) width along Kilometre Pipeline (KP) 7.3 to KP 24.6.

Figure 2.1 – Production ESMP structure



**2021 PERFORMANCE HIGHLIGHTS**

**ENVIRONMENTAL AND SOCIAL FRAMEWORK**



**3** ENVIRONMENTAL MANAGEMENT PLANS



**7** SOCIAL MANAGEMENT PLANS



**1436** REGULATORY COMPLIANCE OBLIGATIONS



**2429** LICENCES, PERMITS & CERTIFICATIONS



# PART A



## NATIONAL CONTENT

# EMPNG has a mission and firm commitment to create shared long-term value for its stakeholders from national content initiatives.

The national content strategy is a focused, coordinated and sustained approach to developing human, social and economic capacity in Papua New Guinea. It has been designed to achieve tangible, positive results for people, communities and businesses. The strategy consists of three components:



Workforce Development – Recruiting, developing and enabling the full contribution of Papua New Guinean citizens in the EMPNG workforce.



Supplier Development – Sustainably developing and engaging qualified and competitive Papua New Guinean businesses for the supply of goods and services.



Strategic Community Investments – Working together with stakeholders on community investments that help build resilient and empowered communities.

It provides EMPNG with a strong foundation for sustainable social and economic development in Papua New Guinea.

# 3



# WORKFORCE

EMPNG consistently seeks opportunities to support the ongoing career development of Papua New Guinean citizens.

### 3.1 Composition

As part of a commitment to national content building and enabling the full contribution of the Papua New Guinean workforce, in 2021 EMPNG updated reporting processes to include national content data from an additional 11 third-party contractor organisations. The categorisation of data was also improved to gain better insights into workforce trends and contractor initiatives. These enhancements will help EMPNG and contractors optimise the tracking and stewardship of national content performance metrics and initiatives that are intended to support economic development in Papua New Guinea.

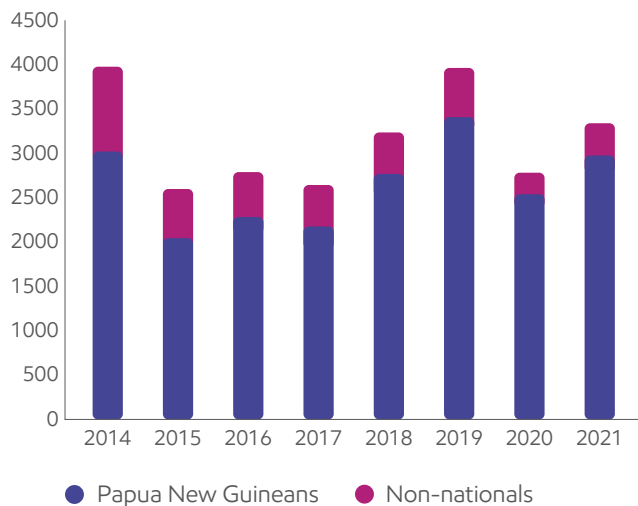


**National Content Analyst, Dari Verave-Tokilivila**

At the end of 2021, the PNG LNG workforce was 3339 workers. This included EMPNG employees and personnel from 25 third-party contractor organisations working on production-related activities for PNG LNG. The PNG LNG workforce included 2978 Papua New Guinean workers, as shown in Figure 3.1.

**Figure 3.1 – Production workforce**

NUMBER OF WORKERS BY YEAR



Of the Papua New Guinean workforce in 2021, 19 percent is female, which is consistent with 2020.

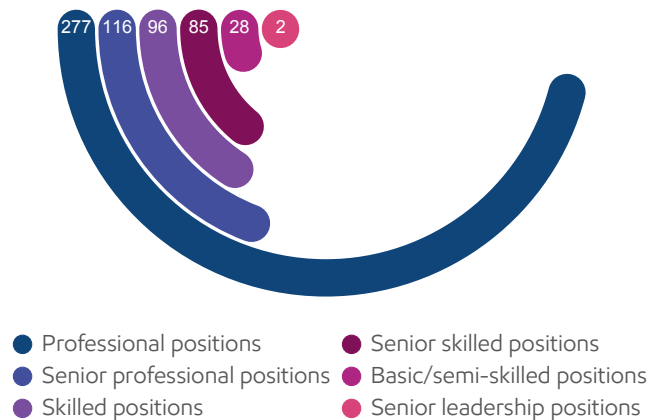
Fifty-four percent of the total PNG LNG workforce, including employees and contractors, is based in the Upstream area while 29 percent is based at the LNG Plant site. The rest of the workforce is based in other locations, such as the PNG LNG headquarters (ExxonMobil Haus) in Port Moresby.

Workers are recruited from areas near production facilities wherever possible, with 45 percent of Papua New Guinean workers of local origin proximate to PNG LNG operations, while 25 percent are of regional origin from provinces where PNG LNG operates. Approximately 30 percent originate from other areas of Papua New Guinea.

As shown in Figure 3.2, Papua New Guinean employees include: two senior leaders in general manager-level roles; 116 senior professionals such as supervisors and team leaders; 277 professionals in discipline-specific roles such as engineers, administrative professionals or accountants; 85 in senior skilled roles such as Level 3 operations and maintenance technicians; and 96 skilled workers, such as electricians and Level 1 and 2 operations and maintenance technicians. The remaining 28 hold basic/semi-skilled positions in roles such as drivers, security officers, radio operations, and apprentices. Eight supervisory roles were nationalised in 2021.

**Figure 3.2 – Employee positions**

NUMBER OF PAPUA NEW GUINEAN EMPNG EMPLOYEES BY POSITION TYPE



### 3.2 Training and development

EMPNG has a comprehensive workforce development approach that encompasses professional and personal development to build the skills and experience of workers for their long-term careers. This is delivered through programs such as in-house and external training, mentoring, employee networks and development forums, and short-term broadening assignments. These programs are helping workers such as Joyce Kopunye Tei to build their careers. Refer to Case Study – *Joyce joins leadership team*. Contractors also provide workforce training and development programs that are relevant to their scopes of work.

During 2021, EMPNG and its contractors delivered the equivalent of 117,785 hours of training to some 8840 participants through more than 2570 courses. Online courses continued, and face-to-face learning was reintroduced as pandemic restrictions eased. Ninety-two percent of training participants were Papua New Guineans, of which 22 percent were women.

## CASE STUDY

## JOYCE JOINS LEADERSHIP TEAM

Joyce Kopunye Tei from Jiwaka/Morobe Province will soon join EMPNG's leadership team following the announcement of her appointment as Environmental and Property Solutions Facilities Manager of ExxonMobil Haus, which she will begin in 2022.

Joyce's new leadership role will involve overseeing operations and maintenance of ExxonMobil Haus in Port Moresby, and managing ground transport and facilities for EMPNG.

The promotion comes within 15 months of Joyce being appointed as the Building Services Supervisor of ExxonMobil Haus.

In this role she has led a team of contractors and subcontractors to operate and maintain equipment such as emergency generators, water treatment plants, the air conditioning plant and elevators.

Joyce said both of these opportunities involved leading talented groups of people, who she had worked with during the past eight years, to ensure ExxonMobil Haus was a safe place to work.

Joyce has worked her way up the career ladder since starting as a graduate engineer with Ok Tedi Mining Limited in 2009. She joined the PNG LNG Project in 2011 and worked in roles such as Operations and Maintenance Engineer, Machinery Engineer before her appointment to the Building Services Supervisor position.

***"I have had a variety of job roles that have equipped me with technical skills and managerial soft skills but ultimately, it's my team that will help to ensure success in my new leadership role. I am optimistic of the future as we will be paving the way for a new breed of Papua New Guineans in EMPNG."***

Joyce said she was grateful for the opportunities that EMPNG had provided with training, skills development and career advancement.

She looks forward to starting the new role as Environmental and Property Solutions Facilities Manager of ExxonMobil Haus and later moving onto other departments within the company to broaden her skills and knowledge.

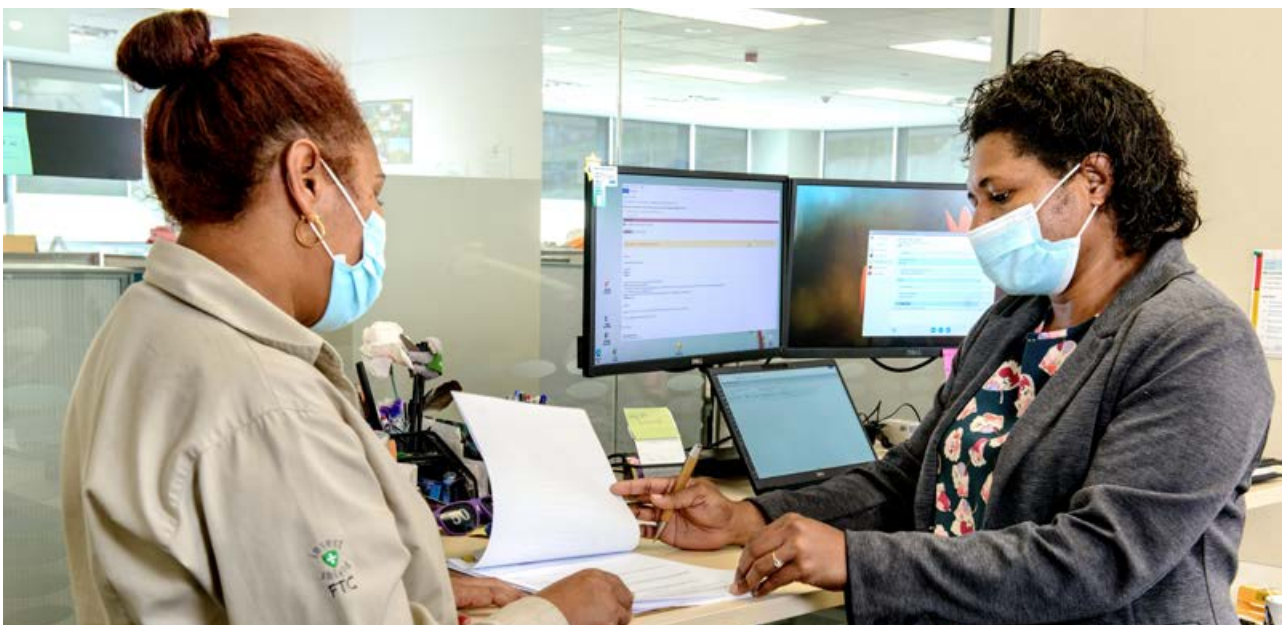
***"EMPNG has given me opportunities to travel the globe and participate in training to broaden and upskill myself. A career highlight for me was a business trip to Sakhalin, Russia where we only had one week to do a unit internal assessment. Even though the work was challenging, I learned a lot."***

Joyce encourages more women to seek careers in traditionally male-dominated career pathways and looks forward to mentoring employee teams.

She said the support of peers and mentors helped develop her career and Joyce looks forward to supporting EMPNG's nationalisation goals by encouraging other Papua New Guinean men and women within the company.

Her advice to women who are interested in engineering is not to be afraid of pursuing their interests.

***"Don't be scared if you realise that you are the only female among a class full of male colleagues at school, work or anywhere else. Remember there are a lot of women just like you out there. You can be your own worst enemy when you doubt your abilities, but if you can overcome yourself then you can overcome anything."***



Joyce Kopunye Tei (right) with Pacific Rim Constructors PNG Limited Procurement Officer, Christine Seta

### 3.2.1 EMPNG workforce training and development

The equivalent of more than 39,000 hours of training was delivered to EMPNG employees in 2021. Nearly 3000 participants completed some 1890 different courses. This equates to an average of 51 hours per employee during the year. Most of the content focused on safety process training and site inductions that were delivered online during the year.



**EMPNG Customer Experience Supervisor, Elmira Puy**

Thirty-three percent of course participants were from the Upstream area, and 38 percent from the LNG Plant site, with the rest from ExxonMobil Haus and elsewhere in Papua New Guinea.

Seventy-seven percent of course participants were Papua New Guinean, with women accounting for 35 percent. Since the start of production, 385,570 hours of employee training has been provided to EMPNG employees.



**EMPNG National Content Advisor, Zillar Miro consulting with National Content Manager, Sam Koyama**

As well as providing courses that develop technical skills, EMPNG delivers cultural awareness training. In 2021, 29 workers and three supervisors participated in this training through site inductions and specific cultural awareness training sessions.

#### *Engineering and technical professionals*

Throughout 2021, engineers were integral to PNG LNG operations and maintenance activities such as the inspection of multiple pipelines, recommissioning of the DMC for the fractionation system at the LNG Plant, and optimisation of naphtha.

Four engineers were recruited to EMPNG during the year, including one Integrity Engineer, one Machinery Engineer, one Surveillance Engineer, and one Electrical Engineer. Five interns were also engaged through the internship program, which involves recruiting graduate engineers in their third year of university study for on-the-job training at PNG LNG facilities. Following their internship, graduates may have the opportunity to join EMPNG’s graduate engineering program.

#### HIGHLIGHT

### GERARD GAINS A GLOBAL OPPORTUNITY

Engineer Gerard Schulze has secured a global opportunity as a Development Planner with ExxonMobil in the United States.

Gerard, from Kavieng in New Ireland, said he always wanted to work and live overseas. Since joining EMPNG as a mechanical engineering graduate in 2011, Gerard has completed on-the-job training in Melbourne, Australia and now an expatriate assignment in Houston, United States.

Gerard was among the first six Papua New Guineans recruited through EMPNG’s graduate engineering program during the construction phase. Within 10 years he has advanced his career by gaining experience in various operational, technical, maintenance and commercial roles. In 2019, Gerard became the first Papua New Guinean to be appointed as a Surveillance Engineering First Line Supervisor.

Gerard said he was excited for the opportunity to take the next significant step in his career with ExxonMobil.

“I am fortunate to have a career where I’ve been exposed to a broad range of exciting projects with EMPNG,” he said.

“It has given me multiple opportunities to engage with many knowledgeable people around the world to ultimately contribute to the development of Papua New Guinea.”



**Development Planner, Gerard Schulze, on expatriate assignment at the ExxonMobil Global Projects office in Houston, United States**

**HIGHLIGHT**

**NIATENG DRIVES DIGITAL TRANSFORMATION**

Niateng Pokanau, from Madang and Manus provinces, has been appointed to the newly created Digital Transformation Lead role with EMPNG. In this role, she identifies opportunities for digital transformation and integrates new technologies that optimise EMPNG’s systems and processes.

During 2021, Niateng led the adoption of RealWear, a wearable technology that supports high-definition, real-time video and two-way audio. This technology supports equipment and laboratory inspections and maintenance from international teams, which means specialist personnel do not need to physically travel from overseas to complete equipment reviews and maintenance.

Niateng started her career with EMPNG as an IT End User Support Analyst in 2012 and within four years was appointed IT Lead at the HGCP. In 2018, she was promoted as Supervisor of Customer Experience where she managed nine people who provide IT support within EMPNG.

Niateng said the Digital Transformation Lead role provided a unique opportunity to lead digital transformation for EMPNG.

“Digital transformation enables organisations to succeed in this digital age. My role is to identify high-value technology opportunities and drive transformation activities through engagement with the business and support teams. My focus is on delivering tools that make life better for users. One example is the RealWear video technology that is used in the field for remote support and inspections.”



**Digital Transformation Lead, Niateng Pokanau**

Due to ongoing COVID-19 restrictions, training for engineering professionals during 2021 involved courses conducted through live video conferencing with global ExxonMobil subject matter experts.

Topics included upstream facilities surveillance, materials and corrosion, offshore structural engineering, process safety, and root cause failure analysis.

A technical talk series also covered control valve sizing and selection, reading technical drawings, process surveillance, and a machinery overview.

The Engineers in Operations program, which was introduced in 2020, continued during 2021. This program involves engineering graduates shadowing operations and maintenance technicians at the LNG Plant site for four to six weeks to learn about operations and maintenance processes.



**Integrity Engineer, Sebastian Hemetsberger, turns a main isolation valve at the Kumul Petroleum Academy safe live plant**

Three engineers completed their early career milestones during the year. The Civil, Integrity and Electrical engineers completed a career progression program that included achieving technical skills and enhancing knowledge, engineering practices, and professional behaviours. This program aims to help engineers more confidently perform their job assignments with limited supervision.

The Operations Technical department created a Digital Transformation Lead role during 2021. This role’s responsibilities include identifying and integrating digital solutions for EMPNG.



**Pacific Rim Constructors PNG Limited Security Systems Technician, Stanley Gabi, using RealWear video technology to inspect CCTV cables**

*Operations and maintenance*

Papua New Guineans comprise 82 percent of operations and maintenance technician roles with EMPNG. All operations lead roles at the LNG Plant are occupied by Papua New Guinean technicians.



Intake seven of the Operations and Maintenance training program at the Kumul Petroleum Academy

Eighty operations and maintenance technicians have qualified as Competency Assurance Standard assessors. In this capacity, they verify the competency of a technician for a particular procedure or task. Papua New Guineans make up 55 percent of assessors, including six women. Technicians are selected by their supervisor to undertake training to become a Competency Assurance Standard assessor. To qualify, they must be a minimum of a Technician Level 3 and progressing to Lead Technician Level 4.



Control Room Technician, Leon Omoa, explaining the controls system to fifth intake operations and maintenance trainees, Alisha Onno and Vera Veratau, during on-the-job training at the HGCP

Operations and maintenance technicians are also offered opportunities to participate in broadening assignments that extend their skills outside of the operations and maintenance discipline. Upon completion of their assignments, technicians return to their operations and maintenance roles.

In 2021, two operations and maintenance technicians undertook broadening assignments as Process Safety Technicians. In this role they are responsible for leading process safety initiatives in the field and supporting high consequence scenario knowledge verification sessions. Another four operations and maintenance technicians started

broadening assignments across the areas of OIMS, contract administration, technical writing and information technology during the year.

EMPNG has welcomed its seventh intake of operations and maintenance technician trainees. The 24 trainees, including six women, are receiving their training through the Kumul Petroleum Academy. Seventeen trainees from the sixth intake of the Operations and Maintenance training program began on-the-job training in June after they completed their 12-month Junior Technician program at the Academy. Twelve of these trainees are assigned to the LNG Plant and five to the Upstream area.

To date, more than 270 Papua New Guineans have joined the Operations and Maintenance training program.



Operations Technicians, Ryan Tagai and McKoddom Pingin, from the sixth intake during training at the Kumul Petroleum Academy

By the end of 2021, 204 Operations and Maintenance training program graduates, including 53 women, were employed as operations and maintenance technicians. Refer to Case Study – *A decade of operations and maintenance training*. An additional 10 technicians from the Operations and Maintenance training program were employed in management and technical professional roles with EMPNG.

**CASE STUDY**

**A DECADE OF OPERATIONS AND MAINTENANCE TRAINING**

EMPNG has delivered more than a decade of the Operations and Maintenance training program, which has produced 204 qualified operations and maintenance technicians for PNG LNG operations.

The Operations and Maintenance training program invited submissions for its first applicant intake at the start of the PNG LNG construction phase. The first intake of 76 operations and maintenance trainees, including 20 women, were selected from more than 10,000 applicants to begin their training in July 2010.

Following Basic Skills training and Advanced Skills training, the trainees began on-the-job training as Junior Technicians at PNG LNG facilities in 2013. By the end of 2021, most of these technicians had progressed their careers to Technician Level 3, with five people reaching Technician Level 4, and three achieving supervisor roles.

EMPNG has now welcomed its seventh intake of 24 operations and maintenance trainees, including six women, who began their training in August 2021. They are on schedule to commence on-the-job training at PNG LNG facilities in August 2022.



**Former National Workforce Development Manager, Patti McNulty (centre), with the first intake of operations and maintenance trainees**

Women are strongly represented in the Operations and Maintenance training program. By the end of 2021, 34 percent of operations and maintenance technicians from the program were women. This includes three women in supervisor positions.

**HIGHLIGHT**

**KUMUL PETROLEUM ACADEMY**

Operations and maintenance trainees now have the benefit of completing their training in a world class facility that contains a safe live plant at the Kumul Petroleum Academy.

The Kumul Petroleum Academy is located at a site that was initially developed in 2010 as the Port Moresby Construction Training Facility for PNG LNG. Located in the grounds of Port Moresby Technical College, this facility delivered internationally accredited training courses to PNG LNG’s construction workforce. It was handed to the Papua New Guinean Government in July 2014 following completion of the construction phase.

After construction of a safe live plant, the training facility became the Kumul Petroleum Academy and accepted its first intake of Junior Technician program participants in 2016.

The Academy’s safe live plant was purpose-built with a state-of-the-art centralised control room designed for training future operations and maintenance technicians in a realistic, safe environment. This has proven successful in preparing trainees for live plant work at the LNG Plant and HGCP.

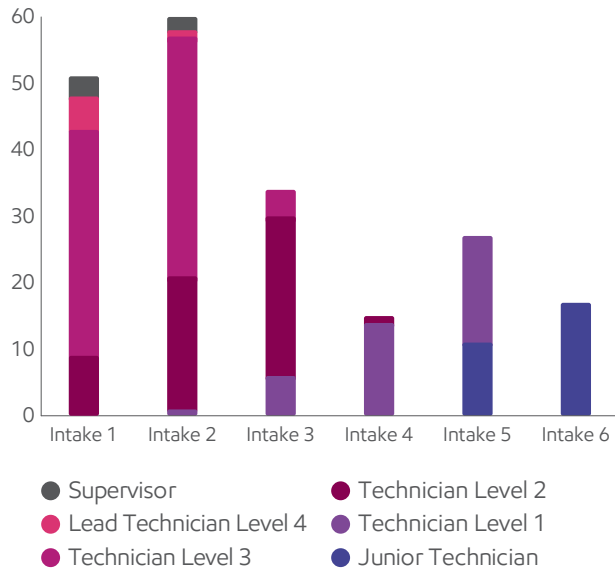


**The first EMPNG-sponsored trainees to undertake their operations and maintenance training at the Kumul Petroleum Academy**

CASE STUDY

A DECADE OF OPERATIONS AND MAINTENANCE TRAINING

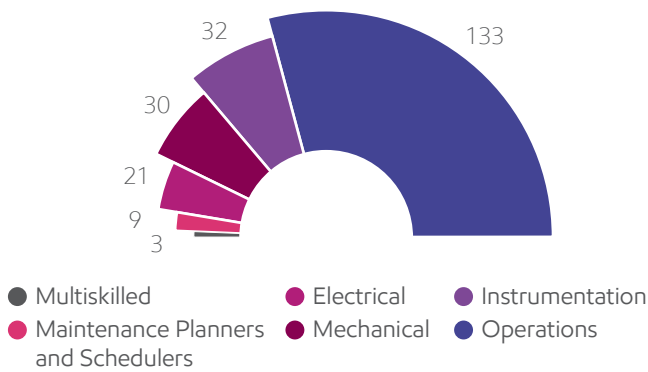
NUMBER OF TECHNICIANS BY TECHNICIAN LEVEL AND INTAKE



PERCENTAGE OF TECHNICIANS BY LOCATION AND INTAKE



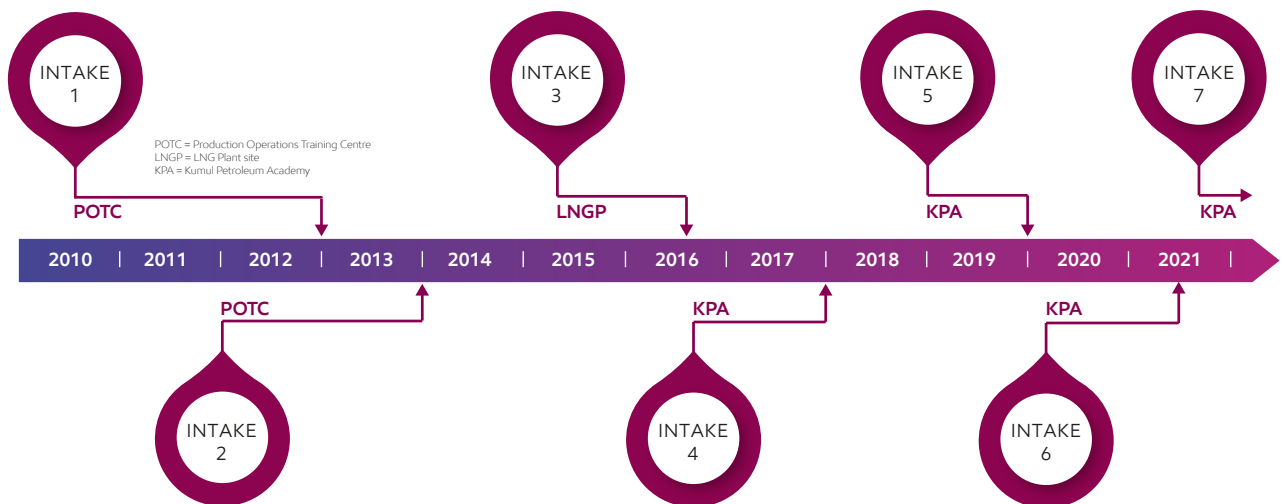
NUMBER OF TECHNICIANS BY DISCIPLINE



● LNG Plant ● HGCP

\* Intake 7 are yet to be placed

Timeline of Operations and Maintenance training program from intake to commencement of on-the-job training





**EMPNG LNG Plant Electrical Technician, Stephanie Raphael, from the fifth intake of the Operations and Maintenance training program**

More than 60 percent of technicians are based at the LNG Plant, and almost 40 percent at the HGCP. For the maintenance disciplines: 30 are Mechanical, 26 are Instrumentation, and 21 are Electrical Technicians, while nine are Maintenance Planners and Schedulers. In the operations discipline there are 115 Operations Technicians and three multiskilled technicians.

In 2021, two operations and maintenance technicians became the first Papua New Guineans to be appointed as Well Operations Technicians. They will support Hides well diagnostics and preparations for Angore drilling activities.

Operations and maintenance technicians have a training progression plan, starting at Junior Technician level. Trainees can progress from Junior Technician level through to Technician Levels 1, 2 and 3.

There is also the opportunity to progress to Lead Technician Level 4 and/or supervisory level and beyond. It takes approximately 11 years to progress from a Junior Technician to Lead Technician.

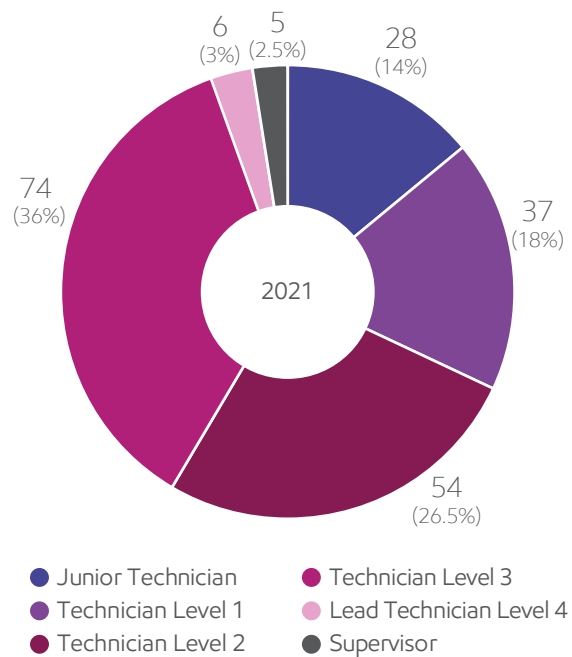
Some 30 percent of operations and maintenance technicians progressed to the next Technician Level during 2021. The current levels of operations and maintenance technicians are shown in Figure 3.3.

### 3.2.2 Contractor training and development

Contractors provided the equivalent of 78,775 hours of training through 682 different courses to more than 5850 participants during 2021. This equates to an average of 33 hours of training per person across PNG LNG’s contractor workforce.

**Figure 3.3 – Operations and Maintenance technicians**

NUMBER AND PERCENTAGE BY TECHNICIAN LEVEL



This is a significant increase compared to 36,370 in 2020. The increase was primarily due to employee recruitment and induction training for the resumption of Angore Gathering System and earthquake recovery works as pandemic restrictions eased.

Since the start of production, contractors have provided the equivalent of 315,940 hours of training to more than 83,500 participants. All contractor training was provided to Papua New Guinean citizens, of which 17 percent were women.

Fifty-six percent of participants were located in the Upstream area, while 32 percent were at the LNG Plant, and the remaining 12 percent at contractor offices and other off-site locations. Fifty-one percent of contractor training participants were employed from local communities, while 33 percent were from a province in which EMPNG operates. The remaining 16 percent were from elsewhere in Papua New Guinea.

Contractor training delivered during 2021 primarily focused on safety, security, health and environmental topics, which comprised 71 percent of total training hours. Administrative, basic and induction training accounted for 14 percent of training hours, while trade training was 11 percent of training hours. Other training topics included technical and professional training, and leadership and management training.

2021 PERFORMANCE HIGHLIGHTS

WORKFORCE



**3339**  
TOTAL WORKERS



**2570+**  
TRAINING COURSES



**82%** PNG  
O&M TECHNICIANS



**89%**

PAPUA NEW GUINEANS IN THE PNG LNG WORKFORCE

'PNG LNG workforce' includes 'workers' consisting of: 'employees' comprising direct EMPNG employees for PNG LNG and staff contractors; and 'contractors', meaning third-party contractors.

PRIORITY 1



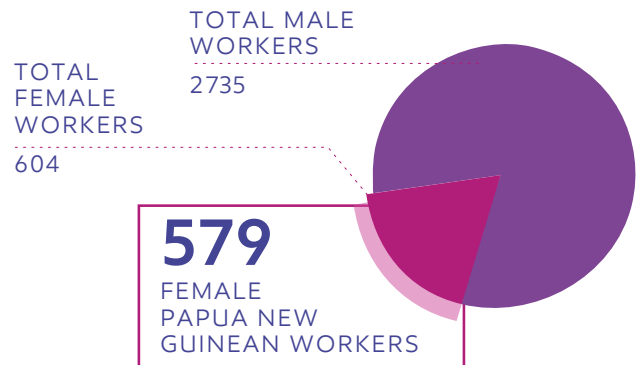
PRIORITY 2



PRIORITY 3



- PRIORITY 1** Papua New Guinean citizens of local origin proximate to PNG LNG operations
- PRIORITY 2** Papua New Guinean citizens of regional origin (Southern Highlands, Hela, Western, Gulf, and Central provinces and the National Capital District)
- PRIORITY 3** Papua New Guinean citizens originating from elsewhere in Papua New Guinea



**117,785** HOURS OF TRAINING DELIVERED IN 2021



1894 COURSES

2986 PARTICIPANTS

51hrs/person AVERAGE

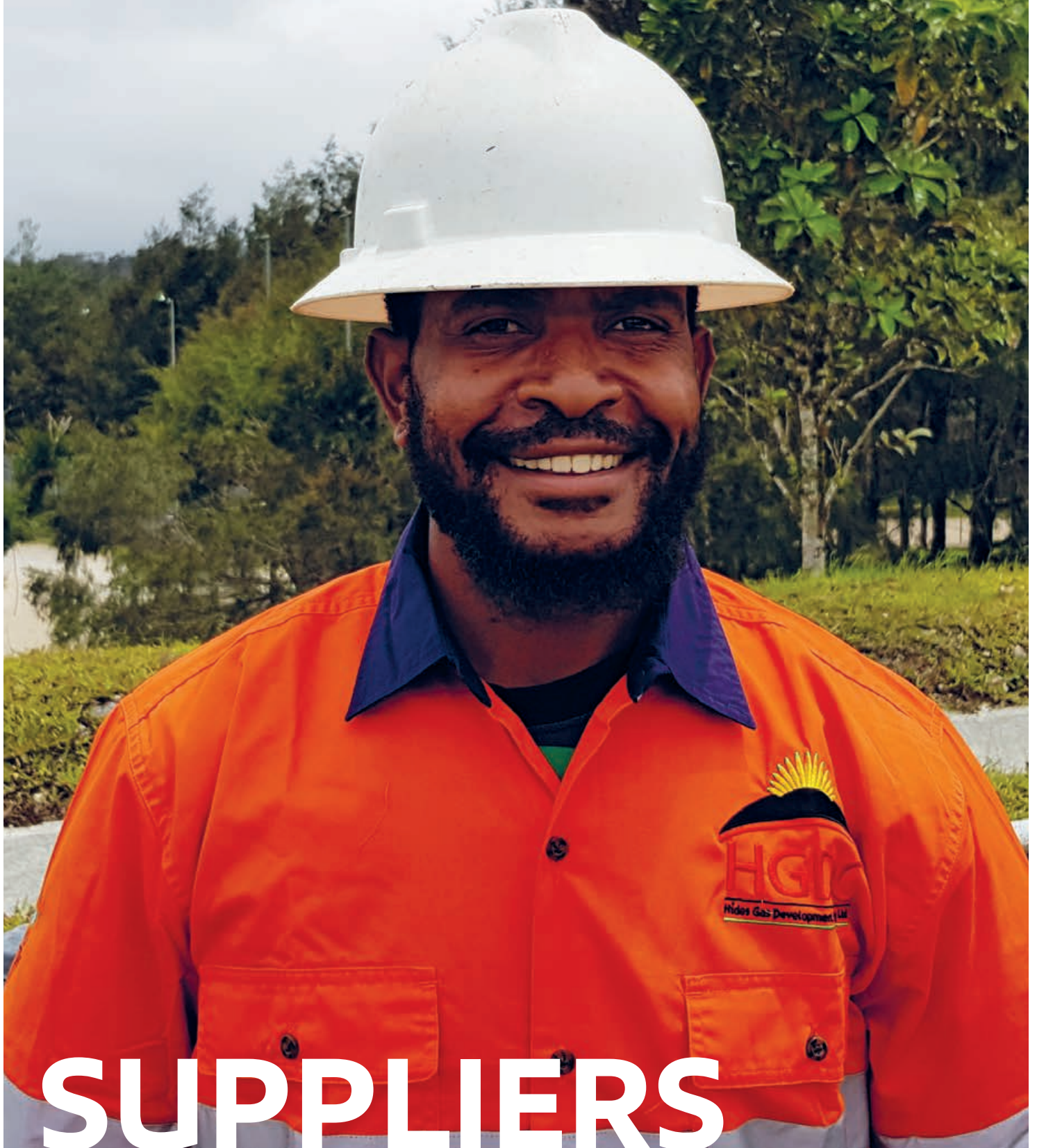


682 COURSES

5854 PARTICIPANTS

33hrs/person AVERAGE

# 4



# SUPPLIERS

EMPNG actively supports the growth and capacity building of Papua New Guinean businesses in recognition of their importance in providing sustainable social and economic development opportunities for the nation.

## 4.1 Procurement and suppliers

EMPNG is committed to supporting the development of Papua New Guinean businesses so they can become self-sustaining enterprises.

Landowner Companies (Lancos) are engaged for services such as road maintenance, civil and construction works, transportation of personnel, fuel distribution, security, camp maintenance and catering, vehicle maintenance, and labour hire.

Non-Lanco businesses provide services including road maintenance, transportation of personnel, security, freight and logistics, catering and food supply, customs clearance, maintenance, surveying, inspection and testing, medical services, and waste management.

During 2021, 10 Lancos and 110 non-Lanco Papua New Guinean businesses were engaged in production-related activities.

EMPNG's total in-country spend with Papua New Guinean businesses in 2021 was PGK645 million (USD183.8 million) compared to PGK817 million (USD232.9 million) in 2020. Approximately 29 percent of the in-country spend in 2021 was spent on Lanco services, which equates to PGK185 million (USD52.7 million) compared to PGK311 million (USD88.7 million) spent on Lanco services in 2020.

The number of Papua New Guinean businesses engaged in 2021, and the correlating in-country spend, decreased compared to 2020 due to the sustained impact of COVID-19 restrictions.

Since the start of production, EMPNG has spent PGK5.2 billion (USD1.5 billion) on Papua New Guinean services, of which PGK1.6 billion (USD456 million) was spent with Lancos.

## 4.2 Capacity building

Through providing relevant training and business development opportunities, EMPNG aims to support the capacity development of Papua New Guinean businesses.

### HIGHLIGHT

#### HIDES SECURITY SERVICES LIMITED TAKES TOP AWARD

Lanco, Hides Security Services Limited was presented with the Best National Content Contribution of the Year Award at EMPNG's second annual Contractor National Content Awards.

Hides Security Services Limited received the Award for its strong commitment to recruiting Papua New Guineans. In the first half of 2021, the company increased its Papua New Guinean workforce from 40 percent to 60 percent.

Papua New Guinea business FALCK PNG Limited was honoured for achieving a 100 percent Papua New Guinean workforce, which included replacing non-national workers with local experienced workers in fire chief positions. FALCK PNG Limited also recruited its first female fire fighters for PNG LNG operations.

In addition to the award winners, numerous local companies replaced non-nationals with Papua New Guinean citizens during the year. For example, International SOS has replaced a non-national worker with an experienced local resource to oversee the delivery of EMPNG's malaria, tuberculosis, and alcohol and drug prevention programs.



**FALCK PNG Limited Chief Fire Officer, Clive Kasua, receives a national content award from EMPNG LNG Plant Superintendent, Paul Case**



**Hides Security Services Limited workers with the Best National Content Contribution of the Year Award at the HGCP**

## HIGHLIGHT

## CONTRACTOR TRAINING BOOSTS EFFICIENCIES

Non-destructive Testing Technicians from contractor Nares Engineers Limited are gaining skills in new digital radiography inspection technology and processes with support from EMPNG.

In 2021, four technicians received digital radiography training using state-of-the-art technology to improve efficiencies in radiographic testing and build the skills and capacity of contractor teams.

Radiographic testing is a non-destructive testing method that uses either x-rays or gamma rays to examine the internal structure of manufactured components like piping to identify any flaws or defects such as corrosion. It requires imagery to be taken of the components, with the images then processed off-site.

Prior to the digital radiography training, Nares Engineers Limited technicians used conventional radiographic testing to inspect the integrity of components of PNG LNG facilities. This involved processing films in a dark room with the use of chemicals. Unlike conventional testing, digital radiography instantly produces a digital radiographic image on a computer. This allows technicians to inspect the integrity of components at the HGCP and LNG Plant more efficiently. The technology eliminates the need for many of the requirements of conventional radiographic testing, including chemical processors, processor maintenance, filing and mailing jackets, and a dark room to process images.

EMPNG Integrity Execution Lead, Andrew Hemetsberger, said "This was the most intensive year for inspections as we had the highest number since production began. Digital radiography has helped us save time and improve efficiencies, with the processing and reporting taking up to two hours less per image than traditional radiographic testing.

"Additionally, this new technology removes safety and environmental risks associated with the chemicals required for conventional radiographic testing.

"We will continue to train and support Papua New Guinean contractor technicians to build their knowledge and skills, and further improve operational efficiencies."

Nares Engineers Limited, Non-destructive Testing Technician, Israel Kuilenge, said that in addition to saving time, digital radiography improved the accuracy of facility testing.

"We appreciate EMPNG's support in developing our technicians' skills, which has helped us improve the accuracy of inspections, and we look forward to acquiring further skills in non-destructive testing processes," he said.



**Nares Engineering Limited, Radiography Technician, Ken Wake, setting up digital radiography equipment for a pipeline inspection (above) and processing digital radiography images (below)**



In June, EMPNG sponsored the Extractive Industry Supplier Development workshop, which involved business and government leaders meeting to discuss partnerships to support economic growth.

The workshop was part of a public and private sector advocacy platform called Praivet Gavamani Konnect 2 (PGK2) focused on efforts to rescue, recover and rebuild the economy following the impact of COVID-19. It involved operators, suppliers and Lancos sharing business development models and key learnings. At the workshop, EMPNG presented an investment lifecycle of petroleum and mining projects to help guide business and government planning.

EMPNG's National Content Plan was acknowledged by the Papua New Guinea Department of Petroleum and Energy as a template that could support the Papua New Guinean Government's national content planning.

EMPNG also continued to support the nationalisation of its workforce and contractors. In 2021, the contractor responsible for maintaining and repairing the marine loading arms at the LNG Plant Marine Terminal recruited three Papua New Guinean workers through Lanco, Laba Holdings Limited, with support from EMPNG. The new recruits are completing mechanical fitter training for ongoing employment with this contractor.



**Newly recruited Technician Level 1 trainee, Tom Homoka (back right), learning how to install a new insulation joint at the LNG Plant Marine Terminal**

During the past decade, EMPNG has helped build the capacity of many Papua New Guinean businesses, including PNG LNG’s two representative Lancos, by supporting the work of the Enterprise Centre.

Overseen by the Papua New Guinea Institute of Banking and Business Management, the Centre was established by PNG LNG in 2010. It now provides services to mining and petroleum industry operators and their suppliers, as well as to other large Papua New Guinean businesses.

During 2021, the Enterprise Centre completed three business assessments for Papua New Guinean companies. EMPNG also continued to work with the Centre to identify local companies and Lancos that qualified for business assessments in 2022.

The 2020 Annual Local Business Development Report, and the 2020 Employment, Training and Development Report were prepared and presented by EMPNG’s National Content team to agencies such as: the Department of Petroleum and Energy; Department of Commerce and Industry; the Department of Higher Education, Research, Science and Technology; and the Department of Labour and Industrial Relations during 2021.

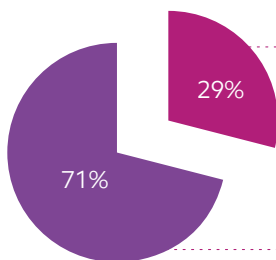
2021 PERFORMANCE HIGHLIGHTS

SUPPLIERS



**PGK645M**

SPENT IN-COUNTRY WITH PAPUA NEW GUINEAN BUSINESSES IN 2021



**LANCOS**

PGK185M IN 2021  
PGK1.6B SINCE START OF PRODUCTION

**NON-LANCOS**

PGK460M IN 2021  
PGK3.6B SINCE START OF PRODUCTION



**PGK5.2B**

SPENT IN-COUNTRY WITH PAPUA NEW GUINEAN BUSINESSES SINCE THE START OF PRODUCTION



**120**

LOCAL BUSINESSES WORKING ON PNG LNG

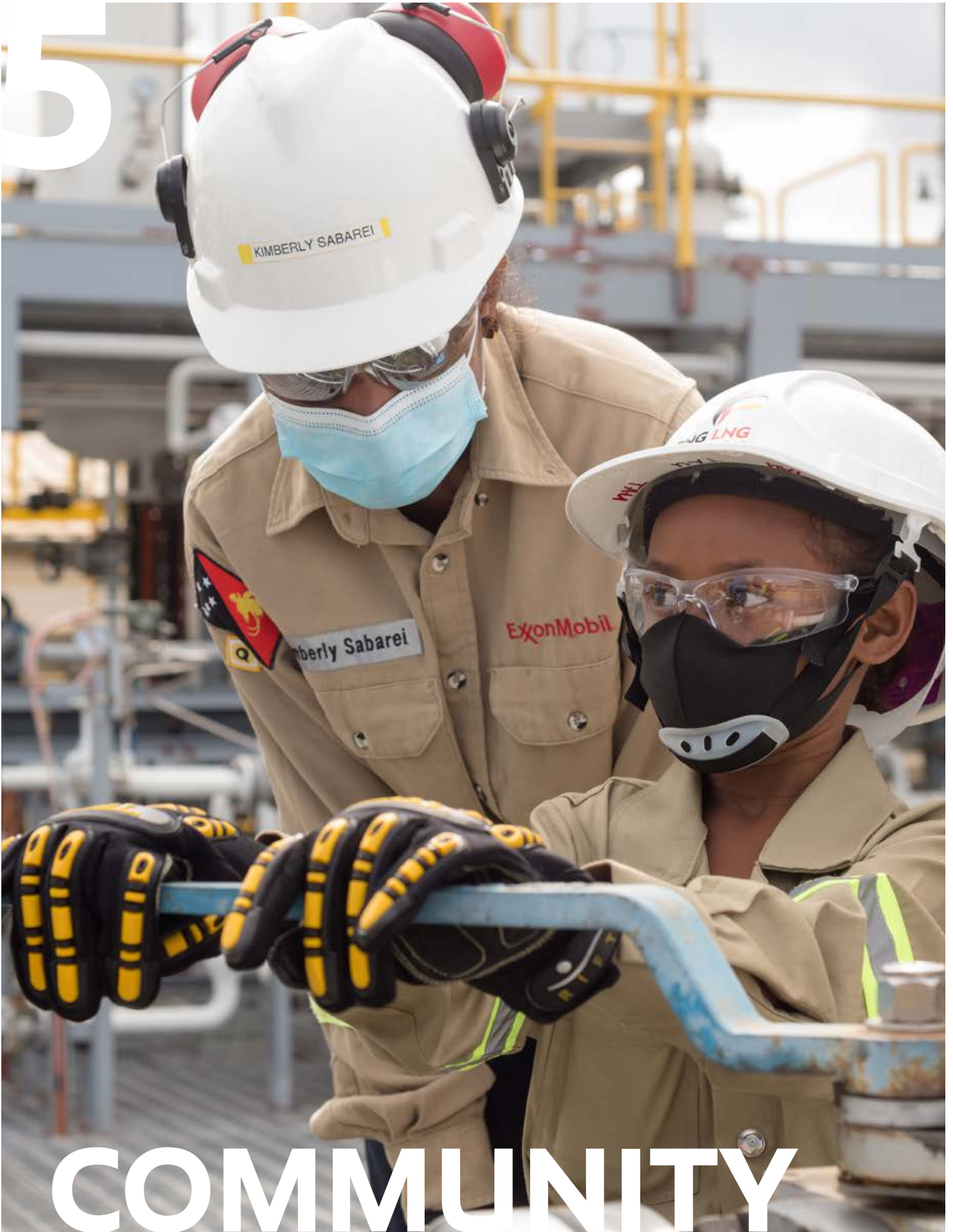
**LANCOS**

**110**

NON-LANCO PNG BUSINESSES

**10**

5



# COMMUNITY

EMPNG works with communities, government and non-government organisations to promote inclusive and sustainable community initiatives with the shared value of building resilient and empowered communities.

## 5.1 Strategic community investment

EMPNG encourages sustainable community and economic development through its strategic community investment programs. These programs encompass education, health, livelihood support, law and justice, environment awareness, key infrastructure improvements and community-based initiatives.

Each of these activities is conducted in accordance with their relevant geographic area, which covers:

- local area programs in communities impacted by PNG LNG
- impacted provinces – programs that support initiatives at the provincial level and include activities aligned with provincial and local-level governments and development partners
- national programs that include broader scale capacity building projects and support projects at provincial and local levels.

In 2021, EMPNG invested PGK8.5 million (USD2.4 million) in the community through contributions, sponsorships, in-kind support and community-based projects.

An additional PGK50.8 million (USD14.5 million) was invested in local infrastructure through infrastructure tax credit projects. EMPNG continued to support the Papua New Guinean Government’s COVID-19 emergency response, with a PGK4.3 million (USD1.2 million) commitment in 2021 for pandemic relief efforts across the National Coordination Centre, and provincial health authorities in the National Capital District, Hela and Central provinces.

This provided much needed supplies and equipment to health authorities such as medical supplies, mobile clinics and vehicles for contact tracing. These initiatives are outlined in further detail within this section.

### 5.1.1 Local area programs

Local area programs are undertaken together with communities to deliver training and business development opportunities for women, quality education for school students, and support for community-based health and well-being initiatives. These programs are intended to build the sustainable capacity of local communities.

#### *Upstream area and pipeline Right of Way*

EMPNG is funding the construction of a new resource centre, store building, community market building, wash bay facilities and multi-purpose basketball and volleyball court for communities located near Hides Wellpad A. These facilities, worth PGK4.6 million (USD1.3 million), are being constructed by Lanco, Hides Gas Development Company Limited.

In 2021, EMPNG announced the winners of the inaugural 2020 Kikori School Recycling Challenge. The challenge, which was held in October and November 2020, involved seven schools along the Kikori River region.

#### HIGHLIGHT

### BRIDGING THE DIGITAL DIVIDE

EMPNG is working with world-wide charity, LiteHaus International, to help bridge the digital divide in the Upstream area.

In 2021, EMPNG provided funding to the LiteHaus Digital Infrastructure Program for the installation of computer laboratories in 27 primary schools across Hela Province, with nine installations completed in 2021. Each laboratory consists of 15 desktop computers with software, an e-library, access to a Digital Skills Passport, a 50-inch display screen with connectivity to devices that support teaching, and 24-hour remote technical support, as well as in-person support. The new computer laboratories will support the digital learning needs of more than 13,000 students and teachers in Hela Province.

Through the LiteHaus Digital Infrastructure Program, students and teachers gain access to digital learning tools. This Program has already established 28 primary school computer laboratories in Papua New Guinea, which provide digital learning opportunities to more than 27,000 students.



**LiteHaus International Technical Lead, Joe Nongur (standing), helps Komo Catholic School Grade 8 students navigate a Digital Skills Passport, which provides the fundamentals of digital competency**



**Students from Komo Catholic School in Hela Province are gaining digital skills with support from LiteHaus International and EMPNG**

Supported through a collaborative partnership between EMPNG, Piku Biodiversity Network Inc., the CDI Foundation and Digicel Foundation, the challenge involved students creating items made from recycled materials to demonstrate the benefits of recycling. Winners included: Kopi Primary School with a battery-operated helicopter; Kikori Primary School with a windmill that generated electricity for Christmas lights; and Aird Hills Primary School that created household ornaments such as vases, flowerpots and plastic flowers.



**Kikori Secondary School students prepare for the Kikori School Recycling Challenge**

EMPNG has handed over a new three-bedroom teacher’s house constructed by the Adventist Development and Relief Agency PNG for the Komo Seventh Day Adventist Primary School. The PGK307,000 (USD87,495) house was funded as part of EMPNG’s earthquake response and recovery support program.

Eight primary schools in Hides and Komo have received hand wash stations funded by EMPNG. The hand wash stations include water tanks installed at school buildings to supply clean water. Schools also received face masks, hand sanitisers, soaps and thermometers to help prevent the spread of COVID-19.

**LNG Plant site**

In 2021, the new Papa Community Resource Centre was officially opened. The Resource Centre was constructed by Lanco, Laba Holdings Limited, and funded by EMPNG. It includes a large conference room, office space, kitchen and restroom facilities. The Resource Centre provides a place for local community members to conduct social events, meetings and training.

In May, Porebada Elementary School received a new school building and classroom furniture also constructed by Lanco, Laba Holdings Limited, and funded by EMPNG. The new building consists of eight student classrooms and a staff office, which are all fully furnished with desks and chairs. The new facility also has a 9000-litre water tank. It will be used for more than 500 students from Porebada Village and nearby communities and replaces an old classroom that needed extensive repairs.



**Students using one of the new classrooms at Porebada Elementary School for the first time**

The Edai Town Flexible Open and Distance Education Study Centre, which was opened in 2020 and has some 40 students enrolled from LNG Plant villages, received a donation of laptops, a projector and office equipment from EMPNG. The new equipment will enhance the learning environment for students and teachers, who previously had to line up to use equipment at the Edai Township office.



**Papa Community Resource Centre was handed over to the local community in 2021**

EMPNG also donated laptops to the Buria Community Police Post in Lea Lea Village to support policing activities.

The Hiri West Netball Association has received a donation of sporting equipment from EMPNG. The equipment, consisting of netballs, first aid kits, whistles, gazebos, folding tables, coolers, t-shirts and megaphones, was used for the Kairuku-Hiri Netball Tournament held during the year. Through the Association, the donation was distributed to netball groups across Papa, Lea Lea, Boera, Porebada and Kido villages. This is the second consecutive year that EMPNG has supported the Hiri West Netball Association.



**President of Hiri West Netball Association, Bera Reuben, receives a sporting equipment donation from EMPNG**

Bogi Literacy School in Lea Lea Village has new playground equipment donated by EMPNG. The school has 60 students and serves as an early learning centre for children between the ages of five and eight. In addition to the playground equipment for Bogi Literacy School, EMPNG donated two televisions for staff houses at Redscar High School and Lea Lea Primary School.

*Community Infrastructure Trust Fund projects*

The Mineral Resources Development Company Limited, which distributes landowner royalty payments derived from PNG LNG production, funded two Community Infrastructure Trust Fund projects during the year.

A two-storey community hall in Boera Village will provide local communities with facilities including two meeting rooms, four offices, and a kitchen. In Lea Lea Village, a community hall is being constructed to include facilities such as an open meeting space, four offices and a kitchen. Both halls will be handed over to these communities during 2022.

**5.1.2 Provincial programs**

EMPNG, in partnership with the Hela Provincial Government, launched a PGK2.5 million (USD712,500) Hela Education Program in 2021 to provide student tuition fees and additional support for more than 3000 secondary students in Hela. This will help keep students in school, as secondary student engagement became challenging due to the economic impacts on families following the 2018 earthquake and the onset of COVID-19.

**HIGHLIGHT**

**TRAINING FOR HELA HEALTHCARE WORKERS**

In August, 23 healthcare workers from Hela Province received three days of intensive training on the diagnosis, treatment and management of tuberculosis, HIV and malnutrition in children. The training was delivered through a partnership between EMPNG, the Paediatric Society of Papua New Guinea, Baylor College of Medicine and Texas Children’s Hospital.

Healthcare workers from seven health centres across three districts in the Hela Province participated in the training, which included practical sessions on obtaining samples for GeneXpert testing to diagnose tuberculosis, and information about the latest HIV treatment guidelines.

Some 40 percent of tuberculosis cases recorded in the Hela Province during 2020 were in children. The training program delivered in 2021 is helping to build the skills and knowledge of local healthcare workers so they can quickly diagnose and treat tuberculosis, and achieve overall better health outcomes for patients and communities.

Following the training, EMPNG donated 800 nasogastric tubes, 100 Child Standard Treatment manuals, 30 HIV treatment manuals, 200 specimen collection cups, fine needle aspiration biopsy needles, and 200 mid-upper arm circumference tapes to health facilities in Hela.



**Hela Provincial Health Authority Deputy Director for Primary Health, Rhondi Hapolo, opens a three-day intensive training program for Hela healthcare workers**



**Trainers and training participants with medical supplies donated by EMPNG**



**EMPNG Managing Director, Peter Larden, and Governor of Hela Province, Philip Undialu, launch the Hela Education Program**

Fifty Papua New Guineans were awarded scholarships funded by EMPNG as part of the 2021 Business and Professional Women’s Association PNG LNG In-Country Scholarships Program for Higher Education in Papua New Guinea. These scholarships are helping students to access high school and tertiary education. Since the start of EMPNG’s partnership with Business and Professional Women’s Association in 2019, ninety students have benefited from this Program.

To support Papua New Guinea’s efforts to combat COVID-19, EMPNG donated a mobile health clinic plus a second bus to transport staff for the Motu Koita Assembly’s vaccination program in the National Capital District.



**EMPNG donated a mobile health clinic that is being used for the Motu Koita Assembly’s vaccination program**

EMPNG also donated 1500 GeneXpert testing cartridges to the Hela Provincial Health Authority to boost COVID-19 testing capabilities across the Hela Province.

EMPNG provided logistics support for the United Nations’ response to help communities impacted by violence in Hela Province during 2021.



**EMPNG provided logistics support to deliver supplies to displaced families in Tari**

The support involved the rapid delivery of more than 4000 kilograms of supplies to some 1000 families displaced by unrest in Tari. Supplies included tarpaulins, water containers, hygiene kits, jerry cans, portable fuel stoves and water purification tablets.

### 5.1.3 National programs

In April, EMPNG donated 10 new vehicles to support the Papua New Guinea National Control Centre’s COVID-19 response. The two 25-seater buses, six mini-vans and two station wagons are being used by Papua New Guinean authorities for contact tracing, community education, and the transportation of personal protective equipment and COVID-19 test samples.

EMPNG also supported the National Department of Health and National Control Centre with a donation of medical equipment, a generator and food to Port Moresby General Hospital. In addition, EMPNG has provided logistics support to transport medical supplies between Port Moresby and the Hela Province, and COVID-19 test samples to the Papua New Guinea Institute of Medical Research in Goroka, Eastern Highlands Province for analysis.



**EMPNG Projects Advisor, Peter Leahy with some of the vehicles donated by EMPNG to support the National Control Centre’s COVID-19 response**

Further support was provided to the National Department of Health through the development of a community awareness video and print materials featuring PNG Kumuls and Melbourne Storm Rugby League star, Justin Olam, supporting Papua New Guinea’s COVID-19 vaccination program.



**PNG Kumuls and Melbourne Storm Rugby League star, Justin Olam**

To encourage children to consider careers in science, technology, engineering and mathematics, EMPNG has donated 10 refurbished laptops and a projector to Papua New Guinea Flying Labs.

For the past decade, Papua New Guinea Flying Labs has worked with organisations to deliver tailored coding and drone technology programs for school children.



**EMPNG IT Facilities Health Check Coordinator, Samantha Kuase (right), presents refurbished laptops and a projector to PNG Flying Labs Co-Founders Sophia-Joy Soli and Kevin Soli**

The laptops and projector will be used to conduct interactive digital literacy classes.

EMPNG supported literacy week activities in September with staff helping Buk bilong Pikinini hold a market day at its Library Learning Centres under the theme ‘My Country My Story’. To help develop financial literacy skills through play-based learning, one of the stalls was managed by children who practiced buying and selling play food items with play money.

Mini cash registers, trolleys and play food items were donated by EMPNG, which also sponsored the development of a new video to teach children about Papua New Guinea’s currency and basic finance literacy. EMPNG is working with Buk bilong Pikinini on the development of a new book for school students, see Case Study – *When I grow up, I want to be an engineer!*

During 2021, 47 participants from Lae, Lorengau, Goroka, Alotau and Port Moresby attended Early Childhood Refresher Training delivered by Buk bilong Pikinini with funding support from EMPNG. The training covered topics such as class management and behaviour strategies, inclusive education and sign language, digital learning, early childhood development, child protection, library management, phonics, and first aid.



**EMPNG Operations Manager, Shameka Nelson, presents at the annual teacher training refresher program**

Participants received tablets to help them deliver Buk bilong Pikinini’s digital learning program in their local Library Learning Centre. Each tablet has Buk bilong Pikinini’s digital learning app, which consists of curriculum-based learning



Teachers attending the Buk bilong Pikinini Early Childhood Refresher Training program

games, audio books and stories developed to increase word recognition, spelling and reading in children. As well as audio versions of Buk bilong Pikinini’s published books, the app includes cultural stories collected from all regions of Papua New Guinea. These stories cover traditional practices and customs under the themes of the ocean, village-life, forest and animals.

During 2021, EMPNG donated seven desktop computers and provided IT support to the Port Moresby Nature Park by relocating servers and communications equipment to a single rack cabinet. This has freed up space in the Park’s education office where the IT equipment was stored. The servers are helping the Park upgrade point of sale applications and increase network storage. EMPNG has provided operational support and donated IT equipment to the Port Moresby Nature Park since 2013. This includes regularly helping the Park to rebuild computers, repair servers, and improve network capacity.

EMPNG funded community grants worth more than PGK385,960 (USD110,000) in 2021 to support the work of organisations including Cheshire disAbility Services, the Business Council of Papua New Guinea, the Institution of Engineers Papua New Guinea Inc., Femili PNG, St John Ambulance, and the Sir Theo Foundation, which provides financial support to Port Moresby General Hospital. The funding also included continued support for the Rotarians Against Malaria health program in the National Capital District. The program started in November 2020 and involves interviewing malaria patients and mapping areas that have a potential malaria risk, with the aim of reducing malaria in the region.

## 5.2 Volunteering

More than 80 EMPNG workers contributed some 105 volunteer hours during 2021.

In February, EMPNG volunteers supported Papua New Guinea Flying Labs with delivering a three-week school holiday program where 37 children from the Laloki area near Port Moresby were introduced to computers, visual programming, drone flying, robotics and electronics.



EMPNG volunteer, Rosinta Lakasa, supports the Papua New Guinea Flying Labs school holiday program

To support biodiversity restoration as part of EMPNG’s commitment to ‘Protect Tomorrow. Today’, 57 LNG Plant site volunteers participated in mangrove planting at mudflats near the LNG Plant site in July.

In September, 14 EMPNG volunteers supported Buk bilong Pikinini Literacy Week activities by helping children operate a mini supermarket stall to learn about financial literacy.



**Volunteers conducting mangrove planting**



**EMPNG volunteers help Buk bilong Pikinini children operate their mini supermarket during Literacy Week celebrations**

Students from SHEN Early Learning School in Boera Village received 10 custom-made desks built by volunteers from the LNG Plant Maintenance team.

The volunteers worked on Christmas Day to ensure the desks would be delivered in time for the start of the 2022 school year.



**SHEN Early Learning School students seated at the new desks**

*Science Ambassador Program*

Almost 50 students from four schools near the LNG Plant site participated in the ExxonMobil Science Ambassador Program in 2021.

The Program encourages high school students to consider careers in science, technology, engineering and mathematics through interactive educational activities. It involves EMPNG volunteers visiting schools to conduct practical experiments and deliver lessons on topics such as rocks and geology, and the origins of oil and gas.

Due to pandemic restrictions throughout 2021, the Science Ambassador Program was delivered by the non-government organisation Papua New Guinea Flying Labs with support from six EMPNG volunteers.

Students learned coding by transforming simple circles into an animated coronavirus and white blood cells computer game, and simple squares into robots for a chatbot program. They also instructed the chatbot program to speak in Motu and Koitabu languages.

Almost 5050 students have participated in the Science Ambassador Program since its inception in Papua New Guinea in 2013.



**Papa Primary School students coding instructions to create a computer game**

**CASE STUDY**

**WHEN I GROW UP, I WANT TO BE AN ENGINEER!**

Five-year-old Dorcas Kilalema had the chance to experience life as an engineer with EMPNG in July as part of Buk bilong Pikinini’s Early Childhood Education program.

Buk bilong Pikinini has established Library Learning Centres across Papua New Guinea to provide free early childhood learning programs. These programs encompass literacy, numeracy, digital learning, health awareness and cultural knowledge. The Early Childhood Education program provides a foundation in problem solving, science, technology, engineering and mathematics. Buk bilong Pikinini also offers teacher training, community library services and special needs teaching. As part of its programs, Buk bilong Pikinini creates and publishes its own series of books featuring Papua New Guinean children and culture.



**Dorcas Kilalema exploring the safe live plant Kumul Petroleum Academy**

Through collaboration between Buk bilong Pikinini, EMPNG and the Kumul Petroleum Academy, Dorcas had a unique opportunity to spend time learning what it takes to be an engineer. EMPNG engineers, Kimberley Sabarei and Sebastian Hemetsberger, showed Dorcas through the Kumul Petroleum Academy where she had the chance to see a safe live oil and gas process plant and control room, as well as valves, compressors and pipelines. During her visit, Dorcas learned how to operate a two-way radio and found out what personal protective equipment was required to work in a process plant.



**Dorcas Kilalema experiences a day in the life of an engineer**



**Dorcas Kilalema exploring the control room with EMPNG engineers Sebastian Hemetsberger and Kimberley Sabarei**

Her visit was photographed and documented for a book and video to be produced as part of Buk bilong Pikinini’s *When I Grow Up* series. The series features children like Dorcas participating in roles such as a teacher, pilot, store manager, paramedic, information and communications technology officer, and farmer. It aims to inspire Papua new Guinean children to pursue careers in science, technology, engineering and mathematics.

Dorcas and her EMPNG mentor engineers attended the book series launch in August. The book featuring Dorcas will be released in 2022.



**Launch of Buk bilong Pikinini’s *When I Grow Up* book series**

Buk bilong Pikinini Head Teacher-Librarian, Judith Tom, said the book series about Papua New Guinean children had proven successful in engaging young children in reading. She said:

***“They are motivated to read the books because the children featured look just like them.”***

Since 2011, EMPNG has provided funding and support to Buk bilong Pikinini’s education programs and Library Learning Centres. This includes the donation of more than 15,000 books, teacher training support, donations of teaching resources and videos, and the development of Papua New Guinea’s first early childhood learning app.

2021 PERFORMANCE HIGHLIGHTS

COMMUNITY



SPENT ON CONTRIBUTIONS, SPONSORSHIPS, IN-KIND SUPPORT AND COMMUNITY-BASED PROJECTS IN 2021



SPENT ON INFRASTRUCTURE TAX CREDIT PROJECTS IN 2021



**50**  
SCHOLARSHIPS AWARDED

THROUGH THE 2021 BUSINESS AND PROFESSIONAL WOMEN'S ASSOCIATION PNG LNG IN-COUNTRY SCHOLARSHIPS PROGRAM



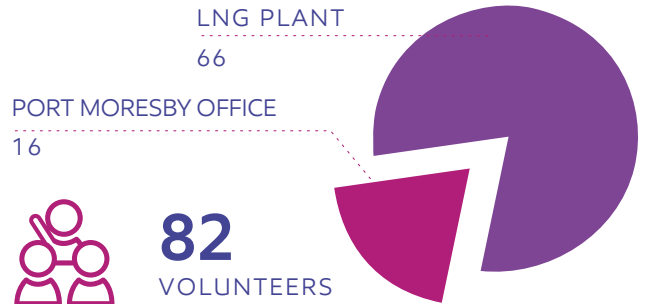
**>3000**  
TUITION FEES PAID

FOR SECONDARY STUDENTS IN HELA PROVINCE THROUGH THE PGK2.5M HELA EDUCATION PROGRAM



**9 OF 27**  
COMPUTER LABS INSTALLED

IN PRIMARY SCHOOLS ACROSS HELA PROVINCE TO SUPPORT THE DIGITAL LEARNING NEEDS OF MORE THAN 13,000 STUDENTS AND TEACHERS



**82**  
VOLUNTEERS



**105**  
HOURS VOLUNTEERED



**50**  
STUDENT PARTICIPANTS

IN THE EXXONMOBIL SCIENCE AMBASSADOR PROGRAM FROM FOUR SCHOOLS NEAR THE LNG PLANT SITE



**10**  
VEHICLES DONATED

TO SUPPORT THE NATIONAL CONTROL CENTRE'S COVID-19 RESPONSE, INCLUDING TWO 25-SEATER BUSES, SIX MINI-VANS AND TWO STATION WAGONS



**23**  
HEALTHCARE WORKERS

FROM SEVEN HEALTH CENTRES IN HELA TRAINED IN DIAGNOSIS, TREATMENT AND MANAGEMENT OF TUBERCULOSIS, HIV AND MALNUTRITION IN CHILDREN



**PART B**



## ENVIRONMENT

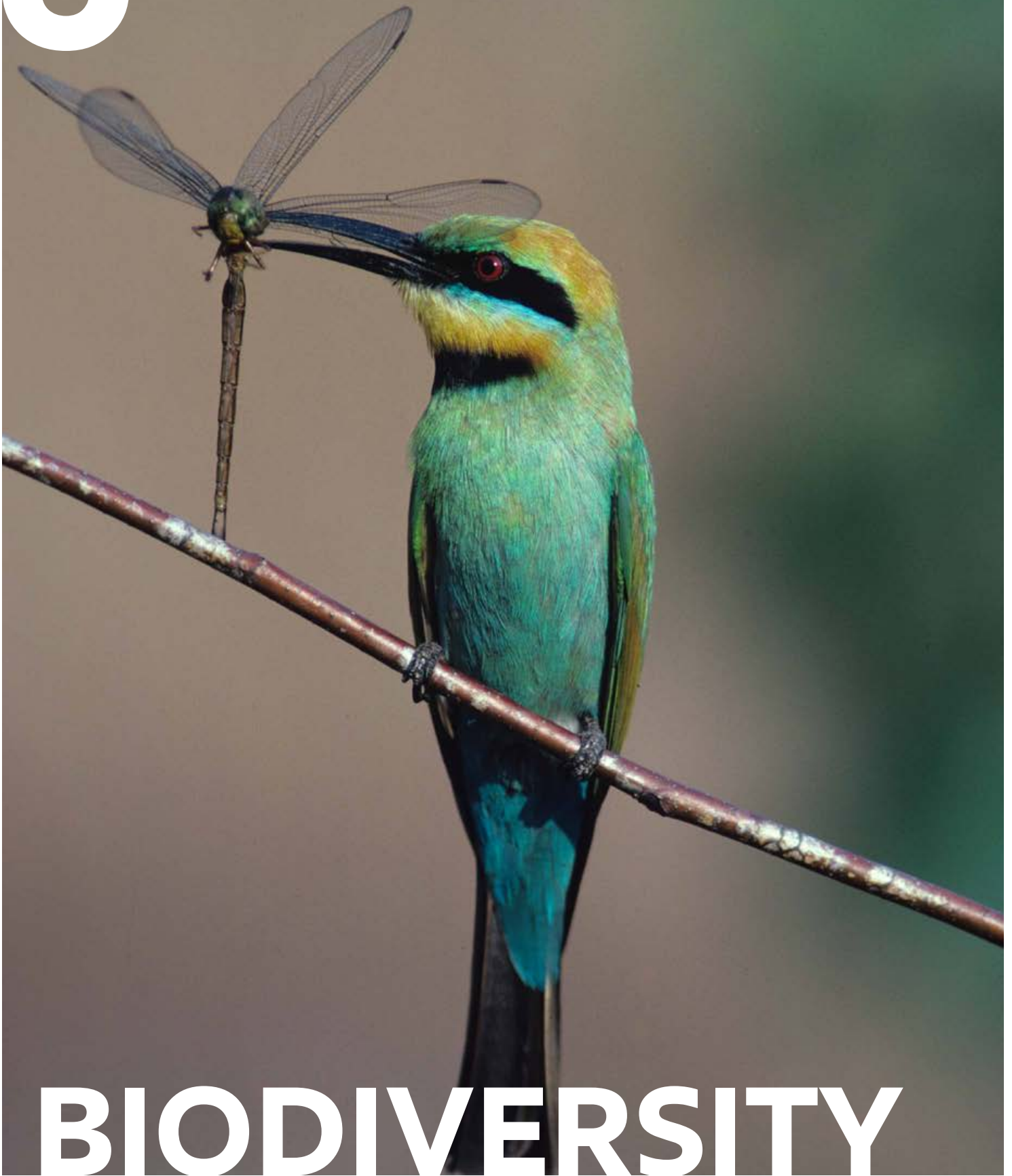
# EMPNG aims to preserve the unique biodiversity values of Papua New Guinea, while mitigating environmental impacts associated with production activities.

To achieve this, EMPNG operates in accordance with the Biodiversity Strategy and three Environmental Management Plans.

The Biodiversity Strategy outlines how potential impacts on biodiversity will be assessed and managed in the long-term, and how EMPNG will offset residual impacts associated with the construction of PNG LNG with equivalent biodiversity gains.

The Environmental Management Plans outline EMPNG's approach to managing air, noise, water and waste impacts, as well as the company's commitment to preserving cultural heritage, managing invasive plant and pest species, controlling access to sensitive areas and reinstating native vegetation.

6



# BIODIVERSITY

Guided by its over-arching Biodiversity Strategy, EMPNG works with local communities to conserve Papua New Guinea's unique biodiversity.

The Biodiversity Strategy includes a Biodiversity Offset Program, and a Biodiversity Implementation and Monitoring Program with Programmed Monitoring Activities (PMAs) that aim to achieve the Strategy's objectives.

## 6.1 Biodiversity Offset Program

EMPNG undertakes biodiversity offset activities in accordance with the Biodiversity Offset Program, which consists of five Components as shown in Figure 6.1.

Components 1, 2 and 3 are collectively referred to as 'enabling activities' because they provide the foundation for sustained conservation outcomes by focusing on capacity building at both national and regional levels. Components 4 and 5 deliver 'conservation outcomes on the ground' through enhancing the protection of existing conservation areas or by establishing new protected areas.

### Enabling activities

Component 1 was completed in 2017 with finalisation of the Protected Area Planning for the Kikori River Basin report developed with the Wildlife Conservation Society. Actions from the report are being progressed through Components 4 and 5.

Component 2 supports the Papua New Guinea Conservation and Environment Protection Authority with implementing the National Biodiversity Strategy and Action Plan. It involves ongoing engagement with conservation representatives from the Papua New Guinean Government, local communities, non-government organisations and academia. These engagements were limited during 2021 due to COVID-19 restrictions.

Component 3 focuses on building the technical capacity of conservation professionals and enhancing community capacity in conservation. During 2021, EMPNG progressed plans to engage additional Papua New Guinean business partners and academic institutions to further develop its Enhancing Conservation Capacity Program, which expands on Papua New Guinea's existing Strengthening Conservation Capacity Programme.

### Conservation outcomes on the ground

EMPNG is helping to enhance the management effectiveness of the Lake Kutubu Wildlife Management Area (WMA), which is managed by the Lake Kutubu WMA Committee.

In 2021, an initial meeting was held with the Sanumahia clan members for a proposed new protected area in Kutubu. Environmental values were also documented as part of the Lake Kutubu WMA Enhancement Plan.

To commemorate World Environment Day in June, the Lake Kutubu WMA Committee raised awareness about waste management by erecting signs conveying the message *No ken tromoi pipia insait long Lake Kutubu WMA*, which translates to 'Do not litter within the Lake Kutubu WMA'. The Committee also installed signs with the message *Tambu long painim fish long hia* at three identified clan waterways. The message translates to 'Fishing in this protected area is prohibited'.

### HIGHLIGHT

## PROTECTED SPECIES CAPTURED ON CAMERA

Biodiversity surveys are helping EMPNG determine the health of frog, bat, terrestrial mammal and bird populations in the Upstream area. This includes protected species such as the eastern long-beaked echidna (*Zaglossus bartoni*).

Listed under the International Union for Conservation of Nature Red List of Threatened Species as 'Vulnerable', the eastern long-beaked echidna is Protected under the Papua New Guinea *Fauna (Protection and Control) Act 1966*.

The eastern long-beaked echidna weighs between 4 and 9 kilograms. It is a slow-moving mammal with a long snout and sharp spines concealed with dark fur. This echidna resides on the forest floor and is endemic to the island of New Guinea where it has been recorded from near sea level to the highest mountains across habitat such as hill forest, montane forest, and subalpine grassland and scrub.

The echidna's population is monitored in the Upstream area through camera traps set up as part of PMA3 biodiversity surveys. This species was recorded on cameras during the 2017, 2019 and 2021 surveys. More images of the echidna were captured at Hides Ridge in the 2021 survey than previous surveys, which indicates a stable population in the area. This includes the camera trap near Wellpad D, which is a location that is regularly visited by local hunters.

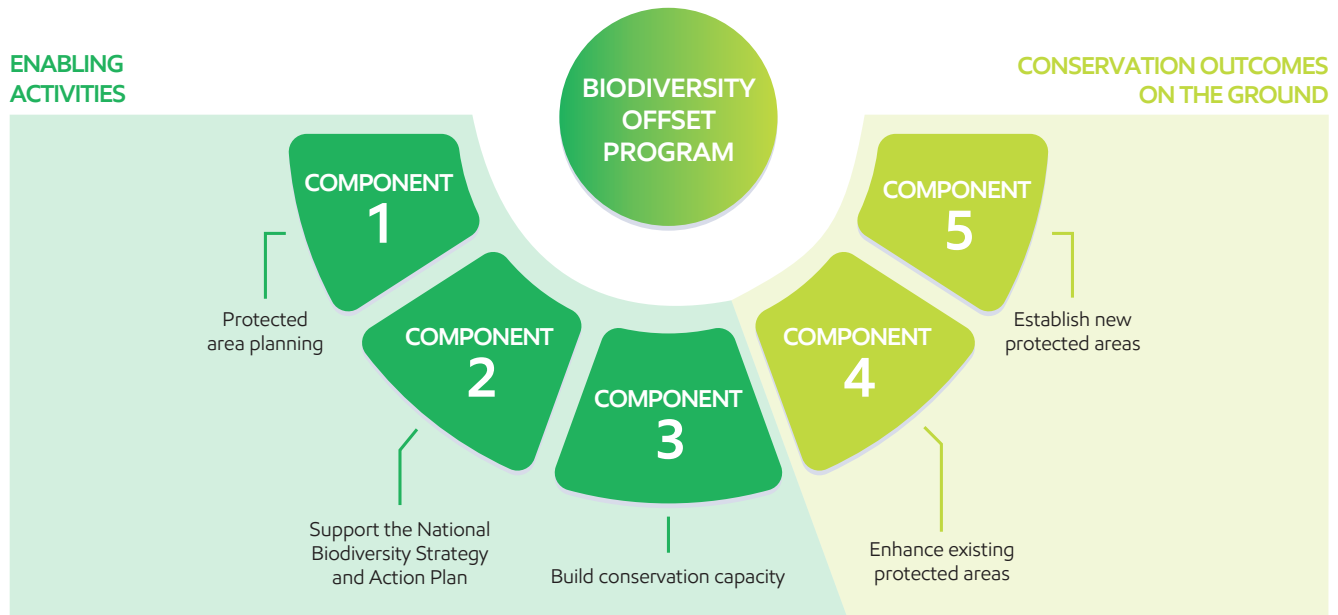
The eastern long-beaked echidna is threatened because it is prized as game and particularly vulnerable to hunting with dogs. It is also susceptible to disturbances that reduce the availability of food sources such as worms and grubs.

The eastern long-beaked echidna is one of the largest and oldest living monotremes. The existence of this species indicates a stable habitat that is largely undisturbed by human interference.



Eastern long-beaked echidna captured on camera during PMA3 biodiversity surveys

**Figure 6.1 – Biodiversity Offset Program Components**



The Lake Kutubu WMA Committee built refuse facilities in local villages during the year. These facilities are part of each community’s commitment to *No ken tromoi pipia insait long Lake Kutubu WMA* and provide a central location for the collection and management of refuse. A guest house was also constructed as an accommodation facility. Funds earned from the guest house will be used for activities such as maintenance of the house and of the Lake Kutubu WMA resource centre. In addition to developing infrastructure, Lake Kutubu WMA Committee members are training village residents about savings and loans.

During 2021, EMPNG conducted one continuous engagement across 18 communities from the Lower Kikori Delta over 20 days. All communities progressed through the new protected area process using resource mapping as a community engagement tool. Eleven communities from the Kerewo and Kibiri tribes are now ready to establish conservation deeds. The sustained engagement approach has resulted in behaviour change within the communities, with residents and local fishers gaining an understanding of the importance of conservation.

Communities are also driving their own conservation efforts. For example, Doibo community used their own resources to build a community conservation hall. In addition, they allocated land for a refuse centre for Kikori Station. Doibo community members continue to conduct environmental awareness raising activities with surrounding communities and businesses. Eleven communities, including Goare, Bisi, Aid’io, Kemei, Mubagovo, Dopima, Goro, Aimaha, Babeio Veraibari and Doibo, are ready to complete conservation deeds.

Communities that were not part of the Barging Route Waterways Memorandum of Understanding, signed between EMPNG and eight Kikori River tribes in 2010, continue to show interest in joining conservation programs and dedicating land for conservation activities.

## 6.2 Biodiversity Implementation and Monitoring Program

The Biodiversity Implementation and Monitoring Program consists of four PMAs:

- PMA1 – Remote Sensing of Broadscale Land Cover uses remote sensing imagery to assess the extent of broadscale changes to land cover due to natural or anthropogenic processes that include direct and indirect residual impacts from PNG LNG.
- PMA2 – Condition Surveys of Focal Habitats and Significant Ecological Features involves data collection and monitoring through field surveys to determine the condition of focal habitats and significant ecological features that were avoided during construction.
- PMA3 – Biodiversity Surveys provide flora and fauna data through field surveys to document trends in species diversity and abundance, to aid in confirming intactness of the Upstream area and retaining long-term biodiversity value.
- PMA4 – Efficacy of Biodiversity Offsets monitors the progress of each Biodiversity Offset Program component so that EMPNG can evaluate whether Objective 4 of the Biodiversity Strategy (identify, measure and offset significant residual impacts) is being achieved.

During 2021, the Biodiversity Implementation and Monitoring Program was revised to align with current objectives, indicators and scope refinements.

### *PMA1 – Remote Sensing of Broadscale Land Cover*

A specialist contractor is continuing to use satellite imagery and remote sensing tools to assess and monitor for broadscale land cover changes in the PNG LNG Upstream area following construction activities.

**HIGHLIGHT**

**PAPUA NEW GUINEAN SCIENTISTS CONDUCT BIODIVERSITY SURVEY**

In 2021, a team of highly accomplished Papua New Guinean fauna experts undertook the biennial PMA3 biodiversity survey in the Upstream area to monitor the presence of frogs, bats, terrestrial mammals and birds. The survey team of 14 consisted of nine scientists, two EMPNG personnel, three support personnel, and logistics teams. The survey was conducted over 24 days in July, covering six transects along the Hides Spine and another five transects in the Moro area. It involved setting up camera traps to detect ground dwelling fauna, live trapping and release of small mammals such as rodents and deploying specialised bioacoustic recording equipment to monitor calling frogs and echolocating bats.

This was the first PMA3 survey conducted by Papua New Guinean scientists with remote support from expatriate scientists who had previously led the survey. It became an opportunity for national capacity building of Papua New Guinea's scientific community.

EMPNG Biodiversity Supervisor, Banak Gamui said, "The survey was successful, with large amounts of data collected for each animal group being studied. This data will be compared with results from previous surveys to determine whether there are detectable changes in local biodiversity. There were no introduced or invasive mammal species identified at any of the transects surveyed, which is a positive result."

Results of the 2021 survey are being analysed and will be published when the analysis is complete.

Results from the broadscale monitoring are verified through a ground-truthing assessment to determine whether changes are directly related to PNG LNG, or not.

The 2021 ground-truthing assessment was conducted to verify 2020 annual forest cover change against land cover results and classifications established during the 2019 forest cover change assessment.

The 2021 assessments concluded that the broadscale forest loss or degradation identified were not attributable to PNG LNG activities and therefore no residual impacts.

*PMA2 – Condition Surveys of Focal Habitats and Significant Ecological Features*

Twenty sites were surveyed during the year, with results indicating that the condition of focal habitats and sensitive ecological features identified in pre-construction surveys remained intact. Substantial vegetation growth meant two sites were inaccessible during the 2021 survey.

*PMA3 – Biodiversity Surveys*

The biennial PMA3 monitoring survey was conducted in July by a field team of Papua New Guinean fauna experts. The survey included the collection of imagery from 80 camera traps placed in forest habitats on Hides Ridge and in the Moro area. Analysis of the data collected will be conducted during 2022.



**Members of the 2021 PMA3 biodiversity survey field team**

*PMA4 – Efficacy of Biodiversity Offsets*

The PMA4 Protocol that was revised in 2020 was reviewed by the IESC early 2021. The Biodiversity Implementation and Monitoring Program was revised late 2021 and, once reviewed by the IESC, will be finalised in 2022, along with the PMA4 Protocol.

**2021 PERFORMANCE HIGHLIGHTS**

**BIODIVERSITY**

**9 PNG LOCAL SCIENTISTS**

CONDUCTED 24-DAY PMA3 SURVEY

**20 DAYS**

ENGAGING WITH COMMUNITIES

**80 CAMERA TRAPS**

PLACED IN FOREST HABITATS FOR PMA3

**11 TRANSECTS**

ALONG HIDES SPINE LINE AND IN MORO

**18 COMMUNITIES**

PROGRESSED THROUGH PROTECTED AREA PROCESS

**20 SITES** SURVEYED FOR CONDITION OF FOCAL HABITAT AND SENSITIVE ECOLOGICAL FEATURES



# ENVIRONMENT MANAGEMENT

EMPNG is maintaining its commitment to continuous improvement in environmental management so that lessons learned can be applied to the operation of its facilities throughout the production phase.

## 7.1 Air

EMPNG conducts a three-yearly stack testing program on a representative selection of air emissions sources to confirm that emissions meet Environment Permit criteria.

Emissions sources tested include compressors, incinerators, power generators, heaters and furnaces. Vehicles and heavy machinery are not included in the stack test program, but are operated in accordance with manufacturer specifications.

Of 30 emissions sources, 29 were tested at the HGCP and LNG Plant site during the 2021 stack testing program, with two of the HGCP gas turbine generators exceeding emissions criteria. This resulted in two Severity Level I non-conformances, which were also recorded as low-level incidents (Severity Level <0). EMPNG’s Engineering team and the equipment manufacturer are making corrective adjustments. Verification testing will be conducted to confirm emissions meet Environmental Management Plan criteria once these corrective measures are implemented. The third HGCP gas turbine generator was not tested because it was out of service at the time of testing.

The 2021 stack testing program included verification testing for three LNG Plant emissions sources that did not meet Environmental Management Plan criteria during the previous stack testing program. The testing found all three sources to be within criteria.

Flaring emissions were higher in 2021 than the previous year primarily due to a power outage at the Kutubu Central Processing Facility. This caused the LNG Plant to operate at a minimum technical rate that resulted in reduced production. Increased flaring occurred both during operations at a minimum rate and the LNG train re-start. Hydrocarbon flaring volumes totalled 1535 million standard cubic feet during the year.

Total greenhouse gas emissions are calculated and reported on an annual basis. In 2021, PNG LNG facilities generated approximately 2132 kilotonnes of carbon dioxide equivalent, which was primarily from gas turbine fuel consumption at the LNG Plant and HGCP.

EMPNG’s greenhouse gas performance is aligned with ExxonMobil’s 2030 Greenhouse Gas Emission-Reduction Plans.

## 7.2 Noise

EMPNG recorded no noise-related incidents or near misses at any PNG LNG facility during 2021.

Biannual noise monitoring continued in the Upstream area and LNG Plant site during both daylight and evening hours. All monitoring events showed noise levels had remained within Environment Permit criteria.

In October, baseline noise monitoring was conducted for pre-construction noise levels at Angore Wellpad C. The monitoring was undertaken in both daylight and evening hours, with all results within Environment Permit criteria.

## 7.3 Water

The amount of water extracted from groundwater, seawater and surface streams for production activities is monitored so that water use remains within permitted extraction volumes. EMPNG also regularly monitors discharges to water, surface water quality and groundwater quality to verify conformance with the criteria specified in the relevant Environmental Management Plan and Environment Permit.

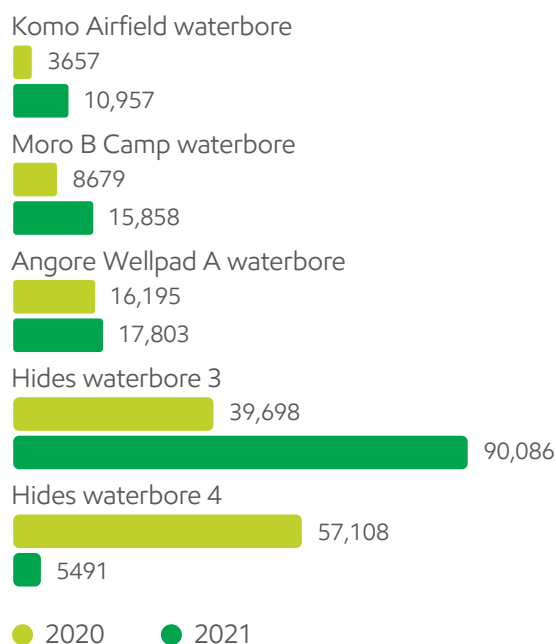
### 7.3.1 Consumption

Water is used for production process operations, worker camps, maintenance activities, dust suppression, safety showers and firewater systems.

Freshwater is extracted from approved groundwater sources for Upstream area operations and includes a permitted volume of surface water, while desalinated seawater is used for LNG Plant production activities. Freshwater volumes taken from each groundwater extraction source in the Upstream area during 2021 are shown in Figure 7.1.

**Figure 7.1 – Groundwater extraction**

VOLUME (KILOLITRES) BY EXTRACTION SOURCE



Approximately 140,195 kilolitres of groundwater was extracted for use in the Upstream area in 2021. This is an increase of 14,858 kilolitres compared to 2020 to support project works at Angore, Komo Airfield and the pipeline ROW at Moro B. Increased project and operational activities following the easing of pandemic restrictions resulted in 429 kilolitres of water extracted from surface streams in 2021, compared to zero surface water extraction in 2020.

Approximately 571,750 kilolitres of seawater was extracted for the desalination plant at the LNG Plant site, which generated more than 85,735 kilolitres of treated water for production use. This is consistent with seawater extraction volumes for 2020.

### 7.3.2 Monitoring

Water quality is regularly tested in wastewater retention systems and treatment plants. This testing is used to provide guidance on operational maintenance needs in case corrective adjustments are required to maintain wastewater quality and performance.

Non-conformances are raised when variations or exceedances are detected. This enables the identification and tracking of any issues through to resolution, and helps operators maintain optimum levels within the system.

During 2021, EMPNG recorded five water-related Severity Level I non-conformances, which were also classified as low-level incidents. This is a significant decrease compared to the 20 Severity Level I non-conformances and one Severity Level <0 incident recorded in 2020.

One of the non-conformances raised in 2021 related to an exceedance of ammonia-nitrogen and biological oxygen demand discharge levels at the HGCP wastewater treatment plant. Investigations identified a blockage in the sludge transfer pump that caused sludge to build-up within the system. This was due to a malfunction in the suspended solids probe, which failed to detect the sludge build up. Permanent system improvements were completed in May and included a new flow meter and detection probe. The transfer pump was also thoroughly cleaned with filter changeout and cleaning added to the preventive maintenance schedule. Another non-conformance was raised when verification monitoring found ammonia-nitrogen above permitted water discharge quality guidelines at the HGCP stormwater pond downstream of the wastewater treatment plant. Subsequent monitoring of both the wastewater treatment plant and stormwater pond found discharge levels to be within Environment Permit criteria.

One non-conformance was recorded for a total suspended solids exceedance at the HGCP retention pond. This was caused by vegetation debris and sediment being washed into the retention pond through an open drainage system during high rainfall events. Corrective measures included cleaning the retention pond and establishing a process of regular checks during high rainfall events. Subsequent monitoring found results to be within discharge guidelines.

Water quality monitoring at the LNG Plant site during the year recorded one non-conformance for a pH level exceedance at the retention pond. Investigations found the exceedance occurred during algae bloom events after heavy rainfall. Corrective measures to prevent pond stagnation included continuously adjusting the pond gate to maintain an acceptable pond level with a constant adequate underflow of water discharging to the environment. This approach is within the existing operational design of the pond for continuous discharge. Brine discharge from the desalination plant was also re-diverted back into the pond to maintain the water level required for adequate underflow to prevent stagnant water inside the pond. Following these adjustments, subsequent sampling events showed pH levels to be within discharge guidelines.

Compliance and verification monitoring in the receiving environment at the mixing pit downstream of the retention pond showed all results to be within Environment Permit criteria.

In January, the Papua New Guinea Conservation and Environment Protection Authority provided approval to cease the Temporary Wastewater Monitoring Plan, which commenced in 2016 to address amine-related exceedances at the LNG Plant retention pond. Approval was granted after permanent engineering modifications were made and 20 months of monitoring confirmed no occurrences of amine at the retention pond.

An exceedance of total suspended solids was recorded as a non-conformance at the LNG Plant site's wastewater treatment plant during the year. This was caused by a faulty filter membrane in the bioreactor tank, which allowed unfiltered sewage to enter the tank. The faulty membrane also caused an airlock, which was rectified when the faulty membrane was taken offline. The LNG Plant site's wastewater treatment plant is now operating efficiently. The permeate tank is being cleaned weekly to prevent a build-up of solids. Subsequent monitoring has found all results to be within Environment Permit criteria. Compliance and verification monitoring in the downstream receiving environment at Vaihua Creek have also shown all results to be within criteria.

EMPNG conducts groundwater monitoring every six months. Monitoring at the HGCP site showed all results to be within Environment Permit criteria. At the HWMF, an assessment conducted by a third-party specialist consultant confirmed that fluctuating results above the Environment Permit criteria were naturally occurring. Three new monitoring wells were installed to provide more detailed data of the groundwater network around landfill cells. Two wells were installed downstream of the landfill and reedbed treatment system, and the third reference well was installed upstream of the well network. Groundwater sampling at the LNG Plant showed fluctuations of dissolved manganese, magnesium and sodium at two monitoring wells.



**EMPNG Field Environmental Specialist, Isabel Roandi-Eka, conducting groundwater sampling at the LNG Plant site**

A third-party expert review attributed these fluctuations to the ingress of saline water due to the close proximity of the two wells to the shoreline. All other groundwater wells within the LNG Plant site and around the operational landfill area were within Environment Permit criteria.

## 7.4 Materials management

EMPNG aims to use resources responsibly, and regularly reviews how it sources raw materials for production-related activities.

During 2021, EMPNG purchased and used 129,123 cubic metres of aggregate, 9586 cubic metres of rock, 458 cubic metres of sand, 87 cubic metres of concrete and 6 cubic metres of timber. There was an increase in the use of rock, aggregate, and concrete to support increased remediation and maintenance works that resumed following the easing of pandemic restrictions. Most of the rock and aggregate were used in Upstream area projects including earthquake remediation works at Komo, erosion control work along the pipeline ROW, Wellpad remediation in the Hides area, and Angore Wellpad A works. Upstream area projects accounted for more than 99 percent of all total raw materials use.



**A toolbox talk prior to undertaking earthquake remediation works at KP 70**

Raw materials used in the Upstream area were sourced from previously approved quarries operated by Lancos under their own environment permits. Materials for Angore Wellpad A works were sourced from an EMPNG-operated quarry in accordance with the approved Environmental Management Plan.

At the LNG Plant site, aggregate and sand were used for upgrades to fire detection equipment at a worker camp and for minor maintenance works.

## 7.5 Waste management

EMPNG aims for continuous improvement with waste management at production facilities, and in the development and delivery of long-term waste management solutions. Approved third-party facilities are used to recycle operational

waste, with reuse initiatives implemented wherever practicable, to reduce the amount of waste sent to landfill.

During the year, approximately 90 tonnes of operational waste from the Upstream area was sent to Total Waste Management's Roku facility for recycling and reuse. Another 15.6 tonnes of used batteries stored in 2020 were sent to an approved Papua New Guinean facility for recycling and reuse in 2021. Approved facilities were also used to recycle 160 tonnes of waste from the LNG Plant site, including scrap metal, plastic and batteries.

Approximately 56 tonnes of waste oil from the Upstream area has been sent to an approved Papua New Guinean specialist contractor for recycling through their waste oil processing unit. In 2021, an opportunity was identified to reuse waste oil from Upstream area operations. As a result, more than 10 tonnes of waste oil and fuel was processed on-site and reused during the year.

At the LNG Plant, 58 tonnes of oily wastewater was treated through the dissolved air flotation unit, with no impact to the quality of discharge water. Approximately 533 tonnes of waste is securely stored at the LNG Plant site. This includes 72 tonnes of oily wastewater that is being stored and analysed to determine the most appropriate disposal method.

The HWMF securely stored 164 tonnes of Upstream area waste awaiting appropriate disposal at an approved third-party facility.

Following sampling and assessments to verify compliance with Environment Permit criteria, 5 tonnes of HGCP process wash water was released into the vetiver grass reedbed at the HWMF during the year. The Papua New Guinea Conservation and Environment Protection Authority has approved this method of treatment and disposal.

Commissioning of a small general waste incinerator that was procured for Moro B Camp in 2020 was not completed in 2021. While this incinerator is being commissioned, incinerable non-restricted waste from the camp continues to be managed through Santos Limited (previously Oil Search Limited) under the existing southern waste synergy arrangement. The HWMF incinerator processed 13 tonnes of medical waste from the Upstream area during the year.

Approximately 337 tonnes of non-restricted waste was incinerated at Total Waste Management's Roku facility from the LNG Plant site and ExxonMobil Haus in 2021.

All incinerable non-restricted waste from the Upstream area is sent to the HWMF landfill for disposal, while non-restricted waste from the LNG Plant and ExxonMobil Haus is sent to the LNG Plant landfill.

A verification survey found that the LNG Plant operations landfill had exceeded capacity by 138 cubic metres. Corrective actions included commissioning of an inactive construction-phase landfill cell, which will begin operation in 2022. The LNG Plant landfill accepted 50 tonnes of non-restricted waste from both the LNG Plant and ExxonMobil Haus, while the HWMF landfill received 2580 tonnes of non-restricted waste in 2021.



**Landfill cell at the LNG Plant site being prepared for commissioning**

The LNG Plant’s processing dehydration bed change out generated 160 tonnes of spent molecular sieves that complied with landfill criteria. These will be used as landfill day cover and backfill at the LNG Plant landfill site.

As part of the LNG Plant’s foam change-out program, 14 tonnes of waste foam water was produced during the year. Evaporation trials are being conducted to determine if this is a viable alternative treatment and disposal method instead of sending waste foam water to overseas third-party facilities for disposal.

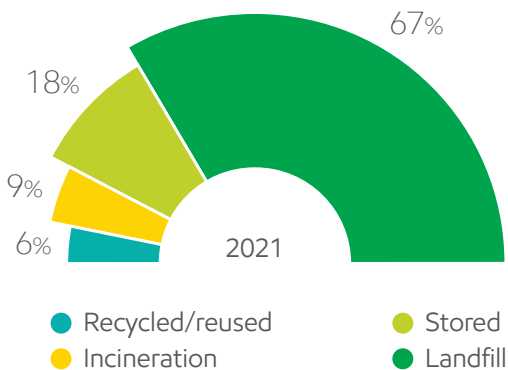
Liquid food composters are used to process food waste at the HGCP and LNG Plant. These fully enclosed automatic commercial bio-digesters compost solid and liquid food waste within 24 hours into greywater that is safely released into the wastewater system for further treatment.

In 2021, the HGCP liquid food composter processed more than 28 tonnes of food waste, while the LNG Plant composter processed some 63 tonnes.

Waste produced during 2021 predominantly consisted of waste oil, food waste, general office and accommodation refuse, cardboard and paper. Most non-restricted waste was disposed of in landfill, as shown in Figure 7.2.

**Figure 7.2 – Waste disposal**

PERCENTAGE BY DISPOSAL METHOD



## 7.6 Spill prevention and response

EMPNG measures and reports spills as part of its spill prevention and response process. Significant spill events are classed as chemical or hydrocarbon releases from primary vessels that may have medium- to long-term impacts on the receiving environment if appropriate controls are not in place. To prevent the potential for significant spill events, EMPNG monitors and records every spill, regardless of the volume involved. During 2021, EMPNG recorded 38 low-level incidents consisting of six wastewater spills, three chemical spills and 29 hydrocarbon spills to ground.

Most of these were contained within worksite boundaries, apart from one 8.5-litre engine oil spill from a light vehicle as it travelled along a sealed road between Hides and Komo.

There was a 30 percent decrease in the number of spills, and an 89 percent reduction in spill volume, in 2021 compared to spills recorded in 2020. This was due to EMPNG’s ongoing commitment to spill prevention and response. In addition to EMPNG and its contractors working to reduce spill events, if a spill occurs, it is responded to quickly and appropriately so there is no significant environmental impact.

Of the six wastewater spills, one occurred when above-ground plumbing became disconnected at the Moro X Camp accommodation block, releasing approximately 20 litres of sewage. The second occurred at the Angore Wellpad A Camp when 400 litres of sewage overflowed from the sewerage lift station due to an issue with the check valve and a damaged outlet pump. A third spill was recorded at the LNG Plant when approximately 20 litres of sewage was spilled from an incorrectly disconnected hose following a vacuum truck discharge at the sewerage lift station. Other wastewater events involved two sewage spills of approximately 1 litre each and a spill of approximately 30 litres of wastewater from a faulty toilet cistern.

Chemical spills included approximately 5 litres of water-based paint spilled due to damage caused to containers during transport, 50 millilitres of engine coolant that leaked from a spider excavator due to a hose fitting failure, and a coolant leak from a broken radiator in an ambulance that was parked at the HGCP clinic.

Hydraulic spills accounted for 23 of the 29 hydrocarbon spills. Of these, 16 were 1 litre or less and the remaining seven spills were 10 litres or less. Other hydrocarbon spills consisted of four diesel spills of less than 5 litres, a 1 litre spill from a marine loading arm, and the engine oil spill of 8.5 litres in Hides.

Forty-two near misses were recorded during the year. Near misses refer to incidents where hydrocarbons or chemicals are released from their primary containment, such as a tank, but are fully contained in a secondary containment or on an impermeable surface, so these substances do not penetrate the ground or reach water.

To prevent spills and near-misses, EMPNG and its contractors maintain regular spill prevention toolbox talks with contractor work teams.

Training was conducted during the year about the types of oil spill response equipment and the appropriate application of each type of equipment on land or water. The training covered oil spill response for minor spills over land or water, accidents, and rescue activities. It included an overview of response equipment, and response strategies, methods and practices. Participants were from areas such as emergency response, operations, maintenance and engineers.

## 7.7 Reinstatement, erosion and sediment control

Additional erosion and sediment control measures were installed at HGCP stormwater monitoring sites in 2021, while upgrades were conducted on the stormwater channel and sediment control measures at the HWMF stormwater pond.

Remediation of Hides Wellpad A and stormwater detention pond embankment repairs at ExxonMobil Haus were also completed.

In Angore, works involved the installation of silt fencing, diversion berms, check dams, straw dams, drop out pits and mulch berms to manage stormwater run-off during earthworks.

As batters were stabilised, permanent control measures such as turf reinforcement mats were put in place. A toe buttress was installed on the northern side of the wellpad to manage fill material.



**Completed embankment repair for the stormwater detention pond at ExxonMobil Haus**

EMPNG continues to provide long-term support for communities and the Papua New Guinean Government with rebuilding and repairing roads, bridges and other critical infrastructure that was damaged by the 2018 earthquake.

In 2021, earthquake repair works focused on erosion and sediment control measures including drainage and micropiling works at KP 64.5 and KP 70, and runway and infrastructure repairs at Komo Airfield. Works also involved the monitoring and maintenance of site drainage, clearing sediment from drains and stormwater culverts, maintaining vegetated drainage areas, constructing drainage, replacing sandbags, installing silt fencing and checking dams as needed.

Reinstatement works at KP 70, and drainage and revegetation works at Komo, were also completed during the year. Vegetation monitoring is ongoing.



**Workers tying gabion baskets on the ExxonMobil Haus stormwater detention pond during embankment repair**



Revegetated stormwater drain at Komo Airfield

CASE STUDY

MEASURING RAINFALL ACROSS PNG LNG

PNG LNG facilities operate within a complex weather system that is subject to heavy rainfall, monsoons, and flooding. Monsoons bring heavy rains between December and April, and the southeast trade winds from May to October also lead to high rainfall each year. At an elevation of up to 3650 metres, the Upstream area generally receives more rainfall than the LNG Plant site, with long-term mean annual precipitation rates in excess of 3500 millimetres in the Upstream area.

In February 2021, the LNG Plant experienced its wettest month since production commenced.

Major rainfall events can lead to sinkholes, landslides, rivers flooding, and road deterioration. Resulting impacts from rainfall events include: damage to sediment and erosion control measures; high inflows of water into the groundwater system; access restrictions; increased growth and propagation of weeds; work delays; and weather downtime.

The impact of Papua New Guinea’s heavy and consistent rainfall is also an important factor in civil construction works, particularly in the Hides area, pipeline ROW and Komo. EMPNG has procedures in place to mitigate the potential impacts of rainfall, which are incorporated during the execution planning phase. These procedures also address other weather-related factors, such as fog cover events when working at higher elevations.

Through the ongoing implementation and maintenance of weed, water, erosion and sediment control measures, EMPNG manages the impact of rainfall events on PNG LNG facilities and during construction works.

As part of regulatory reporting, rainfall is monitored at the HGCP and LNG Plant site.

Since the start of production, PNG LNG weather stations recorded an annual average of 1030 millimetres of rainfall at the LNG Plant site, and 2015 millimetres at the HGCP.



EMPNG Project Engineer, Denise Yakipu, at one of the recently constructed drains, which will help manage the impacts of rainfall in Komo

## 7.8 Ecology

EMPNG has processes and procedures in place to avoid impacts to important ecological features. This includes prohibiting EMPNG employees and contractors from disturbing or harassing wildlife, hunting fauna, possessing hunting or fishing equipment, gathering plants or bush foods, collecting firewood, possessing wildlife products, or disturbing migratory species habitats.

Ecological sensitivities within and in the immediate vicinity of PNG LNG facilities were identified as part of the environmental pre-construction survey program undertaken during construction. Site-specific mitigation and management measures are implemented to avoid and otherwise mitigate potential impacts where feasible. Regular inspections are conducted to check the condition of sensitive ecological features and determine the significance of any change to the condition of the ecological sensitivity.

Wildlife monitoring during 2021 identified increases in some populations of existing species in the LNG Plant site area, particularly the agile wallaby (*Macropus agilis*).



**Agile wallaby (*Macropus agilis*)**

One Severity Level I non-conformance for wildlife management was raised in relation to a wallaby at the LNG Plant site. This was addressed with worker education to reinforce EMPNG's wildlife management policy and Environment Permit condition that prohibits hunting, and the collection of flora or fauna.

One low-level incident was recorded when an area cleared for helipad construction along the pipeline ROW extended outside the defined 30-metre construction boundary at KP 284 and KP 290.4.

During 2021, snake specialist Owen Paiva caught and safely relocated 68 Papuan taipan snakes at the LNG Plant site. Refer to Case Study – *Ensuring snake safety*.

## 7.9 Invasive species, pests and plant pathogens

To preserve unique ecosystems and critical habitats for native flora and fauna, EMPNG implements measures to prevent invasive weeds, pests and plant pathogens from entering or

establishing near production facilities. The company also aims to contain invasive species that were already present prior to PNG LNG construction.

The New Guinea Binatang Research Centre completed the annual weed survey in November. Due to COVID-19 restrictions, the survey was conducted in two parts. The first part was undertaken during March and April and extended from the Hides Spine to Kopi Scraper Station. The remaining pipeline ROW sites and parts of the Homa Access Road were surveyed in November.



**New Guinea Binatang Research Centre botanist conducts the annual weed survey along the Homa-Benaria ridge**

Data collected from the weed survey was analysed in December and compared to the previous survey, which was conducted in 2019. EMPNG was unable to undertake the 2020 survey due to travel restrictions caused by COVID-19. The comparison showed the number of all weed species, including Priority 1 species, per transect had increased. However, the weed density remained comparable to sites outside of the PNG LNG area of operations.

Invasive species and plant pathogen control and management continues at all PNG LNG facilities and along the pipeline ROW.

EMPNG also continues to educate workers and communities about priority weeds and pest species including cane toad management, and the actions they can take to help protect native flora and fauna.



**Biodiversity Advisor, Kalyna Taule, educates a Kaiam villager in the Lower Kikori region about invasive species**

CASE STUDY

ENSURING SNAKE SAFETY

Specialist snake handler, Owen Paiva, is maintaining safety between the workforce and snakes at the LNG Plant site. The site is home to 12 different species of snakes including whipsnakes, carpet pythons, amethystine pythons, olive pythons, slatey grey snakes, common tree snakes, brown tree snakes, mangrove snakes and the Papuan taipans. There are more than 80 snake species in Papua New Guinea, which are an important part of biodiversity and play a crucial role in maintaining the balance of nature.

Owen’s role involves capturing snakes found at the LNG Plant site and relocating them to similar environments in nearby locations that are away from people. He also provides snakebite safety awareness training to the workforce. Prior to his role with EMPNG, Owen managed the Charles Campbell Toxinology Centre at the University of Papua New Guinea, where he also conducted snakebite research. Unlike toxicology, which studies the adverse effects of chemicals on living organisms, toxinology focuses on the impact of toxins from plants, animals, and microbes. Owen said:

*“I am a medical scientist and researcher by profession specialising in snakebite and venom research in Papua New Guinea. My passion is studying the effects of snake venom, exploring options for improving snakebite medicine (antivenom), and handling snakes.”*



Owen Paiva relocating a carpet python at the LNG Plant site

In the 20 years Owen has been handling snakes, he has never been bitten by a venomous snake. Owen said there had been no snakebite incidents since he started working at the LNG Plant due to EMPNG’s strong safety protocols.

*“My most memorable experience with EMPNG was the day I caught five large taipans in a single day. It was an exhilarating moment and experience for me.”*

*“Most snakes feed on rodents, lizards and even other snakes, some feed on frogs, while others feed on aquatic animals. Some birds of prey like eagles, kookaburras, and owls depend on snakes as a major part of their diet. If the number of snakes decreases in an environment, the population of rodents and lizards may increase, and birds and other species that depend on snakes as food may also be affected. Snakes have their part to play in maintaining environmental balance.”*

HIGHLIGHT

PAPUAN TAIPAN (OXYURANUS SCUTELLATUS)

In 2021, snake specialist Owen Paiva caught and relocated 68 Papuan taipan snakes at the LNG Plant site.

The Papuan taipan is the geographical name for the *Oxyuranus scutellatus* snake species that lives on the southern coast of Papua New Guinea. Papuan taipans are more aggressive, and their toxin content is more potent, than coastal taipans, which are the same species but found in Australia. This medium to large size snake grows up to more than 2.5 metres in length. Its belly is cream-coloured with orange spots, while the back darkens to dark brown or reddish in winter and lightens to yellowish in summer.

The Papuan taipan is a carnivorous reptile that mainly hunts rats and mice. It is mostly active in the early morning and at dusk. Like all snakes, Papua taipans try to avoid humans and will quickly retreat to safe cover if they are encountered. However, if they are approached too closely, this snake will defend itself by biting. Papua taipan venom is one of the most lethal in the world. Without medical treatment, virtually all bites can be fatal.



Owen Paiva milking a Papuan taipan at the Charles Campbell Toxinology Centre’s serpentarium at the University of Papua New Guinea [Image by David Williams]



**New Guinea Binatang Research Centre Field Research Supervisor and Entomologist, John Auga, conducting net sweeping for insects during the 2021 regeneration survey in the Upstream area**

## 7.10 Regeneration monitoring

EMPNG conducts biennial surveys to monitor the regeneration of plant species following temporary disturbance from construction activities. Surveys cover elevation zones from 24 to 2721 metres above sea level along the entire pipeline ROW.



**A toolbox talk during 2021 regeneration survey fieldwork at the Hides Spine**

The 2021 survey was conducted between March and April covering low, medium and high elevation zones. An analysis of the survey results was completed in December and showed that the pipeline ROW vegetation regeneration had progressed well towards natural primary and secondary forest. The regenerated vegetation includes a slightly different species composition, dominated by suitable pioneer tree genera.

Two areas at the low- and mid-elevation survey plots were identified for further monitoring due to high grass coverage following vegetation clearance and impacts from Papua New Guinea's 2018 earthquake.

In addition to monitoring, EMPNG continues to raise awareness with workers and communities about vegetation management requirements in the Upstream area.

Mangrove monitoring at the LNG Plant Caution Bay landfall site shows good regeneration progress. EMPNG continues to maintain appropriate control measures to prevent vehicular access to, and harvesting of, the mangroves, while promoting the importance of protecting the mangroves with the community.



**New Guinea Binatang Research Centre Para-ecologist, Samuel Japi, collects data including tree sizes and diversity to measure ecological succession during the 2021 regeneration survey**

## 7.11 Access control

EMPNG uses security checkpoints to manage its access control system, which involves collecting data about the type and number of vehicles that use EMPNG-controlled roads, and the purpose for the road use.

During 2021, the number of vehicles that used EMPNG roads increased by 43 percent compared to the previous year due to the easing of pandemic restrictions.

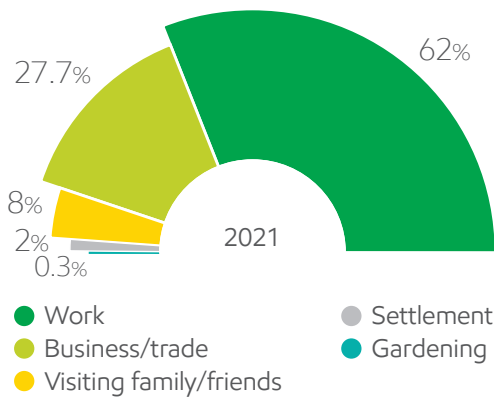
Work was the primary reason for road access, as shown in Figure 7.3. This included EMPNG, Santos Limited, government and community-based work. The types of vehicles that use EMPNG-controlled roads are shown in Figure 7.4.

Regular aerial monitoring was completed along the entire pipeline ROW in 2021, with no signs of logging adjacent to the pipeline ROW infrastructure and no bypassing of access control measures such as gates.

Boom gates, installed during the construction phase, are now operated as manned security checkpoints to control access to Angore worksites.

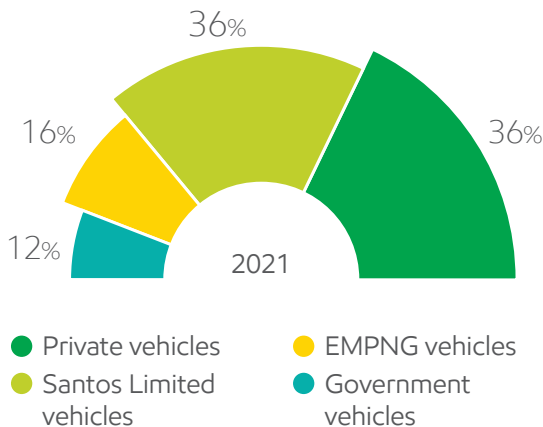
**Figure 7.3 – Purpose of access**

PERCENTAGE OF TRAFFIC USING EMPNG CONTROLLED ROADS BY PURPOSE



**Figure 7.4 – Vehicle types**

PERCENTAGE USING EMPNG ACCESS POINTS



## 7.12 Quarantine management

EMPNG and its contractors comply with National Agriculture Quarantine and Inspection Authority requirements for all freight imported into Papua New Guinea.

Due to the easing of some COVID-19 restrictions, the number of shipments increased from 878 in 2020 to 1009 in 2021. Two of the shipments received in 2021 required re-fumigation to comply with the Authority’s standards.

A total 8117 shipments have been received since the start of production, with 1053 inspected by the National Agriculture Quarantine and Inspection Authority and, of those, 119 requiring re-fumigation.

## 7.13 Cultural heritage

Papua New Guinea’s cultural identity, traditional knowledge and oral histories are maintained through the use of, and relationships with, land and natural resources. Environmental features such as caves, trees, waterholes and many habitat features that are intertwined with biodiversity are often used to express cultural heritage.

In recognition of the importance of environmental features, and as part of a commitment to preserving Papua New Guinea’s unique biodiversity, EMPNG aims to preserve the culture and history of environments located near production facilities.

During the construction of PNG LNG, EMPNG implemented measures to manage known cultural heritage resources and chance finds such as unknown archaeological sites. The Chance Finds protocol was developed to guide the salvage and preservation of artefacts, many of which are kept at the Papua New Guinea National Museum and Art Gallery.

EMPNG’s Biodiversity Offset Program incorporates cultural heritage in the community engagement and resource mapping process conducted under Component 5. The inclusion of cultural heritage has attracted more community members from the Lower Kikori region to participate in conservation activities and to share details of their oral histories. In 2021, a desktop review of compiled oral histories and traditional stories was undertaken, and additional engagements were held with Lower Kikori community members. Through this work, books about Papua New Guinea’s cultural history will be developed for school children and distributed to schools across the PNG LNG area of operations.



**Stone pestle traditionally used to dig up starchy foods such as sweet potato**

Lithic artefacts were identified during earthworks for the Angore Gathering System during the year. These chance finds were documented and provided to the Papua New Guinea National Museum and Art Gallery.

2021 PERFORMANCE HIGHLIGHTS

ENVIRONMENT MANAGEMENT

 **100%** NOISE WITHIN CRITERIA

 **1009** FREIGHT SHIPMENTS

 **89%** REDUCTION IN SPILL VOLUME

 **140,195kL** GROUNDWATER EXTRACTED

**571,750kL** SEAWATER EXTRACTED



**85,735kL** TREATED WATER PRODUCED

ENVIRONMENTAL INCIDENTS



**0** SEVERITY LEVEL 0, 1, 2 AND 3 INCIDENTS

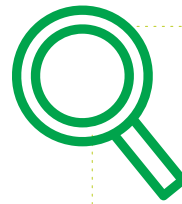
**46** SEVERITY LEVEL <0 INCIDENTS

**42** NEAR MISSES

ENVIRONMENTAL INCIDENTS

Incidents are classified by Severity Levels of <0, 0, 1, 2, or 3. Severity Level <0 has no significant impact, while Severity Level 2 or 3 require notification to the Lender Group's IESC, or relevant government authority.

ENVIRONMENTAL NON-CONFORMANCES AND FIELD OBSERVATIONS



**0** SEVERITY LEVEL II AND III NON-CONFORMANCES

**8** SEVERITY LEVEL I NON-CONFORMANCES

**69** NEEDS IMPROVEMENT FIELD OBSERVATIONS

**68** POSITIVE FIELD OBSERVATIONS

ENVIRONMENTAL NON-CONFORMANCES

Non-conformances are situations that do not meet ESMP requirements and are classified according to three Severity Levels. Severity Level I involves no damage or reasonable expectation of damage progressing through to Severity Level III, typically including observed significant damage or a reasonable expectation of significant damage.



PART C



## SOCIAL

**EMPNG actively engages stakeholders to develop and implement initiatives designed to return the value derived from LNG production back to local communities.**

Through the implementation of Social Management Plans covering health, safety, security, emergency preparedness, labour and working conditions, land access, resettlement and livelihood restoration, EMPNG aims to support the welfare of workers and communities surrounding production facilities.

# 8



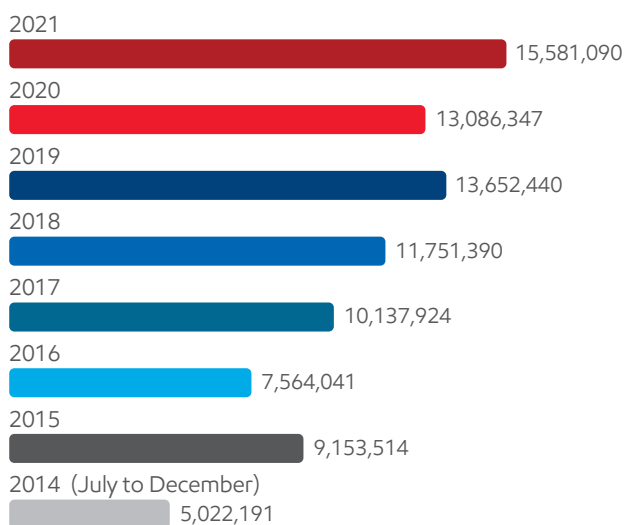
# WORKER WELFARE

Through fair and equitable labour practices, along with procedures that protect the safety, health and well-being of workers, EMPNG proactively promotes a safe and healthy workplace.

## 8.1 Safety

EMPNG is maintaining its industry-leading safety performance with more than eight years recorded without a Lost Time Incident at the LNG Plant and two years without a Restricted Work Incident. In the Upstream area, more than four years of work has been completed without a Lost Time Incident. During 2021, Upstream area aviation contractor HeviLift (PNG) Limited achieved 4000 days, or more than 10 years, without a Lost Time Incident or Restricted Work Incident. More than 85.9 million hours have been worked since the start of production, as shown Figure 8.1, with 15.6 million hours worked during 2021.

**Figure 8.1 – Production work hours**  
NUMBER REPORTED BY PERIOD FOR THE TOTAL PNG LNG WORKFORCE



### Core safety processes

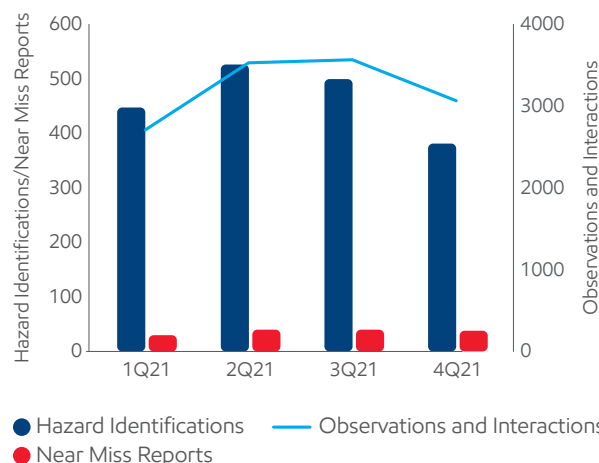
EMPNG uses OIMS to define its core safety programs and processes, which are based on indicators that determine the health of safety systems. Leading indicators measure the effectiveness of EMPNG’s safety programs. Lagging indicators measure actual incidents, consequences and overall safety performance.

Key leading safety indicators include Observations and Interactions, Hazard Identifications and Near Miss Reports, as shown in Figure 8.2.

During 2021, there were 14,711 ‘Nobody Gets Hurt’ cards submitted, 12,858 Observations and Interactions reported, and 1853 Hazard Identifications.

**Figure 8.2 – Core safety processes**

NUMBER REPORTED BY QUARTER



Additionally, 148 Near Miss Reports were submitted during the year.

Key lagging indicators for EMPNG are Lost Time Injury Rate, Total Recordable Incident Rate and the number of Tier 1 and Tier 2 process safety events as defined by IPIECA, the global oil and gas industry association. In March, EMPNG recorded one Tier 1 process safety event. This was due to the loss of primary containment at the HGCP caused by a 10-millimetre hole in a welded joint on a flange connection of the condensate stabiliser column. The stabiliser column was safely repaired.

In December, four Tier 2 process safety events were recorded. One at the HGCP was in relation to a needle valve leak. The remaining three were at the LNG Plant, with one involving a LNG leak on temporary piping, and the other two related to the failure of a pump seal. Process improvements were identified through the investigation process and are being reviewed for implementation.

EMPNG had a Total Recordable Incident Rate of 0.08 compared to 0.06 in 2020 because of increased work complexity as pandemic restrictions eased. There have been no Lost Time Incidents recorded at any PNG LNG operation for more than four years.

### Safety initiatives

Throughout January and February, the 2021 Safe Start campaign was held across all EMPNG worksites. Three safety focus areas of: Do It Right Every Time, Focus Despite Distractions and I’ve Got Your Back, were identified to support EMPNG’s objective of ‘Nobody Gets Hurt’.



The 2021 Safe Start campaign identified three safety focus areas to support EMPNG’s ‘Nobody Gets Hurt’ objective



**Members of the aviation contractor celebrating 4000 days of safe work**

The annual Contractor Safety Leadership Workshop was held in October. The workshop theme ‘Connecting the DOTS for a Safe Future’ highlighted the importance of understanding safety tools and how they work to keep personnel safe. It also emphasised process safety critical safeguards. At the workshop, Laba Security Services Limited, Smit Lamnalco and Baker Hughes PNG Limited received the Best Safety, Security, Health and Environment (SSHE) Performance Contractor of the year award 2021 for outstanding safety performance.

There was an increased focus on process safety as part of the Enhancing Process Safety framework during the year. Field teams were actively engaged in verifying and maintaining critical safeguards for higher consequence process safety scenarios. To further promote process safety, signs were installed at worksites to help workers identify and communicated the safeguards critical for continuing safe operations. EMPNG’s broader safety programs continue to cover high severity near misses and learning opportunities from 2021, especially around dropped objects, arc flash related to electrical work and motor vehicle use.



**Signage installed at the HGCP indicating the device is part of critical safeguards for high consequence process safety scenarios**

Twenty-four Upstream area workers were recognised as Safety and Fair Play Champions during 2021. This program aims to recognise and encourage safe behaviour as part of a journey to building a safety culture. Workers were selected by their supervisors throughout the year for exhibiting safe workplace behaviours and influencing others with ‘Nobody Gets Hurt’ objectives.



**EMPNG Upstream Senior Field Superintendent, Ken Musante, presenting HGDC Safety Officer, Andrew Kumul, with a Safety and Fair Play Champion award**

## 8.2 Health

EMPNG aims to maintain the health and well-being of its workforce by providing high quality medical, public health and industrial hygiene programs at all worksites.

Medical activities in 2021 continued to focus on maintaining the physical and emotional health and well-being of workers during ongoing COVID-19 restrictions.

### Medical

In 2021, some 12,440 patient consultations were conducted across camp clinics, with 49 percent of consultations at the LNG Plant site clinic and 51 percent at Upstream area clinics. EMPNG continued workplace screening for COVID-19, with more than 25,500 test samples collected across worksites during the year. Screening was primarily conducted for: workers who were quarantined before being allowed to enter worksites; unwell workers with respiratory symptoms; and workers who required medical clearance to travel.

Upstream and LNG Plant clinics received upgraded testing equipment to ensure the safe and timely processing of COVID-19 samples. This included polymerase chain reaction (PCR) testing machines to detect COVID-19, and biosafety cabinets for safely preparing samples for testing. All site clinics also received oxygen concentrator machines to increase their capacity to manage COVID-19 cases. In 2021, four moderate COVID-19 cases were recorded and treated at site clinics. Two severe cases were recorded, with one at the HGCP and one at the LNG Plant. Both were transferred to Port Moresby for further treatment and they fully recovered.

Vaccination awareness was provided to workers and more than 5000 vaccine doses delivered at EMPNG clinics throughout the year.

Clinicians conducted 1024 tuberculosis screening tests during 2021 as part of EMPNG’s tuberculosis awareness and prevention program.



**The HGCP Medical team conducts a medical emergency response drill using a mannequin to demonstrate competency in stabilising and managing a patient during an emergency**

Four community-acquired active tuberculosis cases were identified and managed, with no transmission of the illness in the workplace.

Seven medical evacuations were safely conducted during the year. All of these were non-work-related.

Regular medical emergency response drills are conducted at EMPNG site clinics. These drills enable medical teams to test and optimise their response to an emergency event, including responding to emergencies on worksites, and transferring and stabilising patients before medical evacuation.

The Culture of Health program continues to focus on worker biometric screening at site clinics and the delivery of mental health and well-being programs.

More than 1200 workers participated in biometric screening during the year, which involved blood pressure, weight and blood sugar testing to help identify and address any underlying health issues.

The LNG Plant held its first employee Olympics during August and September featuring sports such as volleyball and touch football. The LNG Plant also held a biggest loser challenge, which resulted in participants achieving a combined weight loss of 444 kilograms. Other activities included a perimeter walk challenge around the HGCP, a 5-kilometre walk challenge, and yoga at the LNG Plant.



**One of the winning LNG Plant Olympics teams**



**Culture of Health perimeter walk around the HGCP**

Two Employee Health Advisory Program webinars attracted 180 participants during the year. The webinars were held to support workers with effective stress management and tactics to quit smoking.

Mental Health Week and Pinktober were commemorated concurrently on 8 October. Workers were encouraged to come to work dressed in a combination of pink, to raise awareness about breast cancer, and odd and colourful socks to support *Wantok bilong lukautim tingting* meaning ‘A friend who takes care of mental health’ and the Yu OK? or ‘Are you OK?’ program. An online seminar was also held to support workers with mental health information.

In addition to colourful clothing, the Women in Energy Network hosted an afternoon tea with workers to discuss cancer risk factors. A pledge photo campaign was held where workers pledged a change they could make to protect themselves from breast cancer.

**Public health**

EMPNG continues to implement control measures to safeguard workers from COVID-19. Referred to as the *Niupela Pasin* protocols, which means ‘New Normal’, these control measures include: the use of masks; increased hygiene standards; social distancing; visitor restrictions; the requirement to notify their supervisor and stay home if unwell; virtual meetings and work from home arrangements; revised shift rotations to accommodate quarantine procedures; and COVID-19 testing.

Based on a health risk review regarding the prevalence of malaria at the LNG Plant, from July non-immune workers were no longer required to take malaria chemoprophylaxis to work at the site.

**Industrial hygiene**

EMPNG’s industrial hygiene program aims to protect workers through the assessment, control and communication of potential health hazards in the workplace.

During 2021, camp sanitisation work and enhanced food handling practices continued as part of EMPNG’s COVID-19 management.

Exposure monitoring, assessment reviews and health inspections were conducted at camps and worksites throughout the year. More than 80 personal exposure monitoring samples were collected to assess potential worker

exposure to factors such as benzene, crystalline silica and noise, as well as validate the efficacy of control measures such as personal protective equipment. Benzene exposure monitoring verified respiratory protection requirements for the 2021 pigging campaigns. Crystalline silica and noise exposure monitoring were completed to support the LNG Plant’s molecular sieve change-out and refrigerant compressor servicing activities. The Industrial Hygiene team also supported environmental health technicians with conducting food, public health and water safety inspections at Ambua Lodge, which accommodated pipeline ROW workers while they were in this area.

A general noise survey was conducted at the HWMF to confirm hearing protection requirements during drilling of a monitoring well.

The Industrial Hygiene team worked closely with the Operations, Maintenance, Projects, and Safety teams to review ventilation plans and ensure that appropriate worker health and safety controls were in place during maintenance work on the HGCP stabiliser column.

**Other strategic initiatives**

EMPNG commemorated World Tuberculosis Day, World Malaria Day and World AIDS Day by raising awareness with workers about these illnesses. Free HIV/AIDS testing and counselling is provided for workers at all EMPNG site clinics.

### 8.3 Camps

Ongoing pandemic restrictions required worker camps to maintain ‘island mode’ operations in the first half of the year to ensure the health and safety of more than 1000 camp residents across PNG LNG operations. ‘Island mode’ aims to avoid potential COVID-19 transmission by restricting movements of camp residents to within camp areas, limiting interaction with non-residents. It also includes a quarantine period for workers returning to camps, and social distancing protocols at all offices and common areas including conference rooms, cafeterias and in EMPNG transport vehicles.



**EMPNG Lawyer, Kymerlee Cholai, and Public and Government Affairs Advisor, Lavinia Oli, show their pledge cards, odd socks and pink clothing to support health awareness activities in October**



**Women from Paija Iba Women's Agri Business Inc. selling produce at the Nogoli markets**

During the second half of the year 'island mode' was phased out due to high vaccination uptake at field sites, while other rigorous protocols such as mask wearing, personal hygiene, and social distancing remained at all worksites. These measures proved successful in limiting the transmission of COVID-19.

The HGCP Camp catering contractor continues to purchase goods from local suppliers for camp menus. In 2021, more than 61,700 kilograms of fresh produce from local markets in the Upstream area was sourced through the Paija Iba Women's Agri Business Inc. group. This equated to more than PGK168,000 (USD47,880) spent on produce provided by the women's group. All purchases were conducted in accordance with EMPNG's COVID-19 safeguards and protocols.

## 8.4 Labour and working conditions

EMPNG conducts regular employee and supervisor development forums to support career development and reinforce company policies and procedures. Employee resource groups such as the Women in Energy Network and Wanwoks Initiative, which supports Papua New Guinean workers, also provide mentoring to enhance employees' personal and professional development.

Due to COVID-19 restrictions, most employee forums were conducted online during 2021.

In March, EMPNG commemorated International Women's Day with a webinar that featured male workers who shared their thoughts and experiences about supporting gender equality.

The theme for 2021 was 'choose to challenge', which explored ways to encourage more men to become involved in challenging gender biases in homes, communities and workplaces.

A self-awareness webinar also held during the year helped employees explore their individuality. In addition, EMPNG personnel were invited to attend a finance basics and business acumen webinar aimed at increasing their skills in finance basics relating to general business operations. Ongoing virtual Toastmasters sessions are helping to build the communication and presentation skills of employees.

EMPNG provides an HR Direct platform where EMPNG personnel can register human resources-related enquiries online. The average response time to an enquiry raised through the platform is within one day. Most enquiries are about savings and medical plans. During 2021, the HR Direct program received a 98 percent positive feedback rating from employees.

In addition to employee forums and HR Direct, EMPNG conducts regular engagement sessions with senior management. These sessions provide an opportunity for employees to ask questions and raise concerns directly with EMPNG's senior management.

New EMPNG employees receive Standards of Business Conduct training as part of their induction process, while periodic refresher training is delivered to the existing workforce.



**EMPNG Facilities and Process Surveillance Engineer, Elijah Lavai walking past a utilities pipe rack at the LNG Plant site**

Topics covered in the Standards of Business Conduct training include ethics, conflicts of interest, anti-corruption, health, safety, environment, alcohol and drug use, equal employment opportunity and harassment at worksites. These Standards also outline EMPNG’s open door communication procedures, which encourage employees to ask questions, voice concerns, escalate issues to senior levels of management when needed and make appropriate suggestions regarding the company’s business practices.

**Lead Country Manager Awards**

Eleven EMPNG employees have received 2021 Lead Country Manager Awards for demonstrating outstanding examples of *Em pasin bilong ExxonMobil long PNG* or ‘The way we work at ExxonMobil in PNG’ behaviour.

The 2021 award recipients were: EMPNG Digital Support Advisor, Desmond Vaua; Utilities, Storage and Loading, Common Process, and Trains Operator, Metro Imas; Medical Advisor, Cain Kapiri; Facilities Services Coordinator, Debra Yembi; Mechanical Technician – Planner, Yvette Kuma; Facilities Surveillance Engineer, Lydia Turia; Business Support Manager, Magaru Riva; Security Operations Lead, Jason Pilamp; Engineer, Joachim Kiliu; Media and Communications Manager, Susil Nelson-Kongoi; and Surveillance Engineer, Nathaniel Tuba. Further information on each of these winners is outlined in Case Study – *Award recipients*.

The Lead Country Manager Awards reflect EMPNG’s six core values of safety, security, respect for the environment, excellence, teamwork and integrity.

Each award winner received a certificate and prizes including vouchers and a customised Kundu coffee cup.

**8.5 Security**

Eleven EMPNG security personnel achieved internationally recognised security accreditation through an Australian-based training program. Another six personnel are in the process of obtaining drone pilot accreditation following completion of their training provided by EMPNG. This accreditation will allow them to conduct regular drone flights to monitor EMPNG facilities.



**EMPNG Site Security Contact, Jack Yori, operates a Matrice 210 drone to conduct monitoring at the HGCP**

## CASE STUDY

## AWARD RECIPIENTS

**Security**

1. Desmond Vaua received the Security award for working with developers in India to create an autonomous remote equipment health monitoring tool to ensure the health and reliability of cyber security systems in the field. Desmond also designed and implemented the merger of ExxonMobil Haus and LNG Plant digital trunking radio systems.

**Safety**

2. Metro Imas was recognised for demonstrating outstanding process safety behaviours. Metro mentors and trains teams in Job Safety Analysis assessments, and has identified hazards that work groups haven't considered, which helps to optimise EMPNG's safety performance.

3. Dr Cain Kapiri received a Safety award for proactively finding ways to increase COVID-19 vaccination rates and helping to improve Papua New Guinea's COVID-19 testing capability. Dr Cain also analysed the prevalence of malaria in the Central Province, which led to the removal of malaria chemoprophylaxis requirements for non-immune workers at the LNG Plant site.

**Excellence**

4. Debra Yembi achieved an Excellence award for quickly transforming the LNG Plant turnaround camp into a COVID-19 isolation facility. Debra also developed and implemented the initial LNG Plant site COVID-19 safeguards, supported the LNG Plant maintenance program, and led an initiative to reduce plastic waste generated at the LNG Plant.

5. Yvette Kuma received an Excellence award for outstanding work on many complex maintenance activities. Her commitment to learning and producing quality maintenance plans helped improve the safety and efficiency of maintenance activities throughout 2021.

6. Lydia Turia was recognised for her role in maximising naphtha production, as well as optimising LNG ship

loading practices to reduce flaring, managing LNG tank pressures, and reducing greenhouse gas emissions during ship loading operations.

**Integrity**

7. Magaru Riva was recognised for working with multiple external stakeholders, including various government agencies, to achieve more efficient operations that supported bottom line integrity.

8. Jason Pilamp received an Integrity award for training and mentoring security teams, providing guidance to Lanco, Laba Security Service Limited, and developing and implementing an enhanced access control and inspection procedure at the LNG Plant site.

**Teamwork**

9. Joachim Kiliu achieved the Teamwork award for improving key performance indicator reporting, enhancing synergies between EMPNG work teams, and coordinating the deployment of new monitoring technologies for an airport control system assessment at Komo Airfield.

10. Susil Nelson-Kongoi was awarded for her leadership and innovation in media and communications. Susil was recognised for bringing people together in a way that enables individual and team success. She was also honoured as a strong collaborator who mentors other workers and aims to have a positive impact across the organisation and in Papua New Guinean communities.

**Environment**

11. Nathaniel Tuba was honoured with the Environment award for leading projects to successfully manage wastewater disposal at the HGCP, recycle waste oil, and reduce monoethylene glycol use. He was also recognised as a champion for process safety and production optimisation initiatives.



**2021 Lead Country Manager Award winners include: Security Operations Lead, Jason Pilamp; Media and Communications Manager, Susil Nelson-Kongoi; Digital Support Advisor, Desmond Vaua; and Business Support Manager, Magaru Riva**

As part of a Memorandum of Understanding between the Royal Papua New Guinea Constabulary and EMPNG, 23 new vehicles were purchased by EMPNG in 2021 to support the mobility capacity of Papua New Guinea Defence Force members deployed under the Memorandum.

Community-based automotive mechanic workshops were used to service and maintain the vehicles.

A total 854 Papua New Guinea police officers and Defence Force personnel, and 874 contracted security personnel deployed at EMPNG sites, were trained in the Voluntary Principles of Security and Human Rights in 2021.

EMPNG security personnel also continued to support operations, including implementing COVID-19 restrictions that were in place during the year.

## 8.6 Emergency preparedness

EMPNG has plans and processes in place to mitigate the impact of an emergency event. These processes, along with training and emergency response drills, give workers the competency level needed to appropriately respond if an emergency occurs.

In 2021, EMPNG updated its Emergency Response Plans for all worksites. The updated Plans are consistent with ExxonMobil’s ‘One Plan’ concept. This means that all Emergency Response Plans are now streamlined to focus on key information necessary for response teams to respond to an emergency situation. Common information in previous Plans is captured in the new EMPNG Emergency Reference Guide. The One Plan concept helps response teams quickly and efficiently understand an event so they can implement critical actions to minimise the impact of an emergency. In addition to the Emergency Response Plans, tactical response plans are being revised to incorporate learnings from process safety scenarios.

Emergency response drills conducted during 2021 included: process area drills; fire and evacuation drills; security lockdown drills; loss of containment drills; and helicopter and fixed wing aircraft emergency drills. A key exercise, conducted for the first time, was a boiling liquid expanding vapor explosion drill at the LNG Plant.



The LNG Plant Fire Response team

Incident Management teams received Incident Command System virtual training in February and March, with Emergency Responders participating in theory sessions and deployment exercises conducted by a visiting emergency response consultant.

Field technicians from the Pipeline Operations team recently became Certified First Aid Officers following basic and advanced first aid training in Moro. The training instructed participants about treating snake bites, broken bones, wounds and burns, as well as performing cardiopulmonary resuscitation. Providing first aid training to workers in the field is a vital component of EMPNG’s response to medical emergencies.

Electronic mustering (eMustering) was introduced at the HGCP, Moro and Angore during the year to ensure headcount accuracy and optimise the mustering process. Along with new muster colour coding to help camp personnel easily identify their mustering location, the mustering process is now 15 minutes faster.



New eMustering stations at the HCGP primary safe haven muster point

EMPNG’s Fire and Rescue team received a new fire truck during 2021. The truck features a large water capacity tank, easy-to-use pump, and built-in manual fire monitor to support fire and safety operations at the LNG Plant. It will also be used for support activities such as filling up oil spill quick tanks.



EMPNG Safety Specialist, Gerard Ila, with the new fire truck at the LNG Plant

2021 PERFORMANCE HIGHLIGHTS

WORKER WELFARE



**0** LOST TIME INCIDENTS IN 2021



**4+** YEARS WITHOUT A LOST TIME INCIDENT



**15.6M** WORK HOURS IN 2021



**14,711** 'NOBODY GETS HURT' SUBMISSIONS



**61,700+** KILOGRAMS OF FRESH PRODUCE SOURCED LOCALLY



**1720+** TRAINED ON VOLUNTARY PRINCIPLES OF SECURITY AND HUMAN RIGHTS

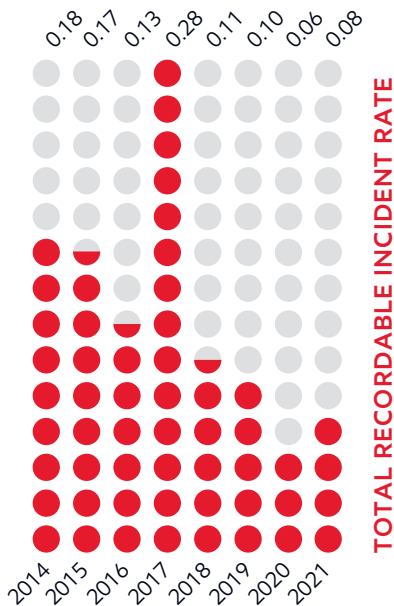


SAFETY PERFORMANCE

LNG PLANT SAFETY RECORD  
**8+** YEARS LTI-FREE

UPSTREAM SAFETY RECORD  
**4+** YEARS LTI-FREE

CONTRACTOR SAFETY RECORD  
**10+** YEARS LTI-FREE



TOTAL RECORDABLE INCIDENT RATE



**7** NON-WORK-RELATED EMERGENCY MEDICAL EVACUATIONS

**1024** TUBERCULOSIS SCREENINGS

**1220** BIOMETRIC SCREENINGS

**25,532** SAMPLES FOR COVID-19 SCREENING COLLECTED

**5058** COVID-19 VACCINES ADMINISTERED AT EMPNG CLINICS

**~12,440** PATIENT CONSULTATIONS

**49%** LNG PLANT

**51%** UPSTREAM

Total Recordable Incidents Rate is the frequency rate of total recordable incidents within a given period, relative to the total number of hours worked in that period by a constant of 200,000 hours, which represents 100 workers working 8 hours per day for a year (250 working days). It is a proxy measurement for safety performance with lower rates indicating better safety performance.

9



# STAKEHOLDER ENGAGEMENT

EMPNG maintains inclusive and open two-way engagement to keep stakeholders updated about production activities and address any community issues raised in a timely manner.

## 9.1 Community engagement

EMPNG is committed to actively engaging with community stakeholders, working in consultation with government and non-government agencies, and addressing community issues in a timely manner. As part of this approach, ongoing engagements are held with communities and government agencies throughout areas in which PNG LNG operates.

During 2021, 7498 engagements were conducted with communities throughout the PNG LNG area of operations. These involved 2470 formal engagements and some 5028 informal engagements with nearly 38,000 stakeholders. This is a 39 percent increase in total engagements compared to 2020, which reflects the increase in work activities following the easing of pandemic restrictions.

Community engagements were conducted in accordance with COVID-19 safe practices and most engagements focused on COVID-19 awareness.

In the Upstream area, engagements covered Clan Caretaking Agreements, and the establishment of exclusion zones around areas identified during land access surveys as at risk of potential landslips. Other engagements addressed business participation and employment requests.

At the LNG Plant, engagements predominantly covered community investment projects including donation and care pack deliveries, as well as awareness raising about marine safety exclusion zones, mangrove conservation and grass fire risks.

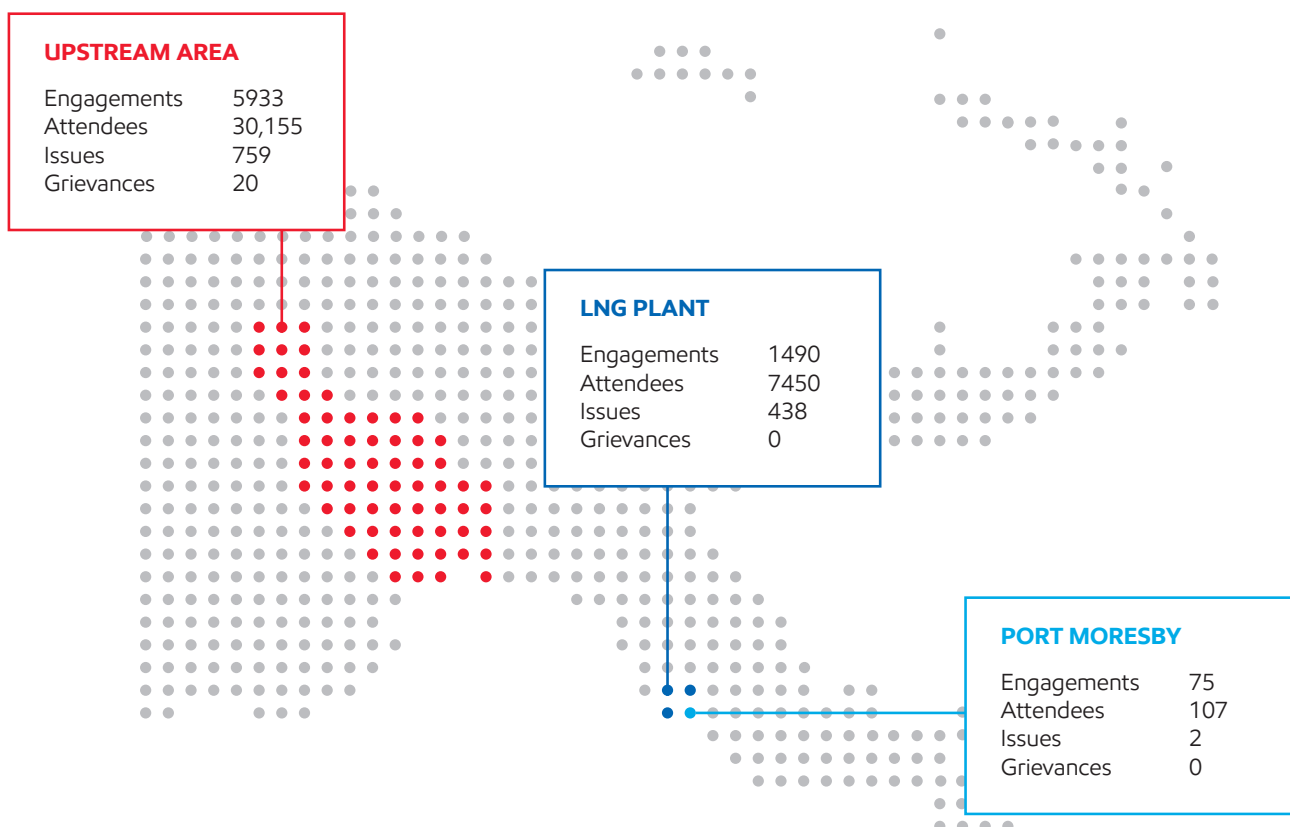
Ten billboards were erected by Lanco, Laba Holdings Limited along the beachfront at Caution Bay to educate local communities about marine safety exclusion zones. The PNG LNG Port Facility Awareness billboards were unveiled in December by EMPNG in collaboration with the Department of Transport’s Maritime Safety Division, Buria Community Police Post, Buria Village Court, and representatives from the ward councillor’s office in Lea Lea Village.



One of the newly installed PNG LNG Port Facility Awareness billboards

A summary of stakeholder engagements conducted during 2021 is shown in Figure 9.1.

Figure 9.1 – Stakeholder engagement summary



## 9.2 Community issues identification

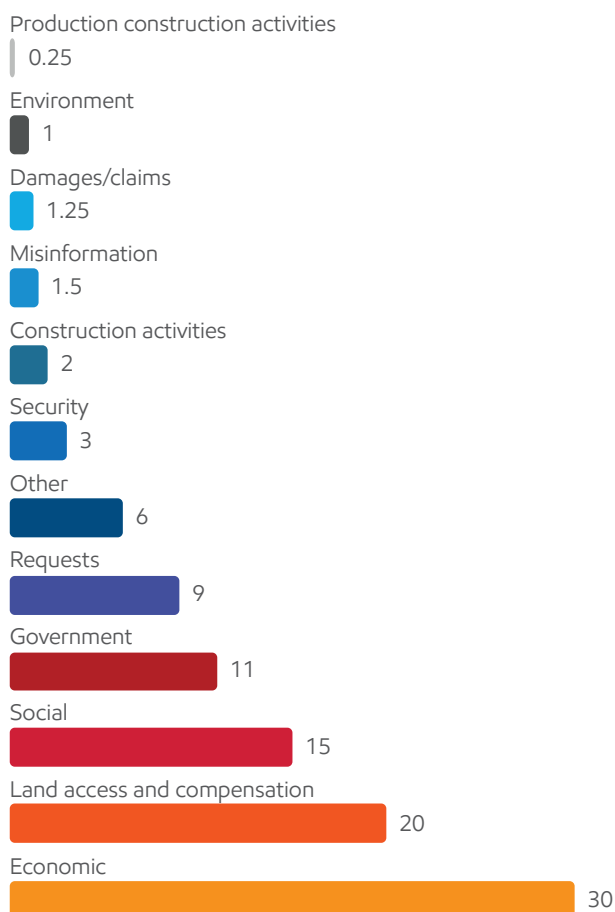
In accordance with the ESMP, community issues are defined as a question, comment, concern, suggestion or observation that is presented to PNG LNG. This includes communications on matters that are outside the control of EMPNG, such as government-related inquiries.

Issues are captured through methods including ongoing community liaison and formal stakeholder engagement processes. They are received, monitored and closed on a daily basis. In some cases, issues may need to remain open for a longer period of time before they can be resolved.

During 2021, almost 1200 issues were received and categorised as shown in Figure 9.2. This reflects the resumption of construction activity for the Angore Gathering System, earthquake recovery works in Komo, and land access surveys in Moro. In total, 1013 issues were addressed and closed during 2021, with 186 remaining open at the end of the year. The Community Affairs team is coordinating further actions to close these issues in 2022.

**Figure 9.2 – Issues**

PERCENTAGE RECEIVED BY CATEGORY



## 9.3 Community grievance management

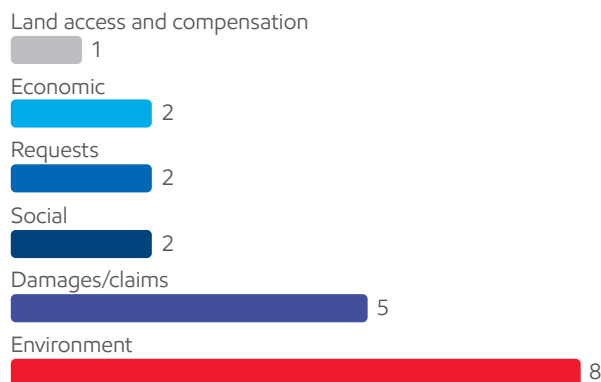
In accordance with the ESMP, a grievance is defined as a complaint lodged by an individual, group or community alleging damage, impact, or dissatisfaction specifically

resulting from EMPNG actions or a lack of action. Grievances are managed through a Grievance Management Process, which has been designed to fairly and promptly receive, assess, respond to, and resolve grievances.

Twenty grievances were registered during 2021 compared to 16 grievances in 2020. Figure 9.3 shows the number of registered grievances in 2021 by category.

**Figure 9.3 – Grievances**

NUMBER OF GRIEVANCES BY CATEGORY



Eight of the 20 grievances recorded were for environmental concerns. One grievance regarded an odour from the HWMF, another was reported for a landslip at Yakora Creek, and the third regarded water flow in Naro Creek. These three grievances were closed, along with an unsubstantiated grievance regarding a Huli ditch. Formal engagements were conducted with grievants about actions taken to close these grievances.

Three of the remaining environmental grievances regarded water quality concerns with two closed by the end of the year. The remaining grievance was associated with tree felling activities along the pipeline ROW and requires further investigation in 2022.

Five damages grievances included one resettlement claim, and one claim of damages to four Casuarina trees. Both grievances were closed and compensation paid. The other three grievances were claims for damages caused during early works associated with telecommunications tower construction. These grievances will be closed in 2022.

Two social grievances were raised during the year. One regarded concerns about cane toads, with cane toad awareness provided to the grievant and closed. The second was about compensation for agricultural assets that were assessed during pre-construction surveys in the landslip exclusion zone in Hides. This grievance was closed and compensation paid.

Two economic grievances were raised, with one regarding business development opportunities and the second about a credit facility. Both grievances were addressed and closed. Two grievances related to requests with one remaining open for further investigation.

In total, 14 grievances were addressed and closed during 2021, with six remaining open and under investigation at the end of the year.

## 9.4 Resettlement

EMPNG aims to avoid resettlement resulting from construction activities. In situations where resettlement is unavoidable, the company's objective is to improve, or at least restore, the standards of living and livelihoods of displaced persons.

In 2021, compensation payments were made for 17 gardens associated with three households located within the Hides Spine exclusion zone.

Pre-construction surveys were conducted at 10 locations along the main pipeline ROW and on the Kutubu Spurline to assess households in additional areas identified as either: at risk of landslips; within areas that are required for the extension of the ROW; or for pipeline remediation works. Thirty households were identified during these surveys as being eligible for compensation. This includes one household that has already received livelihood restoration support and had an initial outcome evaluation. The final outcome evaluation for this household will be conducted in 2022. By the end of 2021, 26 households had received compensation. Payments for the remaining four households will be completed in 2022. Two of these households are also being assessed for eligibility for livelihood restoration support, with the outcome expected in 2022.

## 9.5 Compensation

During 2021, 12 Clan Agency Agreements were signed with landowning clans for land access along 3 kilometres of the pipeline ROW from Kekero to Maruba River. This allowed for ROW extension works and ongoing earthquake repairs along the ROW.

The number of annual deprivation payments increased from 366 in 2020 to 369 in 2021. By the end of the year, 95 percent of deprivation payments were completed, while 16 remained outstanding due to ongoing discussions with clans about potential land release for a public road.

Seventeen clans have been in compensation disputes since the start of PNG LNG construction. Seven clans resolved disputes in 2021, which is additional to seven clans that resolved disputes during 2020. As a result, 82 percent of disputed clan payments have been completed, which includes all Upstream North clans involved in this process. The three remaining clan disputes are for the Upstream South area, Gobe Spurline, KP 270 to KP 272, and the Homa Ridge Access Road.

## 9.6 Government engagement

Through ongoing engagement with all levels of government and working with government departments to support community-based initiatives, EMPNG keeps government representatives informed about operations, projects and production activities.

### 9.6.1 Infrastructure and government support

EMPNG is maintaining its support to the Papua New Guinean Government with the delivery of infrastructure programs, as

well as maintenance and upgrade works to the Highlands Highway between Mendi in the Southern Highlands Province and Komo in the Hela Province.

During 2021, highway upgrade works included a chip-sealed road surface, improved drainage and road shoulders at sections between Ambua and Tari, and the Komo to Anguale road. EMPNG also finalised its funding commitment for the four-story office complex in Tari that is being constructed for the Hela Provincial Government's administration.

PNG LNG infrastructure tax credit projects such as these provide business opportunities for local suppliers and Lancos, and employment for people living in nearby communities.

### 9.6.2 Advocacy

Advocacy workshops are conducted to share information about PNG LNG's operations, community development programs, biodiversity programs and national content initiatives. Due to pandemic restrictions, the advocacy program could not be conducted during the first half of the year. In the second half of the year, 15 advocacy workshops were held with more than 150 representatives from national government departments, and provincial and local-level governments. Attendees found the sessions informative and a good opportunity for relationship-building.

In September, EMPNG commemorated Papua New Guinea's 46<sup>th</sup> Independence Day by organising a webinar of the grand final of the Tertiary School Debate Challenge 2021.



**EMPNG Production Manager, Scott Sandlin (right), congratulates winners of the Tertiary School Debate Challenge 2021, the Papua New Guinea University of Technology debate team**



**Senior Ministerial Advisor and daughter of Grand Chief Sir Michael Thomas Somare, Dulciana Somare-Brash, participating in the discussion panel following the Tertiary School Debate Challenge 2021 held on Papua New Guinea's 46<sup>th</sup> Independence Day**

The Debate involved participants from numerous Papua New Guinean tertiary institutions. It was followed by a panel discussion that included Senior Ministerial Advisor and daughter of Grand Chief Sir Michael Thomas Somare, Dulciana Somare-Brash. In the Upstream area, Independence Day was celebrated with a face painting and photography competition, as well as the sharing of a traditional Papua New Guinean dinner with workers.

#### IN MEMORIAM

### HONOURING GRAND CHIEF SIR MICHAEL THOMAS SOMARE

In 2021, EMPNG joined the people of Papua New Guinea in mourning the passing of the founding father of the nation, Grand Chief Sir Michael Thomas Somare.

Grand Chief Sir Michael Thomas Somare is remembered for laying the foundation for an independent Papua New Guinea, and for paving the way for transforming the economy and improving the lives of Papua New Guineans. He was signatory to the PNG LNG Project Gas Agreement in 2008. His leadership was instrumental in PNG LNG moving from concept to construction.

Grand Chief Sir Michael Thomas Somare's vision has led to Papua New Guinea taking its place on the global stage as a reliable provider of LNG to the world. His legacy remains an inspiration that will continue to guide EMPNG for many years to come.



**Papua New Guinea's founding father, Grand Chief Sir Michael Thomas Somare, shares his country's history with former EMPNG Managing Director, Andrew Barry, during Independence Day celebrations in 2017**

### 9.6.3 Benefits assurance delivery

EMPNG continues to make monthly landowner royalty payments, along with annual Provincial and Local-Level Government Development Levy payments, to the Papua New Guinean Government in accordance with the *Oil and Gas Act 1998*. The Department of Petroleum and Energy and the State-owned Mineral Resources Development Company Limited distribute these funds to beneficiaries on behalf of the government. The funds are managed through trust accounts

at the Bank of Papua New Guinea, with the Department of Finance being custodian of the accounts.

During the early stages of PNG LNG, landowners requested more granularity in information from the Papua New Guinean Government about royalty apportionment than had been provided in the Licence Based Benefits Sharing Agreements. As a result, the Government conducted a detailed review of landowner beneficiary identification, delving below the clan level to establish a clan's constituents, including subclans and members. This process is known as Landowner Beneficiary Identification. It was subject to litigation against the Papua New Guinean Government by some landowners in the Hides area, which resulted in additional administrative steps undertaken to enable the distribution of royalties from oil and gas production by court annexed mediations.

In 2021, Landowner Beneficiary Identification was completed for clans in Petroleum Development Licence PDL7, and the Papua New Guinean Government stated its intention to commence royalty payments in early 2022.

Beneficiaries of Pipeline Segments 2 and 3 received their inaugural royalty payments in August 2021.

Since 2018, beneficiary clans at the LNG Plant site villages of Papa, Boera, Porebada and Lea Lea have received two payments. Beneficiaries from Pipeline Segments 8, 4, 5, 7 and 1 received their inaugural payment in 2020.

In early 2021, EMPNG made its seventh Development Levy payment to the Papua New Guinean Government as required by the *Oil and Gas Act 1998*. The Department of Petroleum and Energy holds the Development Levy in trust for payment to impacted provincial and local-level governments in response to their developmental needs.

### 9.6.4 Revenue management

Papua New Guinea is part of the voluntary Extractive Industries Transparency Initiative (EITI), which aims to improve governance in resource-rich countries through the disclosure and verification of company payments and government revenues from oil, gas and mining projects.

Due to the ongoing and extensive impact of COVID-19, the EITI International Board granted a second extension to Papua New Guinea's validation deadline for 14 corrective actions, which were identified during the first validation process conducted in 2018 that was based on EITI's 2016 global standards. The corrective actions include:

- public disclosure of export volumes and values for each mineral commodity (including oil, condensate and gas) exported in the year under review
- a comprehensive assessment of transactions between State-owned enterprises (and their subsidiaries) and mining, oil and gas companies
- establishing whether direct subnational payments to government entities by extractives companies are material
- an assessment of whether the payments and revenues are subject to credible, independent audit and apply international auditing standards

- clarifying which extractive revenues are recorded in the National Budget
- reporting of mandatory social expenditures to be disaggregated by type of payment and beneficiary, clarifying the name and function of any non-government beneficiaries.

The validation of corrective actions is now scheduled to begin in April 2022.

In July, the Papua New Guinea EITI Secretariat finalised and published the seventh Papua New Guinea EITI Report covering 2019 activities. The 2019 Report took lessons learned from previous Papua New Guinea EITI reports by filling information and data gaps, as well as completing identified corrective measures, in a more comprehensive manner than past reports.

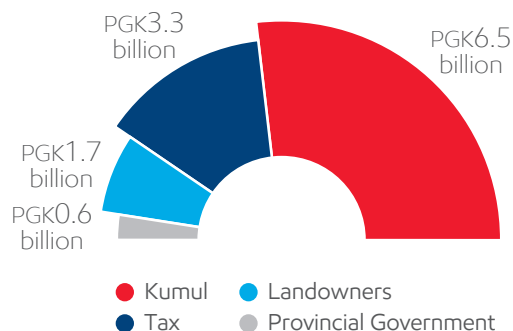
The 2019 EITI Report shows that the extractive industry contributed more than PGK6 billion (USD1.7 billion) in revenue, of which PGK1.1 billion (USD313 million) was recorded in the National Budget as corporate income tax, dividends and import taxes, and PGK2.9 billion (USD818 million) was paid to State-owned enterprises. The contribution to government revenue from the extractives sector was 28 percent, which does not include the multiplier effect from contributions by contractors and subcontractors who support the industry, as well as Lancos and other local suppliers. The 2019 EITI Report also found that the extractives industry contributed cash and in-kind social expenditure of almost PGK450 million (USD128 million). Of this, PGK335 million (USD95 million) were voluntary contributions for community infrastructure projects, community health and education programs, and small business opportunities.

The EITI International Secretariat has advised that Papua New Guinea’s deadline to deliver the 2020 EITI Report is December 2022.

Since the start of production in 2014, PGK12.1 billion (USD3.4 billion) in revenue from PNG LNG has been distributed to landowners and the Papua New Guinean Government, as shown in Figure 9.4.

**Figure 9.4 – PNG LNG distributions**

PRODUCTION-TO-DATE REVENUE DISTRIBUTED BY RECIPIENT



The Papua New Guinea EITI Secretariat has finalised proposed legislation for a Papua New Guinea EITI Commission Bill to establish the group as an independent entity. Community consultations regarding the proposal were conducted in the New Guinea Islands, Momase, Southern and Highlands regions. They involved information sessions where feedback was obtained from key stakeholders across industry, provincial and local-level governments, landowners and interested groups. The proposal will be presented to Papua New Guinea’s parliament in 2022.

EMPNG is among 21 members of the EITI multi-stakeholder group, with ExxonMobil serving continuously on the EITI International Board as either a full or an alternate member since its inception in 2002.

## 9.7 Media

In 2021, media activities focused on providing information about PNG LNG’s progress to Papua New Guinean media organisations and journalism schools. EMPNG’s Media and Communications team is now fully managed by Papua New Guineans, following the appointment of Susil Nelson-Kongi as the Media and Communications Manager during the year.

EMPNG has renewed its Naming Rights sponsorship of Papua New Guinea’s national rugby league team, the PNG LNG Kumuls.



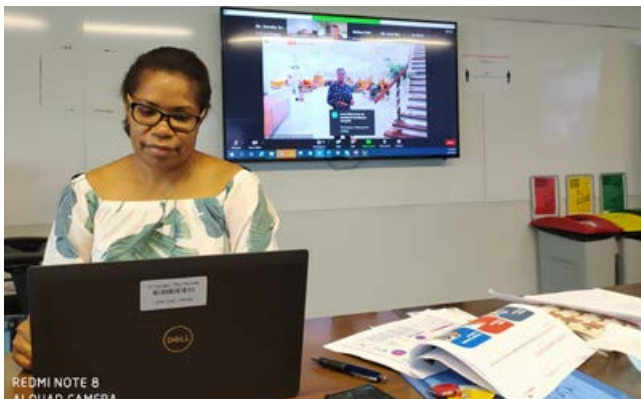
**EMPNG’s Media and Communications team became fully managed by Papua New Guineans in 2021. The team leads EMPNG’s media and communications strategy that includes supporting engagements with media, community, and government stakeholders. Pictured from left are: Melissa Fairi (Lead), Wanita Wakus (Advisor), Toxen Yavetave (Graduate Trainee), Joshua Parep (Graduate Trainee), Belinda Gurra (Advisor), Dorothy Bengo (Advisor), Susil Nelson-Kongi (Manager)**

The announcement was made in April at a virtual media conference held with the Papua New Guinea Rugby Football League.

There were six PNG LNG appearances on FM100's talk back radio show during the year. Each radio show segment featured partners such as the Papua New Guinea Flying Labs, Buk bilong Pikinini, and the Women in Energy Network. The radio show also included representatives from Hides Gas Development Company Limited, Nares Engineering Limited, the Business Council of Papua New Guinea, and the Department of Commerce and Industry who shared updates about the work they were doing to help build the nation's economy.

EMPNG sponsored three social media training sessions, which were conducted for local journalists and key stakeholders in 2021. The training helped participants develop and enhance social media content on numerous online platforms. The first training session, held in February, was conducted by the Media Council of Papua New Guinea and involved 23 participants from 12 media organisations. The other two training sessions were delivered by the Papua New Guinea Chamber of Mines and Petroleum in August and attracted more than 140 participants.

Also in August, EMPNG Media and Communications Lead, Melissa Fairi, and Media and Communications Advisor, Dorothy Bengo, presented online to more than 130 students during the Divine Word University's Faculty of Arts and Social Sciences Virtual Open Day. Melissa and Dorothy spoke about EMPNG's focus on Papua New Guinea's economic development.



**EMPNG Media and Communications Lead, Melissa Fairi, presents online at the Divine Word University's Faculty of Arts and Social Sciences Virtual Open Day**

EMPNG Managing Director, Peter Larden, spoke at Business Advantage Papua New Guinea's 2021 Papua New Guinea Investment Digital Conference about how PNG LNG was maintaining its world-class performance despite the challenges presented by COVID-19.

In October, EMPNG held an information session with journalists from the *Post-Courier* newspaper to provide an overview of PNG LNG since production began in 2014. EMPNG also provided an overview of PNG LNG to 40 final year journalism students from the University of Papua New Guinea School of Journalism during the year.

In early December, EMPNG Managing Director, Peter Larden, presented at the Papua New Guinea Chamber of Mines and Petroleum's annual conference.

The conference theme was 'Resource Industry - Making it Work for PNG'. Mr Larden spoke about the benefits that PNG LNG brought to Papua New Guinea through workforce development and collaborative partnerships with government. He also outlined the work that EMPNG had done with government and community partners to combat COVID-19. EMPNG Media and Communications Manager, Susil Nelson-Kongoi, chaired a session about the Papua New Guinea Government's economic overview and resource wealth creation, which featured panellists from Papua New Guinea's Treasury department and representatives from private sector organisations Santos Limited and the Mineral Resources Development Company Limited.

Following the conference, EMPNG developed a short, animated video to help the Chamber of Mines and Petroleum explain to its stakeholders the benefits that the oil and gas industry has provided to Papua New Guinea's economy and to local communities.



**EMPNG Managing Director, Peter Larden, presents at the 2021 Papua New Guinea Mining and Petroleum Conference**

The PNG LNG Environmental and Social Report – Annual 2020 was published in June. More than 67,000 printed copies of the Report's Executive Summary were published in English and Tok Pisin in national newspapers. The 2020 Report, and previous Environmental and Social Reports, are available on the PNG LNG website.



Visit the website at: [www.pnglng.com](http://www.pnglng.com)

One edition of PNG LNG TIES was distributed to stakeholders in 2021, including EMPNG workers, government, media and local communities. This eight-page pictorial broadsheet-sized newsletter covers production and business updates, and stories about PNG LNG's interactions with local communities. PNG LNG TIES is also published on the PNG LNG website.

More than 1.5 million engagements were achieved on EMPNG's Facebook and Twitter accounts, with the most popular topics being health, fostering workforce skills, environment and community empowerment.

2021 PERFORMANCE HIGHLIGHTS


STAKEHOLDER ENGAGEMENT



**7498**  
ENGAGEMENTS  
CONDUCTED

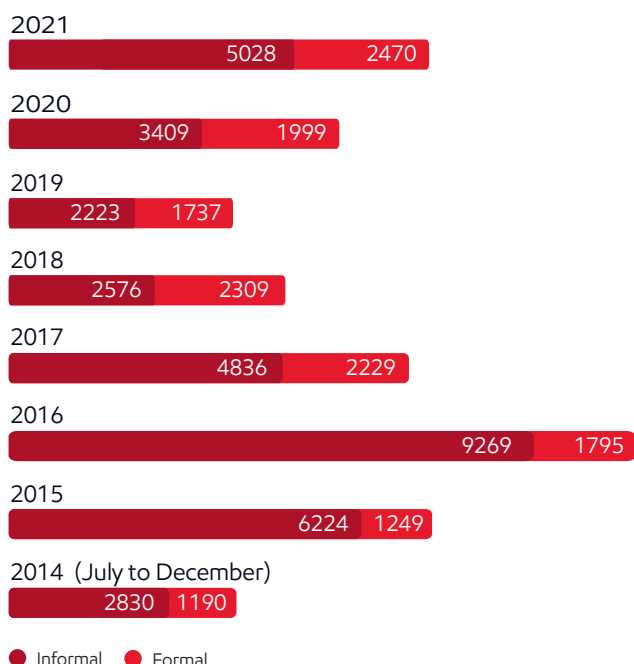


**PGK12.1B**  
REVENUE DISTRIBUTION  
TO DATE

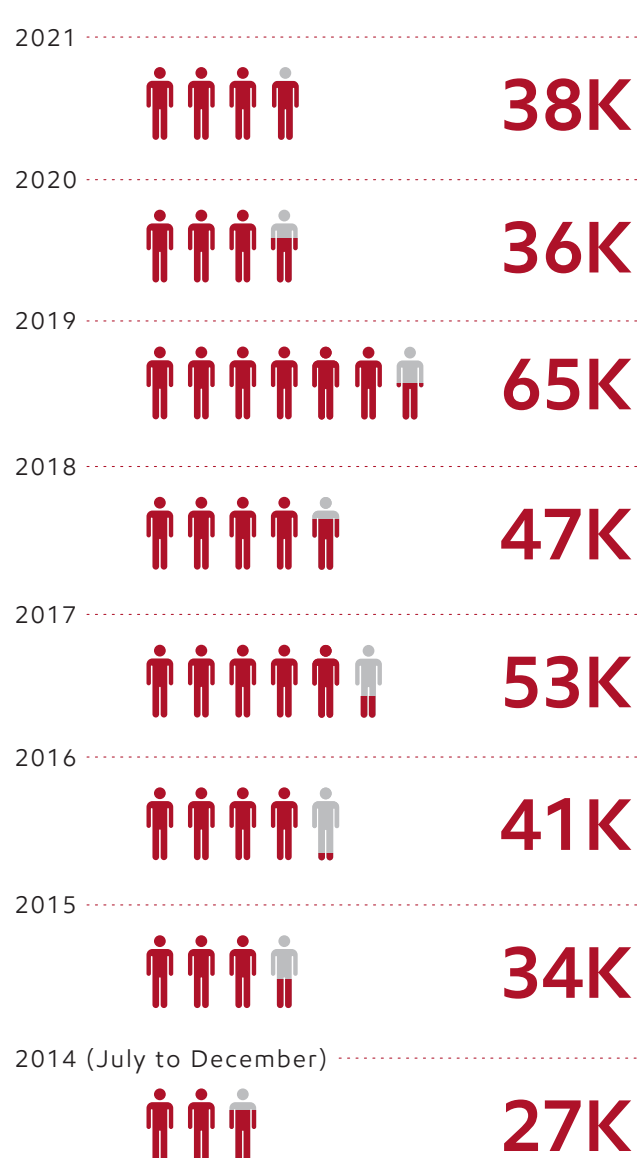


**95%**  
DEPRIVATION  
PAYMENTS MADE

NUMBER OF ENGAGEMENTS SINCE THE START OF PRODUCTION



ENGAGEMENT PARTICIPANTS SINCE THE START OF PRODUCTION




**70%**  
GRIEVANCES  
CLOSED



**15**  
ADVOCACY  
WORKSHOPS



**12**  
CLAN AGENCY  
AGREEMENTS



**154**  
ADVOCACY  
ATTENDEES

**1**  
EDITION OF  
PNG LNG TIES  
NEWSLETTER  
PUBLISHED




**1.5M+**  
SOCIAL MEDIA  
ENGAGEMENTS



**67,000**  
PRINTED COPIES OF  
PNG LNG E&S REPORT -  
ANNUAL 2020  
EXECUTIVE SUMMARY

*Image captions:*

<b>Cover</b>	EMPNG Operations Technician, Elaine Baking, at the HGCP
<b>Executive Summary</b>	EMPNG Operations Technician, Anthony Lohia, with Facilities and Process Surveillance Engineer, Elijah Lavai, at the LNG Plant
<b>Chapter 1</b>	The HGCP at night
<b>Chapter 2</b>	EMPNG Operations Technician, John Oaniu with Electrical Technician, Stephanie Raphael, at the LNG Plant
<b>Part A</b>	LNG Plant Marine Terminal
<b>Chapter 3</b>	EMPNG Operations Technician, Alisha Onno at the HGCP
<b>Chapter 4</b>	HGDC Energy Services Limited Elevated Work Platform Operator, Makeria Yale
<b>Chapter 5</b>	EMPNG Surveillance Engineer, Kimberley Sabarei, with five-year old Dorcas Kilalema at the Kumul Petroleum Academy
<b>Part B</b>	Juvenile southern cassowary ( <i>Casuarius casuarius</i> ) at Kemei Village in Kikori
<b>Chapter 6</b>	Rainbow bee-eater ( <i>Merops ornatus</i> ), a migratory bird that breeds in Australia and moves to Papua New Guinea during winter. Copyright C.B. Frith
<b>Chapter 7</b>	New Guinea Binatang Research Centre Botanists, Steven Sau and Jonah Philip, conducting an invasive species monitoring survey at the HGCP wastewater treatment plant ponds
<b>Part C</b>	Performer in the traditional <i>bila</i> or ‘costume’ of the Simbu Province
<b>Chapter 8</b>	EMPNG Operations Technician, Gloria Trintemnok at the HGCP
<b>Chapter 9</b>	Doibo community members Kakaie Wilson and Woi Biri celebrating the opening of a community hall, which coincided with EMPNG’s 2021 community engagements conducted in Kikori

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Eneji Bilong Wol. Luksave Bilong Papua Niugini.*