ExxonMobil PNG Limited

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Production Operations

Biodiversity Strategy

PGGP-EH-SSZZZ-000003

REV #	REV DATE	DESCRIPTION	PREP BY	DISCIPLINE CHECKED	ENDORSED	APPROVED
4	11-May-2017	Issued for use	See page 2 for signatures			
			IDP	JM	LAD	DV
3	28-Oct-2016	Issued for use	IDP	JM	LAD	DV
2	04-Dec-2010	Issued for use	SW	DR	DM, RS, LH, AA	KL, PG, PC
1	04-Nov-2010	Issued for use	SW	SW	DR	DM
0	29-Sep-2010	Issued for use	SW	SW	DR	DM

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PNG LNG

Via email (11-May-2017)	Via email (11-May-2017)
Laura Ann Dresser E&R Supervisor Endorsed	Dennis Vidmar SHE Manager Approved

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FIGURES

ACRONYMS

ACRONYM	DESCRIPTION
BIMP	Biodiversity Implementation and Monitoring Program
BVG	Broad Vegetation Group
CEPA	Papua New Guinean Conservation and Environment Protection Authority
EMPNG	ExxonMobil PNG Limited
ESMP	Environmental and Social Management Plan
FAO	Food and Agriculture Organization of the United Nations
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KPI	Key Performance Indicator
LNG	Liquefied Natural Gas
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non-government organisation
PMA	Programmed Monitoring Activities
PNG	Papua New Guinea
PNG LNG EIS	PNG LNG Project Environmental Impact Statement
WMA	Wildlife Management Area
WWF	World Wildlife Fund For Nature

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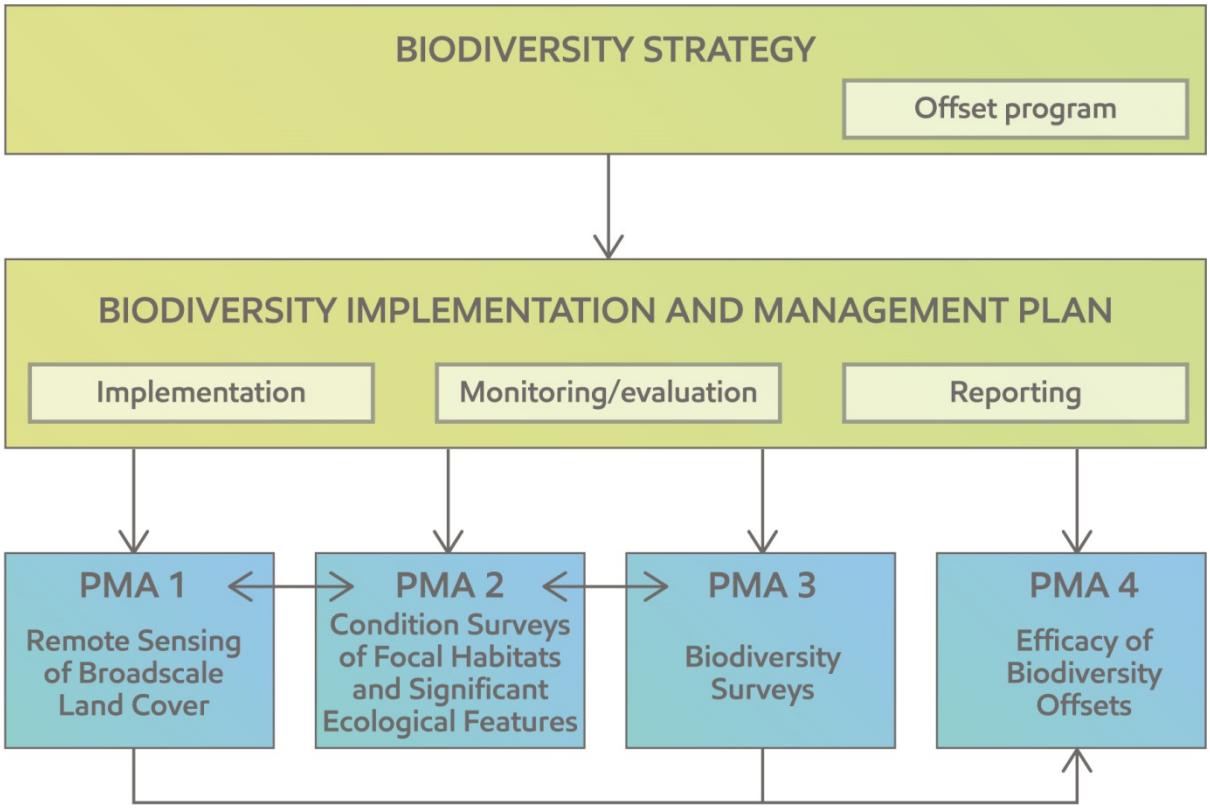
PNG LNG is an integrated development that includes gas production and processing facilities, onshore and offshore pipelines and liquefaction facilities. Participating interests are affiliates of Exxon Mobil Corporation (including ExxonMobil PNG Limited as operator), Oil Search Limited, Kumul Petroleum Holdings Limited, Santos Limited, JX Nippon Oil and Gas Exploration and Mineral Resources Development Company.

PREFACE

ExxonMobil PNG Limited (EMPNG) is committed to safeguarding biodiversity in areas where the company operates and, in particular, the biodiversity values in the Upstream area of the Papua New Guinea Liquefied Natural Gas (PNG LNG) Project. This Biodiversity Strategy and the Biodiversity Implementation and Monitoring Program outline how impacts on biodiversity will be assessed and managed.

EMPNG manages potential impacts to biodiversity across the Upstream area and the LNG Plant and Marine Facilities area through implementation of its Environmental and Social Management Plan (ESMP). While the ESMP applies to a broad range of land and aquatic environments in which PNG LNG is operating, the largely undisturbed tropical forest in the Upstream area was identified as having the highest biodiversity value. This area is also where most of the biodiversity-related impacts from the construction phase were predicted to occur in the PNG LNG Project Environmental Impact Statement. As such, the Upstream area requires additional biodiversity-related management processes to supplement the measures outlined in the ESMP. This Biodiversity Strategy and the Biodiversity Implementation and Monitoring Program address these needs.

The Biodiversity Strategy is an over-arching document that describes the framework and general approach, and is supported by the Biodiversity Implementation and Monitoring Program and a set of Protocols, as outlined below.



Biodiversity strategy document framework

1.0 INTRODUCTION

EMPNG is a subsidiary of Exxon Mobil Corporation and is operating PNG LNG on behalf of co-venturers: Oil Search Limited; Kumul Petroleum Holdings Limited; Santos Limited; JX Nippon Oil and Gas Exploration Corporation; and Mineral Resources Development Company Limited, and their affiliates.

PNG LNG facilities have been constructed in two geographical areas – the Upstream area and the LNG Plant and Marine Facilities area. The Upstream area covers the Hela, Southern Highlands, Western and Gulf provinces of Papua New Guinea, while the LNG Plant and Marine Facilities area is located in the Central Province and National Capital District.

EMPNG manages potential impacts to biodiversity across the Upstream area and the LNG Plant and Marine Facilities area through implementation of its ESMP. While the ESMP applies to a broad range of land and aquatic environments in which PNG LNG is operating, the largely undisturbed tropical forest in the Upstream area was identified as having the highest biodiversity value. This area is also where most of the biodiversity-related impacts from the construction phase were predicted to occur in the PNG LNG Project Environmental Impact Statement (PNG LNG EIS) (EMPNG as Esso Highlands Limited, 2009). This was confirmed in the Initial Post Construction Biodiversity Assessment Report. As such, the Upstream area requires additional biodiversity-related management processes to supplement the measures outlined in the ESMP. This Biodiversity Strategy addresses that need. This Strategy is also a deliverable pursuant to Schedule H of the Common Terms Agreement for the PNG LNG Project (Environmental and Social Milestone Schedule).

Stakeholder engagement has been undertaken since 2010 to inform the development of the Biodiversity Strategy. Formal and informal engagement occurred with key stakeholders including: the Papua New Guinean Conservation and Environment Protection Authority (CEPA) – formerly known as the Department of Environment and Conservation; national and international non-government organisations (NGOs); Papua New Guinean universities; and relevant communities (see Appendix 1).

This Strategy has been updated to incorporate information acquired from stakeholders and through construction and post-construction assessments. EMPNG's progress towards commitments made in this Strategy will be reported publically on an annual basis until decommissioning of the PNG LNG facilities.

1.1 PNG LNG overview

The PNG LNG operation extends from Papua New Guinea's Highlands Region in the north to Caution Bay in the Central Province (Figure 1-1). The five key PNG LNG facilities are the LNG Plant near Port Moresby, the Hides Gas Conditioning Plant, a series of production wells, approximately 800 kilometres of pipelines, and Komo Airfield.

Construction of PNG LNG facilities started in early 2010. The facilities were completed in 2014, with loading of the first LNG cargo on 25 May 2014. In the production phase, PNG LNG has the capacity to produce around 7.4 million tonnes of LNG per year. During the life of PNG LNG, it is expected that about 250 billion cubic metres of gas will be produced and sold to provide a long-term supply of LNG to customers in Asia.

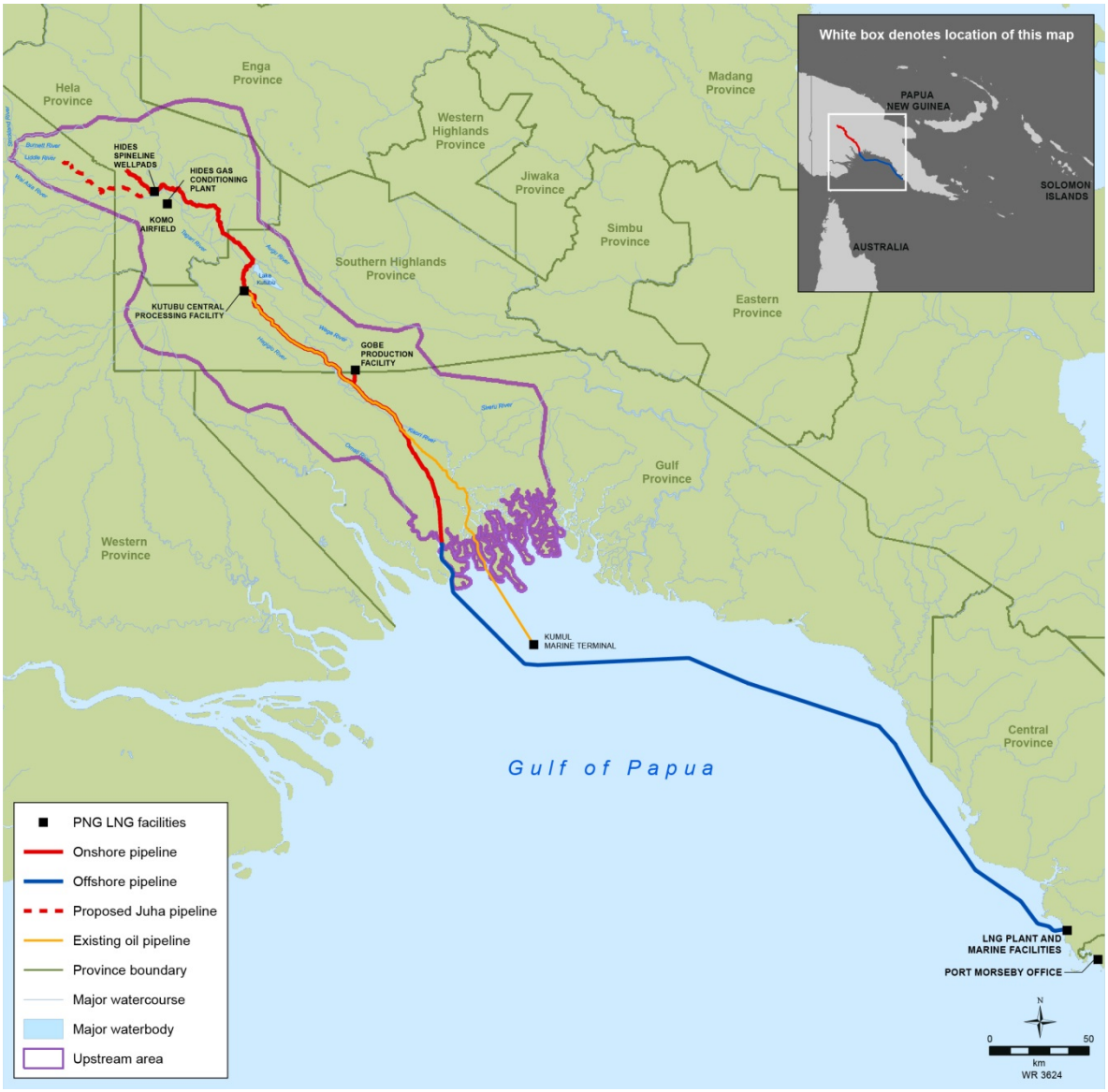


Figure 1-1: PNG LNG facilities

1.1.1 The Upstream area

The Upstream area (Figure 1-2) was delineated using a catchment-based approach. The catchment is based on the Kikori Integrated Conservation and Development Project area (now known as the Kikori River Basin – refer to Section 1.4.1), which encompasses the entire catchment of the Kikori River. It also covers future gas development in the Juha area that will extend PNG LNG beyond the Kikori River catchment and into the Strickland River catchment in the Western Province. The Juha area does not encompass the entire catchment of the Strickland River but includes the catchment of the Liddle River, the southern catchment of the Burnett River, and the northern catchment of the Wai Asia River.

The Upstream area covers 2,265,099 hectares (22,651 square kilometres). Of this, the actual land take for construction of the PNG LNG pipeline and facilities, as defined in the Initial Post Construction Biodiversity Assessment, is 2373 hectares, which is 380 hectares less than what was predicted in the PNG LNG EIS.

PNG LNG's Upstream area facilities are located in the Hela, Southern Highlands and Gulf provinces and include: production wells; the Hides Gas Conditioning Plant; Komo Airfield; Oil Search Limited's pre-existing facilities; and the 290-kilometre onshore pipeline.

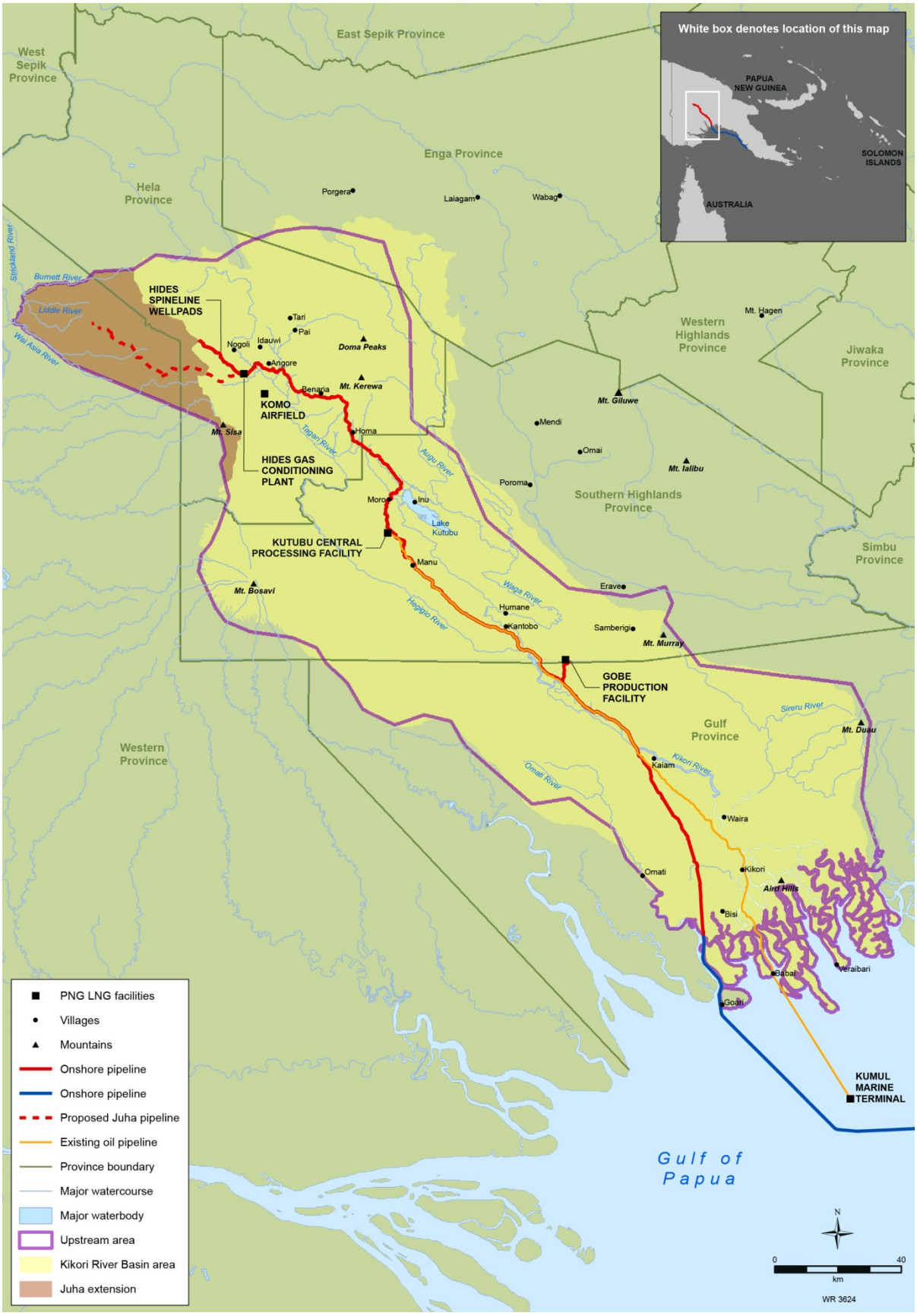


Figure 1-2: Boundaries of the Upstream area

The Upstream area consists of large expanses of largely undisturbed tropical forest with high biodiversity value.

The offshore pipeline links the Upstream area with the LNG Plant and Marine Facilities area and is partly located in the lower section of the Omati River, which drains the mountainous highlands of central Papua New Guinea into the Gulf of Papua. This river forms part of the Kikori–Purari deltaic system of low-lying mangrove and nypa swamp. The offshore pipeline route crosses the Gulf of Papua but does not pass through marine reserves or critical habitats[1] and no significant environmental impacts were detected following its construction.

1.1.2 LNG Plant and Marine Facilities area

The LNG Plant and Marine Facilities area is located on the south coast, approximately 20 kilometres northwest of Port Moresby, in the Central Province. This area is defined by the boundaries of the LNG Plant site lease area. Facilities in this area include two LNG trains, two LNG tanks and a 2.4-kilometre jetty with a marine loading terminal, along with support facilities such as worker accommodation, administration offices, a medical centre, an industrial park with warehouse and maintenance workshops, as well as diesel fuel/chemical storage and an emergency helipad. Unlike the Upstream area, the LNG Plant and Marine Facilities are located on land that was previously used for agricultural purposes, such as livestock grazing. This area therefore has relatively low biodiversity value with small remnant mangrove and woodland habitats.

The LNG jetty and marine facilities extend into Caution Bay in the Gulf of Papua. Caution Bay is a shallow coastal basin comprised of small coral reefs, seagrass and sandy seafloor (submerged and intertidal). The majority of near-shore coral reefs within Caution Bay were previously disturbed and have relatively low coral and fish diversity.

1.2 Biodiversity of the Upstream area

The Upstream area is ecologically significant not only due to its high species richness, but also because it supports large numbers of species that are endemic to Papua New Guinea. These biophysical features contribute to the high biodiversity value of this area. Therefore, the entire Upstream area has been defined as critical habitat, pursuant to the International Finance Corporation's (IFC's) Performance Standards on Social and Environmental Sustainability (IFC, 2006), referred to as the 'Performance Standards'; specifically Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management. Further information on the definition and requirements of operating in areas of critical habitat are provided in Section 1.7.3.

Limestone terrain, mostly rugged polygonal and doline karst, karst plains and plateaus with karst corridors, dominate the Upstream area, which ranges from sea level to 3650 metres in altitude. The Kikori River flows through a karst plain overlain with alluvium.

There are extensive volcanic areas in the north and northwest of the Upstream area, with the cone of Mount Bosavi dominating the landscape to the west of the facilities at Kutubu. Southwest of the Hides gas field lies the crater of Mount Sisa. Its historical lava flows are responsible for the basaltic soils of the agricultural lands around Komo. The Doma Peaks, located northeast of the Hides Gas Conditioning Plant and extending outside the Upstream area, is a region of remnant volcanic cones and domes, volcano-alluvial fans, and mudflows resulting from an eruption several hundred years ago. A summary of the different bioregions (areas characterised by landscape, geology, presumed climate and ecological communities) is shown in Figure 1-3.

[1] The definition of critical habitat, as per Performance Standard 6, is outlined in Section 1.7.3.

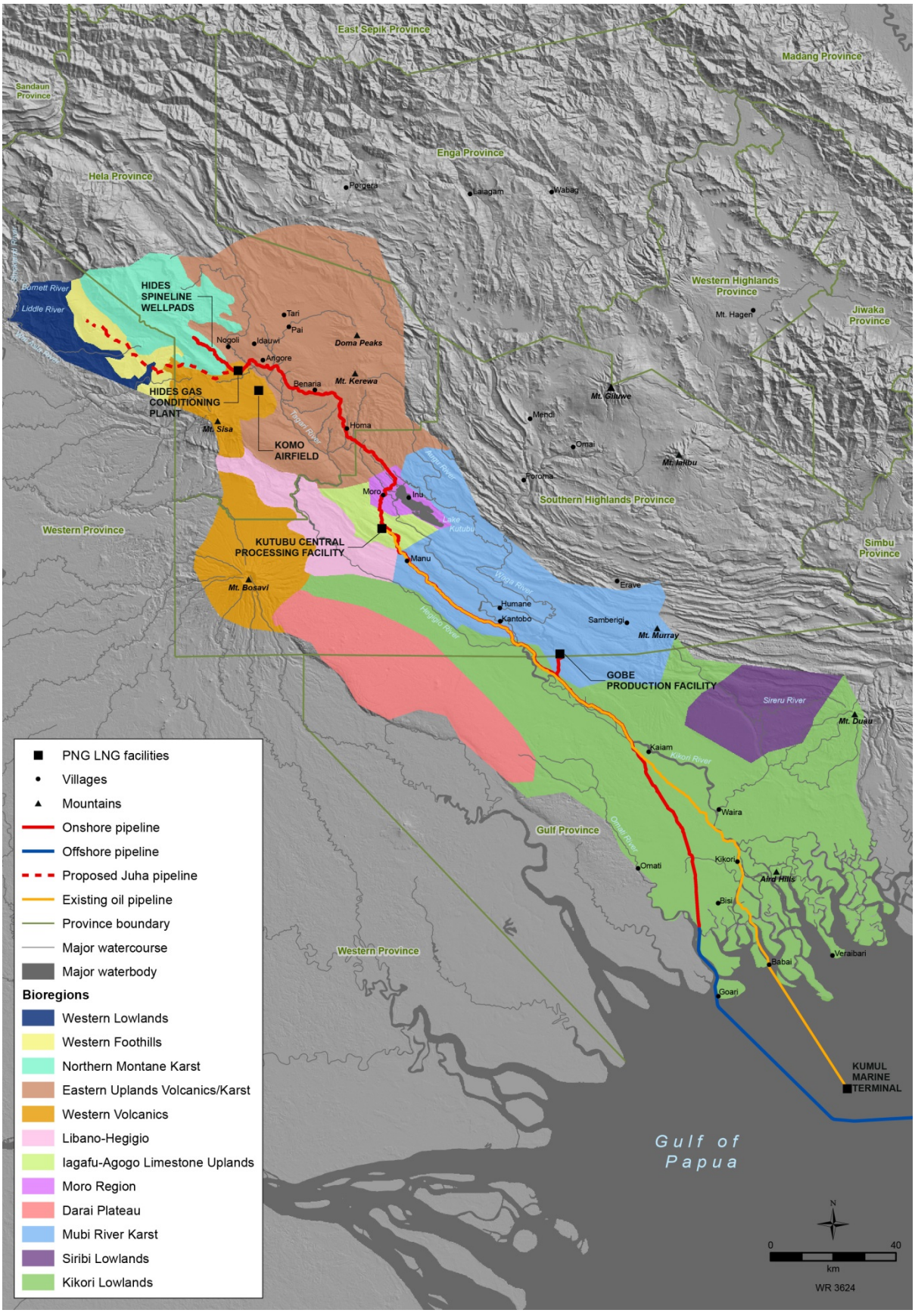


Figure 1-3: Bioregions of the Upstream area

These bioregions consist of 20 vegetation types including montane forests, grasslands, rocky scrubs, open lowland forests, swamp woodlands and mangroves. Within this area, the PNG LNG EIS identified 78 species considered by the International Union for Conservation of Nature (IUCN) to be threatened while an additional 30 were regulated under the *Fauna (Protection and Control) Act 1966* and 15 more are regulated by the *International Trade (Fauna and Flora) Act 1979.*

Of the species listed on the IUCN Red List of Threatened Species[2] (IUCN, 2010a) seven were also listed as Critically Endangered or Endangered, including the Critically Endangered species Bulmer's fruit-bat (*Aproteles bulmerae*), the long-beaked echidna (*Zaglossus bartoni*) and the tree species *Halfordia papuana*. Endangered species included tree kangaroos *Dendrolagus notatus* and *Dendrolagus goodfellowi* as well as tree species *Bleasdalea papuana* and *Flindersia pimenteliana*. These species are among the important biodiversity values addressed by this Biodiversity Strategy.

1.3 Ecosystem services

Ecosystem services are the benefits that the natural environment provides to humans including: (i) provisioning services, which are the products people obtain from ecosystems; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the non-material benefits people obtain from ecosystems; and, (iv) supporting services, which are the natural processes that maintain the other services. People in the Upstream area largely depend on these ecosystem services to meet their everyday needs.

Subsistence land use in the Upstream area consists generally of shifting cultivation, hunting and gathering, and extraction of food products from plants such as sago palm. Shifting cultivation occurs in all forest types but is restricted by terrain and soil quality. Hunting and gathering is not so constrained, with the area providing natural resources including pigs, cassowaries, wallabies, bandicoots, rats, frogs, possums, turtles, lizards and birds. Particularly high value items are birds-of-paradise and cassowaries and, in the lower parts of the Kikori River Basin area, pig-nosed turtles (*Carettochelys insculpta*), listed under The IUCN Red List of Threatened Species (IUCN, 2010a) as Vulnerable, but whose flesh and eggs are a significant food source for local communities. Sago palm is not only an important food staple, it is a valuable source of building materials for many communities living in lowland areas.

Non-urban Papua New Guinean communities have a strong spiritual connection with the land, and culturally significant sites often include caves, sacred lakes, swamps and creeks, limestone outcrops, sacred groves, and plant harvesting and hunting areas.

Given the importance of ecosystem services in the Upstream area, both landscapes and waterscapes were considered when recording cultural and spiritual places during the PNG LNG EIS and subsequent environmental surveys.

1.4 Biodiversity studies

Prior to 1994, the biodiversity value of the Kikori region was not well understood. In the 1970s, the southern karst was identified as one of the areas most in need of botanical exploration (Prance, 1977; Stevens, 1989; Johns, 1993) and the Kikori region and adjacent uplands were ranked among 16 terrestrial regions in Papua New Guinea that required further study (Sekhran and Miller, 1995). More recently, a range of surveys and scientific studies has resulted in a much better appreciation of the biodiversity of the area.

[2] IUCN Red List categories: Extinct; Regionally Extinct; Extinct in the Wild; Critically Endangered; Endangered; Vulnerable; Near Threatened; Least Concern; and Data Deficient.

1.4.1 Biodiversity studies in the Upstream area

In 1994, Chevron Niugini (Kutubu Petroleum Development Project) and the World Wildlife Fund For Nature (WWF) collaborated to facilitate conservation efforts in the Upstream area through a Kikori Integrated Conservation and Development Project. This initiative led to the demarcation of the Kikori River Basin area, an extensive tract of land that encompassed the entire drainage of the Kikori River, extending over 300 kilometres from the Southern Highlands to the coast, as well as biological surveys and collaboration with local communities. The objectives of the collaborative initiatives were to foster conservation through sustainable development activities and counteract possible indirect impacts should in-migration occur as a result of the Kutubu Petroleum Development Project.

Since 1995, a database has been developed from 70 sites over multiple expeditions within the area and has resulted in numerous publications and reports. References to these surveys, with details of their location, timing and biological focus, are presented in Appendix 1 of the PNG LNG EIS. This information was available for biodiversity analysis of the Upstream area, but areas north of the oil fields, including Hides, had not been biologically explored to any significant extent by the WWF or others.

The combined data from the WWF and PNG LNG surveys were analysed to produce 10 independent assessments of the flora, mammals, birds, reptiles and amphibians of the Upstream area. This analysis enabled development of a description of the biodiversity of the Upstream area, which is provided in Appendix 1 of the PNG LNG EIS.

The inclusion of gas developments at Juha (as part of a future PNG LNG development phase) will bring PNG LNG out of the Kikori River catchment and into mostly uninhabited and previously biologically unexplored areas in the headwaters of the Strickland River. EMPNG therefore commissioned eight surveys to improve knowledge about the northwest section of the Upstream area. The Juha surveys were conducted independently of the WWF surveys and were undertaken by biodiversity scientists with more than 75 expeditions across New Guinea[3] between them.

1.4.2 Conservation priorities in the Kikori River Basin

Over the past few decades, numerous studies have been undertaken to establish conservation priorities and facilitate protected area planning in Papua New Guinea. This work was generally performed by conservation NGOs with the involvement of CEPA.

There are currently five legally protected conservation areas in the Kikori River Basin. These are the Lake Kutubu Wildlife Management Area (WMA), Neiru (Aird Hills) WMA, Libano Arisai WMA, Libano Hose WMA and Sulamesi WMA.

During the development of the EMPNG offset program contained within this Strategy, a review of the biodiversity literature of the Kikori River Basin was conducted to help identify candidate areas for protection. The review, performed by Conservation International on behalf of EMPNG, included a range of studies as outlined in Table 1-1.

[3] 'New Guinea' is used here as a collective term for the region comprising the main island of New Guinea, which is divided between two countries: Papua New Guinea to the east; and Indonesia (Papua and West Papua provinces) to the west, and its nearby satellite islands and island groups.

Table 1-1: Summary of conservation research in the Kikori River Basin

TITLE	CONCLUSIONS
General problems of fauna conservation in relation to the conservation of vegetation in New Guinea (Schodde, 1973)	The preliminary analysis conducted by Richard Schodde was the first conservation planning exercise conducted on a national scale. It concluded that 18 landscapes were deserving of protection. Among these areas is the Mount Bosavi/Mount Kerewa/Hegigio River area, which encompasses a substantial part of the central Upstream area.
Papua New Guinea conservation needs assessment (Alcorn and Beehler, 1993)	The conservation needs assessment identified four areas within the Upstream area as being a very high priority for conservation: • Mount Bosavi/Aramia catchment: includes the entire volcanic massif plus the rivers and forests draining Mount Bosavi to the south and southwest • Doma Peaks/Leiwaro Highlands: includes the volcanic highlands with high scenic and biotic value • Kikori Karst/Lake Kutubu: includes remarkable karst topography and Papua New Guinea's largest highland lake • Purari Basin: includes ranges westward to the Kikori River Basin, covering wet zone lowlands and hills, which are considered botanically interesting.
The BioRap Biodiversity Assessment and Planning Study for Papua New Guinea (Faith et al., 2001)	The BioRap study provided methods for trade-off approaches to balance biodiversity conservation and other land uses, given that biodiversity values in Papua New Guinea overlap with forestry production values. The study identified a large block of forest in the Kikori River Basin, as well as near Mount Bosavi, as being important for biodiversity conservation.
Programme of Work on Protected Areas (Secretariat of the Convention on Biological Diversity, 2004)	The Programme of Work on Protected Areas was based on an evaluation that used three major biodiversity surrogates including: 59 land systems; 57 vegetation types from the Forest Inventory Mapping Systems (Saunders, 1993; Hammermaster, E. and Saunders, J., 1995); and 123 restricted range endemic reptiles and amphibians from Bishop Museum collection records, along with 26 restricted range endemic mammals. These biodiversity surrogates were chosen as they have narrow geographic and climatic ranges and are likely to be most vulnerable to climate change.
Key biodiversity areas (IUCN, 2010b)	Conservation International's initiative sought to determine key biodiversity areas based on the presence of species that met irreplaceability and vulnerability criteria and the identification of habitat that would play a critical role in maintaining such species. The key biodiversity areas work considered New Guinea as a whole, recognising that some species are found across the island. Seven key biodiversity areas were identified in the Kikori River Basin.
Areas of biodiversity significance	The WWF undertook surveys in the Kikori River Basin between 1994 and 2000. This work informed environmental management relating to the Kutubu Petroleum Development Project and was the basis of the establishment of WMAs in the area, including the Lake Kutubu WMA (also a listed site under the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat*, refer Section 1.7.2), Neiru (Aird Hills) WMA, the Libano Arisai WMA, the Libano Hose WMA and the Sulamesi WMA.

1.5 Biodiversity impact assessment

An impact assessment for biodiversity was conducted as part of the PNG LNG EIS. Preparation involved approximately 120 technical consultants, from 30 organisations, many of which had experience in Papua New Guinea. The PNG LNG EIS and its appendices describe the PNG LNG Project, the associated environmental and social constraints, the planning process, and the actual and potential impacts and measures developed to manage the related risks.

The impact assessment identified potential direct impacts on biodiversity, namely: habitat loss; edge effects; barrier effects; physical disturbance to caves; fauna falling in the open

pipe trench; erosion; movement of spoil and changes to hydrology; materials handling; disposal of hydro-test fluids; dust; loss of breeding and display grounds; noise; lights and other disturbances; PNG LNG traffic; and other operations. Potential indirect impacts included: fire; vegetation dieback; the introduction and spread of invasive species and plant pathogens; non-sustainable hunting and poaching; and enhanced access to the area in which EMPNG operates.

Following the application of a risk management hierarchy, through the PNG LNG EIS, the significance of residual impacts of all but seven types of impacts was assessed as low. The seven types of impacts with moderate or major potential, and therefore of most significance to biodiversity values were: habitat loss in priority ecosystems; edge effects in high-altitude karst; barrier and erosion impacts; steep cuttings in karst[4]; the indirect impacts of fire; the introduction and spread of invasive species and plant pathogens; and enhanced access. The latter two are most significant in that they have the potential for system-wide impacts in the Upstream area forests. These seven types of potential residual impacts were used to form the basis for management (including biodiversity offset), and monitoring. Examples of impact analyses, and a cross tabulation of the relevance of residual impacts to the biodiversity values, are presented in the PNG LNG EIS.

The PNG LNG EIS was submitted to CEPA (previously known as the Department of Environment and Conservation) in January 2009, and an Environment Permit was subsequently issued on 9 September 2009.

1.6 Environmental and Social Management Plans

Separate ESMPs were developed for the construction and production phases of PNG LNG. Both include: the risk management commitments identified in the PNG LNG EIS; additional measures required to implement good industry practice; and approval conditions stipulated by the Papua New Guinean Government and the export credit agencies and commercial banks that financed PNG LNG (collectively referred to as the Lender Group). The ESMPs:

- scope current environmental and social aspects relevant to PNG LNG
- provide an overview of the relevant environmental and social risks
- outline environmental and social risk management actions and monitoring requirements.

The broad objectives of the ESMPs are to:

- describe specific measures required to implement risk management commitments
- describe specific additional measures required to implement good industry practice and PNG LNG EIS approval conditions stipulated by the Government and the Lender Group
- outline the roles and responsibilities of EMPNG's environmental and social management organisation for PNG LNG
- communicate environmental and social expectations throughout the construction and production organisations
- establish the framework and minimum requirements for contractors.

The Construction ESMP included 30 discipline-specific individual management plans. Of these, the following are relevant to the Biodiversity Strategy: Ecological Management Plan; Weed, Plant Pathogen and Pest Management Plan; Induced Access Management Plan; Erosion and Sediment Control Management Plan; Reinstatement Management Plan; and Water Management Plan. The potential introduction and spread of invasive species and

[4] These barrier and edge effects were divided in the PNG LNG EIS analysis into: 'edge and barrier effects in high-altitude karst', 'edge and barrier effects on arboreal species in high karst' and 'erosion, movement of spoil and change to hydrology on arboreal species in high karst'. The expression of these impacts in this Biodiversity Strategy is more useful.

plant pathogens, and enhanced access, were managed under a Quarantine Management Program.

The Construction ESMP was applicable to construction activities and drilling operations for PNG LNG. Although not directly applicable to production activities, it is being used to manage construction and drilling that occurs during production.

The Production ESMP consists of one main document and ten supporting management plans. Three of the supporting documents are Environmental Management Plans, one of covering the Upstream area facilities, infrastructure and pipelines, another covering the LNG Plant and Marine Facilities area and the last covering the Port Moresby Office. The remaining seven documents are theme-based Social Management Plans that collectively cover the entire PNG LNG footprint and affected communities.

Site-specific risk management measures relevant to the implementation of this Biodiversity Strategy, including mitigation of residual impacts, are outlined in the Environmental Management Plan: Upstream Facilities, Infrastructure and Pipelines.

1.7 Legal and other requirements

There are numerous legislative, administrative and social considerations that bear on matters of conservation and protected areas in Papua New Guinea. These have been considered in the development of this Strategy, along with the requirements of the Lender Group.

1.7.1 Administrative and social framework

The *Constitution of the Independent State of Papua New Guinea 1975* has established a three-tiered government system comprising a national government and a system of provincial and local-level governments.

Although Papua New Guinea recognises four regions (Highlands Region, Islands Region, Momase Region and Papua Region), the primary administrative divisions are the 22 provinces (including two new provinces, Jiwaka and Hela, officially recognised in May 2012).

Each province in Papua New Guinea is subdivided into administrative districts and each district is further subdivided into one or more local-level government areas. The local-level government areas are also subdivided into wards. Each ward has a ward development committee and a ward councillor. The ward councillor is chairman of the ward development committee. Wards, ward development committees, local-level governments and provincial governments are important stakeholders regarding implementation of this Biodiversity Strategy.

The *Constitution of the Independent State of Papua New Guinea 1975*, supported by other components of Papua New Guinean legislation, provides for a type of land tenure referred to as ‘customary land’, thereby establishing a legal basis to the inalienable tenure of land. Customary land prevails across most of the usable land in Papua New Guinea (notionally 97 percent of the total land area). Alienated land is either held by the government or held privately under State lease. Freehold title (also known as fee simple) is rare and can currently only be held by Papua New Guinea citizens. Landowners may agree to a Conservation Deed, which is a resource-owner management agreement that allows for detailed area protection and management. Putting in place a Conservation Deed is a flexible and community-driven process; it involves the consent and signature of landowners and represents a contractual agreement that is not easily undone by a third party.

1.7.2 Legal requirements

Papua New Guinean legislation applicable to this Biodiversity Strategy includes the *Environment Act 2000*; *Fauna (Protection and Control) Act 1966; Conservation and Environment Protection Authority Act 2014; Conservation Areas Act 1978*; *International Trade (Fauna and Flora) Act 1979; Crocodile Trade (Protection) Act 1974; Fisheries*

Management Act 1998; National Parks Act 1982; and the *Organic Law on Provincial Governments and Local-Level Governments 1998*.

In addition to biodiversity-related objectives established in the *Constitution of the Independent State of Papua New Guinea 1975*, Papua New Guinea is party to many international conventions relevant to biodiversity. As part of the State of Papua New Guinea's Medium Term Development Strategy, the Papua New Guinea National Biodiversity Strategy and Action Plan (Department of Environment and Conservation, 2007), herein referred to as the NBSAP, was developed. The NBSAP is the 'roadmap to the sustainable use and management of the country's biological resources'. It is the vehicle for Papua New Guinea to meet its obligations under the *Convention on Biological Diversity* and other multilateral agreements. It also serves to further the implementation of the Millennium Development Goals[5], in particular Goal 7: Environmental Sustainability, in Papua New Guinea.

The NBSAP promotes the following broad programs: policy, legislation and administration; financial and technical resources; benefits sharing; research and information on biodiversity; biodiversity conservation; measures of sustainability; education and public awareness; and monitoring, evaluation and adaptive management.

Papua New Guinea is also party to the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat* (Ramsar Convention).

As well as Papua New Guinean legal requirements, this Strategy is consistent with guidance set out in the Papua New Guinea Policy on Protected Areas (Independent State of Papua New Guinea, 2014).

1.7.3 Lender Group requirements

Financing was secured for the construction and operation of PNG LNG through the Lender Group, which applies certain environmental and social principles and standards, namely The Equator Principles (Equator Principles, 2006) and the IFC's Performance Standards, which were applicable at the time financing was secured.

Performance Standard 6 applies specifically to biodiversity. This Standard aims to protect and conserve biodiversity and promote the sustainable management and use of natural resources through practices that integrate conservation needs and development priorities.

Performance Standard 6 also requires an impact assessment of biodiversity to be an integral part of the social and environmental assessment process focusing on the major threats to biodiversity, which include habitat destruction and the introduction or spread of non-native species. Under Performance Standard 6, habitats are classified as natural, modified, or critical and these categories are recognised as being able to support important biodiversity outcomes.

In natural habitats, the ecological functions are essentially unmodified by humans and biological communities are formed largely by native species, whereas modified habitats have been altered by humans and, in some locations, the introduction of non-native species.

Care must be taken in modified habitats to limit further conversion or degradation and it is expected that opportunities to enhance habitat and protect and conserve biodiversity are part of operations. In natural habitat, a project cannot significantly convert or degrade the habitat unless: there are no technically and financially feasible alternatives; the overall benefits of the project outweigh the costs (including those to the environment and biodiversity); and conversion or degradation is appropriately mitigated in such a way as to demonstrate the achievement of no net loss of biodiversity where feasible.

[5] The *United Nations Millennium Declaration*, adopted on 18 September 2000, outlines the signatory countries' commitment to achieving the Millennium Development Goals.

Critical habitat consists of areas with high biodiversity value and can be either natural or modified habitat. The definition of critical habitat under Performance Standard 6 can be summarised as:

- habitat required for the survival of Critically Endangered or Endangered species[6]
- areas having special significance for endemic or restricted-range species
- sites that are critical for the survival of migratory species
- areas supporting globally significant concentrations or numbers of individuals of congregatory species
- areas with unique assemblages of species, or associated with key evolutionary processes, or provide key ecosystem services
- areas having biodiversity of significant social, economic or cultural importance to local communities.

Paragraph 11 of Performance Standard 6 contains additional provisions for projects located in legally protected areas, as is the case for EMPNG where the pipeline Right of Way crosses the north western extremity of the Lake Kutubu WMA, also designated as a Ramsar [Convention] site (see Section 1.7.2). These provisions require EMPNG to: act in a manner consistent with defined protected area management plans; consult protected area sponsors and managers, local communities, and other key stakeholders; and implement additional programs to promote and enhance the conservation aims and effective management of the area, leading to tangible benefits.

Performance Standard 6 also emphasises the importance of controlling non-native invasive species.

The provisions of Performance Standard 6 are primarily met by EMPNG through the PNG LNG environmental management plans as well as completion of and compliance with four specific environmental and social milestones, as described in the Common Terms Agreement for the Loan Facility Loans issued to PNG LNG in 2009, namely the: Biodiversity Strategy, Biodiversity Monitoring Program, Biodiversity Offset Delivery Plan, and Lake Kutubu Wildlife Enhancement Plan.

Ongoing conformance with Performance Standard 6 during production and decommissioning will be achieved through the ESMP, the Biodiversity Strategy and associated documents.

1.7.4 ExxonMobil Corporate requirements

EMPNG adheres to the Exxon Mobil Corporation Environment Policy, which commits the Corporation to ‘conduct its business in a manner that is compatible with the balanced environmental and economic needs of the communities in which it operates’.

The Corporation is committed to continuous efforts to improve environmental performance throughout its operations. Accordingly, the Corporation's policy is to:

- comply with all applicable environmental laws and regulations and apply responsible standards where laws and regulations do not exist
- encourage concern and respect for the environment, emphasise every employee's responsibility in environmental performance, and foster appropriate operating practices and training
- work with government and industry groups to foster timely development of effective environmental laws and regulations based on sound science and considering risks, costs, and benefits, including effects on energy and product supply

[6] As defined by The IUCN Red List of Threatened Species or as defined in any national legislation.

- manage its business with the goal of preventing incidents and of controlling emissions and wastes to below harmful levels; design, operate, and maintain facilities to this end
- respond quickly and effectively to incidents resulting from its operations, in cooperation with industry organisations and authorised government agencies
- conduct and support research to improve understanding of the impact of its business on the environment, to improve methods of environmental protection, and to enhance its capability to make operations and products compatible with the environment
- communicate with the public on environmental matters and share its experience with others to facilitate improvements in industry performance
- undertake appropriate reviews and evaluations of its operations to measure progress and to foster compliance with this policy.

2.0 BIODIVERSITY STRATEGY APPROACH

The preparation of this Biodiversity Strategy followed a process of first identifying biodiversity values in the Upstream area and then using the impact analysis in the PNG LNG EIS to identify the major potential risks to, or impacts on, these values. This formed the basis for developing goals and objectives for the Strategy, which then followed a hierarchy of avoidance, reduction and remedy, including the offset of residual biodiversity-related impacts attributable to the construction of PNG LNG facilities and infrastructure.

2.1 Identification of biodiversity values

The identification of biodiversity values of the Upstream area was informed by surveys conducted over the past 20 years, as well as pre-construction surveys conducted as part of PNG LNG, and other research.

2.1.1 Large scale biodiversity values

At the large scale, biodiversity values of the Upstream area have been defined as:

- **Extensive intact forest** – The Upstream area encompasses large expanses of largely undisturbed tropical forest.
- **High floristic diversity** – Between 6000 and 12,000 species of plants may exist in the Upstream area, with epiphytes making up 75 percent of floristic diversity in upland forests.
- **High faunal diversity** – Over 700 species of terrestrial vertebrates have been recorded to date.
- **Endemic species** – 75 percent of non-volant mammals, 40 percent of birds and over 90 percent of frogs found in the Upstream area are endemic to New Guinea. This value includes new species previously discovered in the Upstream area.
- **Unique assemblages of species** – The Upstream area is recognised for its high diversity of birds-of-paradise and amphibians.
- **Species of conservation concern** – Species of plants and animals classified by the IUCN as Critically Endangered or Endangered, or protected under Papua New Guinean legislation, are located in the Upstream area.
- **Biodiversity of importance to local communities for resource use and/or cultural and spiritual purposes** – Communities are linked to biodiversity values through their reliance on subsistence harvesting and a close physical and spiritual relationship to ancestral territories.

2.1.2 Medium scale biodiversity values

At the medium scale, priority ecosystems have been identified. The priority ecosystems are areas deemed to have high biodiversity values associated with them and comprise the following:

- **Forest in the Hides Ridge area** – The high-altitude nothofagus forest on karst above 1800 metres harbours a diverse montane fauna in a largely undisturbed tropical forest. Biological values are naturally maintained by the remoteness and difficulty of access.
- **High-altitude forest in the Homa area** – The high-altitude forest, including nothofagus, above 1800 metres contains mature forest with a high diversity of flora and fauna. It has one of the highest mammal diversities in the Upstream area.
- **Lake Kutubu area** – Lake Kutubu is the largest perched lake in Papua New Guinea and the second largest lake in the country. It has the highest level of lacustrine endemicity of any lake in the New Guinea-Australia region. Lake Kutubu is included in the Lake Kutubu Wildlife Management Area (WMA). The lake was listed as a Ramsar wetland in 1998 and the Ramsar boundaries match those of the WMA.

The Lake Kutubu WMA covers 25,455 hectares and is the only WMA that PNG LNG facilities intersect.

- **Forest in the Juha area** – Juha is a remote region where there has been little human influence on the vegetation and fauna, and its ecological values are maintained primarily by its difficulty of access. Among biodiversity values specifically represented in this area, Juha contains notable concentrations of unique assemblages of frog species.

2.1.3 Small scale biodiversity values

At the small scale, biodiversity values have been identified in the form of focal habitats and significant ecological features. These areas are deemed as requiring special focus with respect to impact avoidance and mitigation measures and are as follows:

- **Caves and pinnacles** – Provide important habitats for certain bat species such as the Critically Endangered New Guinea big-eared bat (*Pharotis imogene*), and caves with large entrances in the uplands support colonies of large bats, potentially including the Critically Endangered Bulmer's fruit-bat (*Aproteles bulmerae*).
- **Sinkhole swamps** – Microhabitats at the bottom of dolines, including swamps in sinkholes less than 50 metres deep, in high-altitude karst on Hides Ridge, the only habitats where water-dependent frogs can breed in karst, which tends to have few flowing streams.
- **Upland streams** – Torrent-dwelling frogs require fast-flowing, clear and rocky streams. Riparian vegetation along such streams supports birds such as Salvadori's teal (*Salvadorina waigiuensis*) and the torrent-lark (*Grallina bruijni*).
- **Swamps and mangroves** – Including areas of pandanus, sago swamp forest or mangroves support a range of specialist vertebrates, including the twelve-wired bird-of-paradise (*Seleucidis melanoleuca*), and the New Guinea flightless rail (*Megacrex inepta*). Swamp forests may provide an important breeding habitat for freshwater turtles and crocodiles. High-value conservation swamps in the Lower Kikori contain habitats for fish nurseries.
- **Stream refuges in unstable landscapes** – In unstable terrain where landslides are common, areas of more mature habitat on pockets of more stable substrates such as in stream heads or small plateaus can act as refuges for flora and fauna.
- **Lowland rivers in stable landscapes** – Provide habitat for crocodiles and freshwater turtles, and some bird species are abundant, including kingfishers and shining flycatchers (*Myiagra alecto*).
- **Off-river waterbodies** – Stable habitat type that provides refuge areas and offers habitat for the breeding of New Guinea freshwater crocodiles (*Crocodylus novaeguineae*). It is created by localised damming of runoff by landslides.
- **Flora, fauna and habitats of cultural significance** – Culturally significant areas, habitats and species occur throughout and surrounding settled areas in the Upstream area, varying from small swamps said to harbour spirits, to places where medicinal plants are harvested.
- **Lekking trees or grounds** – Bird-of-paradise or bowerbird display trees or grounds.

Further details about biodiversity values in the Upstream area are provided in the PNG LNG EIS and in subsequent pre-construction surveys.

2.2 Biodiversity goal and objectives

2.2.1 Goal

Based on the impact assessment outlined in the PNG LNG EIS, a Biodiversity Strategy goal was developed for PNG LNG. The goal is to **retain the biodiversity values of the**

Upstream area for the long-term. This is consistent with the Performance Standard 6 that states:

- there are no measurable adverse impacts on the ability of the critical habitat to support the established population of Critically Endangered or Endangered species or the functions of the critical habitat
- there is no reduction in the population of any recognised Critically Endangered or Endangered species
- any lesser impacts are mitigated to achieve no net loss of biodiversity where feasible.

2.2.2 Biodiversity objectives

This Biodiversity Strategy is based on the premise that achieving its goal requires objectives at the: large scale, covering the Upstream area as a whole; medium scale, focusing on priority ecosystems; and small scale, centred on focal habitats and significant ecological features. As such, the objectives of this Biodiversity Strategy are to:

1. At the large scale, **maintain the intactness of the Upstream area as a whole** – The long-term maintenance of biodiversity in the Upstream area, within a natural range of variation, requires the long-term functioning of the constituent ecosystems. This Objective will be realised by ensuring control of PNG LNG-related impacts capable of system wide effects, such as the introduction or spread of invasive species and enhanced access.
2. At the medium scale, **conserve priority ecosystems** – Some PNG LNG infrastructure is located within priority ecosystems, and therefore it is necessary to demonstrate that these ecosystems do not degrade as a result of construction and/or production activities. Realisation of this Objective has, in some cases, required changes to PNG LNG's design and the development of specific risk management measures that require ongoing management and control during production.
3. At the small scale, **protect focal habitats** – Focal habitats and significant ecological features have been avoided or otherwise managed during construction, and in production, so that the risks of reducing a population of Critically Endangered or Endangered species are as low as practicable.
4. **Identify, measure and offset significant residual impacts** – Impacts to those biodiversity values that were assessed as being significant and that cannot be avoided or otherwise managed (residual impacts) are remedied through an offset approach, to ensure no net loss of biodiversity.

The Biodiversity Strategy objectives align with the biodiversity values outlined in Section 2.1.

2.3 Risk management hierarchy

The first step to achieving the Biodiversity Strategy goal is the application of a risk management hierarchy, which involves, in order of application, the following approach:

- **Avoidance** of impacts to identified biodiversity values – Avoiding impacts on the biodiversity of the Upstream area was factored into project feasibility, planning and design studies and the timing and/or performance of construction works.
- **Reduction** of impacts involves implementing management measures in situations where avoidance is not feasible – Management measures to reduce the severity of an impact were established in the PNG LNG EIS and actioned through the Construction and Production ESMPs.
- **Remedy** significant impacts that cannot be avoided or reduced – EMPNG has conducted reinstatement works on construction sites and worked with stakeholders to develop an offset program for significant residual biodiversity-related impacts.

The protection of biodiversity values, in accordance with Objectives 1, 2 and 3 of this Strategy, are achieved through the application of avoidance and reduction measures. The remedy level of the risk management hierarchy applies to Objective 4 of this Strategy, which

requires that significant residual impacts on biodiversity values be appropriately offset. The risk management hierarchy is illustrated in Figure 2-1.

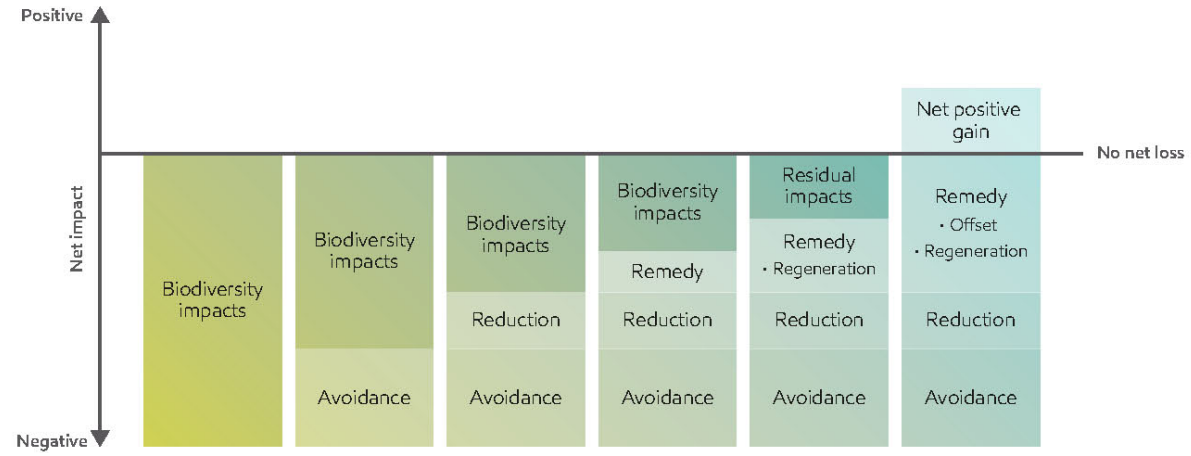


Figure 2-1: Risk management hierarchy

2.3.1 Avoidance

Avoidance was incorporated into the feasibility, planning and design of PNG LNG during the construction phase. In practice, this meant considering avoidance measures at discrete locations and/or points in time. The primary avoidance measures involved optimising the selection of sites for PNG LNG facilities and during routing for the onshore pipeline. These measures are described in detail in the PNG LNG EIS and include:

- following existing infrastructure corridors (e.g. the Kutubu crude oil export pipeline, existing roads and other infrastructure)
- routing the onshore pipeline to best manage safety, social and environmental constraints
- routing the onshore pipeline to optimise traversing landscapes of unoccupied clearings, logged or degraded forest
- choosing the shortest route to reduce habitat loss in areas of relatively undisturbed continuous forest. The shortest route would be modified, where practicable, according to safety, environmental, social and cultural criteria.

During the construction phase, the avoidance of impacts to biodiversity values was achieved through implementation of the Construction ESMP, particularly through topic-specific management plans that were relevant to biodiversity protection, and the pre-construction survey program, as outlined in Section 1.6. For new development phases, such as Juha, the Construction ESMP will be updated to appropriately avoid and manage risks specific to the development.

During the production phase, avoidance of impacts is achieved through implementation of the Production ESMP.

2.3.2 Reduction

Where the avoidance of impacts was not possible or practicable, the Construction ESMP prescribed other risk management measures to reduce the severity of biodiversity impacts, for example:

- a key enabler of biodiversity management during the construction phase was the environmental pre-construction survey program, through which surveys were undertaken at every worksite prior to physical disturbance to identify ecological sensitivities and enable the application of site-specific avoidance and risk management measures where appropriate
- in addition to the Construction ESMP, contractors and subcontractors were required to prepare, maintain and implement site-specific ESMPs tailored to their scope of

work. These documents were supported by site-specific procedures to prevent, reduce and otherwise manage and control environmental and social risks and impacts, and define how these measures would be achieved

- environmental and social risk management commitments were entered into a database, which was used to track and document the implementation and status of each commitment. The database continues to be updated as necessary to incorporate new commitments that arise. It includes site-specific risk management measures resulting from pre-construction environmental and social surveys and alternative or additional measures identified as lessons learned from field programs.

The management of biodiversity impacts is applied throughout PNG LNG's production phase as part of the Production ESMP.

2.3.3 Remedy

EMPNG progressively reinstated worksites, including the onshore pipeline Right of Way, during and at the completion of construction activities. Where a residual construction phase-related impact deemed to be significant has remained, a biodiversity offset is required. A biodiversity offset is defined as a measureable conservation outcome resulting from actions designed to compensate for significant residual adverse biodiversity impacts resulting from PNG LNG after appropriate avoidance and reduction measures have been taken. EMPNG aims to achieve its offset obligations in the Upstream area through a program of conservation. The sustainability of the offset program will be supported by capacity building and other biodiversity-related initiatives, guided by good industry practice.

The extent to which the biodiversity offset contributes to demonstrating the achievement of no net loss of biodiversity over time depends on being able to evaluate residual impacts that could manifest, evolve or persist over time and the offsets implemented by EMPNG, as shown in Figure 2-2.

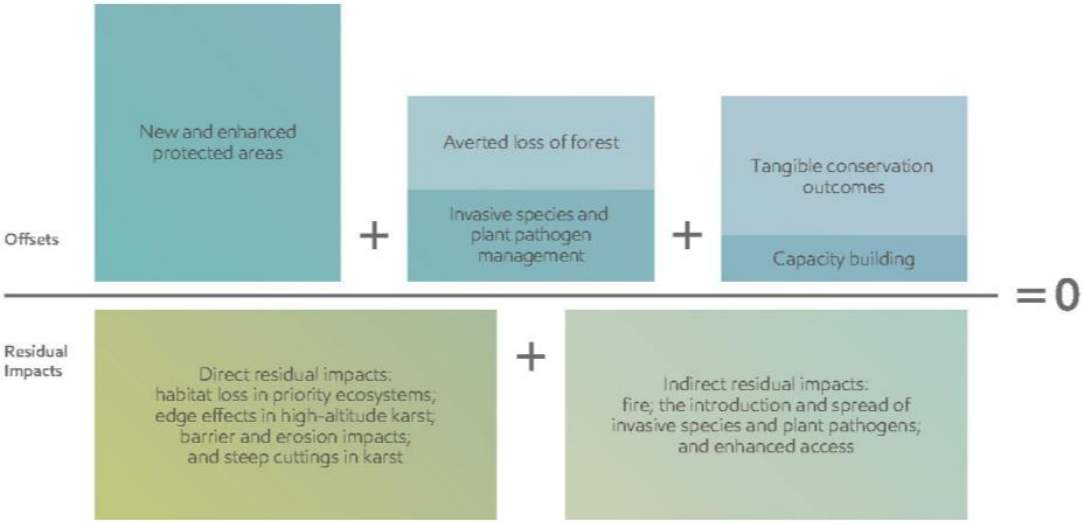


Figure 2-2: Achieving no net loss

Some residual impacts, in particular direct residual impacts such as habitat degradation, were evident in the immediate post-construction period and are not expected to evolve or recur during production. However, other impacts may not be immediately evident and may continue to evolve and/or manifest during production. The Initial Post Construction Biodiversity Assessment evaluated direct residual impacts that eventuated during the construction phase. The measurement of residual impacts from the development of PNG LNG facilities and the biodiversity gains from conservation activities undertaken/supported by EMPNG will continue over time through the offset program (Section 3.0) and Biodiversity Implementation and Monitoring Program (BIMP). The structure of the Plan is described further in Section 4.0.

2.4 Implementation approach

EMPNG has developed an approach to the implementation of this Biodiversity Strategy as shown in Figure 2-3. EMPNG's response to monitoring results, as determined through progressive mapping of interim results against Key Performance Indicators (KPIs), is a key component of this approach.

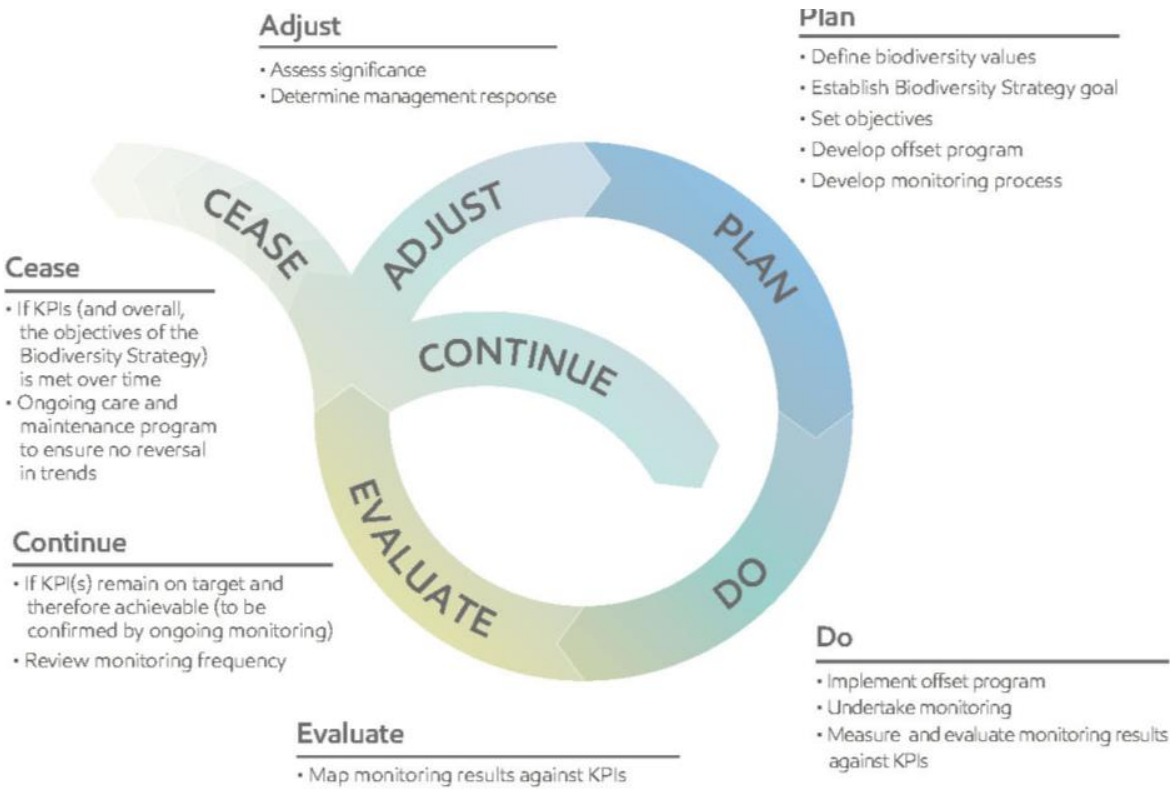


Figure 2-3: Implementation approach

The approach to implementation of this Biodiversity Strategy is as follows:

1. **Plan** – Establish the Biodiversity Strategy with a set of objectives and defined biodiversity values. It also involves development of the BIMP.
2. **Do** – Undertake monitoring as outlined in the BIMP and implement the offset program. Monitoring results are measured and evaluated against pre-determined KPIs.
3. **Evaluate** – Map monitoring results against KPIs and progress towards demonstrating no net loss.
4. The outcomes of evaluation will result in one of three actions:
    a. **Continue** – If KPIs remain on target/schedule, and therefore the targeted outcome is achievable, then reassess the frequency of monitoring and continue monitoring over time.
    b. **Adjust –** If KPIs are not on target/schedule, and the targeted outcome is delayed or not achievable, assess the level of significance and determine and implement an agreed management response.
    c. **Cease** – If KPIs and the overall objectives of the Biodiversity Strategy are consistently met over time, implementation activities cease but a short-term care and maintenance program may be implemented to monitor for reversal in the achieved outcome.

3.0 OFFSET PROGRAM

The PNG LNG EIS identified seven types of potential residual impacts of relevance to the biodiversity of the Upstream area (refer to Section 1.5). To comply with IFC standards, EMPNG developed an offset program with the objective of compensating for the residual impacts. This forms the basis of Objective 4 of this Biodiversity Strategy.

3.1 Guiding principles

The offset program is based on the following guiding principles, which were developed in consultation with stakeholders:

1. EMPNG's offset program uses an area-based conservation strategy to offset potential significant biodiversity-related residual impacts and losses that may eventuate as a result of PNG LNG. This will be achieved through strengthening existing protected areas and/or establishing new protected areas, supplemented by other targeted projects where appropriate.
2. Priority will be given to strengthening and enhancing existing protected areas over the establishment of new protected areas. Opportunities for the establishment of new protected areas will be evaluated primarily on their intrinsic conservation value and the potential for successful and sustainable outcomes.
3. The offset program will be consistent with conservation priorities in Papua New Guinea, which are focused on the development of a functioning and representative protected area system and the retention of large scale forest cover and habitat integrity.
4. Most land in Papua New Guinea is under customary tenure. Therefore, conservation initiatives must be community-owned and managed through consent and the active participation of landowners.
5. EMPNG intends for the protected areas strengthened and/or established as part of the offset program to be of a size that is to be determined case-by-case, based on their ecological, social and economic viability.
6. EMPNG's offset program must be practical in the context of Papua New Guinea and geared to prioritise successful and sustainable ecological, social and economic conservation outcomes.
7. The types of habitat protected as part of EMPNG's offset program should be generally similar to the habitat types affected.
8. The offset program should be representative of the biodiversity values affected by PNG LNG, including potential significant residual impacts to critical habitats, identified focal habitats and species of conservation value.
9. Protected areas to be strengthened and/or established as part of the offset program will be located within the Upstream area where possible.

3.2 Social and technical rationale: developing a sustainable program

The guiding principles described above reflect a number of important social and technical considerations.

3.2.1 Social context

Most land in Papua New Guinea is under customary tenure, involving individuals, families, clans and groups with complex land rights. Boundaries vary from being well agreed and marked to being vague, unmarked, untested and often disputed. Any attempt to control the use of land for conservation purposes requires the consent and active participation of landowners. Conservation initiatives as part of the offset program must therefore be community-owned and managed in order to be viable in the long-term.

3.2.2 Area-based conservation

PNG LNG's Upstream area facilities were developed in a largely undisturbed tropical forest area covering an extended high mountain range with multiple elevations and topographies.

In such areas, the focus of conservation tends to logically be on the maintenance of intact forest cover, and hence habitat integrity, and protection from invasive species and plant pathogens. Based on engagement with key stakeholders, EMPNG understands that conservation priorities in Papua New Guinea are focused on the development of a functioning and representative protected area system and the retention of large scale forest cover.

It was therefore determined that the most appropriate way to offset the unavoidable and potentially significant residual impacts was through an area-based conservation program involving the strengthening of existing protected areas and/or the establishment of new protected areas. This approach is also consistent with national conservation priorities.

3.2.3 The effective size of protected areas

The equilibrium theory of island biogeography[7] (MacArthur and Wilson, 1967) supports the following generalisations: bigger protected areas are better for the preservation of biodiversity; the closer they are the better; the more circular they are the better; and protected areas linked by habitat corridors will have lower extinction rates and therefore hold a greater number of species (Margules and Pressey, 2000; Diamond, 1975; Wilson and Willis, 1975).

The practical explanation that supports the theory is that many types of fauna require large areas for survival, maintenance of genetic diversity and evolutionary development, so small protected areas are generally less likely to be as effective from a conservation biology perspective.

Larger protected areas are also necessary to account for variations in species abundance and distribution due to changes in elevation. Additionally, larger protected areas are buffered against changing land boundaries and their overall integrity is less likely to be affected by neighbouring forest clearing or similar degradation.

Limited investigations have sought to quantify the optimum size of protected areas. Two based on research in New Guinea are Diamond (1986) and Chatterton et al. (2006). Diamond noted that the minimum protected area size should be 100,000 hectares while Chatterton et al., in an assessment of the effectiveness of Papua New Guinea's protected areas, recommended a minimum target of 50,000 hectares to ensure the viability of populations and habitats, although it is noted that there was no scientific basis presented to support this target.

While the size of an area is an important consideration in protected area design and planning, other factors will influence the long-term survival of species, including the specific requirements of individual species; ecosystem dynamics; proximity to protected and unprotected habitat; connectivity; alignment of boundaries, for example watersheds; and the form and presence of external threats. These and other factors are outlined in the Papua New Guinea Policy on Protected Areas (Independent State of Papua New Guinea, 2014). EMPNG therefore intends for the protected areas established as part of the offset program to consider size on a case-by-case basis, along with a range of other ecological, political, social, economic and related considerations.

[7] The theory states that the number of species on an island reflects a balance between the loss of species through extinction and the gain of species via immigration. Since the likelihood of extinction is inversely proportional to population size, and smaller islands support smaller populations, smaller islands will equilibrate at fewer species. Similarly, since new species can only be added via migration from other terrestrial sources, and the likelihood of immigration is proportional to the distance from those sources, islands that are more distant equilibrate at fewer species. Protected areas surrounded by an increasingly modified natural habitat are seen to be analogous to 'islands', hence the application of island biogeographic theory.

3.2.4 Representativeness

One of the guiding principles of the offset program (Section 3.1) is that the biodiversity protected as part of EMPNG's offset program should be generally similar to the biodiversity affected by PNG LNG.

The PNG LNG EIS used a combination of Broad Vegetation Groups (BVGs) and the more detailed Forest Inventory Mapping Systems (Saunders, 1993; Hammermaster, E. and Saunders, J., 1995) to characterise the vegetation types of the Upstream area. The Initial Post Construction Biodiversity Assessment was able to quantify the type and area of each BVG affected as a result of PNG LNG construction. The results of this assessment are summarised in Table 3-1.

Table 3-1: Broad Vegetation Groups affected by construction (by area)

#	BROAD VEGETATION GROUP	AREA OF VEGETATION TYPE (BY BVG) IN PNG LNG LAND TAKE (HA)	% OF PNG LNG LAND TAKE	TOTAL VEGETATION TYPE AREA IN UPSTREAM AREA (HA)	% REDUCED: VEGETATION TYPE IN UPSTREAM AREA
1	Cultivated or non-vegetated	280	11.78	144,985	0.21
2	Swamp forest complexes	61	2.57	57,541	0.11
3	Low-altitude medium crowned forest	138	5.83	478,665	0.15
4	Medium crowned to small crowned forest complexes	440	18.52	579,209	0.59
5	Medium crowned to small crowned forest complexes with nothofagus	50	2.09	55,585	0.09
6	Lower montane small crowned forests	460	19.38	210,904	0.22
7	Lower montane small crowned forests with nothofagus	699	29.46	180,406	0.95
8	Lower montane very small crowned complexes with nothofagus	48	2.04	33,716	0.30
9	Open lowland forest	72	3.02	38,938	0.18
10	Open lowland forest and freshwater swamps	3	0.14	6750	0.05
11	Small crowned lowland forest	68	2.87	54,392	0.13
12	Swamp woodland and forest complexes	54	2.28	10,776	0.50

Offsets will be established at three elevation zones and, to the extent possible, will comprise biological values that are similar in terms of ecological form and function, to the BVGs representative of that which has been affected by construction.

3.2.5 Calculating habitat debt and achieving no net loss

In developing this Biodiversity Strategy, EMPNG undertook a habitat reduction analysis for the Upstream area based on the method outlined in Victoria's Native Vegetation Management: A Framework for Action (Department of Natural Resources and Environment, 2002)[8]. This method uses habitat-hectares as the metric for determining debt, with debt being a function of:

- the area of habitat cleared
- the structural condition of the habitat, based on vegetation structure, benchmarked against old growth forest in non-fragmented landscapes
- habitat importance, as determined by formal recognition as a designated area (e.g. WMA), identified by a recognised body (e.g. WWF) as an area of biodiversity importance, or EMPNG as a priority ecosystem
- the presence of IUCN-listed Critically Endangered or Endangered species.

Using this method, the PNG LNG offset debt was calculated to be 6586 habitat-hectares. Based on this method, this offset debt would need to be accounted for by protecting an equivalent number of hectares of old growth forest from loss or degradation over a defined timeframe. This equivalent number was calculated to be 13,108 hectares over 30 years, and assumed an average national deforestation rate of 2.3 percent per annum (the average over the period 1990-2015)[9]. In other words, the 6586 habitat-hectare debt would be retired by protecting an area of 13,108 hectares of old growth forest (referred to as the offset target) from loss or degradation over a 30-year period. The gain will be measured every two years and will be a function of the applicable deforestation rate (which may change over the life of the offset program) and the quality of forest within the area under protection. It is expected that the offset gain will be relatively modest in the early years of the offset program, increasing as additional protected areas are added, management measures deployed in existing protected areas improve or the boundaries of existing WMAs are expanded. Offset gains can also be achieved through the restoration of degraded areas.

In accordance with the guiding principles set out in Section 3.1, and specifically with the principle of representativeness (Section 3.2.4), no net loss will be deemed to have been achieved when the offset target has been met in each of the three elevation zones, as summarised in Table 3-2.

Table 3-2: Offset target at each elevation zone

ELEVATION ZONE	% LAND TAKE	OFFSET TARGET (HECTARES)*
High (>1200m)	57	7507
Medium (600-1200m)	10	1342
Low (0-<600m)	33	4259
TOTAL	**100**	**13,108**

* Taking into account the primary BVGs affected to the extent possible.

[8] Victoria's Native Vegetation Management: A Framework for Action (Department of Natural Resources and Environment, 2002), also referred to as the 'habitat-hectares' approach, has been acknowledged by the Business and Biodiversity Offsets Programme as being a medium complexity biodiversity offset accounting model for balancing losses and gains. See Resource Paper: No Net Loss and Loss-Gain Calculations in Biodiversity Offsets (Business and Biodiversity Offsets Programme, 2012).

[9] Deforestation rates for Papua New Guinea have been determined on a regular basis since 1990 (Food and Agriculture Organization of the United Nations (FAO), 2000, 2005, 2010, 2015). Reported average annual rates are as follows: 1990-2000 (0.19%); 2000-2010 (2.4%); 1990-2015 (2.3%); and 2010-2015 (2.9%). These data also indicate that the rate of deforestation is increasing. For the purposes of calculating an offset target, the conservative rate of 2.3%per year was selected. The deforestation rate used may be updated if a more reliable estimate becomes available.

3.2.6 Offset framework

While EMPNG's offset target is 13,108 hectares, the company has elected to meet this within an offset framework that comprises a notional area of 50,000 hectares in each of the three elevation zones, giving a combined area of 150,000 hectares as shown in Figure 3-1.

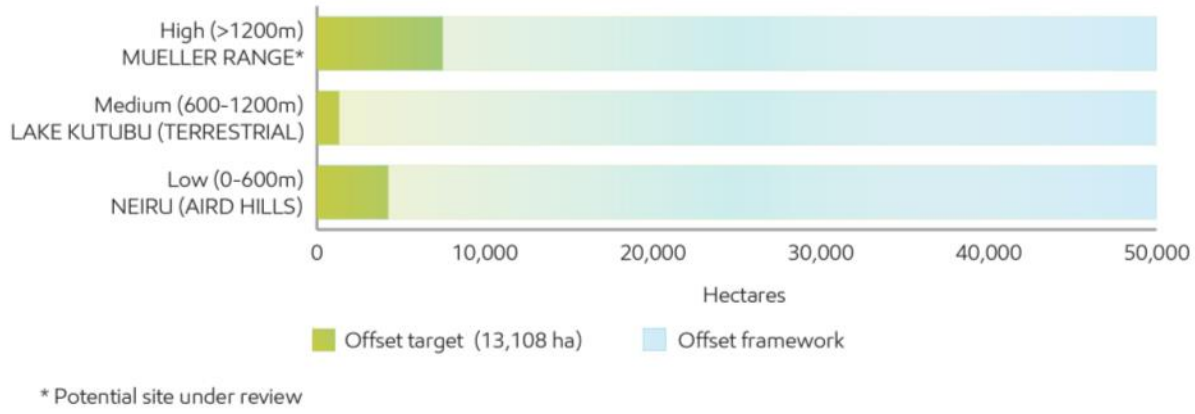


Figure 3-1: Application of an offset framework at each elevation

The rationale for this framework is two-fold.

It is recognised that establishing and implementing an offset program over the planned life of PNG LNG (notionally 30-years) and successfully meeting defined conservation outcomes presents many challenges. Some of these challenges will involve managing reasonably predictable threats such as illegal extraction of forest products. Others will involve unpredictable and uncontrollable events such as droughts, fires, and the spread of natural plant pathogens such as dieback, each of which could impede the attainment of the offset target. An offset framework notionally comprising 150,000 hectares therefore provides a substantial contingency factor designed to mitigate against predictable and unpredictable threats.

The success of any offset program will depend on the extent to which it is sustainable. EMPNG recognises that, in Papua New Guinea, this means that conservation initiatives must be community-owned and managed through consent and the active participation of landowners. This is consistent with the fourth guiding principle as listed in Section 3.1 and the Papua New Guinea Policy on Protected Areas (Independent State of Papua New Guinea, 2014).

An offset framework based on a notional area of 150,000 hectares is therefore not only consistent with the large scale Biodiversity Strategy objective of maintaining the intactness of the Upstream area as a whole, it also provides the foundation for a sustainable, community-based program that has the potential to deliver substantial and enduring biodiversity gains to the Upstream area.

Depending how and when various threats manifest, it is likely that the conservative approach being adopted by EMPNG will result in the offset target being reached within 30 years. If the target is reached in less than 30 years, a care, maintenance and monitoring program will be adopted so that the no net loss achievements endure through to decommissioning.

3.2.7 Demonstrating additionality

A key element of any biodiversity offsets model is the need to achieve conservation outcomes that are demonstrably new and additional, and would not have resulted without the offset. Offsets, by definition, therefore include additionality.

As the focus of the offset program is on averting losses and degradation in existing protected areas and establishing new protected areas to avoid future losses, additionality will be demonstrated by monitoring the condition of the biotypes represented in these areas

and comparing the results against the baseline condition recorded at the commencement of the offset program. The threats that the offset is seeking to avert will also be monitored so that the assumptions that form the basis of the habitat-hectare calculation (e.g. deforestation rates) can be verified and adjusted as necessary via the process described in Section 2.4.

In addition, the offset program has a goal to expand the boundaries of selected protected areas, where ecologically beneficial and appropriate. EMPNG anticipates that the addition of external resources may lead to an increase in the area of the WMAs that will be additional to what would have occurred without EMPNG's involvement.

3.2.8 Supporting activities

In addition to the land-based conservation activities described, EMPNG is supporting a range of other non-land conservation activities. While these are not directly linked to habitat gains and the demonstration of no net loss, they will build conservation capacity in Papua New Guinea, including planning, management, skills development, strengthening the legal framework for protected areas, and facilitating the development of government policy concerning biodiversity. These efforts meet a significant national need and will help improve the sustainability and effectiveness of protected areas in Papua New Guinea. They will also reduce the risk of offsets in the protected areas leading to equivalent losses elsewhere.

3.3 Offset program components

Application of the guiding principles for offset and learnings from the aforementioned studies underpinned EMPNG's definition of five components for its offset program. These components are:

- **Component 1: Protected area planning** – Support CEPA in the development of a Protected Area System Plan for the Kikori River Basin.
- **Component 2: Support the national biodiversity strategy** – Support CEPA in enhancing implementation of the NBSAP.
- **Component 3: Build conservation capacity** – Build technical capacity by contributing to the expansion of a training system aimed at developing qualified professionals across a range of disciplines that relate to the offset program.
- **Component 4: Enhance existing protected areas** – Enhance and strengthen the operation of existing WMAs in the Upstream area.
- **Component 5: Establish new protected areas** – Establish new community-based protected areas in the Upstream area that are representative of the biodiversity values recognised by EMPNG.

Components 1, 2 and 3 provide the foundation for capacity building to support the sustainability of protected areas (Components 4 and 5). Components 1, 2 and 3 are, by their nature, discrete programs that cease when their endpoints have been reached. Components 4 and 5 form the core of the offset program as they define the sites where the averted losses/conservation gains are planned, where the management effectiveness and ecological integrity will be monitored, and hence the objective of achieving the no net loss offset target demonstrated.

3.3.1 Component 1: Protected area planning

The objective of Component 1 is to support CEPA in the development of a Protected Area System Plan for the Kikori River Basin area.

EMPNG is providing support to CEPA, and working with relevant stakeholders, including NGOs, through an ongoing process to refine and extend the work that has been done to identify priorities for conservation in the Kikori River Basin.

EMPNG engaged with CEPA to determine how it proposes to proceed with the development of a protected area system for the Kikori River Basin and how EMPNG can support this process. Preliminary consultation with CEPA found that it was pursuing recognition of the

Kikori River Basin/Great Papuan Plateau under the *Convention Concerning the Protection of the World Cultural and Natural Heritage*.

Component 1 of EMPNG's offset program also aims to provide data to allow CEPA to establish legally binding agreements and formal management structures for the Kikori River Basin so that this can be used by CEPA to support its work in achieving recognition of this area as a World Heritage site under the *Convention for the Protection of the World Cultural and Natural Heritage*.

3.3.2 Component 2: Support the national biodiversity strategy

Component 2 involves supporting CEPA in enhancing its implementation of part of the NBSAP. EMPNG has engaged with CEPA to review progress on the delivery of Papua New Guinea's commitments under the *Convention on Biological Diversity*, and the NBSAP in particular.

EMPNG is supporting CEPA to improve communications and collaboration between the scientific community and relevant stakeholders using existing communication tools, such as conservation meetings, conferences and regular newsletters. EMPNG is working with CEPA and an NGO to deliver regular communications to stakeholders about best conservation practices in Papua New Guinea.

3.3.3 Component 3: Build conservation capacity

This component involves building the technical capacity of conservation professionals and enhancing community capacity in conservation through the development and implementation of the Enhancing Conservation Capacity Program, which expands on Papua New Guinea's existing Strengthening Conservation Capacity Programme.

The Strengthening Conservation Capacity Programme enables stakeholders to collaborate and share knowledge in strengthening conservation management capacity and supports training for individuals, groups or organisations. It includes a Conservation Management Course at the University of Papua New Guinea comprising eight modules, five of which were written and trialled prior to EMPNG's involvement. EMPNG's Enhancing Conservation Capacity Program supports the development of the remaining three Course modules. Once the modules have been finalised, the complete Conservation Management Course will deliver a Post-graduate Diploma and a Masters' Degree in Conservation Management. An independent review and verification will be conducted to confirm academic compliance and provide a comparison with similar courses in other universities and countries. EMPNG has allocated funding for a number of Post-graduate Diploma and Masters' Degree in Conservation Management scholarships at the University of Papua New Guinea. The scholarships require recipients to be supervised by and work for a Papua New Guinean not-for-profit conservation-focused organisation for a specified minimum term. Scholarship recipients are selected based on academic performance, work experience and recommendations from their sponsor. This Programme will benefit conservation in Papua New Guinea by enhancing the pool of conservation professionals and strengthening institutions and organisations.

EMPNG is also funding a conservation mentorship program for conservation practitioners to be placed with a field-based conservation NGO, or similar organisations that are best practice workplaces, for practical field experience. Additionally, EMPNG is funding a program that delivers conservation training courses to community-based organisations upon request.

3.3.4 Component 4: Enhance existing protected areas

Component 4 aims to enhance and strengthen the operation of existing WMAs in the Upstream area that are representative of the biodiversity values affected by PNG LNG.

EMPNG has developed a Lake Kutubu WMA Enhancement Plan, which is guiding the development and implementation of the offset program at the Lake Kutubu WMA. The enhancement plan not only fulfils EMPNG's obligation under the legally protected area provision of Performance Standard 6 (see Section 1.7.3), it also establishes the basis for the medium elevation zone element of the offset program.

Component 4 also includes the development of enhancement plans for existing WMAs that lie within the Upstream area but outside the PNG LNG footprint (and are therefore not an obligation of the protected area provisions of Performance Standard 6, paragraph 11). The objectives of these enhancement plans are to: increase the capacity of the organisational structures involved in the management of the WMAs; strengthen the ability of such organisational structures to deliver conservation outcomes while continuing to support traditional livelihoods of local communities; and reinforce the structural elements that will allow EMPNG to meet its offset obligations.

Following consultation with stakeholders, and using the guiding principles developed in consultation with a broad stakeholder group, EMPNG evaluated options for strengthening existing WMAs outside the PNG LNG footprint. Four candidate WMAs were reviewed:

- Sulamesi WMA
- Libano Arisai WMA (in the Mount Bosavi area)
- Libano Hose WMA
- Neiru (Aird Hills) WMA (in the Kikori River delta area).

As a result of this evaluation, the Neiru (Aird Hills) WMA was selected for enhancement and will form part of Component 4, representing the low elevation zone element of the offset program.

3.3.5 Component 5: Establish new protected areas

Component 5 aims to establish new community-based protected areas in the Upstream area that are representative of the biodiversity values affected by PNG LNG.

It comprises the establishment of new legally gazetted protected areas and development of management plans to support the governance of these areas.

The existing Neiru (Aird Hills) WMA in the Kikori River delta area consists of three separate, non-contiguous areas. An option to create a new protected area that joins the existing WMA areas into one contiguous protected area is being evaluated. This proposed protected area will form part of Component 5, representing the low elevation zone element of the offset program.

The evaluation of candidate sites for new protected areas in the high elevation zone of the offset program is ongoing, including extended consultation with key stakeholders.

3.3.6 Component integration to achieve offset targets

The offset program is built around a set of capacity building enablers (Components 1-3) and an execution phase (Components 4 and 5) that leverages the Papua New Guinea Policy on Protected Areas (Independent State of Papua New Guinea, 2014).

Through information gathered during stakeholder engagement, EMPNG has concluded that the capacity building Components 1-3 will play a significant role in the sustainability of the offset program by informing, supporting and enhancing Components 4 and 5, which will enable EMPNG to achieve its offset target. The sustainability of the offset program depends on the involvement of Upstream area communities as well as the individuals, organisations and communities that are directly involved in activities related to Components 1-3. Therefore, community-based programs developed and implemented with relevant local, provincial and national stakeholders are core to all components of the offset program, with

particular regard to the enhancement and longer-term management of the protected areas (Components 4 and 5).

The work involved in delivering each component of the offset program is not linear in nature, with Components 4 and 5 in particular having both individual and overlapping activities. Due to the non-linear nature of these activities, central to the offset program's success is effective communication and engagement with stakeholders including national, provincial and local-level governments, as well as community groups and conservation NGOs, to ensure the protected areas are enhanced for the people, by the people.

Figure 3-2 illustrates the integration of the offset program components.

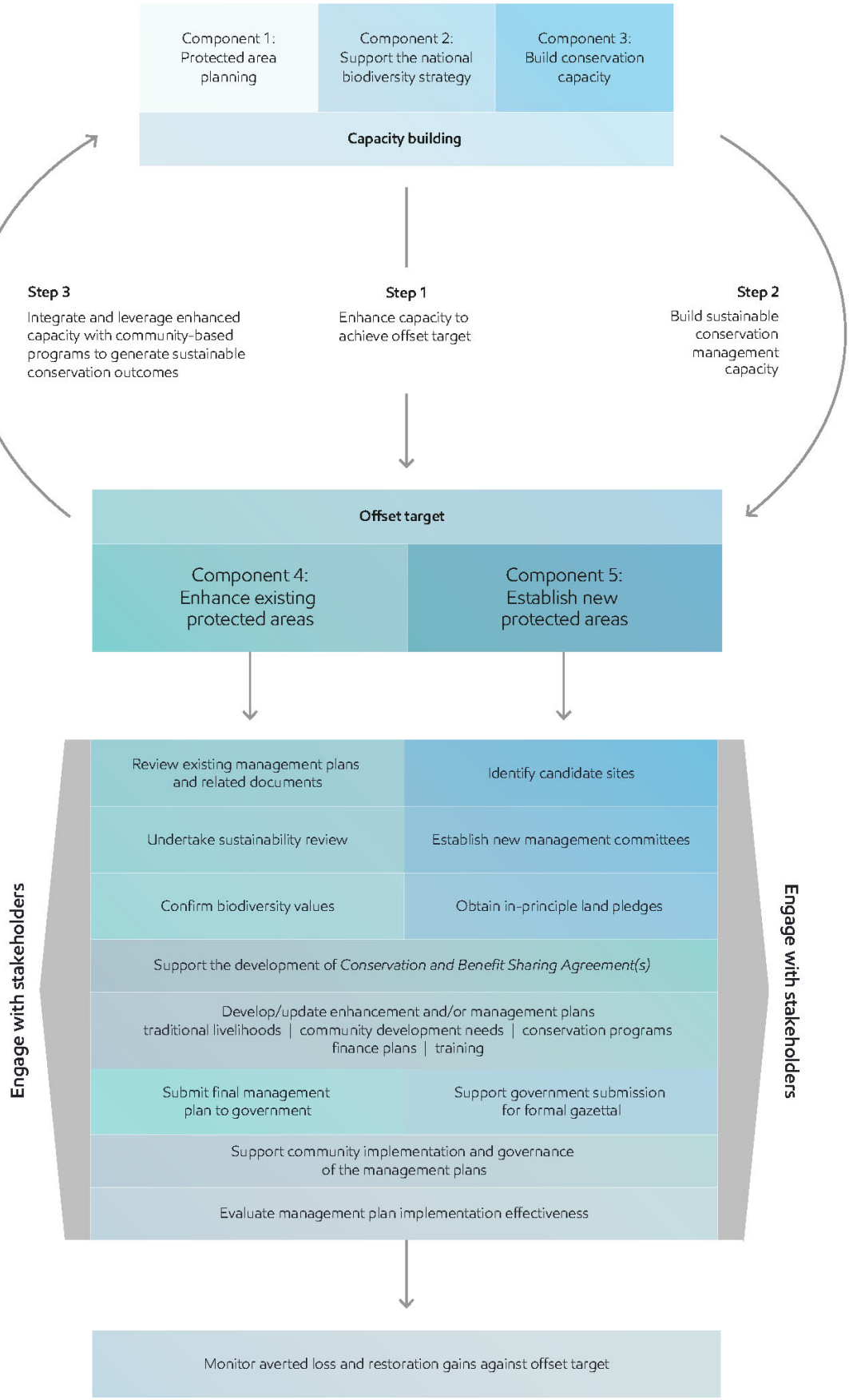


Figure 3-2: Offset program framework

3.4 Monitoring and stewarding conservation outcomes

EMPNG is monitoring the ecological integrity and management effectiveness of the protected areas that form part of the offset program to verify averted losses (forest clearing and degradation) and conservation gain. Data collected will be used to measure EMPNG's progress towards meeting its offset target and achievement of no net loss. The results of these activities will be presented in a report detailing the extent of any change in canopy cover and vegetation condition for each protected offset area, and where relevant, an explanation of the underlying causes if vegetation changes are not the result of the normal ecological functioning of the area.

Performance indicators will focus on attainment of the established conservation outcomes.

In addition, a protected area committee will oversee the monitoring and report conservation outcomes and the overall success of the protected area. The method for monitoring and reporting conservation outcomes will be developed and agreed upon with stakeholders, including the protected area committee, during the detailed design of each protected area and as an ongoing activity during implementation.

3.5 Financing offset

There are various financing mechanisms that could be used to manage and disburse the funds required to deliver the offset program.

In addition to direct payments made by EMPNG, financing of the offset program could be delivered using one or more of the financing mechanisms outlined in Figure 3-3.

Figure 3-3: Financing mechanisms

Whichever financing mechanism is used, one or more legal entities may be required to deliver financing to the third parties implementing conservation actions.

EMPNG will initiate the delivery of financing; however, other entities, such as an intermediary conservation finance entity, third party administrator and advisors/managers, may also play a role. Conservation entity structures have traditionally:

- owned the conservation funds and related accounts
- governed the use of the funds, including making final decisions regarding expenditure of the funds

- administered the day-to-day activities relating to the use of the funds in accordance with the decisions of the governing body, including the disbursement of funds to the third parties implementing conservation actions
- invested endowment or sinking funds.

For offset program activities that are relatively well defined, short in duration and non-recurrent, such as Components 1-3, EMPNG will be directly responsible for the financing and governance of all or most activities. These activities will be delivered through a combination of EMPNG personnel and appropriate third party organisations.

Components 4 and 5 involve both non-recurrent and recurrent activities. EMPNG will be directly involved in the ongoing delivery of the offset program, with the assistance of third party organisations, involving the use of an intermediary, such as a foundation or conservation finance entity, as appropriate at EMPNG's discretion. The intermediary, either existing or set-up specifically for this purpose, will retain an ongoing operational role for EMPNG in the decision-making process to ensure long-term sustainability and delivery of offset objectives. Such an arrangement will allow for other third party sources of funding.

4.0 IMPLEMENTATION AND MONITORING

During PNG LNG's production phase, the implementation, monitoring and evaluation of progress towards achieving the four Biodiversity Strategy objectives is undertaken through the BIMP.

4.1 Initial Post Construction Biodiversity Assessment

The majority of direct residual impacts from the construction of the PNG LNG facilities were evident immediately and are not expected to evolve or recur during the production phase, with the exception of ongoing drilling operations, future development phases and minor civil works at existing worksites.

However, some residual impacts may not have been evident in the immediate post-construction period and may become apparent during production. In particular, the potential direct residual impact of edge and barrier effects and indirect residual impacts relating to the introduction of invasive species and plant pathogens and enhanced access may become more evident with time.

In view of the distinction between finite (i.e. non-recurring) impacts and those that may evolve or manifest during production, and to evaluate the extent to which the objectives of the Biodiversity Strategy have been met during the construction phase, it was necessary to undertake an Initial Post Construction Biodiversity Assessment. Results of the Assessment also helped to inform the BIMP.

In the case of Biodiversity Strategy Objective 1, the Initial Post Construction Biodiversity Assessment evaluated the:

- type and total area of forest lost or degraded during construction
- type and area/population numbers of endemic flora species lost and mitigated during construction
- type and area/population numbers of flora species of conservation concern lost and mitigated during construction.

For Objective 2 the Assessment evaluated the following aspects of the Hides Ridge priority ecosystem:

- the type and area of forest lost or degraded during construction
- the type and number of caves providing suitable habitat for Bulmer's fruit-bat (*Aproteles bulmerae*) or for colonies of other large bats lost and mitigated during construction
- ingress of invasive species or increase in abundance/distribution of existing invasive species
- new instances/extent of dieback.

For the Homa priority ecosystem, the Assessment evaluated:

- the type and area of forest lost or degraded during construction
- ingress of invasive species or increase in abundance/distribution of existing invasive species.

For the Lake Kutubu area priority ecosystem, the Assessment evaluated:

- the type and area of forest lost or degraded during construction
- ingress of invasive species or increase in abundance/distribution of existing invasive species.

In the case of Objective 3, the Assessment evaluated:

- the type and number of caves (providing suitable habitat for colonies of large bats), and sinkhole swamps lost/degraded and mitigated during construction

- the type and number of upland streams and lowland rivers degraded and mitigated during construction
- the type and area of swamp forest lost or degraded during construction.

The Initial Post Construction Biodiversity Assessment used a variety of data sources. Satellite imagery was used for the evaluation of forest loss. Data obtained as part of the PNG LNG EIS and environmental pre-construction surveys coupled with data obtained as part of the environmental verification and monitoring undertaken during the construction phase was used for the evaluation of other ecological elements.

As a result of EMPNG's risk management actions during the construction phase, the Initial Post Construction Biodiversity Assessment found that the amount of land directly impacted from the construction of the PNG LNG facilities was 2373 hectares compared to 2753 hectares predicted in the PNG LNG EIS – a reduction of 380 hectares. Many of the pipeline Right of Way sections, laydown areas, temporary camps, spoil dumps, and workspaces have since been reinstated and natural regeneration is progressing. This indicates that much of the as-built PNG LNG footprint is improving as native plant and animal species return to sites that were cleared during construction.

4.2 Biodiversity Implementation and Monitoring Program

The BIMP outlines the methods EMPNG uses to monitor and measure residual impacts over time, deliver the components of the offset program, and track EMPNG's progress toward demonstrating the achievement of its offset target, and hence, no net loss of biodiversity in the Upstream area.

The BIMP is designed to be adaptive so that KPIs, Programmed Monitoring Activities (PMAs) and other elements of the Plan can be modified in response to findings, as supported by: monitoring data; changing circumstances; and lessons learned, recognising that the overall goal is to sustainably retain the biodiversity values of the Upstream area.

Figure 4-1 illustrates the approach for the BIMP, whereby residual impacts and offset delivery are monitored and evaluated to demonstrate the achievement of EMPNG's offset-related objectives.

4.2.1 Monitoring process

The monitoring process associated with the BIMP defines how EMPNG will evaluate the extent to which the objectives of this Strategy are being achieved. To achieve this, four PMAs are used to collect data, which are then compared against a set of KPIs that reflect the Strategy's objectives. The PMAs are summarised in Table 4-1. Each PMA has a specific protocol that further defines the monitoring process and evaluation methods.

Table 4-1: Programmed Monitoring Activities

TITLE		DESCRIPTION
PMA1	Remote Sensing of Broadscale Land Cover	PMA1 involves using remote sensing imagery to determine the extent to which broadscale direct and indirect residual impacts eventuate as a result of PNG LNG
PMA2	Condition Surveys of Focal Habitats and Significant Ecological Features	PMA2 involves field surveys to collect data, adjacent to and in the vicinity of the pipeline Right of Way and other PNG LNG facilities and infrastructure, relating to condition of focal habitats and significant ecological features
PMA3	Biodiversity Surveys	PMA3 involves biodiversity field surveys providing flora and fauna data in and around the areas affected as part of PNG LNG, and protected areas enhanced and/or established as part of the offset program
PMA4	Efficacy of Biodiversity Offsets	PMA4 monitors progress of the five components of the offset program to enable EMPNG to evaluate whether Objective 4 of the Biodiversity Strategy is being achieved

The monitoring, evaluation and reporting on biodiversity values and the offset program components will be an ongoing process.

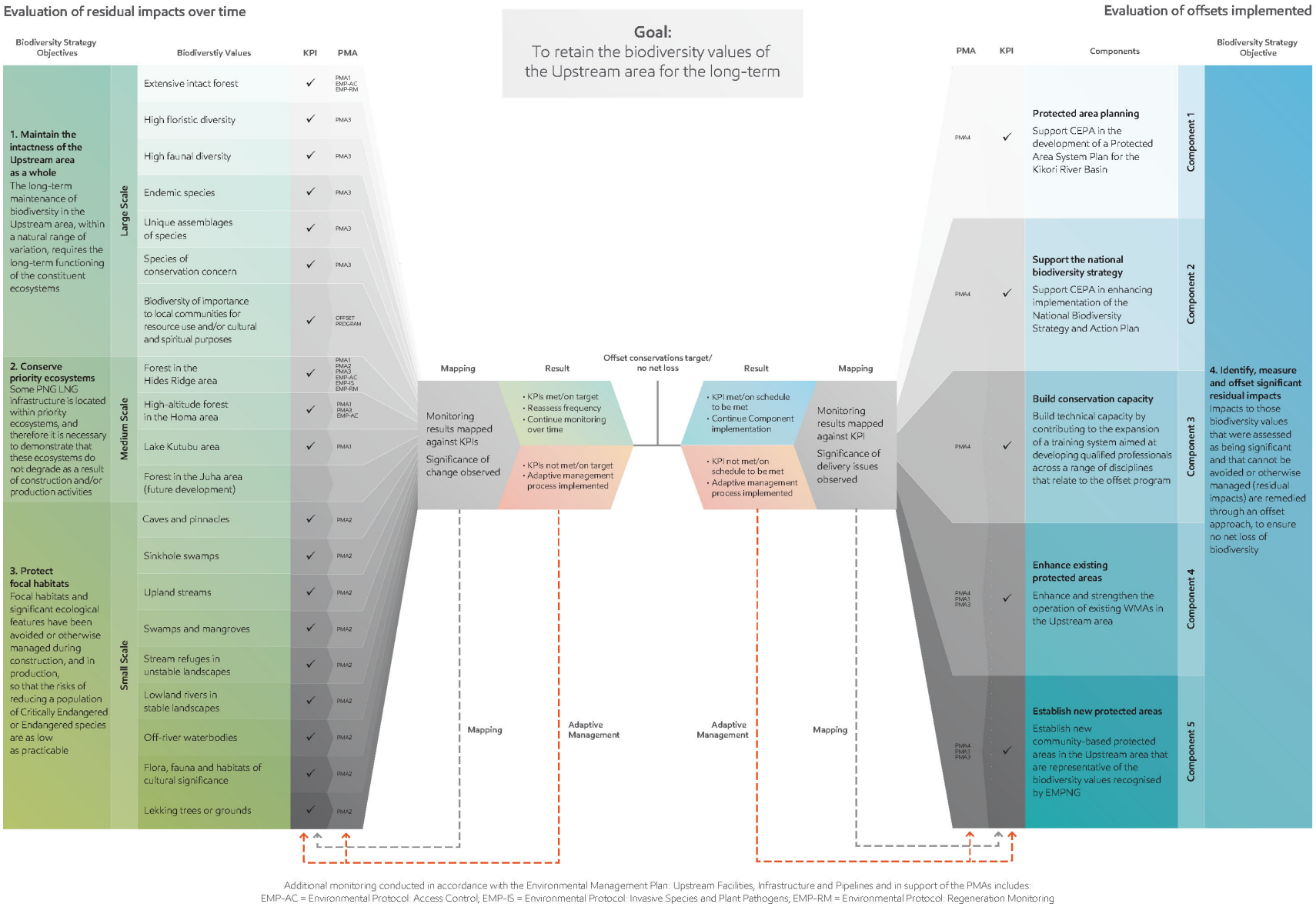


Figure 4-1: Management of residual impacts and offsets

5.0 DELIVERY THROUGH COLLABORATION

EMPNG will continue to promote a collaborative approach to the delivery of this Biodiversity Strategy, based on partnerships between the company and various specialist organisations, consultancy firms, government departments, not-for-profit organisations, communities and other stakeholders. This approach promotes a higher probability for sustainable outcomes.

5.1 Conservation partnerships

Consulting firms and independent specialists have provided valuable input into the design of this Biodiversity Strategy and its supporting Plans, and will continue to play a role in ongoing implementation. Such firms and specialist advisors will be retained by EMPNG as necessary.

Communities directly involved in undertaking the conservation activities proposed as part of the offset program will form the basis of collaborations for this Biodiversity Strategy. Likewise, the relevant existing protected area committees and, in due course, new protected area committees, will form an integral part of such collaborations. This approach is consistent with the Papua New Guinea Policy on Protected Areas (Independent State of Papua New Guinea, 2014), which includes a requirement for a protected area network to be designed and managed for and by the people of Papua New Guinea.

EMPNG recognises the important role of conservation-oriented and other specialist NGOs in the design and delivery of conservation and protected areas in Papua New Guinea. Therefore, EMPNG will work with these organisations during implementation of this Biodiversity Strategy. The core competencies of conservation NGOs vary, so EMPNG envisages an approach that combines, and takes advantage of, the particular strengths of each organisation involved. Beyond achieving the objectives of this Biodiversity Strategy, this collaborative approach has the potential to strengthen relationships between organisations, and promote a coordinated effort that will enable a platform for wider conservation activity in Papua New Guinea.

CEPA is a key stakeholder in all aspects of conservation and protected areas in Papua New Guinea. CEPA will be consulted at all stages during implementation of the Biodiversity Strategy and, as appropriate, will participate in specific collaborations and actions.

Other important stakeholders to be consulted during key stages of offset program delivery include protected area committees, wards, ward development committees, and local-level and provincial governments. As appropriate, these government institutions will participate in specific collaborations and actions.

The actual structure and scope of the collaboration and partnerships will be determined based on the specific needs and prevailing circumstances at the time of implementation. The general approach is described as follows:

- EMPNG will steward delivery and funding of the Biodiversity Strategy and will maintain a close involvement in its implementation
- EMPNG will enter into direct collaborations and partnerships as necessary to deliver the offset program
- the program of work to support CEPA in the development of a protected areas system for the Kikori River Basin, and the program of work to support CEPA in enhancing and accelerating implementation of the National Biodiversity Strategy and Action Plan, requires the involvement of EMPNG in collaboration with the conservation NGO community
- aspects of the offset program relating to enhancing conservation capacity will be delivered through an appropriate educational organisation, which will act as program manager and will be responsible for the detailed design, finalisation, start-up, technical supervision and financial management of the program

- the enhancement of existing protected areas and the new protected area program will require the support of specialty biodiversity advisors, conservation organisations, NGOs, experienced community liaison organisations/individuals and potentially an independent community advocacy organisation. EMPNG intends that these organisations and individuals will work together in partnerships, the structure and scope of which will be tailored to the prevailing circumstances. In all cases, collaborations and partnerships should combine and take advantage of the particular strengths of each organisation and individual involved
- implementation of the offset program will involve similar organisations and individuals working together in partnerships.

EMPNG has biodiversity advisors who oversee implementation of this Biodiversity Strategy and its supporting documents. These advisors are supported by the company's Safety, Health and Environment organisation, Exxon Mobil Corporation subject matter experts and senior technical professionals and by third party specialists as necessary.

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APPENDIX 1: STAKEHOLDERS LIST

Since 2010, EMPNG has engaged, formally and informally, about its Biodiversity Strategy and BIMP with key stakeholders, including national and international NGOs and CEPA. EMPNG acknowledges the contributions from the following organisations and the individuals who represented them at the time of consultation:

- CEPA (Rose Singadan)
- Conservation International (Roger James, Bruce Beehler, Mahlette Betre, Romas Garbaliauskas, Angela Kirkman, David Mitchell, Jennifer Morris, Conrad Savy, Christopher Stone, Justin Ward)
- D'Appolonia as the Independent Environment and Social Consultant (Lori Conzo)
- Environmental Law Centre (Anne Kajir)
- Firescape Science (David Gillison, Leasie Felderhof)
- Francis Crome Pty Ltd (Francis Crome)
- Institute for Applied Ecology - University of Canberra (Prof. Arthur Georges, Dr. Carla Eisemberg)
- Mama Graun Conservation Trust Fund (Jane Mogina)
- New Guinea Binatang Research Centre (Vojtech Novotny, Legi Sam)
- OnePeak Consulting Pty Ltd (Elizabeth Pietrzykowski)
- Papua New Guinea Eco-Forestry Forum Inc. (Thomas Paka)
- Papua New Guinea Institute of Biological Research (Banak Samui, Miriam Supuma, Debra Wright, Paige West)
- Partners with Melanesians Inc. (Kenn Mondiai)
- PEACE Foundation Melanesia (James Laki)
- PNG Conservation Forum (John Ericho)
- Research and Conservation Foundation of Papua New Guinea (Sangion Tiu, Kelvin Waukave)
- Tenkile Conservation Alliance (Jim Thomas)
- The Nature Conservancy (Dan Salzar, Francis Hurahura).
- University of Papua New Guinea, Faculty of Science (Prof. Frank Griffin)
- Wildlife Conservation Society Papua New Guinea (Ross Sinclair, Tanya Zeriga-Alone)
- Woodland Park Zoo Seattle (Lisa Dabek)
- WWF Western Melanesia Programme (Ted Mamu, Eric Verheij)
- YUS Conservation Area Project (Zachary Wells)