



**FRIEDA RIVER**

Frieda River Limited  
**Sepik Development Project**  
Environmental Impact Statement  
Chapter 10 – Cumulative Impact Assessment

SDP-6-G-00-01-T-084-020





## 10. CUMULATIVE IMPACT ASSESSMENT

The consideration and assessment of cumulative impacts arising from other existing or reasonably foreseeable future developments is not specifically addressed under the *Environment Act 2000* and associated guidelines for environmental impact assessment (DEC, 2004b). Therefore, the onus is on proponents to decide on whether it is feasible to assess cumulative impacts as part of an environmental and social impact assessment. FRL has deemed it important to assess the cumulative impacts from other projects that may credibly eventuate in the same space and time as the Sepik Development Project<sup>1</sup> and has therefore adopted the method for cumulative impact assessment informed by the International Finance Corporation Good Practice Handbook: Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (IFC, 2013). The IFC (2013) defines cumulative impacts as:

*... those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.*

Cumulative impact assessment involves identifying those other projects that might contribute to cumulative effects on the environment and people, where what may appear to be minor impacts from the Sepik Development Project at a local level may take on a greater significance when placed in a wider context. This is achieved through (IFC, 2013):

- Identifying the important environmental and social aspects.
- Understanding whether other projects are credible or not.
- Understanding whether the Sepik Development Project's activities overlap or connect in space with those of the other projects, i.e., there is a spatial relationship.
- Understanding whether the Sepik Development Project's activities overlap in time with those of the other projects, i.e., there is a temporal relationship.
- Assessing the cumulative impacts and their significance.
- Proposing mitigation strategies.

A cumulative impact on an important environmental or social aspect is only possible when all three aspects – a credible project and spatial and temporal relationship – exist.

This chapter identifies credible and potential projects within Sandaun and East Sepik provinces, along with the Sepik Development Project, that could contribute to a cumulative impact on the environment and people of Sepik; this chapter does not consider projects in neighbouring Indonesia, as PNG has no jurisdiction over them. It then assesses their spatial and temporal relationships to the Sepik Development Project to determine if cumulative impacts are possible and, if possible, significant. FRL has proposed management strategies where the Sepik Development Project could contribute to a significant cumulative impact but these will require the collaboration of other stakeholders to ensure they are successful (e.g., other project proponents, provincial and national governments).

---

<sup>1</sup> Unlike other chapters in this EIS, this chapter uses the term 'Sepik Development Project' rather than 'the Project' throughout to minimise the potential for confusion with other 'projects'. Sub-components of the Sepik Development Project (e.g., FRCGP) are still referred to by their acronym.

## 10.1 Important Environmental and Social Aspects

The important environmental and social aspects of the Sepik Development Project's setting are described in Chapter 7. The aspects most at risk of cumulative impacts are:

- Terrestrial habitats from combined effects of forest clearance.
- Freshwater habitats from combined effects of increased sediment loads and potential changes in water quality.
- Livelihoods and community health of the different social catchments from an influx of people seeking work or business opportunities.
- Road user safety from an increase in commuters.
- Timely distribution of cargoes from competing priorities for access to ports and berths.
- Nearshore marine habitats from combined effects of increased vessel traffic at the proposed Vanimo Ocean Port.

These aspects form the basis for identifying and evaluating cumulative impacts that may arise from the Sepik Development Project and other projects.

## 10.2 Method for Identifying Credible Projects

The method to determine projects that could contribute to a cumulative impact is explained in this section.

### 10.2.1 Credible Projects

Existing projects and their impacts have been considered in the environment and social baseline characterisations described in Chapter 7. Two examples of these are the existing impacts to terrestrial ecology from logging and oil palm development in the north of the infrastructure corridor, and the existing impacts to nearshore marine ecology from log export operations at the existing Port of Vanimo. These existing projects are only considered in the cumulative impact assessment if their operations are expected to change during the life of the Sepik Development Project.

Credible projects are those that are:

- In operation and seeking approvals for expansion; for example, an existing mine that has lodged an application with the PNG Government to expand operation or increase production.
- Under construction or being commissioned; for example, an oil palm processing facility.
- Approved and awaiting Final Investment Decision; for example, a project that has received approval from the PNG Government and is awaiting the proponent's decision on whether to proceed with the investment or not.
- Approved and in detailed engineering design; for example, a project that has received approval from the PNG Government and is currently in detailed design before construction begins.
- In an approvals process and likely to proceed if approval is obtained; for example, a project for which an EIR and/or EIS has been lodged with CEPA, and the company has established a presence in PNG and expressed a desire to proceed with the project if approved.

For a project to be eligible for consideration in the cumulative impact assessment, the important environmental and social aspects need to have been described in an EIS or sufficiently described in an EIR or permit amendment (and these need to be publicly available, which is not always the case) to enable the project's contributions to a cumulative impact to be assessed, either qualitatively or quantitatively. The cumulative impact assessment cannot assess potential projects which are speculative and for which there is no verified publicly-available information relating to the design, construction and operation of the project.

### **10.2.2 Spatial Relationship**

Projects geographically connected (e.g., via a river or road) or near to each other (e.g., in the same river catchment) may contribute to a cumulative impact. An example of this would be where sediment runoff from the Sepik Development Project and existing and future projects within the catchment (combined) may cause a significant change in water quality.

Projects within the same catchment or connected via a transport corridor such as a road may contribute to cumulative impacts through successive clearing of forested areas or stressing community, health and education infrastructure and services within the area serviced by the road.

The Sepik Development Project is located in the Frieda, Upper Sepik, May and Green river catchments. Proposed and existing other projects in these catchments could contribute to a cumulative impact within these catchments, which all report to the Sepik River.

The Mine Area will be connected to the existing road from Vanimo to Green River via a new road to be constructed from Green River. Other projects that could benefit from these roads have the potential to contribute to cumulative impacts in these areas.

### **10.2.3 Temporal Relationship**

A project's construction, operation and decommissioning activities must overlap with the life of the Sepik Development Project for a cumulative impact to occur. If this is not likely to happen then the project has not been considered in this cumulative impact assessment.

## **10.3 Identification of Credible Projects**

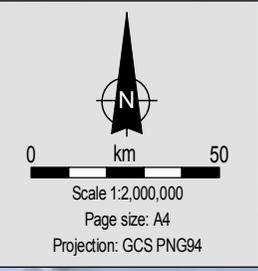
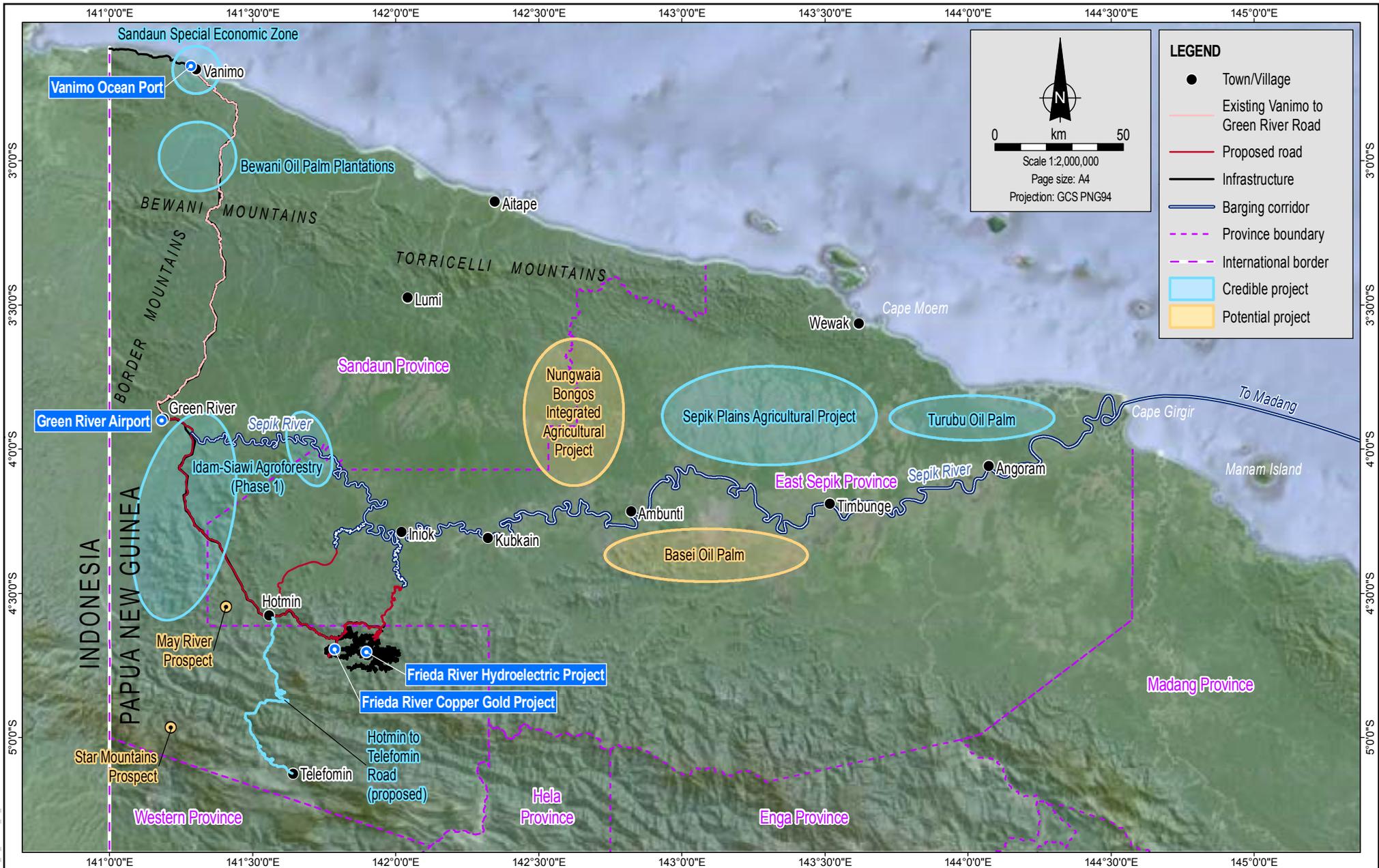
Projects spatially and temporally connected to the Sepik Development Project are listed in Table 10.1 along with an evaluation of whether they meet the criteria for a credible project. The projects are shown in Figure 10.1.

**Table 10.1 Evaluation of projects**

<b>Project</b>	<b>Spatial relationship</b>	<b>Temporal relationship</b>	<b>Eligibility</b>
<b>Bewani Oil Palm Plantations</b> is an oil palm project within the Bewani Valley and adjacent to the Vanimo to Green River Road. A total of 80,000 ha is anticipated to be covered by oil palm trees of which 7,500 ha has been cultivated since 2011.	The plantation is located approximately 40 km south-west from Vanimo town and is within the infrastructure corridor.	The Sepik Development Project is expected to commence construction within the life of the Bewani Oil Palm Plantations.	This is a credible project for the purposes of this cumulative impact assessment.
<b>Idam-Siawi Agroforestry Project</b> is an integrated agroforestry project located in the Green River Rural LLG of Sandaun Province. The project will involve clearing vegetation, comprising a sizeable volume of commercial trees, over an estimated 780,000 ha of land area identified as suitable for cultivation of various commercial crops and livestock (Tangoy Vivafounder, 2017). Tangoy Vivafounder Investment Holdings has environmental approval (for phase one) and will commence logging operations followed by agricultural development.	The agroforestry development is located approximately 90 km north-west of the FRCGP and is within the infrastructure corridor.	The Sepik Development Project is expected to commence construction within the life of the Idam-Siawi Agro-Forestry development.	This is a credible project for the purposes of this cumulative impact assessment.
<b>Sandaun Special Economic Zone</b> is a concept proposal supported by the PNG Department of National Planning to establish a free trade zone in Vanimo including an international wharf.	The conceptual development would be located within the vicinity of the Vanimo Ocean Port. A designated area for the free trade zone has been identified.	The project is a concept in the Vanimo Urban Development and Detailed Zoning Plan. However, construction of ancillary infrastructure has commenced to support this concept.	This is a credible project for the purposes of this cumulative impact assessment.
<b>Sepik Plains Agriculture Project</b> is being developed by a joint venture between Kumul Consolidated Holdings and Innovative Agro Industry. The proposed development will involve chicken and chicken feed production including commercial cocoa plantation.	The project is within the Sepik River catchment approximately 230 km downstream (river distance) from the mine area.	There is no publicly available information on the status of agricultural development. However, it could be expected during the life of the Sepik Development Project.	This is a credible project for the purposes of this cumulative impact assessment.
<b>Turubu Oil Palm</b> is being developed by Wewak Agricultural Development Limited. A total of 116,840 ha has been proposed for development. Field planting has been completed and construction of a 720 t oil palm mill commenced in 2016.	The project is within the lower Sepik River catchment approximately 300 km (river distance) from the mine area.	The Sepik Development Project is expected to commence construction within the life of the Turubu Oil Palm project.	This is a credible project for the purposes of this cumulative impact assessment.

**Table 10.1 Evaluation of projects (cont'd)**

<b>Project</b>	<b>Spatial relationship</b>	<b>Temporal relationship</b>	<b>Eligibility</b>
<b>Basei Oil Palm</b> is being developed by Baseil Oil Palm Investment Limited. Phase one would involve five oil palm estates totaling 95,000 ha. The project is still undertaking land investigation studies and is sourcing financing for the project.	The project's footprint is anticipated to cover the Nukuma area in Ambunti-Drekirkir District and parts of the neighboring Nuku District.	There is no publicly available information on the status of the oil palm development.	This potential project is not included for the purposes of this cumulative impact assessment.
<b>Nungwaia Bongos Integrated Agriculture</b> recently announced that an investment of US\$150 million would be made by New Zealand firm Eldoncorp Holdings Limited. However, the project is awaiting legal clearance from the PNG Government.	The project's footprint is anticipated to cover the Wosera-Gawi, Ambunti Drekirkir and Aitape-Lumi districts.	There is no publicly available information on the status of this integrated agricultural development.	This potential project is not included for the purposes of this cumulative impact assessment.
<b>Hotmin to Telefomin Road</b> is being proposed for development by the national government via FRL. However, it is not assessed as part of this EIS. The proposed road will extend the planned new Green River to Hotmin Road to Telefomin airstrip. The PNG Development Strategic Plan 2010-2030 (2010) identified 16 'missing links' and additional corridor roads. This road is categorised as one of the missing links and if built will facilitate the flow of people and goods and services along the Indonesian and PNG boarder corridor (DNPM, 2010).	The proposed project would extend the Vanimo to Hotmin Road into Telefomin.	The project is anticipated to occur during the life of the Sepik Development Project.	This is a credible project for the purposes of this cumulative impact assessment.
<b>Star Mountains Prospect</b> is a mineral exploration project led by Highlands Pacific Limited. The recent work involved a drilling campaign in 2017 at various prospects confirming extensive mineralised zones.	The project is located approximately 20 km north-east of the Ok Tedi mine and approximately 100 km south-west of the FRCGP.	This project is at an early exploration stage and there is no information on future planned project development activities.	Engineering studies to develop the project are not well advanced. Therefore, this potential project is not included for the purposes of this cumulative impact assessment.
<b>May River Prospect</b> is a mineral exploration project led by Niuminco. Airborne geophysical surveys were conducted over the prospect and a two-year extension application of the exploration license was lodged in 2015.	The project is located within the May River catchment approximately 40 km north from the FRCGP.	This project is at an early exploration stage and there is no information on future planned project development activities.	Engineering studies to develop the project are not well advanced. Therefore, this potential project is not included for the purposes of this cumulative impact assessment.



LEGEND	
●	Town/Village
— (light red)	Existing Vanimo to Green River Road
— (red)	Proposed road
— (black)	Infrastructure
— (blue)	Barging corridor
- - - (purple)	Province boundary
- - - (dashed purple)	International border
○ (light blue)	Credible project
○ (yellow)	Potential project

MXD Reference: 11575E\_11\_GIS039\_v0\_9

Source:  
 Project locations and areas approximated by Coffey.  
 Infrastructure and roads from FRL. Villages from FRL and Coffey.  
 Provinces from NMB.  
 Imagery from Google Earth (capture date unknown).  
 Hillshade DEM from SRTM.



Date: 07.11.2018  
 Project: 754-ENAUABTF11575B  
 File Name: 11575\_11\_F10.01\_GIS

Frieda River Limited  
 Sepik Development Project



Credible and potential projects

Figure No: 10.1

Six projects have been identified as credible projects for the purposes of this cumulative impact assessment. They are:

- Bewani Oil Palm Plantations.
- Idam-Siawi Agroforestry.
- Sandaun Special Economic Zone.
- Sepik Plains Agriculture Project.
- Turubu Oil Palm Project.
- Hotmin to Telefomin Road.

These projects were evaluated for their potential to cause further change to the important environmental and social aspects already predicted to be affected by the Sepik Development Project.

## **10.4 Cumulative Impact Assessment**

Potential cumulative impacts are discussed in the following sections, along with proposed management strategies for the potentially significant cumulative impacts. The impacts are discussed under each of the causes of cumulative impact that could arise from the credible projects identified in Table 10.1.

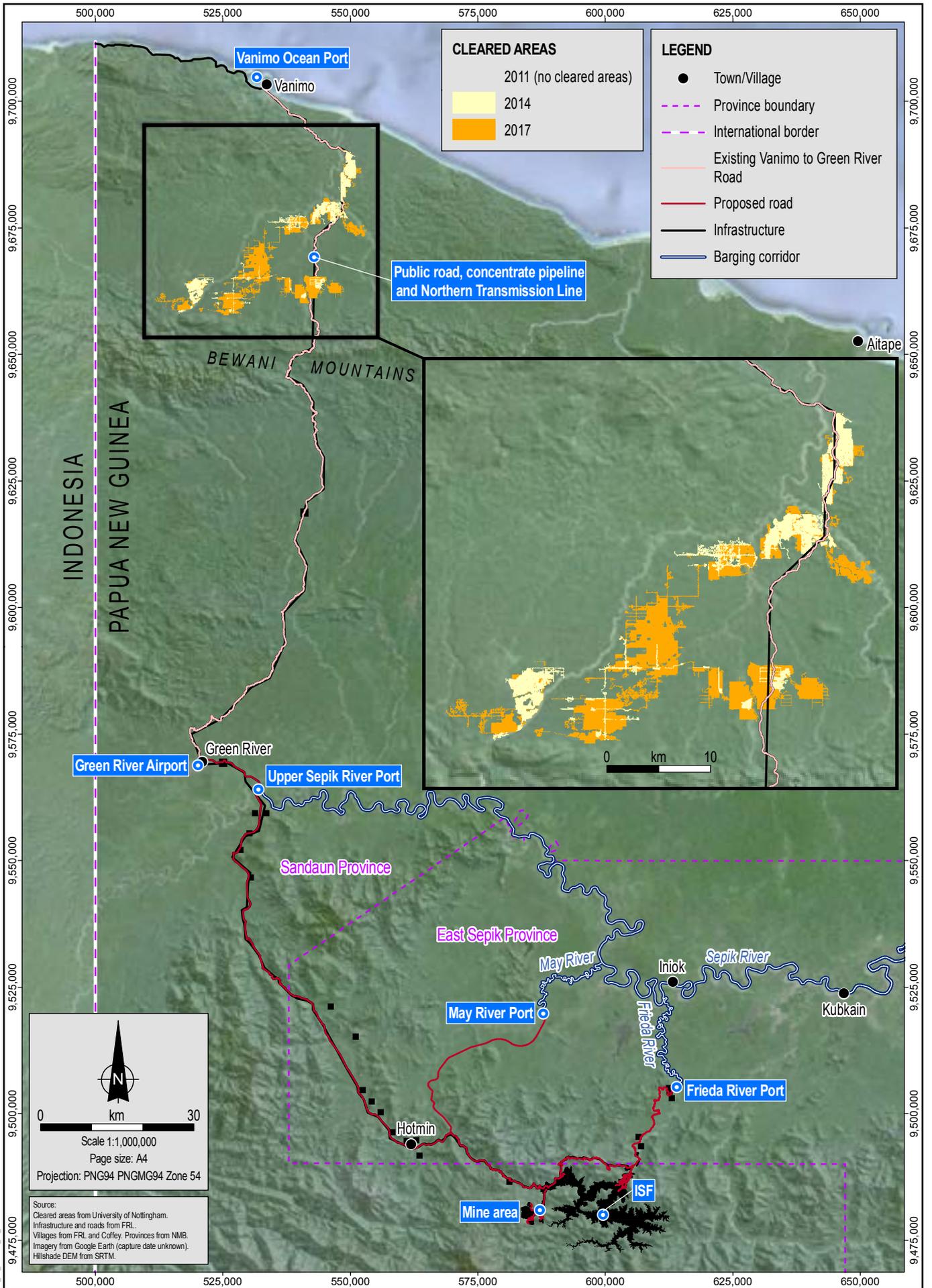
### **10.4.1 Physical Disturbance (Vegetation Clearing)**

The Idam-Siawi Agroforestry Project will involve the clearing and conversion of largely undisturbed forest adjacent to the infrastructure corridor and near to the FRCGP. Vegetation clearing for the agroforestry project and the Sepik Development Project will increase the extent of habitat loss in the region. The permitted phase of the agroforestry project ('Phase One of Block One') will clear more than 141,000 ha (Tangoy Vivafounder, 2017), which is an order of magnitude greater than the disturbance area proposed for the Sepik Development Project (approximately 16,000 ha). Up to 780,000 ha of vegetation will be cleared if all phases of the Idam-Siawi Agroforestry Project proceed (Tangoy Vivafounder, 2017). This is approximately 50 times the disturbance area that will result from the Sepik Development Project.

Land cleared for the agroforestry project will be used for the cultivation of crops including oil palm, paddy rice, sago, cassava, spices and vegetables, and stock including cattle, poultry and pigs. As a result, the cleared land will lose its ecological integrity with limited potential for progressive rehabilitation of disturbed areas as the purpose of the land clearing is to convert it from undisturbed forest to agricultural land use.

The Idam-Siawi Agroforestry Project will continue the existing trend of vegetation clearance extending south along the road corridor between Vanimo and Green River. The area that had been cleared in each of 2011, 2014 and 2017 in Sandaun Province is shown in Figure 10.2, with clearing activities moving further south along the road corridor through time. The Idam-Siawi Agroforestry Project will continue this trend, as it will represent an extension of vegetation clearance further south within the road corridor, and it will be on a larger scale than previous clearing.

The Sepik Development Project infrastructure corridor will use the existing road corridor where practicable, to minimise additional vegetation clearance in the vicinity of the Bewani Oil Palm Plantations and is unlikely to contribute to cumulative physical disturbance impacts in that area.



IMD Reference: 11575B\_11\_GIS041\_v0\_3



Date: 11.09.2018  
 Project: 754-ENAUABTF11575B  
 File Name: 11575\_11\_F10.02\_GIS

Frieda River Limited  
 Sepik Development Project



Area of cleared vegetation in Sandaun Province in 2011, 2014 and 2017

Figure No: 10.2

The proposed Hotmin to Telefomin Road would increase access to largely undisturbed areas, with potential impacts to biodiversity including barrier and edge effects and increased hunting pressure. Management measures outlined for the Sepik Development Project will also apply to the Hotmin to Telefomin Road, if it is constructed.

While the Turubu Oil Palm Project will potentially involve clearing more than 116,000 ha, and the Sepik Plains Agriculture Project may also involve forest clearing and conversion, both projects are located in lowland areas closer to Wewak in East Sepik Province and are unlikely to contribute to cumulative impacts from vegetation clearing for the Sepik Development Project.

The Sandaun Special Economic Zone is not expected to directly involve physical disturbance.

The management measures outlined in Section 8.6.3 will limit the Sepik Development Project's contribution to cumulative impacts from vegetation clearing. Hence no additional measures are proposed given the relatively small contribution from the Sepik Development Project compared to that of the Idam-Siawi Agroforestry Project.

#### **10.4.2 Physical Disturbance (Sedimentation)**

The majority of sedimentation generated by the Sepik Development Project will occur upstream of the ISF. Small increases to total suspended sediment (TSS) levels in the Frieda River are predicted to occur in the short period prior to impoundment of the ISF (Section 8.5.4). Following impoundment, the ISF will play a major role in attenuating TSS levels in the Frieda River to below existing conditions. Influences on TSS concentrations in the Sepik River, particularly during operations, are predicted to be comparable to the natural variability for existing conditions.

Sedimentation generated by vegetation clearance for the Idam-Siawi Agroforestry Project is not assessed in detail in its EIS. However, this has the potential to be significant given the scale of the proposed vegetation clearance and the difficulty of containing sediment in the project's setting. The EIS for the agroforestry project mentions the use of silt traps; the number, location or design of these are not described (Tangoy Vivafounder, 2017). The other projects further downstream in the Sepik River catchment (Turubu Oil Palm Project and the Sepik Plains Agriculture Project) also have the potential to generate significant sediment given the extent of vegetation clearing that is anticipated, if erosion is not appropriately managed. There is a risk that increased TSS within the Sepik River from vegetation clearance for these projects will be incorrectly attributed to the Sepik Development Project.

The proposed Hotmin to Telefomin Road is unlikely to generate significant sedimentation, other than highly localised areas immediately downstream of construction activity, and management measures outlined for the Sepik Development Project (Attachment 2) could be applied to the Hotmin to Telefomin Road, if it is constructed.

The Bewani Oil Palm Plantations are located in different catchments to the Sepik Development Project – which drain to the coast to the north of the Bewani Mountains – and will therefore not contribute to cumulative impacts in the Sepik River catchment.

The Sandaun Special Economic Zone is not expected to directly involve physical disturbance. However, the associated international wharf development may cause a cumulative effect from increase in sedimentation during construction. This would contribute to impacts to nearshore marine habitats at the existing Port of Vanimo port. Management measures to minimise these impacts are discussed in Section 8.10.3.

The management measures outlined in Section 8.5.2 and the location of the ISF will limit the Sepik Development Project's contribution to TSS in the Frieda and Sepik rivers which are

downstream of the Project, and no additional measures are proposed to manage cumulative impacts associated with sedimentation.

### **10.4.3 Road and River Use**

The SIP involves the upgrade of the existing public road from Vanimo to Green River and the construction of a new road from Green River to Hotmin. The road will enable passenger and freight access. The Sepik Development Project will enable the movement of trucks (transporting containerised and break-bulk cargoes to and from the Vanimo Ocean Port), buses and PMVs (transporting personnel along the public road and from the Green River airstrip to the mine) and light vehicles. The social impacts associated with increased traffic for the Sepik Development Project are outlined in Section 9.2.4.

The Idam-Siawi Agroforestry Project will involve the construction of more than 430 km of new roads and tracks including a connection to the existing public road at Green River, which is approximately 30 km from the project site (Tangoy Vivafounder, 2017). An estimated 600,000 m<sup>3</sup> of round logs and 50,000 m<sup>3</sup> of sawn timber is expected to be transported via road to Vanimo annually (Tangoy Vivafounder, 2017). The proponents plan to acquire 87 trucks to convey round logs and sawn timber between Green River and Vanimo Port, although the number of vehicle movements is unknown (Tangoy Vivafounder, 2017).

The other projects along the road corridor (Bewani Oil Palm Plantations and the Sandaun Special Economic Zone) may also contribute to increased road traffic volumes.

The cumulative effects of the road traffic generated by the projects are likely to increase vehicle movements along the road corridor, heighten the risk of accidents and increase the nuisance value caused by noise, dust, lighting and air emissions. These effects will be greatest if the construction phase of the Sepik Development Project (when vehicle movements are highest) overlaps with periods of vegetation clearing and transportation of logs from the agroforestry project.

Conversely, the increased vehicle traffic will provide new opportunities for business development and access to markets for the sale of produce and cash crops. For example, increased traffic will expand the customer base for small-scale family enterprises selling garden produce and other products such as small goods and consumable items along the road corridor.

The proposed future road link between Hotmin and Telefomin would contribute additional light vehicle traffic to the road corridor, however the additional volume of traffic generated is unlikely to be significant as it is likely to be used primarily for the movement by Min and Telefol people towards the mine and FRHEP.

The other credible projects (Turubu Oil Palm Project and Sepik Plains Agriculture Project) will not use the SIP road corridor and therefore will not contribute to cumulative impacts from road use. There is the potential for a combined increase in barge traffic on the Sepik River if these projects overlap in time with the early stages of construction of the Sepik Development Project prior to the road corridor being in place.

The management measures outlined in Section 9.4 will limit the Sepik Development Project's contribution to cumulative negative impacts from road and river use hence no additional measures are proposed. It is assumed that other proponents using the road from Vanimo to Hotmin will have driver awareness and road safety programs to minimise risks to the safety of other road users, and other proponents using the Sepik River for barge transport will have river safety programs to minimise risks to the safety of other river users.

#### **10.4.4 Shipping**

The upgrade of the existing Vanimo Port is a key component of the SIP. During its operation, the FRCGP will generate additional vessel movements through the port for the importation of freight and fuel and the export of concentrate (Section 5.2).

The Idam-Siawi Agroforestry Project will also involve the installation of product export facilities at Vanimo for the export of round logs and sawn timber (Tangoy Vivafounder, 2017). Bewani Oil Palm Plantations also uses port facilities at Vanimo for the export of timber and, in the future, palm oil. Both projects are likely to also use port facilities at Vanimo for the import of freight. The Sandaun Special Economic Zone will also seek to increase the volume of goods transiting through the port facilities at Vanimo.

There is potential for congestion at the Vanimo port facilities as a cumulative effect of the multiple projects. This will be mitigated by the construction of dedicated port facilities for the Sepik Development Project and the agroforestry project, although there may still be congestion of vessels entering and exiting the port. There is also potential for impacts to the marine environment from the construction of additional port facilities and the additional ship movements in the vicinity of Vanimo. Measures to address potential impacts to the nearshore marine environment are outlined in Section 8.10.3.

The proposed Hotmin to Telefomin Road is not expected to generate significant additional traffic through the Vanimo Ocean Port.

In addition, the Sepik Development Project may indirectly contribute to congestion in the ports at Lae and Wewak, if construction of the Sepik Development Project overlaps with construction of the Wafi-Golpu Project (Lae) or the Turubu Oil Palm Project or Sepik Plains Agriculture Project (Wewak). During construction of the Sepik Development Project, freight will be imported via existing ports including Lae and Wewak and barged upstream along the Sepik River to the Frieda or May River ports, until upgrade of the Vanimo Ocean Port and construction of the road corridor is completed.

FRL will work with PNG Ports Corporation Limited and other project proponents to coordinate logistics and access to the port facilities at Vanimo (and Lae and Wewak, if required).

#### **10.4.5 Construction Workforce**

Skilled and unskilled workers will be required for each of the credible projects. Competition for employees will be greatest when project construction timeframes coincide or overlap. This may act to increase the attraction for in-migrants seeking work on the projects.

The workforce numbers for the Sepik Development Project will vary for each Project component and during construction and operation (Section 5.11.2). During construction, workforce numbers onsite will peak at about 2,750 for the FRCGP, 2,260 for the FRHEP, 880 for the SIP and 290 for the SPGP. Operations staff for FRL and contractors is estimated at approximately 2,080 personnel excluding hydroelectric power facility operation which will require approximately 130 personnel. Recruitment will focus on sourcing labour within PNG with expatriates to be employed where suitable skills and experience cannot be sourced within PNG.

The EIS for the Idam-Siawi Agroforestry Project outlines the following personnel numbers: 43 employees in the head office; 1,290 employees for forest harvesting; 211 employees for the sawmill; 146 employees in wood processing; 40 employees to build wooden houses; and 38 employees for heat and electricity supply (Tangoy Vivafounder, 2017) – a total of approximately 1,800 employees. Production workers will mainly be hired from within PNG while personnel for

technology and management will be recruited primarily from Malaysia, Indonesia and the Philippines (Tangoy Vivafounder, 2017).

No information on workforce numbers is available for the other credible projects (Bewani Oil Palm Plantations, Sandaun Special Economic Zone, Sepik Plains Agriculture Project, Turubu Oil Palm Project, or the proposed Hotmin to Telefomin Road).

FRL will develop and implement a Project-Induced In-Migration Management Strategy (PIIMMS) (Section 9.4). The strategy will be reviewed periodically to ensure the measures remain effective in dealing with the Sepik Development Project's contribution to cumulative impacts caused by in-migration. The Sandaun and East Sepik provincial governments will have an important role to play in managing the cumulative effects of in-migration as a result of the various credible projects.

## **10.5 Conclusion**

A total of 10 projects were assessed to determine whether they were eligible and would contribute to the cumulative impacts of the Sepik Development Project. From the assessment, six credible projects had spatial and temporal relationships with the Sepik Development Project and were considered to have the potential for a cumulative effect. The potential cumulative impacts likely to arise were considered from the following aspects:

- Vegetation clearance.
- Sedimentation.
- Road and use.
- Shipping.
- Construction workforce.

Cumulative impacts from vegetation clearance, sedimentation, road use, shipping and construction workforce are possible. Management strategies for mitigating the potential cumulative effect for each aspect has been discussed (Section 10.4) and will be developed as part of the Project mitigation strategies and programs in consultation with other project developers. This will provide an overarching framework to cater for changing conditions. The provincial governments of Sandaun and East Sepik will be encouraged to incorporate these management strategies into their development plans to manage increases in population and the economy while also managing impacts to the environment.