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**THE GOVERNMENT OF PAPUA NEW GUINEA**

**PRODUCTIVE PARTNERSHIP IN AGRICULTURE PROJECT (PPAP)**

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**DRAFT**

**ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK**

**Volume 1**

**December 5, 2009**

## Contents

Executive Summary .....	<b>Error! Bookmark not defined.</b>
1.0 Introduction .....	1
2.0 Description Of The Proposed Project.....	4
3.0 Baseline Data.....	10
4.0 Description Of World Bank Environmental And Social Safeguards Policies And Triggers .....	22
5.0 Administrative, Policy, Legislative And Regulatory Framework .....	28
6.0 Environmental Management Plan .....	34
7.0. Institutional Assessment and Framework For Environmental And Social Management.....	58
8.0 Environmental and Social Planning, Review and Clearing Process For PPAP .....	60
9.0 ESMF Implementation Budget.....	63
Annex 1: Verification of Safeguards Policies triggered by PPAP Sub .....	64
Projects .....	64
Annex 2: Outline for an Environmental and Social Impact Assessment Report.....	67
Annex 3: Guidelines for an Environmental and Social Management Plan .....	69
(ESMP).....	69
Annex 4: Environmental And Social Screening Form .....	70
Annex 6: Generic Guidelines for Preparing and Implementing a Public .....	75
Consultation Plan for an ESIA .....	75
Annex 7: Environmental And Social Appraisal Form (ESAF).....	77
Annex 8: Environmentally Sensitive Areas (ESA'S) And Ecosystems In PNG.....	80
Annex 9: Provision of a TOR for the Environmental Specialist .....	81

## List of Tables

Table 1: Temperature and Rainfall of the PPAP provinces .....	11
Table 2: Major Soil Orders in PNG.....	13
Table 3: Endemicity of land and freshwater vertebrates of PNG.....	14
Table 4: Herpetofauna (native species) of Papua New Guinea.....	17
Table 5: Some Economic, Social and Environmental Indicators for PNG .....	21
Table 6: Summary of the Requirement of Bank Safeguard Policies triggered by the PPAP .....	27
Table 7: Sample of Feeder Roads in EHP & ARB for Environmental Screening Purposes.....	36
Table 8: Description of the sub projects in the PPAP .....	43
Table 9: Proposed Mitigation and Monitoring Measures for Coffee and Cocoa .....	45
Table 10: Propose Mitigation and Monitoring Measures for Minor Roads and Paths.....	47
Table 11: Proposed Mitigation and Monitoring Measurs for Wharves and Jetties .....	55
Table 12: Potential PPAP Sub Project Types, Environmental & Social Concerns and Probable Category* .....	61

## List of Figures

Figure 1: Department of Agriculture and Livestock Structure.....	1
Figure 2: EIA Process in PNG .....	30
Figure 3: Regulatory Streams under the Environmental Act 2000 (DEC 1996).....	32



## 1.0 Introduction

### *Background*

Following the Government of Papua New Guinea's (GoPNG) request for World Bank support to the agriculture sector, the GoPNG and the World Bank agreed in March 2008 on the concept and the outline of the proposed PNG Productive Partnerships in Agriculture Project (PPAP). In April 2008, the Secretary for DNPM formally confirmed by letter, on behalf of Government, its endorsement of the project concept. Project preparation was carried out in 2009 and the ESMF is one of the instruments prepared to support the implementation of the PPAP.

The proposed PPAP will be one of Government's programs contributing towards the goals of PNG's National Agriculture Development Plan (NADP) and complementing other government initiatives. The focus of the PPAP is on the coffee and the cocoa industries, given their strategic importance for the rural economy and in view of the challenges that those industries are facing. Within those two major industries, the proposed PPAP would provide, over several years, the predictable and continued support required to implement some of the structural changes necessary to improve their performance and sustainability – and maintain their competitiveness in global markets- by strengthening core institutions and improving the delivery of support services and infrastructure for smallholders.

The development objective of the proposed project would be to improve the performance and the sustainability of value chains in cocoa- and coffee-producing areas, in order to improve the livelihoods of smallholder cocoa and coffee producers. This would be achieved through strengthening industry coordination and institutions, expanding and strengthening linkages between smallholder farmers and agribusiness for the provision of technologies and services, and through the provision of critical market access infrastructure.

Key outcomes would be that: (i) smallholder farmers adopt efficient, market responsive and sustainable production practices leading to an increase in their income; (ii) demand-driven productive partnerships are established with the help of public support; and (iii) key infrastructure bottlenecks in the targeted value chains are addressed.

The proposed project would include the following components:

**Component 1: Institutional strengthening and industry coordination**

**Component 2: Productive partnerships**

**Component 3: Market access infrastructure**

### *Environmental and social safeguards instruments*

Component 2 and 3 of the PPAP follow a demand-driven approach and therefore the specific locations of PPAP activities are not known at the time of project preparation. Hence, the laws of the Independent State in Papua New Guinea and Operational Policy 4.01 of the Bank require the Government of Papua New Guinea (GoPNG) to prepare an **Environmental and Social Management Framework (ESMF)**. The ESMF establishes the guidelines and procedures to be followed to determine and assess future potential environmental and social impacts of activities to be financed under PPAP, and then to set out mitigation, monitoring and institutional measures to be taken during implementation and operation of the project to

eliminate, offset, or reduce any potentially adverse environmental and social impacts to acceptable levels.

Furthermore, in compliance with the World Bank's OP 4.12 on Involuntary Resettlement, GoPNG has prepared a **Compensation Policy Framework (CPF)**. The CPF constitutes volume 2 of this ESMF. The GoPNG is further required to disclose both documents (the draft and final ESMF and CPF) in country as two separate and stand alone documents so that they are accessible by the general public, local communities, potential project-affected groups, local NGOs and all other stakeholders. The draft and final documents will also be disclosed at the Infoshop of the World Bank.

Finally, as per World Bank policy OP4.09, Government is also required to prepare an Integrated Pest Management Plan (IPMP). The IPMP constitutes volume 3 of this ESMF.

### *Structure of the ESMF*

The ESMF consists of three volumes:

- (i) This volume (volume 1)
- (ii) The CPF (volume 2) and
- (iii) The IPMP (volume 3).

The key highlights in this volume of the ESMF (volume 1) are as follows:

a) Environmental and social baseline data which will provide the basis for the environmental and social management process. The information contains data on Papua New Guinea's bio-physical environmental features such as its climate, geology and geomorphology, soils, flora and fauna, protected area, wildlife management areas and critical habitats. On social aspects, the report discusses the main features of Papua New Guinea's population, political structure and the economy.

b) A review of the World Bank's Safeguards Policies is made where triggered policies are:

- OP 4.01 Environmental Assessment
- OP 4.09 Pest Management
- OD 4.10 Indigenous People
- OP 4.12 Involuntary Resettlement

Section 4.5 presents a summary of the requirements to comply with these policies.

c) The administrative, policy, legislative and regulatory framework in Papua New Guinea for the agriculture sector in particular and for environmental management in general is presented in section 5.0.

d) An environmental management plan covering the potential environmental impacts from anticipated PPAP sub project activities is presented in Section 6.0. The EMP contains mitigation measures and indicators for monitoring.

e) The roles and responsibilities of key institutions and players for the purposes of this ESMF are discussed in Chapter 7.0 and they include the: Project Steering Committee; the Project Coordination Unit at the Department of Agriculture and Livestock, together with the Project Management Unit at the Cocoa Board (Kokopo/Buka) and CIC (Goroka).

At the provincial levels the Transport Planner (for Component 3) and the Component 2 Coordinator (for Component 2) will be responsible for:

- (i) complying with the relevant national laws regarding the environment and with all social guidelines set by the GoPNG, and all World Bank Safeguards policies;
- (ii) supervising the implementation of PPAP subproject activities according to and consistent with the provisions of this ESMF;
- (iii) ensuring that these mitigation measures are complied with during construction and post construction (i.e. operations) stages of PPAP activities, by monitoring these activities and by periodically reporting to the PMU and PCU; maintaining an adequate budget to implement the appropriate procedures and practices for their operations; and ensuring that relevant mitigation measures are implemented and sustained in their operations; and
- (vi) complying with any directives that may be issued from time to time from the DEC or DAL.

f) Section 8.0 contains the Institutional Assessment and Framework for Environment and Social Management ;

g) The Environmental and Social Management Process is contained in Section 9.0; and

h) Finally, Section 10 contains the estimated budget for the environmental management of the PPAP. The social management components have not been budgeted for as yet and this will be done during the appraisal of this project.

## 2.0 Description of the Proposed Project

### 2.1 Project Description

**Project Development Objective.** The development objective of the proposed project would be to improve the performance and the sustainability of value chains in cocoa- and coffee-producing areas, in order to improve the livelihoods of smallholder farmers engaged in those value chains. This would be achieved through strengthening industry coordination and institutions, expanding and strengthening linkages between farmers and agribusiness for the provision of technologies and services, and through the provision of critical market access infrastructure.

Key outcomes would be that: (i) smallholder farmers adopt efficient, market responsive and sustainable production practices leading to an increase in their incomes; (ii) demand-driven productive partnerships are established with the help of public support; and (iii) key infrastructure bottlenecks in the targeted value chains are addressed.

The project would link four groups of stakeholders into public-private partnerships to enhance the performance of the sector, these are: smallholder farmers, agribusinesses, governments (national, provincial and local) and knowledge providers (research and training institutions, technical experts).

**Project Implementation Period.** The project would be implemented over a six year period, considering the time required to implement the structural changes to be promoted in coffee- and cocoa-growing areas, the production cycles of both crops, as well as institution building needs in the sector.

**Geographical coverage.** The project would initially be implemented in five provinces: Eastern Highlands Province, Simbu Province, Western Highland Province (which jointly export 92 percent of PNG coffee), East New Britain Province and the Autonomous Region of Bougainville (which jointly export 70 percent of PNG cocoa). A roll-out of project activities to other producing areas (such as Madang Province, East Sepik Province and Morobe Province) would be considered at the time end of the second year of project implementation. Key criteria for expansion to new provinces would include: (i) successful implementation of activities in initial project provinces; (ii) demonstrated capacity of implementing agencies to manage a larger geographical coverage of project activities; and (iii) strong interest demonstrated by the private sector in other provinces. Component 1 focuses on national-level and industry-wide institutions and therefore activities would benefit all provinces.

**Detailed Component Description.** The project would include three components: (a) Institutional Strengthening and Industry Coordination; (b) Productive Partnerships; and (c) Market Access Infrastructure.

**Component 1: Institutional Strengthening and Industry Coordination.** The specific objective of this component would be to improve the performance of sector institutions and to enhance industry coordination in the cocoa and coffee sectors. The ultimate goal would be to enable those institutions to support the structural changes required in the cocoa and coffee sectors in response to market demand and other major developments such as the impact of the cocoa pod borer on yields and quality. This component would cover the following sub-components:

*Sub-component A: Industry coordination and policy development.* This subcomponent would build the capacity of industry level coordination committees (Industry

Coordination Committees) to support sector dialogue and policy development respectively in the cocoa and coffee subsectors. The CIC and the Cocoa Board would respectively provide the Secretariat for those industry-level platforms. Support for the operation of those Committees would be provided as well as technical assistance for key policy studies on priority topics identified by the Committees. In the cocoa sector, it is expected that those studies would cover: (i) the financial sustainability of the Cocoa Board and revision of the Cocoa Board Act; and (ii) support for the development of an industry development plan. In the coffee sector, those studies would cover: (i) the efficiency of public expenditure in the coffee sector; (ii) the efficiency and transparency of PNG coffee grades and standards; (iii) the effectiveness of industry associations; and (iv) reviewing CIC extension services.

*Sub-component B: Communication and information management systems.* This subcomponent would aim at improving transparency in the sector and support policy development. It would finance targeted communication campaigns identified by the industry coordination committees around key policy and farming practice changes. It would also support the development of effective communication and information management systems addressing the current gaps in the collection, generation and dissemination of technical and market information to stakeholders, including on prices. The related TA, training, data collection, surveys and information dissemination would be financed by the project.

*Sub-component C: Quality promotion and sustainability management.* This subcomponent would strengthen quality promotion in the coffee and the cocoa industries and support, where appropriate, the adoption of sustainability practices. In the cocoa industry, this would include: (i) re-training of fermentary owners, traders and inspectors, working with the exporters in view of the CPB impact on cocoa quality, (ii) studies on potential changes to PNG export standards and licensing regulations in response to the impact of the CPB<sup>1</sup>, and (iii) improvement in the capacity of the Cocoa Board to carry out annual fermentary inspections. In the coffee sector, this would include: (i) an analysis of options and benefits for PNG farmers regarding differentiated coffees, in order to inform decisions on the adoption of specific practices (including: certified coffees- Organic, Fair Trade, Bird Friendly, Rainforest, Utz, etc; gourmet coffees; and Geographical Indications) and the development and implementation of a strategy to promote differentiated coffees. This could leverage the expertise of COSA<sup>2</sup> and that of the Coffee Quality Institute; (ii) leveraging SCAN<sup>3</sup> for training of trainers in order to reduce the costs of certification in PNG, and assessing opportunities to leverage the resources of FAST<sup>4</sup>. Resources would also be available for PNG origin promotion.

*Sub-component D: Project management and monitoring and evaluation (M&E).* This sub-component would finance all project management functions of the Project Coordinating Unit in Port Moresby, the Project Management Units in Goroka and Rabaul (and for the latter, its sub-office in Buka), as well as the related M&E activities. This sub-component would also finance the operations of the Technical Appraisal Committee (TAC). A detailed description of project implementation arrangements is provided in

<sup>1</sup> Introduction of two export quality standards; revision of fermenteries licensing requirements, and of the dry bean dealer licensing policy.

<sup>2</sup> The Committee on Sustainability Assessment

<sup>3</sup> The Sustainable Commodity Assistance Network

<sup>4</sup> The Finance Alliance for Sustainable Trade

Annex 2. This sub-component would finance local and international TA, training, vehicles and equipment, as well as operating costs of the PCU and PMUs.

**Component 2: Productive Partnerships.** The specific objective of this component would be to foster the integration of a greater number of smallholder producers in performing and remunerative value-chains, by developing and implementing public-private alliances in the project areas. This component would have two sub-components:

*Sub-component A: Productive partnerships in cocoa growing areas.* This subcomponent would finance result-oriented partnerships in cocoa-growing areas which improve the profitability, quality and sustainability of smallholder cocoa production, as well as cocoa farming systems. Its implementation would be under the responsibility of the PMU within the Cocoa Board with support for proposals appraisal provided by a Technical Appraisal Committee (TAC).

*Sub-component B: Productive partnerships in coffee growing areas.* This subcomponent would cover result-oriented partnerships in coffee-growing areas which improve the profitability, quality and sustainability of smallholder coffee production, as well as coffee farming systems. Its implementation would be under the responsibility of the PMU within the CIC with support for proposals appraisal provided by the TAC.

*Eligible partners.* Project funding would be channeled through partnerships with legal entities in the private and associative sector, who have already been successfully working with smallholders to increase productivity, quality and sustainability of cocoa- and coffee-based farming systems, and are interested in scaling up those activities. They would also need to have a demonstrated capacity to manage contracts and activities of the scope and nature identified in the proposed partnership.

The partnerships would include identified farmer groups and any of the following: an agribusiness or private sector entity engaged in the sector; a knowledge provider (private, NGO, public); a multiple partnership involving an agribusiness/private sector operator and knowledge provider(s).

*Eligible activities.* Those partnerships would be demand-driven, and based on agreed objectives which would be consistent with the specific objectives of the PPAP. During project preparation, a number of priority activities have been jointly identified by stakeholders and they include the following:

*Specialized training on CPB management, good farming practices for coffee and cocoa, business skills and farm management.* The establishment of on-plantation facilities for “training by association” and the provision of training through “training by association” and through other proven methodologies for smallholder farmers, extension agents and other key stakeholders;

*Certification.* Support to interested groups of farmers for certification under the internationally recognized sustainability schemes;

*Production of improved planting material:* The rehabilitation and expansion of existing nurseries, and the establishment under technical control by qualified operators of satellite nurseries and budwood gardens at local level;

*Replanting.* Support to farmers for the implementation of rotational replanting using improved planting material (training and provision of improved planting materials and tools);

*Diversification of farming systems.* Partnerships with smallholder farmers for training, the provision of improved planting material and other new technologies for the diversification of cocoa- and coffee-farming systems;

*Post-harvest and processing.* Matching grants for investments in improved processing and storage facilities for quality management and environmental-sustainability, as per technical specifications provided in the PIM.

*Partnership development.* The PMU would advertize and call for expressions of interest in the proposed partnerships. The PMU, assisted by a small Technical Appraisal Committee, would identify eligible proposals and contract expertise to provide assistance to eligible proponents, as needed, for the full development of those proposals. Financing of eligible proposals would be proposed by the PMU, appraised by an expert Technical Appraisal Committee, and submissions endorsed by the Industry Steering Committee on a “no objection” basis. The composition and TOR of the TAC would be agreed upon at appraisal.

The detailed guidelines on cost sharing arrangements, ceiling level for partnerships, standard contractual formats and the rules for the implementation of this component (e.g. eligibility criteria, selection process, evaluation process, etc) would be described in the Project Implementation Manual (PIM).

By the end of the project, it is expected that up to 50 partnerships would have been implemented, and through them that up to 25,000 to 30,000 smallholder farmers would have been trained, up to 13,000 hectares of smallholder cocoa gardens rejuvenated as well as up to 10,500 hectares of smallholder coffee gardens, and up to 1,000 hectares of alternative crops developed by smallholders in partnerships with the private sector.

**Component 3: Market access infrastructure.** The specific objective of this component would be to improve smallholder market access in targeted areas under the project. Lack of market access is directly correlated with high levels of poverty in the project areas. Deteriorated market access infrastructure significantly reduces farm-gate prices, when it does not result in significant product losses, poor product quality, or total lack of market opportunities. Deteriorated transport infrastructure is also associated with higher levels of law and order issues and directly affects linkages between smallholders and the private sector.

Investments would be directed at the rehabilitation of existing transport links that provide access between smallholder farming communities and marketing or processing points (located on a trafficable route), for which a sustainable maintenance regime can be introduced or strengthened during the project. These links would generally be short (maximum length 5km) land transport routes comprising district access roads or feeder roads and local access tracks or walking paths, but could possibly also include nodes such as wharves and jetties for sea or river transport.

Specific investments in infrastructure under Component 3 would only be identified following the selection of individual Component 2 project activities. Once the scope of a Component 2 investment is agreed, the potential infrastructure interventions that will directly impact on the market access of the target beneficiary smallholder communities can be identified and undergo a rigorous selection process for prioritization for funding under PPAP. Project interventions under Component 3 would thus follow a 2-stage process: preparation and implementation.

*Sub-component A: Preparation of market access infrastructure investments.* The preparation process for each Component 3 specific investment would involve identification, screening, assessment and ranking of all candidate routes/ nodes that provide access to and from the targeted communities. The process would be led by the PMU Transport Planner and would consider the following aspects:

- i. Use of available mapping supported by field survey to identify the location of target communities and their existing access routes/nodes;
- ii. Initial screening of identified routes / nodes to select those that meet project and component objectives (i.e. provide or potentially provide market access, but in their current state impose a constraint to that access) for further investigation;
- iii. Assessment of community size and structure, current and potential production of coffee/cocoa and other crops;
- iv. Presence of existing social welfare and/or other facilities located within the community or along selected routes;
- v. Determination of length of each selected access route between community and market / processing point, assessment of physical condition along its length, current and future traffic (volumes and type), or
- vi. Condition and traffic assessment of selected node(s);
- vii. Investigation of appropriate standard of rehabilitation required to suit the estimated future traffic needs, and estimated cost to rehabilitate. The intention is to find a balance in all cases between investment cost and maintainability. Adequate drainage provision will be a critical factor in all land transport routes, be they roads or paths;
- viii. Consideration and further investigation, including suitability, acceptability and sustainability assessments, initial investment and future operational & maintenance (O&M) cost assessment, of developing innovative or alternative means of transport for a selected route;
- ix. Assessing future ability of, and obtaining formal commitment from target community, PPAP partner, LLG, District Administration and/or other stakeholder as appropriate, to provide sustained maintenance of the completed route/ along its full length;
- x. Secondary screening process to select the routes/nodes that meet the applied eligibility criteria (short length, feasible rehabilitation, maintainability);
- xi. Undertaking a straightforward but rigorous comparative socio-economic cost / benefit analysis to rank all selected routes/nodes within the target area; and
- xii. Agreement on the extent of investment available to each individual target area and the resulting scope of transport routes/links that will be rehabilitated.

The method for allocating available funds for Component 3 investments between approved/signed partnerships will be set out in the Implementation Manual. Given the cyclical process for establishing partnerships in Component 2, it is expected that the Component 3 selection process would start at about the same time for all signed partnerships in each cycle. However, obtaining the required maintenance commitment may take longer in some districts or provinces than in others, and so it is likely that available funds would be distributed initially to the top ranked route or node of each partnership on a ‘first come, first served’ basis, with further distributions made once all maintenance commitments for that cycle are in place.

*Sub-component B: Market access infrastructure development.* The implementation process for Component 3 investments will be set out in detail in the Implementation Manual and would comprise the following activities:

- i. Procurement and contracting of engineering consulting services as required (individuals or firms) in accordance with World Bank guidelines to design, prepare suitable bid and contract documentation (i.e. small works, labor-based methods and/or community-based works where appropriate); to supervise the transport route / node rehabilitation works of all Component 3 activities; and to work with target communities and other stakeholders to develop and introduce a sustainable maintenance regime along the full lengths of rehabilitated routes / links;
- ii. Procurement and contracting rehabilitation works in accordance with World Bank guidelines on selected lengths of transport route / nodes, including provision of innovative or alternative transport means, through appropriate design and contract packaging;

Working with target community groups, Component 2 partners, LLGs, District Administrations and/or other stakeholders to develop and introduce sustainable regimes for routine, periodic and emergency maintenance of the rehabilitated transport routes / nodes, and where applicable, for the operation and maintenance of innovative or alternative transport means.

## 3.0 Baseline Data

### 3.1 The Bio-Physical Environmental Features

Papua New Guinea (PNG) is a group of 600 islands including the eastern half of the island of New Guinea placed between the Coral Sea and the South Pacific Ocean, east of Indonesia and north of Australia. Papua New Guinea has a total land area of 462,840 square kilometres. 360,000 square kilometres (78%) are covered in forests. The total sea area of PNG is 3,120,000 square kilometres with a coastline totalling 17,110 km and has a land boundary of 820km with the Indonesian Province of Papua (formerly Irian Jaya).

Some of the islands are mountainous and many are low lying coral atolls. PNG is subject to frequent severe earthquakes, landslides and occasional volcanic eruptions. Papua New Guinea has very high biodiversity with a remarkable variety of landscapes, ecosystems and species. It is ranked as one of the world's top 20 mega diverse countries, within some groups 90% endemism (also see section 3.1.4).

The coasts include species rich mangroves, lagoons, wetlands, coral reefs and atolls. The lowland rainforests are highly diverse with other common vegetation types including savannas, swamps, semi-deciduous forests, low to high mountain forests, grasslands and small areas of high alpine vegetation. About 70% of PNG remains forested. Traditionally plant species have been used for subsistence and traditional activities and continue to provide much of the population with their basic needs for building materials, food, medicines and cultural activities.

#### 3.1.1 Climate

Papua New Guinea climate is tropical and is generally hot and humid but varies dramatically throughout the country. Typically, there is a northwest monsoon (December to March), with a southeast monsoon (May to October) and slight seasonal temperature variation. Annual rainfall varies from over 8000mm in the Star Mountains of Western Province to only about 1150mm in Port Moresby. Temperature generally remains between 20 and 32.5°C but can get to as low as 5°C to 0°C in the highlands. The country is mostly mountainous with the mainland having a central cordillera and with coastal lowlands and rolling hills. Large rivers flow down from these mountains, the Fly and Purari to the south coast, and the Sepik, Ramu and Markham to the north coast. The highest mountain is Mount Wilhelm of height 4509 m.

The PPAP initially covers Eastern & Western Highlands, Simbu, East New Britain and the Autonomous Region of Bougainville. These are the pilot project areas and other provinces such as Madang, Morobe and East Sepik would follow hence descriptions given here are for PNG generally and then specifics for the pilot provinces mentioned.

The country consists of a central mountain range with elevations up to > 3900m and these then fall back into hills and plains in both north and south direction. The island chain also has pockets of upper mountain forest. The climatic variations within the PPAP provinces are in Table 1.

Provinces in the Highlands naturally display cooler climate with EHP having the lower range of the climates. Alongside with this are volcanic fertile soil for the growing of coffee and

food crops. On the summit of Mt Wilhelm and other mountain peaks, temperatures can get as low as 5<sup>0</sup> C or less in the night.

In contrast, coastal provinces display the typical tropical weather temperature of 23<sup>0</sup> – 30<sup>0</sup> C, and it gets cooler in the evenings and is affected by changing weather patterns from Australia.

The Eastern Highlands Province is in the Central Highlands of PNG and covers 11,000km<sup>2</sup>. It is bounded in the north by the rugged Bismark Range and reaches elevation of 3500m on Mt Otto, while other peaks in the South of the Province such as Mt Michael exceed 3500m. Elevation is from 300 – 2400m a.s.l. and most people lived from within the narrow range of 1500-2000m. The flood plain; plains and fans of the Asaro, Benabena, Kamnuntina, Enfutina and upper Ramu valleys have productive soils supporting intense agriculture with the population mass.

**Table 1: Temperature and Rainfall of the PPAP provinces**

Province	Temperature <sup>5</sup>	Rainfall (mm) <sup>6</sup>	Elevation Range (m)
EHP	13 - 25	2200 – 4400	300 – 2400
WHP	13 - 25	2200 – 4000	600 – 4000
SP	13 - 25	2200 - 4000	300 – 4500
ENB	23 - 30	2000 - 5000	0 - > 2000
ARB	23 - 30	2500 - > 4000	0 – 2700
Morobe	23 - 30	1600 - > 4000	0 - > 4000
Madang	23 – 30	2000 - > 4000	0 – 4000
East Sepik	23 – 30	1800 - > 4000	0 - > 3000

In the Eastern Highlands Province, generally the northern valleys are economically vibrant with intensive small holder coffee production and good road access to markets in Goroka and Lae. However, the south of the province is mountainous and remote, and the absence of roads is an impediment for development.

The Western Highlands Province occupies 900km<sup>2</sup>, also in the central highlands of PNG consisting of valleys in the north centre, northwest and southwest; these contain very fertile soils derived from the ash falls from dormant volcanoes of Mt Hagen and others in close proximity such as Mt Giluwe. There is also the Kubor Range and the Sepik Waghi divide which consists of mountains. Remonetess and isolation are impediments to development in the Jimi Valley.

Most people live within the 1400-2200m altitude range of these areas; the Waghi Valley is densely populated and has a high coffee production small holder and plantation coffee growing. Elevation varies from 600m to over 4000m on Mt Wilhelm, Mt Kabangama and Mt Keheraga. Rainfall ranges from 2200 to 4000 mm per annum and this varies from district where the Waghi valley valley has lower rainfall while the lower Kagul and Jimi valleys have higher rainfall.

Sharing borders with Western Highlands and Eastern Highlands Provinces is Simbu Province which covers 6000km<sup>2</sup>. It is bounded by Mt Wilhelm, PNG's highest mountain, in the north to the lowland south of Karimui. This is also a dominant small holder coffee growing regions

<sup>5</sup> Temperature taken from McAlpine, Keig and Fall, 1983. ARB's temperature is inferred from Rabaul as is for East Sepik.

<sup>6</sup> Taken from Hanson et al 2001. Rainfall in the Autonomous Region of Bougainville range from 2500 to 5000mm annually and this is included within the range for East New Britain, although not explicitly stated

in the country and the economy of the province is heavily reliant on coffee. Altitude ranges from 300 m on the southern border with the Gulf province to over 4500m on the summit of Mt Wilhelm. Most people reside within the 1400 – 2000m altitude range. Average annual rainfall ranges from 2200 – 4000 mm and it increases from the north to south.

East New Britain Province includes roughly 15,100km<sup>2</sup> of the island of New Britain. Altitude ranges from sea level to over 2000m at Mt Ulawun, Mt Bamus and Mt Berurumea. The Gazelle Peninsula is in the north of the province and encompasses the Baining Mountain, valleys of Keravat and Warongoi, and numerous smaller rivers and nature coastal plains. In the North East of the Gazelle Peninsula are fertile hills and plains that surround the Rabaul volcanoes.

The islands of Wartom and Duke of York make up the larger of the islands to the northwest and east of Rabaul respectively. In the south, the Nakanai Mountains of extensive limestone plateaus dominate, with narrow coastal plains and the active volcanic peaks of Mt Ulawun and Mt. Bamus. With the province built upon successive layers of ash, agriculture is extensive and small holder cocoa farmers thrive. Agriculture is practiced up to 1200m on the Mamusi Plateau in the Baining Mountains. The average annual rainfall varies from 2000mm near Kokopo to over 5000mm on the south coast.

The Autonomous Region of Bougainville is dominated by the volcanic peaks of the Crown Prince Range, including the active volcano of Mt Bagana. Altitude varies from sea level to over 2700m on Mt Balbi. The coastal areas include raised coral limestone plains, volcanic plains and fans, valleys, flood plains and swamps. Most of the coastal areas have fertile volcanic soils that have been used intensively for plantation and small holder cocoa and coconut production. Buka Island is a raised coral limestone plain bordered by the hills of the Parkinson Range in the south west. Average annual rainfall varies from 2500mm around Tinupuz, to over 4000mm around Buin (Henson et al 2001).

Madang province occupies 28,000 km<sup>2</sup> in the central north of the PNG mainland. It has a diverse range of environments from having a border with Mt Wilhelm, the highest peak in PNG, to the coast. Mountain ranges of Adelbert, Finisterre and Bismarck, together with extensive Ramu River floodplains, coastal limestone plains together with volcanic islands offshore make up the landscape.

Three of these volcanoes are active and are a serious hazard to the people of Madang. Bismarck Fall has a vertical drop of 4300m from the summit of Mt Wilhelm to the Ramu valley, over a distance of 45kms. Altitude ranges from the sea level to over 4000m on the slopes of Mt Wilhelm. Annual rainfall varies from 2000mm around Bogia to more than 4000 mm in the Ramu valley and Bismarck Fall. Both cocoa and coffee are grown in Madang with cocoa being dominant together with copra from coconut.

The province of Morobe occupies 33, 525 km<sup>2</sup> in the central north of PNG and shares boundaries with the Madang, Eastern Highlands, Oro, Central and Gulf provinces. The Owen Stanley Range and two major fault valleys, together with the coastal ranges and offshore islands provide a summary of the geomorphology of the Morobe province. Altitude varies from sea level to over 4000 m on the Sarawaget Range. Average rainfall varies from 1600mm in the Snake Valley, to over 4000mm around Lae. In Morobe, emphasis is on coffee production and these are in Wau, Bulolo and Menyamy areas. The latter area roads are in a very bad state and often coffee bags are not able to be transported to Lae.

East Sepik province occupies 43,700 km<sup>2</sup> in the northwest of PNG. The northern part contains the Wewak coastline plains and islands, the Torricelli Range and the Prince Alexander Range. The South

contains a large area of hills. In the middle are plains, flood plains and swamps and lakes of the Sepik River which is one of the largest river systems in PNG. The Sepik River is often inundated annually where water level can rise and fall by five meters. The province borders with Madang, West Sepik and Enga provinces. Altitude ranges from sea level to over 3000 m on the Central Range. Average annual rainfall varies from 1800mm near Maprik to over 4000 mm near April River. Coffee and cocoa are grown in three of the four districts and cocoa is more dominant in Maprik although feeder roads are not properly maintained which is an impediment to development.

### 3.1.2 Geology and Geomorphology

Papua New Guinea (and adjacent area) geology is characterized by:

- i. Continental craton in the south west,
- ii. A complex collisional zone in the centre ,and
- iii Volcanic islands in the north east.

The collision zone corresponds to the cordillera whilst the craton provides a stable platform for the lowland forest, swamps and wetlands. Papua New Guinea is highly mineralized. Mineral and petroleum deposit locations are noted on the map. Mineral exploration is incomplete (Williamson & Hancock 2005). The zones that are in collision are still moving slowly in a north westerly direction at a rate of 3cm/yr. The dynamic geology of Papua New Guinea is part of the *Pacific Ring of Fire* which has active volcanoes along its path. Associated with this geology are earthquakes, floods and tsunamis.

Papua New Guinea has very young rocks (up to 260 million years) and combined with the heavy annual rainfalls up to 10,000 mms and the central cordillera has resulted in a variety of landforms ranging from deeply incised valleys and rugged mountains to limestone karst terrains. The heavy annual rainfalls increase weathering and erosion rates and lead to very high rates of aggradation in the river systems and flood plains. These climatic and geological characteristics greatly increase the costs of road building and maintenance in Papua New Guinea.

### 3.1.3 Soils

Soils within PNG fall into eight classes or orders ranging from Entisols (mangrove, alluvial soils), Histosols (peat soils), Inceptisols (humic, ash and clay soils), Vertisols (earth soils), Mollisols (limestone soils), Alfisols (meadow, podzolic, brown clay soils), Ultisols (lateritic, humic clayey soils), and Oxisols (strongly weathered red and brown clay soils). Within these eight orders are 73 individual soil types. Of these, over half are very localized while others are common soil types (Bryne & Sherman 2008). Their distribution is determined by the geological and geomorphologic processes at work and influenced by extensive rainfall patterns. Soil distribution with the main classes is presented in Table 2.

**Table 2: Major Soil Orders in PNG<sup>7</sup>**

Major Soil Classes	Area of coverage (10 <sup>3</sup> km <sup>2</sup> )	Percentage of coverage (%)
Entisols	120	26
Histosols	8.6	2
Inceptisols	219	48
Vertisols	0.2	< 0.1
Mollisols	34	7
Alfisols	13.3	3
Ultisols	63	14
Oxisols	0.007	< 0.1

<sup>7</sup> Table adapted from Hope & Hartemink, 2007, p.174.

About three million of PNG's population live on Inceptisols, mainly derived from volcanic ash or mixed with volcanic ash from explosive eruptions which are now extinct in the Highlands and also a few from volcanic islands off Madang (Long Island) (Hope & Hartemink 2007). The bulk of the PPAP areas involve Inceptisols and hence provide fertile soils for the planting of cash crops such as coffee and cocoa and food crops. Cocoa is now trialed in the Simbu province while coffee is also grown in the ENB, although it is the Robusta variety as opposed to Arabica in the Highland provinces.

### 3.1.4 Biological Environment

#### 3.1.4.1 Overview

PNG is a mega biodiversity country having tremendous and endemic flora and fauna and the PNG Country Study on Biological Diversity (Sekran and Miller 1995), estimates about 400,000 species of fungi, plants and animals. This is due to the complex geological history of PNG, relative isolation from continental areas with similar climates, its greater topographic diversity and the evolutionary diversification of species (Allison 2007). Inadequate studies of fungis, nematodes and insects makes detailed tabulations impossible. However, some cataloging has been done (ibid). PNG shares a land boundary with the Papuan province of Indonesia, hence some of the species have an extensive or similar range across the total land mass and is often referred to as the island of New Guinea. Within mammals, six orders exist; monotremes, three orders of marsupials [Dasyuromorphia, Peramelemorphia & Diprotodontia], rodents and bats. Of these 284 species and 69% (195) are endemic (Table 3). Mammal bats and rodents are incompletely known and ten new species have been described and still more unknown left to be discovered. Frog numbers still to be discovered and the number stated may double or triple if more research is being undertaken.

As for birds, New Guinea has 578 species of breeding birds with 324 species endemic. Some interesting data for freshwater fish relates to their evolution. Most, around 84% lack a marine larvae stage and are thought to have evolved from their marine ancestors. For marine fishes, it is thought that around 2600 – 3000 species exist in New Guinea and about 30% of the total world reef fishes can be found (Allison 2007). These marine species are wide spread in the Indo Pacific region, and species richness of the marine biota is higher here than in other parts of the world.

**Table 3: Endemicity of land and freshwater vertebrates of PNG<sup>8</sup>**

<b>Taxon</b>	<b>No of endemic species</b>	<b>Total no of species</b>	<b>% Endemic</b>
Freshwater fishes	179	213	84.0
Frogs	260	282	92.2
Turtle	8	11	72.7
Crocodile	1	2	50
Lizard	124	193	64.2
Snakes	41	84	48.8
Birds	324	578	56.1
Mammals	195	284	68.7
<b>Total</b>	1,132	1,647	68.7

<sup>8</sup> Table taken from Allison 2007, p482 without data from the Papuan province of Indonesia..

A large number of other data do exist for some organisms (eg; flowering plants and most vertebrates) but these data are scattered and not synthesised into a suitable information management system.

Endemism within the island of New Guinea ranges from high (many plants, insects and vertebrates) to low (many marine animals).

Besides there are exotic species that have arrived in PNG, such as the fresh water weed (*Sylvania molesta*) and the climbing perch. These created havoc in lakes and waterways in the Sepik and Fly River systems during the late 1990 and since then the *Sylvania molesta* has been brought under control by a biological agent.

For descriptions of flora and fauna within each province in PNG, there is no cataloguing and it would be impossible to describe terrestrial flora and fauna, invertebrates, vertebrates for each province. Furthermore a generalisation of the flora and fauna would be given for the Highland provinces covering EHP, Simbu and Western Highlands. On the island of New Britain and Autonomous Region of Bougainville, there is some information available.

#### 3.1.4.2 Flora

In lowland environments (below 1000 m), the most important groups of vegetation groups are the *Anacardiaceae*, *Anonaceae*, *Burseraceae*, *Combretaceae*, *Euphorbiaceae*, *Elaeocarpaceae*, *Flacoutiaceae*, *Malvaceae* and *Sapindaceae* (Takeucki 2007). As altitude change with montane habitats, the most important groups are the cryptogams, gymnosperms (seed plants) and angiosperms (flowering plants) such as *Araliaceae*, *Cunoniaceae*, *Ericaceae*, *Fagaceae* and *Orchidaceae* among others (ibid). Often biodiversity falls sharply at elevation above 2500 m. Endemism is highest in the montane zone as a result of environmental change brought about by rapid rates of geological uplifts (section 3.1.2).

Vegetation within the three highland provinces range from the common grassland with kunai (*Imperia cylindrical*), and other grass species such as *Imperata* and minor shrubs. Tree species are dependent on the soil conditions and there is a graded range from the grasslands up to the mountain forests. The mountain forest is divided into the lower mountain, mid mountain and upper mountain. The lower mountain is dominated by *Castanopsis* and *Lithocarpus*, together with *Araucaria* (pine trees) *Agathis* and *Eucalpytosi* and *Nothofagus*. This corresponds to the agriculture zone where tradition gardening is being practiced.

*Nothofargus* (broad leaf trees) dominates the mid montane zone and is often covered with epiphytes, particularly orchids and ferns. Above this is the upper montane forest dominated by *Podocarpaceae* and *Cupressacae*. This is often mixed with tree species. At the higher level, species diversity decreases and epiphytes increase (Johns et al 2007). Within the EHP and WHP, these vegetation are likely to be found and most common trees planted as they are used for firewood, house building and other purposes are the *Casurina Casurinaea* and *Eucalyptus Degulpta* and other species. Within these are also several species of pandanus, which has domestic uses.

#### 3.1.4.3 East New Britain

Very few studies have been done on the flora and fauna on New Britain although there may be individual studies but the data has not been collated. The province of East New Britain is featured resting onto of a volcanic caldera setting where the Gazelle Peninsula consists of

layers of ash that have been settled over periods of volcanism and this is still continuing today from the active Mt Tavurvur. Flora and flora within the cocoa blocks are not endemic but are common throughout the province. Only through the inner mountain ranges where extensive logging or development has not gone to will there be an abundance of endemic flora and fauna.

Vegetation is mostly lowland rainforest with numerous coastal plains having coconut palms with island cedar (*calophyllum papuanum*). Fifty three forest birds have been recorded where half are within the New Britain and Bismarck Archipelago. Of these, six are endangered with also several bat species facing similar fate (Duguman 2008). The marine life provides an abundance of organisms however, information on this is scarce.

#### 3.1.4.4 Autonomous Region of Bougainville

Fauna of Bougainville consists of 55 species of reptiles and amphibians of which 20 are endemic frogs, 9 species of snake, 8 species of geckos and 27 species of skinks (ARB 2007). Most of them are endemic to the ARB and a few have affinities to the Solomon Islands. Within ARB, are also rare butterflies such as the *Graphium meeki*, *Graphium mendana* (*Graphium spp*) and *Papilio toboroi* (Swallowtail butterfly).

The flora of ARB consists of lowland and montane forest types which includes lowland *Calophyllum kajexkskii* forest and *Neonauclea/Sloanea* forest at 450 – 750 m, swamp forest in the south, beach forest, mangroves, scrub and grasslands, rivers, coastal lagoons and fringing reefs. Occuring along the coast and adjacent inland areas is mostly lowland forest together with swamp grassland and forest with the presence of *Terminalia brassii* occurring along the west coast. Along the ranges are numerous limestone/karst areas where stunted growth of montane forest is noted. (ibid).

#### 3.1.5 Fauna

The native herpetofauna of PNG includes 33 families, 117 genera and 553 species of frogs, crocodiles, turtles, lizards and snakes (Table 4). Within the Indonesian province of Papua, it is stated that the majority of species (~ 340) are found primary on land or in freshwater although a small portion (24) are primarily marine (sea snakes and turtles) (Allison, 2007b, p.564). Hence, this can be extracted for PNG where the landmass is hared. Likewise, frogs within PNG can be found within the lowlands to alpine grassland above 3,200m. Species richness varies geographically in relation to climate and geological history but is generally highest in hill forest and upland forests. These frogs fall into being a vegetation climber (scansorial) remain on the forest floor (terrestrial) or live in burrows or cavities within the soil (fossorial).

The number of invertebrates known from New Guinea is not known with any accuracy and these are no comprehensive checklists of most groups. Miller (2007) estimates a figure of slightly more than 300,000 species, although this is very conservative and the actual number could be near to a half a million. Butterflies seem to be well known and but it is likely to be only about 50% of species have been described in most insect order. For fauna, besides the listing in Table 4, a lot of material are in museums worldwide and may add to the inventory of New Guinea if they are returned back to PNG.

**Table 4: Herpetofauna (native species) of Papua New Guinea<sup>9</sup>**

Taxon	Families	Genera	Species
Frogs	4	33	248
Turtles	5	11	16
Crocodiles	1	1	2
Lizards	5	32	183
Snakes	6	40	103
Total	21	117	553

### 3.6 Protected Areas

Papua New Guinea has fifty-two declared areas as protected; having a total area of 1,643,900 hectares. According to Papua New Guinea's Convention of Biological Diversity commitments, PNG is required to set aside 10% of our landmass for biodiversity conservation. However, the total area protected is only 4% of the country's total landmass.

The constitution of Papua New Guinea allows for the creation of currently twelve types of protected areas. These, twelve protected area types can either be government owned (the most common ones being; Parks [that is, National/ Provincial/District/Memorial], Sanctuaries, Nature Reserves, National Walking Tracks others include; Protected Areas, Historical Sites) or community owned (Wildlife Management Areas, Conservation Areas) or specific others such as; world heritage area, Ramsar sites, or the newly introduced Local Level Government Project Protected Areas. So far all 52 protected areas have been gazetted only under seven of the types of protected areas.

Protected areas and critical habitats within PNG vary from province to province and ninety-seven per cent of the land in Papua New Guinea is owned under customary tenure arrangements, therefore, most protected areas are community based. Ultimate power over the land lies with the landowners and no development can take place without their consent.

There are protected areas in all the PPAP provinces however these are not in close proximity to any of the PPAP activities. The Crater Mountain WMA occurs about 70kms to the North West of the Okapa area. This extensive area of 270,000 ha is remote and only accessible by light aircraft or is a couple of days walk to the nearest road. Its remoteness provides the barrier against human intrusion in search of forest resources. Although in recent years, minerals and petroleum exploration licenses covering extensive portions of the WMA provides threats to the protected area. Mt Gahavisuka Provincial Park is situated in the forth hills of Mt Otto at 145° 20'E 60's between an elevation of 2000-2600m. Its primary focus is to maintain scenic and recreational values and over 1000 orchids and a couple of rhododendron shrubs. Also 6 species of the Bird of Paradise have been recorded. In addition, it is an important lower mountain area rich in fauna, 3 un-described rhododendron and orchid collection, also valuable for tourism and local community education. The park is accessibly by road into the main Highlands Highway to Goroka. It is located 70-80km directly north of the Okapa area.

Within East New Britain are the Kavakuna Cave, Klampun WMA, Nanuk Island Reserve, Talele Island National Park Reserve and Tavallo WMA. Tavallo WMA, Kavakuna Cave and Klampun are situated in the Pomio district at 230, 130 or 120 kms to the South of the Gazelle

<sup>9</sup> Extracted from Table 4.6.1, Allison 2007b, p565)

Peninsula where the majority of small holder cocoa farmers reside. Pomio district produces cocoa and copra from coconut and some plantations are affected by CPB (Curry et al 2009).

Each of these protected area have their own significance where Tavalu contains extensive back sandy beaches together with creeks with a diverse range of aquatic endemic marine species. Kavakuna Cave is a karst feature where rivers disappear into sinkholes where Klampun WMA contains the last remaining tract of *Agathis spp* pine tree on the island of New Britain, as the island of New Britain has been extensively logged.

Talela and Nanuk Island are two islands to the North West and east of the Gazelle Peninsula. Both are small islands which contain nesting and spang area for turtles and other marine species. Talele Island is threatened by local harvesting marine species and as population increases, this will become ever worst. Nanuk Island Resource is supposed to become a Provincial Park where the management responsibilities go to the ENB Provincial Administration. Both these protected areas are not in close proximity to the cocoa blocks or plantations in ENB.

In the Autonomous Region of Bougainville, there is only a single protected area of Pirung WMA, which covers 43,200ha on customary land about one kilometer from Kieta. The WMA contains coastal and marine areas where reefs and eight islands are intact with a range of marine biodiversity. Potential threats could be over harvesting of marine resources although it is not known at this stage. Elsewhere on ARB are the upper mountain lakes of Mt. Balbi and the active Mt Bagaia volcanoes.

Within Morobe, Madang and East Sepik provinces are 17 protected areas which having a range of biodiversity from terrestrial, marine and natural sanctuary. Their sizes range from 220,000 down to 1.9.

### **3.6.1 Wildlife Management Areas**

Wildlife Management Areas were devised in the 1970s so that PAs could be generated through community initiative and could retain and even strengthen existing local traditions. The community selects the WMA committee and devises the boundary and the rules. This allows for local practices, such as restricted access as traditionally enforced by *masalai* spirits, to be incorporated. Although respect for traditional lines of authority has diminished, traditional forms of resource management have in some cases been the only safety-net following a collapse of formal management.

A major drawback of having derived the WMA concept from traditional rights is that those rights revolve around hunting, so only the fauna and not the flora is legally protected. Thus, large developers such as logging, mining and oil companies can legally buy their way past landowners. WMA committees are commonly under pressure from rapidly increasing human populations placing ever-higher demands on the natural resources. With no formalized system of patrols the PAs are open to abuse without fear of recrimination. Maintaining local respect for the ideals of the WMA appears to be essential and can only be achieved with strong local leadership and effective enforcement of rules.

### **3.6.2 Critical Habitats**

PNG has 15 critical habitat areas. Within EHP – Crater Mountain is designated as very high priority because of the intact mountain forest vegetation containing endemic flora and fauna. As mentioned earlier, it is an area under threat from primary and petroleum development, and this will need to be monitored by the Department of Environment and Conservation.

Mt Wilhelm National Reserve and Jimi Valley National Park are critical habitats from the Simbu and Western Highlands provinces. Both are allocated high priority areas because of the mountain vegetation and as Mt. Wilhelm is the highest mountain in PNG, it is of significance and steps to conserve this habitat are imperative.

The Kavakuna Caves in Easter Highlands Province are considered very High Priority as they consist of karst topography with cave fauna and structures like stalagmites and stalactites. It has also been suggested to be part of the Nakanai mountain range running the New Britain mountain ranges from ENB to West New Britain. In Bougainville, there is no critical habitat present. Other critical areas exist in Morobe, East Sepik, Central, Gulf Central, Western and Milne Bay provinces. These again represent areas with immense biodiversity with a high percentage of flora and fauna endemic.

### **3.8 Agricultural Chemical Use by Smallholders**

Twenty known agrochemical companies or suppliers, including the National Agriculture Quarantine & Inspection Authority (NAQIA) and the Department of Health have stockpiles of agrochemicals in PNG (Annex 6). There may be other suppliers of agrochemicals that could contain banned substances and in some cases, these are imported with labeling in foreign languages with no checks that the chemical setup is that of a banned agrochemical as it is in the Persistent Organic Pesticides (POPs) list<sup>10</sup>.

These agrochemicals products are then obtained by plantations and semi- subsistence farmers. These products ranges from miticides, insecticides, fungicides, herbicides, rodenticides, and molluscides. The quantity of these chemicals is unknown although the National Implementation Plan for the Removal of POPs (DEC 2006) was endorsed by the GoPNG but have yet to commence this work.

Use of agrochemicals has not been practiced by a large number of coffee or cocoa smallholder farmers. This is attributed to the cost of the chemicals which is expensive. The common practice would be to maximize his economic return without having to spend cash to start off with. Small holders seen in the field used *RoundUp* or *Glyphosate* to control weeds in their coffee and cocoa plots.

The environmental impacts of these weedicides are restricted within areas of application and do not have a greater retention period in the soil and quickly decompose into harmless compounds that are absorbed by the soil by naturally occurring bacteria. There is the potential of weedicides and herbicides getting into the streams and waterways if the coffee or cocoa plots are in close proximity and these may need to be assessed if there is need for greater application. Within the large plantations, large quantities of agrochemicals are used to improve their productive yields and this could be an area of concern. However, the PPAP focuses on smallholder cocoa and coffee growers and not plantations.

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<sup>10</sup> Information obtained from Dr. Samson Laup at CCIL 15 Sept 2009.

### **3.9 The Sociopolitical Environment**

#### **3.9.1 Population**

Papua New Guineans represent a wide variety of cultural groups, collectively described as Melanesians. Papua New Guinea had an estimated population in 2000 (PNG National Census) of 5.2 million people giving a population density of about 11 persons per square kilometre, with 40% below 15 years of age and a population growth rate of 2.7 per annum (1980-2000), total fertility is 4.6 children born per woman, infant mortality rate of 64 per 1000. The average age of the population is about 24 years. Life expectancy is about 54 years with only about 2.4% older than 65 years. 13.1 % of the population live in urban areas, the largest town being Port Moresby estimated to have a population in 2000 of 250,000.

There are 715 indigenous languages with 40% of the population literate in English, 45% in Tok Pisin (Pidgin), 5% in Motu and 42% in native languages. Literacy in at least one language is 51% in females and 61% in males averaging 56% overall. UNDP (2004) gives literacy a value of 64.6% for 2002. English is the medium in all schools after the 3rd year of schooling. English is the official language for formal business activities, the education system, government bureaucracy and the mass media, though Tok Pisin is being used more and more in these areas. Motu is only spoken in the Papuan region.

The working age of the population ranges from 15-60 years and covers 58% of the population, though only about 270,000 people are employed in the formal sector, the rest are either in non-formal employment and most being semi-subsistence farmers. Few people who commence school continue on to tertiary institutions including, universities. Table 5 provides some economic, social and environmental indicators for PNG.

#### **3.9.2 Political Structure and Development Objectives**

PNG is a parliamentary democracy. It achieved political self-independence from Australia on the 16th September 1975. PNG is a member of the Commonwealth of Nations. There is a Governor General who represents the Queen as the head of state but he only plays a ceremonial role. The political leader and head of Government is the Prime Minister. There are 109 elected members of the national parliament. The capital of the country is Port Moresby. The country is divided into twenty provincial governments, but within each are lower levels or local government councils.

The 20 provinces are: Central, Eastern Highlands, East New Britain, East Sepik, Enga, Gulf, Madang, Manus, Milne Bay, Morobe, National Capital, New Ireland, North Solomons (Bougainville), Oro (Northern), Simbu (Chimbu), Southern Highlands, West Sepik (Sandaun), Western, Western Highlands, and West New Britain. For convenience the provinces are often grouped into four regions: Southern or Papuan, Highlands, Islands and New Guinea Mainland, the last also called Northern or Momase.

The MTDS is the main document outlining the development objectives of PNG.

### 3.9.3 The Economy

PNG has a large informal base principally relying on agriculture and a small formal base. Agriculture is one of the most important economic activities in PNG, for the most part practiced on a semi-subsistence level. It is said most Papua New Guineans are farmers. Coconuts, sweet potatoes (kaukau), bananas and yams are the most important subsistence crops. Other important staple crops are taro, potato, sago, and cassava. Betel nut and betel peppers are very important crops grown as a mild drug important culturally in PNG. Agriculture provides a subsistence livelihood for 84% of the population.

The cash economy of PNG is resource based although exploitation is constrained by the rugged terrain and the high cost of developing infrastructure. Agriculture, forestry, fisheries, mining and petroleum make up the primary sector and contribute half the nation's wealth, when measured in terms of gross domestic product (GDP). The total GDP for 2002 was K10.9 billion. In 2002 the primary sector was projected to contribute approximately 53%, followed by the tertiary or service sector contribution of 34% and the secondary sector consisting of manufacturing and construction only 13%. This proportion has remained relatively constant over the last few years. The GNP per capita in 2000 was K 1900 (US\$700), placing PNG among the lower middle income countries.

In the primary sector, agriculture continues to be the most important source of GDP for the country. Agriculture, in this case is mainly tree crops cultivated for cash income with the major tree crops being coffee, cocoa, copra and palm oil. Agricultural together with forestry and fisheries has contributed 28% of GDP. The major contributors are oil palm, logs, coffee and cocoa. The mining and petroleum sector also had a large share in the overall component of the GDP, contributing 26% of GDP. The secondary sector that contributed 13% to the gross domestic product was mainly manufacturing (9%) and construction (4%).

Since Papua New Guinea lacks comparative advantage in manufacturing and much of its exports are raw materials, the secondary sector is undeveloped. PNG has been described as a country undergoing urbanisation but without industrialisation.

The tertiary or services sector contributed 34% towards the GDP of PNG. This sector consists of commerce (9%), electricity and other services (1%), transport and storage (5%) finance, insurance, real estate and business services (4%), community and social services (13%) and import duties of (2%). Mining of mainly copper, gold and silver, together with petroleum now constitutes the major export earnings for PNG. Total export earnings for 2002 were K6.4 billion.

**Table 5: Some Economic, Social and Environmental Indicators for PNG<sup>11</sup>**

Indicator	Unit	Year	Measure
Human Development Index	No unit	2002	0.542 ; rank = 133/177

<sup>11</sup> Mowbray & Tom, 2005 PNG National Profile on Chemicals, Department of Environment and Conservation.

Population size	Million	2002	5.6
Population density	Persons per 1000 hectares	2000	110
Urbanisation	%	2002	13.2
Contraceptive prevalence	Any method/ %	1990-98	26
Women in Government	Seats in parliament held by women	2004	0.9
Poverty rate	Measured as human deprivation index	1996	43.7
Poverty rate	Measured as human poverty index (HPI-1) – as %	2002	37; rank = 62
Infant mortality rate	Per 100,000 live births	2004	79
Life expectancy at birth	Years	2002	57.4
Gender-related Development Index	No unit	2002	0.536; rank = 106 / 144
GNP	per capita US\$	2004	530
Average Annual Growth Rate of GDP	%	1990-2002	0.5
Average Annual Growth Rate of GNP	%	1975-95	0.7
Agriculture and Forestry as a % GDP	%	2002	27.6
Manufacturing / construction industry as a % GDP	%	2002	12.9
Petroleum & Mining as a % GDP	%	2002	25.8
Population without sustainable access to an improved water source water	%	2000	58
Energy consumption	Petajoules/ commercial + traditional	1995	96
Fertiliser consumption per cropping	area Kg ha-1 a-1	1994	30
Public Expenditure on Health	% GDP	1996	2.8
Military expenditure	% GDP	1996	2
Food Intake	Daily calories supply per capita (kilocalories)	1996	2253
No of doctors	Physicians or doctors per 100,000	2003	0.6
HIV/AIDS	AIDs cases per 100,000	1997	6.8
Carbon dioxide emissions	Million tonnes	1996	2.4
Greenhouse Index	Share of global CO2 emissions	1996	0
Total freshwater withdrawals annually	Cubic metres per capita	1987-95	28
Deforestation Average	Annual rate of deforestation	1990-95	0.4
National Protected Areas	% all protected areas IUCN categories I – V of total land area	1996	0.1
% mammals at risk/ threatened	No at risk over no of species known	1990s	26.7
% birds at risk/ threatened	No at risk over no of species known	1990s	4.8
% higher plants at risk/threatened	No at risk over no of species knowns	1990s	1

The mining and petroleum sector account for about 75% of export earnings. However despite its much higher contribution to export earnings and its high contribution to GDP mining and petroleum employ far fewer people than do agriculture and the manufacturing sector. Agriculture crops, forest logs and marine products constitute most of the rest. Few manufactured products are exported.

#### 4.0 Description of World Bank Environmental And Social Safeguards Policies And Triggers

This ESMF has been designed so that all investments in the PPAP comply with all the Environmental Laws of the Independent State of Papua New Guinea and the Environmental and Social Safeguard Policies of the World Bank. In this chapter, the Bank's safeguards policies and their applicability are discussed and in the subsequent chapter those of the PNG are presented.

The World Bank Safeguard Policies that will be triggered are:

1. Environmental Assessment (OP4.01)
2. Pest Management (OP 4.09)
3. Indigenous Peoples (OP 4.10)
4. Involuntary Resettlement (OP 4.12)

These policies apply to all activities funded under the PPAP irrespective of whether or not they are being funded in whole or in part by the World Bank, IFAD, Government of Papua New Guinea or any other donor.

The World Bank's official web site [www.worldbank.org](http://www.worldbank.org) lists a complete description of the Bank safeguards and their triggers for applicability and some of these are summarized in Annex 1.0, to be used as part of the Environmental and Social Management process presented in chapter 9 of this ESMF.

#### **4.1 Environmental Assessment (OP4.01)**

This policy requires environmental assessment (EA) of projects/programs proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus improve decision making. The EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the program. The EA process takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and cultural property) and transboundary and global environmental aspects.

The ESMF will establish a mechanism to determine and assess future potential environmental and social impacts during implementation of the sub project activities and investments contained in the approved PPAPs under the proposed PPAP, and then to set out mitigation, monitoring and institutional measures to be taken during operations of these activities, to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels.

OP 4.01 further requires that the ESMF report must be disclosed as a separate and stand alone document by the Government of Papua New Guinea and the World Bank as a condition for the Bank's appraisal of the PPAP. The disclosure should be both in Papua New Guinea where it can be accessed by the general public and at the Infoshop of the World Bank and the date for disclosure must precede the date for appraisal of the program and no later than 120 days prior to the board approval date of the World Bank's Board of Directors as required by the United States Federal Law<sup>12</sup>.

The policy further calls for the PPAP as a whole to be environmentally screened to determine the extent and type of the EA process. The PPAP has thus been screened and assigned an EA Category B. This category of projects/programs is defined as follows:

“Category B projects are likely to have potential adverse environmental impacts on human populations or environmentally important areas - including wetlands, forests, grasslands, and

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<sup>12</sup> Pelosi Amendment (US Federal Law) prohibits US Executive Directors of multi-national development agencies from voting in favor of the agencies lending operations if the EA reports are not publicly disclosed 120 days prior to board date.

other natural habitats - and are less adverse than those of category A projects. These impacts are site specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. The EA process for category B projects examines the potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.”

Therefore, this ESMF sets out to establish the process to be undertaken for screening of PPAP activities when they are being identified and implemented. This process requires the implementers/operators/sponsors of the activities in the PPAPs, such as the province, district, ward, village officials and/or farmer groups and associations to use processes contained in the ESMF, especially section 6.0, to identify potential adverse impacts of their activities in the PPAPs and determine the corresponding mitigation measures they would need to incorporate into their planned activities. Section 9.0 sets the relevant process and requirements for environmental and social management.

#### **4.2 Pest Management (OP 4.09)**

The Bank uses various means to assess pest management in the country and support integrated pest management (IPM) and the safe use of agricultural pesticides: economic and sector work, sectoral or project-specific environmental assessments, participatory IPM assessments, and adjustment or investment projects and components aimed specifically at supporting the adoption and use of IPM.

In Bank-financed agriculture operations, pest populations are normally controlled through IPM approaches, such as biological control, cultural practices, and the development and use of crop varieties that are resistant or tolerant to the pest. An IPMP is a comprehensive plan, developed when there are significant pest management issues such as (a) new land-use development or changed cultivation practices in an area, (b) significant expansion into new areas, (c) diversification into new crops in agriculture (d) intensification of existing low-technology systems, (e) proposed procurement of relatively hazardous pest control products or methods, or (f) specific environmental or health concerns (e.g. proximity of protected areas or important aquatic resources; worker safety).

An IPMP is also developed when proposed financing of pest control products represents a large component of the project. A pest management plan reflects the policies set out in OP 4.09, Pest Management. The plan is designed to minimize potential adverse impacts on human health and the environment and to advance ecologically based IPM.

As the targeted/significant stakeholders in this program are small block holders, together with the cocoa and coffee industry, who during the implementation cycle of the PPAP, will, independently continue to require the use of inputs, the provisions of OP4.09 are being triggered so that best practice methodologies in this field become part of the farmer empowerment activities of the PPAP.

Papua New Guinea does not have a fully developed policy on IPM although the Oil Palm industry has its IPM. This will be the second initiative to have an IPMP developed in PNG. Thus the GoPNG has prepared an Integrated Pest Management Plan (IPMP), which will be included as part of the ESMF as a stand alone document to address the needs of OP4.09.

The IPMP has the following objectives:

- To enhance capacity of the program beneficiaries (individual farmers) to be aware of benefits and possible negative impacts of pesticides and to use pesticides in an economic, efficient and safe way for farmers, their families and environment (ensuring that banned pesticides or agro-chemicals under the Stockholm and Rotterdam Conventions will not be acquired by farmers),
- Introduce them to Integrated Pest Management (IPM) approach or concept as the way to control pests and reduce losses and also as the way to increase their production through good farming practices; and
- Identify the current available IPM practices and improve them in the project, with a view to promote movement towards the development and implementation of a pest management policy.

The first phase of the plan is the presentation of the current policy regulations together with context of the project. It then identifies the main pest problem pertinent to the cocoa and coffee industry. It then outlines the current IPM practices and includes best practices into the PPAP. At this stage, the Cocoa Pod Borer (CPB) is the only active pest that can cause destructive damages to the cocoa industry and these IPM practices are endorsed for the PPAP.

In the case of coffee, the Coffee Cherry Borer (CBB) has not yet arrived into Papua New Guinea, hence the approach here is to do surveillance and raise awareness of the coffee farmers and ensure that all stakeholders to be prepared for possible incursion. A contingency plan framework has been prepared. The use of agrochemicals is not properly regulated in PNG and that is also covered in the IPMP.

#### **4.3 Indigenous people (OP/BP 4.10)**

This policy focuses on two goals. A) To ensure that indigenous people benefit from development projects, and B) to avoid or mitigate potential adverse effects on indigenous people caused by Bank –assisted activities. Special action is required where Bank investments affect indigenous peoples, tribes, ethnic minorities, or other groups whose social and economic restricts their capacity to assert their interests and rights in land and other productive resources.

The PPAP triggers OP/BP 4.10 on Indigenous People. However, as all beneficiaries of the project, and all people affected by the project are indigenous, no separate Indigenous Policy Policy (IPP) will be required. However, elements of an IPP have been integrated in the project design. In line with this is the community consultation framework given the need for broad community support for the PPAP.

Social surveys carried out under the Social Assessment work together with the community consultations carried out as part of the EA highlight the community's support for both the cocoa and coffee interventions. The project will however ensure the specific characteristics and vulnerabilities of groups targeted by the sub projects will be considered.

#### **4.4 Involuntary Resettlement (OP/BP 4.12)**

The project will not finance any activity that requires involuntary resettlement. However, in exceptional cases there may be need for minor land acquisition when works are carried out under Component 3, or damage to assets. Under Component 2 (productive partnerships), any activities requiring land use, such as rehabilitation and expansion of existing nurseries, the establishment of satellite nurseries and budwood gardens, and the improvement of processing and storage facilities will be voluntary in nature and will take place within existing facilities. The Project Implementation Manual will detail the process for due diligence that will be required as a prerequisite for approval of these sub-projects.

Under Component 3 (road rehabilitation) sub-projects may possibly result in temporary land use, minor land acquisition, or damage of crops and economic trees.

A Compensation Policy Framework (CPF) has been prepared which details the key principles for land use and compensation for damaged assets. These principles include:

- i) Consultations with, and support from, communities as a first step in sub-project preparation.
- ii) Avoiding involuntary resettlement, minimizing land acquisition and damage to assets.
- iii) The provision of minor land acquisition through voluntary donations only.

**Table 6: Summary of the Requirement of Bank Safeguard Policies triggered by the PPAP**

<b>Bank Safeguards Policy Triggered</b>	<b>Action Required by Triggered Policy</b>	<b>By Whom</b>	<b>Date action required by</b>
OP4.01 Environmental Assessment (including Pest Management OP 4.09)	<p>1) Preparation of ESMF and IPMP (this document)</p> <p>2) Preparation of sub project ESIA's (see section 7.0 of this report)</p>	<p>1) ESMF and IPMP by GoPNG</p> <p>2) Sub project ESIA's Screening forms, and EMPs by sub project sponsors</p>	<p>1) ESMF and IPMP to be approved by the DAL of the GoPNG and Bank and disclosed in PNG and Bank Infoshop before program appraisal date and 120 days before Bank Board date.</p> <p>2) Category B sub projects to be approved at the PMUs in EHP and ENB and then appropriate funding released for activities.</p>
OP/BP 4.10 Indigenous People	1) Elements of IPP to be included into Project Design.	1) Elements of IPP by GoPNG	1) Elements of IPP to be included in the Project Appraisal Document
OP 4.12 Involuntary Resettlement	1) Preparation of CPF.	1) CPF by GoPNG.	1) CPF to be approved by DAL and by the Bank and disclosed in PNG and Bank Infoshop before program appraisal date and 120 days before Bank Board date.

## **5.0 Administrative, Policy, Legislative And Regulatory Framework**

### **5.1 Administrative Structure**

The Independent State of Papua New Guinea is made up of mainland Papua New Guinea and the island of New Britain, New Ireland, Bougainville and the 600 smaller islands stretched out in the Bismarck, Solomon and Coral Sea. Administratively, PNG is divided into 20 provinces with the 81 Districts, corresponding Local Level Governments and Wards and villages. The village is the smallest administrative area and the one closest to the communities.

The role of Government for the Agricultural Sector is to facilitate development, provide stimulus for private investment initiatives, and promote effective regulation, monitoring and co-ordination of the sector. The agricultural sector lead Ministry, and department, namely the Department of Agriculture and Livestock (DAL) will coordinate the implementation of the PPAP at national level and Project Management Units (PMU) oversee its implementation in the project provinces. Overall policy guidance and coordination of the PPAP will be provided through the Project Steering Committee (PSC).

The PSC, chaired by the Secretary of DAL, DAL, is responsible for overseeing the implementation of the PPAP and monitoring its performance to ensure that the goals of the project are being achieved. The PSC, which meets at least six-monthly, comprises representatives from the Department of Finance (DOF), the Department of Treasury (DOT), the Department of Transport (DOT), the Department of Environment and Conservation (DEC), the Department of Commerce, the Cocoa Board (CB), the Coffee Industry Corporation, the Rural Industry Council (RIC), the National Agriculture Research Institute (NARI) and the Provincial Governments.

### **5.2 Management and Administration Framework for Agriculture**

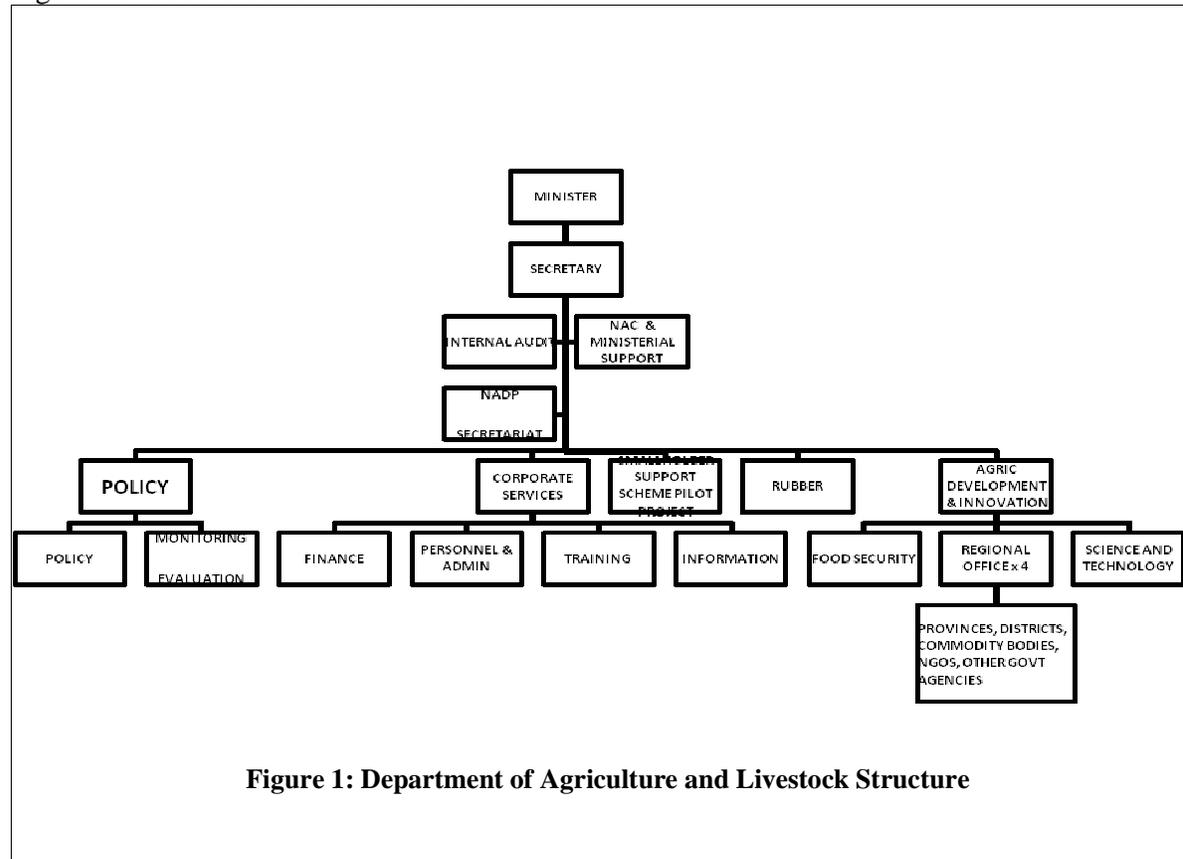
With regards to the management and administration of agriculture projects and activities throughout Papua New Guinea, the overall responsibility lies with the Department of Agriculture and Livestock, and for the management of the bio physical environment, the responsibility rests with the Department of Environment and Conservation although there are other sector departments and agencies that have specific obligations to natural resources such as;

- Department of Mining and Geohazards
- Mineral Resources Authority
- Department of Petroleum and Energy
- Department of Lands and Physical Planning
- National Forestry Authority
- National Fisheries Authority
- Department of Transport
- Department of Commerce

### **5.3 Policy Framework for the Management of Agriculture**

Agriculture in PNG is coordinated by the Ministry of Agriculture and Livestock, where the Department of Agriculture and Livestock has an overarching responsibility over a number of agencies and research institutions such as the National Agriculture Research Institute (NARI), National Agriculture Quarantine Inspection Agency (NAQIA), the Coffee Industry Corporation (CIC), the Cocoa Coconut Institute Limited (CCIL) and the Cocoa Board (CB).

Figure 1 shows the current structure of DAL.

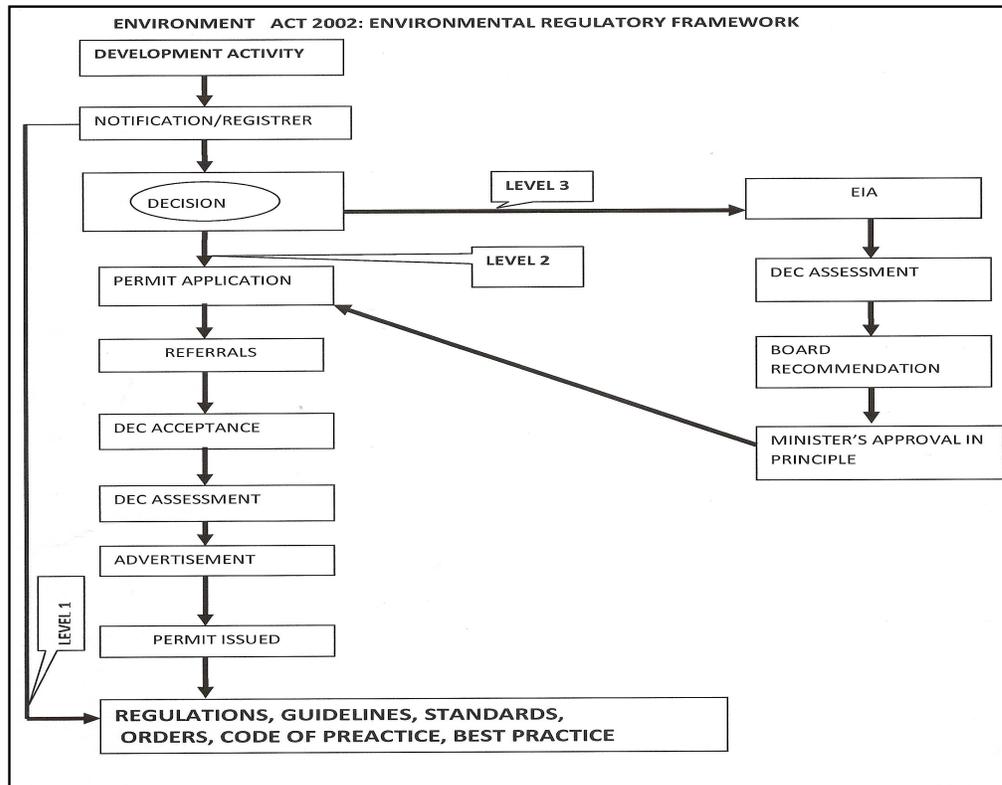


**Figure 1: Department of Agriculture and Livestock Structure**

Within the PPAP, the commodity boards having a direct input into project management are the CIC and CB.

### 5.5 The EIA Process in Papua New Guinea

The EIA process in Papua New Guinea is shown by Figure 2 and it sets out the process in relation to the Environmental Act 2000 and the Environmental Regulatory Framework (ERF) as outlined by DEC 1996.



**Figure 2: EIA Process in PNG**

Provided with the ERF document are prescribed activities within different Levels to determine whether an activity will require either a full EIA or be subjected to regulations, guidelines, standards, orders, code of practice and best practice. Level 1 is deemed to have insignificant impact and would be subject to regulations. While Level 2 and 3 has significant impact and will be subjected to the EIA process.

The EIA procedure involves the following:

\* **Registering a development activity:** The proponent is required to register the activity or project with the DEC.

\* **Screening and Decision Making:** The project is classified to determine the level at which the environmental assessment should be carried out. If the project does not have any significant impact on the environment then the activity will be approved and subject to the guidelines, regulations, standards or code of best practice. If the project falls into Level 2 or Level 3 then the EIA process will continue.

\* **Conducting an EIA:** This involves the three main stages of the EIA process (scoping, preparing terms of reference and preparing a Notification of Preparatory Work). For the PPAP, this was provided in the Environmental Assessment document. By submitting a notification of the preparatory work, projects can be further screened and then decisions made. Level 2 activities will be assessed and then approval through an appropriate Permit. For Level 3, a full EIA will need to be conducted.

A number of documents are submitted to DEC for the Level 3 project with firstly an Environmental Inception Report. This is assessed and feedbacks made to the proponent to adjust or expand on the EIA process. This is then followed through with the full project EIA. Guidelines for the Environmental Inception Report and the Environmental Impact Statement (EIS) is provided by DEC.

\* **Reviewing the EIA:** An Environment Council established by the DEC reviews the EIA and decides whether the EIA is acceptable or not.

\* **Issuing the relevant permits:** If the EIS is approved, the DEC issues the necessary environmental permit that confirms the EIS has been satisfactorily completed and the project may proceed.

\* **Decision-making:** A decision is made as to whether a proposal is approved or not; a record of decision explains how environmental issues were taken into consideration.

\* **Monitoring project implementation:** The operator prepares and executes an appropriate monitoring program (i.e. an environmental management program).

**Monitoring the project:** The DEC undertakes periodic and independent compliance monitoring of the project. It will provide a report which will be given back to the developer for discussions and amendment to its operation, should there be an environmental concern.

\* **Decommissioning the project upon its completion:** A decommissioning report is prepared at the end of the project life. This report outlines the restoration/rehabilitation activities to be carried out by the operator and is lodged with the DEC. At the moment in PNG, only mines have followed the process of decommissioning completed projects. In the other sectors, reporting has not been consistent.

## 5.6 Extent of public participation

Public consultation and participation is required during the scoping stages and while fulfilling the terms of reference for the impact assessment of the EIA process. The operator is responsible for identifying interested and affected parties and ensuring that all parties concerned are given adequate opportunity to participate in the process. A public information program is initiated, and public notices are issued during the scoping and EIA stages.

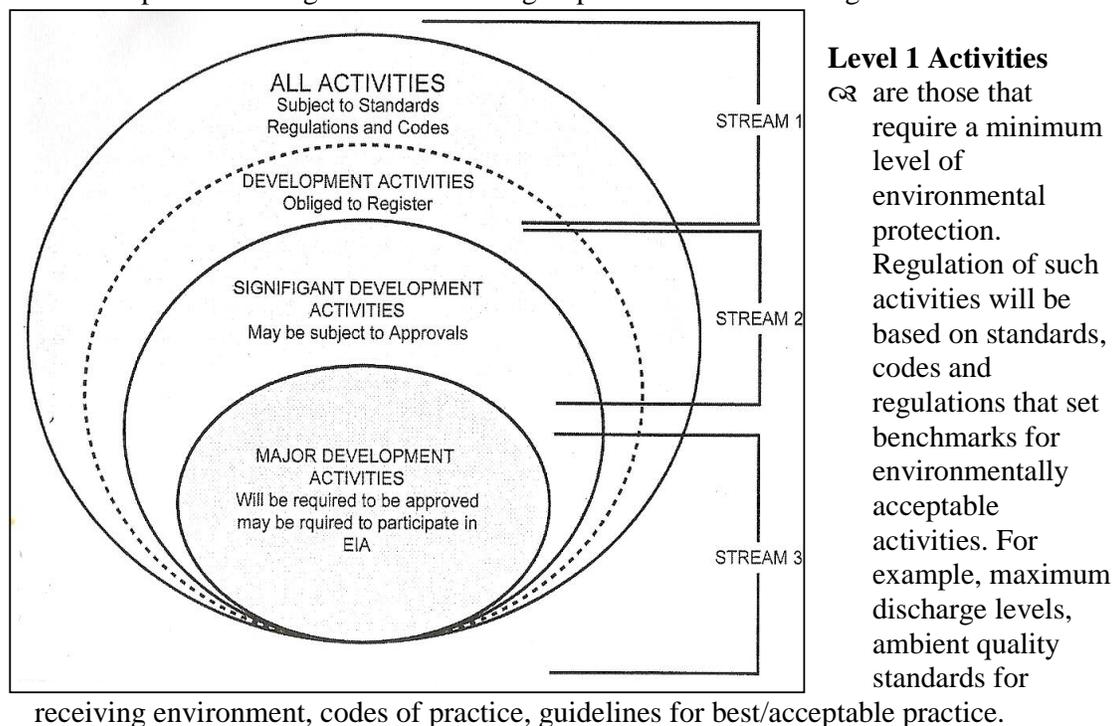
Whenever a strong public concern over the proposed project is indicated and impacts are extensive and far-reaching, the DEC is required to organize a public hearing. The results of the public hearing should be taken into account when a decision is taken whether or not a permit is to be issued.

## 5.7 Legislative Framework for the Management of the Environment

The Papua New Guinea Department of Environment and Conservation (DEC) is the national agency tasked with environmental management within Papua New Guinea. It has undergone a regulatory reform process in line with other public sector reforms and institutional structure for environmental management has changed. DEC had key strategic directions opting to move away from a central management to a national, provincial and community oriented management system (DEC, 1996).

In 2002, the Environmental Act 2000 was enacted where environmental assessment requirements for activities and projects in Papua New Guinea incorporated the previous three Acts; Environmental Planning Act (1978), Environmental Contaminants Act 1982 And Water Resources Act 1982. The Environmental Contaminants Act contains procedures and permitting of pesticides and these are now incorporated into the Environmental Act 2000.

As earlier stated, activities are screened into three streams (Figure 2) where Level 1 or Stream 1 activities could be subjected to standards, regulations and codes. The new Environment Act provides for a regulatory framework for environment management which also covers management of chemicals and hazardous substances. The Act specifies three levels of Activities which is a categorisation of the degree and magnitude of environmental impacts. Levels of impacts are categorized into three groups and illustrated in Figure 3.



**Figure 3: Regulatory Streams under the Environmental Act 2000 (DEC 1996)**

In cases of non-compliance, environmental protection orders, clean-up orders and emergency directions may be issued.

### **Level 2 Activities**

☞ are those that require a framework of environmental approvals allowing for water discharge permits, or licensing for importation, sale and use of environmental contaminants (hazardous chemicals) and for site-specific environmental conditions to

be set for these activities which have more significant potential impacts. Level two activities will be regulated by means of conditions in environmental permits, environmental improvement plans and environmental management programs.

### **Level 3 activities**

☞ cover those with the potential of major environmental impact and are projects of national significance or of large scale. Such activities will be subject to a process of public and detailed considerations of environmental implication through the Environmental Impact Assessment process.

Activities of the Productive Partnerships in Agriculture Project (**PPAP**) all fall under Level 1 and Level 2 and is consistent with the World Bank Category 'B' project. Level 2 activities are stated in the following sub categories 2, 8, 9 & 12 of the Environmental Act 2000 respectively.

- 2.3 Gravel extraction operating continuously for more than 6 months and involves the extraction of no greater than 10,000 tonnes per annum.
- 2.4 Quarrying involving the extraction of no greater than 100,000 tonnes per annum.
- 8.5 Agricultural cultivation of an area greater than 1,000 hectares.  
Sub category 9: Food processing and plant product processing.
- 9.4 Processing of coffee or cocoa in plants producing more than 5,000 tonnes per year
- 12.2 Construction of marinas and boating facilities designed or used to provide mooring for more that 50 powered vessels at any one time

Hence, for this, the anticipated impacts and their mitigation measures will be covered in Section 6.0.

### **5.9 International Conventions**

Papua New Guinea is a party to many international agreements on Biodiversity, Climate Change, Desertification, Endangered Species, Ozone layer protection, Marine Life Conservation, etc. Within the context of the PPAP, only the following are applicable and explained more in the Environmental Assessment (EA).

- i. International Plant Protection Convention
- ii. Convention on Biological Diversity
- iii. Rotterdam Convention as the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International/ Trade and
- iv. Stockholm Convention on Persistent Organic Pollutants

## 6.0 Environmental Management Plan

This section presents the Environmental Management Plan (EMP) for the PPAP. It sets out firstly the type of activities proposed under the PPAP, provides a screening process of these activities, especially for the feeder roads and other small market infrastructure such as paths, wharfs and jetties, then the anticipated environmental impacts from the coffee and cocoa processing, and the appropriate mitigation measures and indicators for environmental monitoring. At the end, the institutional capacity for effective compliance with the EMP is assessed. The last element is the duty statement for the Environmental Specialist. This is further stated in Annex 9 and Section 10.

### 6.1 Environmental Screening

#### 6.1.1 Screening Objectives

The main objective of environmental screening is to identify which subprojects will require a full EIS and which will be covered under the sectoral EMP. Criteria for environmental screening of subprojects have been developed for a number of existing projects in PNG. Generally, screening involves the identification of a combination of factors which determine the extent of study required. Screening is based on the type of activity and the existing environment in which the activity takes place.

### 6.3 Screening Methodology for Component 3

The rehabilitation of land and water transport routes in the pilot provinces of the PPAP would include:

- Rehabilitation of pavement, restoration of drainage and minor bridge work for up to 100 km of minor (feeder and/or district access) roads and pathways;
- Rehabilitation of wharfs and jetties.

The rehabilitation work may include three levels:

- Level 1- Restoration of drainage system and minor reinstallation of pavement.
- Level 2- Minor work to widen bench, restore drainage system and minor bridges design standards.
- Level 3- major work to widen bench restore drainage system and reinstate pavement also consist of repair / improvement work to drains, culverts, bridges, retaining walls and slopes.

As all these routes are existing roads or paths, but overgrown or impassable in some areas, activities such as site clearing with the removal of the soil, followed by the placement of the granular pavement and the construction of culverts and drains might be needed.

It is not anticipated that there would be any major widening, although in some areas, slope stabilization and drainage improvements may require the acquisition of small areas of land in

order to undertake corrective measures. The project is anticipated to have a number of positive impacts, including a reduction in dust generated, less accidents, and a decrease in travel times. Repairs to drains, bridges and culverts will also have a positive impact in reducing potential slope instability and sedimentation in some areas.

During the field visits carried out under the EA, a sample of feeder roads and potential quarry sites were visited. The sample feeder roads were used to test the screening methodology. Detailed field information was collected from the Papua New Guinea Resource Information System (PNGRIS) GIS system at the University of Papua New Guinea. This system maps soil type, slopes, sensitivity to erosion, location of protected areas such as National Parks, Wildlife Reserves and other sensitive areas. This, combined with an examination of the project location on topographical sheets, provided sufficient information on the general nature of the environment to assess the need for further study.

As indicated, screening involves the classification of the type of activity undertaken and the sensitivity of the receiving environment. Thus, there are a number of 'combinations' of activities and environment which can lead to the need for detailed EIS. These are outlined as follows:

1. **Works which improve access (from 4wd to all vehicles or from dry season only to year round) to or near to legally protected natural areas (Natural Reserves or Conservation Areas, Wildlife Reserves, natural forests or watershed catchment areas)**  
If a proposed sub-project will provide new access in or around these areas the potential for impact is significant and a full EIS is required.
2. **Works which improve access (from 4wd to all vehicles or from dry season only to year round) to or near to areas of ecological sensitivity (such as mangrove areas, wetlands or coral reefs)**  
If a proposed sub-project will provide new access in or around these areas the potential for impact is significant and a full EIS is required
3. **Works which involve major (> 1m) widening in areas of steep slopes >40%), unstable land systems, highly erosive soils and/or areas of settlements or villages**  
Where road rehabilitation requires widening and significant earthworks in very steep areas, the potential for increased erosion and sedimentation and other negative impacts is high. Implementation of such projects needs to be carefully considered and should require a full EIS. The same is true of areas of high sensitivity to soil erosion. In settled areas, widening will have implications for possible compensation.
4. **Works which involve major new structures in steep (>40% slope) areas, unstable land systems and/or highly erosive soils**  
If a project requires new bridges or large retaining walls in very steep areas or highly erosive soils and the potential for serious environmental impacts (for instance, downstream) is high, a full EIS would be required.
5. **Works which involve major new structures (bridges, bank protection) and traverse major river crossings**  
Activities which will affect major river crossings (and potentially increase downstream sedimentation) should have an EIS.
6. **Works which require the development of a new quarry**  
If the rehabilitation activities require the development of a new quarry, a full EIS should also be completed. However, the opening of the quarry would undoubtedly

involve substantial new land acquisition and environmental impacts and therefore would not be eligible under PPAP.

## 6.4 Screening Results

A sample of feeder roads were checked against the criteria established above to determine their potential impacts on the environment (Table 7). These included the following roads, which were randomly selected in coffee and cocoa growing areas:

**Table 7: Random sample of Feeder Roads in EHP & ARB used for testing of Environmental Screening methodology**

Province	Section	Length Kms	Type	Scope of Work	Result <sup>13</sup>
EHP	Lufa – Agutu	19	2	Minor works to wider bench; restore drainage system and minor bridges design standards.	Minimal impact
		9	3	Major work to wider bench, restore drainage system and reinstall pavement.	Minimal impact
	Total	28			
	Tarabo – Gimi – Ivingoi Loop	42	2	Minor works to wider bench; restore drainage system and minor bridges design standards.	Minimal impact
		10	3	Major work to wider bench, restore drainage system and reinstall pavement.	Minimal impact
	Total	52			
	Yababi – Hofokafanofi	20	2	Minor works to wider bench; restore drainage system and minor bridges design standards	Minimal impact
	Total	20			
	Barola – Ino'onka-Kainantu	12	2	Minor works to wider bench; restore drainage system and minor bridges design standards	Minimal impact
		5	3	Major work to wider bench ,restore drainage system and reinstall pavement.	Minimal impact
	Total	17			
	Okasa – Asempa – Tairora- Aiyura	16	1	Restoration of drainage system and minor reinstall pavement.	Minimal impact
		18	2		
		27	3	Major work to wider bench ,restore drainage system and reinstall pavement.	Minimal impact
Total	61				
ARB	Rugen – Romsis –	8	2	Minor works to wider bench; restore drainage system and minor bridges design standards	Minimal impact
	Mackiwi – Aravia	7.5	2	Minor works to wider bench; restore drainage system and minor bridges design standards	Minimal impact
	Benmat	4.5	2	Minor works to wider bench; restore drainage system and minor bridges design standards	Minimal impact
	Puto	5	2 <sup>14</sup>	As above	Minimal impact
	Do'Aso	6	2	Minor works to wider bench; restore drainage system and minor bridges design standards	Minimal impact

<sup>13</sup> Minimal impact indicates that all roads are within the existing right of way and treatment of roads will have localised impacts.

<sup>14</sup> Type 2 scope of work on the selected ARB roads is to rehabilitate to a minimum engineering standard hence it is applicable here.

In order to complete the environmental screening, each of the roads was located on the road maps (1:1,000,000 scale published by the DOW in 1992). Furthermore, these general location maps were overlain with environmental and resource information obtained from the PNGRIS at DEC. This is a GIS-based system which includes basic information such as areas of significant land use, erosion risk, seasonal inundation, tidal flooding, permanent inundation, high slope and forest cover. The PNGRIS maps were prepared as overlays and are therefore not completely accurate due to difficulties with exact locations (geographical co-ordination). For the purpose of preliminary environmental screening, this information proved quite adequate. Due to the difficulties with exact map co-ordination, the environmental and resource information extracted from the PNGRIS maps was used to provide a general description of the environmental constraints for each road.

Each of the sample feeder roads was checked to determine whether they fell under any of the six criteria that would require the preparation of a full EIS. The environmental screening concluded that none of the feeder roads requires a full EIS. No significant environmental impacts are anticipated from any of these feeder roads, and mitigation of any minor impacts can be controlled through the EMP presented in this section. Regarding the actual segments that may be rehabilitated under PPAP, the Environmental Specialist and the Transport Planner under the Project Management Units (PMUs) will have to screen these feeder roads according to the above criteria to determine whether more detailed EIA will be required. However, the sample roads used for testing generally represent a higher level of infrastructure than what PPAP may eventually finance. In particular, all road rehabilitation works that would qualify as level 3 would not be financed under the PPAP.

## **6.5 Sectoral Assessment of Environmental Effects**

### **6.5.1 Rehabilitation of Minor Roads**

The SEA assumes that for minor roads where activities are very similar, the anticipated environmental impacts will also be similar and it is therefore not necessary to prepare separate environmental assessments for each sub-project. Rather, the SEA will cover all of the minor roads. In order to prepare the SEA and EMP, a generic environmental impact listing was prepared. This listed the main activities involved in the rehabilitation work and identified the expected impacts as a result of these activities. The anticipated impacts are based on experiences on other minor roads of a similar nature.

- **Acquisition of land for Widening or Realignments**

This involves the acquisition of land for widening or realignment requirements. In PNG, land acquisition and issues of compensation are often problematic and therefore it is important to deal with any potential land acquisition questions in an effective and efficient manner. This project will not require any involuntary acquisition of land or resettlement. Part IV of the Environmental Management and Social Framework contains the Compensation Policy Framework (CPF) which defines the approach taken by the PPAP.

- **Clearing of ROW**

During rehabilitation activities, there will be clearing of the existing ROW. In some cases, this ROW will not have been cleared for many years and there will be a significant loss of vegetation along the roadside as a result of the clearing exercise. In the case where there are large trees or other desirable vegetation, it will be important to ensure that these are not

removed by the contractors if at all possible. However, if it is in the middle of the ROW, then appropriate steps must be taken to solve this in line with the CPF.

- **Equipment Mobilisation**

Includes the delivery of materials, plant and equipment to the site and may involve large transport vehicles which cause air and noise pollution. May also result in traffic and safety problems and damage to vegetation.

- **Mobilisation of the Labour Force**

Refers to the arrival of an outside labour force for construction activities. These newcomers may be culturally or ethnically different from people in the area and in PNG this can have significant impacts. Potential health impacts are also possible. To avoid social conflict, local labor must be used as much as possible.

- **Establishment and Operation of Labour Camps**

This refers to the camp established to house the non-resident workforce. The major problems with the labour camps are the pollution caused by waste and sewage disposal and the potential use of local resources in an unsustainable manner (for instance, fuelwood for cooking, hunting and fishing activities).

- **Operation of Existing Quarry Sites (Terrestrial)**

This refers to the on-going operation of quarry sites which have been established prior to the commencement of project construction activities. The activities associated with this include blasting and the resultant noise and dust pollution. Abandonment of the quarry after material extraction can have impacts if not properly managed. These will be overseen by the Environmental Specialist and Sr. Engineer at the project level.

- **Establishment and Operation of Stone Crushing Plants:**

This involves the crushing of stones using large and very noisy equipment. The activity generates substantial amounts of dust and can be very disturbing to nearby settlements.

- **Earth Movements Relating to Cutting and Filling Activities in Steep, Hilly or Unstable Areas:**

This involves cutting and filling in areas that are steep and as such could result in significant increased erosion and increasing slope instability unless carefully controlled.

- **Earth Movements in the Vicinity of Settlements along the Roadside:**

This could disturb local market activities and affect pedestrian walkways. Even though the earthworks would be undertaken within the ROW, there is the possibility that illegal structures have been constructed which could be affected. Compensation for these assets should be provided as per the Compensation Policy Framework.

- **Drainage Works:**

This includes all drainage works such as culverts and drainage ditches. The main anticipated impacts are the possible effects of increased sedimentation in surrounding water bodies as a result of inappropriate deposition of excavated materials and associated disturbances.

- **Material Transport:**

This includes the transport of all construction materials such as rock, gravel, bitumen, concrete or other material as well as the transport of equipment or machinery. Again, minor environmental impacts would include noise and dust pollution.

- **Increased Access:**

This is actually an indirect impact of the road rehabilitation and the major impacts that could result include increased and unsustainable exploitation of the natural resources in the area.

- **Increased Traffic and Operating Speeds:**

This can result in increased traffic accidents, especially involving children. Increased traffic can also result in some pollution in surrounding water bodies as a result of runoff.

## 6.5.2 Coffee Production and Processing

- **Seedling and Nursery**

Coffee seedlings are placed in nurseries where adequate water and fertilizer is provided to them. The only possible impact would be if nurseries are close to rivers or drinking sources and fertilizer residues may contaminate these water sources

- **Planting and Growing**

Young coffee plants are planted into prepared coffee plant plots. Similar to the seedlings and nursery, fertilizers, herbicides and fungicides are used in reducing pest and diseases and ensuring fully development coffee trees. Minor environment impact would be from fertilizers and herbicides residues to run off into water ways or drinking water sources.

- **Picking, Fermenting and Processing**

No impact arises when people hand pick coffee cherries and as long as the cherries are processed at once, they will not ferment.

Processing of coffee through the dry, semidry and wet processing methods involve varying amounts of water where the dry method uses minimal water and hence waste water when discharged. Impact on the receiving water will be also for coffee pulp that is not disposed under coffee trees. No impact on the coffee pulp on soil as it will decompose into organic matter

- **Ferment and Wash Method.** Remainders of coffee pulp are broken down by microbes and washed down with water. Impact here is the waste water containing high Biological Oxygen Demand (BOD). In addition, waste water gives off a pungent smell that is unpleasant.
- **Dry Milling.** This involves the removal of the last layer of dry skin and remaining fruit residue from the dry coffee bean. Potential impacts is the waste of dry skins, however coffee factories in visited use this as a fuel for the hot air drying of the coffee beans
- **Polishing and Sorting.** Polishing involves the removal of remaining silver skin on the coffee beans and the chaff produced when roasted. Sorting involves sorting by colour through machines or by hand. No adverse impacts are anticipated here except for the

fruit skins of the coffee beans that are removed. It is used as a fuel for the drying of coffee beans or can be burned of creating air pollution.

### 6.5.3 Cocoa Production and Processing

- **Seeding and Nursery.** Cocoa seedlings are regularly watered and fertiliser added (NPK and Urea) to enhance growth up to about 60cm in height before they are ready to be planted. Most likely impact would be on possible excess of fertiliser that could run off into water ways and creeks and will be a danger for aquatic organisms. This might be an issue in very large nurseries.
- **Planting and Growing.** During the juvenile and during the production phase of cocoa trees, fertilisers and herbicides are often applied to stimulate trees to develop well, start flowering and pod-setting. Most likely environmental impact could be excess of fertilisers or herbicides leached into water ways and creeks affecting aquatic organisms. However, in PNG the majority of small farmers are not using fertilizers due to very good soil.
- **Harvesting and Fermenting.** Ripe cocoa pods are harvested, broken and cocoa beans are placed into a wet box tray where beans 'sweats' releasing the thick pulp. Partly drained cocoa beans are then placed into the fermentation boxes where they release the rest of pulp during the fermentation. The thick 'sludge' from the collection of the pulp may pose an impact if it enters into water ways. This could only occur if the fermentery is close to a creek. The sludge itself is not toxic but in large quantities could be toxic to aquatic organisms.
- **Drying of cocoa beans.** After the fermentation process, the beans are dried to reduce the moisture level in the beans to 7%. Sun drying is preferred for good quality and low cost, however due to excessive rainfall majority of cocoa in PNG is being dried by kiln driers with the heat generated with firewood and in some fermenteries by fuel. Excessive fire-wood collection could be a problem in the future. More economic and environmental friendly methods of cocoa drying should be developed. Badly maintained driers are the reason for very serious negative impacts to the quality of the bean as escaping smoke will tint the flavour of cocoa. No impacts are foreseen from the processed cocoa beans as they ready for sale.

## 6.6 Environmental Management and Monitoring Plan

### 6.6.1 Implementation of Recommended Mitigation Measures

Table 8 presents the descriptions of typical activities under the subprojects in the PPAP while Table 9 – 11 provides details on the Environmental Management Plan. This annex has been prepared so that the information appears in a logical and straightforward fashion that should make it easy to understand and use, even for persons with minimal understanding of environmental issues. For each of the mitigation measures presented, a method of implementation is proposed. Timing is extremely important with respect to effective implementation because some of the recommendations involve additional cost and can affect the subproject budget. The recommended methods of implementation include the following:

- **As a design guideline or recommendation**

The mitigation measure should be included in the initial design of the subproject. Often, on road maintenance projects where anticipated environmental impacts are minimal, effective mitigation is simply a matter of ensuring that the roads are designed properly to control negative effects. In general, if the design is properly done (as should be the case on this project), there will be NO IMPACTS at all. In a few cases, slight changes to design will eliminate the potential for impacts. Of particular concern in the design stage is the location of material sources. These should be clearly identified and located on maps in order to ensure that no problems ensue once construction starts.

- **As a suggested clause in the contract**

There should be a clause in the works contract document (or partnership agreement under component 2) referring to this particular mitigation measure. There are a number of ways of addressing this. A common method is to simply refer, in the contract, to the Environmental Management Guidelines in existence, detailing any specific aspects not already in the guidelines. However, this assumes that all parties are familiar with and understand how to implement these guidelines, which is not always the case. . Therefore providing specific clauses in the contract detailing measures and actions required on the part of the contractor is the recommended approach.

- **To be included in the Bill of Quantities (and usually also in the contract)**

Recommended mitigation measure should be included as an item in the Bill of Quantities. This will ensure that the item has been budgeted for and will be implemented as required. There are two approaches to deal with the incorporation of environmental management costs into the bids prepared. One is to request that the contractors include these costs in their rates. Although this works well in some instances, in many cases the contractors, in remaining competitive, will not adequately reflect the real cost of environmental mitigation in their bids. The second approach, recommended above, presents the mitigation measure as a line item in the Bill of Quantities. There would be an identified extra payment in the contract to ensure that the work is carried out by the contractor as specified. An example of clauses that could be included in the Bill of Quantities are as follows:

- the definition of exactly how many cubic metres of spoil and excess material must be disposed of
- a definition of how many hectares in total of replanting or revegetation must be undertaken and cost per hectare (or m<sup>2</sup>)
- cost of recommended erosion control structures (if over and above those that would normally be constructed as part of normal engineering design)

In order to achieve this in practice, it is recommended that the draft contracts be reviewed by an environmental specialist to ensure that the appropriate clauses have been incorporated. This could be undertaken by the PPAP Environmental Specialist.

As for the coffee and cocoa industry, appropriate mitigation measures will need to be overseen by the Component 2 Coordinator with guidance from the Environmental Specialist.

## **6.2 Supervision of Environmental Mitigation**

The main objective of environmental supervision is to ensure that the recommended mitigation measures are implemented as required by the works contractor (component 3) and project partners (component 2). In road rehabilitation projects, environmental supervision is often part of the standard construction supervision. It will be important to specifically outline exactly what needs to be focused on during the supervision. The third column in Table 9-11 provides detailed monitoring and supervision recommendations for the engineer in charge of supervision. By including clauses into a contract document and specific items in the Bill of Quantities forming part of the contract, monitoring and supervision of the application of mitigation measures is automatically included in the normal engineering supervision of the contract on a day-to-day basis. Once the Environmental Specialist and is in place at the PMU, s/he would ensure appropriate training of key PPAP staff. DEC could also be invited to participate in six-monthly reviews.

**Table 8: Description of the sub projects in the PPAP**

<b>Component 2: Productive Partnership</b>			
<b>Cocoa sector</b>	<b>Details</b>	<b>Coffee sector</b>	<b>Details</b>
a) Management activities supporting Cocoa Pod Borer (CPB) control including training on good farming systems.	Activities involve the training of cocoa farmers on aspects of IPM that will manage CPB within cocoa blocks. IPM requirement.	c) Production of improved planting material for replanting and coffee garden rejuvenation and market driven diversification of coffee farming systems.	Nurseries to provide improved coffee seedlings and hybrids to replace over grown coffee with the opportunity to produce better output.
b) Provision of improved planting material (nurseries and budwood gardens) supplied to farmers to replace old/ affected trees.	Nurseries will supply cocoa seedlings to replace CPB affected trees within East New Britain and Autonomous Region of Bougainville initially.	d) Adoption of quality of coffee through the post harvest and processing technologies.	Need for waste water management to ensure receiving water quality is maintained. Also is the provision of grants to factories to adopt low environmental impact technologies.
c) Promotion and support for rotational planting and cocoa garden rejuvenation and market driven diversification of cocoa farming system	The provision of tools including budding knives and harvesting poles to improve cocoa gardens and harvesting and the rehabilitation of old cocoa trees.	Component 3: Market Access Infrastructure	
d) Adoption of quality of cocoa through the post harvest and processing technologies.	Improvement in the delivery of smoke free and air dried cocoa to meet high quality of cocoa through the replacement of faulty kiln pipes in cocoa fermenteries and the safe disposal of cocoa sludge from sweating.	a) Upgrading up to 100 km of minor roads in project area	See provisions for mitigation.
<b>Coffee sector</b> a) The supported expansion of differentiated coffees such as organically grown and certified, Fair Trade and others and these support sustainability practices.	Activities involve more farmer groups to joint up with a differentiated coffee practice within a particular area, eg Fair Trade and entails training and assistance.	b) Upgrading of paths, wharves and jetties allowing the transportations of coffee and cocoa to be delivered to marketing or processing points.	Cocoa delivered from ARB requires potential areas where ship may service these wharfs and jetties and connecting tracks would need to be upgraded. The level of jetties will need to be assessed to determine the necessary capacity and load to ensure containment of the cocoa bags.
b) Improvement in training of good farming practices and also the threat of the Coffee Berry Borer (CBB).	Similar to above activity, with more focus on individuals who are outside of the certification to ensure coffee pulp is returned under the coffee tree and the		

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	maintenance of shade for the reduction of weeds. CBB has not arrived in PNG as yet however awareness of the threat and the need for surveillance need to be given to the majority of coffee farmers through cooperative groups and other stakeholders.		
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**Table 9: Proposed Mitigation and Monitoring Measures for Coffee and Cocoa**

Sub project level impact	Proposed Mitigation Measures	Monitoring Measures and applicable indicator	Costings
<p><b>Coffee</b></p> <p>Nursery establishment, bush clearance; disturbance to habitats; Chemical alteration of ecosystems by application of fertiliser, pesticides or weedicide. Fertiliser/Pesticide/ Weedicides Run off cause changes in the ecosystem and population of organisms.</p>	<ul style="list-style-type: none"> <li>• Ensure there is minimal clearing of vegetation for nursery sites. All mitigation measures here to be implemented by nursery staff.</li> <li>• Ensure nurseries are sited away from water ways or creeks.</li> <li>• Have fertiliser and weedicides applied individually with its correct dosage and frequency.</li> <li>• Ensure all fertilisers, pesticides and weedicides are stored in a bunded area under a dry roof.</li> </ul>	<ul style="list-style-type: none"> <li>• All activities to be monitored by C2 coordinator in PMU in EHP through the Coffee Industry Coordinating Committee (Coffee ICC) and overseen by the Environmental Specialist (ES).</li> </ul> <p><b>Indicators</b></p> <ul style="list-style-type: none"> <li>• Observation of nurseries away from creeks</li> <li>• Good farm practices</li> <li>• Fertilisers, pesticides and weedicides stored in secure location</li> </ul>	<p>Costs as part of the operations of the Component 2 (C2) Coordinator and ES.</p>
<p>Rehabilitations of coffee plots with the clearing of overgrown coffee trees and the planting of improved coffee farming system; slight alteration of ecosystems.</p>	<ul style="list-style-type: none"> <li>• Removal of aging coffee trees to be replaced by new seedlings together with filling gaps in coffee gardens.</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly monitoring visits to selected farmer groups or cooperative's areas to establish this practice.</li> </ul> <p><b>Indicators</b></p> <ul style="list-style-type: none"> <li>• Good house keeping of storage</li> </ul>	<p>Costs as part of the C2 coordinator quarterly visits</p>
<p>Waste generated from coffee pulp and waste water, impact on the terrestrial and aquatic environment</p> <p>Smoke from burning of coffee bean skins. Source of air pollution.</p>	<ul style="list-style-type: none"> <li>• Ensure coffee pulp is placed back under coffee trees or in food gardens to allow natural decomposition.</li> <li>• Coffee waste water to be kept in anerobic ponds to allow oxidation and reduction of Biological Oxygen Demand (BOD) and Chemical Oxidation Demand (COD) to meet PNG Water Quality Standards before being discharged into the receiving waterways and rivers.</li> <li>• Mitigation measures to be implemented by wet factories</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly monitoring visits to selected wet processors/ coffee factories to establish this practice.</li> </ul> <p><b>Indicators</b></p> <ul style="list-style-type: none"> <li>• Waste water pond adequate and BOD low at discharge point</li> <li>• If received grant, determine if recycling is working and receiving water minimal into water ways</li> </ul>	<p>Similar comments as above</p>
<b>Cocoa sector</b>			
<p>Nursery establishment, bush clearance; disturbance to habitats;</p>	<ul style="list-style-type: none"> <li>• Ensure there is minimal clearing of vegetation for nursery sites. All</li> </ul>	<ul style="list-style-type: none"> <li>• All activities to be monitored by PMU in ENB through the C2 coordinator</li> </ul>	<p>Costs as part of the commitment of the C2 coordinator and ES's quarterly visits.</p>

<p>Chemical alteration of ecosystems by application of fertiliser, pesticides or weedicide.</p> <p>Fertiliser/Pesticide/ Weedicides Run off cause changes in the ecosystem and population of organisms.</p> <p>Farmers and their families could be affected by pesticides</p>	<p>mitigation measures here to be implemented by nursery staff.</p> <ul style="list-style-type: none"> <li>• Ensure nurseries are sited away from water ways or creeks.</li> <li>• Have fertilizer, insecticides and herbicides applied individually with its correct dosage and frequency.</li> <li>• Ensure all fertilisers, pesticides and weedicides are stored in a bunded area under a dry roof.</li> <li>• Training of farmers on minimal, efficient and safe utilization of permitted pesticides.</li> </ul>	<p>and overseen by the Environmental Specialist (ES) during quarterly visits.</p> <p><b>Indicators</b></p> <ul style="list-style-type: none"> <li>• Observation of nurseries away from creeks</li> <li>• Good farm practices</li> <li>• Fertilisers, pesticides and weedicides stored in secure location</li> <li>• Utilisation of right nozzles and equipment for spraying</li> <li>• Utilisation of personal protective gears for spraying</li> </ul>	
<p>Old cocoa trees are heavily pruned or replaced by highly productive small cocoa clones</p> <p>Destroying host insects habitats.</p>	<ul style="list-style-type: none"> <li>• Cutting of old cocoa trees to be heaped in an area where these can dried out and used as fuel wood for fermentery. Mitigation measures here by individual block holders</li> <li>• Loping of cocoa trees to be in line with IPM height recommendations of 3 metres.</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly monitoring visits to selected farmer groups or cooperative's areas to establish this practice.</li> </ul> <p><b>Indicators</b></p> <ul style="list-style-type: none"> <li>• Good house keeping of storage</li> </ul>	<p>Similar comments as above</p>
<p>Waste pulp generated from cocoa pods, potential impact on the terrestrial environment</p> <p>Smoke from fermentery is contaminating cocoa beans, and compromising cocoa quality.</p>	<ul style="list-style-type: none"> <li>• Promote that waste generated from the cocoa 'sweating 'process is placed under cocoa trees or in food gardens to allow natural decomposition. Mitigation measures to be implemented by individual farmers and overseen by PMU.</li> <li>• To ensure flue pipes and chimneys are replaced to ensure smoke does not taint cocoa beans.</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly monitoring visits to selected farmer groups areas and also industry partners to observe practices.</li> </ul> <p><b>Indicators</b></p> <ul style="list-style-type: none"> <li>• Clear disposal of sludge under gardens</li> <li>• Creek to be clear of sludge</li> <li>• Cocoa beans are free from smoke taint</li> </ul>	<p>Similar comments as above</p>

**Table 10: Propose Mitigation and Monitoring Measures for Minor Roads and Paths**

Sub project level impact Component 3	Proposed Mitigation Measures	Monitoring Measures and applicable indicator	Costings
<p><b>Clearing of the right- of-way (ROW) and Social Issues</b></p> <ul style="list-style-type: none"> <li>• Dissatisfaction on the part of potential persons that may have fruit trees or other structures on current ROW.</li> <li>• Disturbances from construction activities, Safety problems</li> <li>• Areas of historical or archaeological significance could be discovered and affected (chance finds)</li> </ul>	<p>Obtain broad community consent as a prerequisite to work being undertaken on roads.</p> <p>Following the procedures detailed in the Compensation Policy Framework, obtain and document agreements on land use from communities, specifically, compensation for lost assets and Adequate compensation shall be provide to all affected landowners for the loss of the assets according to the guidelines set out in the Compensation Policy Framework. Identify culturally sensitive areas. Projects which impact historical or archaeological sites will not be financed. All required safety measures shall be implemented. This includes occupational health and safety requirements on construction sites and in work camps.</p> <p>Maximise the opportunities for local people on the project. This could include hiring of day labour for gravel crushing, maintenance of revegetation areas, and any other activities.</p> <p>Communities and landowners shall always be consulted on the disposal areas, removal of trees and other vegetation, and stockpiles for spoil material.</p>	<p>Monitor use of CPF</p> <p>Ensure that affected parties are satisfied.</p> <p>All activities within all minor roads /paths to be overseen by the Provincial Lands Officer and Community Liaison Officer together with the Transport Planner in the PMU.</p>	<p>Compensation per the CPF.</p> <p>Sr. Engineer/Transport Planner costs</p>
<p><b>Operating of Labour Camp</b></p> <ul style="list-style-type: none"> <li>• Introduction of small labour force with different attitudes resulting in social conflicts</li> <li>• Introduced health problems such as STDs and HIV</li> <li>• Deforestation, excessive use of fuelwood</li> <li>• Competition for scarce natural resources and food supplies</li> <li>• Pollution of surface and groundwater supplies from unsanitary waste disposal</li> </ul>	<p>Camps shall not be located near settlements or near drinking water supply intakes.</p> <p>They shall not negatively impact local residents' access to drinking water.</p> <p>Camps shall not be located in the vicinity of landslides and floodplains.</p> <p>The camp shall be operated within a self-sufficient infrastructure. No trees shall be cut for fuelwood, and removal of vegetation shall be minimised.</p> <p>The contractor shall prohibit employees from poaching wildlife and cutting trees. The contractor shall be responsible for the action of their workers.</p> <p>Water and sanitation facilities shall be provided for employees. In water deficient areas, the contractor shall haul water from a source outside the area. Solid waste shall be managed according to the following preference hierarchy: recycling, burial or burning. Green or organic wastes shall be composted or used as animal food.</p>	<p>Camp is self sufficient in food, water and fuel: No complaints from residents, local prices remain stable.</p> <p>Provision of water and sanitation facilities constructed no disruption in local water supplies.</p> <p>Waste disposal: Upon completion, camp site is neat and no rubbish and materials remain.</p>	<p>Costs will be borne by the project through the visit by the Sr. Engineer during his field inspection.</p>

practice	<p>Water and pit latrines shall be provided for employees. Use above-water pit latrines or composting toilets at residential construction sites.</p> <p>Sewage shall be disposed of into hygienic pit latrines or into a septic tank system. In low-lying areas the latrine areas shall be elevated and constructed on a mound of sandy sediment to control seepage into the local groundwater.</p> <p>The contractor shall recruit, to the maximum extent possible, local persons for the labour force, and shall provide appropriate training where necessary.</p>		
<b>Sub project level impact</b>	<b>Proposed Mitigation Measures</b>	<b>Monitoring Measures and applicable indicator</b>	<b>Costings</b>
<p><b>Minor Road Rehabilitation Erosion Control Management And Monitoring</b></p> <p><b>Objective</b></p> <p>To minimise the erosion of soil from sites</p>	<p>All road contractors will apply the following methods of erosion control. Compliance by the contractor will be regularly checked by the Sr Engineer:</p> <ul style="list-style-type: none"> <li>• Minimise as far as practicable the time that surfaces remain bare.</li> <li>• A staged road reconstruction plan will be followed so that road reconstruction and earthworks are completed in stages (500m stages recommended) so that only a minimal area of ground is open or clear at anyone time;</li> <li>• Progressively re-vegetate and mulch disturbed areas as soon as practicable after completion of work;</li> <li>• Keep vegetation clearing to a minimum and re-vegetate cleared sites, in consultation with the landowner(s);</li> <li>• On steep slopes, and where otherwise appropriate, clear vegetation using chainsaws so that tree roots can remain to help stabilise slopes;</li> <li>• Erosion control structures such as stormwater diversion (catch) drains and bunds will be constructed and maintained to temporarily divert stormwater around construction sites;</li> <li>• Onsite drainage schemes will be constructed and maintained to minimise ponding and uncontrolled runoff;</li> <li>• Avoid earthworks during high rainfall periods, if possible;</li> <li>• Side drains (depth 500mm or greater) will be installed along all roads to prevent roadside "ponding" and surface wash;</li> </ul>	<p><b>Monitoring</b></p> <p>Monitoring of compliance with these methods of erosion control by the contractor at each site will be carried out by the supervisor and will occur by way of regular (at least once every two weeks) visual inspections to ensure that appropriate control structures have been installed and are operating effectively.</p> <p><b>Corrective Action</b></p> <p>Where visual inspection identifies that damage has occurred to areas then these shall be rehabilitated. The contractor will be reminded that these form Conditions of Contract and a failure to comply could lead to a breach of contract action being taken.</p> <p><b>Responsible Party</b></p> <p>Under the terms of the contract, the contractor will be responsible for implementing and self-monitoring the methods of erosion control detailed above. The supervisor will be responsible for monitoring each contractor's compliance with these at all sites.</p>	<p>All costs associated with these activities will be borne by the project through routine field inspection in conjunction with PMU..</p>

	<ul style="list-style-type: none"> <li>• Design drains and culverts to remove all runoff water without scour. On steep slopes culverts may need to be stepped using rock slabs or gravel in gabion baskets;</li> <li>• Ensure major roads to be used by 12-14 tonne trucks have a base of at least 300mm to reduce the need for future rehabilitation;</li> </ul>	Enforcement will be through advice and warning to the contractor, and if the failure to comply continues, through the application of Breach of Contract procedures	
<p><b>MINOR ROAD REHABILITATION; DUST CONTROL MANAGEMENT and MONITORING</b></p> <p><b>Objective:</b></p> <p>To minimize the generation of dust at along the minor roads.</p>	<p>All road contractors will apply the following methods of dust control. Compliance by the contractor will be regularly checked by the Sr Engineer:</p> <ul style="list-style-type: none"> <li>• All exposed /bare soil surfaces are to be mulched and re-vegetated as soon as practicable after clearing;</li> <li>• A staged road reconstruction plan will be followed so that road reconstruction and earthworks are completed in stages (100m stages recommended) so that only a minimal area of ground is open or clear at any one time;</li> <li>• During dry weather water spray will be used to dampen reconstruction working surfaces and gravels, newly-laid road surfaces and newly formed roadsides (including newly mulched and re-vegetated roadsides); if so directed by the Sr Engineer.</li> <li>• A speed restriction of 40 km per hour will be imposed on all gravel haul trucks;</li> </ul>	<p><b>Monitoring</b></p> <p>Monitoring of compliance with these methods of dust control by the contractor and I or gravel pit operator at each site will be carried out by the supervisor. This will comprise regular (at least once every two weeks) visual inspections to ensure that appropriate control structures have been installed and are operating effectively.</p> <p>The supervisor will also enquire of roadside householders (focussing on the women of the households) whether they have experienced any nuisance or concerns regarding dust from passing gravel trucks or the road construction works at each site.</p> <p><b>Corrective Action</b></p> <p>Where inspection indicates that one or more of the above methods have not been complied with by a contractor or gravel pit operator, the contractor or operator will be reminded that these form Conditions of Contract and a failure to comply could lead to a breach of contract action being taken.</p> <p><b>Responsible Party</b></p> <p>Under the terms of the contract, the contractor</p>	

		<p>will be responsible for implementing and self-monitoring the methods of erosion control detailed above. The supervisor will be responsible for monitoring each contractor's compliance with these at all sites.</p> <p>Enforcement will be through advice and warning to the contractor, and if the failure to comply continues, through the application of Breach of Contract procedures.</p>	
<p><b>SEDIMENTATION CONTROL MANAGEMENT AND MONITORING</b></p> <p>Objective:</p> <p>To minimise the impact of sedimentation on waterways</p>	<p>All road contractors will apply the following methods of sedimentation control. Compliance by the contractor will be regularly checked by the Sr Engineer:</p> <ul style="list-style-type: none"> <li>• Complete reconstruction works and earthworks in stages so that only a minimal area of ground is exposed at any one time;</li> <li>• Avoid earthworks during periods of high rainfall, if possible;</li> <li>• Minimise the number of discharge points from the site;</li> <li>• Construct control structures such as sumps and settlement ponds around drainage points to trap sediment;</li> <li>• Avoid discharging directly into streams or other water-bodies, or into garden areas. Site stormwater discharges should be constructed with flow breakers and should be located well away from streams and directed into areas of well-established dense vegetation that will disperse the flow over a wide area as possible to maximise rapid percolation and minimise overland flows;</li> <li>• Provide silt fences or similar around areas susceptible to erosion;</li> <li>• Protect construction sites from off-site surface runoff using bunds or trenches in order to minimise the amount of on-site stormwater and ponding;</li> <li>• Locate stockpiles and spoil-heaps away from any drainage channels or waterways, and contain them with silt fences and containment trenches;</li> <li>• Do not allow machinery to enter a watercourse unless this is</li> </ul>	<p>The supervisor will conduct regular inspections of all sites to assess the contractor's compliance with the sedimentation control measures set out above.</p> <p>Where road reconstruction crosses a permanent stream or other permanent watercourse, or where it runs adjacent to a permanent stream or watercourse, the supervisor will carry out a baseline visual inspection of the streambed, water quality (noting any turbidity or coloration of the water and water flow at one or more sites upstream and two or more sites downstream of the construction site before construction commences. In particular the visual inspection will assess and record any differences in the streambed morphology and benthic components between the upstream and downstream sites, and any changes (increase or decreases) in the water turbidity and colouration, and water flow between these sites. These inspections will be carried out on at least two occasions, one of which should be during dry weather conditions and one during or immediately following rainfall.</p>	

	<p>unavoidable;</p> <ul style="list-style-type: none"> <li>• Avoid vehicle fording of streams. If this cannot be avoided, the vehicles must be thoroughly washed down, well away from the stream before the vehicle enters it;</li> <li>• Where weirs and diversion channels are constructed around culvert installation and headwall construction works, the walls must be properly graded and compacted to minimise the risk of collapse and entrainment of sediment in the diversion channel;</li> <li>• All diversion channel bends should be constructed with as large a radius as possible to minimise the risk of undercutting of the bend walls by the diverted waterflow;</li> <li>• Diversion channel gradients should be minimised as far as practicable and where necessary flow breakers, such as rocks or widening of the channel should be installed <i>I</i> constructed to minimise flow velocities;</li> <li>• Where culvert headwalls are constructed in-situ (for example winged headwalls), a diversion channel must be constructed so that the concreting works are carried out in the dry. All construction debris and spilt concrete fines must be removed from the dry site before the flow is restored to avoid any risk of downstream contamination of the watercourse by concrete fines or other construction materials.</li> </ul>	<p>A field record including observations of water conditions (flow assessments, clarity, colour, odour and the presence of any scums), stream bed, in-stream habitats and streamside habitats, and weather will be made at each site on each occasion.</p>	
<p><b>GRAVEL EXTRACTION MANAGEMENT and MONITORING</b></p> <p><b>Objective</b></p> <p>To minimize the long term impacts of gravel extraction.</p>	<p>All contractors operating gravel pits will apply the following methods of control. Compliance by the contractor will be regularly checked by the Road Engineer:</p> <ul style="list-style-type: none"> <li>• the contractor shall prepare a Gravel Extraction Plan for each site providing a staged extraction program and specifying the measures to be taken at each site to minimise erosion and sedimentation of watercourses;</li> <li>• Where possible, extract gravel from dry gravel pits rather than gravel pits in river channels;</li> <li>• Where river gravel is extracted, machinery or equipment must not be allowed to enter the water channel, and extraction of gravels should be restricted to no closer than a minimum 5m</li> </ul>	<p>The supervisor will conduct regular (at least once every two weeks) inspections of all gravel extraction sites to assess the contractor's compliance with the control measures set out above.</p> <p>The supervisor will also ensure that regular inspection (at least once a month) of water quality upstream and downstream of the gravel extraction site is carried out throughout the period the site is operating and for at least three (3) months after all gravel extraction operations cease.</p>	

	<p>from the water channel;</p> <ul style="list-style-type: none"> <li>• under high flow conditions;</li> <li>• Ensure containment of sediment-loaded runoff and contaminants at all quarry sites;</li> <li>• Employ safety measures to avoid any loss of load from trucks;</li> <li>• Ensure stability of exposed quarry faces or overburden stockpiles;</li> <li>• Bund refuelling areas and ensure containment of any oil leaks or spillages;</li> <li>• Specify means employed to protect the channel banks, avoid discontinuities in the river bed, minimise erosion upstream and sediment loading problems downstream of the quarry site.</li> </ul>	<p>This water quality inspection program will be based on and follow a similar format to the monitoring program proposed for the monitoring of sedimentation impacts (see previous).</p> <p>A baseline series of water quality observations will be conducted by the Environmental Specialist prior to extraction operations commencing at the site and will comprise of observations carried out at three locations (one upstream, two downstream) on at least two occasions (one following a period of dry weather and one during or immediately following rainfall). A field record including observations of water conditions (flow assessments, clarity, colour, odour and the presence of any scums), stream bed, in-stream habitats and streamside habitats, and weather will be made at each site on each occasion.</p> <p><b>Corrective Action</b></p> <p>Where inspection by the supervisor indicates that one or more of the above methods of control have not been complied with by a contractor operating the gravel pit / extraction site, the contractor will be reminded that these form Conditions of Contract and a failure to comply could lead to a breach of contract action being taken.</p> <p>Where local landowners and other water users express their concern regarding water quality, the gravel extraction site will be inspected and additional methods of control implemented. Where the local landowners and other water users provide substantive comments on water</p>	
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		<p>tainting or contamination, additional water quality data will be immediately collected and expert opinion sought (see above).</p> <p><b>Responsible Party</b></p> <p>Under the terms of the contract, the contractor operating the gravel pit / extraction site will be responsible for implementing and self-monitoring the mitigation measures and methods of control detailed above: The supervisor will be responsible for monitoring each contractor's compliance with these at all sites.</p> <p>Enforcement will be through advice and warning to the contractor, and if the failure to comply continues, through the application of Breach of Contract procedures.</p>	
<p><b>PUBLIC DISRUPTION AND SAFETY MANAGEMENT and MONITORING</b></p> <p><b>Objective</b></p> <p>To minimise disruption to communities during construction</p>	<p>All road contractors will apply the following measures to minimize public disruption and ensure public safety. Compliance by the contractor will be regularly checked by the Sr Engineer:</p> <ul style="list-style-type: none"> <li>• Inform local authorities and local landowners of project plans, works schedule and location of proposed works;</li> <li>• Maximise opportunities for local employment associated with construction activities;</li> <li>• Include women's and other community groups in project activities;</li> <li>• Ensure that previously identified cultural sites are not disturbed;</li> <li>• Where objects of archaeological or historical importance are located during construction works, cease construction work and notify the Engineer who will in turn notify the PNG National Museum and other relevant authorities at local level; PPAP will not finance sub-projects which impact these sites;</li> <li>•</li> <li>• Where possible, program work such that high noise levels occur</li> </ul>	<p><b>Monitoring</b></p> <p>Regular monitoring shall be undertaken by the contractor and the supervisor by way of discussions with local residents, with a particular focus on the women, youth and elderly, to ensure that communities are not unduly affected by construction activities and that all local people are aware of the safety risks and the appropriate measures they should take to avoid injury or accident.</p> <p><b>Corrective Action</b></p> <p>Any complaints from the community will be investigated and action taken, if necessary, to minimise the specified disruption. Where inspection or substantiated complaints indicate that one or more of the above measures</p>	

	<p>during times of least impact (Le. during normal working hours avoiding Saturdays and Sundays);</p> <ul style="list-style-type: none"> <li>• Minimise noise impacts by maintaining construction equipment in good order;</li> <li>• Discuss with externally-sourced construction workers the need for considerate and safe behaviour while located in the area;</li> <li>• Raise awareness amongst landowners &amp; villagers of HIV/AIDS.</li> </ul>	<p>have not been complied with by a contractor or gravel pit operator, the contractor or operator will be reminded that these form Conditions of Contract and that a failure to comply could lead to a breach of contract action being taken.</p> <p><b>Responsible Party</b></p> <p>Under the terms of the contract, the contractor will be responsible for implementing and self-monitoring the measures to minimise public disruption and ensure public safety detailed above. The supervisor will be responsible for monitoring each contractor's compliance with these at all sites.</p> <p>Enforcement will be through advice and warning to the contractor, and if the failure to comply continues, through the application of Breach of Contract procedures.</p>	
<p><b>GENERAL SITE MANAGEMENT and MONITORING</b></p> <p><b>Objective:</b></p> <p>To provide and maintain a clean and safe working environment</p>	<p>All road contractors will apply the following methods of general site management to maintain a clean and safe working environment. Compliance by the contractor will be regularly checked by the supervisor:</p> <ul style="list-style-type: none"> <li>• Provide and maintain adequate warning signs at construction site boundaries;</li> <li>• Maintain materials used for vehicle maintenance and repair in a clearly marked and secure area;</li> <li>• Spray water on exposed surfaces, resulting from construction works, during dry periods and stabilise disturbed areas as soon as practicable to prevent dust problems;</li> <li>• Wet any spoil loads being carried in open trucks in dry weather;</li> <li>• Operate and maintain plant and equipment in accordance with manufacturer's instructions;</li> <li>• Provide an impervious and bunded area for oil and fuel transfer and</li> </ul>	<p><b>Monitoring</b></p> <p>Regular monitoring shall be undertaken by the supervisor by way of weekly (at least) visual inspection to ensure that all construction sites fully comply with the measures specified above.</p> <p>The supervisor will also enquire of local residents, with a particular focus on women, youth and the elderly, whether they have experienced any nuisance or have concerns regarding the construction site and its operations.</p> <p><b>Corrective Action</b></p> <p>Any complaints from the community will be investigated and action taken, if necessary, to minimise the specified disruption.</p>	

	<p>cleaning of equipment and vehicles;</p> <ul style="list-style-type: none"> <li>• Minimise waste generated through reduction, reuse, recycling and composting;</li> <li>• Prior to removal from site, store all waste in suitable areas/receptacles to prevent hazards such as fires, attraction to vermin or dissemination of dust;</li> <li>• Dispose of all inorganic construction waste at a Council-designated dump site;</li> <li>• Remove all disabled machinery from the project site;</li> <li>• Ensure adequate sanitation is provided for construction workers and that it does not contaminate groundwater;</li> <li>• Minimise depressions and screen areas of standing water to reduce potential for mosquito breeding;</li> <li>• Ensure occupational health and safety measures and equipment are in place on construction sites and that workers receive appropriate training/induction (including in HIV / AIDS).</li> </ul>	<p>Where inspection or substantiated complaints indicate that one or more of the above measures have not been complied with by a contractor or gravel pit operator, the contractor or operator will be reminded that these form Conditions of Contract and that a failure to comply could lead to a breach of contract action being taken.</p> <p><b>Responsible Party</b></p> <p>Under the terms of the contract, the contractor will be responsible for implementing and self-monitoring the general site management measures detailed above. The supervisor will be responsible for monitoring each contractor's compliance with these at all sites.</p> <p>Enforcement will be through advice and warning to the contractor, and if the failure to comply continues, through the application of Breach of Contract procedures.</p>	
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**Table 11: Proposed Mitigation and Monitoring Measures for Wharves and Jetties**

Subproject level impact	Proposed Mitigation Measures	Monitoring Measures and applicable indicators	Costings
Rehabilitation of wharfs and jetties	<p>Ensure works on the wharf and jetties are limited to the extent of the described works</p> <p>Design and siting, avoid sensitive areas</p> <p>Siltation control:</p> <ul style="list-style-type: none"> <li>• Silt curtains</li> <li>• Settling ponds</li> <li>• Appropriate technology (use what is practical to minimize impact of jetties or wharfs on the surrounding marine ecosystem)</li> </ul>	<p>Regular monitoring to ensure that the scope of work on the jetty and wharf are followed.</p> <p>Monitor after construction to determine if impact would have reduced and reached background levels</p>	<p>Monitoring costs to be borne by ES in his field visits. Project support with transport to sites and if silt curtain or an appropriate technology then this will need to be costed out.</p>

## **6.6.2 Environmental Monitoring**

A very important aspect of environmental management is environmental monitoring. Monitoring has two aspects. The first and simplest is compliance monitoring which basically ensures that mitigation measures are properly implemented. This is part of the supervisory activities discussed above and is generally the one that most monitoring programmes focus on. Detailed monitoring recommendations are included in Table 9 - 11 including suggested parameters and indicators.

The second aspect of environmental monitoring is impact monitoring. The main objective of impact monitoring is to determine whether the environmental mitigation measures implemented prove to be effective in reducing anticipated impacts. This monitoring allows the mitigation measures to be modified if the original measures prove to be ineffective.

Impact monitoring is the most difficult type of monitoring as it sometimes requires long term programmes, some existing expertise and adequate funding. Obviously, a clear commitment to effective environmental management is necessary in order for an impact monitoring programme to be successful.

## **6.7 Institutional Requirements for Effective Implementation of EMP**

### **6.7.1 Public Participation**

World Bank requirements OD 4.01 stipulate that the involvement of the public in any project is an important aspect of environmental management. Any road rehabilitation project in PNG is likely to have at least some impacts on local people, and their involvement at the earliest stages of project feasibility is essential, particularly where any asset loss, however minor, is likely. In addition, the particular conditions in PNG make it important for villagers to be directly involved in the maintenance works, requiring a more creative and flexible approach to contracting than is normally the case.

In PNG, the DOW works very closely with the Department of Lands in order to ensure that land acquisition issues are addressed at the earliest possible stages. It is recommended that this structure continue to be applied in the present project. The Compensation Policy Framework in Part III of the Environmental Management and Social Framework states these arrangements.

It is important that the public be advised and consulted very early in the project planning cycle in order to ensure that their concerns are properly addressed. This should be done by the PMUs. This could be simply a public notification of the intent to commence with the project and the name of the contact person within PMU or the provincial offices responsible (this could also be someone in the Department of Lands). This person should maintain involvement throughout the life of the project and be available for discussions with the local people. In EHP, the General Manager of the Eastern Highlands Development Authority (EHDA) has experience with sorting out compensation issues on Asian Development Bank (ADB) funded road projects and he would be a key person to consult.

### **6.7.2 Staffing, Technical Assistance and Training Requirements**

### **6.7.3 Technical Assistance for DAL, Cocoa Board and CIC**

The proposed Project Coordination Unit (PCU) within DAL will provide coordination of the PPAP at the national level. Discussions with the Deputy Secretary - Science and Technology and the PPAP Coordinator determined the need for Technical Assistance to support the implementation of the ESMF. The TA (Environmental Specialist) would also build capacity of key PCU and PMU staff. This Technical Assistance will be required for three months in year 1 and on a decreasing basis in subsequent years. Upon engagement, the Environmental Specialist will be required to visit the project provinces to oversee the EMP being implemented through the PPAP. S/he will also ensure that such capacity is build within the implementing agencies, and with key staff in the PMUs (Component 2 coordinator and Transport Planner/Sr. Engineer). By providing quarterly report to the DEC, the PMUs will be adhering to the requirements of the Environmental Act 2000.

The focus of the Environment Specialist would be very much that of monitoring and evaluating against the indicators that are specified in the EMP. It is hoped that during this engagement, the PPAP staff involved in Monitoring and Evaluation will be able to collaborate to ensure that their work plans synchronize and so is part of the overall project review during the project duration. The other duties would include:

1. Undertaking preliminary screening of all infrastructure subprojects to identify the need for environmental studies as per World Bank requirements and PNG regulations.
2. Coordination with DEC and other agencies on environmental matters for the PPAP.
3. Liaison with the project management offices of all donor funded infrastructure projects in order to ensure good complementarity and coordination between programs.
4. Provide environmental awareness and training on the monitoring aspects of the EMP to appropriate PMU, CIC and CB staff. A detailed training program will be prepared based on a needs assessment.
5. Development of procedures for effective environmental management. This should include the design of an effective supervision and monitoring system for environmental impacts. This would involve close co-ordination with DAL/Cocoa Board/CIC as well as the Provincial Administration.
6. Provision of input to a revision of the standard specifications for road and bridge construction in order to ensure that existing practices take into account more fully environmental aspects.

A costing for this TA together with the Terms of Reference for this position is in Annex 9.

## **7.0. Institutional Assessment and Framework For Environmental And Social Management**

### **7.1 PPAP Institutional Roles and Responsibilities**

The main institutions with key responsibilities for environment and social management are the Project Management Units in CIC and Cocoa Board and the Project Coordination Unit at DAL.

#### **7.1.1 National Level**

Overall policy guidance and coordination of the PPAP will continue to be provided through the Project Steering Committee (PSC) (section 5.1). The PSC is responsible for overseeing the implementation of the PPAP and monitoring its performance to ensure that the goals of the program are being achieved. The PSC meets at least six-monthly, and consists of representatives of the commodity boards and other stakeholders in the PPAP.

#### **7.1.2 Industry Level**

Coordination of the PPAP within the industry level will be through the PMUs, which will be situated within the Coffee Industry Corporation (CIC) and the Cocoa Board (CB). In both instances, the PMU would be responsible for daily management of project implementation.

The two PMUs would have overall responsibility for project management and performance in the Provinces that they cover<sup>15</sup>. Each PMU will be headed by a PMU Manager with expertise in the implementation of large investment programs in that respective industry.

Project Management Units would be established under both institutions to implement the project (including daily management of project activities, financial management, procurement, and reporting). The PMU based in Goroka within the CIC would be guided by a Coffee Industry Coordination Committee (Coffee ICC), which would also act as an industry-level steering committee for the PPAP. Similarly, the PMU based in Kokopo within the Cocoa Board would be guided by a Cocoa Industry Coordination Committee (Cocoa ICC), which would act as an industry-level steering committee for the PPAP. Due to the special status of ARB, a Deputy PMU Manager reporting to the Project Manager in Kokopo would be based in the Cocoa Board office in Buka. A Transport Planner would also be part of each PMU and be responsible for the implementation of Component 3.

#### **7.1.3 Institutional Roles and Responsibilities at all levels for Environment and Social Management**

Under the PMU is a Transport Planner (TP) who will be assisted by the Environmental Specialist (ES) for Component 3; similarly, for component 2 responsibilities for the ESMF will rest with the Component 2 Coordinator. They will be supported by the Provincial Lands

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<sup>15</sup> Initially East New Britain province and Autonomous Region of Bougainville for the Rabaul PMU; and Eastern Highlands, Simbu and Western Highlands provinces for the Goroka PMU.

Officer (PLO) and Community Liaisons Officer (CLO). They will be responsible for the environmental and social management. This will include:

- (i) complying with the relevant national laws regarding the environment and with all social guidelines set by the GoPNG, and all World Bank Safeguards policies;
- (ii) supervising the implementation of PPAP subproject activities according to and consistent with the provisions of this ESMF;
- (iii) ensuring that these mitigation measures are complied with during construction and post construction (i.e. operations) stages of PPAP activities, by monitoring these activities and by periodically reporting to the PMU and PCU; maintaining an adequate budget to implement the appropriate procedures and practices for their operations; ensuring that relevant mitigation measures are implemented and sustained in their operations; and
- (vi) complying with any directives that may be issued from time to time from the DEC or DAL.

#### **7.1.4 Field Assessment**

Within the PPAP provinces, the Transport Planner and the Component 2 Coordinator, supported by the Environmental Specialist together with the PLO and CLO would provide periodic and oversight monitoring to ensure no adverse cumulative impacts from the activities of the PPAPs are occurring at the district level and will provide oversight and technical assistance to the districts and provinces when required.

The Environmental Specialist will be tasked to provide to the TS and the Component 2 coordinator the following:

- (i) training on the EMP and monitoring oversight.
- (ii) on the ground ESMF performance reviews of the PPAP.

With regards to training, a programme for the training and its contents will be drawn up as soon as the Environmental Specialist is on board. The ES's duty statement has been stated in section 7.73. It is proposed that environmental officers within the provinces will also attend to gain insights into the PPAP.

## 8.0 Environmental and Social Planning, Review and Clearing Process For PPAP

### 8.1 Environmental And Social Management Process

This section identifies and illustrates the specific steps involved in the environmental and social assessment process leading towards the clearance and approval of the PPAP sub projects from an environmental and social management standpoint. This process is embedded into the overall PPAP cycle, timeline, and phasing and project implementation process for the entire PPAP. The steps listed here incorporate the requirements of both, relevant national laws and the Bank's triggered safeguards policies. The steps of the environmental and social management process are:

The **FIRST** step in the process begins at the start of the planning cycle for the preparation of the PPAP. The first step is for the potential sub project owner, implementer or operator to assign an Environmental Category for their sub project type, using Table 12, and with support from the PMU as needed.

The Environmental Specialist or in his absence the Transport Planner and Component 2 Coordinator will determine this category. As it is, all subprojects are classified B or C and will involve minimal impacts with appropriate mitigation measures proposed.

The categorization in Table 12 is based on the extent of the potential impacts and their intensity of impacts and not the generic "sub-project type", which in turn determines the extent of the environmental assessment required for it. Depending upon the nature of the sub project, its extent, and the extent of the potential impacts, the Category, and hence the level of rigor for environmental analysis, is determined. Table 12 provides a list of sub project types that are in the PPAP.

**Table 12: Potential PPAP Sub Project Types, Environmental & Social Concerns and Probable Category\***

PPAP Sub Project Type	Potential Major Environmental and Social Concerns	Sub projects Environmental Category
<b>A: Cocoa Sector</b>		
a) Management activities supporting Cocoa Pod Borer (CPB) including training on good farming systems.	None anticipated for training component	B or C
b) Provision of improved planting material (nurseries and budwood gardens) supplied to farmers to replace CPB affected trees.	None, except minor land clearing	C
c) Promotion and support for rotational planting and cocoa garden rejuvenation and market driven diversification of cocoa farming system	Minor land clearing, land erosion, species loss	C
d) Adoption of quality of cocoa through improved post harvest and processing technologies.	Minor air pollution, water pollution, firewood collection	C
<b>B: Coffee Sector</b>		
a) The supported expansion of differentiated coffees such as organically grown and certified, Fair Trade and others and these support sustainability practices.	None anticipated as it involves only facilitating of people	C
b) Improvement in training of good farming practices and also the threat of the Coffee Berry Borer (CBB).	Minor land clearing to conform to good practice	C
c) Production of improved planting material for replanting and coffee garden rejuvenation and market driven diversification of coffee farming systems.	None anticipated here	C
d) Adoption of quality of coffee through the post harvest and processing technologies.	Water pollution and water quality, construction issues	B or C
<b>C: Market Access Infrastructure</b>		
a) Rehabilitation of up to 100 km of minor roads in the project area	Land clearing, asset loss and compensation, construction issues such as spoil disposal management.	B
b) Rehabilitation of paths, wharves and jetties allowing the transportations of coffee and cocoa to be delivered to marketing or processing points	Land clearing, marine works, asset loss and compensation, species loss	B

The **SECOND** step is to determine which activities may be excluded as per the World Bank's safeguards policies.

This requires the sub project proponents /implementer/operator to use the Safeguards Tables in Annex 1. Further information on these policies is available on the Bank's website, [www.worldbank.org](http://www.worldbank.org).

The assumption is that the Environment Assessment OP 4.01 is already triggered and hence the need for compliance with this ESMF. OP 4.01 is included in Annex 1 to provide additional guidance and information to the sub project potential owner /implementer / operator. Therefore, compliance by the sub project potential owner/implementer/operator with this ESMF process is deemed to be accepted as compliance with OP 4.01.

The following Safeguards Policies are not included in Annex 1, because they are not likely to apply for the reasons noted in brackets next to the OP.

- 1.Natural Habitats OP 4.04 (exclusion of projects which involve significant conversion of natural habitats)

2. Physical Cultural Resource OP 4.11 ( not likely to affect archaeological and historical sites; “chance find” procedures to be applied)
- 3 Forests OP 4.36 (no conversion of critical forest areas – project exclusion clause)

If any of the Bank safeguards policies are triggered by sub project, the owner / implementer/operator will modify the design, implementation, operation, maintenance and decommissioning phases to ensure that the sub project satisfies the requirements of that particular policy.

The **THIRD** step is for the proponent/ implementer/ operator to prepare a comprehensive sub project Environmental and Social Impact Assessment (ESIA) including an environmental and social management plan (ESMP) (see Annex 3 for guidelines on how to prepare and ESMP). Additionally, for situations where OP 4.12 apply, the Owner/Implementer/ Operator will prepare a Community Consultation Plan.

Where Pest Management issues apply, the use of the IPMP is mandated.

Annex 2 contains an example of comprehensive terms of reference (TORs) for the ESIA.

For Category C sub projects, the owner/implementer/operator is only required to prepare an Environmental and Social Management Plan (ESMP).

Annex 3 contains guidelines for the preparation of an ESMP for Category C sub projects and what the ESMP in Category A or B sub project ESIA's should also contain.

According to PNG Law and World Bank OP4.01, Public Consultation is required as part of the ESIA and/or ESMP process.

Annex 6 has a generic guide to an acceptable public involvement process.

Step **FOUR:** Following compliance with these steps the operators submit their ESIA and or ESMP to the required authority as specified.

The ESIA for Category B sub projects will be reviewed and cleared by the DEC. The ESMP for Category C sub projects is to be reviewed and cleared by the Transport Planner/ Environmental Specialist/Component 2 Coordinator.

Annex G contains a generic Environmental and Social Appraisal Form to be used by DEC and the PMU and PCU technical staff, to provide guidance to their review, process and to notify the Provincial and Local Level Governments.

The first set of cleared ESIA's for Category A and B sub projects would also have to be reviewed and cleared by the World Bank, to ensure compliance with its safeguards policies. The World Bank reserves the right to not allow funds under the PPAP be applied to sub projects that do not meet the requirements of its safeguards policies.

## 9.0 ESMF Implementation Budget

At the moment, no costing has been done into the social management of this project and this may be considered at the Project Appraisal phase. Only the environmental cost for the Environmental Specialist is mentioned here in Annex 9.

**Table 10:** Cost for Environmental Specialist in the PPAP (in US\$)

Requirements	Costs
Position Needs	<b>63,030.00</b>
Equipment Needs	<b>11,605.00</b>
<b>GRAND TOTAL</b>	<b>74,635.00</b>

## Annex 1: Verification of Safeguards Policies triggered by PPAP Sub Projects

### I. Environmental Assessment (OP 4.01)

**Summary:** The Bank requires environmental and social impact assessment (ESIA) of subprojects proposed for Bank financing to help ensure that they are environmentally sound and sustainable. The environmental assessment is a process that is conducted to identify the negative impacts that a project may have on aspects of the biophysical and social environment. It analysis the impacts of project alternatives, provides mitigation measures to be undertaken to eliminate or minimize the impacts identified. A more comprehensive description is provided in Section 5 of these guidelines.

**Objective:** To identify potential impacts that a project may have on the environment and to provide mitigative solutions to eliminate or minimize these impacts.

The Sub project operator automatically complies with this policy by complying with the measures described in this ESMF. Preparation of ESIA's including ESMP's are required for Category B sub projects, and only an ESMP is required for Category C sub projects.

### II. Pest Management (OP 4.09)

**Summary:** The Bank supports a strategy that that promoted the use of biological or environmental control methods and reduced reliance on synthetic chemical pesticides. In its endeavour to safeguard the critical natural habitats, the Bank will use various means to assess pest management and support integrated pest management (IPM), and the safe use of agricultural pesticides: economic and sector work, sectoral or project- specific environmental assessments, participatory IPM assessments, and investment projects and components aimed specifically at supporting the adoption and use of IPM

**Objective:** To ensure that the target pest species are reduced to manageable population while ensuring pesticides use are not harmful to the human population and the natural habitats.

Questions:	Actions:
i) Will the sub project use pesticides in reducing pest population?	If 'yes', and the pesticide is a banned item under WHO regulations, the Bank will not support the sub project.
ii) Will the project be using IPM in its approach in addressing pest threats?	If 'yes', the project may proceed.
iii) Within the project, are there feasible alternatives to reduce pests for the sub project?	If, 'yes' go to the feasible alternative. If 'no', go to question iv)
iv) Do the overall benefits of the use of IPM in the sub project substantially outweigh the environmental costs?	If 'yes', the Bank may support the sub project.

<b>Other comments:</b>
In deciding whether to support a sub project that will procure pesticides, it should not be a banned substance by WHO. If there are potential institutional capacity problems of implementing the IPM, then, there will be need within the sub projects and overall PPAP to develop the capacity of national and local institutions for effective environmental and social planning of the Integrated Pest Management
The Bank expects the GoPNG to take into account the views, roles and rights of interest groups including NGOs and local communities affected by the sub project. It expects that such interested parties be involved in the planning, design, implementing and evaluating of such sub projects.

<b>III. Involuntary Resettlement (OP 4.12)</b>	
<b>Summary:</b> Bank experience indicates that involuntary resettlement under development projects, if left unmitigated, often gives rise to severe economic, social and environmental risks: production systems are dismantled; people face impoverishment when their production assets or income sources are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community institutions and social networks are weakened; kin groups are dispersed; and cultural identity, traditional authority, and the potential for mutual help are diminished or lost. Where people are forced into resettling as a result of a Bank project or a component of the project that may be under other financial arrangements, the Bank requires that those who are affected are treated in such a way so as to minimize their disruption and to compensate for their losses. The borrower will be responsible for preparing, implementing, and monitoring a resettlement plan, a resettlement policy framework, or a process framework, as appropriate, that conforms to the policy. The GoPNG has prepared the draft Compensation Policy Framework (CPF) which the operator is supposed to comply with should his sub project trigger this policy.	
<b>Objective:</b> Involuntary resettlement will be avoided.	
<b>Questions:</b>	<b>Actions:</b>
i) Is there any loss of access, restriction or denial of access to land?	Apply CPF
ii) Will the subproject result in relocation or loss of shelter?	
iii) Will the subproject result in a loss of assets or access to assets?	
iv) Will the subproject result in the loss of income sources or means of livelihood?	
<b>Other comments:</b>	
The CPF will be funded out of a fund by the GoPNG	
The full cost of compensation to achieve the objectives of the project is included in the total costs of the sub project to be paid for by the operator.	
The borrower is responsible for adequate monitoring and evaluation of the activities set forth in the CPF.	

<b>V. Cultural Property (OP 4.11)</b>	
<p><b>Summary:</b> Cultural property includes sites having archaeological (prehistoric), paleontological, historical, religious and unique natural values. The Bank will normally decline to finance a sub project that will significantly damage non-replicable cultural property, and will assist only those sub projects that are sited or designed so as to prevent such damage. The policy pertains to any project/sub project in which the Bank is involved, irrespective of the whether the Bank is itself financing the part of the project that may affect cultural property.</p>	
<b>Objective:</b> To assist in the preservation, and to seek to avoid elimination of cultural property.	
<b>Questions:</b>	<b>Actions:</b>
i) Will the sub project damage or remove cultural property?	If 'yes', the project will not finance the activity.
<b>Other comments:</b>	
<p>The Bank will assist in the protection and enhancement of cultural properties encountered in Bank-financed projects, rather than leaving their protection to chance. In some cases, the sub project is best relocated in order that sites and structures can be preserved, studied, and restored in situ. In other cases, structures can be relocated, preserved, studied, and restored on alternative sites. Often, scientific study, selective salvage, and museum preservation before destruction is all that is necessary.</p>	

## Annex 2: Outline for an Environmental and Social Impact Assessment Report

The following is a recommended outline for an ESIA that would be required for Category B PPAP sub projects. The owner/operator of the sub project for which use of PPAP funds is being sought, will be required to submit such a report if the activity falls within this category. The rigor of the environmental analysis for a Category B report will be significantly less than that required for a Category A report. In the outline accompanied by brief descriptions, the differences for addressing each of the Categories are provided where appropriate and necessary for clarity.

<b>Report Sections</b>	<b>Category A</b>	<b>Category B</b>
Executive Summary	Stand alone document; comprehensive and summarizing all of the salient points of the ESIA; not to exceed 15 pages	Same but may be shorter in length.
Acknowledgements	Acknowledgements to all of those who were instrumental in the carrying out and completion of the ESIA	Same
Introduction	Explains the purpose of the ESIA, its structure and audience; describes the WB and Papua New Guinea's needs for an ESIA	Same
Sub Project Description	Describes the sub project in detail. Describes sub project goals, objectives, beneficiaries, outcomes, value, general description schedule, and implementing bodies	Same but the more general description of the sub project may be given.
Legal and Administrative Framework	Describes the main legal instrumentation for environmental control and management, particularly specific instrumentation relating to the type of sub project (e.g. irrigation/dams), and the general effectiveness of the legal instruments. Indicates government bodies responsible for each of the relevant instruments. Lists relevant ratified international conventions and where appropriate and relevant, track record of ensuring that conventions are adhered to.  Describes the institutional framework for the administration of the relevant environmental legislation and implementation of policy, and analyzes the capacity and effectiveness of the institutions.	Same, but the analysis may not be as rigorous.
Alternatives	Discusses the various sub project alternatives that were considered and weighs the environmental merits of each. Rationalizes the selected project on various grounds including environmental	Same
Methodology	Describes how the assessment was conducted including: screening, scoping and bounding; the composition of the assessment team; the impact scoring system (if utilized) employed; the public	Same

	participation program (refer to Annex H); sources of data and information; field studies conducted and other major inputs to the assessment.	
The Bio- physical and Social Environment	Describes both the physical and social environment within which the project will take place. . This will include the soils, fauna, flora, protected areas, other special areas, biodiversity, population, ethnicity, relevant cultural patterns and traits, employment, health and relationship of the people to the resources, land use, and development patterns. Selected areas of the above will involve surveys to obtain primary data.	Same but will rely mostly on secondary data
Potential Environmental <sup>16</sup> and Social Impacts	Identifies the important potential impacts (biophysical and social), the most effective mitigation to conduct, the residual impacts to be expected, and the cumulative effect to be expected. Impacts may or may not be rated on a scale of, for instance, very significant, significant, moderately significant, low significance, or no significance  Description of those safeguard policies that may be affected and how these will be addressed.	Same, but some assessment examinations may not be as rigorous
Environmental Management <sup>17</sup>	A detailed description of how each of the impacts will be mitigated included cost, scheduling and the responsible body. Includes a monitoring procedure with schedule, cost and responsibilities, including monitoring feedback mechanism. Includes a self assessment of institutional capacity building needs for effective environmental management with a schedule and cost of various types of capacity building required.	Same
Literature cited	A complete reference to all literature cited in the conducting of the assessment and preparation of the ESIA report.	Same
Annexes	Various volumes covering separate studies (e.g. social assessment, biological studies, etc.) as well as an annex including detailed descriptions of impacts and most effective mitigation.	Same, but separate studies probably not required since most of the data will be secondary.

<sup>16</sup> Annex D contains screening forms.

<sup>17</sup> Annex E contains Generic Mitigation Measures for adverse impacts in Annex D.

## Annex 3: Guidelines for an Environmental and Social Management Plan (ESMP)

EMP Contents usually are:

- Description of adverse impacts: The anticipated impacts are identified and summarized.
- Description of Mitigation Measure: Each measure is described with reference to the effects it is intended to deal with. As needed, detailed plans, designs, equipment description, and operating procedures are described.
- Description of monitoring program: Monitoring provides information on the occurrence of impacts. It helps identify how well mitigation measures are working, and where better mitigation may be needed. The monitoring program should identify what information will be collected, how, where and how often. It should also indicate at what level of effect there will be a need for further mitigation. How environmental impacts are monitored is discussed below.
- Responsibilities: The people, groups, or organizations that will carry out the mitigation and monitoring activities are defined, as well as to whom they report and are responsible. There may be a need to train people to carry out these responsibilities, and to provide them with equipment and supplies.
- Implementation Schedule: The timing, frequency and duration of mitigation measure and monitoring are specified in an implementation schedule, and linked to the overall sub project schedule.
- Cost Estimates and Source of Funds: These are specified for the initial sub project investment and for the mitigation and monitoring activities as a sub project is implemented. Funds to implement the EMP will be part of the PPAP budget.

### Monitoring methods:

Methods for monitoring the implementation of mitigation measures or environmental and social impacts should be as simple as possible, consistent with collecting useful information, so that the sub project implementer/farmer group can apply them. For instance, they could just be regular observations of the sub project activities or sites during construction and then when in use. Are plant/equipment being maintained and damages repaired, does a water source look muddier/cloudier different than it should, if so, why and where is the potential source of contamination. Most observations of inappropriate behavior or adverse impacts should lead to common sense solutions. In some case, e.g. high emission of green house gases or loss/death of flora and fauna, there may be need to require investigation by a technically qualified person.

## **Annex 4: Environmental And Social Screening Form**

The Environmental and Social Screening Form (ESSF) has been designed to assist in the evaluation of sub-projects in the PPAP. The form is designed to place information in the hands of reviewers so that mitigation measures, if any, can be identified and/or that requirements for further environmental analysis be determined.

The ESSF contains information that will allow reviewers to determine if endangered or threatened species or their habitat, protected areas or forest are likely to be present, and if further investigation is, therefore, required. The ESSF will also identify potential socioeconomic impacts that will require mitigation measures and or resettlement and compensation.

Name of Sub project:

Name of Sub-project's sponsor:

Name of the District:

Name of the Province and LLG:

Name, department, job title, and contact details for the person who is responsible for filling out this form.

Name:

Department and title:

Name of Provincial Body:

Telephone number:

Fax number:

E-Mail address:

Date:

Signature:

### 1. Sub project Description

Please provide information on the type and scale of the sub project, sub project area, area of plants and buildings, amount of waste (solid, liquid and air generation), including construction work areas and access roads. (Complete on a separate sheet of paper if necessary).

### 2. The Natural Environment

(a) Describe the vegetation/trees in/adjacent to the sub project area

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(b) Estimate and indicate where vegetation/trees might need to be cleared

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(c) Are there any environmentally sensitive areas or threatened species (specify below) that could be adversely affected by the sub project? Yes\_\_\_\_\_ No\_\_\_\_\_

(i) Natural Forests Yes\_\_\_\_\_ No\_\_\_\_\_

(ii) National Parks Yes\_\_\_\_\_ No\_\_\_\_\_

(iii) Rivers Yes \_\_\_\_\_ No\_\_\_\_\_

(iv) Lakes Yes \_\_\_\_\_ No\_\_\_\_\_

(v) Wetlands (swamps, polder areas, seasonally inundated areas) Yes\_\_\_\_\_ No\_\_\_\_\_

(vi) Habitats of endangered species for which protection is required under Papua New Guinea laws and/or international agreements. Yes \_\_\_\_\_ No\_\_\_\_\_

(vii) Others (describe). Yes \_\_\_\_\_ No\_\_\_\_\_

### 3. River Ecology

Is there a possibility that the river ecology will be adversely affected? Attention should be paid to water quality and quantity; the nature, productivity and use of aquatic habitats, and variations of these over time.

Yes \_\_\_\_\_ No\_\_\_\_\_

#### 4. Protected areas

Does the sub project area (or components of the sub project) occur within/adjacent to any protected areas designated by government (national park, national reserve, world heritage site etc.)

Yes \_\_\_\_\_ No \_\_\_\_\_

If the sub project is outside of, but close to, any protected area, is it likely to adversely affect the ecology within the protected area areas (e.g., interference with the migration routes of mammals or birds)

Yes \_\_\_\_\_ No \_\_\_\_\_

#### 5. Geology and Soils

Based upon visual inspection or available literature, are there areas of possible geologic or soil instability (erosion prone, landslide prone, subsidence-prone)?

Yes \_\_\_\_\_ No \_\_\_\_\_

Based upon visual inspection or available literature, are there areas that have risks of large scale increase in soil leaching and/or erosion?

Yes \_\_\_\_\_ No \_\_\_\_\_

#### 6. Landscape/aesthetics

Is there a possibility that the sub project will adversely affect the aesthetic attractiveness of the local landscape?

Yes \_\_\_\_\_ No \_\_\_\_\_

#### 7. Invasive plant species along minor road routes

Is the sub project likely to result in the spread of invasive plant species (along minor road routes)?

Yes \_\_\_\_\_ No \_\_\_\_\_

#### 8. Historical, archaeological or cultural heritage site

Based on available sources, consultation with local authorities, local knowledge and/or observations, could the sub project alter any historical, archaeological or cultural heritage site (including cemeteries, memorials and graves) or require excavation near same?

Yes \_\_\_\_\_ No \_\_\_\_\_

**9. Resettlement and/or Land Acquisition**

Will involuntary resettlement, land acquisition, or loss of access to land as defined by World Bank OP4.12 be caused by sub project implementation?

Yes \_\_\_\_\_ No \_\_\_\_\_

**10. Loss of Crops, Fruit Trees and infrastructure**

Will the sub project result in the permanent or temporary loss of crops, or fruit trees ?

Yes \_\_\_\_\_ No \_\_\_\_\_

**Loss of physical infrastructure**

Will the subproject result in the permanent loss of infrastructure?

Yes \_\_\_\_\_ No \_\_\_\_\_

**11. Noise pollution during Construction and Operations**

Will the operating noise level exceed the allowable decibel level for that zone?

Yes \_\_\_\_\_ No \_\_\_\_\_

**12. Will the project have adverse impacts on Natural Habitats and not have acceptable mitigation measures according to OP 4.04 Natural Habitats?**

Yes \_\_\_\_\_ No \_\_\_\_\_

**13. Solid or Liquid Wastes.**

Will the sub-project generate solid or liquid wastes?

Yes \_\_\_\_\_ No \_\_\_\_\_

If "Yes", does the sub project include a plan for their adequate collection and disposal?

Yes \_\_\_\_\_ No \_\_\_\_\_

**14. Public Consultation Process:**

Briefly describe the sub project consultation process in terms of when consultations took place, where they took place, who participated and how the criteria used to select participants in this process, what were the contributions from the participants, was it recorded and were contributions from participants included in decision making. Use separate sheet if necessary and *attached a consultation report*.

**Broad Community Support**

**Is there broad community support for this project. Briefly describe how you make the assessment.**

**Yes                      No**

**15. Vulnerable Groups:** Were members of associations from the following vulnerable groups consulted?

W omen: Yes \_\_\_\_\_ No \_\_\_\_\_

Youth groups Yes \_\_\_\_\_ No \_\_\_\_\_

Other groups  
( e.g. orphans, widows/widowers, the elderly, ) Yes \_\_\_\_\_ No \_\_\_\_\_

*If answer is Yes, provide names of groups consulted*

:

**16.** Will these groups ( in 15. above) have access to and benefit from this sub project.?

Yes \_\_\_\_\_ \_ No \_\_\_\_\_

*If answer is Yes, specify which groups and describe how they will benefit.*

## **Annex 6: Generic Guidelines for Preparing and Implementing a Public Consultation Plan for an ESIA**

The purpose of community involvement is not to find the 'right' answer from the community, but to engage the community in the sub project so that they can share ownership and to give them the opportunity to inform the design process. It will also give the community the comfort of knowing early on in the process the mechanism through which affected individuals/households will be treated. In developing a strategy for public involvement there are a number of key issues that must be considered:

- Define goals clearly
- Secure commitment to effective implementation
- Plan consultation timing and phasing
- Provide adequate resources
- Be aware of site specific sensitivities
- Be aware of the historical context
- Recognize the interest of developers/operators
- Be prepared to hear different views.

**In planning for the process of a public involvement program, the following principals must be followed:**

- Identify all stakeholder groups (typically integrated with social assessment). Who will be affected directly and indirectly? Who else might have an interest or feel that they are affected?
- Identify the key issues around which public involvement will be required (scoping). These key issues would include:
  - environmental and social issues or decisions at stake
  - key organizations and interested parties involved
  - local authorities and the agencies involved
  - size of the issue or importance of the decision
  - urgency and time frame
- Understand the decision making process
  - identification of parties making the decisions
  - where in the project cycle decisions are made
- Determine the necessary level of involvement. Meaningful public involvement
- takes place at three levels:
  - conveying information to the public
  - listening to the opinions and preferences of the public
  - involving the public in making decisions

The nature and size of the project, combined with both the nature and number of stakeholders and the status of national legislation, will largely define when, where, and at what level public involvement is required for an EA and the environmental management plan.

- Identify key points to be included in the public involvement process

Timely disclosure of information is key and it may be useful to develop systems to ensure that stakeholders receive information on time and in an accessible format. Whilst it is important that consultation take place before major decision points, the aim should be to facilitate consultation throughout the preparation and implementation phases. This implies that consultation will often be necessary as part of the research effort of the EA and in the development of mitigation measures during the analysis phase of the study.

- Select most effective involvement techniques to be used
- Define a communication methodology
- Develop a budget

## **Annex 7: Environmental And Social Appraisal Form (ESAF)**

The Environmental and Social Appraisal Form (ESAF) has been designed to assist in the evaluation of PPAP sub project packages sent for review. The form is designed to place information in the hands of the Transport Planner, Component 2 Coordinator and Environmental Specialist and the DEC so that the respective PPAP sub project proposal/package applications for environmental and social clearance can be reviewed and cleared.

The ESAF contains information that will allow reviewers to determine the characterization of the prevailing local bio-physical and social environment with the aim to assess the potential sub project impacts on it. The ESAF will also identify potential socio-economic impacts that will require mitigation measures and or resettlement and compensation.

PPAP Sub project Application Number:.....

### **Part 1: Identification**

1. Name of District: Name of Owner/Operator:
2. Sub project Location ( this may be more than one location for a sub project package):
3. Reason for Field Appraisal: *Summarize the issues from the ESIA or ESMP that determined the need for a Field Appraisal.*
4. Date(s) of Field Appraisal:
5. Field Appraisal Officer and Address:
6. Extension Agent/Service Provider/Owners/Operators ESIA Consultant's Representative and Address:
7. Owners/Operators Representative and Address:

### **Part 2: Description of the Owners/Operators Sub project Application**

8. PPAP Sub project application Details: *Provide details that are not adequately presented in the sub project application. If needed to clarify application details, attach sketches of the subproject component(s) in relation to the community and to existing facilities*

### Part 3: Environmental and Social Issues

9. Will the sub project:

- Affect an individual or the community's access to land or available resources?  
Yes \_\_\_\_\_.No\_\_\_\_\_.
- Displace or result in the involuntary resettlement of an individual or family?  
Yes\_\_\_\_\_.No\_\_\_\_\_.

**If Yes, the subproject cannot be financed**

10. Will the sub project:

Affect an individual or the community's access to land or available resources?

Yes \_\_\_\_\_.No\_\_\_\_\_.

Impact assets such as trees and cash crops

Yes                      No

**If "Yes", tick one of the following boxes:**

- The Compensation Plan (CP) included in the subproject application is adequate. No further action required.
- The CP included in the subproject application must be improved before the application can be considered further.
- A CP must be prepared and approved before the application can be considered further.

10. Will the sub project:

- Encroach onto an important natural habitat? Yes \_\_\_\_\_ No\_\_\_\_\_.
- Negatively affect ecologically sensitive ecosystems? Yes \_\_\_\_\_ No\_\_\_\_\_.

**If "Yes", tick one of the following boxes:**

- The ESIA and or ESMP included in the operators application is adequate. No further action required.
- The ESIA and or ESMP included in the operators application must be improved before the application can be considered further.
- An EMP must be prepared and approved before the application can be considered further.

11. Will this project involve or result in:

- Diversion or use of surface waters?

**If "Yes", tick one of the following boxes:**

- The application describes suitable measures for managing the potential adverse environmental effects of these activities. No further action required.
- The application does not describe suitable measures for managing the potential adverse environmental effects of these activities. An Environmental Management Plan must be prepared and approved before the application is considered further.

12. Are there any other environmental or social issues that have not been adequately addressed?

If "Yes", summarize them:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

and tick one of the following boxes:

- Before it is considered further, the application needs to be amended to include suitable measures for addressing these environmental or social issues.
- An Environmental Management Plan needs to be prepared and approved before the application is considered further.

**Part 4: Field Appraisal Decision**

- The sub project application can be considered for approval.**

Based on a site visit and consultations with both interested and affected parties, the field appraisal determined that the community and the proposed operator adequately address environmental and/or social issues as required by the PPAP's ESMF and meets the requirements of Environment Act 2000, in Papua New Guinea, DEC and the World Bank OP4.0.1

- Further subproject preparation work is required before the application can be considered further.**

The field appraisal has identified environmental and/or social issues that have not been adequately addressed. The following work needs to be undertaken before further consideration of the application:

\_\_\_\_\_  
\_\_\_\_\_

All required documentation such as an amended application, EMP, CCF, . Screening Forms, draft Civil works contracts, etc., will be added to the operators application package before it is considered further.

Name of Transport Planner, IT Specialist, Environmental Specialist and DEC's Head of EIA Division (each to sign and print name):

.....

Signature:

.....

Date: .....

## **Annex 8: Environmentally Sensitive Areas (ESA'S) And Ecosystems In PNG**

1. Areas prone to natural disasters (geological hazards, floods, rain storms, earthquakes, landslides, volcanic activity, etc.)
2. Wetlands: ( Flood plains. Swamps, lakes, rivers, etc.) water bodies.
3. Areas susceptible to erosion e.g. (a) hilly areas with critical slopes and (b) unprotected or bare lands.
4. Areas of importance to threatened cultural groups.
5. Areas with rare/endangered/or threatened plants and animals.
6. Areas of unique socio-cultural, historic archaeological, scientific, tourist areas.
7. Polluted areas.
8. Area subject to desertification and bush fires.
9. Coastal areas and Marine ecosystems, such as coral reefs, Islands, lagoons and estuaries, continental shelves, beach fronts and inter tidal zones.
10. Areas declared as, national parks, water shed reserves, forest reserves, wildlife reserves and sanctuaries, sacred areas wildlife corridors and hot spring areas.
11. Mountainous areas, water catchment areas and recharge areas of aquifers.
12. Areas classified as prime agricultural lands or range lands.
13. Green belts or public open spaces in urban areas.
14. Burial sites and graves.

## **Annex 9: Provision of a TOR for the Environmental Specialist**

### **1.0 Introduction**

{Insert project background information }

To guide the PPAP, an ESMF including an Environmental Management Plan (EMP) has been prepared to assess the potential impacts, both negative and positive, associated with the PPAP and these have appropriate mitigation measures to reduce these impacts. The requirements of the EMP would then be adhered to by having the environmental specialist through a consultancy, visit the PPAP provinces and monitor by the EMP and the equipments purchased.

Within the three components of the PPAP, emphasis on the potential impacts associated with component 2 and 3 where component 2 focuses on Productive Partnerships and component 3 is on Market Access Infrastructure. The productive partnership with the private sector involves the coffee and cocoa industry and associated impacts with them. Market Access Infrastructure focuses more on rehabilitation of minor roads and the wharves or jetties associated with the production and exportation of the two focus commodity crops.

In undertaking of the environmental management of the PPAP, the Environmental Specialist could benefit from the environmental management experience of the Department of Works in road rehabilitation through close contact with the DOW environmental officer funded under the Road Maintenance and Rehabilitation Project.

Upon engagement, the Environmental Specialist will be required to visit the project provinces during each quarter to oversee the EMP being implemented through the PPAP. By providing quarterly report to the DEC, the PPAP will be adhering to the requirements of the Environmental Act 2000.

The focus of the Technical Assistance would be very much that of monitoring and evaluating against the indicators that are specified in the EMP. It is hoped that during this engagement, the PPAP staff involved in Monitoring in Evaluation will be able to collaborate to ensure that their work plans synchronize and so is part of the overall project review during the project duration.

### **2.0 Terms of Reference**

His/her other duties within a Terms of Reference would be;

Undertaking field visits to the three PPAP provinces to undertake environmental management of the components of the PPAP. This will involve discussions with appropriate personnel at the PMU.

Undertake a preliminary screening of all infrastructure projects to identify the need for environmental studies as per World Bank requirements and PNG regulations.  
 Coordination with DEC and other agencies with respect to submitting of requests for pesticides and monitoring procedures as needed by the PPAP partnerships.  
 Liaison with DEC on the ongoing discussion and approval of environmental management guidelines for road and bridge projects  
 Development of procedures for effective environmental management within the PPAP during the project duration incorporating the EMP. Provision of input to a revision of the standard specifications for road and bridge construction in order to ensure that existing practices take into account more fully environmental aspects. Upon project quarterly visits to the PPAP provinces, provide a written report to both the PMUs in EHP, ENB and ARB and PPAP Coordination Office in Port Moresby.

### **3.0 Monitoring**

Monitoring in the PPAP will consist of firstly determining baseline information which should show the current status of the water quality of a river during both the wet and dry season. The locations of the wet factories are not yet known although the current coffee factories locations are known and as soon as the equipment is procured, then these baseline measurements can be done. From these, a benchmark will be set from which to compare periodic monitoring results. Within Annex 2 of the EMP, there are suggested parameters and indicators such as pH, temperature, dissolved oxygen, turbidity and conductivity which will be determined prior to the start of the projects.

Once baseline data are established then, compliance monitoring can take place. Mitigation measures put in place would be checked to ensure that these are working satisfactorily and hence reducing impacts to background levels. Impact monitoring will need to be developed however given the scale of works in the PPAP, it is not envisaged to be a big problem and would only be an exercise that is not necessary. It may be essential for the engineers to be given some training or awareness on the monitoring activities by the environmental specialist.

### **4.0 Monitoring Requirements**

The minor roads in the PPAP have the most environmental impacts during the construction phase when road preparation and earthworks are undertaken.  
 In the EMP, that aspect is covered in three ways either as;

- a design guideline,
- as a suggested clause in the contract, and
- an inclusion into the Bill of Quantities (and usually also in the contract).

During the absence of the Environmental Specialist, the Transport Planner (TP) together with the Design and Supervision Consultant within each Project Management Unit (PMU) in EHP and ARB will oversee environmental management of these minor roads.

For environmental management matters within the coffee and cocoa industries, these will be overseen by the Monitoring and Evaluation Unit in the Coffee Industry Corporation (CIC)

and an office within the Cocoa Board. The Environmental Specialist upon appointment will visit these provinces and discuss these matters with the mentioned officer.

### 5.0 Equipment Specification

Equipment requirements for the PPAP within DAL would be procured and left within the care of the the PPAP Coordinator. Here equipment falls into two categories namely computer support and field equipment. The computer support will address all responsibilities with an emphasis on 1 and 8 in the Terms of Reference.

The computer support will be a laptop computer and a digital camera, a dual colour and black and white printer and a scanner. The software would consist of Windows XP Operating System, MS Office Software together with the (Papua New Guinea Resource Information System (PNGRIS) database and also others such as MASP, and other Provincial and Local Level Government databases. The environmental specialist will have knowledge of the PNGRIS and the other database so that he or she can relate these databases and gather appropriate information for the PPAP. Office space and an air condition unit is essential within the PPAP office for computer maintenance and staff comfort, although this is not included here.

Field equipment will consist of portable instrumentation to measure parameters that are of significance to the project. Not a lot of parameters such as heavy metals would be produced from the PPAP and as such there will be no need for its determination. However, should there be a need then such measurements can be determined at commercial laboratories such as the National Analytical Laboratory (NAL) in Lae or the National Agriculture Research Laboratory in Port Moresby(NARI) NARI is also a partner in PPAP and this relationship could be strengthen through this engagement. In addition, a portable laptop is necessary for report compilation whilst out in the field and other items such as a Global Positioning System (GPS) for accurate location of facilities when reporting. Full specifications are given in Table 1.

**Table 1: Specifications for Equipments for the Environmental Specialist**

Equipment	Specification	Purpose and Remarks
Laptop computer	Original brand, 160GB Hard Disk 2Gb RAM 2 GbMHz co processor Core Duo Processor with internal modem for wireless internet access	For report compilation whilst out on the field for feedback to PPAP and PMU offices, DEC and other stakeholders. It would involve a complete set of PNGRIS and other database as the desktop computer.
Complete MS Office 2000 Suite	IBM Compatible software	Essential for MS Office applications.
Laser Jet Printer	Dual colour and black and white printer	To print out reports and also other documentation for the project
Digital camera	3.1 Mega Pixel, 2 Gb Picture Card	To ensure that images of projects are captured quickly for the compilation of environmental reports
Scanner (Dual colour and black and white)	A4 with text options	To scan in documents that cannot be captured on camera

Water Quality Meter & consumables (calibration kits etc)	Instrument that can measure pH, temperature, dissolved oxygen, electrolytic conductivity, turbidity and, salinity insitu	Portable and robust instrument with a digital readout that does not need daily calibrations. Must have powerful sensor with state of the art functions
Global Positioning Systems	Instrument to determine exact location	This will be to provide accurate information on setup of facilities that can aid monitoring during the project. Information will be down loaded onto computers for reporting.

## 6.0 Equipment Costs

Preliminary costing based on the approximate value of equipments is given here. VAT and other taxes have not been calculated in fully however as a guide, it is hoped this would equate to real prices.

**Table 2: Equipment Costs for the Environmental Technical Assistance**

Item	Quantity	Cost (USD)	Total Costs (USD)
Complete Office 2000 Suite	1	250	250
PNGRIS software and other databases	1	250	250
Laptop computer	1	2000	2000
Laser Printer	1	600	600
Digital camera	1	400	400
A4 Scanner (Dual colour and black and white)	1	150	150
Water Quality Meter & consumables (calibration kits etc) Horiba U22	1	5000	5000
Global Positioning System	1	500	500
		<b>TOTAL</b>	<b>10,550.00</b>
		Incidentals (10%)	1055.00
		<b>GRAND TOTAL US\$</b>	<b>11,605.00</b>

## 7.0 Training Requirements

It is not envisaged for full training to be given to the engineers within the project and it may require a brief overview of the EMP and the need to determine the potential effluents from the project's activities hence, this would not be an additional cost to the project.

It may be given during the first trip when the environmental specialist visits the project areas and then given in the new provinces when they are included. The Environmental Assessment would then need to be undertaken from then. These are additional costs not included in this determination and will need to be considered by the PPAP Coordination Office and the PMUs.

## 8.0 Costings for the Environmental Specialist

The Environmental Specialist will be required for three calendar months during each year of the PPAP and the person will need to be on a retainer basis for the full period of the project.

This will be to allow consistency in reporting and feedback to both the PPAP Coordination Office, PMU in the provinces, World Bank, DEC and other stakeholders.

Hence, the costing for this are;

Item	Rate (US\$)	Total (US\$)
Consultancy fees for 90 days	450	40,500
DSA for 80 days	120	9,600
Airfares to EHP,ENB, & ARB Return	1800 x 4	7,200
SubTotal		57300
Incidentals	10% of total costs	5,730
Total		Grand 63,030

## 9.0 Conclusion

The grand total as calculated for the Environmental Specialist and the equipments are as follows

- Position Needs                      63,030.00
- Equipment Needs                11,605.00

**GRAND TOTAL                      US\$ 74,635.00**

Equipments should be purchased earlier on so that the tools for monitoring can be demonstrated to the engineers out in the PPAP provinces. The equipments can also be used for other environmental monitoring work and it is in this regard that the PPAP can play an important role in determining impacts within sectors other than the PPAP in the provinces.