

Framework Contract AMS/451 Lot N°6
Request for Services N°2005/102581

Country Environmental Profile

Papua New Guinea

Final Report

February 2006



This project is funded
by the European Union



A project implemented
by MWH

This report is financed by the European Commission and is presented by Mr. Wayne Borden and Mr. Gareth Ward of MWH SA for the Government of Papua New Guinea and the European Commission. It does not necessarily reflect the opinion of the Government of Papua New Guinea or the European Commission.

INDEX

LIST OF FIGURES	V
LIST OF TABLES.....	V
LIST OF ABBREVIATIONS	VI
1. EXECUTIVE SUMMARY	1
2. STATE OF THE ENVIRONMENT	4
2.1. Country Profile	4
2.2. Physical Environment	4
2.2.1. Air and Climate	4
2.2.2. Land Based Resources	5
2.2.3. Water Resources	5
2.2.4. Natural Disasters and Risks	6
2.3. Biological Environment	6
2.3.1. Biodiversity	6
2.3.2. Forest Resources	8
2.3.3. Marine Resources	9
2.3.4. Pressures on the Environment	10
2.4. Socio-Economic and Socio-Cultural Conditions and Human Health	10
2.4.1. Waste Disposal	11
2.4.2. Health	12
2.4.3. Climate change	12
2.4.4. Loss of resources (biodiversity, marine resources etc)	12
2.5. Indicators	13
3. ENVIRONMENTAL POLICY, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK	15
3.1. Environmental policy and legislation	15
3.1.1. Policy	15
3.1.2. Legislation	15
3.1.3. Land Tenure Issues	17
3.1.4. International Treaties, Conventions and Agreements	18
3.1.5. Climate Change	18
3.2. Environmental institutional framework	19
3.2.1. Legislative institutions	19
3.2.2. Main Government Sector Institutions	19
3.2.3. Institutional Capability	21
3.2.4. Environmental Co-ordination between Government Sector Institutions	22
3.2.5. Civil Society organisations	22
3.2.6. Universities and Colleges	23
3.2.7. Planning and Monitoring	23
3.2.8. Governance and Enforcement	24
3.2.9. Institutional Capacity and Human Resources	24
3.3. Integration of environmental concerns into the main sectors	24

3.3.1. <i>Main Environmental Issues</i>	24
3.3.2. <i>Main Sectors for Environmental Integration</i>	25
4. EU AND OTHER DONOR COOPERATION WITH THE COUNTRY FROM AN ENVIRONMENTAL PERSPECTIVE	32
4.1. <i>International Cooperation</i>	32
4.1.1. <i>Donors and Regional Institutions:</i>	32
4.2. <i>European Commission</i>	33
4.2.1. <i>Rural development and environment</i>	34
5. CONCLUSIONS AND RECOMMENDATIONS	36
5.1. <i>Conclusions</i>	36
5.2. <i>Recommendations</i>	38
5.2.1. <i>Areas of support</i>	38
5.2.2. <i>Approach</i>	40
APPENDIX 1. ENVIRONMENTAL MAPS OF THE COUNTRY	41
APPENDIX 2. LIST OF DOCUMENTS CONSULTED	42
APPENDIX 3. INTERNATIONAL ENVIRONMENTAL TREATIES, CONVENTIONS AND AGREEMENTS RATIFIED BY PAPUA NEW GUINEA	44
APPENDIX 4. ORGANISATIONAL STRUCTURE OF THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION	45
APPENDIX 5. ENVIRONMENTAL NGOS WORKING IN PNG	46
APPENDIX 6. SUMMARY OF ENVIRONMENTAL ISSUES	47
APPENDIX 7. CO-ORDINATION MATRIX FOR KEY EXTERNAL ASSISTANCE	50
APPENDIX 8. LIST OF PERSONS/ORGANISATIONS CONSULTED WITH THEIR AFFILIATION AND CONTACT DETAILS	54
APPENDIX 9. LIST OF PARTICIPANTS AT THE CONSULTATIVE WORKSHOP, HELD AT ELA BEACH HOTEL, PORT MORESBY, 25TH NOVEMBER 2005.	59
APPENDIX 10. STUDY METHODOLOGY/WORK PLAN	61
APPENDIX 11. REFERENCE LIST OF ENVIRONMENTAL POLICY DOCUMENTS, STATEMENTS AND ACTION PLANS AND OTHER RELEVAT TECHNICAL INFORMATION	64
APPENDIX 12. TERMS OF REFERENCE FOR THE COUNTRY ENVIRONMENTAL PROFILE	66
APPENDIX 13. CONSULTANTS CURRICULA VITAE	71

LIST OF FIGURES

Figure 1: Official Development Assistance to PNG 1992 - 2002 (% of total)	32
Figure 2: Map of Papua New Guinea	41
Figure 3: Regional Map of Australasia	41

LIST OF TABLES

Table 2.1: Terrestrial Biodiversity in PNG.	7
Table 2.2: Summary of Forest Resources in Papua New Guinea.	8
Table 2.3: Features of PNG's Marine and Coastal Zone.	9
Table 2.4: Millennium Development Goals (MDG) Indicators for the Environment	14
Table 4.1: Sectoral Involvement of Development Organisations (excluding EC) in PNG.	33

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ARD	Acid Rock Drainage
CDR	Clean Development Mechanism
CEP	Country Environmental Profile
CER	Certified Emission Reductions
CI	Conservation International
CITIES	International Convention on Trade in Endangered Species
CSP	Country Strategy Paper
DAL	Department of Agriculture and Livestock
DEC	Department of the Environment and Conservation
DFID	Department For International Development (UK)
EC	European Commission
EEZ	Exclusive Economic Zone
EA	Environment Act
EU/EC	European Union/European Commission
EIA	Environmental Impact Assessment
EVI	Environmental Vulnerability Index
FAO	Food and Agricultural Organisation of the United Nations
FMA	Forest Management Area
GDP	Gross Domestic Product
GEF	Global Environment Fund
GoPNG	Government of Papua New Guinea
HKL	Highlands Kainantu Limited
IUCN	International Union for the Conservation of Nature
JICA	Japan International Cooperation Agency
K (i.e. K24 million)	Kina, the Papua New Guinean currency unit
ktC	Kilotons of Carbon
MDG	Millennium Development Goal(s)

List of Abbreviations Continued

MT	Metric Tons
NCD	National Capital District (The administrative district that governs Port Moresby)
NGO	Non-Government Organisation
NFA	National Fisheries Authority
NIP	National Indicative Programme
NDMO	National Disaster Management Office
NGO	Non Governmental Organisation
OECD	Organisation for Economic Cooperation and Development
PM ₁₀	Particulate matter with a maximum diameter of 10 microns which has a potential to harm human health.
PNG	Papua New Guinea
PNGFA	Papua New Guinea Forest Authority
PNGSDP	Papua New Guinea Sustainable Development Programme
SEA	Strategic Environmental Impact Assessment
SIDS	Small Island Developing States
SOPAC	South Pacific Applied Geoscience Commission
SPREP	South Pacific Regional Environment Programme
SYSMIN	Mining Sector Support Programme
TOR	Terms of Reference
UNDP	United Nations Development Programme
UPNG	University of Papua New Guinea
USD	United States (of America) Dollar
UV-B	Ultra Violet (light)
WWF	World Wide Fund for Nature

1. EXECUTIVE SUMMARY

The environment and attendant biodiversity of Papua New Guinea has escaped much of the degradation witnessed in neighbouring countries, thanks more to the rugged terrain, absence of infrastructure and the traditional land tenure system than to any environmental management on the part of Government, individuals or the private sector. However, some areas of the country have experienced significant levels of degradation, generally related to resource extractions (i.e. mining and logging) and there are serious future threats that need to be addressed with more vigour than heretofore.

With few exceptions the environmental legislation in PNG provides a coherent and comprehensive basis for environmental management. What is lacking is the implementation of the policies and regulations. There appear to be two main constraints – the lack of financial capacity for those responsible for applying the law (a symptom of lack of will), and interference in central government department operations.

Most stakeholders conclude that while there are some technical issues to be solved in certain areas (e.g. capacity strengthening), most environmental issues should be seen as symptoms rather than the primary problem to be solved. The underlying causes for these environmental issues are primarily related to the high levels of poverty amongst the population of PNG and expedient governance. Poverty, particularly rural poverty, leaves communities vulnerable to the corrupt and exploitative practices of developers (e.g. logging companies) and often with little apparent choice. For this reason environment should be treated as a major cross-cutting component in all development initiatives.

Specific environmental or environmental related issues in PNG include:

- a lack of resources within DEC and a lack of will within government;
- social and economic issues that result in poverty and lack of education resulting in underselling natural resources to developers with little interest in sustainable harvesting;
- waste management from all sectors including mine tailings and effluent associated pollution;
- unsustainable harvest of resources, primarily unsustainable logging and fishing practices (including introduction and management of exotic species).
- land use changes that can lead to a reduction in biodiversity habitat and pollution of freshwater and marine resources.

It seems unlikely that environmental projects *per se* will be good investments. Environment and sustainable production should be one part of the greater picture centred on sustainable livelihood opportunity generation.

For ordinary Papua New Guineans, the main environmental concern is the continued access to traditionally held natural resources for the provision of food and water. Traditionally held lands sustain the 85% of PNG's 5.7 million citizens who still live in villages and rural communities, nearly all of whom rely to a large extent on subsistence agriculture and/or fishing. Any degradation of the country's natural resources has a potentially catastrophic effect on the livelihoods. These people are probably also the most disadvantaged in terms of education and access to other public services. Thus they are understandably vulnerable to offers to sell their inherent resources (e.g. the timber on

their land) as a solution to an immediate problem (e.g. children's school fees) and can be victims of promises not kept. While Government, at all levels, can set policy and promote sustainable management of the environment, effective implementation of that policy is in the control of the traditional communities, since in PNG, 97% of land is traditionally owned and 3 % is alienated land.

Given the above, it is strongly recommended that future development assistance to PNG should focus primarily on the rural sector, addressing environmental issues by addressing poverty alleviation and economic development. This will enable the GoPNG to achieve the Millennium Development Goals as set out in the Papua New Guinea (Millennium Development Goals Progress Report 2004b).

Environmental projects *per se*, are not likely to be the key to improving environmental management in the rural communities. Environment and sustainable production must be part of the greater picture. The main focus should be sustainable livelihood opportunity generation. This is not to exclude other sectors or projects where the main focus is environmental management (e.g. urban waste management). To achieve sustainable rural development issues of governance, planning and policy making at all levels of government may also need to be addressed. But the main focus should be mainstreaming environment into projects where the rural communities are the main beneficiaries.

The findings of the CEP mission indicate that development in the following areas would have concurrent benefits in sustainably managing the environment:

- addressing livelihood and poverty alleviation through improved agricultural technologies and sustainable forest and marine harvesting;
- integration of resource management (for example, linking watershed management with sustainable resource use, energy production, rural livelihood opportunities, nature-based tourism development, etc.);
- working with communities and NGOs to initiate self-help and diverse income generation opportunities; and
- raising environmental awareness and awareness of legal rights in regard to traditional resources and the long-term consequences of indiscriminate exploitation of those resources.

EU support to PNG in future should focus on assisting rural communities to meet the needs of the twenty first century. Future development interventions should address livelihood and educational issues within the communities, working with community leaders and NGO's to initiate self help and diverse income generating opportunity, improve levels of education and awareness of the environmental consequences of indiscriminate exploitation of those natural resources. Any such developments would need to be holistic and should focus on the whole community, assisting beneficiaries to develop skills and business opportunities, and assisting in developing markets for goods and services produced as a result of project interventions.

Interventions that encourage and support the small community business initiatives should be part of any rural development project. Such assistance could include environmental awareness and education programmes and nature-based tourism development.

While the demand for capacity building within National Government Departments will continue, there seems to be little advantage in pursuing projects in these areas if there is no operational budget or higher level commitment to the environment. Rather than focus on National Government the findings of the CEP indicate that assistance be given to:

- national resource management planning. This could also include assistance with resource inventory, codes of practice (such as the one on Oil Palm Processing), impact studies (such as deep sea tailings deposition), succession processes following logging operations (e.g. impact of serial cutting), etc.;
- education materials and facilities that focus on environmental awareness to assist the Department of Education and schools to achieve the objectives of the environment component of the curriculum;
- strengthening capability of provincial and local area government officials to assume responsibilities allowable under the Organic Law;
- facilitate the understanding of future environment management responsibilities between Central and Local Governments.

On the premise that every action has an impact (whether direct or indirect) on the environment, no proposed project should be accepted unless it has had been at least screened for environmental impacts and a management plan incorporated to deal with the identified impacts. Such an approach need not be onerous and would mainstream environment at the heart of any development. The introduction of SEA into the project identification process would further mainstream environment, and assist the decision process. The main constraint at the moment in PNG is that there appears to be little knowledge of application and benefits of SEA.

Mono-culture concerns notwithstanding, plantation agriculture has perhaps the best potential for absorbing rural labour and spreading wealth more equitably throughout the county, but there is a need to address the attendant environmental and social issues.

2. STATE OF THE ENVIRONMENT

To date the Department of the Environment and Conservation (DEC) has not been able to produce a State of the Environment Report. The various sectors (e.g. mining) have addresses the issue in their sector reports but these have not been synthesised into one overall report authorised by the DEC. The Asian Development Bank, World Bank and the United Nations Development Programme have prepared reports in the past 2 -3 years to meet their programme requirements.

2.1. COUNTRY PROFILE

Covering a land area of some 460,000 square kilometres (sq km), PNG is the largest of all Pacific Island nations. Its population of approximately 5.7 million is sparsely scattered over this large land area, with an average density of 12 persons per sq km, as compared to 45 persons/sq km in Fiji and 114 in Indonesia (MTDS 2004). Topographically, PNG's varied and rugged terrain supports an extraordinary range of ecosystems.

2.2. PHYSICAL ENVIRONMENT

2.2.1. Air and Climate

To date, air quality in PNG remains good as a result of low population densities and low levels of industrialisation. PNG is not a major emitter of greenhouse gases (GHGs), and successfully utilises hydropower and natural gas resources for energy production. The Yonki hydropower facility is one of the most successful energy development projects in the country and supplies electric power to all the highlands provinces, Morobe and Madang. Given the extensive river systems throughout the country, there is further potential for hydropower development, especially small-scale systems.

PNG has large reserves of clean-burning natural gas. At present, a small operation utilizing the Hides gas-field of the Southern Highlands is being used to power the Porgera Mine. Much greater potential for developing natural gas resources exists, especially in the Moran area, Southern Highlands. There is also scope for the use of alternative fuels in PNG including biomass, biogas, and potentially bio-diesel for energy production.

In PNG current weather patterns may indicate the types of impacts that could be expected to occur as a result of major climatic change (global warming). One example was the serious drought that affected much of the country in 1997-1998, which was linked to the large-scale El Niño/La Niña weather phenomenon. Other types of natural disasters including extreme rainfall events, drought, high sea levels, extreme winds and extreme air temperatures already affect thousands of people in PNG, and may further intensify or become more frequent with global warming.

Air Pollution

Though not reported at the time, PNG was subject to large-scale fires during the 1997-1998 El Niño event, and as in adjacent Indonesia, parts of the country experienced a severe deterioration in air quality. Subsequent analysis of remote sensing data at the University of PNG (UPNG) is providing new information regarding forest and land fires in PNG. Large numbers of small fires are regularly reported across the country both in grassland and forest habitats. This suggests that PNG forests are (perhaps increasingly) at risk from large scale fires and consequent deterioration in air quality, at least in parts of the country affected. At the moment reported fires are generally associated with the

burning of grassland areas. Whether this is done for hunting or clearing for planting, or through negligence, in a prolonged drought such fires could lead to larger uncontrolled burning with consequent air pollution and loss of natural resources and biodiversity.

2.2.2. Land Based Resources

Land Resource

During the 1990's, the Papua New Guinea Resource Information System (PNGRIS) Programme prepared detailed inventory and maps of the country's natural resources, including the land resource. This work provides a good base for future development planning. The EU, through its Stabex facility is currently assisting the UPNG to update this database.

Mineral and Petroleum Resources

Mineral resources in PNG include: Copper, Gold, Nickel, Zinc, Cobalt, Chromite, Manganese and Silver. PNG is currently ranked as the 11th largest gold producer in the world and 13th in terms of copper production (World Bank 2002). All of the mining activities since 1970 have produced approximately 2,000 metric tons (MT) of gold, almost 2,000 MT of silver and over five million MT of copper. There are still huge deposits of undeveloped mineral resources spread across the country. Current world prices have sparked a new wave of prospecting.

Significant oil and natural gas deposits are found in PNG, with the petroleum sector contributing around 9% to GDP. In 1991, the Hides project started generating gas for electricity for the Porgera gold mine. Commercial oil started flowing from the Kutubu field in 1992 and from the Gobe field in 1998. A development license was issued for the Moran field in 2001. Further exploration has also been actively promoted, and numerous basins that hold petroleum deposits have been identified. The country's first oil refinery started operating in Port Moresby in 2005. A pipeline is being planned that would deliver natural gas from the PNG Highlands to Queensland, Australia.

The mining and petroleum sectors as a whole contributed around 21% of estimated GDP in 2003, and accounted for some PNGK 4.8 billion (approximately US\$1.5 billion) of exports (74% of all natural resources exports). In terms of employment, the mining sector employs 5% of the total workforce in PNG. (ADB 2005c)

2.2.3. Water Resources

PNG is endowed with abundant renewable freshwater resources with an estimated total renewable water resource per capita of 159,171 cu m per person in 2002. However, only 29% of the population has access to safe drinking water (ADB, 2005c)

Extensive rivers and perennial streams are found throughout the country, with an estimated cumulative flow rate of 5,000 cu m/sec annually. Total surface waters cover some 64,341 sq km, and include the major river systems such as the Fly, Strickland, Sepik, Ramu and Markham rivers, and approximately 5,383 freshwater lakes and wetlands. Rainfall varies widely across the country from less than 1000mm to over 14,000 mm per annum. Surface water flows recharge extensive groundwater aquifers on the PNG mainland, though the extent of these groundwater resources is currently unknown. Freshwater aquifers and lenses on low-lying atolls and small coral islands are more limited in extent, and their usefulness as sources of fresh drinking water may also be compromised by saline intrusion (ADB 2005c).

2.2.4. Natural Disasters and Risks

PNG is at risk from a variety of natural disasters including cyclones, earthquakes, landslides, flooding and storm surges, and volcanic eruptions. In recent years, the most dramatic and most damaging disasters have included the volcanic eruption in Rabaul (East New Britain) in 1994, and the tsunami of 1998 that affected more than 100,000 (ADB 2005c) persons and left more than 2,000 dead in the Aitape, Sandaun (West Sepik) area.

A national Disaster Management Office has been set up to supervise the state preparedness for emergencies, co-ordinate relief efforts, supervise the production of provincial disaster management plans and to raise public awareness.

Assistance has also been forthcoming from the South Pacific Applied Geoscience Commission (SOPAC) to assist South Pacific countries address issues of disaster preparedness. The recently prepared Environmental Vulnerability Index (EVI) provides comparative data for countries around the region to enable them to assess key areas of environmental vulnerability and environmental resilience. It is intended that data in the EVI will be useful as a baseline against which future data can be compared to measure changes in environmental vulnerability over time.

2.3. BIOLOGICAL ENVIRONMENT

The forests of PNG are the third largest block of intact tropical forest in the world. As a nation PNG is estimated to hold between 5% and 7% of the world's biodiversity and lies at the geographic centre of the Bismarck Solomon seas which form one of the world's most diverse and rich marine areas (World Bank 2002, WWF 2004).

2.3.1. Biodiversity

In addition to the wild biodiversity (listed in Table 2.1) there are estimated 5000 sweet potato cultivars, 30 root crops, 21 legumes, 40 leafy vegetables, 60 other vegetables and roots, 43 varieties of nut, 102 fruit, and 89 other plants used for food and seasonings within PNG (World Bank 2002).

There are the vast biological and genetic resources and numerous charismatic species important to the national identity and as a source of revenue. Many of the plants and animals found here are indigenous (occurring naturally in PNG, but also found in other geographically defined areas), or endemic to Papua New Guinea (found nowhere else in the world).

Biodiversity in PNG has a very high value to society not only from the provision of various goods and environmental services but also from a socio-cultural perspective. The diversity of social knowledge and culture is closely related to the mega diversity of species found in the country. Preservation of biodiversity resources is essential for the welfare of the large segment of the population who, as subsistence users, depend directly on these resources.

The global trend towards the development of biotechnology is potentially a source of wealth to PNG but in order to tap into this source of wealth real biodiversity management is required. Additionally, the bio-diverse communities of plants and animals that form complex ecosystems, including PNG's rainforests and coral reefs, also can support other revenue-generating activities such as ecotourism and scientific research.

Standard practice in biodiversity conservation includes the establishment of protected areas to conserve habitats and the species contained therein. There are 52 designated conservation areas in PNG covering approximately 2.5 % of the country's land area (WWF Per. Comm.), however unlike

Table 2.1: Terrestrial Biodiversity in PNG.

Group	Est. total no. of living native species	Est. no. (%) endemic (unique) to PNG	Number (%) of threatened species
Mammals	187		40 (21%)
Marsupials	71	60 (84%)	
Bats	75	57	
Monotremes	2	1 (50%)	
Rodents	58	49 (84%)	
Birds	762	405 (53%)	148 (19%)
Amphibians			
Frogs	193	115 (60%)	
Reptiles			
Turtles (incl. marine)	13	3 (23%)	8 (62%)
Lizards	184	58 (60%)	7 (4%)
Snakes	98	32 (33%)	10 (10%)
Crocodiles	3	1 (33%)	2 (67%)
Invertebrates			
Insects	300,000 (est.)		23 (<1%)
Butterflies	303	56 (18%)	22 (7%)
Land snails	1000		1 (<1%)
Plants – Flora			
All Vascular Plants	15,000-20,000 (est.)		4 families (?)
Orchids	3,200		All (100%)
Mangroves	37		
Fungi	90,000 (est.)		
Freshwater bivalves and gastropods	165+		
Freshwater Fish	214	149	45 (21%)
Marine Fish	3000		
Marine Invertebrates			
Sponges	90		
Corals	700		6 (<1%)
Crustaceans	198		
Mollusks	950+		2 (<1%)
Nudibranchs	700		
Echinoderms	177		
Marine mammals (cetaceans and dugong)	25		4 (16%)

Source: ADB 2005c. (ADB Source: Sekhran and Miller 1994; others. Note: figures for number of threatened species are based on a composite of those listed for protection under the PNG Fauna Act, CITES, and IUCN)

other countries these protected areas do not form part of a national conservation estate. The land tenure system in PNG requires that the landowners decide which areas they want to protect or agree with suggestions from outside. The landowners also decide how they are going to protect the areas in question.

2.3.2. Forest Resources

Papua New Guinea has significant forest resources that have been commercially exploited in industrial scale developments since the 1970s. Estimates of Papua New Guinea's forest resources vary between 26.1 million hectares (Bun *et al* 2004) to around 33 million hectares or approximately three-quarters of PNG's land mass (ADB 2005c). Five main forest types dominate the country's landscape: lowland plains, lowland hills, lower montane forests, dry evergreen, and swamp forests. Some 200 tree species are extracted for commercial purposes. Those in greatest demand include premium furniture timbers such as rosewood, kwila, walnut, pencil cedar, taun, bintangor, malas and hopea.

A summary of PNG's forest resources is provided in Table 2.2.

Table 2.2: Summary of Forest Resources in Papua New Guinea.

CATEGORY	
Total forest area, 2000 (000 ha)	30,601
Natural forest area, 2000 (000 ha)	30,511
Plantation area, 2000 (000 ha)	90
Change in forest area:	
Total, 1990-2000	-4%
Natural, 1990-2000	-4%
Plantations, 1990-2000	6%
Original forest as a percent of total land area	96%
Forest area in 2000 as a percent of total land area	66%
Percent of tropical forests protected, 1990s	10.7%
Number of tree species threatened, 1990s	165

Source: ADB 2005c and Earth Trends, World Resources Institute; accessible at <http://earthtrends.wri.org>

While much of the richest and most accessible tropical forest areas have already been harvested, Papua New Guinea still has areas of natural forest that are suitable for logging. The division of these forest resources by province shows that the majority of the unconstrained resource occurs in the Western, Gulf and West Sepik Provinces. With the majority of resources outside of these provinces already allocated to the logging industry, it is the allocation of those concessions within these three provinces that are now the focus of most political and industry attention.

Papua New Guinea also has a number of timber plantations, although the development of this sector has been slow and somewhat piecemeal. There are currently some 60,000 hectares of plantations almost equally divided between State and private ownership.

Forestry contributes significantly to employment creation (directly employing 7,500 people, or 4% of total employment), and revenue generation for local landowners and the National Government. Landowners benefit from forestry through royalties and premiums, while the national government benefits through export taxes. Logs account for 3% by value of domestic exports. Export taxes are levied on unprocessed logs at rates of up to 70%. In 2002 the country exported 1.85 million cubic meters of logs valued at US\$99.75 million (K367.0 million in local currency) mainly to China, Japan and South Korea. The country also exported wood chips, high-grade sawn timber, plywood, veneer and furniture components.

Mangrove and swamp forests provide direct benefits from utilisation of the ecosystems (for example fishing and wood cutting); indirect benefits including coastal protection and the prevention of seawater infiltration; and biodiversity benefits such as fish breeding grounds and the provision of vital habitat.

2.3.3. Marine Resources

Principal marine and coastal ecosystems in PNG include coral reefs, sea grass beds, mangrove swamp forests, and pelagic seas. Marine and coastal zone features are described in Table 2.3.

Table 2.3: Features of PNG's Marine and Coastal Zone.

Length of coastline	20,197 km
Percent population living within 100 km of coast	61%
Claimed Exclusive Economic Zone (EEZ)	1,673,759 sq km
Territorial sea (up to 12 nautical miles from shore)	752,256 sq km
Area of coral reefs	40,000 sq km
Area of coral reefs under protection	--
Area of mangrove forests	4,586 sq km
Area of mangrove forests under protection	23%
Area of sea grass beds	--

Source: EarthTrends 2003. *Coastal and Marine Ecosystems. Country Profile-Papua New Guinea.* World Resource Institute (<http://earthtrends.wri.org>); other sources; --- = not known.

Fisheries resources in PNG are found in coastal (including lagoons and reefs), pelagic (open ocean) and freshwater habitats. The rich resources found in these environments create a huge opportunity, but also present an enormous challenge for monitoring and control. The total market value of PNG's fisheries catch is estimated at K350 to K400 million annually. However, exploitation of these resources provides little revenue for the country, the total contribution to PNG's GDP is the lowest in the Pacific region. Improved management and development programmes could help provide and increase in returns to the national purse from this resource.

In addition the fisheries provide a vital and widely utilised source of protein to the local population. Accurate figures on the value of subsistence fishing are not available but the estimated value of subsistence fisheries production is reported equivalent to about K62 (US\$20) million annually (ADB 2005c).

PNG's coastal waters are internationally recognised hotspots of marine biodiversity and the Papua New Guinean coastline includes extensive mangrove forests and sea grass beds. PNG lies at the centre of the Bismarck-Solomon Sea, one of the Global 200 Eco-regions identified as containing highly diverse marine ecosystems with functions that exceed the eco-region itself. This area is also known as the "Western Indo Pacific Cradle of Marine Biodiversity" and includes various important turtle nesting sites, the channels between nearby major land masses serve as passages for migrating mammals and mantas and the waters of the eco-region supports feeding grounds and other functions for large tuna populations that are targeted by international fishing fleets (WWF 2004a and *pers com* 2005).

To date there has been little research into PNG's sea grass beds. However, it is evident that there is a close relationship between the sea grass ecosystems and both the coral and mangrove ecosystems. A recent (November 2005) study by Conservation International to ascertain the numbers of dugong (*Dugong dugon*) in the sea grass beds of Milne Bay and the south east coast of PNG counted a total of 5 individuals in what is reputed to be a major feeding ground for this species. This result was significantly lower than had been anticipated at the outset of the study.

2.3.4. Pressures on the Environment

The main pressures on the environment are:

- land use change resulting in the alteration of eco-systems with attended reduction in biodiversity, risk of soil erosion and run-off to water bodies;
- unsustainable harvest of resources, particularly within the forest and fisheries sector, but also an over use of resources by the 85% of the population reliant on subsistence activities for their daily needs due to population growth and lack of environmental awareness; and
- waste management in sectors, particularly mine and urban/industrial waste.

Other pressures include intensification of agriculture and the impacts of fire on vegetation succession.

2.4. SOCIO-ECONOMIC AND SOCIO-CULTURAL CONDITIONS AND HUMAN HEALTH

PNG is the largest Pacific island country in total land area (some 460,000 square kilometres [sq km]) and second in respect to ocean area (some 3 million sq km within its Exclusive Economic Zone [EEZ]). The average population density is about 12 people per sq km, making PNG the country with the lowest density in the Pacific region. Average density in this case is very misleading as there are great differences between provinces. Life expectancy in PNG is 57 years and the adult literacy rate is approximately 65 % (2001 figures). The prediction of a doubling of the population in less than 30 years (ADB 2005c) with potential extension of life expectancy will greatly increase the pressure on current land and natural resources with attendant environmental impacts.

Eighty-five percent of the population rely on subsistence agriculture, fishing, forest harvesting, and hunting for their everyday food and material needs. A component of natural resource management in PNG is the close linkage between the majority of the population and their land of which 97% is customary land privately owned by individuals and communities rather than by the government. The result of this model of ownership is that very little land is readily available for development and it ensures that the owners have the opportunity to benefit from the resources on their land. It also means that the link between the population and the environment is closer and more interrelated in PNG than is the case in many other countries (e.g. community objectives have greater influence than Government policies/initiatives on environmental management).

With 85% of the population reliant on subsistence activities, poverty is widespread, with an estimated 39 % of the population currently living below the international poverty line of US\$1 per day (World Bank 2005). PNG also has the lowest human poverty and human development indices (52.2 and 0.314, respectively) in the Pacific region (average of 21.19 and 0.560, respectively, ADB 2004). However, with so little of the population directly involved in the cash economy of the country poverty should not be viewed simply in financial terms. Fulfilment of basic human needs, improved quality of life, access to services (e.g., health, education, transport), and reduction in vulnerability would be more meaningful measures of poverty to the vast majority of the population (ADB 2005c).

2.4.1. Waste Disposal

PNG has an annual population growth rate of around 2.5% (ADB 2005) nationally and up to 3% in some provinces (e.g. Morobe). Limited employment opportunity in rural areas exacerbates an urban migration and a move towards a more consumer based society that has led to a rapid increase in the quantities of waste that require disposal in both urban and rural areas.

Solid Waste

Solid waste disposal is a major concern in the urban areas of PNG with most wastes being collected and transported to local (unsanitary) landfills where they are buried or burned. There are inadequate sites for the proper disposal of solid waste and there is little waste management undertaken, resulting in quantities of unprocessed rubbish that are a source of disease and pollution either in the form of leachate or from ending up in the rivers as the only perceived method of disposal.

Local authorities in each of the 19 provinces and the National Capital District (NDC) manage and operate their own waste disposal. Disposal sites are often poorly located and have inadequate capacity to handle the growing volumes of waste. Contractors collect municipal solid waste on a routine basis, the frequency of collections being dictated by population size and the amount of waste generated. Little is done to encourage waste reduction, reuse, recovery or recycling.

The Department of Health administers the Public Health Act that provides the mechanism for regulating and controlling domestic refuse and the establishment of refuse points. It covers health, sanitation, cleaning, scavenging and disposal of wastes.

PNG is signatory to various waste management-related conventions both regionally and globally, such as the Basel Convention on Hazardous Waste, Waigani Convention, and a South Pacific Regional Environment Programme (SPREP) convention for solid waste management.

Despite having frameworks in place that should ensure proper waste disposal, waste management programs have generally been ineffective. This is reflected by the fact that waste collectors and operators are not adequately trained to achieve improved standards or performance, and there is no proper engineering design of waste disposal sites. No controls are in place on waste generation at the source to minimise waste, and rapid development of towns and industries results in increased waste generation, creating added pressure and making further planning difficult. Finally, customary land tenure arrangements severely limit the availability of lands to be used as waste disposal sites

Wastewater

Provision for the disposal and treatment of both domestic and industrial wastewater is rudimentary at best and often completely lacking in PNG. Dumping of a variety of wastes (domestic waste, sewage, industrial and hazardous wastes) directly into water bodies contributes to water pollution. Sanitation facilities in PNG are not well developed; approximately 96% of rural households use traditional toilet facilities, and more than half the households in urban areas also lack flush toilets.

The disposal of mine tailings directly into rivers is discussed in Section 3.3.2.

Water Pollution

Water pollution caused by unregulated runoff from industrial activities and the direct dumping of wastes including domestic waste, and sewage into river systems is widespread in PNG. The effect of water pollution, particularly for the 71% of the rural population who have no access to an improved water supply, usually manifests itself as diarrhoea which is a major contributor to childhood morbidity and mortality accounting for 9% of admissions to health facilities amongst children aged 1-4 years and 6% of child deaths in health facilities (World Bank 2002).

In addition in areas where there is extensive small scale gold mining there are raised levels of mercury pollution in the rivers which has serious health consequences.

2.4.2. Health

The greatest health concern in PNG is HIV/AIDS with current infection rates standing at 50 000 individuals with a potential infection rate of 30% of the total population within 10 years. The areas with the highest occurrence of the disease are Western Highlands, Sandaun, Western, and Morobe Provinces and the NCD; areas where population concentration and pressures on the natural environment are highest. Vulnerable groups include women, sex workers, youth, the poor, and workers in industrial enclaves (mining camps, factories, etc.). Some steps are being taken to combat the disease. Government is receiving K24 million annually from AusAID for programs that include awareness raising; promotion of the use of condoms; and studies of potential treatments of the disease. Other major funding is on-line from other agencies, including the EU (Sexual Health Project), the ADB and GEF (ADB 2005c). Instigated under the 8th EDF the EUSHP has so far conducted evaluations of previous interventions and assessments of 16 out of 20 provinces to be used as basis for developing locally relevant peer education programs, and contributed to the strategic planning for the forthcoming MTP (2004 to 2008).

Whilst air quality in PNG remains good, the increased risk of forest fires, particularly in drought years has ramifications for air quality. Large scale fires may result in haze pollution and increase PM₁₀ levels with the attendant health issues as experienced in the SE Asian region following the Indonesian fires of 1997/8.

The impact of climate change on human health is equally grave with an increase in temperature and humidity increasing the survival chances of disease vectors such as mosquitoes. In PNG this is likely to manifest itself as an increase in the number of Dengue Fever and Malaria cases.

2.4.3. Climate change

Emissions relating to climate change have the potential to gravely effect the socio-economic situation of the Papua New Guinean population. A shift in the timing of the dry and rainy seasons may adversely affect the natural resources on which many peoples' livelihoods depend and may reduce the agriculturally productive time period.

2.4.4. Loss of resources (biodiversity, marine resources etc)

Over exploitation of forest resources contribute to erosion, floods, and landslides. On customary land this will increase the difficulties related to subsistence agriculture. Long term any deforested areas may become denuded of soil and no longer be able to support families.

The loss of marine resources in the form of marine water quality, coral reefs, mangrove swamps and sea grass beds directly effects those sections of the PNG population that rely on fishing and marine

tourism for their livelihoods. These resources are threatened by destructive fishing practices, poisoning, pollution and inappropriate and unsustainable development in the sea shore area.

The loss of these resources not only reduces the potential catch size of fishermen but also reduces the attractiveness of the areas to tourists who may chose to spend their money elsewhere.

Biodiversity in PNG has a very high value to society not only from the provision of various goods and environmental services but also from a socio-cultural perspective. The diversity of social knowledge and culture is closely related to the mega diversity of species found in the country.

There are the vast biological and genetic resources and numerous charismatic species (e.g. Bird of Paradise) important to the national identity and as a source of revenue. The global trend towards the development of biotechnology is potentially a source of wealth to PNG but in order to tap into this source of wealth real biodiversity management is required. This requires not only the preservation of the biodiversity but also the development of bio-knowledge, biotechnology, policies and institutions. If PNG is to avoid losses in its potential biodiversity related wealth, both to extinction and to overseas countries, these crucial issues must be addressed as a matter of priority.

2.5. INDICATORS

Currently there are no environment specific indicators in use in PNG. The current state of the monitoring regime, the collation of data and its analysis does not allow even island wide indicators to be developed let alone a regime of national environmental indicators. At best a far from complete set of district wide indicators could be developed in those areas with district governors who have shown an interest in monitoring the environment.

As part of the environmental permitting for mining and agricultural activities there are monitoring requirements that are carried out by the companies in question. These are then reported to DEC as per the conditions of the permits. However, there is no attempt to collate all this information into a single comprehensive body of information.

As such it is necessary to look elsewhere for suitable environmental indicators. Potential sources of these include:

- The European Environmental Agency ;
- The OECD; and
- The Millennium Development Goal (MDG) Indicators.

The European Environmental Agency Indicators are not relevant to the PNG situation as they are designed for use in comparing European countries against one another.

The OECD Environmental Indicators are considered to be the goal most countries should aim for as they are of global value, highly relevant, and not too detailed (i.e. they are achievable). However, in the PNG context, they may still represent a goal rather than an option for the present decade.

Of most relevance to the Papua New Guinean situation are the broad-based Millennium Development Goal Indicators specifically designed for use in developing countries with no reliable source of monitoring.

These indicators have a direct relevance to the situation in PNG and considerable effort is required to assess the baseline situation against which these indicators may be assessed. Goal 7 of these indicators is to "Ensure environmental sustainability" are shown in Table 2.4.

The GoPNG has recognised that these indicators have a direct relevance to the situation in PNG and have set four targets to meet MDG 7 and ensure environmental sustainability (GoPNG 2004b). These are:

- Target 13 – Implement the principles of sustainable development through sector specific programmes by 2010 and no later than 2015.
- Target 14 – By 2020, increase commercial use of land and natural resources through improvements in environmentally friendly technologies and methods of production.
- Target 15 – Increase to 60% the number of households with access to safe water by 2010 and to 85% by 2020.
- Target 16 – By 2020, to have achieved a significant improvement in the lives of disadvantaged and vulnerable groups in urban areas.

Additionally the Government has identified indicators for each of these targets, however considerable effort is required to assess the baseline situation against which these indicators may be assessed. Donor intervention will be of considerable value here in the form of nation wide assistance and capacity building to undertake monitoring and inventory work. This work should include not only the studies themselves but also work on the standardisation and collation of data into a form that can be used on a national basis and subsequent analysis of the data.

Table 2.4: Millennium Development Goals (MDG) Indicators for the Environment

Goal 7: Ensure Environmental Sustainability	Indicator
Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources.	<ul style="list-style-type: none"> • Proportion of land area covered by forest.
	<ul style="list-style-type: none"> • Land area protected to maintain biological diversity.
	<ul style="list-style-type: none"> • GDP per unit of energy use (as a proxy for energy efficiency).
	<ul style="list-style-type: none"> • Carbon dioxide emissions (per capita) • (Plus two figures of global atmospheric pollution: ozone depletion and the accumulation of global warming gases)
Target 10: Halve by 2015 the proportion of people without sustainable access to safe drinking water.	<ul style="list-style-type: none"> • Proportion of population with sustainable access to an improved water source.
Target 11: By 2020 to have achieved a significant improvement in the lives of at least 100 million slum dwellers.	<ul style="list-style-type: none"> • Proportion of people with access to improved sanitation.
	<ul style="list-style-type: none"> • Proportion of people with access to secure tenure • (Urban/rural disaggregation of several of the above indicators may be relevant for monitoring improvement in the lives of slum dwellers).

3. ENVIRONMENTAL POLICY, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK

3.1. ENVIRONMENTAL POLICY AND LEGISLATION

3.1.1. Policy

Environmental sustainability is enshrined within the constitution of PNG which states in the Preamble to the Constitution:

“we declare ...PNG’s natural resources and environment to be conserved and used for the collective benefit of ...all, and to be replenished for the benefit of future generations. (Goal Four)

As such there is a constitutional basis for the legislative framework that has developed in PNG to manage the nation’s natural resources.

3.1.2. Legislation

Environmental Management

The primary piece of legislation pertaining to the management of natural resources is the Environment Act 2000 (as amended 2002) which became fully operative in 2004. This legislation was developed using Australian legislation as a starting point and replaced three pieces of earlier legislation, namely:

- Environment Planning Act;
- Environmental Contaminant Act; and
- Water Resource Management Act.

The new legislation aims to streamline the process of environmental management and improves the process of obtaining and monitoring permits for development activities. Key to the Environment Act is the establishment of three levels of development activity (Section 42). The Act and the Environment (Prescribed Activities) Regulation 2002 defines the specific requirements for environmental impact assessment that need to be complied with, in order for permits and licenses to be issued for activities of each level. EIA’s are required for level 3 developments and may, in specific cases, also be required for level 2 developments. Under the Organic Law, Provincial and Local Governments may, within limits, make Local Environment Policy. There is no requirement in the Act for Strategic Environmental Impact Assessments (SEA), nor does it appear that such assessments have been ever been undertaken, though such an approach has many benefits for managing environmental impacts.

In addition the requirements and penalties for exceeding the conditions attached to permits are detailed within the Act. Stakeholders within the mining, forestry and agriculture sectors indicated that the Environment Act was considerably more stringent than the previous legislation and the penalties for transgressions were more severe.

The Act is comprehensive but during the course of this mission a number of stakeholders including DEC, commented that the focus was on large scale projects and no provision was made for managing the effects of the large numbers of small scale activities that occur in PNG.

Conservation

Conservation is not included in the remit of the Environment Act and as such is managed under five existing pieces of legislation:

- Fauna Protection and Control Act (1974, 1982);
- The Conservation Areas Act (1980, 1992);
- The National Parks Act (1982);
- International Trade (Fauna and Flora) Act (1993); and
- Crocodile Trade (Protection) Act (1982).

A review of all conservation legislation was carried out as part of the AusAID project to strengthen DEC during the 1990's; however no rationalisation or streamlining of the legislation was carried out. Staff within the division of DEC charged with administering the conservation legislation, the Wildlife Permits and Enforcement division, expressed regret that this had not been undertaken as they were operating within a cumbersome legislative framework that was difficult to administer.

With regard to the Protected Area system in PNG there is limited land available for the establishment of a comprehensive PA system due to the land tenure system (see Section 3.1.3). The Protected Area system differs radically from those found in other countries and few of the Protected Areas (PA) would fall under the IUCN 1a PA category of "Strict Nature reserve: protected area managed mainly for science", 1b "Wilderness Area: protected area managed mainly for wilderness protection" or 2 "National Park: Protected Area managed mainly for ecosystem protection and recreation".

The majority of PAs, 30 of 52, are designated as "Wildlife Management Areas" and a further five are Wildlife Sanctuaries both of which fall under Category VI of the IUCN classification. These are Managed Resource Protected Areas: protected areas managed mainly for the sustainable use of natural ecosystems. Under this category the areas are defined as containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs. However, few of the community organisations set up to run these protected areas are functioning and as a result the Wildlife Management Areas and Wildlife Sanctuaries provide little or no protection (Conservation international *pers.com*).

Of the remaining PAs, eight are National Parks. These are on freehold land and remain on the map despite little or no management on the part of DEC (Conservation International *pers.com*). As in all other areas DEC are so under-funded they are unable to actively manage the parks. As a result the National Parks provide little or no protection.

Other Legislation

The Fisheries Act gives broad powers to the Minister of Fisheries and Marine Resources to regulate fishing activity, mainly through prohibition (ban on using explosives) and licensing restrictions. Other pieces of legislation pertaining to fisheries includes the Continental Shelf (Living Resources) Act, 1978, The Fisheries (Torres Strait Protected Zone) Act, 1978; the Export (Fish) Regulation Act.

The Forestry Act (1991) represents the main legislation covering the management and conservation of forest resources. Environmental safeguards, especially pertaining to logging on steep slopes or in proximity to rivers, are provided for by agreements between government and the permit holder. Landowners who cut less than 500 cubic meters per year do not have to obtain a permit.

Concession holders or logging companies wishing to obtain permits for logging operations are required to liaise with DEC and to ensure all the requirements of the Environment Act are met prior to permits being issued. This includes having environmental management and annual work plans.

The recent (2005) amendments to the Forestry Act have been controversial not least for removing the sole NGO voice, the Eco-forestry Forum, from the board of the PNGFA. This has raised concerns about transparency in the process for awarding forestry concessions.

The Mining Act is currently under review and an amended Act is expected in 2006. Mine owners and developers are expected to conform to the requirements of the Mining Act which does not currently directly address environmental issues but there is a requirement for the mines themselves to liaise with DEC and to ensure all the requirements of the Environment Act are met prior to mining or exploration permits being issued.

The National Agriculture and Quarantine Inspection Authority (NAQIA) is responsible for how the agriculture and quarantine sectors are managed. As part of this, there are provisions to safeguard the environment from agriculture where it is not covered in the Environment Act; this includes requirements for the safe disposal of agrichemicals.

Other legislation environmental instrumental in managing PNG's natural resources includes National Seas Act; the Prevention of Pollution of the Sea Act, 1981; the Dumping of Wastes at Sea Act, 1981; and the Lands Act.

In order to address the considerable amount of litter caused by plastic bags the Minister of Environment and Conservation declared a ban prohibiting the importation of plastic shopping bags as of 1st January 2005, with an additional provision banning local manufacture of plastic bags that was due to go into effect on June 1, 2005. However, commercial interests in PNG have challenged this and an injunction has been obtained effectively over turning the declaration. Despite this the Milne Bay Provincial administration has introduced a by-law that prohibits the use of plastic bags in the province.

3.1.3. Land Tenure Issues

The land tenure and land utilisation system in Papua New Guinea (PNG) is based on customary land ownership. Ninety-seven percent of the land is owned by traditional landowners who have the right to decide what does and does not happen on their land. Only 3%, known as alienated land, is controlled by the State. This system supports the largely subsistence non-cash economy that supports 85% of Papua New Guineans.

The land tenure system in PNG ensures that the customary owners of the land are involved in the decision to exploit the resource and benefit from the exploitation of resources. Under a system of lease and lease-back agreements the land owning communities obtain benefits that include a portion of the resource royalties, development of local infrastructure (roads, schools, health clinics, etc.), though apparently such agreements are not always adhered to, or completed to the satisfaction of the land owners.

While this system of land ownership provides financial and material gain in the community, it is a significant major constraint to economic development and integrated land use management and planning. Any potential developer is required to ascertain ownership of the land area of interest and then must then enter into negotiations with the landowners to set the terms of "compensation" payable. This can be a long and convoluted process often taking years to resolve, at significant costs and fraught with uncertainty. Many developers are unable or unwilling to undergo this process and look elsewhere for investment opportunities. This slowing of the pace of exploitation, combined

with the general inaccessibility of much of the country assists in conserving the country's natural resources and biodiversity.

While the national government has the power to acquire lands for public purposes, doing so would be politically unpopular in a country where traditional land ownership is such a highly-charged issue and thus these powers are rarely used (ADB 2005c).

The difficulties of acquiring land is not limited to investors and developers but has also precludes the development of a protected area system as it would be recognised in other countries. In order for a protected area to be established the landowners have to nominate areas for protection to DEC. For example, Wildlife Management Areas are put forward at the initiative of the landowners and Wildlife Sanctuaries are initially suggested by DEC and then officially nominated This occurs where communities have seen the false promises of unsustainable utilisation of their resources and the resultant short term financial gain. Once the area has been nominated the communities set the management terms and conditions. The protected areas take different forms and may be to protect certain areas whilst allowing for resource use on other areas or may remove whole blocks of land from potential development. To date there are 52 such protected areas in PNG covering approximately 2.5 % of the country's land area (Section 3.1.2).

3.1.4. International Treaties, Conventions and Agreements

PNG is a signatory to a number of international and regional environmental conventions (Appendix 3). While the treaties and conventions may be officially ratified, there is a delay in the associated, national legislation and a clear lack of knowledge of how to implement the status or the contents of the conventions locally.

3.1.5. Climate Change

The Kyoto Protocol, and particularly the so called "carbon credits" are seen by the GoPNG as an opportunity for fiscal benefit. The Government is actively seeking ways to earn revenue from PNG's existing pristine natural resources, secondary forest growth and plantation developments (both forestry and other tree crops).

The country's forested area alone has been estimated to have an annual carbon sequestration rate of 112,457 kilotons of carbon (ktC). However, while PNG's natural forests, secondary and old-growth (or primary) forests, and potential agro-forestry areas provide the largest available carbon sinks, these are not recognized as "certified emission reductions" (CERs) under the Clean Development Mechanism (CDM) of the Kyoto Protocol and are therefore not eligible for carbon trading. In the forestry sector, only reforestation projects and afforestation projects qualify as CERs.

The GoPNG has identified this as an apparent anomaly in the Protocol and are concerned that unless it is addressed primary forests will be lost as countries replace them with plantation and reforestation schemes that are eligible for carbon trading benefits. In order to begin the process of changing this, the GoPNG has taken some determined steps to press forward with its case, including active dialogue with the UN and lobbying for the formation of a "coalition of rainforest countries". However, currently the situation remains that only the reforestation projects are eligible for carbon trading and the hope that PNG will see substantial financial benefits from this scheme are likely to go unfulfilled.

3.2. ENVIRONMENTAL INSTITUTIONAL FRAMEWORK

3.2.1. Legislative institutions

To date the National Government agencies have had the main responsibility for implementing, monitoring and enforcing the country's legislation. With the passing of the Organic Law on Provincial Governments and Local-level Governments (1995), most of the operational functions could be devolved to the Provincial and/or local governments. However, devolution has been slow to be implemented.

Local Government Level

Under the Organic Law, provinces and local level governments have the authority to make their own laws for "transferred powers" and to pass their own by-laws (e.g. prohibition of plastic bags in Milne Bay Province) as well as to take on the responsibility for implementing the various pieces of National Government Legislation. To date, the devolution appears to be mostly theoretical and as a result, in the environmental field, DEC is still accountable for implementing virtually all environmental regulatory, monitoring, and management functions across 19 provinces and NCD nationwide.

Limitations in capacity and budget are greater constraints at local than at national level and as a result provincial governments and local level government require assistance if they are to take on their legally mandated powers to undertake monitoring and management functions and pass appropriate by-laws.

While awareness of the importance of the environment is growing at National Level, this is not as advanced at provincial, community level.

3.2.2. Main Government Sector Institutions

Department of Environment and Conservation

The Department of Environment and Conservation is the principal national government agency responsible for management the countries environment and environmental legislation. The departmental structure, budget and specific functions are outlined in Appendix 4. As this shows, DEC coordinates with other national-level departments and authorities (i.e. National Planning and Rural Development, Land and Physical Planning, Agriculture and Livestock, Works, Mining, Petroleum and Energy, Health, Forest Authority, National Fisheries Authority, etc.). DEC also relies on these bodies to undertake some of its duties in addition to their own specific environmental management responsibilities, and to provide logistic support for monitoring visits. Appendix 4 sets out the specific functions of some of these other responsible agencies.

The main operational divisions within DEC are the:

- *Environmental Management and Protection Division* whose main responsibility is enforcement and compliance, assessment and monitoring - that is overseeing the application of the EPA (2000); and
- *Conservation Management and Development Division* which is primarily responsible for five conservation legislations (Section 3.1.2).

The DEC is severely constrained in its operations by extremely limited funding and, in some areas, capable staff. In the current financial year the department's operating budget is K240,000; barely enough to pay its telephone bill let alone carry out its most basic regulatory duties. This budget represents a 20 percent increase over the previous year and is presented as indicating the

increased importance Government is placing on the environment. Much greater budget appropriations will be required to support the DEC's mandate (impact assessments, compliance monitoring, etc.) effectively, without depending on clients for support, and to equip it with facilities and capabilities in data and geographic management systems and similar technologies.

While environmental monitoring, regulation, and management are a function of the national government, implementation of the majority of these functions occurs at the provincial, district, local level, and community/village level government. Under the Organic Law, provinces and local level governments have the authority to make their own laws for "transferred powers." Currently, however, very few environment-related functions have been decentralised. Furthermore, limitations in capacity and budget are greater constraints at local level than in DEC itself. At best the result is a haphazard application of the requirements of the Environment Act and at worst no application of its provisions.

Other National Government Institutions

Other government bodies with direct influence upon and responsibilities for liaising with the DEC re environmental impacts and mitigations are the Department of Agriculture and Livestock, the National Forestry Authority, the National Fisheries Authority and the Department of Mining (soon to become the Mineral Resources Authority).

The Department of Agriculture and Livestock has been reduced essentially to a planning body with the hiving off of the various production boards:

- Oil Palm Industry Corporation (OPIC);
- Cocoa Board (CB);
- Kokonas Industri Korporesen (KIK);
- Coffee Industry Corporation (CIC);
- Livestock Development Corporation (DC);
- Spice Industry Board (SIB);
- Rubber Industry Board (RIB);
- Cocoa and Coconut Institute (CCI);
- Fresh Produce Development Company (FPDC); and
- National Agricultural Quarantine Inspection Authority

The DAL's primary function is now policy development and organisation with no remit to control the various agricultural industry corporations; however, it can influence their activities through its place on the boards of all the institutions. DAL still retains responsibility for Land Use Planning, Training and Information, Food Security and Smallholder Rice as these sectors are not viable profit centres on their own.

A National Agricultural Development Plan is currently being developed in a project funded by FAO. It is intended that this project will provide guidance for the various agricultural corporations and produce development plans for the various agricultural sectors.

Agricultural Extension has been devolved to the provincial level. The National Agricultural Council (NAC) formed in 1978 is in the process of being given new powers which will enable it to better function as a co-ordinating body for agriculture and the agricultural corporations within PNG.

The National Forestry Authority has responsibility for overseeing the Forestry Act (1991), which with some modification represents the main legislation covering the management and conservation of forest resources. Under this act government purchases timber rights from customary landowners for a certain period and then grants a license to commercial companies to extract the timber. Royalties are paid to the provincial government and the landowners. Environmental safeguards, especially pertaining to logging on steep slopes or in proximity to rivers, are embedded in the harvesting agreements between government and the permit holder.

The National Fisheries Authority has broad powers under the Fisheries Act (1994) to regulate fishing activity, mainly through prohibition and licensing restrictions. Regulations under this Act prohibit the use of explosives in fishing, establish management rules (e.g., gear restrictions) for a few species, and declare a 200-mile fishing zone. The Act contains provisions aimed at requiring proponents to explain how sustainable exploitation will be achieved.

The Department of Mining is currently being restructured with the transfer of, exploration, regulatory and supervisory functions to the soon to be established Mineral Resources Authority (MRA). The MRA will be funded by a levy placed on the mining operations in PNG. The new Authority will have a more substantial budget than the current Department and will be able to pay market rates to attract and keep staff. The Department of Mining will retain responsibility for policy issues and geohazard monitoring (e.g. the Rabaul Volcanological Observatory and associated seismology stations).

The Mining Act and the Mine Safety Act are both in the process of being reviewed and revised and will include sections regarding mine closure that have been missing from earlier legislation. Currently the environmental aspects of mining are covered by the Environment Act and mine developers and operators are required to work with DEC to develop environmental plans in order to obtain the necessary permits.

Provincial and Local Government Institutions

The Organic Act of 1995 enables provincial governments and local level governments to make their own laws for “transferred powers.” Provisions within the Environment Act allow devolution of responsibility for some environmental management functions to the provinces and lower levels of government. However, like the national institutions, those at provincial and local level are also under resourced and struggle to take on the responsibilities devolved to them.

3.2.3. Institutional Capability

The Department of the Environment and Conservation (DEC) are charged with the implementation of the Environment Act. However, to date the department has been given a low budgetary priority. During the Mission’s visits to the DEC offices the electricity had been disconnected because the bill had not been paid. Given such a drastic financial constraint it is virtually impossible for DEC to maintain the staffing capabilities that are required to undertake their departmental brief.

During the 1990’s AusAID funded a successful project to strengthen the institutional capability within DEC and transformed it into a strong political force. However, once the project finished, vested interests elsewhere within the political system resulted in DEC being strangled and starved of resources to the point that it has become a department that cannot function.

Budgets are set annually and DEC is so under staffed and ineffective that it is currently unable to put together a coherent budget request and as the GoPNG does not see a substantial input to GDP from the environment the Department receives its infinitesimal budget. This is further evidence of the level of priority given to the environment at a national government level in PNG.

Unlike DEC the Department of Mines and the National Forest Authority provide considerable sums to the national coffers. The NFA and the soon to be formed Mineral Resources Authority are better funded and are therefore able to attract and keep the staff they require to do their work. They have staff in the regional centres that are able to undertake the tasks on a local and provincial level. DEC have no provincial representation and so are unable to liaise on the ground with operators or developers and as a result are unaware of much that goes on outside Port Moresby.

As a result such fundamental tasks as monitoring the conditions set on forestry or mining concessions are not carried out or are carried out by field operatives who are paid for by the concessionaires and therefore potentially subject to pressure from the concession owners.

These shortfalls in manpower and financial resources make it impossible for DEC to conduct compliance monitoring of forestry or mining projects on a consistent or regular basis.

Logging company activities cover a very wide area within the entire logging concession and are quite dynamic and mobile. Developers often take advantage of the regulatory agencies' inability to carry out effective compliance monitoring, by conducting unsustainable and illegal harvesting of logs in restricted areas or within buffer zones.

Equally significant in this regard, is the fact that, while devolution of some environmental management functions to local level governments is legally mandated (under the Organic Law), the reality is that very little devolution has occurred. In the rare event of a local or provincial administrator trying to take the initiative and addressing environmental issues the parlous state of DEC means that they cannot get any assistance, guidance or even advice.

3.2.4. Environmental Co-ordination between Government Sector Institutions

Currently there is virtually no environmental co-ordination between the Government sector institutions. DEC is unable to respond to even the simplest of requests from other agencies and although the Mining, Forestry, Agriculture and Fishing sector bodies are aware that they have to work closely with DEC they find it very difficult to do so.

The sectors refer developers and operators to DEC for issues that they are aware fall under the Environment Act but their knowledge of the Act is limited and there is a need for much closer co-ordination with DEC to ensure all the requirements of the Act are taken into account. This is difficult to achieve when DEC has, at best, a single working telephone. The Department of National Planning has the potential to play a larger coordination role as it sits on a number of relevant Boards but so far has not been effective.

At the workshop held as part of this CEP mission (25-1-05) all the sectors represented (Forestry, Mining and Agriculture) said that this lack of co-ordination was a major constraint to managing the environmental effects within their sectors. It should be noted that DEC failed to attend the workshop despite concerted efforts to get a representative to attend.

3.2.5. Civil Society organisations

Non-Government Organisations

There is a broad range of international, national and local NGO's with an environmental focus active in PNG. While the national and local NGO's tend to have a narrow issue focus, the international organisations tend also to address a broader range of issues, including capacity building, thus filling in critical gaps that exist within governmental agencies, particularly at the lower levels of government. Most of these focus on awareness-raising and knowledge and skills development at the grass-roots community level, to promote self-management of resources among landowners and

resource users. Most NGOs make the long term commitment and investments of effort required to effect positive change, raising awareness among villagers about conservation issues and facilitating low-impact village-based livelihood activities. A listing of environment-related NGOs working in PNG is provided in Appendix 5.

Community Organisations

Throughout the country there are a wide range of social, religious and women's groups providing assistance in a number of environmentally related areas (e.g. health, education, disaster relief, community awareness, women's empowerment) and some of these emphasize environmental activities. These civil society groups play an important role in providing needed assistance to communities, supplementing and more often covering for the weaknesses in government institutions,

Landowners

Approximately 97% of the land area of PNG is owned by Clans and Communities, and are recognised by tradition and law as having customary rights over the natural resource on their lands, and their traditional fishing areas. This gives them considerable influence over the use and development of the country's natural resources and management of the environment. Legislation recognising these traditional rights [e.g. the Environment Act (2000), Mining Act (1992), Forestry Act (1991), Fisheries Act (1998), and Oil and Gas Act (2000)] require that landowners participate in the development of resources. The position of landowners is further strengthened by the Organic Law, which specifies that resource owners must be consulted before any natural resources development is initiated in their area.

3.2.6. Universities and Colleges

The University of Papua New Guinea (UPNG) is the principal institution of higher learning in the country, and has several programs in environmental and natural sciences that prepare students for future participation in these fields. Other regional colleges and universities also have similar programs. Examples of include Conservation Internationals partnership with the Alatou Technical College where they are providing inputs to conservation courses.

3.2.7. Planning and Monitoring

National Planning

There is apparently no overall national development plan. Each development is addressed on an individual basis focused on the economic aspects of the development little thought as to the environment or social consequences developments such as mines (Mine owners generally have to provide what in other countries would be Government services – this increases the local impact when mines close).

In November 2004 the GoPNG published its Medium Term Development Strategy (MTDS) for the years 2005 to 2010. It is a plan for economic and social advancement, and one of its objectives is to “maximise the value of natural resources and environment through sustainable primary production and downstream processing with a focus on agriculture, forestry, fisheries and tourism supported by mining, petroleum and gas”.

Official data collection

There is an absence of sound data and information on the state of most of the countries resources and the intensity of harvesting. This is particularly acute where the activity takes place in remote

areas (e.g. timber extraction and trawler fishing) where location compounds the shortage of financial and political support for monitoring of development.

3.2.8. Governance and Enforcement

Governance

Increasingly Papua New Guinean stakeholders from all sectors of society; central government, local government, NGOs, private sector and the general public are seeing the issues of pollution, land degradation, and the loss of natural resources as issues of rural poverty and governance rather than environmental issues in their own right. These negative impacts are seen as the symptoms of all pervading rather than sectoral issues *per se*.

Enforcement

It is generally accepted that while the legal instruments are more than adequate for sustainable environmental management there is a serious weakness in enforcement of the laws. Government Departments and agencies are in general responsible for the primary steps of law enforcement and prosecution.

3.2.9. Institutional Capacity and Human Resources

Though there are shortages of particular skills, in general this is not a major factor. More important is the shortage of resources to carry out responsibilities. The DEC and other Departments within GoPNG normally have a very limited operational budget, which means that staff cannot carry out their mandate effectively. Lack of operational funds also makes keeping qualified staff more difficult as they are tempted to the private sector by better professional and personal working conditions. There is also the belief in some quarters that some Departments are over staffed and thus wages consume money that could otherwise be allocated to operations (i.e. fewer staff with an adequate operation budget would be more effective than more staff with limited operation funds). The Authorities and Institutions are generally not so financially constrained as the Departments as they have sources of funds though levies from the sector of responsibility.

3.3. INTEGRATION OF ENVIRONMENTAL CONCERNS INTO THE MAIN SECTORS

3.3.1. Main Environmental Issues

The main issues so far as the Department of Environment and Conservation is concerned are:

- Conservation is not fully covered by the Environmental Act (2002), though some changes have been made in the five main items of conservation legislation (Section 3.1.2) to better fit the act but more work needs to be done to bring the older laws up-to-date. Land tenure and requirements for protracted owner consultation means that few conservation/protected areas have been established to date Conservation of some species requires foreign cooperation and this is not always forthcoming.
- Waste Management is a concern in all sectors but particularly larger urban areas and in mining (where it is believed that inherent threat of a tectonic event makes containment methods insecure and unsafe). To date there are no proper landfill sites and even the National Capital does not have a complete sewage treatment facility. With few exceptions urban and industrial waste disposal is piped straight into rivers or sea);

- Compliance in the forestry sector is difficult to monitor due to isolated location of many concessions. There is concern that most illegal logging in unauthorised areas is not detected. Allied with this is the concern that some forests are being subjected to a second cut in 10-15 years and not the 35-40 years required for full recovery.
- Concern for the amount of terrestrial sediments and urban rubbish that finds its way into the marine environment, the cutting of mangroves for fuel-wood and building material, dynamite fishing on and around reef areas and WWII relics (leaky ships, explosives, etc.);
- Mining threatens conservation areas as conservation is at ground level and above where communities own the user rights while anything below ground level is Government owned and thus there is a conflict of land use; DEC has no control on privately owned land and thus no control over the operations of small scale miners; Little is known of the effects of discharging mine tailings in the deep sea (DEC believes this will have minimal impact, but has no hard evidence – one of the initiatives of the EU Mining Sector Support Programme is an investigation into the potential impacts of deep sea tailing discharge); Mining, forestry and large scale agriculture can be outside threats to the local community and to biodiversity;
- There is limited knowledge of the whole benefit that people get from forestry extraction activities. There is a need to put a value on it (i.e. if land owner/user community are currently benefiting why is it necessary for logging camps to have police protection?). Also many of the forest operations lead to soil erosion, grassland and general forest degradation. There is a need for better planning, monitoring and enforcement to assure good practice. There is still a major environment problem with loggers intruding into water course buffer zones and onto steep slopes.
- The PNG highlands are now a deforestation zone due to high population pressure on land and forest resources. Where the forest area is still rich (or relatively rich) few people see the problem coming There needs to be more awareness raising, which this requires emphasis to be moved to provinces and communities to get them working with National Government.
- There is a lack of detailed information about biodiversity and the high value areas. DEC's Biodiversity Division is short of necessary resources. There is urgent need to get communities and individuals to see the value of protecting or sustainable harvesting of local biodiversity, particularly species that have traditionally been hunted and are now endangered. Enforcement in remote areas requires local cooperation.

3.3.2. Main Sectors for Environmental Integration

The main economic sectors that directly and indirectly impacting on the environment, and thus of focal concern are Agriculture, Forestry, Fisheries Mining and Municipal/Industrial. Other sectors and activities with either lesser impacts or whose impacts currently affect smaller areas are set out in the Table in Appendix 6.

Agriculture

Agriculture is a two tier industry in PNG with both commercial agricultural enterprises and a high level of subsistence agriculture. About 4.8 million people live in the rural areas.

Papua New Guinea has approximately 60,000 sq. km of land suitable for agriculture of which about 6500 sq. km is in permanent cropland (ADB 2005c). However, the actual area under agriculture may

be larger as increasing land pressure, especially around urban areas, is pushing individual gardens further away from communities and higher up surrounding hillsides.

Subsistence agriculture supplemented with some small scale cash cropping is commonly practiced in the rural villages and provides 80 % of the caloric intake of rural people. Most gardens are in low intensity shifting cultivation systems, which operate on cycles of one or two years of cropping, followed by 5-15 years of fallowing. Gardens sites are cleared of vegetation manually and usually burned. Sweet potato (*Ipomoea batatas*) is the staple food for about 60 % of the rural population with additional crops including banana, sago, taro, yams, cassava, and peanuts. Domestic livestock (pigs, poultry, goats, sheep, and cattle) as well as cassowary and other wild meat provide an important source of protein in the diet.

Coffee, coconuts, cocoa and oil palm are the key plantation industries, with oil palm currently creating the most investment interest. There are a number of potential new areas for oil palm and new estates and smallholder-grower numbers are steadily increasing. The oil palm industry currently comprises five milling companies, approximately 44 independent estates and 17,000 smallholder growers. PNG also produces a significant quantity of beef and has potential for spices and cashew nut, and cassava growing. In order to meet future needs for employment and a healthier society, emphasis needs to be put on both agricultural intensification and value added – through promoting sustainable crop production and agri-business ventures.

Smallholders dominate the production of most locally important commercial crops and there has been a moderately rising production trend for most of the major crops in recent years (ADB 2004, *Key Indicators*). Smallholder agriculture tends to be mixed rather than mono-cropping and thus offers more opportunity for biodiversity. Also socio-economic benefits tend to be more evenly spread.

Oil palm estates tend to be the focus of criticism for non-environmentally friendly commercial agricultural practices, but the industry is becoming more aware and introducing new practices. The older plantations rarely incorporated buffer strips around waterways to protect the waterways from runoff pollution. In response to this plantation owners and managers are retro-fitting buffer strips around waterways in the older estates and ensuring that they are included in new estates. The Oil Palm Processing Industry along with the Department of the Environment and Conservation have produced an Environmental Code of Practice for the processing industry (GoPNG 1997) and now needs to prepare the same for field management as persistent concerns remain regarding erosion and runoff from estate and small holder lands in near-shore areas threatening to smother coral reefs and choke mangrove forests (Conservation International and WWF *pers. com*). Discussions between Milne Bay Estate and Conservation International are underway to develop and implement methods that will prevent erosion from the estates around Alotau (*pers. com*).

These innovations are of interest both to conservationists and to the growers themselves—better methods for conserving soil and preventing runoff will reduce the impacts on coral reefs and waterways and at the same time, will reduce plantation costs associated with agrichemicals, soil replacement and enrichment.

With the adoption of best practice within the plantation industry many of the environmental concerns can be mitigated. However, plantations are a mono-culture with occasional examples of inter-cropping. This reduction in biodiversity is a fundamental environmental concern and one that is difficult to mitigate.

Because a high proportion of the population is engaged in food production, have access to land, and rely on a diverse range of subsistence food sources, food security is generally good in rural PNG, though less so in the larger urban centres such as Port Moresby and Lae.

Despite the fact that the traditional land ownership system is so deeply ingrained, modern practices and rapid population growth are effecting radical changes on the land. The traditional practice of shifting cultivation, generally thought to be sustainable for lower-density populations, is not viable for more highly populated areas.

Around 20% of rural people use land very intensively (ADB 2005c) to the point where cultivation is nearly continuous. Common methods of intensification include the shortening of fallow periods, the extension of cropping periods and the adoption of fast-growing crops such as sweet potato, cassava, Chinese taro and triploid banana. For intensive cultivation, productivity is maintained through the use of various land improvement practices such as composting, mounding, drainage, legume rotation, planted tree fallow periods and soil retention barriers.

Most of the intensification in subsistence gardening has occurred over the last three decades and it is still not clear how sustainable these more intensive methods will be over the long term. With increasing population pressure in some areas, more subsistence farmers have been forced to cultivate steep-slope areas, resulting in increased soil erosion and siltation of drainage ways.

Farming, whether at the subsistence level or smaller holder commercial or plantation level is, and is likely to remain, the country's more important industry. If the food requirements and the socio-economic improvements necessary for a stable nation are to be achieved in the face of a rapidly rising population, the agriculture and agri-business industry will increasingly be the driver that provides employment and income to Papua New Guineans.

Forestry

Seventy eight percent of PNG's 462,000 sq. km of land is still under natural forest – the world's third largest block of tropical forest. It is estimated that of some 15 million hectares of accessible forest lands, about 11.2 million hectares have been allocated for logging (2000 figures).

With the exception of some government owned plantations, indigenous people own nearly all the forest area. Even though only 15 % of the forested area can profitably be logged on a large scale, forestry is a major resource industry. In mid 2004, 10 companies, mostly Malaysian-owned – held 29 large timber concessions (Eco-Forestry Forum). The 87 % of timber exported as logs brought PNG about K300 million a year. The forest industry employs about 10,000 people and puts millions of kina in the hands of landowners either as royalties or wages and payments for services to the logging companies. Based on current export levels, resource owners are currently entitled to receive approximately K20 million kina in royalties each year. This represents about K4 per person if averaged across the whole population of PNG. This can be contrasted with the K100 million that the government receives each year through the log export tax. As with agriculture, the future is in decreasing of log exports in favour of value added processing in PNG.

Following the 1989 Barnett Commission the 1991 Forestry Act was enacted and the Papua New Guinea Forestry Authority (PNGFA) adopted a more sustainable approach to forest management. Under the new Act and its subsequent amendments forest concessions are acquired under the Forest Management Area (FMA) system. Under this arrangement, concession-holders can operate within timber concessions for 35 years (the Act states 40 years). It is assumed that residual or undersized trees left behind by initial logging operations will have grown to an acceptable size within

this period and thus that timber can be managed as a renewable resource and harvested in a sustainable manner on a 35-year cutting cycle.

Whilst the land owners see benefits from logging operations in the short term there may also be significant longer term adverse environmental impacts and a long-term irretrievable loss of resources. Potential impacts include:

- loss of non-timber resources such as the loss of habitat and displacement of rich forest biodiversity that occurs. Some endemic forest species that are unable to adapt to new environments will face possible extinction. are among the major impacts,
- soil erosion, and
- contamination of water supplies.

For these reasons, it is critical that, in the future, logging operations are more carefully monitored than they have been in the past. Although more new roads are built for logging than for other transportation purposes, the benefits are usually short lived, as logging roads are typically unpaved and quickly become unusable and lead to increased erosion once the logging company ceases to maintain them.

Fishing

PNG has one of the world's richest fishing grounds and one of the greatest tuna fisheries with 3.2 million sq. km of economic zone around its shores. The area is licensed mostly to Asian fishing boats that catch 150-200,000 tonnes of tuna a year. While the value of tuna and other seafood exports (in 2004) exceeded US\$80 million, this was far short of the projected hundreds of millions as most of the tuna leaves the county as frozen fish destined for foreign countries – PNG sees only a fraction of the value paid to it as fishing licences. Small pole-and-line fishing boats manned by 2000 community level fishermen land more that 30,000 tonnes annually (peak catch 48,900 tonnes).

Direct negative environmental effects include destructive fishing practices including the use of dynamite and explosives scavenged from WWII munitions, cyanide, and traditional fish poisons (*Derris* root). While these practices are relatively isolated and small in scale they have a localised effect depleting the coastal resources in these areas.

Illegal, unreported and unregulated (IUU) fishing has increased during the last decade with long-line fishing boats entering and illegally fishing (predominantly for tuna) in PNG waters. Whilst PNG licences over 200 overseas fishing vessels to fish within the PNG territorial waters it has no way of satisfactorily monitoring how many are actually present or how much they are catching. As a result of these activities large quantities of foreign capital are lost to PNG and there is the potential to deplete the resource.

By-catch issues are a concern with both long-line fishing and trawling. By-catch may include endangered species of turtle, as well as seabirds and dolphins. It is estimated (Kuk R. *pers com* 2005) that up to 80% of the catch in prawn trawling nets is considered by-catch which is discarded. Not only is this a waste of valuable protein but also has a serious negative impact on the sustainability of the fish stocks. Due to the areas that prawn trawling takes place the by-catch is largely juvenile fish which are effectively removed from the fish population before they can breed and add to the resource.

Steps have been taken to reduce the numbers of turtles caught by the regulated fishing boats by attaching turtle excluding or escape mechanisms to the nets and lines. There is no information on the amounts or types of by-catch taken by the IUU fishing fleet.

Of further concern is the loss of revenue that occurs both through IUU fishing and through the export of fish in a raw, non-value added state. There are no official figures for the potential increase in revenue from value-added processes, but this is lost revenue that could be utilised for poverty relief or re-invested into the industry to generate further income and improve monitoring and surveillance of the fishing activities in PNG's 3.1 million sq km Exclusive Economic Zone (EEZ).

Mining

From 1984 to 2001, mining increased from 40 to 80% of PNG exports and in 2003 contributed 21% of GDP. In addition the oil industry contributes 9% of the country's GDP (ADB 2005c).

Although mine sites themselves may be relatively small (on a national scale) the environmental effects may be far reaching. Environmental effects of mining in Papua New Guinea include:

- discharge of processing chemicals including heavy metals, cyanide, mercury, arsenic, copper, cadmium, chromium, lead, iron, cobalt, kerosene, sodium sulphide, ammonia lime and acids into rivers, streams, and coastal waters;
- disposal of mine tailings into rivers and the marine environment;
- land degradation and loss of vegetation associated with opening land for pit mines which dump spoil and tailings into the water courses causing clogging and shallowing of rivers and streams; and
- social and economic disruptions (e.g., influx of outsiders, introduction of HIV/AIDS and other sexually-transmitted diseases [STDs], increased crime, etc.) to the communities in the vicinity of the mine site.

Because mines typically discharge effluents to adjacent rivers, impacts are not limited to the mine sites alone, but are disseminated downstream through the river systems. Pollutants have potential impacts on in-stream fauna, and may cause fish mortality or render these resources unsuitable for food use by the community-dwellers along the rivers.

The mining industry in PNG has been associated with river and sea pollution since the early days of large scale commercial mining in the country. Examples include:

- The *Bougainville Panguna* copper mine discharged 150 000 tonnes of waste rock and tailings into the Kawerong River which the flowed onto the Jaba River and on to the coast. In total over 360 million tonnes of material were deposited leading to the loss of all fish stocks along the entire 480 km Jaba River watershed, declines in coastal fish stocks and terrestrial wildlife, and a loss of land for agriculture. The result was that Bougainvilleans felt that the development of the mine had robbed them of their land, irrevocably changed their way of life, and left them with little of the wealth. This led to unrest and demands for compensation to landowners for environmental and other damage caused by the mine operations (World Bank 2002).
- The *Ok Tedi* mine is the largest copper mine in the world and has been disposing of 65 million tons of mine tailings to the Fly River system since successive landslides caused the abandonment of a tailings dam shortly after mining began in 1984. The Fly River system was the most biologically significant river in PNG has been devastated by the build up of tailings. An

estimated 1,300 sq km of vegetation has died or become blighted, populations of river fish have declined 70-90 percent, animals have migrated, and villagers have been forced to hunt, fish, and farm over larger areas.

In 1996 Ok Tedi Mining Ltd (OTML) reached an out of court settlement with the land owners to pay out US\$ 28.6 million over 13 years as compensation for the severe environmental damages caused by the disposal of tailings. In 2002 BHP, the majority partner, decided to relinquish its ownership share. It's 52 per cent equity in Ok Tedi Mining Limited was transferred to the PNG Sustainable Development Program (PNGSDP) Ltd. With the appreciation of the value of that initial investment, it is expected that within a few years PNGSDP's annual capacity for investment in sustainable development initiatives in PNG will exceed that of any other donor except Australia. The useful life of the mine is expected to end in 2010; it is intended that monies flowing from PNGSDP and through the PNG government during the remaining years of operation can be reinvested in the communities in the area, to help to reverse some of the losses that have been suffered through damage to the environment over the past twenty years (World Bank 2002; ADB 2005c).

Recent monitoring (2005) in the Fly River system has raised concerns regarding acid rock drainage (ARD). Previously this had not been an issue at Ok Tedi but it is now recognised that the tailings are lowering the pH of the river system to unacceptable levels. Discussions are currently underway to address this issue and it is hoped that a solution can be found. Every option is being considered including early mine closure. This is, however, unlikely to happen given the substantial contribution to GDP the mine makes.

- The *Porgera* gold mine, in Enga province, is one of the six largest gold mines in the world, and over the last decade has contributed more than 15 percent of PNG's total export earnings. As with any extractive industry there are environmental effects associated with the Porgera mine. These have been the subject of intensive study by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) of Australia. Following the 1996 CSIRO report, the management of Porgera Joint Venture have made public its intention to improve the environmental and social performance of the operations at Porter. However, to date there seems to be little urgency in carrying out the recommendations of the CSIRO report and the situation regarding tailings disposal in the Strickland River remains dire (Shearman 2001a).

Highlands Kainantu Limited (HKL) is developing the Kainantu gold mine in Eastern Highlands Province. This development has been designed as a low impact underground development that will have no riverine disposal of tailings. The tailings dam will discharge into a wetland and there is provision for limited disposal of clear water from the tailings dam following tailings settlement. Environmental considerations were key to the decision not to undertake gold processing on-site but rather to ship the concentrate overseas for processing. HKL have also given detailed consideration to the social aspects of their operation and have developed a broad array of social and community development programmes.

Municipal and Industrial

The Industrial sector, primarily light manufacturing and food processing, is relatively small in PNG and with a few exceptions based in either Lae or Port Moresby. The impact of these mainly comes from untreated liquid and solid waste which is either bumped into drainage channel or is mixed with waste from the surrounding urban area. Ultimately this ends in either (unsanitary) landfills or in the ocean. Waste management in this sector is of increasing concern, given problems and the projected increase in population and expansion in industrialisation.

Tourism

There is great, unrealised potential for predominantly nature and cultural based tourism in PNG. The only tourism sector that is any way developed at this time is the diving sector, which accommodates approximately 68% of the tourists visiting PNG (Tourism Promotion Authority, 2001 visitor survey). There are, however, a large number of other activities that if properly managed, could provide considerable revenue to the resource owners and to the national treasury.

Currently the impact of tourism on the environment is negligible as the levels of tourists are so low (during 2004 the total number of tourist visiting PNG amounted to fewer than 17,000). Given the potential range of activities available to tourists there is scope for greatly increasing this number. There is potential for the development of tourist ventures in most outdoor activities including climbing, trekking, rafting, canoeing and marine recreation. In addition bird watching, cultural tours and village based tourism have the potential to broaden their market. However, the current model of *ad hoc* tourist developments will require closer management if an increase in tourist numbers is not to adversely affect the environment on which it will depend.

Transport

PNG has 20 000 km of roads, 140 ports (plus an unknown number of beach landings and small jetties); and 450 operational airstrips. Passenger travel is predominantly by boat in the coastal and island regions and by air throughout the country. Air Niugini has regular service to most provincial capitals and other airlines service smaller airports. Trade and passenger boats ply the main routes and smaller craft ferry passengers and goods throughout the country. Many of these smaller boats ply from beaches or local jetty's as there are few landing docks outside main centres. A ten-year National Transport Development Plan (NTDP) has been prepared by the Department of Transport and Civil Aviation. (ADB 2005c)

Whilst major roads exist within provinces, there are few major inter-province connections. No road connection exists between Port Moresby and the Highland, Western or Milne Bay Provinces. During the field visit to Milne Bay as part of this mission, the inhabitants of Alotau expressed a hope that there never would be a road linking them to the capital. Locally there are roads and tracks linking centres of population. The majority of these roads are in a poor state of repair and often become impassable for months at a time whilst they await repair by the Provincial Authorities. Where external donors have upgraded roads problems still exist in a country where rainfall is measured in metres and little financial or practical resources are available to Provincial authorities for the maintenance of the new roads.

The difficulties posed by transportation and transport facility in PNG are a major disincentive to development and makes taking goods to market or to ports for export very difficult. For example, a considerable quantity of coffee is not being brought to market due to the poor plantation-to-market road conditions. In many cases mines and agricultural estates build and maintain the infrastructure they require out of their annual operating budgets. Poor road construction and maintenance also has environmental implications. Poorly constructed, designed and maintained roadways can accelerate erosion and soil loss (ADB 2005c).

4. EU AND OTHER DONOR COOPERATION WITH THE COUNTRY FROM AN ENVIRONMENTAL PERSPECTIVE

4.1. INTERNATIONAL COOPERATION

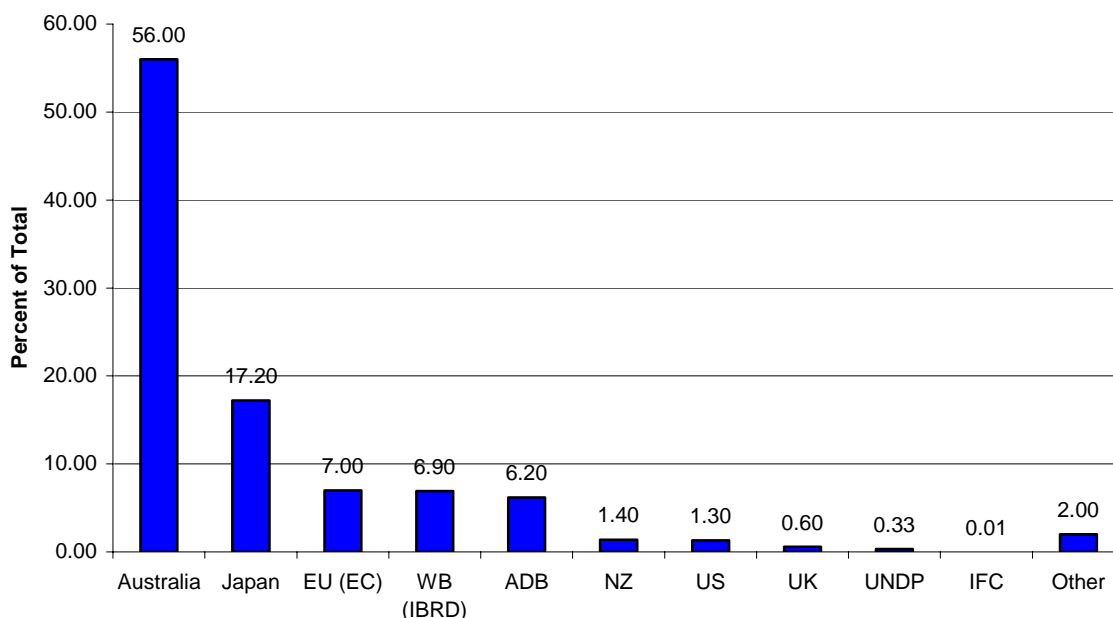
4.1.1. Donors and Regional Institutions:

In the period 1992-2002, Australia (AusAID) was the largest donor in PNG providing A\$350-400 million annually in grant assistance. This represents nearly 60 percent of all donor assistance. The other major donors are:

- Asian Development Bank who have provided US\$1-2 million in technical assistance and 20-50million in loans to PNG (ADB 2005c).
- World Bank
- Japan (JICA)

Figure 4.1 presents the percentage of the total assistance budget provided by each of the donor organisations currently active in PNG. A matrix illustrating the main activities of key International Financing Institutions is presented in Appendix 7.

Figure 1: Official Development Assistance to PNG 1992 - 2002 (% of total)



Source: OECD Database, February 2004 (quoted in ADB 2005c).

Uniquely amongst the primary donor organisations (excluding EU - see Section 4.2) AusAID have increased their level of assistance to PNG in recent years. This has primarily been through the placement of technical assistance in the key government departments and agencies.

The World Bank has recently (2003) reduced its level of involvement with the cancellation of the Forest Conservation Programme loan. This project aimed to strengthen the Department of Forestry

and the Department of Environment and Conservation as well as to clarify the role of landowners in the forestry process and to develop strategies for engagement. However, the government was repeatedly unable to meet a requirement to limit new forest concessions and the loan was cancelled.

The ADB has also encountered difficulties at governmental level with its assistance programme. These problems have largely been due to a failure by government to meet financial commitments agreed to as part of the loan conditions.

As a result of these difficulties relations with GoPNG and the donor and lending organisation have become strained. It is now more difficult to plan, prepare and deliver projects that are going to succeed.

Table 4.1: Sectoral Involvement of Development Organisations (excluding EC) in PNG.

SECTOR	INSTITUTION
Economic and Public Sector Reform	AusAID, ADB, JICA, WB, UNDP
Private Sector Reform and micro-finance	AusAID, ADB, WB, UNDP
Education	AusAID, ADB, JICA, NZAID
Gender	NZAID
Health	AusAID, ADB, JICA,
Transportation and Communication	AusAID, ADB, JICA,
Water and Sanitation	AusAID, ADB, JICA,
Environment	UNDP
Agriculture, Forestry and Fisheries	AusAID, WB, NZAID, JICA, ADB
Small Scale Mining	JICA, WB

In addition, there are several Pacific regional cooperation and research institutions that provide significant assistance to PNG in environmental and natural resources-related areas. These include the South Pacific Regional Environment Programme (SPREP), the Secretariat of the Pacific Community (SPC), the Forum Secretariat, and the South Pacific Applied Geoscience Commission (SOPAC). SPREP is active in the areas of environmental monitoring, pollution prevention, and similar fields; SPC and the Forum are concerned with fisheries and marine resources management; while SOPAC conducts research in geological, climate, and oceanographic disciplines.

There are currently no purely environmental projects funded by the major donors listed above. Of the lesser donors only UNDP is providing assistance directly to an environmental project – the Conservation International Milne Bay marine protection project, there are however projects in other sectors which have cross-cutting environmental aspects.

4.2. EUROPEAN COMMISSION

The *Co-operation between European Union and Papua New Guinea – Joint Annual Report 2004* provides a detailed discussion on the European Union donor involvement in PNG.

In brief the EC's programmes continue to focus on Education, Training and Human Resources Development as well as on Rural Development.

Under the 8th EDF, the focal sectors programme and projects included;

- Human Resources Development Programme;

- Rural Coastal Fisheries Development Programme (RCFDP);
- Eco-forestry Programme (EFP);
- Sexual Health Project;
- Rural Primary Education Facilities Project; and
- Mining Sector Support Programme (SYSMIN).

Under the 9th EDF focal sectors are:

- Education, Training and Human Resource Development Programme; and
- Rural Water Supply and Sanitation Programme (RWSSP).

These sectoral involvements are consistent with the GoPNG's development priorities of rural development and education.

To date, environmental aspects have tended to be taken on a project by project basis rather than mainstreamed as a cross cutting issue, and apparently some obvious exclusions have been made (EU 2005). Those such as the RWSSP, RCFDP, EFP and SYSMIN which could be considered 'environmental' interventions (or to have a large environmental component) have been implemented with due consideration of environment issues.

4.2.1. Rural development and environment

Three projects were funded under the 8th EDF: the Eco-forestry Programme and the Rural Coastal Fisheries Development Programme.

Eco-forestry Programme

The project consists of three main components: an eco-forestry field component, a timber marketing component and a forestry policy support component. The key findings of the 2004 mid term review include:

- The programme offers rural communities a viable alternative to destructive logging practices that is strongly supported by government and the communities. There is evidence to indicate that a sustainable eco-forestry model may be economically viable.
- The national eco-forestry policy has been completed and the marketing component has made progress although further practically oriented work is required.

Whilst problems were encountered in the early stages of the project recent progress (continued in 2005) has been made with increases in sawn timber production and sales, commitments by the private sector, completion of the eco-forestry policy and creation of a functioning timber marketing information system. The eco-forestry policy has not been incorporated into the national forestry legislation.

Although the project was due to end in March 2005 due to delays in implementing the programme the date has been extended and the project is due to end in early 2006.

Following a visit to the project during this CEP mission it would seem that the comments made during the mid-term review are an accurate representation of the project and it should be noted that the successes have been continued in the 12 months since the mid-term review.

The mission felt this project provided a good model for future EC involvement in rural development as it is both economically and environmentally sustainable, community focused and brings demonstrable benefits to the communities taking part which makes the message of eco-forestry attractive to other communities.

Rural Coastal Fisheries Development Programme

This project is implemented by the National Fisheries Authority. It is not directly an environmental project but contains cross-cutting components that promote environmental sustainability. The stated aim of the project is to “increase family incomes through greater participation in sustainable commercial production and improved marketing of marine products.” This is achieved through increased landings of fin-fish and under-exploited marine resources, increase earnings and improve management of marine resources.

The project has introduced fishing techniques and culture techniques that move effort away from the vulnerable shallow reefs to deeper offshore reefs and emphasises better management of resources so as to reduce over-fishing.

This model of a rural development project that contains cross-cutting components that promote environmental sustainability is one that should be considered in all such donor assistance provided by the EC.

Mining Sector Support Programme (SYSMIN)

The overall objective of the SYSMIN mining sector support programme is to ensure that mining continues to provide GoPNG with revenue into the future. The programme is predominantly concerned with undertaking an airborne geophysical survey of PNG and a geological resource assessment. In addition there are two environmental components of the programme:

- An investigation into the effects of deep sea tailings disposal; and
- Development of waste management guidelines and water quality standards for the mining industry with particular reference to the Highland provinces.

In addition a GIS system is being developed that will make all the information currently held in disparate formats and locations available to interested parties.

The outcome of the environmental components of the programme will be two sets of best practice guidelines that will guide future mining developments in PNG to reduce and minimise their effect on the environment. There will be a change in emphasis in planning new mines and an improved legislative framework.

The SYSMIN Financing Agreement makes the creation of a Mining Environmental Unit, by GoPNG, a precondition to implementation of the SYSMIN project. Building capacity for environmental impact assessment and the formulation of a mining waste management policy will constitute key outputs from the unit.

The new MRA plans to work closely with Porgera, Ok Tedi, Lihir, Kainantu and others to secure their active participation in environmental protection of mining sites.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. CONCLUSIONS

For ordinary Papua New Guineans, the main environmental concern is the continued access to traditionally held natural resources for the provision of food and water. In PNG, 97% of land is traditionally owned and 3% is alienated land. This gives the various communities with claim to any particular parcel of land a significant role (enshrined in legislation) in the development decision process, and thus can (at least in theory) virtually dictate the progress and direction of development in the country. Government, at all levels, can only dictate what happens on the small portion of alienated land, and this can do little on its own to promote sustainable management of the environment.

PNG, with an area of 460,000 sq km and an estimated 5.7 million population, has an average population density of just over 12 persons per sq km. However some areas, particularly in the Highlands, have densities far greater than this, resulting in reduced rotation in the bush-fallow cycle practiced in most gardens. The projection that the population of PNG will double by 2030 means that in future the land and sea food base will have to be even more productive than it is today. Traditional customs and social structures make it difficult for people to move from one community to another to level out access to resources.

Traditionally held lands sustain the 85 % of PNG's citizens who live in villages and rural communities, nearly all of whom rely to a large extent on subsistence agriculture and/or fishing. Any degradation of the country's natural resources has a potentially catastrophic effect on their livelihoods. Equally significant is the fact that 30% of the population lives on less than Kina 399 per year [about Euro 0.30 per day] (GoPNG, 2004b). These people are probably also the most disadvantaged in terms of education and access to other public services. Thus they are understandably vulnerable to offers to sell their inherent resources (e.g. the timber on their land) as a solution to an immediate problem (e.g. children's school fees) and can be victims of promises not kept. Clearly an alternative route out of poverty must be provided if land owners are to be persuaded to adopt more sustainable utilisation of their resources.

Most stakeholders have concluded that while there are some technical issues to be solved and certain areas (e.g. capacity building) require assistance, most environmental issues should be seen as symptoms of the socio-economic and political situation in the country rather than the primary problem to be addressed. The underlying causes for these environmental symptoms are primarily related to the high levels of poverty amongst the population of PNG on the one hand, and a failure of will on the part of various levels of Government (primarily National) to implement policy and the requirements of the environment and resource management legislation. For this reason environment should be treated as a major cross-cutting component in all development initiatives.

With a few exceptions the environmental laws of PNG are more than adequate – what is lacking is the implementation of the policies and regulations. There appear to be two constraints here – one is lack of financial allocation for those responsible for applying the law (to some extent sacrificed to over staffing), and the other is side agreements between developers and some politicians and government officials.

The land tenure system in PNG ensures that customary owners of the land are involved in decisions to exploit the resource and gain some of the benefits. Via lease agreements, landowner's benefits

include timber royalties, infrastructure development (such as schools and rural health clinics) and direct employment. Priority is frequently given to resource owners when awarding contracts and recruiting workers.

This CEP study has shown that, in the Papua New Guinean instance, consideration should be given to the following environmental or environment related issues regardless of the specific sector of focus for the project under consideration:

- **Socio-environmental Issues:** If donor assistance is to succeed and benefit the greatest proportion of the population, projects need to ensure a strong community benefit focus.
- **Institutional Capacity:** There is a fundamental lack of capability in the Department of Environment and Conservation largely as a result of a combination of under-funding and mismanagement of resources. The under-funding is in turn a result of the low priority afforded to the department by central government and is indicative (along with resources mismanagement) of the lack of will in the higher echelons of government to seriously address environmental issues.
- **Waste Management:** Waste management is a serious concern in all sectors. There is very little infrastructure for managing either solid or liquid waste even in the major urban centres. In mining the most visible waste product are the mine tailings but other products include process chemicals, particularly mercury that is used in the small-scale gold mining industry. The agriculture, energy, forestry and fisheries sectors all produce waste streams that require careful management if they are not to pollute the receiving environment.
- **Land Use Change:** The effects of land use change are a cross-cutting issue relevant to all sectors; any development that requires the removal of the existing vegetation cover will impact the environment.
- **Unsustainable Harvest of Resources:** This is of particular concern in the forestry and fisheries sectors but also has relevance to other development sectors. Population growth and a lack of awareness may result in over exploitation of resources for both subsistence needs and small-scale commercial enterprises. A major cross cutting issue associated with the logging is what happens to areas that have been logged not once but two and perhaps three times in fairly rapid succession (e.g. 10 -15 years) and not allowed the recommended regeneration period of 40 years between cuts. Such short return periods have the potential to result in the conversion of the forest to some other vegetation type, and/or increase the risk of a fire conversion. The introduction and management of exotic species is another area of some concern.
- **Social Impacts:** PNG has over 800 different languages with an equally diverse community structure that includes both staunchly patrilineal and matrilineal societies. Most parts of PNG are also sparsely populated and as a result development projects in all sectors often require the use of migrant labour. With such a diverse nation, donors need to be sensitive to these differences and be prepared to manage them accordingly.

Given the track record of some components of the central government, It in seems unlikely that environmental projects *per se* will be good investments. Environment and sustainable production should be one part of the greater picture centred on sustainable livelihood opportunity generation. If donor assistance, regardless of the specific sector, is to succeed in PNG and benefit the greatest proportion of the population projects need to ensure a strong landowner and community benefit focus. This is not to exclude projects where the main focus is environmental management (e.g.

urban waste management), nor supporting governance, planning and policy making at all levels of government (particularly at the provincial and local levels).

5.2. RECOMMENDATIONS

Environmental issues rarely fall within one technical and economic sector; they should be seen as cross-cutting issues that require consideration in whichever sector programmes are developed.

It is strongly recommended that in addressing environmental issues in future assistance to PNG all interventions be linked to poverty alleviation and economic development focused primarily in the rural sector. Environment and sustainable production must be part of the greater picture. The main focus should be sustainable livelihood opportunity generation. This is not to exclude other sectors, and to achieve sustainable rural development there will be a need in future to address issues of governance, planning or policy making at all levels of government.

Environment can be mainstreamed by requiring that all proposed interventions or projects be screened for environmental impacts and a management plan incorporated to deal with the identified impacts. The management plan would then serve as a key indicator of project review stages. Such an approach need not be onerous and would mainstream environment at the heart of any development. The introduction of SEA into the project identification process would further mainstream environment, as this process expands an EIA to strategic levels (i.e. programmes, plans, policies) to assist the decision process. A SEA should assist in identifying indirect or cumulative impacts and could present an opportunity to consider wider range of development options. The main constraint at the moment in PNG is that there appears to be little knowledge of application and benefits of SEA, and implementation capacity is limited. Consideration should be given in future to the incorporation of a SEA into one of the more diverse interventions as a means of introducing and trialling the concept. This would need to be accompanied by a strong monitoring programme in order to assess the benefits of the intervention to project planning and management and to the country's environment.

5.2.1. Areas of support

Rural Sector

Given that:

- 97% of the land is traditionally owned;
- 85% of the population of Papua New Guinea lives in rural areas;
- the traditional land management practices are under pressure from within sections of the rural communities and from developers;
- the rural population has fewer opportunities for income generation and lower levels of access to government services (education, etc.)

development in PNG should focus on rural areas addressing environmental issues by addressing poverty alleviation and economic development. This will enable the GoPNG to achieve the Millennium Development Goals as set out in the Papua New Guinea (Millennium Development Goals Progress Report 2004b).

The findings of the CEP mission indicate that development in the following areas would have concurrent benefits in sustainably managing the environment:

- addressing livelihood and poverty alleviation through improved agricultural technologies and sustainable forest and marine harvesting;
- integration of resource management (for example, linking watershed management with sustainable resource use, energy production, rural livelihood opportunities, nature-based tourism development, or linking terrestrial and marine resource management on a community basis);
- working with communities, CBOs and NGOs to initiate self-help and diverse income generation opportunities; and
- raising awareness of legal rights in regard to traditional resources and the long-term consequences of indiscriminate exploitation of those resources; programmes to develop environmental awareness.

EU support to PNG in future should focus on assisting rural communities to meet the needs of the twenty first century. Future development interventions should address livelihood and educational issues within communities, working with community leaders and NGO's to initiate self help and create income generating opportunity, improve levels of education and awareness of the environmental consequences of indiscriminate exploitation of those natural resources. Any such developments would need to be holistic and should focus on the whole community, assisting beneficiaries to develop skills and business opportunities, and assisting in developing markets for goods and services produced as a result of project interventions. Such assistance could include environmental awareness and education programmes and Nature-based Tourism Development.

Plantation agriculture has perhaps the best potential for absorbing rural labour and spreading wealth more equitably throughout the county, but extensive use of plantations brings attendant environmental and social problems which will need to be addressed. The majority of attendant environmental impacts of plantation crops can be reduced – even eliminated – by good management practice, but the one impact on biodiversity that management cannot solve is the mono-crop aspect. There is also social price to pay – one that communities often will not pay – to importing labour from other communities. There is a need to address these issues and provide models and guidelines to find models and solutions that enhance both the environment and livelihoods.

Government Sector

While the demand for capacity building within National Government Departments will continue, there seems to be little advantage in pursuing projects in these areas if there is no operational budget or higher level commitment to the environment. Rather than focus on National Government the findings of the CEP indicate that assistance be given to:

- national resource management planning. This could also include assistance with resource inventory, codes of practice (such as the one on Oil Palm Processing), impact studies (such as deep sea tailings deposition and impact of invasive species), succession processes following logging operations (e.g. impact of serial cutting), support to research, etc.;
- education materials and facilities that focus on environmental awareness to assist the Department of Education and schools to achieve the objectives of the environment component of the curriculum;
- strengthening capability of provincial and local area government officials to assume responsibilities allowable under the Organic Law;
- facilitate the understanding of future environment management responsibilities between Central and Local Governments including development of guidelines and tools.

5.2.2. Approach

The EU Eco-Forestry Project at Lae serves as one model of achieving poverty alleviation along with sustainable resource harvesting. With modification – and taking note of lessons learned to date - this model can be taken to other sectors. Conservation International has a community development programme integrating both agriculture and fisheries that could also act a model. Projects like the Rural Water Supply and Sanitation Programme could be a vehicle for enhancing environmental awareness while addressing health and community development issues.

The nucleus estate and out-grower model used in the agricultural sector could also be adapted to other sectors. For example, nature-based tourism could use a larger central hotel facility to feed a number of smaller lodges based in specific areas of interest. Or a central marketing arrangement could support a number of surrounding villages.

APPENDIX 1. MAPS OF THE COUNTRY



Figure 2: Map of Papua New Guinea



Figure 3: Regional Map of Australasia

APPENDIX 2. LIST OF DOCUMENTS CONSULTED.

- Asian Development Bank (2004). ***Pacific Region Environmental Strategy.***
- Asian Development Bank (2005a). ***Papua New Guinea: Country Environmental Analysis: Proceedings of the Consultative Workshop.***
- Asian Development Bank (2005b). ***Papua New Guinea: Country Environmental Analysis: Executive Summary.***
- Asian Development Bank (2005c). ***Papua New Guinea: Country Environmental Analysis: Mainstreaming Environmental Considerations in Economic and Development Planning Processes.***
- Bank of Papua New Guinea (2004). ***Quarterly Economic Bulletin.*** Port Moresby.
- Bun, Y., King, T and Shearman, P (2004) ***China's Impact on Papua New Guinea's Forestry Industry.*** DFID 2004
- Department of Environment and Conservation (1997a). ***Environmental Code of Practice for Papua New Guinea Oil Palm Processing Industry.***
- Department of Environment and Conservation (1997b). ***Environmental Code of Practice for Papua New Guinea Vehicle and Machinery Workshops Petroleum Storage, Resale and Usage Sites.***
- Department of Environment and Conservation (2001). ***Environmental Code of Practice for Sanitary Landfill Sites.***
- EU (2004). ***Co-operation between European Union and Papua New Guinea, Joint Annual Report.*** European Union and Government of Papua New Guinea
- EU (2005). ***Evaluation Of The Commission's Support To Papua New Guinea: Country Level Evaluation*** Draft Final Report. European Union (November)
- Government of Papua New Guinea (2000). ***Papua New Guinea Initial National Communication Under the United Nations Framework Convention on Climate Change.***
- Government of Papua New Guinea (2001). ***Environment Act 2000.*** Number 64 of 2000. Certified on 19th April 2001.
- Government of Papua New Guinea (2004a). ***Medium Term Development Strategy 2005 – 2010.***
- Government of Papua New Guinea (2004b). ***Papua New Guinea – Millennium Development Goals Progress Report 2004.***
- Papua New Guinea Chamber of Mines and Petroleum (2005). ***Profile: Mining and Petroleum Investment in PNG.*** Eighth Edition – 2005.
- Shearman, P., (2001a). ***Giving away another river: an analysis of the impacts of the Porgera mine on the Strickland River system,*** in Mining in Papua New Guinea: analysis and policy implications , B.Y. Imbun, P.A. McGavin (eds) 1 edition, University of Papua New Guinea Press, Waigani, Papua New Guinea, pp 173-190.
- Shearman, P., (2001b). ***A Scoping Assessment for an Asia-Pacific Invasive Species Initiative:*** A Report to the Nature Conservancy.
- Wilkinson C. (2004). ***Status of Coral Reefs of the World: 2004 Volume 2.*** Australian Institute of Marine Science 2004.
- World Bank (2005). ***Interim Strategy Note for Papua New Guinea.*** Papua New Guinea, Pacific Islands and Timor Leste Country Unit, East Asia and Pacific Region.
- World Resources Institute (2003). ***Mining and Critical Ecosystems: Mapping the Risks.*** Washington DC.

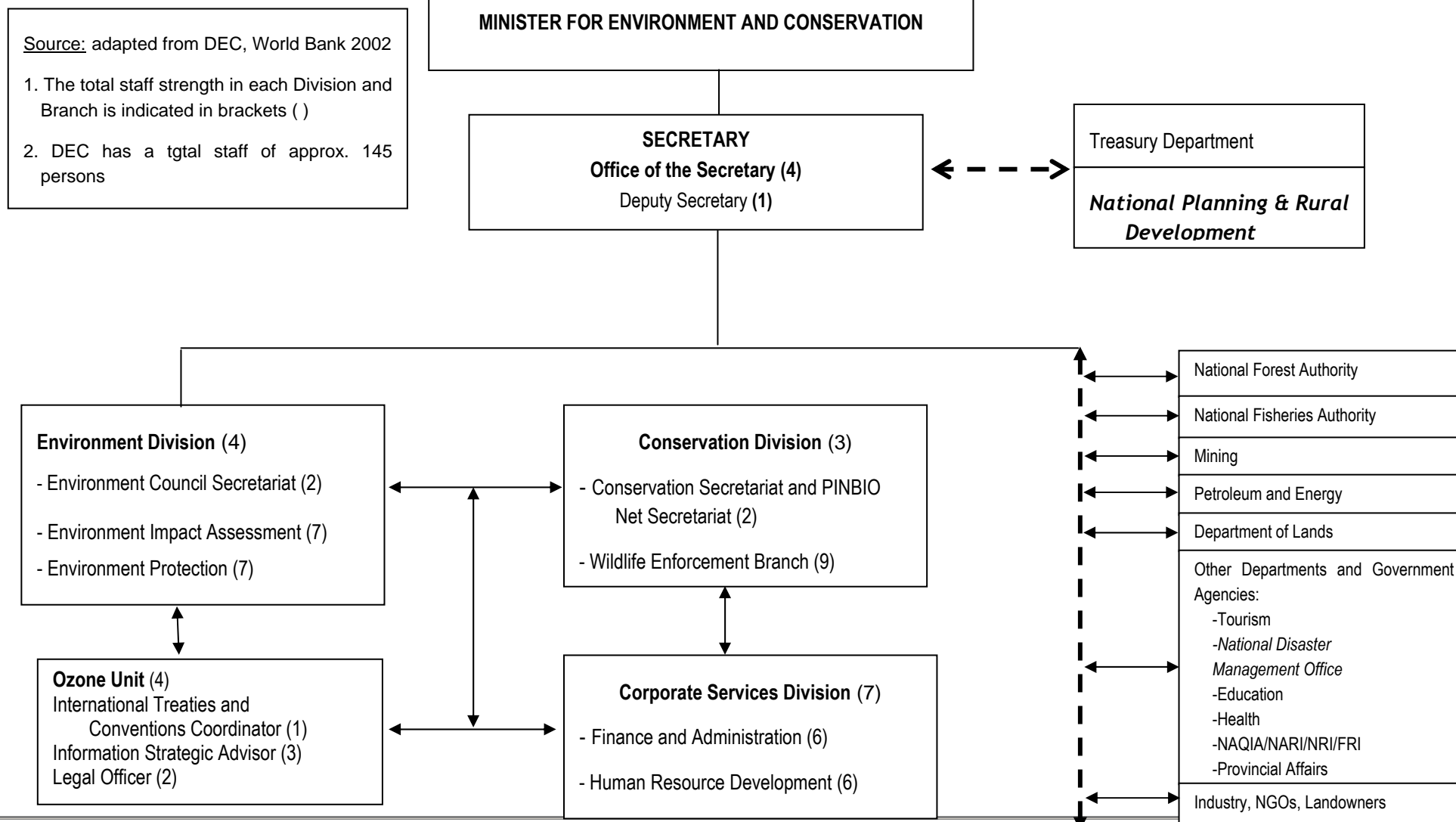
WWF (2004a). ***South Pacific Programme Annual Report***. WWF South Pacific.

WWF (2004b). ***Bismarck Solomon Seas Ecoregion: A Cradle of Marine Biodiversity***. WWF South Pacific.

APPENDIX 3. INTERNATIONAL ENVIRONMENTAL TREATIES, CONVENTIONS AND AGREEMENTS RATIFIED BY PAPUA NEW GUINEA

- Convention on Biological Biodiversity (CBD),
- Convention on International Trade in Endangered Species,
- International Tropical Timber Agreement (1983 and 1994),
- Ramsar Convention on Wetlands
- Climate Change Convention (the Kyoto Protocol has not been ratified)
- Vienna Convention for the Protection of the Ozone Layer
- Convention to Combat Desertification
- Basel Convention
- Nuclear Test Ban Treaty
- Convention on the Law of the Sea,
- International Convention for the Prevention of Pollution From Ships (the Marine Life Conservation has not been ratified).

APPENDIX 4. ORGANISATIONAL STRUCTURE OF THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION



APPENDIX 5. ENVIRONMENTAL NGOS WORKING IN PNG

- Alotau Environment Ltd.
- Bismarck-Ramu Group
- Center for Environmental Law and Community Rights (CELCOR) Inc., Damien Ase, Executive Director, 323 4509 / 4237, 3112106
- Conservation International, Mr. Peter Bossip, Conservation Officer, 323 1532
- Conservation Melanesia, Mr. Lester Seri , Executive Director, 323 2758, 3232773
- Department of Environment & Conservation , Ms Onika Kimui, NGO Coordinator, 3231045, 325 0182
- Eco Forestry Forum, Mr. Thomas Paka, Executive Director, 323 9050, 3254610
- Environmental Law Centre Ltd., Ms. Annie Kajir, CEO, 323 4480, 323 4483
- Environment Watch Group, Mr. Yati Bun, Chairperson, 311 2966 / 2967, 311 2982
- Foundation for People & Community Development, Mr. Bun, Executive Director, 325 8470, 3252670
- Foundation for Rural Development (FORD), Mr. Pu , Executive Director, 542 3524, 542 3530
- Greenpeace
- Kamiali Integrated Conservation and Development , Mr. Karol Kisokau, Programme Director, 479 3242, 479 3233
- Niugini Wildlife Society, Mr. Peter Wakal, Programme Officer, 547 1003, 542 1142
- Partners with Melanesia, Mr. Ken Mondiai, Executive Director, 3239924
- PNG Reef Check Inc., Mr. Edward Kibikibi, Programme Officer, 323 6714 / 686 3839
- The Nature Conservancy, Mr. Paul Locani, Manager, 323 0699, 323 0397
- Wildlife Conservation Society, Mr. Ross Sinclair, Asst. Director
- WWF South Pacific, Daniel McCall, a/Country Manager, 323 9855, 325 3224
- OXFAM PNG

APPENDIX 6. SUMMARY OF ENVIRONMENTAL ISSUES

SECTOR	IMPACTS & ISSUES	COMMENTS/MITIGATIONS
1. Land Resources		
1.1 Changes in Land Use	Destruction of existing ecosystem and replacement with another ecosystem	General considered a negative environmental impact but may have economic and social benefits that are deemed to outweigh the loss. Need to obtain better/more realistic data/information on activities of land owners/users Need to encourage/strengthen traditional sense of land stewardship with landowners
1.2 Agriculture	Excess use of agro-chemical	Intensification of production
	Degradation of Biodiversity	Removal of forest for gardens & estates
1.3 Forestry	Rate of deforestation high; lack of accurate inventory	Last forest inventory in 1993 and that only partial – complete inventory has never been made Need for comprehensive resource base line and a resource use plan
	Non-registered portable sawmills	Difficult to monitor as work to agreement of landowner possible without Dept of Forestry knowledge (i.e. – not all are regulated by permit conditions as are larger mills); shortage of monitoring capability means the Forestry Authority has no means of knowing how much timber is taken/remaining.
	Illegal logging	Deemed mainly to be by logging companies straying outside concession boundaries; Tighter monitoring of concession holders
	Grassland and Forest Fires	This is, as yet, a potentially serious threat. Forest areas tend to be too wet for fires to start easily, but fires are frequently set to grassland areas during the dry season, and can move into, or even occur in forest areas that have been extensively logged. Need to be aware that more of these incidences are occurring.
1.4 Mining	Destruction of surface vegetation, biodiversity, etc	Total destruction area at mines site generally small – few 10s of hectares; National economic benefits deemed to outweigh environmental concerns
	Downstream pollution of rivers and water bodies resulting in loss of aquatic life habitat, ill health in water users, etc.	Major impact on river systems – monitoring weak and access to appropriate sites difficult (some monitoring stations placed up to 175 km downstream)

Summary of Environmental Issues (Continued)

1.4 Mining Con't.	Course fraction (sand & gravel) clog streams/river beds changing bed depths/ flows which can result in loss of fish spawning beds (leading to reduction in fish stock) and vegetation die-back; Fine fraction (silt & clay) carried into marine environment affecting coral habitat resulting in decline of fish stock and marine flora and fauna	Dredging of stream/river beds to increase depth/flow
	Location of mines	Often needs ownership conflict resolution
	Downstream Impacts	Need to negotiate compensation package with land owners (e.g. sharing of royalties, other benefit packages)
	Waste management	Better systems and codes of practice need to be implemented and monitored
2. Water Resources	Lack of clean water services in urban areas	Country has one of world's highest stocks of fresh water per capital but there is a need for improved water supply systems – particularly in urban areas – to counter water related diseases and health of humans and animals
	Toxic and hazardous industrial waste (e.g. mine tailings, mercury) deposited in water courses	Human and animal health hazards related to pollution downstream of operating industry
3. Marine Resources	Appear relatively well preserved but potentially declining in quality due to sedimentation associated with mining and logging; over fishing, etc.	Need for better data collection and monitoring as true extent of resource is unknown
3.1 Fisheries	Artisanal fishery said to be in decline	Need for better data collection and monitoring as true extent of resource is unknown
3.2 Reef	Reefs still primarily pristine but some degraded by dynamite fishing and sedimentation	Need for wide awareness of value of reef to biodiversity, artisanal fishery, and tourism
3.3 Mangrove Forest	Loss of mangrove near larger urban centres due mainly to cutting for firewood	Need for wide awareness of value of reef to biodiversity and artisanal fishery
4. Bio-diversity	Increasing threat to wide range of species by changes in land use – e.g. logging	5–7 % of the world's species of plants and terrestrial life forms found in country
	Illegal trade in wildlife	Need for better monitoring and control
	Official expenditure for biodiversity conservation minimal	Need for wider awareness of the value of a rich biodiversity to communities and the country
	Over-harvesting of resources	Need for raising awareness of value of with range of natural resources to community – the need to sustainably harvest these resources Need for mechanisms that facilitate channeling benefits of conservation to owner communities – e.g. Fishing Lodge in West Province; MPA's.
	Invasion of non indigenous species	Threat to local species by invasives
5. Municipal /Urban	Urban and Industrial Waste Management	Need for greater awareness by citizens of the benefits (i.e. health, sanitation, reducing of flooding) of keeping urban areas clean and tidy

Summary of Environmental Issues (Continued)

6. Institutional	Operational Budget for DEC infinitesimal at K200,000 for current financial year	DEC needs to be given a realistic operational budget - current budget not sufficient to operate office let alone provide transport, etc. for Officers to undertake inspection/monitor activities; Officers currently appeal to potential polluters for travel assistance, putting them in a difficult position
	Shortage of Staff in DEC	Work overload
	The Forest Authority is better funded than DEC but still has shortfall	Remote and difficult working conditions of forest monitors mean greater need for logistical support and higher staff and equipment replacement costs.
7. Public Education	General lack of awareness	Need for more informed public, including media
	NGO One Issue Focus	Need for balanced reporting
8. Socio-cultural	Land Tenure Systems	Breakdown in traditional land use authority as a result of the planting of cash crops changing authority within the clan
	Social Structure	Breakdown in socio-cultural traditions due to urbanization and movement of clan members away from their communities

APPENDIX 7. CO-ORDINATION MATRIX FOR KEY EXTERNAL ASSISTANCE

Source: ADB 2005c

Sector/ Area	ADB Strategy/Activities	Other Development Partners' Strategy/Activities
A. Economic and Public Sector Reform	<p>Ongoing</p> <ul style="list-style-type: none"> • Strengthen public sector financial management • Public service program (build performance orientation, reorient personnel management, strengthen probity organizations, strengthen public service delivery) • Strengthen management of public service and delivery of basic services • Help develop a poverty strategy <p>Programmed</p> <ul style="list-style-type: none"> • Improve public sector management and service delivery at the subnational level • Strengthen economic statistics capacities • Review public expenditure • Review land tenure 	<ul style="list-style-type: none"> • Structural adjustment (Australia, EU, Japan, World Bank) • Strengthen public sector financial management at the provincial level (Australia, UNDP) • Technical assistance for public sector reform (Australia) • Electoral capacity building (Australia) • Strengthening of national and decentralized planning (Australia, UNDP) • Support for census and statistical capacity strengthening (Australia) • Support for various agencies for management and service delivery (Australia) • High-level economic policy advice and staff exchanges (Australia)
B. Private Sector Development	<p>Ongoing</p> <ul style="list-style-type: none"> • Microfinance <p>Programmed</p> <ul style="list-style-type: none"> • Development finance • Small and medium-sized enterprises 	<ul style="list-style-type: none"> • Structural adjustment policy support (Australia, World Bank) • Microfinance (Australia, UNDP) • Business advisory and support services (Australia, UNDP) • Training of company directors (Australia)
C. Education	<p>Ongoing</p> <ul style="list-style-type: none"> • Skills development (contracting out) 	<ul style="list-style-type: none"> • Education media (Japan) • Miscellaneous projects

Sector/ Area	ADB Strategy/Activities	Other Development Partners' Strategy/Activities
	<p>Programmed</p> <ul style="list-style-type: none"> • Adult and nonformal education 	<p>(infrastructure and supplies) (Japan)</p> <ul style="list-style-type: none"> • Strengthening of the Department of Education (Australia) • Community development (Australia, Japan) • Strengthening of the trade testing system (Australia) • Elementary school teacher training (Australia) • Provincial high school project (Australia) • Basic education infrastructure and curriculum materials (Australia, New Zealand) • Short-term training (Australia, New Zealand) • Scholarships (secondary and tertiary) (Australia, New Zealand) • Teacher education (Australia, New Zealand) • Education commodity assistance (Australia) • Curriculum reform and teacher training (Australia) • Education quality initiatives (Australia) • Training awards (Australia) • Education capacity building (Australia)
D. Health	<p>Ongoing</p> <ul style="list-style-type: none"> • Health sector development project to support health in rural areas • Human resource development • Sector policy support • Sector review <p>Programmed</p>	<ul style="list-style-type: none"> • Equipment (Australia, Japan) • Communications equipment (Japan) • Civil works (Japan) • Training of health personnel (Australia) • Research (Australia) • Women and children health services (Australia, Japan)

Sector/ Area	ADB Strategy/Activities	Other Development Partners' Strategy/Activities
	<ul style="list-style-type: none"> • Further health sector support (sector-wide approach) 	<ul style="list-style-type: none"> • Medical equipment management (Australia)
E. Gender/Youth	<p>Programmed</p> <ul style="list-style-type: none"> • Proposal for a Population and gender project¹ 	<ul style="list-style-type: none"> • Gender and development (New Zealand)
<p>F. Infrastructure</p> <p>a. Transport and Communication</p>	<p>Ongoing</p> <ul style="list-style-type: none"> • Road maintenance and upgrading (Highlands and Southern regions) • Road asset management system (whole country) • Road authority • Road fund • Maritime navigational aids • Maritime transport management • Maritime Safety Authority • Community water transport <p>Programmed</p> <ul style="list-style-type: none"> • Transport sector support 	<ul style="list-style-type: none"> • Road construction and improvement (Japan) • Road maintenance and upgrading (various, whole country) (Australia, Japan) • Highlands Highway rehabilitation/upgrading (Australia) • Highlands Highway bridges (Australia, Japan) • Lae city roads (Australia) • Bridge projects (Australia, Japan) • Airport development (Port Moresby) (Japan) • Air transport project (airport maintenance, sector management) (Australia)
<p>b. Water Supply and Sanitation</p>	<p>Ongoing</p> <ul style="list-style-type: none"> • Provincial towns water supply and sanitation • Low-cost sanitation <p>Programmed</p> <ul style="list-style-type: none"> • Rural water and sanitation 	<ul style="list-style-type: none"> • Maritime transport institutional reform (Australia) • Maritime navigational aids (Australia) • Transport sector support program (equipment and training) (Australia) • Gazelle reconstruction (Australia, World Bank) • Bougainville roads (Australia)

¹ The project was originally programmed for 2004; however, the Government has requested that this project be deferred.

Sector/ Area	ADB Strategy/Activities	Other Development Partners' Strategy/Activities
		<ul style="list-style-type: none"> • Communications sector support (television) (Australia) • Groundwater development study (Japan) • Lae city water supply (Australia) • Town water supply (Japan) • Country-wide water supply project (EU) • Port Moresby sewage system upgrading (Japan)
G. Environment	<p>Ongoing</p> <ul style="list-style-type: none"> • Coastal area management 	<p>Ongoing</p> <ul style="list-style-type: none"> • Milne Bay maritime environment • NGO environment projects
H. Agriculture, Forestry, and Fisheries	<p>Ongoing</p> <ul style="list-style-type: none"> • Smallholder support services through contracting out • Improving service delivery at the province level • Nucleus agro-enterprise feasibility studies <p>Programmed</p> <ul style="list-style-type: none"> • Sector policy review • Agriculture and rural development • Fisheries policy development, institutional and sector management strengthening, fisheries infrastructure • Coastal waters fisheries management and development • Regional development (Sandaun East-Sepik) 	<ul style="list-style-type: none"> • Nucleus oil palm estates (World Bank) • Agricultural research (Australia) • Strengthening of research institutions (Australia, New Zealand) • Quarantine (Australia) • Cocoa rehabilitation (Bougainville) (Australia, EU) • Forestry policy, institutional strengthening, forestry training (Australia) • Strengthening fisheries training (Australia) • Agricultural marketing (New Zealand) • Agriculture policy (World Bank) • Miscellaneous small projects (Australia, Japan, New Zealand)

EU = European Union, NGO = nongovernment organization, UNDP = United Nations Development Programme.

APPENDIX 8. LIST OF PERSONS/ORGANISATIONS CONSULTED WITH THEIR AFFILIATION AND CONTACT DETAILS

Date	Person	Organisation	Position	Contact Details
06-11-05	David Freyne	EC Delegation	Programme Specialist: Forestry and Rural Development	+675 321 3544 david.freyne@cec.eu.int
07-11-05	Wesley Irma	Department of Environment and Conservation	Assistant Secretary: Enforcement and Compliance Branch	+675 325 0914 wesley.irma@global.com.pg
07-11-05	Barnabus Wilmott	Department of Environment and Conservation	Assistant Secretary: Wildlife Permits and Enforcement Branch	+675 325 0914 barnabus.wilmott@global.com.pg
07-11-05	Timothee Maurice	EC Delegation	Young Expert Placement	+675 321 3544
07-11-05	Jerry Huekwahin	EU Programme Management Unit	Project Monitoring Officer	+675 328 8524 eupmu.jh@global.com.pg
08-11-05	Vitus Ambia	National Forest Service	Divisional Manager Forest Planning Division	+675 327 7874 vambia@pngfa.gov.pg
08-11-05	Andrew Aopo	National Forest Service	Acting Divisional Manager Field Services Division	+675 327 7957 aaopo@pngfa.gov.pg
09-11-05	Mika Andrew	Department of Agriculture and Livestock	Chief Land Use Officer	+675 320 2959
09-11-05	Gaikovina (Gai) Kula	Conservation International	Executive Director Melanesia Programme	+675 325 9709 g.kula@conservation.org

Consultation List Continued

Date	Person	Organisation	Position	Contact Details
09-11-05	David Mitchell	Conservation International	Terrestrial Biodiversity Corridor Project Director	+675 325 9709
10-11-05	Hannah Birdsey	AusAID	Second Secretary	+675 325 9333 ext. 357 hannah_birdsey@ausaid.gov.au
10-11-05	Michael Avosa	WWF South Pacific	Country Programme Manager	+675 323 9855 mavosa@wwfpacific.org.pg
10-11-05	Paul Chatterton	WWF South Pacific	Conservation Manager	+675 323 9855 pchatterton@wwfpacific.org.pg
10-11-05	Luanne Losi	WWF South Pacific	Marine Officer	+675 323 9855 llosi@wwfpacific.org.pg
10-11-05	Steven van der Tak	Asian Development Bank	Country Director	+675 321 0408 svandertak@adb.org
10-11-05	Benson Ateng	World Bank	Country Manager	+675 321 7111 bateng@worldbank.org
10-11-05	Rufina Peter	Department of Planning	Acting First Assistant Secretary	+675 328 8353 rufina_peter@treasury.gov.pg
10-11-05	Jonathan Kennett	Department of Planning	Acting Senior Planner Renewable Development, Planning and Programming.	+675 328 8316 jonathan_kennett@treasury.gov.pg

Consultation List Continued

Date	Person	Organisation	Position	Contact Details
10-11-05	Terence B. Tupi	Department of Planning	Monitoring Officer	+675 328 8542 terence_tupi@treasury.gov.pg
10-11-05	Roger Kara	Department of Planning	Acting First Assistant Secretary	+675 328 8503 roger_kara@treasury.gov.pg
10-11-05	Phil Sherman	University of PNG		+675 326 7388 shearma@ozemail.com.au
11-11-05	Robert Norombe	Department of Environment and Conservation	Acting Deputy Secretary	+675 325 0914 robert.norombe@global.com.pg
11-11-05	Ronald Kuk	National Fishing Authority	Manager	+675 309 0444 rkuk@fisheries.gov.pg
13-11-05	Robin Kimpton	PNG Eco-Forestry Programme	Eco-Forestry Advisor	+675 479 1773 r_kimpton@hotmail.com
14-11-05	Anda Akivi	PNG Eco-Forestry Programme	Field Co-ordinator	+675 479 1748 efpfc@global.net.pg
14-11-05	Manusupi Zurenouc	Morobi Provincial Government	Provincial Administrator	+675 473 1751
15-11-05	Robert Guest	Highlands Kainantu Limited	General Manager - Operations	+675 474 3091 Ext. 116 rquest@highlandspacific.com
15-11-05	Billy Sari	Highlands Kainantu Limited	Environmental Manager	675 474 3091 bsari@highlandspacific.com
15-11-05	Ashton Benson	Ramu Sugar Limited	Agricultural Manager	+675 474 3264 abenson@ramusugar.com.pg
15-11-05	Lastus Kuniata	Ramu Sugar Limited	Senior Principal Scientist	+675 474 3299 ext. 207 lkuniata@ramusugar.com.pg
15-11-05	Pawa Limu	Ramu Sugar Limited	Environmental Officer	+675 474 3299 plimu@ramusugar.com.pg

Consultation List Continued

Date	Person	Organisation	Position	Contact Details
16-11-05	Rolf Braun	EU Mining Sector Support Programme	Chief Technical Advisor	+675 321 0150 mssp_pmu@mineral.gov.pg
16-11-05	John Arumba	EU Mining Sector Support Programme	Technical Monitoring Officer	+675 321 0150 john_arumba@mineral.gov.pg
16-11-05	Greg Anderson	PNG Chamber of Mines and Petroleum	Executive Director	+675 321 2988 ga@pngchamberminpet.com.pg
17-11-05	Iva Kola	NCD Council	Acting Deputy City Manager – Community and Social Services	+675 323 1239 ik_ncdc@online.net.pg
17-11-05	Robin Yanopa	NCD Council	Chief Health Surveyor	+675 323 3212 ry_ncdc@online.net.pg
17-11-05	Francis Daink	National Department of Agriculture and Livestock	Deputy Secretary	+675 321 2271
18-11-05	Joe Castle	Pacific Rim Plantations Ltd. Milne Bay Estates	General Manager - Operations	+675 641 1211 jcastle@mbe.com.pg
18-11-05	Gareth Disley	CTP Holdings Pte Ltd. Milne Bay Estates	Field Manager – Mature Plantations	+675 641 1211 gdisley@mbe.com.pg
18-11-05	Peter Mackay	Conservation International	Chief Technical Advisor, Milne Bay Project	+675 641 0349 pmackay@conservation.org
19-11-05	Gretta	Alotau Chamber of Commerce	President of the Chamber of Commerce	+675 641 1209
20-11-05	Mikkel Christensen	Conservation International	Team Leader, Community Development and Livelihoods, Milne Bay Project	+675 641 0349 mchristensen@conservation.org

Consultation List Continued

Date	Person	Organisation	Position	Contact Details
21-11-05	Ivan Gutai	PNG Microfinance Ltd.	Senior Manager – Operations	+675 321 2111
22-11-05	Jaru Bisa	PNG Sustainable Development Program Ltd.	Program Manager: Environment and Conservation	+675 308 7509 jbisa@pngsdp.com
22-11-05	Almah Tararia	The Eco-Forestry Forum	Policy Manager	+675 323 9050 policy.teff@global.net.pg
22-11-05	Tony Torea	United Nations Development Fund	Programme Officer – Environment	+675 321 2877 tony.torea@undp.org
23-11-05	Steve Nion	Department of Mining	Acting Secretary	+675 321 2945 steve_nion@mineral.gov.pg

APPENDIX 9. LIST OF PARTICIPANTS AT THE CONSULTATIVE WORKSHOP, HELD AT ELA BEACH HOTEL, PORT MORESBY, 25TH NOVEMBER 2005.

1	Maureen Ewai	Conservation International
2	Anton Benjamin	Department of Agriculture and Livestock
3	Rolf Braun	Mining Sector Support Programme
4	Hari Politopolous	EU Adviser –EUPMU
5	Jonathan Kennett	Department of National Planning and Rural Development
6	Jerry Huekwahin	Department of National Planning and Rural Development
7	Michael Avosa	WWF PNG
8	Lars Gronvald	EU Delegation PNG
9	Timothee Maurice	EU Delegation PNG
10	Phil Sherman	University of PNG
11	Roger Kara	Department of National Planning and Rural Development
12	Thomas Paka	PNG Eco-Forestry Forum
13	Brown Konabe	Department of Agriculture and Livestock
14	Vitus Ambia	PNG Forestry Authority
15	David Freyne	EU Delegation PNG
16	Mathilda Koma	Centre for Environmental Research and Development

Workshop Outline

After a brief introduction by the Mission outlining in general terms the observations and conclusions reach to date the workshop participants were divided into two discussion groups.

Each discussion group considered a number of cross-cutting issues, as follows:

Legislative framework

Assess current level of legislative coverage, weaknesses and strengths

Institutional framework including decentralisation and governance

Assess relevant institutional mandates, their weaknesses and strengths

Assess effect of current level of decentralisation and its effect on implementation

The various sectors that impact the environment

Assess the current situation, status and needs of the various sectors

Prioritise the main issues facing the environment in PNG.

Identify the challenges facing the various sectors.

During a final plenary session each discussion group reported back to the group as a whole on their findings, opinions and recommendations. This was followed by an open discussion during which points were clarified and discussed.

The results of the workshop were broadly in line with the findings of the consultation undertaken by the mission members both before and after the workshop. No major discrepancies between organisations or sectors of society were identified and the results allowed the Mission to focus their subsequent inquiries.

The results of the Workshop have been incorporated into the text of the Environmental Profile Report.

APPENDIX 10. STUDY METHODOLOGY/WORK PLAN

Approach

The study was to assess the state of the environment (current status, pressures, trends) and Papua New Guinea's environmental performance in meeting objectives in the physical environment; biological conditions, biodiversity, ecology and nature conservation; and socio-economic conditions, socio-cultural conditions and human health.

In other terms, the Consultant understood that the overall objective entailed a sustainability assessment against the three-pillar concept of Sustainable Development (environment, social and economic factors).

Analysis included assessments of key environmental issues and trends, environmental policy and legislation, institutional structure and capacity, integration of environmental concerns into the main economic sectors, involvement of civil society, EC co-operation and international development assistance, and recommendations and priorities.

These assessments were conducted through a range of methods, including:

- Consultations with the EC Delegation in Port Moresby, relevant Papua New Guinean national and local authorities, key international funding agencies in PNG, private sector, and key national and international civil society stakeholders operating in the environmental field in PNG.
- Literature review of relevant studies, national policies, environmental strategies, action plans, and legislation.
- A national workshop to identify and obtain consensus on key environmental concerns.
- Final debriefing with the EC delegation in Port Moresby and with the relevant EC services in Brussels.

The outcome of the study is a Country Environmental Profile in the EC standard format containing:

- An assessment of the environment identifying key environmental factors influencing PNG's development and response to these.
- An assessment of national environmental policy and legislation, institutional structures and capacity, and the involvement of civil society in environmental issues.
- An assessment of past and likely future trends in environmental indicators.
- An overview of past and ongoing international co-operation in the environment sector in PNG.
- Recommendations, and where possible, guidelines or criteria for mainstreaming environmental concerns in priority development areas. These would aim to support the preparation of the Country Strategy Paper, and the guidelines/criteria would be designed for use in environmental mainstreaming in later phases of the EC programme operational cycle.

METHODOLOGY

Team Methodology

The Consultant fielded a team of two consultants; Mr W. Borden and Mr G. Ward. These consultants worked as a unit supporting each other. The team portrayed itself as a unit and conducted meetings and interviews as a team. Due to time constraints, there were, however, instances where the team split for individual activities.

Briefing by EC Delegation in Port Moresby

In the initial briefing with the EC delegation in Port Moresby the mission sought to obtain the Delegation's views on environmental issues in PNG and the future direction of the EC-PNG programme; institutional arrangements in PNG with respect to environmental legislation, policy, and management; literature sources; setting up of appointments with relevant PNG government departments, other donors, NGOs, etc.

Country Environmental Profile

A danger of this mission was for the team to be bogged down in excessive reading of legislation, regulations, plans and background information. This reading was therefore focused and prioritised in order to achieve the mission targets within the stipulated timeframe. The reading was guided by the institutional survey and the associated interviews aiming at establishing issues, trends and priorities.

After initial discussions with the Delegation and key environmental institutions, an overview of the organisations dealing with environmental policies and issues was made. This included governmental as well as non-governmental organisations. The mandates were analysed and compared with legal background for the establishment of the organisations.

In order to research the Country Environmental Profile the team met with 47 individuals from key government departments, NGO's, funding organisations and the private sector. Of particular assistance were the ADB who have recently undertaken a Country Environmental Analysis for PNG.

Appendix 8 lists the individuals and organisations met.

In assessing the state of the environment, due attention was given to the urban, industrial and the rural environments both terrestrial and aquatic and the interaction between these environments and the human environment.

In assessing the institutional framework, the team evaluated:

In assessing the institutional framework, the team evaluated:

- The institutional structure and responsibilities of national and local authorities and agencies dealing with environmental issues in policy making, legislation, planning, environmental protection, monitoring and enforcement.
- Formal structures and procedures for public participation in development control and planning, and
- The capacity and financial resources of authorities responsible for environmental management.

As part of the study recent, current and planned international co-operation, projects or strategies in PNG were reviewed.

A national workshop was held three weeks into the mission. The purpose of the workshop was to give the team an initial feed-back on its findings, assistance to prioritising environmental issues within PNG.

Recommendations

The Country Environmental Profile has analysed the environmental issues and related these to the institutional framework, which either has or ought to have responsibility for the particular issues.

The result of this analysis was two-fold:

1: Assessment how environmental issues are related to the various economic sectors and development activities with regard to long term environmental sustainability.

2: Recommendations of the key issues affecting the environment that require consideration in planning future EC funded intervention and its effect on the environmental development of PNG.

Debriefings in Port Moresby and Brussels

Upon completion of field work, the mission presented its findings and recommendations to the EC Delegation in Port Moresby and the EC in Brussels.

Reporting

The final report is presented in the required Country Environmental Profile format attached to the Terms of Reference with attached technical and administrative appendices. The report follows the requirements in terms of deadline, content, language, form and number of copies.

APPENDIX 11. REFERENCE LIST OF ENVIRONMENTAL POLICY DOCUMENTS, STATEMENTS AND ACTION PLANS AND OTHER RELEVANT TECHNICAL INFORMATION

National Environmental Legislation:

- Conservation Areas Act 1978
- Crocodile Trade (Protection) Act 1974
- Dumping of Wastes at Sea Act 1979
- Environment Act 2000 as amended 2002
- Environmental Contaminants (Pesticides) Regulation 1988
- Environmental Planning Regulation 1992
- Fauna (Protection and Control) Act 1966
- Fisheries (Torres Strait Protected Zone) Act 1984
- Fisheries (Torres Strait Protected Zone) Regulation 1987
- Fisheries Management Act 1998
- Fisheries Management Regulation 2000
- Forestry Act 1991
- Forestry Regulation 1998
- International Trade (Fauna and Flora) (Fauna) Regulation 1982
- International Trade (Fauna and Flora) Act 1979
- Land (Ownership of Freeholds) Act 1976
- Land (Ownership of Freeholds) Regulation 1977
- Land (Tenure Conversion) Act 1963
- Land (Tenure Conversion) Regulation 1964
- Land Act 1996
- Land Regulation 1999
- Mineral Resources Development Company Pty Limited (Privatisation) Act 1996
- Mining Act 1992
- Mining Development Act 1955
- Mining Development Regulation 1957
- Mining Regulation 1992
- National Parks Regulation 1984
- National Seas Act
- National Water Supply and Sewerage Act 1986
- Oil and Gas Act 2000
- Prevention of Pollution of the Sea Act 1979
- Prevention of Pollution of the Sea Regulation 1980

Other relevant Legislation:

- Organic Act on Provincial Governments and Local-level Governments;

- Mining (Ok Tedi) Agreement Act
- Mining (Bougainville Copper Agreement) Act; and
- Petroleum (Gulf of Papua Agreement) Act.
- National Agriculture and Quarantine Inspection Act.

International Conventions

A full list of International Conventions to which PNG is party is provided in Appendix 3.

APPENDIX 12. TERMS OF REFERENCE FOR THE COUNTRY ENVIRONMENTAL PROFILE

1. Background

Taking into account PNG's development goals and the overall objectives of the Cotonou agreement, lessons from previous EC interventions and following consultation with beneficiaries and stakeholders, the EC response strategy is to foster good governance, strengthen education, and improve the quality of rural life through enhanced delivery of water to village communities.

2. Objective

The main objective of a Country Environmental Profile (CEP) is to identify and assess environmental issues to be considered during the preparation of a Country Strategy Paper (CSP), which will directly or indirectly influence EC cooperation activities.

The CEP will provide decision-makers in PNG and in the EC with clear information on the key environmental challenges, as well as policies, strategies and programmes designed to address them. This information will ensure that the EC cooperation strategies take account of environmental considerations into the selection of priority focal areas and also analyse environmental safeguards to be developed for cooperation activities in PNG.

The CEP will identify the key linkages between the environment and poverty reduction. It will constitute an important source of baseline information and contribute to focusing policy dialogue and cooperation on key areas of concern, as well as raising awareness among policy-makers.

3. Results

The assessment will deliver the following results:

- An assessment of the environment, identifying key environmental factors influencing PNG's development and the responses to these.
- An assessment of national environmental policy and legislation; institutional structures and capacity, and the involvement of civil society in environmental issues.
- An assessment of past and future environmental indicators.
- An overview of past and ongoing international donors' cooperation in the environment sector.
- Recommendations and guidelines for including environmental concerns in priority development areas.

4. Issues to be addressed

4.1. *The state of the environment*

Identify key issues, including facts (pressures, current status and trends) and problems in the following areas:

- **Physical environment:** air and climate, land, water, and natural disaster risks.
- **Biological environment:** biodiversity, ecosystems, biological resources of cultural, social, or economic importance. The social and economic causes of the environmental situation and

trends and their consequences on human well-being and sustainable development should be presented.

Specific issues to be addressed include:

- land use planning and national legislation
- forest management and logging
- marine resource development

Reference should be made to local and internationally recognised environmental indicators and quality standards to establish a consistent basis for comparison of environmental and sustainable development performance. The indicators selected should facilitate future monitoring and evaluation of the environmental impact of policy implementation and be useful for future environmental assessments. Attention should be paid to the rate of change of indicators where information is available. If appropriate, the information could be organized according to eco-geographical subdivisions with the scale (regional, national, local) of the issues indicated.

4.2. Environmental policy and legislation

The consultants will describe and review the strengths and weaknesses of the following:

- National policies, environmental strategies and action plans, including, an assessment of the environmental performance in meeting the objectives and targets.
- Legislation, current and possibly in preparation, including, requirements for environmental assessments, sustainable use or conservation of natural resources, pollution control, land tenure and land reform, the effectiveness of legislation enforcement and the provision for public participation in environmental issues, procedures for public participation in development control and environmental planning and public access to environmental information.
- National approaches to key international or regional environmental conventions such as those concerning climate change, biodiversity and land use.

4.3. Environmental institutional framework

The consultants will describe and review the strengths and weaknesses of the following:

- The Institutional structures and responsibilities of the authorities dealing with environmental issues in policy making, legislation, planning, environmental protection, monitoring and enforcement.
- The level of co-ordination between sectoral institutions or ministries involved in environmental or natural resources management issues.
- The major NGOs, institutes or other institutional stakeholders.
- The capacity and financial resources of authorities responsible for environmental management.
- The extent and quality of protected areas and other land use measures.

4.4. Integration of environmental concerns into the main sectors

The assessment should examine the integration of environmental concerns in the main sectors, that have key linkages with environmental issues and might be identified for EC support: in particular, agriculture, forestry and fisheries.

4.5. EU cooperation with PNG from an environmental perspective

This should cover experience relating to interventions with specific environmental objectives as well as the integration of environmental issues into other sectors, including the application of environmental assessment procedures. Where information is available the environmental impacts of EU cooperation or potential risks should be identified for the benefit of future programmes. The

results of existing evaluations/reviews should be incorporated and lessons should be drawn for the future.

4.6. Cooperation funded by other agencies from an environmental perspective

The study should review the involvement of other funding agencies (AusAID, NZ Aid, JICA, World Bank, Asian Development Bank, etc) and their experience in PNG and include a list of recent and planned projects/programmes, with an environmental focus or anticipated impact.

Programmes/projects implemented through the regional bodies of the Pacific, including SPC, SPREP, SOPAC, etc of direct and indirect benefit to PNG should be assessed.

5. Conclusions and recommendations

The key aspects of the state and trends of the environment in PNG including policy and institutional constraints and challenges should be clearly stated. This may be presented in a matrix, cross-referencing environmental concerns and the main sectors or policies.

Based on a comprehensive assessment of available information and consultation with stakeholders recommendations on how best to address environmental issues should be elaborated. Individual recommendations should be clearly articulated and linked to the problems to be solved and grouped according to the involved sector or institutional stakeholder. Recommendations should be easily used in the preparation of the CSP, taking into account the existing CSP and any pre-identified options for the next CSP. Nevertheless, useful recommendations can also be made for the Government, other donors (particularly EU Member States) and the use of EC horizontal budget lines.

The relative priority of the recommendations and an indication of the challenges to their implementation should be given.

Recommendations should also be made as to how best the Commission and the Government can include environmental issues in the next CSP. Guidance should be given regarding strategic environmental assessment in major sectors and performance indicators if budgetary supports are foreseen.

The constraints to preparing the profile caused by limited information should be described, and an evaluation of the need for additional studies, such as strategic environment assessments or others, should be made.

6. Work plan

The work plan should include but not necessarily be limited to the following activities:

- Consultation with EC country desk officers and other relevant officials, EC Delegation in PNG, a selection of national and local authorities, key international funding agencies operating in PNG, plus key national and international civil society actors operating in the environmental field.
- Review of previous CEP and Cusp's; evaluation reports with respect to environmental issues on development and economic co-operation produced by government, EC or other agency sources.
- Review of environmental literature, evaluation reports, environmental policy and legislation framework, legislation and regulations and enforcement relating to environmental issues, action plans, and progress in implementation.
- Review of environmental performance indicators selecting appropriate indicators from those suggested by organisations such as EEA/OECD/Euro stat.

- Field visits to sites of key environmental concern and the organisation of a workshop to which national authorities, donors, experts and civil society representatives should be invited with the aim of identifying and attempting to obtain a consensus on key environmental concerns.

STANDARD REPORT FORMAT FOR A COUNTRY ENVIRONMENTAL PROFILE

Maximum length (excluding appendices) 40 pages.

The following text appears on the inside front cover of the report:

This report is financed by the European Commission and is presented by [name of consultant] for the Government of Papua New Guinea and the European Commission. It does not necessarily reflect the opinion of the Government of PNG or the European Commission.

1. Summary

This is an executive summary of the key chapters of the Country Environmental Profile clearly indicating priority challenges and areas for action at the country level in the context of the Country Strategy Paper to be prepared prior to future development funding.

2. State of the environment

This chapter will also set out an assessment of the state and trends of the environment as outlined in Section 4.1 of the TOR.

3. Environmental policy, legislative and institutional framework

This chapter will provide an assessment of PNG's environmental policy, regulatory and institutional framework for pollution control, natural resource use and sustainable development. It will be divided into sections as follows:

3.1. Environmental policy and legislation

This chapter must include an assessment of the key issues outlined in Section 4.2 of the TOR.

3.2. Environmental institutional framework

This chapter should review the roles and capabilities of the main national institutions as outlined in Section 4.3 of the TOR.

3.3. Integration of environmental concerns into the main sectors

This section must include an assessment of the key issues as outlined in Section 4.4 of the TOR.

4. EU and other donor cooperation with PNG from an environmental perspective

This section must include EC and other donor assistance within PNG from an environmental perspective covering the issues outlined in Sections 4.5 and 4.6 of the TOR.

5. Conclusions and recommendations

This chapter will present the conclusions on the state and trends of the environment in PNG, including a summary of the key environmental issues in a table form. Recommendations will be made for major stakeholders (including the Government, the Commission and other donors) with a

particular emphasis on how best the Commission can include environmental issues into the new Country Strategy Paper.

6. Technical appendices

I. Environmental maps of PNG

II. Reference list of environmental policy documents, statements and action plans, and other relevant technical information.

7. Administrative appendices

I. Study methodology/work plan (1–2 pages)

II. Consultants' Itinerary (1–2 pages)

III. List of persons/organisations consulted with their affiliation and contact details (1–2 pages)

IV. List of documentation consulted (1–2 pages)

V. Curricula vitae of the consultants (1 page per person)

VI. Terms of Reference for the Country Environmental Profile

APPENDIX 13. CONSULTANTS CURRICULA VITAE

CURRICULUM VITAE

1. **Surname:** Ward
2. **Name:** David Gareth
3. **Date of birth:** 04-08-1968
4. **Nationality:** British
5. **Civil status:** Married
6. **Education:**

Institution:	Cranfield University
<i>Graduation Year:</i>	1997
Degree(s) or diploma(s):	MSc Land Resource Management
Institution:	Sheffield University
<i>Graduation Year:</i>	1990
Degree(s) or diploma(s):	BA Ancient History and Classical Archaeology
Institution:	London College of Printing and Distributive Trades
<i>Graduation Year:</i>	1994
Degree(s) or diploma(s):	PGDip Photojournalism

7. **Language skills:** (Mark 1 to 5 for competence, where 5 is the highest)

Language	<i>Passive</i>	<i>Spoken</i>	<i>Written</i>
English	5	5	5

8. **Membership of professional bodies:** Chartered Biologist, Institute of Biology, UK, 1999

Fellow Royal Geographical Society, 1997

9. **Other skills:** (e.g. computer literacy, etc.) computer literate with standard word processing, spreadsheet and database packages

10. **Present position:** Environmental Scientist and Planner

11. **Years within the company:** 1

CURRICULUM VITAE

- 1. Family name:** BORDEN
- 2. First names:** R. Wayne
- 3. Date of birth:** 1939
- 4. Nationality:** British
- 5. Civil status:** Married
- 6. Education:**

Institution	McGill University, Montreal, Canada
Date:	September 1970 to September 1972
Degree obtained:	MSc Soil Science
Institution	University of Alberta, Edmonton, Canada
Date:	September 1964 to May 1968
Degree obtained:	BSc Agriculture
Institution	University of London, UK
Date:	February to October 2004
Degree obtained:	Certificate – Conservation of Bio-diversity within Ecosystems
Institution	University of London, UK
Date:	February to October 1999
Degree obtained:	Certificate - Environmental Auditing & Environmental Management Systems
Institution	University of Kingston, UK
Date:	December 1995 to December 1997
Degree obtained:	Certificate – Geographical Information System
Institution	University of London, UK
Date:	February to October 1995
Degree obtained:	Certificate - Environmental Impact Assessment

7. Language skills:

Language	Reading	Speaking	Writing
English	5	5	5
Bahasa Indosesian	1	2	1
French	2	1	1
KiSwahili	1	3	1

- 8. Professional Membership:** Institute of Ecology and Environmental Management
 Institute of Professional Soil Scientists (Fellow)
 Society of Environment (Chartered Member)

10. Present position: Environment and Natural Resources Management Consultant- o -