



THE NATIONAL
RESEARCH INSTITUTE
PAPUA NEW GUINEA

DISCUSSION PAPER

IMPROVING URBAN DEVELOPMENT IN PAPUA NEW GUINEA

ENVIRONMENTAL ASPECTS

Lyn Leger
Jeremy Visser
Jessica Andoiye
Simon Aleker

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Direct any inquiries regarding this publication to:

The Publications Unit Leader
National Research Institute
P.O. Box 5854
Boroko, NCD 111
Papua New Guinea

Tel: +675 326 0300/326 0061; Fax: +675 326 0213

Email: nri@nri.org.pg

Website: www.pngnri.org

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Abstract

This paper summarises environmental challenges in the physical planning and urban development processes in Papua New Guinea (PNG). The key objectives include a review of existing planning and development mechanisms as well as suggesting strategies for promoting sustainable urban development and green infrastructure investment. The review of the planning and development system considers the legal framework as well as strategic and detailed plans. It is based on the National Capital District and Lae-Nadzab Urban Development Plans (UDPs). The case study's findings indicate uncontrolled urban development in some areas, lack of planning and management of existing public infrastructure, and inadequate public infrastructure such as water supply and sewerage installations.

Based on the review, the environmental challenges in the planning and development processes in PNG are related to the inconsistent planning of environmental outcomes, limited systematic implementation, low levels of compliance and enforcement, as well as limited public participation. This paper highlights the main environmental issues of physical planning and urban development processes that need to be considered and addressed. Key recommendations and suggested strategies in the paper include:

- the adjustment of planning processes to incorporate community aspirations and ensure ongoing data collection;
- the amendment of key legislation to encourage the consideration of environmental outcomes;
- the improvement of planning transparency and introduction of regular compliance audits; and
- the amendment of the Physical Planning Act 1989 to provide for greater public participation.

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Abbreviations & Acronyms

8/9 LDP	8/9 Mile Area Local Development Plan
DEC	Department of Environment and Conservation
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
KPI	Key Performance Indicator
LDP	Local Development Plan
LLG	Local Level Government
LNUDP	Lae-Nadzab Urban Development Plan
MTDP	Medium Term Development Plan
NCD	National Capital District
NCDSSP	National Capital District Settlement Strategic Plan 2007–2011
NCDUDP	National Capital District Urban Development Plan
NRI	National Research Institute
NSW	New South Wales
NUP	National Urbanisation Policy
PNG	Papua New Guinea
PNGDSP	Papua New Guinea Development Strategic Plan
PNGPPAT	Papua New Guinea Physical Planning Appeals Tribunal
PNLDP	Poreporena-Napa Napa Local Development Plan
POMTLDP	Port Moresby Town Local Development Plan
PGK	Papua New Guinea Kina
UDP	Urban Development Plan

Ch. 1 Introduction

The process and regulatory and administrative functions of urban planning and implementation in Papua New Guinea (PNG) have not been able to provide a viable or efficient land and properties market.¹ PNG has experienced, and continues to experience, a shortage of serviced land for development, especially housing. In Port Moresby and Lae, which are the biggest cities in PNG, the services that are provided by the urban authorities are poor, and a number of problems need to be addressed in order to provide planning to international standards, and resultant ‘liveable cities’. Notable problems include housing shortages, poor transport services, urban poverty, squatter settlements, environmental pollution, informal marketing, and deteriorating (or limited or non-existent) infrastructure, such as roads and sewerage.²

Recognising these issues, the National Research Institute (NRI) commissioned the City Plan Services PNG and the BMT WBM team to undertake a review of the current policies and programs, projects and schemes of current Urban Development Plans (UDPs)—the National Capital District Urban Development Plan (NCDUDP) and Lae-Nadzab Urban Development Plan (LNUDP). The review included an examination of existing regulatory frameworks and governance measures. It also provided an analysis of the present status of these plans, including implementation and enforcement, and recommendations for improvement.

The broad aim of the review that was commissioned by the NRI was to draw lessons from the review of planning, development, and management of the NCDUDP and LNUDP which would be useful for policy improvement, including the land use policy, urban development policy and physical planning policy in PNG. The detailed objectives for the review are provided as part of the report prepared by City Plan Services PNG and the NRI, titled, *“Improving Urban Development in Papua New Guinea”*.³ The BMT WBM team’s role was to advise on environmental aspects relating to the following objectives:

- review the existing mechanisms available for the protection of urban environment and related aspects, and suggest remedial measures; and
- suggest strategies for promoting sustainable urban development and green infrastructure investment.

The concepts within these objectives of protection of the urban environment, sustainable urban development, and green infrastructure are interrelated, and for the purposes of this report, the following key themes were considered:

- environment protection, including issues such as habitat destruction, encroachment, prevention of pollution, and maintenance/rehabilitation of ecosystem services;

¹ Referencing generally, Yala, C. (ed.) (2010).

² Walter, P., Yala, C. and Aleker, S. (2015)

³ Ibid.

- sustainable development principles with a focus on ecological aspects (social and economic aspects were covered by other team members); and
- A ‘green infrastructure’ approach to land use planning to ensure the function and values of natural environments are maintained, and to provide for the integration of different functions or activities on the same piece of land (e.g. maintenance of open space zones that can provide for multiple uses such as social benefits, flood protection, water sensitive urban design features and conservation of natural habitats).

Within these concepts, the review also touched on natural hazards, waste management, environmental health, hydrologic systems, land conservation, and ecological resources.

This report presents the findings of the review in the following sections:

- The System—the legal framework, and strategic and detailed plans that apply to urban development in PNG;
- Urban development case studies in NCD and Lae;
- Issues identified through examination of the system and case studies; and
- Recommendations to address the issues that were identified.

Ch. 2 The System

The effectiveness of the NCD and Lae-Nadzab UDPs relies on the broader planning system; from the establishment of the objectives, through to the effective implementation and enforcement of the development strategies. The planning system in PNG considers environmental aspects through a number of means:⁴

- *Legal framework*, which covers environmental and planning requirements, and (mostly) taking into account the various commitments made under those international conventions to which PNG is a signatory;
- *Strategic or general plans*, which outline visions or broad objectives and operate over an extended timeframe (typically decades); and
- *Detailed or focused plans*, which concentrate on a geographical area or certain function, and outline management strategies.

Having the plans in place does not necessarily mean that an effective planning system exists, that environmental aspects will be considered during development, or that environmental objectives will be achieved. Implementation, including consideration of decision-making processes, compliance, and enforcement are fundamental. Public participation is also important in terms of contributing to decision making.

On the basis of the requirements for an effective system to achieve environmental outcomes, the following concepts have been considered, where applicable under each of the following sections:

- planning for environmental outcomes, including:
 - o establishment of overarching objectives for the achievement of environmental outcomes (either functional or location/habitat specific);
 - o collation and analysis of background data to identify issues and needs; and
 - o development of management strategies to address the issues and needs;
- Implementation, monitoring, and review (and consideration of approaches to allow for adaptation);
- compliance and enforcement; and
- public participation, including public submission, and right of appeal.

⁴Government of Papua New Guinea (1989).

2.1. Legal Framework

2.1.1. Legislated objectives to achieve environmental outcomes

This section outlines the *Constitution* and key pieces of legislation that consider, or legislate, with the aim of achieving specific environmental outcomes. It is clear from the various goals, matters to be considered, and the purpose and objects of Acts outlined below that PNG's legislation clearly mandates that all development should be undertaken in a manner which protects the environment (unless otherwise approved), including subsistence resources, and provides for sustainable development.

2.1.1.1. *The Constitution*

Environmental aspects are considered at the highest level under PNG's *Constitution*. The Fourth Goal in the National Goals and Directive Principles declares, '*Our natural resources and environment to be conserved and used for the collective benefit of us all and are replenished for the benefit of future generations*'.

2.1.1.2. *Physical Planning Act 1989*

While the purpose of the *Physical Planning Act 1989* does not explicitly provide a commitment to the environment, *Section 5* outlines a number of relevant matters to be taken into account when considering a physical planning matter under the Act. Some of these matters are:

- the provisions of the *Environmental Planning Act 1978*, the *Environmental Contaminants Act 1978* [now replaced by the *Environment Act 2000*], and the *Conservation Areas Act 1978*;
- the impact on the environment, and where harm to the environment is likely to be caused, any means that may be employed to protect the environment or to reduce that harm;
- the effect of any development on amenity, including the external appearance of the development in so far as this affects amenity;
- the character, location, bulk, scale, size, height, and density of any development;
- the social and the economic aspects of the matter;
- the size and shape of land which is proposed to be developed, the siting of any building or works thereon, and the area to be occupied by any development;
- whether land is unsuitable for development by reason of its being, or likely to be, subject to flooding, tidal inundation, subsidence, slip, bushfire, earthquake, volcanic eruption, or to any other risk, whether natural or manmade;
- whether public transport services are available and adequate;
- whether utility services are available and adequate;
- the landscaping of the land on which development is proposed, and whether trees on the land should be preserved; and
- representations on physical planning grounds made by a member of the general public.

2.1.1.3. Environment Act 2000

The *Environment Act 2000* is the key piece of legislation in PNG providing for the protection of the environment and prevention of environmental harm (without government approval). While it appears the Act has been written with the intention of preventing harm from large developments that are capable of causing significant environmental harm (e.g. resource sector activities), the Act's objects include concepts of sustainable development (e.g. inter-generational equity). In particular, *Section 4(h)* requires the precautionary approach to be applied to the assessment of risk of environmental harm.

In doing so, matters of national importance are to be recognised and provided for, including maintenance of sources of clean water and subsistence food sources to enable those Papua New Guineans who depend upon them to maintain their traditional lifestyles, and the protection of areas of significant biological diversity and the habitats of rare, unique, or endangered species. Sustainable economic development is also required under the Act.

2.1.1.4. Protected areas and species

A number of pieces of legislation (*Conservation Areas Act 1978*, *National Parks Act 1982*, *Fauna (Protection and Control) Act 1966*) provide for the protection of areas, habitats and species.

The *Conservation Areas Act* and *National Parks Act* both provide for the preservation of the environment and of the national cultural inheritance by legislating for the conservation of sites and areas having particular biological, topographical, geological, historical, scientific, or social importance, and the management of those sites and areas in accordance with the Fourth National Goal of the *Constitution*. Further, the *Fauna (Protection and Control) Act* provides for the protection of declared protected fauna species. While urban development does not usually occur in areas where these Acts apply, there have been circumstances where protected areas have been degazetted to allow for urban development planning processes to proceed (e.g. Paga Hill). They are therefore relevant to consider.

2.1.2. Preparation and implementation of development plans

The *Physical Planning Act 1989* provides for the preparation and approval of development plans (provincial, urban, local, or subject). The Act enables plans to include measures to improve the environment and zoning. Development plans shall include the principal physical, social, and economic characteristics of the area.

It is noteworthy that the *Physical Planning Regulations 1990* do not provide for an Environment Protection Zone, but they do provide for an Open Space Zone. The Urban Development Plans are further discussed in Section 2.2.2.

2.1.3. Development application and approval processes

There are two key levels of approval for urban-related development in PNG:

- Planning permission under the *Physical Planning Act 1989*; and
- Environment permit under the *Environment Act 2000*.

2.1.3.1. Physical Planning Act 1989

The regime for planning permissions is intimately linked to the preparation of development plans, particularly to designated zones.

Section 7 of the *Physical Planning Regulation 1990* outlines the information to be provided with an application for planning permission. There is no requirement to provide any information related to environmental protection or sustainable development aspects, except for a site plan which shows the proposed alterations to the natural contours of the area and landscaping where the development relates to building or engineering works. Also, there is no requirement to demonstrate that the land is not subject to flooding or tidal inundation, even though these are matters to be taken into account when considering a physical planning matter under the Act.

The *Physical Planning Manual* outlines the matters to be taken into account when making decisions on applications for zoning and for planning permission. The matters which are listed are the same as those in *Section 5* of the Act (see Section 2.1.1.2). The Application Appraisal Checklist in the manual also provides a list of detailed questions and gives examples which cover most environmental considerations. However, it does not appear that there is any legislated requirement for consideration of all of the *Section 5* matters (including those relevant to the environment) when making decisions on zonings or planning permission applications.

No evidence was available at the time of writing to determine whether the process in the *Physical Planning Manual* or the *Section 5* matters are taken into account when planning decisions are made.

2.1.3.2. Environment Act 2000

The environment permit process provides an overarching system for considering environmental issues in development. An environment permit is required for Level 2 and Level 3 activities. These activities are listed under the *Environment (Prescribed Activities) Regulation 2002* and contain a number of urban development activities, including the construction of housing estates larger than five hectares, the construction and operation of sewage treatment plants, and the construction and operation of landfill sites.

Where an environmental impact assessment (EIA) is required, as part of the permitting process, the approval of the associated environmental impact statement (EIS) requires consideration of the objects of the Act (see Section 2.1.1.3), matters of national importance, the general environmental duty, and other environmental considerations (*Section 58*). The same matters must also be considered in the approval of an environment permit, along with any international relevant environmental obligations to which PNG is bound (*Section 65*). Assuming that assessments and decisions by the Government are properly undertaken (note that no evidence was reviewed in the preparation of this report), this legal requirement suggests the importation of principles of sustainable development (e.g. inter-generational equity, and precautionary principle) into the development assessment and approval process.

2.1.4. Enforcement

The enforcement of permit and planning outcomes under PNG's legislation is by way of offence provisions and appeal rights. Orders may be made by relevant bodies under the Acts in order to prevent development that is inconsistent with legislation. However, the making of these orders is discretionary, and does not require consideration to be given to the objects of the relevant Acts.

Applications may be made for review by statutory tribunals within limited circumstances. The Papua New Guinea Physical Planning Appeals Tribunal (PNGPPAT) may hear appeals

in relation to various matters, including a decision on a planning permission. These appeals are open only to ‘an applicant, or an owner, or an occupier of land who is aggrieved by a decision of a Board’ (*Section 94*). The matters that must be considered as part of the appeal process are not prescribed in the Act or the *Physical Planning Regulation 1989*, but presumably would include the matters in *Section 5*. The *Physical Planning Manual* does not provide guidance on this procedure. However, appeals cannot be made against the approval of a Development Plan.

An applicant for an environment permit, under the *Environment Act 2000*, who is dissatisfied with a decision by the Director may appeal to the Environment Council for review. In accordance with the *Environment (Council’s Procedures) Regulation 2007*, the Council does not need to consider the objects of the Act when deciding upon the appeal. The Department of Environment and Conservation’s *Operational Manual* does not provide any necessary criteria for consideration by the Council.

There is also the possibility of reviews by the National Court and Supreme Court on administrative grounds where an applicant with a ‘sufficient interest’⁵ is denied procedural fairness in the decision-making process. This includes the decision not to utilise offence provisions to prevent illegal development. No review on the merits is allowable, however, and the courts cannot force decision makers to consider matters that are not listed in the relevant decision-making Act. Where the decision-making process that is undertaken by relevant authorities is not documented, it is difficult to challenge decisions on the grounds of administrative law.

The lack of merits review and decision-making criteria under the *Physical Planning Act 1989* makes it difficult to challenge decisions to ensure that environmental protection and sustainable developments are achieved.

2.1.5. Public Participation

Public participation under the stated approval regimes is more inclusive under the *Environment Act 2000* than the *Physical Planning Act 1989*. The public have the statutory right to involvement in the preparation of environment policies (tools used under the Environment Act 2000), and the assessment of EIS and environment permit applications. By contrast, the right of participation under the *Physical Planning Act 1989* is limited to the preparation of Development Plans.

Enforcement (right of appeal) of decision making is also limited only to applicants or affected owners/occupiers, and to persons deemed to have a ‘sufficient interest’ for the purposes of administrative law. This limits appeals by public interest groups and other bodies not sufficiently proximate to the decision in question.

2.1.6. Summary

PNG’s legislation provides appropriate objectives to achieve environmental outcomes, but little detail is provided on the assessment process and those matters (environmental or otherwise) that must, shall, or may be taken into account in decision making. Where departmental manuals specify a process, this is not backed up through legislation or enforcement. Where decision-making documentation is lacking, this raises difficulties in bringing objections to decisions on the grounds of administrative law. Options for public participation are limited.

⁵ *Valentine v Somare* [1988–1989] PNGLR 51; *Mugridge v Minister for Labour and Employment* [1987] PNGLR 348.

2.2. Planning Framework

For the purposes of this study, the review has been limited to a number of overarching strategic plans and development plans for urban development areas and local development areas.

2.2.1. Strategic planning

The strategic planning framework that is applicable to development in PNG is shown in Figure 1. The environmental aspirations of the higher-level plans are briefly discussed in this section—PNG Vision 2050, PNG Development Strategic Plan (PNGDSP) 2010–2030, and Medium Term Development Plan (MTDP) 2011–2015.

Figure 1: Logic of Development Planning in PNG



Source: http://incentivefund.org/cms/our_processes/relationships (accessed October 2013).

- **PNG Vision 2050 (2010–2050):** This document sets the framework for PNG’s development over the next (almost) forty years. The plan embraces the Five National Goals and Directive Principles of the *Constitution* through the establishment and focus on ‘Seven Pillars’, one of which is “*Environment Sustainability and Climate Change*”. *PNG Vision 2050 considers inter-generational equity, and “promotes a sustainable development strategy through the ‘wise use’ principle. Proper environmental management will ensure that environmental benefit will be enjoyed by the present generation and that there will be investment for future generations. It also emphasises the importance of conserving biodiversity and promoting sustainable use in economic planning. PNG needs to devise appropriate strategies to deal with conservation and carbon trade issues (see Paragraph 15.2.3).*
- **PNGDSP 2010–2030:** This document is PNG’s strategy to achieve the aspirations of the PNG Vision 2050 over the first twenty years. Among other goals, the PNGDSP provides that urban centres will be developed according to international town planning standards in order to cater for urbanisation and socioeconomic progress and deliver quality of life for all urban people (*see Section 4.13*). Importantly, the PNGDSP proposes that effective physical town planning will be required to ensure that residential and industrial developments are well located and properly provided with essential public infrastructure. It also requires:
 - *Promotion of Sustainable Development.* Among other aspects, it considers the contribution of urban development to water pollution through the direct disposal of untreated household wastes and raw sewerage into the ocean from most coastal villages.
 - *Adapting to the Domestic Impacts of Climate Change.* Rising sea levels will force many coastal communities to relocate.
 - *Managing the Risks of Natural Disasters* (including floods and landslides). While no specific avoidance strategies are mentioned in the PNGDSP, the

plan does consider the implementation and enforcement of building standards for the construction of infrastructure in disaster prone areas.

- **MTDP 2011–2015:** This document aims at implementing actions that are necessary to achieve the goals of the PNGDSP. Two sectors that have been identified under the MTDP and which are relevant to planning and environmental outcomes are *Key Sector: Urban Development*, and *Cross-Cutting Sector: Environment*. The goals of these sectors that are relevant to sustainable development and environmental planning include:
 - o *Urban Development:* Ensuring that less than 15 percent of the population lives in settlements by 2030, and that urban development plans are in place for the major cities or towns of each province by 2015, and in all cities and towns by 2020.
 - o *Environment:* Retain the percentage of land area covered by primary forest at a minimum of 59 percent.

2.2.2. Urban development plans

Urban Development Plans (UDPs) have been developed for both the National Capital District (NCD) and Lae. In the hierarchy of development plans, these are of a higher level than Local Development Plans (LDPs) and set the outcomes and schedule to be achieved by the LDPs. Broad zoning under the UDPs reflects the high-level intention for the area.

2.2.2.1. National Capital District Urban Development Plan

The National Capital District Urban Development Plan (NCDUDP) has been prepared in consideration of the requirements in the *Physical Planning Act 1989* and *Physical Planning Regulations 1990*. The objectives of the Plan which focused on environment and sustainability are:

- protect important and valued environmental features; and
- safeguard development from natural risks.

Although the Plan has been prepared on outdated data (from 1996), the physical environment has been considered in its preparation.

The key chapters that influence environment and sustainability outcomes are Infrastructure Services (*Chapter 5*) and Physical and Environmental Constraints (*Chapter 6*).

Chapter 5 covers water supply, sewage disposal, stormwater, waste disposal, and transport. The key issues impacting the achievement of environmental outcomes include:

- 7(a): A greater proportion of the residents of the NCD do not have access to the sewerage system. Also a number of trunk sewers were overloaded or flowing at capacity at the time of the preparation of the Plan in 2006, and a number of trunk sewers are flagged in the document as requiring augmentation by 2015.
- 8(a): Both the Baruni and Six Mile Dumps are currently being poorly managed and the methods of operation need major improvement.
- 8(b): As the NCD expands, there is an increase in the level of pollution of land, waterways, and foreshores, which is threatening the natural environment. This is caused by the irresponsible disposal of rubbish and human and animal waste, as well as air pollution from fires and the burning of rubbish.

No key issues were raised in the UDP regarding stormwater, despite the fact that the Port Moresby Urban Stormwater Management Study⁶ found that local failures are the result of undersized or blocked culverts. Flooding which has resulted in damage to property continues to occur within the NCD because of blockages, lack of maintenance, and other issues with the drainage system. Potential climate change issues such as sea level rise and increased inundation from flooding as a result of tidal surges have not been considered in the Plan.

Chapter 6 considers physical constraints such as topography, slopes, and stability, predominantly from the perspective of preventing development (because of development risk).

However, the consideration of drainage conditions (*Chapter 6.4*) reveals that the majority of run-off from inland areas within the NCD discharges into the Waigani Swamp (300 ha), the Laloki River (North-East of NCD), and other minor catchments. Coastal areas tend to drain directly to the ocean. As a result, a key issue (14(a)) states that, “*Alternative sources of water for residential and industrial use within the NCD are becoming prone to contamination from development and need to be protected*”.

The Plan identifies environmental features, “*that reflect the presentation of fauna, flora and land formation in the promotion of scenic and recreational landscape resources*” (see Table 1). The threats to these environmental features, especially mangrove swamps and open space areas, are identified as a key issue to be protected by the limitation of development.

Table 1: NCDUDP Environmental Features

Category	Description
The urban waterfront	Areas currently used for urban purposes such as wharves for container and passenger ships and as yacht berths. This covers the waterfront areas from Napa Napa to Konedobu, Paga Hill and Koki.
Intense active recreational areas	Areas such as the waterfront and beaches that are actively utilised by the public. These areas include Ela Beach, Taurama Beach, and areas around Walter Bay and the Port Moresby Harbour.
Recreational scenic areas in relatively natural state	Areas within the NCD that have the potential to be developed for scenic and recreational purposes, but are currently not fully utilised. These include the outer shore islands of Daugo, Honundamava, Lolorua, and Manubada. On the mainland, such scenic areas are hilltops and ridges overlooking the lowlands and the coastal areas.
Areas in a relatively natural state	Areas that are currently in their natural state which should be preserved. These areas are basically the coastal areas that are covered by mangrove swamps which extend from Napa Napa to the Taurama coast and the meandering banks, especially the Joyce Bay area and the Laloki River area. The likely preservation of these natural resource locations from intense development pressures should be enforced.

⁶SMEC (PNG) (1995).

Scenic areas and passive open spaces	Areas that have scenic and recreational value. Ridge-lines of surrounding hills provide a basis for scenic areas. These areas are currently utilised as ‘look out’ points, such as Paga Hill and Touaguba Hill, and Waigani and Koki Heights. All visually prominent hilltop sites are to be protected from the impact of development. The criteria used for selecting the sites were largely aesthetic, and the issues of soil stability, land slopes, erosion, or ecological constraints are evident.
Wetlands (water resource catchment areas)	These areas provide accessibility to water and have the potential as alternative underground sources, given the water situation in the NCD. There are no areas in the NCD other than Waigani Swamp and Laloki River that are significant water catchment areas. These areas must be protected from contamination and the potential impacts from any development.

In particular, the NCDUDP seeks to limit development in the coastal strip. This corresponds to Strategy (iii) of the desired outcome to, “*Ensure protection and stability of coastlines and natural waterways through application of best practices and management principles*”. This is reflected in the broad-level zoning which utilises open space zoning to protect undeveloped coastal and mangrove areas.

Open space areas are utilised under the Plan as ‘green space buffers’ to sensitive environmental areas. In addition, the Plan sets aside an area to the South-East of the NCD as an, ‘*environment preservation promotional area*’, for the purpose of constraining development.

Section 11.0 of the Plan identifies all of the stakeholders concerned with development and planning in the NCD.

In summary, the NCDUDP provides overarching goals for the achievement of environmental and sustainability outcomes. However, it does not appear to consider an adaptive management approach to changing environmental or climatic conditions such as sea level rise, increased flooding, and so on. In addition, even though environmental data are provided in the form of maps, it has been acknowledged at the time of publication that these data was outdated. This casts doubt on the applicability of environmental and planning outcomes in the NCDUDP. Maps in the Appendices do not appear to be consistent with the development that has occurred.

Several “Key Issues” are identified in the Plan to address specific environmental issues and needs. However, key issues such as stormwater management have not been identified, and no recommendation has been made on how to address them. The main development control mechanisms are zoning and the approvals regime, but it is uncertain within the Plan which aspects form binding criteria for decision makers.

It appears that the development which has occurred in the planning area does not comply with the provisions of “environmental protection” areas within the NCD (it is noted that in some circumstances, these may be landowner communities rather than new developments). Therefore, it has been assumed that the zonings in the Plan have not been enforced.

As noted in *Section 14.0*, the preparation of the NCDUDP has revealed a lack of recognition of the importance of physical planning, with preference granted to engineering proj-

ects. A useful review objective has been set but without indicative timeframes.

2.2.2.2. Lae-Nadzab Urban Development Plan

The Lae-Nadzab Urban Development Plan 2005–2015 (LNUDP) has been prepared in accordance with the *Physical Planning Act 1989* and *Physical Planning Regulation 1990*. The environmental considerations that are highlighted in the LNUDP include:

- historical flooding along the Bumbu and Busu Rivers, and extensive floodplains in the study area;
- high risk of landslides, including those as a result of human modification of natural vegetation cover; and
- instability of the coastal foreshore at Voco Point and the former Lae airstrip.

These environmental features have been reflected in the physical constraints mapping under *Section 5.0*. Physical constraints have been summarised as mountains, rivers, the sea, floodplains, and swamps. Zoning, as mapped in *Plan 7*, avoids the development on land mapped as ‘constrained by environmental features’.

As part of the Infrastructure and Services Plan in *Section 8.0*, drainage is a key concern. Based on drainage and stormwater run-off risks associated with the construction of hard surfaces through the Malahang Local Development Area, a drainage reserve has been proposed to operate as both a drain and an open space. In addition to this provision, local development policies emphasise the retention of open space, including foreshore and riparian areas.

Section 4.3 of the LNUDP identifies that, ‘*the effectiveness of the current zoning plan for Lae is undermined by the approval of non-conforming uses on a regular basis.*’ The Plan does not provide a concrete remedy for this concern outside of the existing planning framework provided by the Act.

Public participation in the form of stakeholder consultation occurred as part of the preparation of the LNUDP. No participation outside of the statutory scheme is recommended under the Plan.

2.2.3. Local development plans

This section reviews the environmental aspects of the Port Moresby Town Local Development Plan (POMTLDP), the Poreporena Napa-Napa Local Development Plan (PNLDP) and the 8/9 Mile Area Local Development Plan (8/9 Area LDP) in the NCD.

There is no LDP within the planning area of the Lae-Nadzab UDP.

2.2.3.1. Port Moresby Town Local Development Plan

The Port Moresby Town Local Development Plan (POMTLDP) provides the planning future for the area, in accordance with the NCDUDP. This LDP has been prepared under the *Physical Planning Act 1989* and the *Physical Planning Regulation 1990*. The scheduled completion date for this LDP was 2005. However, the Plan was completed in early 2007.

Port Moresby is a large city which is heavily constrained by the steep terrain that surrounds the area. These areas have traditionally retained natural vegetation cover, although there is evidence of farming through some grassland areas. The zoning provided for under the LDP places most of this area within an Environment Protection Zone. The POMTLDP also discusses the possibility of revegetation opportunities but does not provide any strategic

framework for such activities.

The POMTLDP identifies litter as a major social and amenity problem in Port Moresby. This has implications for the contamination of waterways and environmental values, especially because of the numerous drainage channels that exist throughout the city. Sediment and gross pollutant traps have been proposed under zoning regimes which will help capture contaminants. This will also have positive impacts for receiving environments including marine ecosystems. In addition, penalty regimes are considered (but not enforced) under the POMTLDP in relation to littering and land contamination.

Other environmental and sustainability concerns that are recognised under the POMTLDP relate to the development of the shoreline, especially the modification/clearing of coastal habitats and the resulting effects on erosion and environmental values. Limited environmental protection constraints have been placed over foreshore and coastal vegetation areas. The majority of the environment that is protected in the POMTLDP area is on steep hills, representing only two of the four vegetation communities of Port Moresby (savannah grassland and deciduous forest, but not beach and mangrove forests).

There are no compliance issues with the overall zoning and development controls of the NCDUDP because of the special status given to the Port Moresby LDP area under this instrument. There are potential concerns associated with consistent application, however, due to the reliance of the POMTLDP upon zoning constraints without corresponding development mechanisms and controls that directly reflect the NCDUDP. No public participation is integrated into the application of the POMTLDP.

2.2.3.2. Poreporena-Napa Napa Local Development Plan

The Poreporena-Napa Napa Local Development Plan (PNLDP) has been prepared under the *Physical Planning Act 1989* and *Physical Planning Regulation 1990* and in accordance with the NCDUDP. This LDP was completed in May 2014, despite a schedule completion date of 2007 under the NCDUDP.

The PNLDP promotes environmental and sustainability outcomes through zoning and development controls, as well as design principles. The key chapters for achieving these outcomes are:

- Constraints and Strategies (*Chapter 4*);
- Zoning (*Chapter 6*); and
- Infrastructure (*Chapter 8*).

The Environmental Protection Area reflects the environmental constraints that have been identified for the PNLDP. These are mangroves along the foreshore, reefs, riparian corridors along major creek lines, and grassland and woodland vegetation communities above 90 metres. Despite this, the zoning for individual precincts shows much of the existing mangrove communities on the eastern side of Port Moresby Harbour as outside of this zone. Development in this area also covers existing reef sites. A number of creeks flowing into the bay are also zoned as part of new development rather than as a protection area.

Stormwater management principles have been adopted from the *NSW Residential Flat Design Code* and promote the creation of 'wide riparian corridors for stormwater collection and management'. As many existing creeks and drainage channels are subject to development under the proposed zoning arrangements, there are definite constraints on the achievement of this objective. Furthermore, there are no clear principles for erosion and turbidity con-

trol, especially in relation to land clearance, other than the use of gross-pollutant traps and on-site detention storage.

Flooding and associated inundation risks are discussed in *Chapter 6* in relation to zoning principles. However, there is no consideration of climate change impacts, including sea level rise, increased flooding and higher rainfall, or its impacts on the existing environment, for example, movements in the foreshore and increased sediment loading in stormwater). This includes the consideration of natural features, such as mangroves, to increase resilience to hazards.

The PNLDP is generally compliant with the principles and planning outcomes that are outlined in the NCDUDP. However, *Strategy 10.3(iii)* requires coastlines and natural waterways to be protected and stabilised. This is contrary to the approach of the PNLDP in placing these areas within urban development footprints, especially where buffering against the effects of sea level rise and storms has not been considered.

Public participation has been included through the consultation process leading up to the development of the PNLDP. This was not required as part of the plan processes but was conducted to ensure that PNLDP reflected the community vision.

2.2.3.3. 8/9 Mile Area Local Development Plan

The 8/9 Mile Area LDP (8/9 LDP) has been developed under the *Physical Planning Act 1989* and *Physical Planning Regulation 1990*. The NCDUDP scheduled completion date of the 8/9 LDP was 2006. The LDP was finally completed in 2010.

The 8/9 LDP promotes the conversion of large areas of grassland savannah and ridgeline vegetation, excluding riparian areas and ridge tops above 90 metres into open space. Development impacts on waterways are controlled by reference to *the Environment (Water Quality Criteria) Regulation 2002*, and the development of natural drainage by reference to best practice engineering design.

Apart from these controls, the 8/9 LDP has no provision for promoting environmental and sustainability outcomes. The bulk of the planning material focuses upon zoning and relying upon open space areas as a form of habitat protection. The lack of detailed planning requirements for infrastructure and the natural environment provides greater opportunity for inappropriate activities causing environmental impacts such as erosion, turbidity impacts, and vegetation degradation or removal. This is contrary to the objectives and vision statements of the 8/9 LDP. No public participation has been integrated into the application of the 8/9 LDP.

2.3. Other Plans and Policies

There are a number of other plans and policies that guide urban development in PNG and set standards for the protection of the environment.

2.3.1. Environmental policies and codes

The *Environment Act 2000* provides that an environment policy may be prepared to apply to the whole country, or to a segment or element of the environment in respect of any of the following matters: contaminant; an industry or activity; a technology or process; a beneficial value; loss of a beneficial value relating to the environment; waste management or minimization; contamination control practice; land, air or water quality; noise; litter;

management of surface and underground water; and decommissioning and rehabilitation requirements. Provincial environment policies may also be made with respect to noise, litter, hygiene, sanitation; or such other matters as are within the law-making capacity of provincial governments. It is not known whether any general environment policies or provincial environment policies have been prepared.

A number of Codes of Practice have also been developed under the Act. Those that are most relevant to urban development include:

- **Draft Environmental Guideline for Sewage Treatment and Disposal.** In addition to outlining environmental management requirements and water quality criteria, the guideline considers the linkages with utility providers and outlines the following critical issues:
 - o the need for baseline water quality data across the country;
 - o the need to establish environmental values in all catchments, nationwide; and
 - o the wide range and cost of sewage treatment systems, varying environmental values, and the option to impose catchment specific effluent quality standards, as opposed to nationwide standards.
- **Environmental Code of Practice for Sanitary Landfill Sites.** This Code outlines the management requirements and considerations when planning, constructing, operating, and closing a landfill site.

Note: These Codes are considered as guidelines only and cannot be enforced unless specifically included in the conditions of approval for an Environment Permit.

2.3.2. Urbanisation policies

2.3.2.1. Papua New Guinea National Urbanisation Policy 2010–2030

The *Papua New Guinea National Urbanisation Policy 2010–2030* (NUP) adopts a strategy of ‘sustainable urbanisation’, which is consistent with the existing framework for development, as advocated under the following instruments:

- *Constitution of PNG: National Goals and PNG Eight Point Plan;*
- *Medium Term Development Strategy 2005–2010;*
- *National Strategic Vision 2050 ;*
- *Development Strategic Plan 2010–2030; and*
- *National Population Policy 2000–2010.*

In *Section 2.0* of the NUP, exploitation of the PNG environment is noted as a major point of tension between the need to exploit resources, and the need to protect biodiversity and ecosystems. In particular, exploitation of the environment, combined with a lack of effective measures for conservation and resource management are noted as key contributors to the deterioration of the urban environment.

These tensions were acknowledged in the *2005 Interim Statement of Urbanisation Policy* and carried over as a national thematic cross-sector policy area— *Urban Environment and Climate Change*. The goal of this policy area is, *‘the creation of better living environments suited to the range of needs and demands of urban dwellers whilst making a positive and tangible*

contribution to minimising the impacts of climate change. Primarily, this policy is concerned with integrating climate change ‘proofing’ measures into urban planning, and forward planning for settlements. The development of ‘environmental’ structure plans that aim to minimise travel, encourage public transport, designate major employment nodes, and provide for open space and multi-purpose drainage areas is a key measure towards achieving sustainable outcomes. The policy also aims to ensure that development activities are subject to appropriate checks on environmental impact, which is a step that is not currently explicit under planning legislation.

An Implementation Plan is proposed in *Section 5.0*. This involves adopting the NUP and ensuring that appropriate institutional arrangements and capacity building are in place for its implementation. A program approach based on integrated and coordinated planning for thematic areas has been adopted. This involves the implementation and enforcement of individual programs that are based on various funding arrangements and partnerships.

There are also plans for the enactment of the *Physical Planning and Urbanisation Management Bill*, but it is uncertain if this bill has been passed and to what extent it implements the matters identified in the NUP. To the extent that the NUP is not reflected in legislation, its enforcement remains at the discretion of the Office of Urbanisation.

The implementation of the NUP involves public awareness building in order to ensure that development activities occur in accordance with the provisions of the policy. Extensive research and stakeholder engagement was also undertaken in the preparation of the NUP, although it is uncertain to what extent the policy represents community views.

2.3.2.2. National Capital District Settlements Strategic Plan 2007–2011

The *National Capital District Settlements Strategic Plan 2007–2011* (NCDSSP) has been prepared in accordance with the National Goals and Directive Principles of the PNG *Constitution*. The NCDSSP builds on the thematic policy areas of the Interim Statement of Urbanisation Policy that was released in 2005, and includes Undesirable Urban Environments, which was the precursor to the NUP Urban Environment and Climate Change.

The two main environmental concerns for settlement planning in the NCD that have been identified are soil erosion and pollution. The Plan addresses these concerns, as well as the need to maintain a sustainable settlement pattern, through the adoption of environmental goals (*Section 9.4*). This goal is, ‘to prevent degradation of the local environment and protect high value environmental assets’, to be achieved through the following measures:

- aiming for the preservation of important local environmental areas through demarcation on settlement subdivision designs;
- educating settlers on the importance of protecting the natural environment, catchment areas, ridge lines, swamps, mangroves and foreshores, and about the risks of settling on hill slopes, drainage reserves, and road reserves; and
- supporting environmental awareness programs amongst the community, especially in schools.

The implementation targets for these strategies include the completion of an assessment report on all valuable environmental and heritage areas in the NCD (by 2007), increased public awareness programs to commence (in 2007), and the participation of the NCD in the annual World Environment Day.

It is uncertain if these implementation targets have been met, but where they have not, this

would suggest that these are enforcement and/or capacity problems.

2.3.3. Utilities and infrastructure policies

Two types of policies or guidelines would usually be expected in relation to utilities and infrastructure:

- documents that set out the vision and actions of an organisation; and
- documents to guide the development and activities associated with the utility or infrastructure.

Only the first type of policy document from Water PNG was able to be reviewed as part of this research project. It is presumed that organisations such as PNG Ports would have guidelines for developers applying to construct infrastructure such as a wharf within a marine area. It is not known if these guidelines consider environmental aspects and set standards for development.

2.3.3.1. Water PNG

The *Master Plan and Annual Report* of Water PNG outline their corporate goals to include the provision of safe and sustainable water and sanitation services on an equitable basis, and to be environmentally conscious in all aspects of planning, construction, and operations.

One of Water PNG's roles is to complement the roles and responsibilities of the Department of Environment and Conservation (DEC). As such, Water PNG considers one of their stakeholders to be the DEC, and notes that the department expects greater sensitivity to environmental impacts, climate change issues, and integrated water resources management from them. It also acknowledges climate change induced environmental impacts as a real challenge to Water PNG's business and services in the medium term. It also links back to the PNGDSP and the MTDP. Within the action plans, Water PNG aims to ensure that waste water discharge and treatment is compliant with 'standards' and is environmentally friendly. However, it does not nominate which 'standards', or define 'environmentally friendly'. It also required that operations cause, "*minimal degradation of the environment through safe and environmentally friendlier utilisation for water resources and discharge of wastes*".

In addition to acknowledging the impact on the environment, the Master Plan also acknowledges the impacts of extreme weather patterns (and resulting flash flooding and landslides) on Water PNG's infrastructure. Likewise, it acknowledges the impacts of other activities on water quality, and therefore Water PNG's ability to deliver water of an acceptable quality to its customers.

Ch. 3 Case Study Findings

For the most part, urban development in PNG has occurred on available land that is predominantly State land. This land is not necessarily well-sited from an environmental perspective, and it appears that a range of planning issues have resulted in a lack of appropriate areas being made available for continued urban expansion, and a lack of sufficient infrastructure to service a growing population (see Section 4).

This has resulted in less than ideal circumstances including:

- uncontrolled urban development in areas that are prone to flooding (e.g. in Lae);
- National Parks being degazetted to make way for development (e.g. the controversial Paga Hill case (Portion 1597), where a 99-year business lease has been issued over the National Park, and where one of Port Moresby's largest developments is imminent);
- uncontrolled landfills, and limited or inadequate water supply and sewerage infrastructure; and
- lack of planning and ongoing management of drainage and stormwater quantity and quality.

Further, during the workshops that were held in August 2013, it became apparent that the lack of integration of the environmental assessment process into the planning process may have, or is having, real environmental impacts. Provincial planning officers were unaware whether developments that trigger the requirement for assessment and approval of an environmental permit had undergone the correct level of assessment. This included a lack of knowledge and awareness regarding management of issues such as wastewater treatment and the location of discharges. This suggests that environmental considerations are not being properly considered during the assessment and approval process (*see Section 5, Physical Planning Act, and the Physical Planning Manual*). Additionally, it appears that many developments proceed without permits, and therefore, the environmental impacts are unregulated.

These observations are further discussed in the case studies for Port Moresby and Lae.

3.1. Port Moresby

The Port Moresby case studies that were examined from an environmental perspective were Taurama and Motukea Island. Findings of the Taurama case study are presented in this section, while additional observations relating to urban development in Port Moresby are also provided.

3.1.1. Taurama

Taurama is a new development that is occurring in an ad hoc manner on customary land. The area is not serviced with a reticulated water supply or sewerage infrastructure, and there is no stormwater infrastructure or treatment. Water trucks service the development multiple times daily and some residents pay to fill their 50,000 litre water tanks. Others have opted to have bores drilled to obtain a water supply. Some houses have septic systems while others have a pit latrine. Anecdotally, many people still use the bush as their toilet. Combined with the lack of stormwater management, this situation has the potential to cause impacts on water quality through run-off, including untreated sewage, grey water, and stormwater. This situation is not consistent with the legal and planning framework described in *Section 2*.

Under the NCDUDP, the south-eastern area of Taurama is mapped as an Environmental Preservation Area (see Map 10). While much of this land is in a relatively natural state, there has been significant urban encroachment on the areas mapped for preservation of the environment. Additionally, the coastal areas, including the mangroves and reef along the Taurama coastline, are identified under the NCDUDP as within areas of '*coastal marine and reef protection*'. Within the Taurama development, it was observed that encroachment was also beginning to occur within mangrove areas. Further, a population increase within this area is likely to cause an increase in the impact on reefs and the marine environment adjacent to the development through fishing pressure. Inundation impacts on residents may be exacerbated in the future because of climate change impacts, such as sea level rise, as residents build in marine areas amongst the mangroves.

3.1.2. Other observations

3.1.2.1. *Developments without an Environment Permit*

During the review, the authors were advised by government officers that many existing developments and developments under construction within Port Moresby do not have an Environment Permit, despite the fact that they trigger the requirement for a permit under the *Environment Act 2000* and the *Environment (Prescribed Activities) Regulation 2002*.

With the likely cost of a number of these developments exceeding PGK50 million, these developments would be categorised as Level 3 Activities under the *Environment (Prescribed Activities) Regulation 2002*. This would in turn trigger the need for an Environment Permit through the preparation of an environmental and social impact assessment. Anecdotal evidence suggests that the proponents of these developments are not pursuing the required assessments and approvals. While it could be argued that the regulation regarding such developments needs to be revisited to concentrate on activities which place a greater impact on the environment, or that DEC is under-resourced to deal with assessments for what may be considered low-risk developments under the existing legal framework, these developments trigger the requirement for assessment and approval.

The wastes and discharges from these developments predominantly end up in facilities which are required to have their own Environment Permits, such as the Baruni Dump, and operations run by Water PNG and Eda Ranu. Where other contaminated wastes are generated by these developments, they may go unassessed, if not subjected to the correct level of assessment under the *Environment Act 2000*. This would result in uncontrolled discharges and environmental pollution.

Solid waste management in Port Moresby is a recognised health and environmental con-

cern, and the topic has received considerable funding and attention in order to improve the situation.⁷ Most solid waste in Port Moresby is currently taken to the Baruni Dump, while medical waste is taken to another smaller landfill site near the Port Moresby General Hospital. The Baruni Dump is not fenced (i.e. open access), or lined (allowing leachate to escape from the site). The waste is burned which causes pollution of the surrounding environment. These issues have been identified in the NCDUDP, but strategies to achieve real solutions have not been developed within the Plan. Anecdotal evidence suggests that the Environment Permit for the Baruni Dump has been allowed to expire, and as such, the site is currently unpermitted and activities are unregulated.

3.1.2.2. Stormwater management

The urban drainage system in Port Moresby is poorly maintained, and its effective operation is hindered by solid waste and sediment build up in undersized or blocked culverts. During heavy rains, locations adjacent to stormwater drains are regularly flooded (e.g. near the Gordons Market), creating traffic chaos, hazardous situations, and endangering lives. These issues are recognised in the NCDUDP, but no overarching objective or action has been developed within the Plan to address the issue.

In some locations, open spaces have been used as a flood protection mechanism (e.g. the open spaces, grassed areas, and parks along the lower areas of the Poreporena Freeway near Gordons). However in a number of locations, encroachment has reduced the capacity of the drain and increased the hazards to others along the drainage network.

Without drastic action such as the removal of development which encroaches on areas required for drainage, redesigning of the drainage network, or implementing a revived maintenance program, the situation is unlikely to change in the new future.

The NCDUDP identifies the Waigani Swamp and the Laloki River as water resource catchment areas within the NCD, and proposes that these areas are to be protected from contamination and potential impacts from any development. It also highlights that these areas provide accessibility to water, given the water scarcity situation in the NCD. However, an inspection of aerial imagery shows that encroachment is occurring in these water resource catchment areas. Further, with the solid waste and sediment drainage issues that have been identified, uncontrolled drainage direct from urban areas has the potential to significantly impact on water quality and amenity. Maintaining the mapped buffer areas around resource areas is essential in order to protect the water quality of the Waigani Swamp and the Laloki River, for the dual purpose of environmental protection and potential human uses.

3.2. Lae

The Lae case study examined the rubbish tip from an environmental perspective. Additional observations relating to urban development were made in relation to planning for natural hazards.

3.2.1. Rubbish tip

At the time of preparation of the LNUDP, a Waste Management Plan was being prepared for Lae by Cairns City Council and Cairns Water under the Sister City program and through the Lae Urban LLG. While the study had not been finalised, it was noted that the

⁷ <http://devpolicy.org/solid-waste-management-in-papua-new-guinea-20130812/>, accessed 17 October 2013.

dump was considered to only have five or six years remaining before it reached capacity. Poor management practices were highlighted in the Plan, including a lack of security fencing, the nearby squatter settlement, no daily coverage of rubbish, uncontrolled burning of waste, and the problem of rainwater percolating through the garbage and creating leachate. These poor management practices have resulted in air, groundwater, and surface water pollution, as well as potential human health issues.

It is not known whether the Lae City Council holds an Environment Permit for the operation of the site. It is noted however that the operation of the site is inconsistent with the *Environmental Code of Practice for Sanitary Landfill Sites (2001)*.

The LNUDP highlights that the management of the dump is a serious issue which needs to be addressed. However, during the site visit in August 2013, observations at the dump included a lack of security fencing, the burning of waste, and residents of the squatters' settlement accessing the dump site for resource recovery.

3.2.2. Planning for natural hazards

The LNUDP recognises the potential impacts of natural hazards such as flooding, landslides and tsunamis as potential issues for urban development in the Lae area. Coastal stability issues are also recognised, particularly in the vicinity of Voco Point and the former Lae airstrip.⁸ The Plan noted that the Bumbu and Busu Rivers flooded in the 1980s and 1990s causing property damage, homelessness, and loss of life. It therefore identifies that the extensive floodplains of the planning area should be avoided for urban development. It also requires that buffers should be provided along rivers and streams to cater for floods, and vegetated mountain slopes must be protected to avoid erosion and landslides. With the coastal stability issues in areas around Voco Point and the airstrip, consideration of buffers along the coastal strip is also required.

Observations in August 2013 confirmed that the LNUDP is not being effectively implemented or enforced in Lae, with respect to the management of urban development areas to reduce the risk of impacts from natural hazards, and to build resilience into development. For example, settlements along the Bumbu River are within the flood zone, and the lives of the people living in these areas are at risk. Development is also occurring in areas that are prone to shoreline erosion.

⁸ During the site visit in August 2013, it was noted that the coastline at Voco Point has changed dramatically compared with aerial imagery from 2010.

Ch. 4 Issues

Based on the review of the legal and planning framework in Section 2 and the case studies outlined in *Section 3*, this section identifies the key issues that influence and prevent the achievement of environmental and sustainability outcomes. While the issues that have been identified are related and often overlap, they have been separated under the following themes:

- planning for environmental outcomes;
- implementation;
- compliance and enforcement; and
- public participation.

4.1. Planning for Environmental Outcomes

4.1.1. Overarching objectives

Section 2 has demonstrated that there are a number of statutes which outline objects and matters that are relevant to achieving environmental outcomes. However, the commitment to these objectives is not necessarily included within the legislation itself, or in lower level plans, manuals, or policies.

Under *Section 5* of the *Physical Planning Act 1989*, consideration of environmental matters, such as the impact on the environment of a physical planning decision, is required. However, there is no legislative requirement for the consideration, or documentation, of these considerations. The inclusion of an appraisal checklist within the *Physical Planning Manual* would be a useful tool to encourage consideration and documentation. However, as this tool would not have legislative force, there would be no way to compel decision making in this manner. This then raises concerns, upon seeing development outcomes, that the matters within *Section 5* are not being considered when making planning decisions.

This lack of commitment also transpires from planning instruments that only indirectly address environmental outcomes, such as through the application of zoning, which avoids environmental areas on the basis of inherent physical constraints, such as steep land.

While the *Papua New Guinea National Urbanisation Policy 2010-2030*, and to an extent, the *National Capital District Settlements Strategic Plan 2007-2011* include environmental outcomes within their policy areas, there is no clear commitment to these environmental objectives at UDP or LDP levels. In addition, where environmental objectives are stated, these are only developed on an ad hoc basis, with little or no consistency across the plans.

There is also a lack of objectives and commitment focusing on green infrastructure. For

example, the stated predominant purpose of environmental protection zones is for the preservation of vegetation communities, which reside on constrained land. There has been no consideration or assessment of the capacity of these zones to serve multiple functions, including providing water regulation services, such as flood protection, stormwater management, and water sensitive urban design.

4.1.2. Collation and analysis of background data to identify issues and needs

The data required to adequately inform the planning process, including the identification of environmental constraints and opportunities, are lacking, or are out of date for each of the urban development planning areas. This seriously diminishes the capacity of these plans and associated planning authorities to adequately respond to changes, such as population increase, to maintain environmental and sustainability outcomes.

Where data are available, it is also apparent that there is a lack of available resources, including qualified personnel, for the processing and analysis of this data. Much of the time, analysis requires external assistance. This limits the efficiency and effectiveness of the system to deliver outcomes without sufficient funding (*see Section 4.2.5*).

Finally, if the background data have not been analysed, it is almost impossible to ensure that the issues and needs have been correctly identified to the level required. In essence, the absence of proper field data collection and analysis transcribes into an apparent lack of awareness in the government's urban planning about the actual development trends and challenges that exist in PNG's main cities.

4.1.3. Development of management strategies to address the issues and needs

Where the essential planning issues and needs have been identified, strategies should be developed to deal with these matters. It is evident from this review that management strategies are lacking at both the UDP and LDP levels:

- **UDPs:** Despite the availability of data, evidence and studies (albeit outdated) identifying environmental issues, appropriate management strategies, or actions to address all issues have not been developed in the UDP. For example, stormwater management in the NCDUDP is identified as a critical issue, but no '*Key Issue*' or other mitigation measure or strategy has been presented. Stormwater issues and associated flooding continue to be a problem in the NCD.
- **LDPs:** It is not apparent, and potentially unlikely, considering data that have been collected and the limited analysis capabilities, that the lower level development plans have been produced on the basis of sound data or analysis, which suggests that planning strategies may be misguided. Further, strategies have been developed to address these specific issues which are inconsistent with the development that has already occurred. For example, there are no rehabilitation provisions for environmental protection zones although many such zones have already been degraded by uncontrolled development.

These strategies could result in related issues such as an unexpected burden being placed on Government in order to remedy previously unidentified challenges, prior to being able to implement any planning policies.

4.2. Implementation, Compliance, and Enforcement

Through an examination of the legal and planning framework in *Section 2* and the case studies and other observations in *Section 3*, it appears that the key issues that prevent the achievement of environmental outcomes are related to implementation and compliance. These issues mostly relate to poor governance, which result in:

- no strict or systematic consideration or implementation of environmental objectives through planning processes;
- little or no systematic collection of information and data that are necessary to understand the issues and better plan to address them (*see Section 4.1.2*);
- discrepancy between stated environmental objectives and the outcomes of planning instruments;
- significant delays in implementation; and
- lack of consistency in the application of higher-level policies and plans to planning activities.

Governance is considered to be the government's management of urban planning activities, which include the methods used to:

- draft planning documents;
- implement planning provisions on the ground;
- monitor development trends and subsequently review planning documents;
- appropriately resource planning activities;
- foster intergovernmental collaboration to produce a coordinated approach to planning; and
- ensure compliance with planning rules and enforce them, whether within government or by the public.

The governance issues that have been identified contribute to unsatisfactory development on the ground.

4.2.1. Limited coordination between, or within, implementing organisations

Through the workshops that were conducted for this review in August 2013, it became apparent that there are coordination problems between organisations which could impact on the implementation of plans and the delivery of environmental outcomes including:

- between planning authorities, at the provincial and national levels, and DEC;
- within departments, such as between the conservation and assessment branches of DEC; and
- between municipal service providers, city authorities, and authorities at the national or provincial levels.

Examples show that this can occur where a consultative approach is required, for example, in the development or enforcement of plans or through the development assessment process.

- **Consultative Approach to Planning:** The NCDUDP lists DEC as a relevant stakeholder with interests in compliance with ‘*Environmental Plans, Programs and Issues*’ (Chapter 12.0). However, there is no evidence that any consultation or coordination actually occurred as part of the development of the Plan. Under the LNUDP, DEC is not listed in the confirmed list of stakeholder groups and information sources (see LNUDP, Appendix 1). Similarly, none of the LDPs make reference to any consultation or coordination of planning with DEC as part of the planning process. This suggests a potential lack of awareness of the need to consider environmental outcomes, and/or a lack of capacity or willingness on the part of DEC to participate in the planning process. This hampers the achievement of environmental outcomes.
- **Development Assessment Process:** This review revealed little evidence of any involvement of DEC in the assessment of planning permission applications. There is a requirement for decision makers under the *Physical Planning Act 1989* to take into account environmental matters when considering physical planning matters (see Section 5). Consideration of the general environmental duty or any other requirements under the *Environment Act 2000*, including triggers for the assessment of regulated activities, is not explicitly required. In the case where the application triggers assessment under the *Environment Act 2000*, the assessment needs to be coordinated with DEC officers to ensure that the required level of assessment has been completed, and that the assessment is technically sufficient to address the concerns of both DEC and the Section 5 matters under the *Physical Planning Act 1989*.

If DEC officers are not included in the decision-making process, or developments are assessed by government personnel, without the appropriate skills to do so, there is a risk that environmental impacts may not be properly assessed or may go unregulated. There is also a risk that the need to consider sustainable development principles, under the *Environment Act 2000*, will be overlooked. Further, without considering all impacts of a development, there is the potential that the cumulative impacts of future developments will not be considered at a later stage.

4.2.2. Lack of coordinated production of planning instruments

The coordination of development of the NCDUDP and LDPs has been responsible for a number of adverse environmental outcomes. In particular, the period of time between the preparation of these documents, particularly the NCDUDP and the PNLDP, has led to development activities occurring in the interim that are not consistent with the provisions of the final LDP. While these activities may not have been permitted, they may have been approved because of consistency with the broad, less-detailed approach of the UDP, or the lack of a specific instrument for enforcement.

For example, satellite images of the PNLDP area show that extensive clearing and development have already occurred along the Napa Napa peninsula and the northern parts of Fairfax Harbour. Assuming that this development has occurred prior to the implementation of controls under the LDP, there needs to be provisions in the plan for restoration of these areas, especially to maintain the environmental outcomes of the NCDUDP. Other implementation and enforcement issues arise as a result of the incomplete implementation strategy of the LDP and the broad-level zoning of the LDP area under the NCDUDP, as an economic development corridor.

4.2.3. Lack of enforcement of environmental legislation and planning instruments

The lack of enforcement resulting in plans or decisions that are inconsistent with legislative requirements and planning instruments occur in two key areas—the development of plans, and the *approval of developments*.

- **Development of Plans:** In preparing development plans, *Section 5* of the *Physical Planning Act 1989* requires consideration of some environmental outcomes but does not require any consideration of instruments under the *Environment Act 2000*. This is partly because of the dated reference to the *Environmental Planning Act 1978*, the *Environmental Contaminants Act 1978*, and the *Conservation Areas Act 1978*. This lack of cross-referencing leads to a lack of coordination in planning and can result in conflicting requirements under the instruments (*see Section 4.2.2*). This also raises the question as to which instrument will prevail in the event of any inconsistency. This has not been addressed under either Act or in the corresponding operational manuals.
- **Approval of Developments:** Planning legislation lacks mandatory provisions which require proof that the Government considers environmental matters when making planning decisions. This presents the risk that environmental matters may not systematically be considered in planning decisions, particularly if they are seen as an obstacle to a particular planning objective. A number of developments have received planning permission which required consideration of aspects under the *Environment Act 2000* and the *Environment (Prescribed Activities) Regulation 2002*. While DEC possesses enforcement powers, it has not used them. Additionally, and based on a comparison between the provisions and developments of planning instruments that have been approved, it appears likely that there is no application of environmental decision-making criteria as required under the *Physical Planning Act 1989*. This also poses concerns regarding the enforcement of zoning plans or constraint maps and raises questions as to the rigour with which planning authorities consider existing planning instruments and requirements when assessing a development proposal.

In addition to this, it appears that the Government has also failed to fulfil its own requirement to facilitate appropriate urban development by not building public infrastructure. By not building and developing the necessary sewerage, potable water, and stormwater, public network servicing areas will contribute to uncontrolled sewage discharges from pit toilets, which will contaminate the soil and groundwater, the uncontrolled use of (potentially contaminated) groundwater through private bores, and soil erosion (eventually leading to ground instability) from uncontrolled stormwater run-off.

4.2.4. Lack of compliance and enforcement against breach of regulation and permit conditions

In some circumstances, it appears that developments have occurred which are either:

- permitted developments which do not comply with environmental regulations, for example, those developments with discharges exceeding the water quality criteria; or
- developments in areas zoned for environmental protection, such as areas above the 90 metre contour within an area set aside as open space.

This situation raises additional issues concerning the lack of control over developments in certain areas which are in breach of planning instruments and legislation; that is, the resulting environmental impacts and the failure of authorities to exercise discretion to restrain and/or remove these developments.

Based on the workshop and site visits in August 2013, it would appear that these situations occur because of a lack of resourcing and capacity and political will to implement planning processes (*see Section 4.2.5*).

There are also associated issues including:

- limited provisions for rehabilitation and remediation orders within development plans, which limit the ability of planning authorities to enforce zoning and other planning controls in the event of breach; and
- the widespread lack of awareness of planning rules amongst the population which constitutes a challenge in areas of customary land ownership. Individuals who use the customary process for buying and selling land may go unregulated until the development is completed, resulting in a development that contradicts planning regulations.

4.2.5. Lack of adequate resourcing

The key resourcing issues that are considered as impediments to implementation are the lack of:

- **Personnel with the relevant environmental knowledge as it relates to urban planning:** Personnel within both planning and environmental authorities appear to lack the necessary knowledge regarding legislative and planning requirements for development or plans, and approval of planning permission applications, in order to effectively implement planning rules and deliver environmental outcomes. Other agencies that require consideration of environmental matters, such as the Mineral Resources Authority, have employed an environmental officer who can provide guidance on environmental matters and liaise with DEC in order to achieve a coordinated approach.
- **Available funding for the employment of sufficient resources:** During this review, government officers advised that most departments in PNG have insufficient funding to undertake the tasks required of them and train their staff accordingly. Sufficient funds are required to employ new personnel and/or train existing personnel to undertake the tasks that have been identified in the implementation issues.
- **Available funding for the required development of services and infrastructure:** To the best knowledge of the authors, no public funding has been made available to provide infrastructure for land development including water supply, sewerage, and stormwater to customary landowners. Necessary infrastructure improvements to land, in accordance with development plans, are therefore often not implemented.

4.3. Public Participation

Public participation in the planning and enforcement process is an important aspect of

planning. Under the *Physical Planning Act 1989*, public participation is enabled at two stages:

- when the final draft of a development plan is produced; and
- when a development is approved or refused by a Planning Board, by way of appeal of the decision.

Although the legislation opens avenues for public participation, important limitations have been identified that can constrain the possibility for effective participation.

One limitation resides in the potential limited access by the public to the documents that are open for review. Where documents which are associated with development plans or applications are not easily available for all persons who may have a particular interest, including public interest groups, this raises difficulties in the capacity of the public to be meaningfully involved. Limited accessibility to documents can be for a variety of reasons:

- inability of interested persons to travel to the relevant government office to view the documents;
- documents not being available for viewing at the relevant government department;
- inability to read (because of a different language or illiteracy); or
- lack of education resulting in a poor understanding of the potential issues associated with a development and how they are proposed to be addressed.

Under the *Physical Planning Act 1989*, public participation concerning development proposals is only by way of appeal of the approval or refusal decision of a Planning Board. The Act does not require development proposals to be advertised and opened for public submissions before they are decided upon. Developments have the potential to affect environmental matters with repercussions on residents and communities, who should be consulted. With an appeal against a Planning Board decision being the only means to raise concerns regarding a development, a large majority of people are likely to be excluded from this process because of the costs involved in litigation. Furthermore, the opportunity to appeal the decision of a Planning Board concerning a proposed development is only available to the proponents of developments and owners/occupiers of land who are “aggrieved” by the decision. In the absence of a definition of an “aggrieved” owner or occupier of land, there are risks that, if defined restrictively, limited people or groups may be entitled to lodge appeals.

Similarly, applications to the Courts for administrative review are limited to those parties with a “sufficient interest” which, according to prevailing case law, precludes public interest groups and individuals who have failed to make a formal submission because of time limitations, constraints to accessibility, or lack of awareness. Also, there is no provision for merits review, which makes it difficult to challenge a decision, especially where decision-making processes are not documented.

Ch. 5 Recommendations

This section identifies the recommendations which address the issues that have been discussed in *Section 4*. The recommendations are presented to address those concepts that are listed in *Section 2*, and which are considered as fundamental to ensure the sound functioning of a planning system, and to directly target environmental issues to ensure environmental protection, sustainable development, and the implementation of green infrastructure. However, no recommendations have been made to address the rehabilitation of existing environmental issues.

5.1. Planning for Environmental Outcomes

5.1.1. Establishment of overarching objectives

Objectives are likely to receive community support when they are consistent with the aspirations of the community. Likewise, approved developments that are inconsistent with the community's aspirations are likely to encounter issues during the planning or development phases, as long as the community is not apathetic. It is recommended that objectives are reviewed to ensure that they are consistent with community aspirations.

To determine whether environmental and sustainability objectives are consistent with community aspirations, an initial process of community consultation should be undertaken. The aim of this consultation would be to determine the environmental and socio-economic values that are recognised by the community and to design planning objectives around these values. Once these objectives have been established and integrate these community values, subsequent engagement can use the values and resulting objectives to secure community support for planning decisions.

Where literacy or education levels are low, it would be important to explain the potential consequences of any particular planning decisions, for example, providing maritime infrastructure or public access to the coast that results in the removal of mangroves, which will have impacts on fisheries resources.

5.1.2. Collation and analysis of background data to identify issues and needs

It is recommended that data are updated and reanalysed to ensure that the UDPs and LDPs are based on current trends and issues. Taking into account the potentially inadequate funding to collect all the required data, the following process is recommended as a way to prioritise data collection and analysis:

- identify key environmental issues from a planning perspective, for example, flooding impacting on settlements, and uncontrolled stormwater impacting on water

quality;

- determine the data required to obtain a comprehensive and accurate account of the situation, for example, the area of potential impact and frequency of floods;
- prioritise data collection based on the potential level of risk that each issue presents, for example, floods resulting in loss of life = high priority; and
- process and analyse data, including undertaking any specialist studies where required, to provide sufficient understanding of the environmental issues. Data should be analysed by appropriately competent personnel in order to be used effectively in the development of planning solutions.

This process should be implemented on a regular basis to ensure that data remains current. The frequency of data collection will depend on the environmental issues considered, but is likely to be required approximately every five years.

5.1.2.1. Updated data to underpin reviews

The data upon which existing plans were developed are now outdated. Therefore, it is recommended that current data should be collected to provide the background for the effective review of the UDPs and LDPs. This data collection exercise will need to be funded. Data will need to be analysed to determine trends in development, and the plans revised to determine any changes to issues and needs. This process would allow for the identification of an increase in habitat destruction as a result of illegal or inappropriately located development. Revisions to the issues and needs should reflect a commitment to any updated environmental objectives.

5.1.3. Development of management strategies to address issues and needs

Following the identification of revised issues and needs, strategies will also need to be revised. Some recommended strategies include:

- rehabilitation requirements to address environmental degradation that has occurred as the result of a lack of implementation of existing planning requirements such as that which has resulted from encroachment and/or direct loss of habitat;
- strategies to address any changes to, or new issues that have been identified, through the previous process in *Section 5.1.2*;
- specific strategies to incorporate the principles of environmental protection and sustainable development that are in line with community aspirations and plan objectives; and
- specific strategies for the incorporation of green infrastructure; that is, using areas of 'no commercial value' to make the city liveable and be sited to achieve environmental outcomes. This could include the use of parks or open spaces for flood protection zones, wetlands, sediment traps, and other water sensitive urban design features. Examples include:
 - o designation of open spaces (parks) in low-lying, flood-prone areas, and maintain these areas free of structures and debris;
 - o maintenance of vegetated areas for community enjoyment, as well as for the provision of fauna habitat; and

- o maintenance of wetland and riparian corridors for the protection of water quality, community enjoyment, and amenity; and
- specific strategies to ensure that resilience is increased to allow for the adaptation to potential impacts from climate change, for example where possible, expand open spaces in low-lying areas and along foreshores to prevent future increases in inundation through sea level rise, increased storminess, increased rainfall, and flooding.

Strategies are also recommended to address future encroachment on these areas by formal or informal development, such as the prevention of the use of flood-prone land for settlements.

As part of the review process, government endorsement is critical to ensure that there is political will to implement the strategies and deliver the environmental outcomes of the plans.

5.2. Implementation

5.2.1. Improve coordination between or within implementing organisations

To ensure that environmental outcomes are achieved through proper consideration of environmental aspects of development plans and planning permission applications, it is recommended that a person with environmental knowledge as well as an understanding of the considerations under the *Environment Act 2000* and the *Physical Planning Act 1989* be present at any meetings where decisions are being made concerning development plans or proposals. This person could be either:

- A DEC officer with an understanding of the Environment Act 2000 requirements, especially in relation to Level 2B and Level 3 activities under the Regulations requiring an Environment Permit, and also trained in the considerations under Section 5 of the *Physical Planning Act 1989*; or
- An employee or member of the Physical Planning Board with knowledge and qualifications in a relevant environmental discipline, similar to the Mineral Resources Authority, that employs environment officers to deal with environmental matters and liaise with DEC. The advantage of having permanent personnel with environmental qualifications embedded in the planning team is because of their ability to work on a day-to-day basis at integrating environmental matters into planning considerations.

It is also recommended that DEC is systematically consulted as part of the development or amendment of development plans, and that this consultation is documented. DEC should ensure that it actively engages with the Physical Planning Board and the Department of Lands and Physical Planning as part of any consultation process.

5.2.2. Improve coordination for production and implementation of planning instruments

Where the LDPs have not been completed for a local development area, it is recommended that the development of these plans should be finalised as a matter of priority.

In addition, a systematic review is recommended to be undertaken between the existing UDPs and LDPs to ensure that commitments, zonings and strategies in the higher-level plan are implemented through the lower-level plan. A review against the updated data is also required to ensure that there is effective implementation of the plans (see Section 5.23).

5.2.3. Amend the Physical Planning Act 1989 to ensure effective implementation

It is recommended that the *Physical Planning Act 1989* be amended to ensure that:

- sustainable development principles, including the precautionary principle, are incorporated into the decision-making criteria (*Section 5*);
- the legislation referred to in *Section 5* is updated to reflect the current legislation and ensure that considerations within the *Environment Act 2000* are considered in any planning and decision making; and
- environmental matters are considered and documented in the decision-making process. In particular, the amendments need to compel the Government to consider and document environmental matters in *Section 5* when making decisions about physical planning matters, such as development plans or planning permission applications. This could include legislating to:
 - o make the use of the appraisal checklist that is contained within the *Physical Planning Manual* compulsory; and
 - o require the Physical Planning Board to document how each of the *Section 5* considerations were taken into account in making the decision.

It is also recommended that minutes of the Physical Planning Board are made available online (see *Section 5.4.4*). Similarly, the *Environment Act 2000* should be amended to add similar provisions in order to ensure that DEC carries out a proper assessment of those development proposals that trigger the Act.

5.2.4. Improve resourcing

5.2.4.1. Improvement of capacity of planners and decision makers

It is recommended that resourcing is increased to provide for:

- Enhanced capacity-building and targeted training programs for staff in DEC and on the Physical Planning Board who are involved in planning and decision making concerning urban development. Programs will need to cover the requirements for planning permissions, activities under the *Environment Act 2000* which require an Environment Permit, and the decision-making criteria under the *Environment Act 2000* and the *Physical Planning Act 1989*. Additionally, decision makers need to be trained in applying and documenting decision-making criteria, and in assessing developments against the requirements of the development plans. These training sessions must be compulsory and all officers who attend must undergo continual assessment through Key Performance Indicators (KPIs) to ensure commitment and competency.
- Increase the available resources in order to assist with the proper consideration of environmental aspects in the implementation of planning requirements through

the employment of additional personnel in DEC and the Department of Lands and Physical Planning. These personnel should be appropriately skilled and highly motivated. They should also be appropriately remunerated in order to keep their skills and experience within government agencies.

- Funding to achieve the above two outcomes.

Although the increase in resourcing is recommended as a long-term commitment, a short-term increase in funding will also be required to provide for the change in processes, especially in relation to the documentation, monitoring, and review of decisions to ensure that the changes are having the desired effect of achieving environmental outcomes.

5.2.4.2. Provide funding for necessary public infrastructure and services

If the rate of in-migration to cities and development is to continue without having a significant impact on the environment through water quality deterioration from sewerage and stormwater issues, the Government must commit to a program of public infrastructure construction.

It is recommended that funding should be allocated to cover the costs of construction of infrastructure in areas that are already developed but not currently serviced, and in areas earmarked for development. As a minimum, infrastructure should include sewerage, stormwater drainage, and potable water networks.

5.3. Compliance and Enforcement

5.3.1. Implement a system of periodic and regular audits

A system of periodic auditing should be established and implemented on a regular basis. The audits should cover:

- Permitted developments and activities, for example, dumps and industries, in order to monitor compliance with permit conditions and environmental codes of practice. Where a breach is identified, authorities must use their enforcement powers to sanction and compel the offenders to remedy the breach and remediate any environmental impacts.
- Decisions made by the Physical Planning Board on planning permission applications to ensure that environmental matters and UDPs and LDPs are being considered, and decisions are being properly documented (*see Section 5*). Evidence will also be required that the procedures of the Acts and Manuals are applied, and that Environment Permits are being required for relevant activities prior to the provision of planning permission. Where a breach is identified, the Physical Planning Board should be required to rectify the issue immediately. Where an individual is identified as having responsibility for the issue, he or she should be removed from the Physical Planning Board and any related decision-making responsibilities.

5.3.2. Provision of planning information to the community

In order to ensure that the community is better informed regarding the planning requirements, it is recommended that an information or 'awareness' campaign is carried out targeting landowners and occupiers within the urban area to make them aware of the planning regulations applying to their land.

5.4. Public Participation

5.4.1. Provision of the opportunity for public comment on planning permission applications

The *Physical Planning Act 1989* should be amended to include provisions to introduce a public consultation stage, at which time, proposals for significant developments are assessed by the Physical Planning Board. This participatory opportunity should be open to the public for large developments that have important environmental and associated social impacts.

5.4.2. Provision of the opportunity for public interest groups to appeal a decision regarding a proposed development

It should be compulsory for any appeal and administrative review of a decision regarding a proposed development to be open to public interest groups. Such groups are often the only parties that have the ability to understand the environmental ramifications of major developments, have a more objective and broad view of the consequences of an approval or refusal decision, and have the financial means to pay for litigation costs.

5.4.3. Provision of the opportunity for public engagement regarding development plans

For existing development plans, as part of the review process, the community should be consulted when determining overarching environmental objectives. For new development plans, this consultation should be undertaken as part of the plan preparation. This will require active engagement, rather than public notification and invitation of comments.

5.4.4. Improve access to draft planning documents and proposed development applications

Access to draft development plans or planning permission applications should be provided by:

- online access; and
- provision of hard copies at a number of locations in the local area of the proposed development or plan.

A planning officer should also be assigned the task of conducting an information session in the local area to provide information to those submitters who do not have formal education, or to answer questions from the general public. This approach would also serve to educate and raise awareness amongst residents of the existence of planning regulations.

Minutes of Planning Board decisions should also be provided online. In addition, DEC should make environmental assessments available online to the public for review for the purpose of making a public submission.

Ch. 6 Conclusions

The consideration of environmental aspects in the preparation and implementation of development plans is vital for sustainable and efficient development in PNG. In this context, this paper has reviewed the existing mechanisms that are available for the protection of urban environment and related aspects, and has suggested remedial measures. In addition, it has suggested strategies as to how sustainable urban development and green infrastructure investment in PNG could be improved.

At present, PNG lacks a comprehensive approach to consider environmental aspects in the physical planning and implementation of development plans. Although, there are a number of high-level statutes which consider relevant environmental aspects, it is not necessarily included within the legislation itself or in lower-level plans. However, the key issues that influence and prevent the achievement of environmental outcomes are related to implementation and compliance. In particular, this study identified issues caused by limited coordination between implementing departments, and a lack of coordinated use of planning instruments and enforcement of compliance with environmental and planning legislation. There is also an inadequate level of public participation in the planning and implementation processes of development plans.

The recommendations that are presented in this paper are important actions to progress towards achieving environmental protection, sustainable development, and the implementation of green infrastructure within a functioning planning system. Through a review of legislation and case studies for Port Moresby and Lae, a set of recommendations has been identified, and grouped, based on aspects of the urban development process—*planning, implementation, compliance, enforcement, and public participation*. The key recommendations are:

- **Planning:** Set development objectives that are consistent with community aspirations, and undertake ongoing data collection and analysis in relation to these objectives.
- **Implementation:** Increase the consideration of environmental outcomes in planning through legislative amendments; that is, amend the *Physical Planning Act 1989* to ensure consideration of the *Environment Act 2000*, through the dedication of a DEC and/or Physical Planning Board officer to both environmental and planning matters, and through capacity building and training of planners and decision makers.
- **Compliance and Enforcement:** Introduce a system of regular compliance audits, and strengthen community contributions through improved planning transparency.
- **Public Participation:** Provide for greater public participation in the planning and appeal processes through amendment of the *Physical Planning Act 1989* in order to

enforce community consultation on development plans and broader appeal rights. Greater access to planning documents for community review is also required.

In summary, the existing planning system in PNG, as observed through the Port Moresby and Lae case studies, currently does not provide a robust framework to ensure environmental protection, sustainable development, and implementation of green infrastructure. However, there are clear opportunities for improvement and linkages to existing environmental regulatory systems that, if implemented, will assist PNG to provide urban development and 'liveable cities' that meet international standards.

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