

# Enhancing Adaptive Capacity of Communities to Climate Change-related Floods in the North Coast and Islands Region of PNG



Empowered lives. Resilient nations.

## Project Rationale

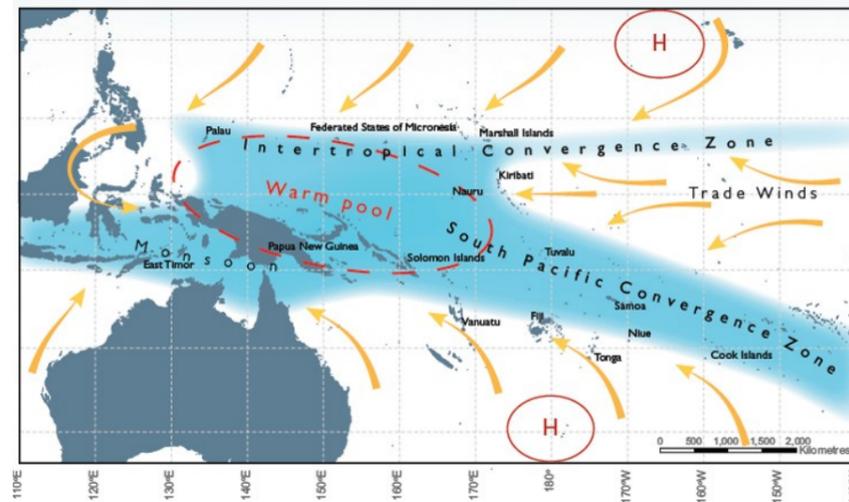
The impact of climate change-related hazards in Papua New Guinea (PNG) has been increasing in intensity and frequency. Two serious climate induced hazards: (1) coastal flooding and sea level rise, and (2) inland flooding driven by irregular rainfall have been identified by the Government of PNG as emerging climate change related impacts and prioritised as a growing threat to its country, people and economy.

Many of the places where people affected by these hazards live have poor access to services and markets. They are commonly located away from roads, along provincial borders, inland between the highlands and the lowlands, or inland on the larger islands and on most of the small islands. The vulnerability of these communities to anticipated climate change-related floods is expected to increase.

## Project Objective

To enhance the adaptive capacity of communities to make informed decisions about and adapt to climate change-driven hazards affecting both coastal and riverine communities in the North Coast and Islands Region of PNG. In particular, the Project will build resilience towards occurrences of coastal and inland flooding events. The strategy to achieve this objective will focus on implementing community based adaptation (CBA) and disaster risk management (DRM) measures at the community level and building institutional as well as policy capacity that promote efficient and cost-effective adaptation to coastal and inland flood-related risks at sub-national levels (Local Level Government and Ward).

The Project is being implemented in five provinces: East Sepik, Madang, Morobe, New Ireland and Northern (Oro) Province which have been identified as most vulnerable to climate change related coastal and inland flooding.



(Source: CSIRO et al, 2011)

## Climate of PNG & Climate Change in the Pacific

PNG experiences two seasons:

- Wet season from December to March, driven by the Northwest Monsoon (above image).
- Dry season from May to October, driven by the Southeast Monsoon.

Rainfall is at its heaviest into the western interior of PNG with mean annual precipitation varying from less than 1,000mm in Port Moresby up to 9,000 mm in the higher west.

Other hydro-meteorological phenomena driving PNG climate include high and low pressure systems, the Pacific Warm Pool of ocean and the El Niño Southern Oscillation.

Climate change is causing incremental sea level rise and is projected to bring changes in intensity and frequency of storm surges, destructive cyclones, flooding, and changes in intensity and variability of rainfall patterns. As a consequence social, environmental and economic systems will be impacted.

## Climate Change Flooding Impacts : What is at Risk?

- Human Life and Health
- Drinking water
- Food gardens
- Livelihoods
- Household Economic Assets
- Ecosystem Health
- Public Infrastructure, including bridges and roads, airports, towns, schools, and aid posts/health centres.

## Coastal Flooding

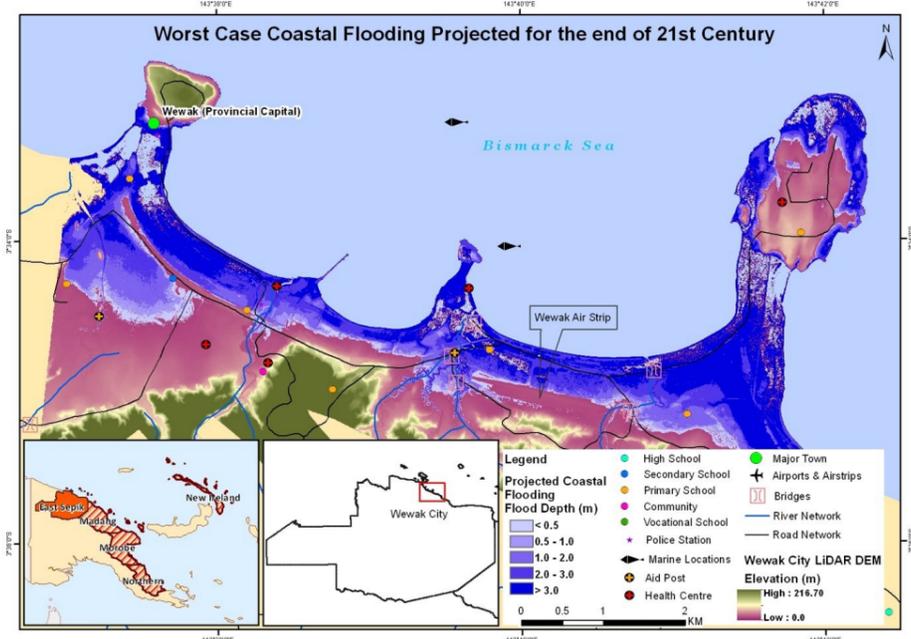
With 20,000km of coastline in PNG, coastal flooding is the most important climate change related hazard in the North Coast and Islands Region, where it not only threatens people in coastal communities, but also important economic centres, as most provincial capitals and economic centres are situated along the coast, particularly the provincial capitals of East Sepik (Wewak), Madang (Madang), and Morobe (Lae).

From 1995 - 2009 and through four catastrophic flood events, coastal floods have affected some 8,000 people a year. On an annualized basis, the floods cause USD 10-20m of damage, displace 500 people and killed five.

Communities are being pushed further inland due to receding coastlines and have been increasingly affected by king tides, cyclones and storm surges, which in turn leads to degradation of coral reefs and marine ecosystems and further diminishes fish resources. Within these coastal areas, flooding exacerbates problems caused by the loss of wetlands, seawater intrusion into freshwater sources, and loss of land, all of which have and are likely to further displace communities and induce knock-on social, economic and environmental problems.

## Who is at risk?

Nearly 500,000 people in 2,000 coastal villages are low-lying and vulnerable to climate-induced flooding risks. The Project commissioned RMSI to conduct hazard assessments of the pilot provinces. Analysis for Wewak in ESP (below) found key infrastructure at risk from flooding by 2100 due to sea level rise. Such maps can form the basis for effective disaster risk management.



## Executing entity:

The Office of Climate Change and Development, through its Adaptation & Projects Division, with support from UNDP and Adaptation Fund; and the Provincial Administration of East Sepik. Province

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ADAPTATION FUND

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## River floods

In the hinterland areas, climate change related inland flooding, driven by heavy irregular rainfalls, affects valleys and wetlands and is the most pressing hazard with the largest potential for widespread damage. Steep inclines and valleys, deforestation and low-lying land also contribute to inland flooding.

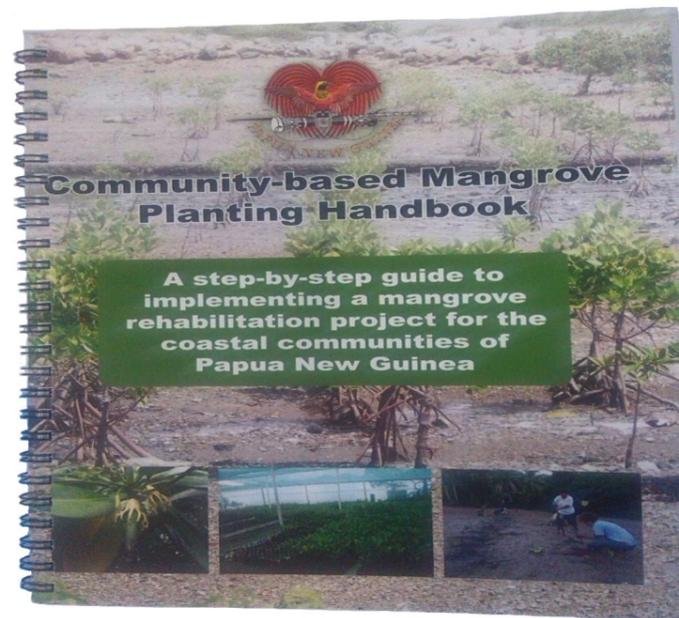
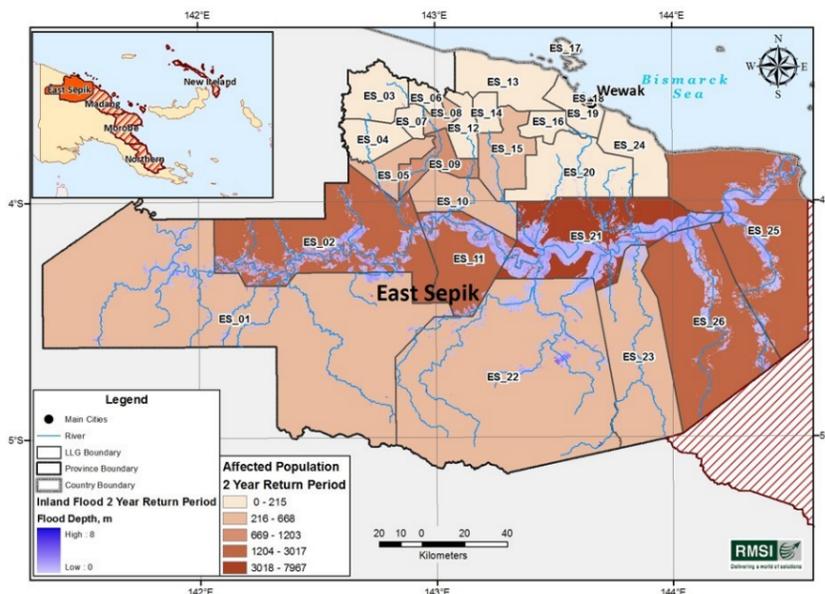
Between 1990 and 2009, 22,000-26,000 people were affected annually, displacing 6,000-8,000 and typically resulting in a few deaths each year. Public records estimate annual damage at USD 8-12m, a burden usually shouldered by the poorest people in the country.

Changes in climatic conditions – both through increased average precipitation and increased extreme rainfall events – will strongly affect the impact of inland floods and expose more vulnerable communities to flood risk.

## Who is at risk?

The Project commissioned RMSI to conduct hazard assessments of the pilot provinces. Climate projections revealed wet season rainfall would significantly increase by 2080s in all provinces due to climate change and this would contribute to an increase in surface runoff with increased landslides and flooding.

With East Sepik, sixty one rivers based on the location and proximity of settlement areas were assessed for a variety of return periods. For a 2 year return period event (a low severity event) the potential inundation area is likely to be 4,347 sq. km., while for a 100 year return period event (a high severity event) the inundation area is likely to be 4,763 sq. km. This translates to an affected population of approximately 21,500 and 3,700 households and 23,300 and 4,000 for a 2 year and 100 year return period respectively (2000 census).



## Mangrove Rehabilitation and Planting

Over-exploitation and degradation of mangrove areas in recent years has meant coastal communities are now losing their protection against storm surges and coastal erosion. By slowing down tidal currents and accumulating mud and sediment, mangroves, through the structural integrity of their root systems protect the coastline by creating a buffer from storms and reducing erosion.

As an urgent issue, the Project aims to reverse the rapid loss of mangrove forests experienced within PNG in recent years as a key strategy to enhancing resilience to sea level rise and coastal flooding. The Office of Climate Change and Development, through its Millions of Mangroves Initiative (aiming to plant two million mangroves) launched the Community-based Mangrove Planting Handbook in celebration of World Mangrove Day on July 26th, 2014 in Madang.

Developed by OCCD's Sub-Technical Working Group on Mangroves, with technical input led by the Wildlife Conservation Society, WWF, Mama Graun Conservation Trust Fund and McKinsey & Company, the handbook is a tool aimed at helping rural communities with the necessary skills to be empowered and take responsibility to protect themselves from increased coastal flooding and sea surges. Designed to be used in the field, the handbook contains a step-by-step guide beginning with planning, site analysis, identifying the right species, through to planting and ensuring mangrove survival.

Analysis by OCCD highlighted community based mangrove planting as a cost effective CCA intervention for coastal communities benefiting a large number of people. Further, mangrove forests provide fundamental ecosystem services to coastal communities, including timber for construction and abundant sources of food.

## Climate Change & Development

As climate change unfolds, impacts on the population are likely to intensify and development will be hindered, if not reversed. The adverse impacts will compromise PNG's ability to meet and sustain the Millennium Development Goals and national development plans, the pursuit of which will be hampered by the loss of community livelihoods, property and economic infrastructure from climate related hazards such as coastal and inland flooding.

Hazard maps (such as those created by RMSI) for coastal and inland flooding are important for development planning as they can be applied as inputs to risk and vulnerability assessments, forming the basis for:

- Land use planning and flood plain regulation
- Disaster response and recovery
- Community awareness
- Flood insurance and risk financing
- Evacuation planning
- Budget allocations
- Provincial, District, LLG, and Ward development plans

CCA and DRM interventions arising from the Project are critical to increasing vulnerable communities' resilience to climate change. Development frameworks, including PNG Vision 2050, Development Strategic Plan (2030), Medium Term Development Plan (2011-2015), the Climate Compatible Development Strategy (CCDS) and Interim Action Plan are fundamental to promoting an inclusive economy-wide approach to building climate resilience with a common goal of protecting communities, property and economic infrastructure.

## Next Steps

### Two key components of the Project:

Establishment of an integrated inland and coastal flood **Early Warning System (EWS)** crucial to minimizing damage in the event of a flood disaster. In particular, the ability to communicate early warnings is a special concern given the remoteness of communities with limited communication access. The PNG National Weather Service, Department of Environment and Conservation and National Disaster Centre will work with various agencies including Provincial Administrations to establish the EWS.

Following an assessment of the level of exposure of communities to coastal and inland flooding, a comprehensive **Climate Risk and Vulnerability Needs Assessment** will be conducted, forming an important component of DRM and CCA programmes in the Provinces. The assessment will provide the information necessary for prioritizing actions in DRM and community-based adaptation and will create the knowledge base for development programmes aimed at enhancing the resilience of at risk communities.

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