International CLIMATE CHANGE ADAPTATION Initiative

Pacific-Australia Climate Change Science and Adaptation Planning

Papua New Guinea LiDAR **Factsheet**

Australian Government

Australian AID

PACCSAP PNG LiDAR project

Pacific Island countries are particularly vulnerable to the impacts of climate change. With most settlements, infrastructure and industry of both atolls and high Pacific Islands in the coastal zone there is an urgent need to better understand risks from sea level rise, coastal erosion and extreme events.

Papua New Guinea's *Climate-Compatible Development Strategy,* the key national plan for addressing climate change in PNG, and its associated *Interim Action Plan* identified coastal flooding as a serious phenomenon that regularly affects 6,000 people, causing many to evacuate their homes and some to lose their lives. This risk will increase significantly with rising sea levels.

The *Interim Action Plan* identifies the area on the north coast of PNG from Vanimo to Lae as a high priority for climate change adaptation measures, due to its exposure to tsunami hazards and severe sea swells. These measures include management activities to address coastal flooding.

For populated coastal areas of low elevation, such as areas along the north coast of PNG, high resolution elevation data improves the accuracy of inundation modelling and our ability to understand current and future risk to infrastructure and communities.

In September 2010 the PNG Office of Climate Change and Development (OCCD) requested support from the Australian Government to assist with inundation mapping capability, including capacity building and training of relevant officials.

In response to the OCCD's request the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (DIICCSRTE) collaborated with Geoscience Australia to capture high resolution elevation data for the priority areas identified on the north coast of PNG, including the vulnerable coastal towns of Lae, Madang, Wewak and Vanimo.

The project will also provide hardware, software and training to build capacity within the Government of PNG to use, manage and store the data.

As part of the Australian Government's International Climate Change Adaptation Initiative (ICCAI), the Pacific Adaptation Strategies Assistance Program (PASAP) and its successor, the Pacific-Australia Climate Change Science and Adaptation Planning (PACCSAP) program, aim to strengthen partner country capacity to assess vulnerability to climate change and develop robust adaptation strategies.

Figure 1: Aerial photo of Vanimo, PNG

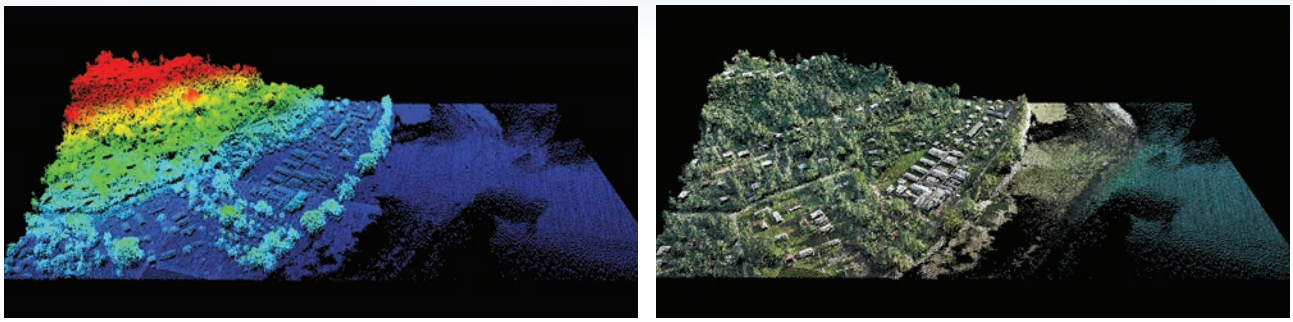

Figure 2: A 3D perspective of buildings on the eastern coast of Vanimo. The red areas in the image on the left are the highest elevation, and the blue areas are the lowest. The image on the right uses the colours from the aerial imagery.

PNG topographic survey

AAM Pty Ltd was engaged to capture and supply topographic data and aerial imagery for Papua New Guinea, to underpin future coastal planning and management activities.

The topographic LiDAR for PNG was captured via airborne surveys flown between 5 May and 13 July 2012. It included the four towns of Vanimo, Wewak, Madang and Lae, as well as the connecting coastal strips. The PNG survey covered 1066km of coastline. The total area of the topographic survey for the PNG town sites was 629km^2. Port Moresby being located on the south east of the mainland was not covered by this survey.

Madang is the lowest lying of the four towns with an average height above sea level of 11m. Wewak has an average height of 14m, Vanimo 22m and Lae has an average height of 41m above sea level.

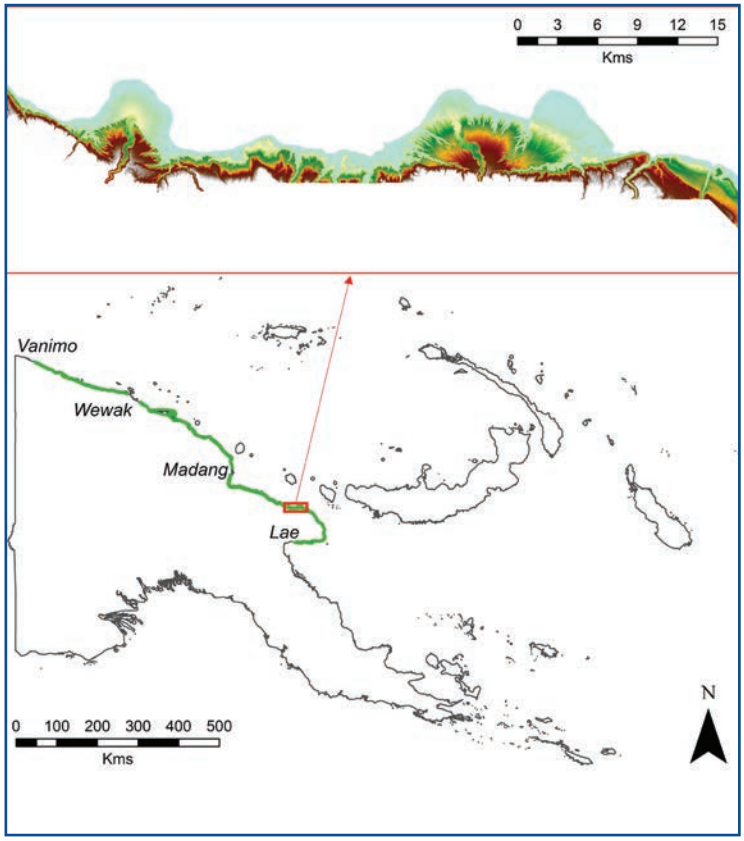

Figure 3: Map showing extent of LiDAR capture in PNG and digital elevation model (DEM) of the coastal section highlighted.

Future work between Government of Australia and Government of PNG

The data captured through this project is a significant asset to PNG which will improve their understanding of coastal impacts from climate change and other inundation events.

The coastal modelling and capacity building project will be implemented under the *Pacific-Australia Climate Change Science and Adaptation Planning* program and will build on the LiDAR acquisition by:

- providing hardware, software and training for relevant Government of PNG personnel to support management and use of the LiDAR data;
- using the LiDAR data to undertake simple coastal inundation modelling to support an initial risk assessment of priority coastal areas of PNG;
- providing training in the use of coastal inundation modelling analysis to support sustainable planning decisions.

In addition, the LiDAR data acquired under the PACCSAP LiDAR project will be accessible for other projects in PNG.

Figure 4: Foreshore development in Wewak

PNG LiDAR and Imagery Products

The PNG LiDAR survey involved the capture of topographic LiDAR, aerial imagery, tidal data and ground survey points.

The products derived from the topographic LiDAR under this project include:

- Digital elevation model (DEM) - elevation of the ground in 1m ESRI grid format.
- Contours - ground 0.5m interval in ESRI shapefile format.
- Digital surface model (DSM) - elevation of surface features such as tops of buildings, trees and bare ground in 1m ESRI grid format.
- Canopy height model (CHM) - height of vegetation above the ground in 2m ESRI grid format.
- Fractional cover model (FCM) - density of vegetation above 2m from the ground in 10m ESRI grid format.
- 3D point cloud - all measured LiDAR points classified in LAS format, with additional reflectivity information.

Coincident aerial photography was flown with orthophotos generated in ECW and TIFF formats.

Airborne LiDAR technology and applications

Airborne Light Detection and Ranging (LiDAR) is an optical remote sensing technology that provides extremely accurate, high-resolution elevation data. Airborne LiDAR measures distances (and therefore height or depth) by sending a pulse of light from a laser towards the area being surveyed and measuring how long the light pulse takes to return. The laser and sensor are mounted on a specialist aircraft in which a GPS system is used for positioning. This process produces elevation data and other derived products such as digital elevation models (DEMs) and contour maps which can be used in a range of applications. Airborne LiDAR data is able to provide highly detailed maps and 3D models.

In coastal management topographic LiDAR data can be used to monitor shoreline change, beach erosion and accretion, and vegetation changes.

For coastal risk assessment this elevation data is critical to calculating inundation projections, drainage, catchment boundaries, water flow and water sinks.

It is also valuable for many other uses including infrastructure planning, evacuation planning and natural resource management.

Topographic LiDAR can be used in conjunction with aerial imagery to produce maps of roads, structures and water courses. For disaster planning the data can be used to model storm surge and tsunami inundation. Industry can use the elevation data to plan construction sites, monitor land subsidence, determine pipeline routes and detect changes in vegetation growth. The 3D models can be used for assessing attributes such as vegetation volumes and calculating slope stability.

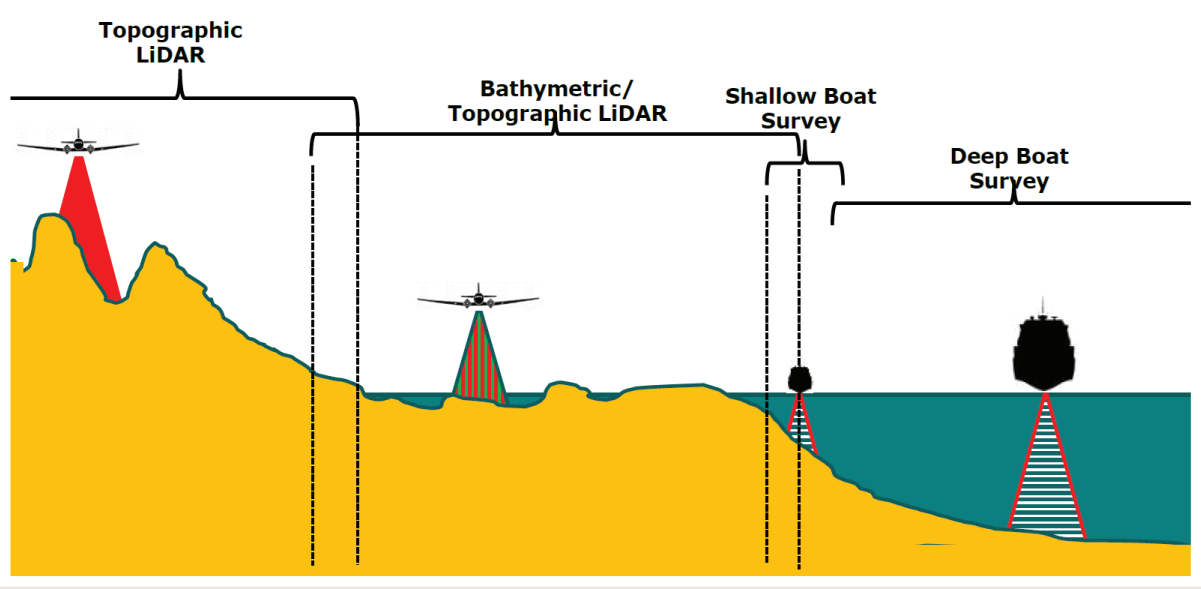

Figure 5: Diagram of technologies used to obtain elevation data

Contact us

For further information about the *Pacific-Australia Climate Change Science and Adaptation Planning* program, please contact the International Adaptation Strategies team:

international.adaptation@climatechange.gov.au

Canberra Office

Science and International Adaptation Branch
Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education

GPO Box 854, Canberra ACT 2601, Australia

✆ +61 2 6159 7000

Samoa Office

PACCSAP Pacific office
c/- SPREP PO Box 240
Apia, Samoa

✆ +685 66316

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