

The Effects of Climate Change , Vulnerability and Natural Disasters on the National Geodetic Network.

The Vanuatu National Geodetic Network provides the fundamental support for high precision monitoring of crustal movements and climate change impacts, land surveying, mapping, engineering and related applications and is the basis for the integration of all such activities. It is the basic reference framework for all surveying, mapping and land related information. The geodetic network controls the position, extent and orientation of surveys throughout the Archipelago.

Historically Vanuatu sits within the Pacific rim of fire stretching from the Torres group to Mathew and Hunter Island. This Island Arc system is a resultant of the Pacific plate colliding with the Indo-Australian plate, forming a volcanic chain of islands. The New Hebrides trench is divided into two parts by the D'Entrecasteaux ridge which rises some 1500m and collides with the trench between Santo and Malekula.

Geohazard or Crust monitoring surveys is particularly important in Vanuatu, as the nation regularly experiences significant seismic and volcanic activity following our location within the Pacific Rim of Fire, and also we regularly experience very powerful and destructive cyclones such as the Cat 5, TC Pam which hit the country in March 2015 and earthquakes with magnitudes of 7.1 or more on the Richter scale. The seismic experiences are of considerable concerns as there has been considerable damage to housing and infrastructure, and lives and livelihoods threatened. In addition, climate change and sea level rise potentially threaten coastal communities and infrastructure, particularly in low lying areas or areas which are highly vulnerable to inundation.

GEODETTIC ACTIVITIES IN BRIEF

Geodetic control activities date back to the earliest efforts by Survey Department to establish isolated triangulation networks in areas of need. Since then, Vanuatu has tried much attempts to provide a uniform horizontal network throughout the whole country.

These first efforts in those days were simple and then were followed by more extensive triangulation and traversing surveys before the introduction of Doppler satellite and GPS surveys. With the Assistance from the French Government IGN (French)in 1950 and the British Government, DOS (British) in 1970, the Royal Australian Survey Corps (RASC) in the mid 1980's, we have been assisted by these agencies. At the moment, the Survey Department has the establishment of a control network, using Doppler satellite survey techniques to date. The result of this survey called Operation ALGUM has given Vanuatu a much stronger and viable informed system for the country. The survey covered the whole of Vanuatu and will now and into the future be used to control aerial photography for future map production and to enable the establishment of Exclusive Economic Zone baselines.

WORKING TOWARDS A UNIFIED SINGLE DATUM

With the current developments that are now taking place around the country, it is becoming more pressing for the Vanuatu Lands and Surveys Division to work towards achieving a unified single datum. With the single geodetic datum, surveys, mapping and land information systems will be compatible with the satellite datum as positions determined from satellites will be of a much higher accuracy.

The accuracy of surveys in using the single Datum will be controlled and maintained with the hope that the propagation of errors will be greatly reduced.

The continuous assistance from IRD with the present Cors Stations established are in full operation throughout the Country, some of these stations have just been revisited by the survey team in reconnecting the ones affected by the TC Pam and also downloading data from all stations around the country.

WEAKNESS WITHIN THE SYSTEM

Although we are doing what we can, we are faced with the challenges of sea level rise, monitoring of the changes which is really one of the main issues with the mapping of the islands. The sea level rise has caused a lot of erosion along our coast lines resulting in many of our control stations being buried or washed away.

With continued cyclone experiences like the passing of TC Pam, this has also destroyed some of our Geodetic Control points along the coastal areas around the country. The Land and Surveys Division is now reviewing, maintaining and upgrading the current National Geodetic Control Network, however with the establishment of a single datum with the Geodetic Network in place in the near future will ensure that the position, extend and orientation of surveys and mapping will be controlled thereby preventing the creation of gaps or overlaps.

WAY FORWARD

With a unified single Datum we are hoping very much to see all future surveys connected to the network be integrated into one system, avoiding duplication and wasted effort. Cadastral surveys which are also related to mapping and other geographical land information will be able to be connected to the geodetic network with greater accuracy.

The present Land Information System the DCDB (Digital Cadastral Data Base) is being created by entering of coordinates of boundaries from cadastral survey information. It is therefore essential that all data in The DCDB is based on the same geodetic datum and is on the same map projection. The DCDB is the base layer for the national Geographic Information System (GIS). Unless the base layer is homogeneous it is impossible to integrate other layers of data into the National Geographic Information System.
