PACIFIC HYCOS

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Distribution of drinking water during drought - Nukulaelae, Tuvalu, November 2011.

Why we need HYDROLOGICAL DATA

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Why hydrological data is important

Floodwaters at the Navua hospital, Navua, Fiji, 2004.

Water is fundamental to every aspect of our daily lives. We use it to drink, wash, cook, clean, and for recreation. It is a driver for economic development, supporting industries in manufacturing agriculture, mining and tourism. Water is also vital to the health and protection of the environment. While the Pacific is generally blessed with regular reliable rainfall across, extreme events such as floods and drought are common, with the prediction that extremes in the variation will increase under climate change.

Accessing well water during drought - Vaitupu, Tuvalu November 2011.

Our reliance and the fragility of this vital resource is too often taken for granted.

It is generally only when something happens to our water supply – such as lack of water during droughts, or through overuse, when water quality becomes unsuitable for intended uses, or when our crops and infrastructure are destroyed by unpredictable floods – then only we notice.

It is not always possible to predict the severity of floods and droughts, but we can do a lot to improve our understanding of our water resources. Doing so will allow us to reduce our exposure to these extreme events and provide data that will help us design better infrastructure, devise more accurate and responsive early warning systems, and plan sustainable developments with both economic and environmental benefits.

"forwarned is forearmed!"

Hydrological data can help us prepare and plan for extreme events by identifying where the risks are highest. Day to day hydrological data is used to better manage our water resources in ways which suit our economic and environmental needs by providing information on the availability and quality of water for all uses.

Access to accurate and reliable hydrological data allows us to better appreciate our own water needs and that of the environment, so that options, and strategies can be developed which are better placed to benefit all.

"you can't manage what you don't measure"

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Changes in land use through clearing, or the construction of river control structures, like dams and weirs, can change natural runoff patterns and alter our waterways and catchments. Hydrological modelling allows us to investigate potential impacts from any natural or man-made changes in our catchments, rivers, streams and groundwater systems. Hydrological information also helps us to consider the options, and supports our decisions, on how to use this essential resource.

Observations using standardised measurement practices, and measurements taken over many years, are necessary to provide confidence on the variability's found within Pacific's water resources. Analysis of this valuable information will help us grow better crops, generate electricity more efficiently, and design more appropriate infrastructure. Ultimately it allows us to develop our resources in harmony with the environment and for the benefit of our families and future generations.

Hydrology is the measurement of water resources at a specific location and point in time and the comparison of these measurement over time. It provides an irreplaceable historical insight into the a country's water resources and should be treated as a valuable national archive. Hydrology is an investment which contributes to the safety and well being of a nation's people, environment, and economic development. By observing and recording historical events, we can take measures to lessen the impacts of future events.

Floods continue to cause tremendous damage to communities. People's lives and livelihoods are regularly lost. Damage to infrastructure and crops, reduced productivity, impacts to schools and hospitals, all have an enormous cost on communities and can setback a nations economic development. Similarly droughts, while slower to develop, can place enormous burdens on families and communities. Water becomes less available for daily needs, forcing people to do with less. People travel further to get water for their basic needs, or have to use poorer quality water. This in turn affects their productivity, health, and quality of life.

Accurate, reliable, and accessible hydrological data can not necessarily stop floods and drought from occurring, it can however provide timely warnings, and be used to reduce the impacts. Early warning systems, flood modelling, and drought prediction, can help us to prepare for these events and reduce our exposure to risk. Hydrological information is also be used to identify alternate water sources for use during critical times.

The rapid growth of data communication networks in recent years, now makes it possible to quickly disseminate hydrological data to a wider audience. The availability of mobile communications, and technology advances, provides the potential to share information about a rapidly rising river, or the likelihood of reduced rainfall in coming months to the community and decision makers in a more timely manner.

Calibration of an automatic raingauge - Rarotonga Cook Islands, 2009.

Groundwater level and quality measurement - Tongatapu, Tonga, 2008.

Measurement of water level in raintanks - Amatuku, Tuvalu, November 2011.

Hydrological models are now used to determine the extent and timing of floods and to predict the likelihood of drought in coming seasons. This provides forewarning to authorities and communities alike allowing them to together take timely and appropriate actions to reduce the impacts. The more accurate and comprehensive our hydrological data is, the better our predictions.

Hydrological data is also used by engineers and planners to design infrastructure, roads and bridges to specifications that will maintain their accessibility and longevity. Knowing the historical size of floods and their frequencies helps governments plan where to put businesses, hospitals, homes and dams for flood mitigation needs.

Hydrological data is therefore important across a wide variety of sectors, whether it be for use in total watershed management, disaster preparedness and mitigation, infrastructure and industry development, water use, urban planning, water safety and supply, health, agriculture, mining, tourism or environmental conservation.

Despite this, many of Pacific nations do not maintain sufficient hydrological datasets nor do they provide sufficient annual financial support to maintain even basic hydrological services and their data collection. Without the recognition and financial support for this important service, national hydrological branches within the pacific region will continue to struggle, putting lives and infrastructure at risk and limiting the potential for better decisions and sustainable developments for the future.

Our challenge is to improve both the quality of information available and how it is presented, and ensure that the hydrological information collected and produced is of the highest quality, and both relevant and accessible to a growing audience with wider needs and demands.

Hydroelectric power generation on the Laloki river, Papua New Guinea, 2009.

Flood debris on Navua bridge, Fiji, April 2004.

Where and how hydrological information is used

Nadi town flooding, Fiji, January 2009.

Bouma waterfalls, Taveuni, Fiji, July 2011.

Rainwater tank farm, Funafuti, Tuvalu, 2011.

Hydrological information has a wide range of uses across many sectors;

- Planning – identifying where water resources for improved water supply can be found and the sustainability of those water sources; the location of schools, hospitals, residential areas within our developing communities; developing and enforcing appropriate building codes for our houses, public buildings, roads and bridges.
- Urban water management – design of drainage and infrastructure to ensure our roads and properties are built to a minimum standard for the environment we live in.
- Disaster planning and response – identifies risks, guides policies and planning mitigation options. Provide more focussed and immediate response during disasters with early flood warning systems and improved drought prediction as well as assisting in post disaster recovery.
- Environment – monitoring water quality to protect the aquatic health within our rivers, streams and thus our reefs and lagoons; identifying areas of salinisation, erosion, or high sediment loads; assessing the effectiveness, needs and impacts of river dredging.
- Climate change – identifying potential changes to hydrological systems with increased frequency of extreme events. Assisting government, the community and insurance industries to better plan for future uncertainties.
- Agriculture, Mining, Industry, and Tourism – development of industries that result in improved economic development all require water and influence the catchment environs they are developed in. Hydrological information helps these industries to develop in a more sustainable way for future long-term benefits.

Data collection challenges

Across the Pacific, our nations struggle to provide the recognition and financial support necessary to maintain efficient and effective national hydrological services, even at a basic level. Sustained national support is required and partnering opportunities need to be developed with private industry and other users to maintain a cost effective and responsive service that is relevant to the needs of the community, the environment and industry, and coordinated at a national level.

Hydrological Data

Similarly, government and industry alike are protective of the data they collect, with unnecessarily restrictive administrative requirements. These can be a barrier to the accessibility of the data and its potential application, resulting in unnecessary duplication, and ultimately poor decisions. The World Meteorological Organisation, promotes, the free and unrestricted exchange of hydrological data and products, through Resolution 25, recognising that access to information is the first step towards improved understanding and transparency with long-term benefits to the community and a nation's development.

Data management and analysis is in general poorly carried out in the Pacific. This situation is worsened by a lack of financial support, limited standardised and ongoing training opportunities applicable to the Pacific, poor recognition of the value and importance of hydrological information and data, and inadequate policies, systems and procedures to safeguard the data and provide information to a minimum standard.

Future Directions

In order to ensure confidence in accuracy of the data, hydrological information will continue to require dedicated trained professionals to measure and collect information in the field, often in adverse conditions, to an exacting standard. Improvements in technologies will continue to provide opportunities for efficiencies and accuracy in field operations, where data can be transmitted in real time from remote locations. Similarly, computer technologies will improve our ability to process and analyse the information and in time generate numerical models which better represent the complexity of our natural systems, allowing us to generate scenarios of different options and test them with greater confidence.

However, some of the greatest improvements in the near future will be in the accessibility of the information and how that information is presented. Products which are visually informative are the easiest way to communicate information in hydrology. Improvements in Geographic Information Systems (GIS), and animations from numerical models, presented in accessible media formats will empower government, industry, and the community alike, resulting in more sustainably responsible decisions to be reached more easily and with greater participation.

Digitising hydrological stream data, Vanuatu, 2010.

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