A system of systems:
Early warning systems and managing the effects of El Niño

Summary of Webinar - 9 June 2020

El Niño plays a dominant role in driving drought globally. Its cold phase, La Niña, tends to be associated with enhanced rainfall, particularly in South East Asia. In this review of El Niño Long Range Warning Systems the following issues and recommendations are discussed:

- El Niño and La Niña have perhaps the strongest influence on year-to-year climate variability. The El Niño-Southern Oscillation (ENSO for short) is a naturally occurring global climate cycle.
- ENSO influences rainfall, temperature, and wind patterns around the world, including New Zealand. These could influence several hydro-meteorological hazards such as drought, floods and storm.
- Early warning is the key element for disaster and climate risk reduction and is highlighted strongly in the Global Risk Assessment Frameworks (GRAF). For El Niño, a long range warning system (30 days to 3-6 months) is available.
- With the advances in science and multi-model ensembles, warning skills have increased and have the potential to reduce disaster risk and sectoral decision making as across fields such as water resource, agriculture, dairy/livestock, energy, epidemics, ecology, etc.
- The reality is very complex and system based thinking is crucial. An early warning system factoring in compounding and cascading hazards and a seamless integration of hours to decadal warnings could enhance the decision making process.
- With a change in our culture and mindset using advances in science and technology, we can produce more useful, usable information to help industries, sectors and communities to better understand foreseeable risks and adaptation options.

State of the art - El Niño early warning systems, global warming and risk communication

Despite the progress made in modelling and statistical information in recent decades, there is still uncertainty surrounding the timing, severity and related impacts of weather events due to El Niño. The severity of El Niño weather systems ranges from “weak”, to “strong” and “very strong” events. Each level of severity has different impacts on vulnerable communities. This places great importance on Early Warning Systems.

In a traditional, idealised view of EWS, the warning system acts as a “searchlight” on society - it finds a problem, alerts the government and the problem gets addressed. The reality of this is more precarious and the stability of society can often balance on the correctness and accuracy of early warning systems, leaving little room beyond survival in the face of a major event or disaster. Lessons from historical events are motivation for governments to improve their EWS; and know what lies ahead to help maintain civil and political stability.

While global warming is supercharging El Niño impacts globally, simultaneously there is also speculation on how global warming will affect the frequency of El Niño and whether El Niño will continue to affect the same places. El Niño may provide a unique opportunity to serve as a bridge between the present and a climate changed future. If we can’t cope with El Niño related droughts today, we won’t be able to cope with droughts that are more severe or in different locations decades from now. It provides a laboratory every 2-7 years so we can ask ourselves - are we coping correctly? Are we adjusting correctly to a changing climate?

Under the existing reality of El Niño early warning forecasts, once it has been forecast other sectors take this information to create a forecast for the benefit of their particular sector - whether that be agriculture, energy, water, or humanitarian services etc. Our forecasts and response are informed not only by science, but also by observations on the impact of El Niño related events over the past century.

Effective communication of the risk of El Niño is an ongoing issue that needs to be addressed. Following an El Niño warning from an official forecasting centre, response action often relies on following warnings, with some people inevitably

International Science Council
IRDR Integrated Research on Disaster Risk
Committee on Data CODATA International Science Council
Tonkin+Taylor

waiting until the last minute to take action. We need to focus on answering the question of 'when is early warning too late to take action?'. The implementation of a "late warning system" may help to provide certainty to governments and sections of society that inevitably take this risk.

Lessons from past events are a crucial aspect of developing effective El Niño early warning systems. All too often post-disaster lessons learned are identified but not applied due to the lack of money, govt changes and other issues. We can be El Niño ready If we can combine our scientific forecasts, with local and indigenous knowledge and learnings from previous events.

The benefits of El Niño forecasting

El Niño plays a dominant role in driving drought and other climate hazards globally. Understanding how to provide useful early warning information relies on the intended applications by users. For some governments and United Nations agencies, El Niño early warning indices are sufficient to trigger contingency planning and resource mobilisation for early response. Some social protection schemes use these indices as a basis for setting triggers for early intervention, such as cash for work and alternative livelihood support.

But some users need El Niño indices to be translated in terms of the expected impacts of El Niño on seasonal rainfall and temperature. These are normally provided through seasonal climate outlook 3 to 6 months in advance. A useful seasonal forecast allows proactive action in agriculture and water management, such as farm management decisions to switch crops, adjust the timing of planting and planning to provide supplemental irrigation sources. The usefulness of this information has also been noted on anticipating secondary El Niño impacts, such as forest fires.

Some users require indices to be further translated into impacts on specific sectors and communities. There is wide scope for improving this, as this is still not part of routine early warning services issued by national meteorological agencies and relevant sector agencies.

The success of applying ENSO indices and seasonal forecasts relies largely on pre-agreed plans and procedures - How will the information be used? What actions will be taken once certain thresholds are crossed? Where will the funds come from to finance these actions?

Applying El Niño early warning forecasts in known vulnerability hotspots is good for development, despite forecast limitations. We can save lives and reduce damages with the knowledge we already have, despite its limitations. The history of past El Niño events clearly highlights locations that are considered as El Niño hotspots due to their sensitivity to El Niño-induced rainfall variations and high societal vulnerability resulting from poverty, prevalence of food insecurity, and other factors.

Where forecast limitations are considerable, it is even more critical for procedures to be in place for receiving updated forecast information so that actions on the ground and resources can be appropriately adjusted, as the forecast becomes more certain.

Establishing predictable mechanisms for communicating information to a whole range of decision-makers from policymakers to farmers is essential.
The following examples have proven useful:

- Several Met services in South-East Asia are convening over regular monsoon forums ahead of each season to explain the seasonal climate forecast for users and to obtain feedback.
- In many countries, government agencies and non-governmental organisations collaborate in running climate field schools to empower farmers to interpret and use climate information. Innovation has been also seen in delivering integrated agromet services through mobile-based applications.

Regularity is essential - users need to know when to expect the release of critical information for climate sensitive decisions. Ultimately, disaster and climate plans must be organised to manage disaster risks caused by El Niño and other factors.

How Long Range Warning Systems (LRWS) can help communities and industries prepare for severe weather events and El Niño impacts.

An imbalance exists between user expectations and what forecasters or Met services can actually provide to the community. Science can provide skilled and informed services up to a certain limit, but users will always demand more. When expectations are not met, users are less willing to use the information accurately or to take on the information in the decision-making process. It is necessary to find a balance between user expectations and the services that forecasters can provide.

One method of achieving this is in the above mentioned seasonal monsoon forums, which are held to better understand how to provide guidance for users and understand user expectations.

When developing and implementing an early warning system, we need to consider that a more widespread application of early warning systems equates to a more widely experienced uncertainty.

Even when there is warning information available, especially for sector and strategy decision-making, it doesn't immediately translate into successful application, because you have a time horizon to turn strategic decisions into tactical decisions.

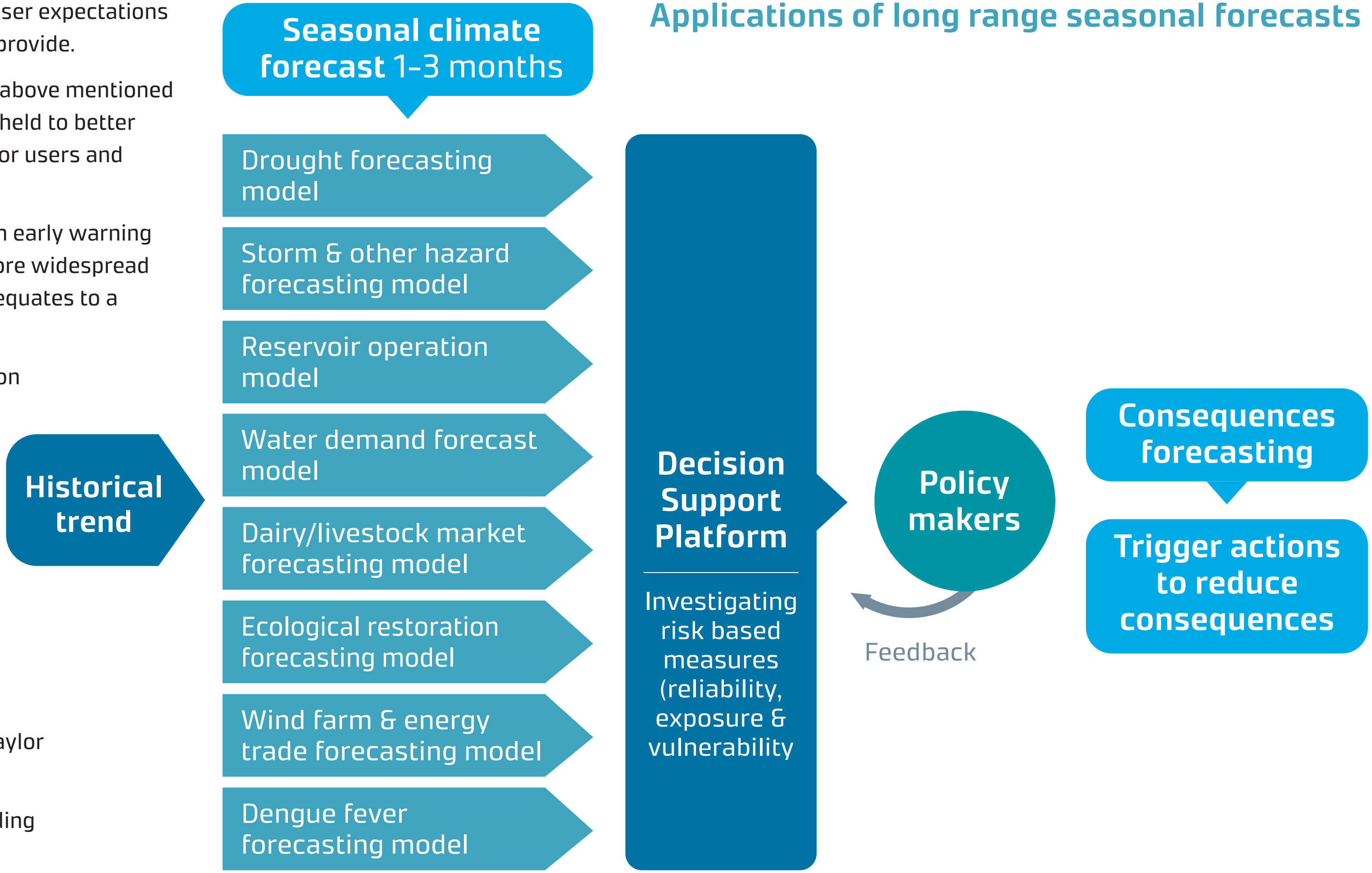
Presenters:

Bapon Fakhruddin
Natural Hazards Specialist, Tonkin + Taylor

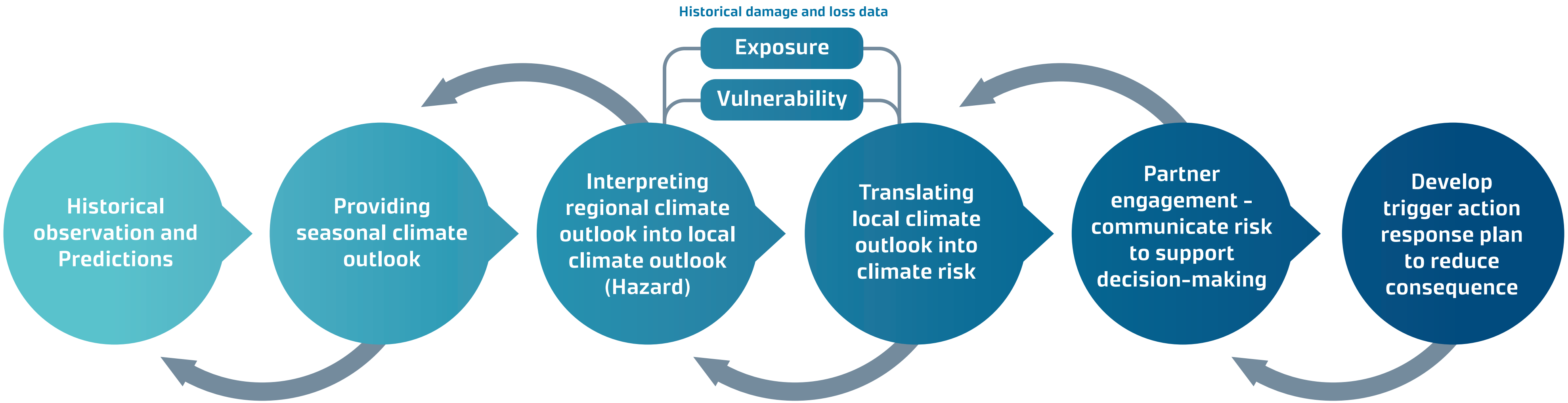
Mickey Glantz
Director, Consortium for Capacity Building

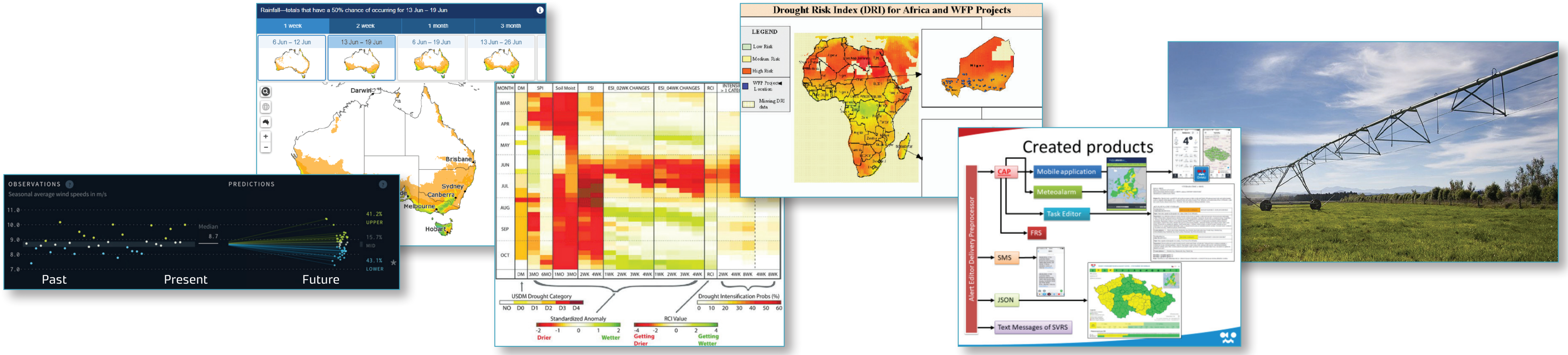
Kareff Rafisura
Disaster Risk Reduction, United Nations Economic and Social Commission for Asia and the Pacific

Applications of long range seasonal forecasts



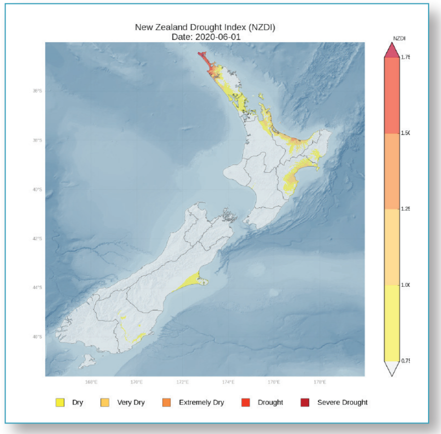
Climate information and application system



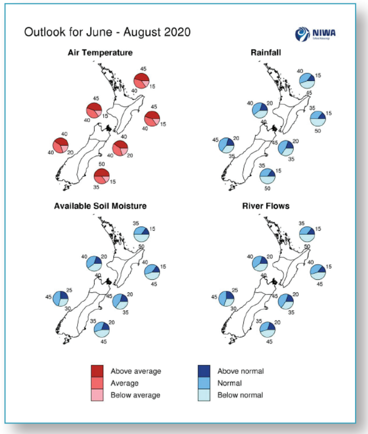


Long range hazard forecasting and dealing with uncertainty

Nowcasting- Drought Index



Seasonal Outlook (1-3 months)



Drought Forecasting