EVENT SNAPSHOT

Part 5 – The Future of Hydrological Forecasting

Event Details

Date and Time
6 October, 3:00–4:00 p.m. (Manila time)

Venue
Zoom

Related water subthemes

	Water supply, sanitation, and wastewater	x	Flood/drought risk management and disaster resilience
	Irrigation and productivity	x	Water governance and finance
	IWRM, storage, water-food-energy nexus		Water and health

Real-time flood forecasting is one of the most effective flood risk management measures. Many governments operate bespoke hydrological forecasting services that continuously monitor and forecast coastal and fluvial water levels.

However, given the rapid advancements in technology, such as artificial intelligence and cloud computing, as well as our changing macro environment, the big question is: how will these affect the hydrological forecasting domain?

For Deltares, they wanted to have an idea of what the world will look like in 2025 in order to guide their investment decisions and ensure that their tools and expertise remain "state-of-the-art". In the last webinar of the series, Nadine Slootjes, manager for water operations and early warning at Deltares, described five future scenarios, sharing characteristics and insights and the way Deltares adapts their tools and expertise accordingly.

This session gathered a total of nearly 100 participants, and was supported by the Flood/Drought Risk Management and Disaster Resilience advisory team of the ADB Water Sector Group. Lance Gore, principal portfolio management specialist from the South Asia Environment, Natural Resources, and Agriculture Division moderated the session.

To close the series, Deltares International Director Toon Segeren and ADB Chief of Water Sector Group Tom Panella each delivered closing remarks. Segeren highlighted how the ongoing pandemic underscores the importance of the discussions and tools shared over the series, while Panella noted that this series could lead to greater collaboration and a more programmatic approach with Deltares.

Key Takeaways

Emerging technologies will change the way who and how hydrological forecasts will be made in the future. The availability of detailed global hydrological models, new types of data (such as social media), and communications tools will change the way hydrological forecasts will be made in the future. It is expected that forecasters will need to process large amounts of data, assess more models, and describe the potential *impact* of extreme weather and water events. They have to communicate their prognoses – including uncertainties – to the wider public using new visualization methods.

Furthermore, it is expected that due to the availability of forecasting as a service, hydrological forecasts are no longer exclusively made by experts at the larger forecasting agencies. Smaller organizations with restricted resources now also have access to hydrological predictions for their area of interest.

Highly modular open software offers the flexibility to adapt to a changing world. An open and modular software approach, of which data handling and the easy connection with third-party software are key, makes it possible to deliver solutions tailored to end-users' needs. Those solutions can vary from simple data viewer to an end-to-end forecasting system.

> **"This is the start of greater collaboration, since the challenges we face in the region – climate change, land use change, and many of the water challenges – are just going to get worse and worse. Deltares is at the forefront of working on these, so we look forward to working with them more."**
>
> — Tom Panella, ADB Chief of Water Sector Group,
> in summing up the ADB Water and Deltares Seminar Series

Questions from the Audience

One of the more difficult elements in hydrology is obtaining reliable field data on flow and discharge, which involves physical equipment and field activity. Do you see future technical developments reducing the need for the physical side and if so how would that occur?

There will always be a need for ground truth (maybe even more than ever). However, there are many developments in the area of measurement devices (partly because of reduced costs for cameras and electronics). Besides that, there are possibilities of using new data sources like commercial microwave link data for QPE and QPF (see https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020GL089365 for a proof of concept) and opportunistic data sources based on rainfall data from private citizens in areas where there is currently a poor measurement network. In addition, satellite data becomes available at higher and higher resolution and better temporal resolutions both in the public and commercial domains.

Where/who will provide the validation data if public institutes are no longer generating forecasts in the various scenarios?
It is very likely that the government authorities will still remain responsible for the forecasting – warning – response process. We expect that government authorities will also remain responsible for maintaining and providing the base measurement data for validation. These data have often a wider use than just in the hydrological forecast process (they are often needed in the primary process of the public institutes for yearly reporting, planning, maintenance, and risk assessments, etc.). However, if it becomes interesting to improve the quality of commercial forecast/information products or develop new commercial data products, one can imagine that companies also invest in obtaining their own closed data (there are examples out there, for instance: https://www.covadem.com/en/home).

For smaller governments with limited resources and budget for a forecasting model, would this exciting future make it even more difficult since technology is the main focus?
Developments toward 'forecasting as a service' will give smaller governments with limited resources the opportunity to purchase a subscription to these types of services. The advantage is that they do not have to develop and maintain the models themselves.

Commercial parties also want to have proprietary rights to processes/technology. How does that work with contracting for services or changing services as a government?
This is one of the reasons that the software approach of Deltares is open and 'dare to share'. We work together with consultants all over the world who use our software. This approach helps to prevent a commercial vendor lock in for governments.

The transition to the new future world is upon us. It would be interesting to see how flood forecasting could/should develop but how might seasonal forecasting at global to basin scale develop?
Deltares is currently working on the development of global hydrological, water quality and groundwater models. Our ultimate goal is to connect these models and have one approach on a global scale. We expect the resolution of these models to increase in the coming years making it possible to zoom in on catchment level.

Additionally, this is a challenge for the wider forecasting community. Europe has launched the initiative on Destination Earth: https://ec.europa.eu/digital-single-market/en/destination-earth-destine

You highlight impact in the presentation. Do you mean that rather than just forecasting an amount of rainfall or a flood level, is the forecast interpreted to indicate impact, such as: "We predict bus services will be interrupted" or "These major roads will be impassable." Is that correct? If so, then has your team looked into the means of collecting information relevant to forecasting impact, such as info from social media (Twitter) on what actually happened during previous event?
Yes, indeed. We see a tendency from flood-level prediction toward the impact of a flood. We work together with other companies (e.g. FloodTags) to include social media data.

Is the hydrological forecasting software free and available to everyone?
The Delft-FEWS software is free of license. You can download the fully functional demonstration version via our website (www.delft-fews.com). If you plan to use the system for operational use, we offer support and maintenance packages.

Would you recommend combining the Delft-FEWS system with other hydrological models like HEC-HMS for flood forecasting in some ways?
Delft-FEWS is a platform that integrates data and models. In theory, you can connect any model to the platform, from open source models as Delft3D and HEC-RAS to licensed models as Mike11, as long as an adapter is available. We have many examples of operational systems where Delft-FEWS is working together with HEC-HMS. On this map, you can find an overview of all Delft-FEWS systems in the world.

About the Speaker

Nadine Slootjes
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Nadine Slootjes is the Manager for Water Operations and Early Warning at Deltares. With a group of 35 water and software developers, she is responsible for the development and delivery of state-of-the-art information technology solutions in water management. Flood forecasting and warning systems (Delft-FEWS) and real-time control systems (RTC-Tools) are an essential element in regional and national water management. The team operates globally and assists national and regional water authorities to optimize their water operations and real-time decision-making.

Related Resources

Deltares-Delft-FEWS
www.delft-fews.com

Scenario Analysis: Real-time Hydrological Forecasting
https://www.deltares.nl/app/uploads/2017/06/scenario_study_real-time_hydrological_forecasting.pdf

Blog: The future of real-time hydrological forecasting
https://www.deltares.nl/en/blog/the-future-of-realtime-hydrological-forecasting/

Map of all Delft-FEWS applications
https://v-web002.deltares.nl/fewsprojectviewer/projectviewer/