INTERNATIONAL WATERS EXPERIENCE NOTES

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Incorporating climate information into Water Safety Planning

Flood and drought events are becoming increasingly common, more severe and less predictable due to the impacts of climate change. Stakeholders from catchment to tap have a role to play in strengthening climate resilience. Water utilities, in particular, must ensure water supply and quality for a growing number of customers, and water safety planning (WSP) provides a risk management approach to achieve this. The Flood & Drought Management Tools (FDMTs) project is using WSPs as an entry point to prompt utilities to consider climate information and the risks of floods and droughts in their planning procedures.

The FDMT partner utilities across the project's 3 pilot basins have differing capacities to respond to and awareness of climate hazards; differing access to climate information and thus are integrating climate information to varying degrees into operational and management procedures and plans. There has been an understanding as the project has progressed that there is a need for greater awareness and understanding around the applicability of climate information in assuring drinking water quality. As other projects take up the tools, more work will also need to be done to ensure the institutionalisation of climate risk management. This is critical as knowledge gained does not necessarily lead to changes in planning and implementation. The FDMT project experience can inform the refinement of similar projects that seek to support utilities to develop climate-resilient water safety plans.

Flood & Drought Management Tools
Incorporating climate information into Water Safety Planning

Experience of the GEF - sponsored

GEF/UN Environment/DHI/International Water Association: Flood and Drought Management Tools

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Contacts: Katharine Cross, IWA (katharine.cross@iwahq.org)
Oluf Zeilund Jessen, DHI (ozj@dhigroup.com)

PROJECT DESCRIPTION

Flood and drought events are becoming increasingly common, more severe and less predictable. Climate change is a major driver, but a growing global population, urbanisation, changing land use, and increased demand for water from competing sectors, are putting pressure on an already limited resource: water.

This hydrological uncertainty dramatically increases risks for many countries, affecting the organisations responsible for managing river basins as well as their end-users such as industry, agriculture and utilities. These risks are magnified in transboundary river basins, which have the additional challenge of multiple countries competing for water resources.

There is a growing sense of urgency around the need to improve our ability to recognise and address flood and drought risks, and to improve resilience and cooperation within river basins and amongst end-user. Land, water and urban area managers can better prepare for water related risks by integrating information on flood and drought events into planning and analysis processes.

A key output of the **FDMT project is a decision support system (DSS) for land, water and urban managers** in the form of an online set of technical applications accessed through the Flood and Drought Portal (www.flooddroughtmonitor.com)**.** The technical applications can be applied individually or together at the basin or local level to facilitate the inclusion of information about floods, droughts and future scenarios. FDMT users will have access to satellite data to support baseline assessments; a platform to analyse data to support impact assessments and formulate planning options and disseminate information on a centralized platform. The tools are designed to support already existing planning and management activities. **The entry point for water utilities is through the Water Safety Planning application which can help support systematic documentation of a WSP.**

Beyond the technical outputs, the project aims to strengthen the development and implementation of WSP in the context of linking catchments with urban water utilities. Integrating risks and hazards management from the catchment, including the impacts of climate change and variability, is necessary for utilities to become more resilient. The project has a unique opportunity to do this as it involves both basin/water resource agencies and water utilities as key stakeholders.

This experience note will highlight urban water utility needs for strengthening resilience and the methods that have been employed in the FDMT project to meet these needs. The learning and awareness raising strategies employed to trigger a shift towards climate-resilient water safety plans will be highlighted.

THE EXPERIENCE

Issue

Managing and planning for resilient urban water supply systems

Water Safety Plans are recognized by the WHO and IWA as the most effective means of ensuring the safety and acceptability of drinking water supply. Water Safety Plans are connected to resilience in that they offer a comprehensive risk-based approach that addresses all stages in the water supply chain from catchment to consumer. In order for urban water supply systems to strengthen their resilience, water managers need:

- Knowledge to understand the complex challenges of climate change and variability
- Access to the right tools and information to have a more scientifically sound basis upon which to address climate change
- Capacity to manage and address current operational risks and emerging risks and their impacts on service provision.

It should be noted that WHO is a key driver of climate resilient water safety planning and many of the approaches and ideas have been incorporated into the project from the DFID funded on WASH and climate change (http://www.who.int/globalchange/projects/wash/en/).

Addressing the Issue

This experience note highlights how the development of the Water Safety Plan application has promoted the **catchment to consumer** approach to hazard and risk management and encouraged the initiation of climate-resilient WSP. WSP has as a prime focus to identify hazards and control measures to reduce risk in water service provision. WSP pushes utilities to consider and address hazards that lie within and beyond traditional boundaries of control (See Figure 1 below). The design of the WSP approach leads to the inclusion of stakeholders inside and outside of utilities. For example, in the case of utilities in Thailand, Metropolitan Waterworks Authority (MWA) and the provincial Waterworks Authority (PWA) receive climate information from the Hydro and Agro Informatics Institute (HAII) and the Thai Meteorological Department (TMD) to better understand external hazards to the water supply system.

A) The catchment to consumer approach – Re-orienting priorities & building bridges

Utilities in both urban and rural contexts need to move beyond the current operation and management framework which is often bounded by the areas they directly control to ensure water quality and adequate supply (see Figure 1). This means interacting and influencing what is happening in their water sources, including influencing and directing investment at the catchment level for cost effective water quality improvement and sustainable management of source waters. This also means interacting more with consumers as collaborators in water supply management. For example, initiating awareness raising campaigns to reduce water demand during periods of drought and water shortages, like what is currently happening in Cape Town, South Africa. The city is on track to reach ‘Day Zero’, when household taps will run dry, by April 2018. Residents are being asked to reduce their water consumption to 87 L/day and this is expected to drop further as of February 2018. Periods of extreme droughts are the new reality for Cape Town and demand management will be an enduring management strategy to ensure stable supply of water to the city (Burke, 2018).

The impacts of droughts and flooding have been observed the world over and are expected to intensify due to climate change and variability. It was initially assumed by the FDMT project that utilities are actively considering climate information in short-term operational planning and long-term asset management. Climate change impacts, such as, water quality degradation and water shortage and scarcity can severely impact the ability of water utilities to supply their customers, so utilities need to prepare for these risks in their supply systems. However, often the approach is responsive once floods and droughts take place. As climate information can be difficult to understand and interpret, especially at the local level, water safety plans become the inroad to approaching utilities about integrating climate information into their risk assessment within their supply systems. Supported by the right information and tools, climate change information can be better integrated into planning and management procedures.

Throughout the numerous workshops and meetings with our partner utilities during the design, development and training components of the project, many barriers to change came to light that speak to competing priorities that utilities must manage. Such competing priorities can include upstream pollution, rise in salinity because of low flows due to over-abstraction or less rainfall, as well as the day to day infrastructure operation and maintenance. Overcoming these barriers can be seen as an opportunity to improve water supply systems. There is a high potential for utilities to adapt and improve the resilience of their water supply systems (WHO, 2009).

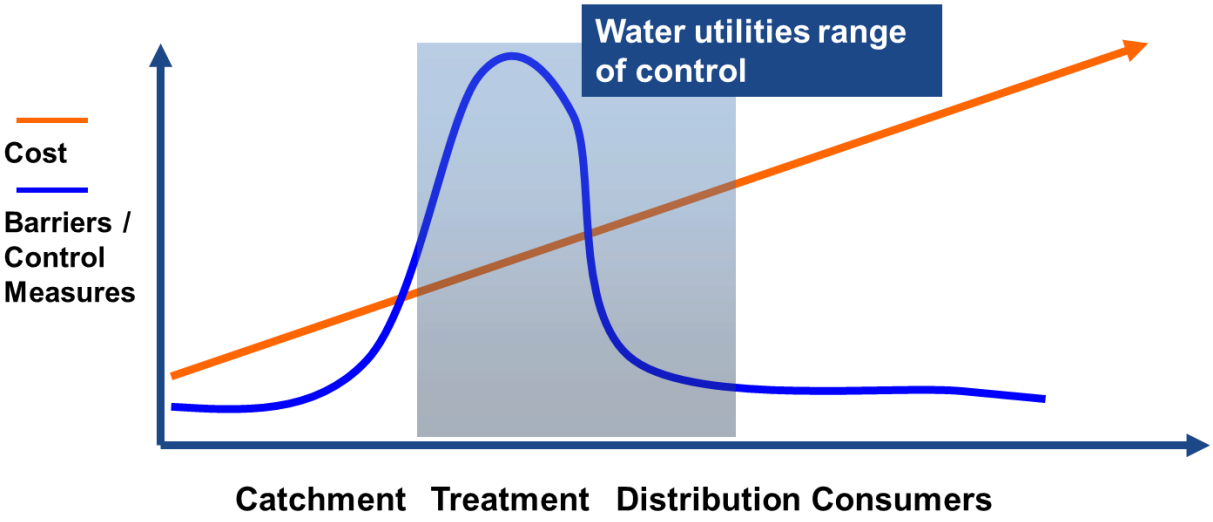

Figure 1 Traditional range of control of water utilities

B) **Climate-resilient water safety planning – bridging knowledge gaps**
The recent edition of the WHO (2011) *Guidelines for Drinking-water Quality* highlight the importance of a comprehensive risk assessment and risk management approach for water supply systems from catchment to consumer and which addresses climate change impacts on drinking water quality and water scarcity. WSP is an approach providing utilities a starting point to address water quality and quantity challenges. The FDMT portal supports greater understanding of climate change issues and their integration into the WSP process; which is explicitly addressed in the recent WHO (2017) report *Climate-resilient water safety plans: Managing health risks associated with climate variability and change.*

The FDMT project is well positioned to engage utilities in building their capacity to integrate climate information into WSP. For example, utilities can benefit from accessing climate data (near real time data, forecasting data, historical data, information from climate change models) through the Data and Information application, another technical application developed as part of the FDMT project. This application allows utilities to visualize climate information such as rainfall and temperature, as well as indices which show whether geographic areas are comparatively drier or wetter to previous years, and also introduces them to climate data interpretation through training, detailed guidance documents and other online support materials. Output from the Data and Information application can be used for identifying climatic hazards and the level of associated risk on the water supply system (from catchment to consumer) which feeds into the WSP process.

Based on the familiarity that most large scale utilities have with water safety planning (or less holistic risk assessment tools like sanitary inspections (WHO/UNICEF, 2017)), during the workshop trainings and engagement opportunities, linkages between the different modules in WSP and climate information could be highlighted and applied in context. The workshop trainings have offered the different stakeholders the opportunity to use information from their own utilities and basins and respond to questions, such as:

WSP Module	Guiding question 1	Guiding question 2
1: Assemble the WSP Team	*Who is on your WSP team?*	*Who could you include (internal or external as a climate expert)?*
2: Describe the water supply system	*What part of your system is likely to be affected by climate impacts (flooding, droughts)?*	
3: Identify hazards and hazardous events and assess the risks	*What are the top 3 hazards to the system?*	*How are these affected by climate impacts?*
4: Determine and validate control measures, reassess and prioritize the risks	*How would a control measure be affected by climate hazards?*	*Will the control measure be sufficient?*
5: Develop, implement and maintain an improvement/upgrade plan	*What are long term impacts of climate hazards on water utility?*	*What can be addressed by water utility? And by others (and who)?*
8: Prepare management procedures	*What management procedures do you have that consider climate and weather emergencies?*	
9: Develop supporting programmes	*What supporting programmes address climate risk?*	
10: Plan and carry out periodic review of WSP & 11: Revise the WSP following an incident	*What climate hazard might result in an incident at your water utility?*	*What would be the impact (e.g. flooding damages infrastructure)?*

The project has used an iterative feedback approach through the development of the Flood and Drought Portal and its technical applications. This includes the WSP application development cycle which has had input from utilities from across Lake Victoria, Volta and Chao Phraya basins, with additional input from the WHO and leading experts from across the globe (e.g. Australia, Sri Lanka, etc.). A more detailed account on the stakeholder engagement process is available in a dedicated IW Experience Note from the FDMT project. Utilities at different stages of developing, implementing, reviewing or revising their WSPs can use the application to improve their integration of climate information into their risk assessments and control measure identification. After all, WSP is a circular process, with each plan requiring revision after incidents occur or once new hazards are identified.

RESULTS AND LEARNING

Like many utilities across Africa and Asia, the water utilities involved in the FDMT project face many challenges in ensuring safe drinking water quality and sustainable and continued supply. **Short-term operational & maintenance priorities can distract from medium and long-term risks associated with the impacts of climate change and variability**. This issue is compounded by differing access (and often limited access) to resources, differing human and technical capacities and differing access to climate information and inter-organisational information sharing cultures. Consequently, the FDMT project has used different **approaches** to raise awareness and increase the knowledge base, on the importance of being prepared for climate associated risks. For utilities, this pushes forward the idea of climate-resilient water safety planning (see FDMT IW Experience Note on Stakeholder Engagement).

N**ot all utilities consider climate change in their operational and management strategies**. Fundamentally, utilities can only monitor and respond to risks in the water supply system insofar as they can access the correct information. This highlights the need for a more holistic (catchment to consumer) water safety planning process and great potential to develop climate-resilient water supply systems. As mentioned above, ongoing effort is being made through the FDMT project within the scope of the WSP

application development to improve understanding of the ways in which climate information can be shared with utilities.

A key lesson learned from the deep engagement that the project has had with utilities is that **knowledge gained does not necessarily lead to practical changes in implementation** of water operating and planning procedures. Raising awareness on the importance of climate information in WSP must be coupled with practical knowledge on how to integrate the information into WSP. For example, within the FDMT project, resources have been allocated to develop practical guidance on interpreting and using climate information at the local level to inform WSP and ensure that utilities build their climate resilience.

Stakeholder engagement via multiple strategies has also been applied to activate champions at the local level and key decision makers at higher levels. This helps ensure greater uptake of the WSP tool with utilities and a gradual strengthening of climate-resilient water supply systems from catchment to consumer.

WHO is leading the push for the integration of climate information into water supply operation and management by WHO (2009, 2011, 2017). The WHO has been working on the development of effective plans for climate change adaptation in the health sector in low and low-middle income countries. The recent publication on Climate-resilient water safety plans (WHO, 2017) discusses how to take into consideration the broader issues of climate change, regional climate vulnerability assessments, disaster risk reduction and integrated water resources management within the WSP process.

Although implementation of methodologies and tools is outside the FDMT project's scope, the project is laying the foundation for attainment of climate-resilient water supply systems. **The FDMT suite of applications and planning methodologies can aid decision-making and prompt utilities and other basin stakeholders to consider climate information and the risks of floods and droughts in their planning procedures**.

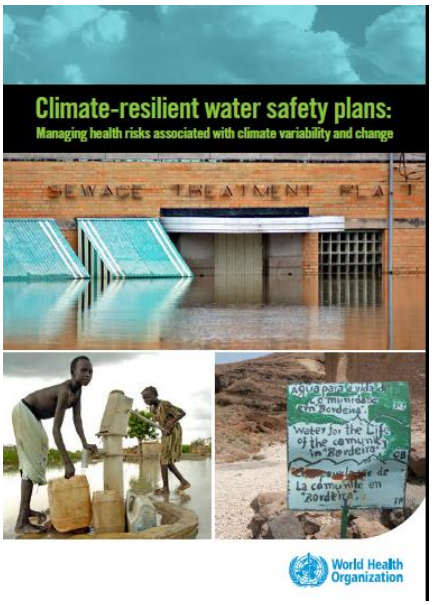

Figure 2. WHO guide on "Climate-resilient water safety plans"

REPLICATION

A key lesson from working with water utilities is that the relevance and application of climate information needs to be tailored to the water supply system context. This can be articulated as part of the risks that utilities need to address. However, there is varying capacity to do this effectively with the right information depending if the impacts of climate are considered a threat and priority to address.

Some key utility stakeholders may be able to speak knowledgeably about global/regional impacts of climate change and variability. Others have a deeper understanding of how climate information can be applied and interpreted at the local level, while others have limited experience in considering climate hazards in their short and long-term planning and limited access to climate-related information. A strategic project partner selection process and in-depth consultations early on with partner utilities and key stakeholders will clarify what inroads can be used to begin the iterative process in moving through the WSP framework and beginning the process in building climate-resilient water supply systems, from catchment to consumer.

Successes achieved in gaining interest from utilities to integrate climate information into their operation and planning processes must be coupled with strategic engagement that seeks to gain support from high level stakeholders to create an enabling environment that ensures a sustainable transition towards climate resilient water supply systems. In this same vein, because of strategic engagement with other projects and key organisations, like the WHO and UNICEF, the FDMT project outputs and outcomes can

be imbedded in upcoming initiatives and programmes, which are significant for the sustainability and the intended goal to support utilities in their effort to become climate-resilient through WSP. For example, MWA and PWA in Thailand intend to register all technical staff on the FDMT portal, demonstrating their commitment to integrating flood and drought management into their practices.

SIGNIFICANCE

This experience represents the first GEF IW project that has specifically developed a suite of technical applications as part of a DSS. The development of the WSP supporting application within the suite of FDMT applications is an entry point for utilities, local governments and other stakeholders to consider how to integrate climate adaptation into their current planning and preparedness approaches and pinpoint specific weaknesses that threaten resilience in water supply systems.

As the technology for remote sensing and in-situ monitoring become more sophisticated and the data more accessible, climate information will become easier to understand and interpret. The development of the Flood and Drought Management Tools and, specifically the WSP tool, has shown the complexity involved in developing smart support tools that can facilitate and improve capacity to respond and prepare for the impacts of climate change, particularly around flooding and droughts. The integration of climate information and the associated risks force utilities to think in the short **and** long-term. Limited risk mitigation now will have serious consequences for long-term asset management and sustainable water supply to a growing number of consumers.

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KEYWORDS

- Resilience
- Water basin
- Water utilities
- Floods

- Droughts
- Transboudnary water management

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Visit www.flooddroughtmonitor.com to register and log-in to the technical applications.

Contact Katharine Cross: Katharine.Cross@iwahq.org; Oluf Zeilund Jessen: ozj@dhigroup.com for more information.

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