



FLOOD & DROUGHT MANAGEMENT TOOLS

Planning for Floods and Droughts: Reflections and Future Opportunities Report

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United Nations

Nairobi, Kenya



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1. Executive summary

There is a growing sense of urgency around the need to improve resilience within river basins, and for this to become a critical part of water management plans. The increased frequency and unpredictability of floods and droughts is a priority concern across scales from transboundary to local, along with the other multiple drivers that cause depletion and degradation of shared water resources.

The Flood and Drought Management Tools (FDMT) project (<http://fdmt.iwlearn.org/>) is financed by the Global Environment Facility (GEF) International Waters (IW) and implemented by UN Environment, with the International Water Association (IWA) and DHI as executing agencies. The project developed the Flood and Drought Management Tools portal, with tools to support planning from the transboundary basin to water utility level by including better information on floods and droughts. The project is being implemented from 2014 - 2018, on 3 pilot basins Volta, Lake Victoria and Chao Phraya.

With support from the UN Environment, DHI and the International Water Association (IWA) organised a 1 day event: “Planning for Flood and Droughts: Reflections and Future Opportunities” on October 2nd, 2018, to bring together high level representatives from national and international institutions to help highlight the ongoing transition towards using data tool solutions in water management, with perspectives and lessons learned from the FDMT project.

The event was an opportunity to put forward the experience of the FDMT project, through the lens of key project stakeholders within the pilot basins (and learning basins) and executing agencies (DHI and IWA). The event initiated dialogue on how the smart water management solution: the Flood and Drought Portal can be used by a broader group of stakeholders and key international institutes beyond the project, now and in the future, with respect to the management of water resources in the context of climate variability and change. The event took place at the United Nations Conference Centre in Gigiri, Nairobi, Kenya.

The main objectives of the event was to share experiences and the future vision for managing water resources in transboundary basins, to help raise awareness and ownership of the Flood and Drought Portal applications as a mechanism to address current and future water challenges and to officially hand over the key output of the Flood and Drought Management Tools project to GEF and the key stakeholders. The event helped highlight the consequences of extreme flood and drought events to the environment and s, and the severe ramifications on societal development, in terms of cost and recovery. Planning for disasters in no longer an option but a must and key to the success is improving our planning capacity around extreme events. The event also highlighted how planning for flood and drought management can benefit from technical tools to ensure more informed decision making, but these tools should not be developed for the sake of tools, they should be developed to help address issues.

Through cases highlighted by utilities, national institutes and international organisations who attended the event, it was clear that flood and drought management has been enhanced through the use of ICT and improved planning across all levels of basin management. Tools and technologies used for improved management are vital; their sustainability is dependent on the buy in by the intended users and on their knowledge and capacity to use the information.

An overview of the event is available on the project website with access to the presentations given during the event: <http://fdmt.iwlearn.org/events/planning-for-floods-and-droughts-reflections-and-future-opportunities>

2. Project background

The Flood and Drought Management Tool (FDMT) project is funded by the Global Environment Facility (GEF) International Waters (IW) and implemented by UN Environment, with DHI and the International Water Association (IWA) as the executing agencies. The project is being implemented from 2014 - 2018, with 3 pilot basins (Volta, Lake Victoria and Chao Phraya) for testing and validating the methodology and technical applications.

The project responds to a growing sense of urgency around the need to improve resilience within river basins, and for this to become a critical part of water management plans. Consequently, the International Waters (IW) focal area of the GEF identified the increased frequency and unpredictability of floods and droughts as a priority concern in transboundary contexts, along with the other multiple drivers that cause depletion and degradation of shared water resources.

Based on these issues, the project is developed a decision support system (DSS) that supports the integration of information on floods and droughts into planning across scales including Transboundary Diagnostic Analysis (TDA) and Strategic Action Programmes (SAP), and Integrated Water Resources Management at the basin level and Water Safety Planning (WSP) and the local (water utility) level.

The DSS or Flood and Drought Portal is a freely available web-based system containing a package of technical applications (<http://www.flooddroughtmonitor.com/home>). The portal has been tested and validated with available data at both basin and local levels in the 3 pilot basins; however it will be available for all transboundary basins.

3. Planning for Floods and Droughts

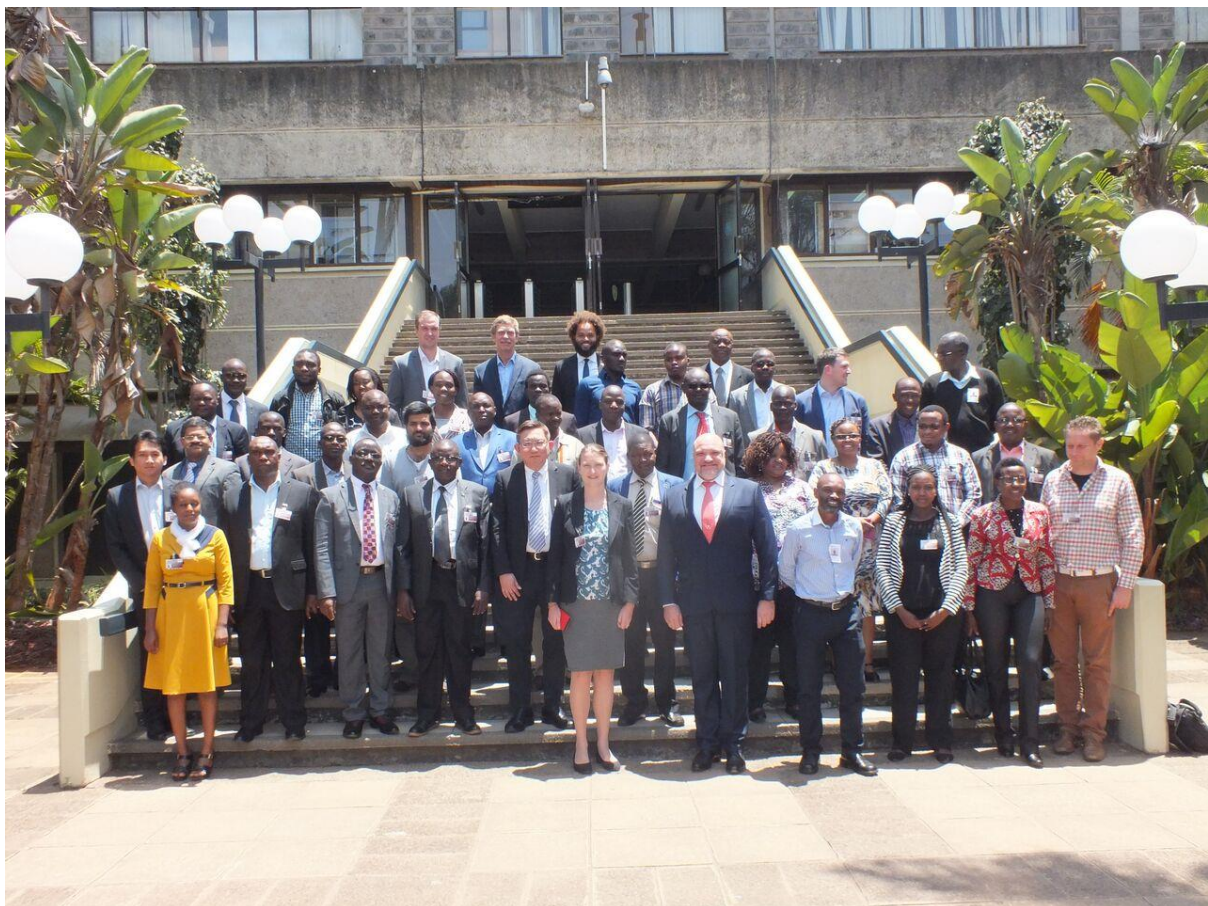
3.1 Overview of the event

The objective of the event held in Nairobi on the 2nd October 2018, was to help put forward the experience of the FDMT project, through the lens of key project stakeholders within the 3 pilot basins (Volta, Lake Victoria and Chao Phraya) and the executing agencies (DHI and IWA). The event was an opportunity to explore how the project outputs can be used by a broader group of stakeholders and key international institutes beyond the project now and in the future with respect to the management of water resources in the context of climate variability and change.

The event provided an avenue for participants to provide their experiences around water management in the context of climate variability and change, while also providing an opportunity to reflect on the project, and see how to integrate project outputs in their activities. The agenda can be found in Annex 1 and participants list in Annex 2.

3.1.1 Target group

The target group of this event were organisations and individuals working on addressing the impacts of climate change, with a focus on the water sector. Participants were high level representatives from water utilities, government agencies, research institutes, the ICT sector and NGOs. A full list of participants can be found in Annex 2.



Participants during the event at the UN Conference Centre, Gigiri, Nairobi, Kenya

3.2 Flood and Drought Event: Perspective, experience and next steps

Since the inception of the Flood and Drought Management Tools project in 2014, the executing agencies; DHI and IWA, and implementing agency; UN Environment, have gained considerable experience around flood and drought management. The event was an opportunity to share our perspectives on the topic and provide strategic recommendations from our experience and lessons learned over the 4 years.

3.2.1 UN Environment - perspective, experience and next steps (strategic recommendations)



Yegor Volovik, delivering GEF perspectives and experiences on the project

Yegor Volovik, GEF IW Portfolio Manager for UN Environment, opened the event with a welcome address, highlighting how climate change has increasingly led to the occurrence of extreme climatic events globally, and with the challenge of predicting these events in a timely manner having significant ramifications on people and economic development. There are intensive rainfalls events resulting in devastating floods and high temperatures leading to water scarcity and drought, both of which have devastating impacts on soil degradation, deforestation and human migration and death. A UN report (UNISDR) showed that in the last 20 years, 157,000 people died as a result of flooding. The report also says that between 1995 and 2015, floods affected 2.3 billion people, which accounts for 56% of all those affected by weather-related disasters – considerably more than any other type of

weather-related disaster. Droughts may not appear as immediately as floods, however they have significant social and economic implications. A recent study of mortality due to extreme weather events found droughts to be responsible for more deaths than any other single entity (58%). In the US, the 2012 drought resulted in an economic loss of about USD 20.

Sub-Saharan Africa is one of the regions most affected by climate change and that the region will face an increasing burden on human welfare as a result of climate change. In Kenya in 2018, close to 200 people died as a result of the worst flooding since 1997, with more than 300,000 displaced and over 21,000 acres of farmland destroyed, leaving thousands of people without livelihoods or sustenance. The floods came on the back of the nation's worst drought since 2010, with 23 of 47 counties affected, leaving 3.4 million people severely food insecure and an estimated 500,000 people without access to water.

The high prevalence and severe impacts of flood and drought events on water resources, human communities and ecosystems, demonstrates the need for improving our resilience against such events. Inadequate access to climate, hydrological and other data types required for effective decision-making has left communities and organisations unable to properly prepare and implement appropriate management techniques as a method of protection.

The severity of these extreme events would only be reduced if there were mitigation mechanisms, which are not only timely but effective. There is increasingly sophisticated smart water management and monitoring tools becoming available, which allow water managers to access information on current and forecasted climate conditions. UN Environment along with the Global Environment Facility (GEF) are interested in ensuring scientifically sound climate information is incorporated into planning across scales.

The Flood and Drought Management Tools project taps into available data sources and provides an online portal which allows users within transboundary basins to access data as well as a package of technical applications to improve management and planning for floods and droughts. Yegor further emphasised the need for new approaches to governance in the water sector, as well as increased risk transfer tools and innovative financing schemes.

3.2.3 DHI - perspective, experience and next steps (strategic recommendations)

Oluf Jessen, Head of Projects with DHI emphasised the importance of data availability for appropriate water resources management. Accessing a basic set of data for water resources management is critical to ensure a better decision making process.

Some of the experiences and lessons learned in the FDMT project include the importance of data as a driver for sustainable water management and the importance of appropriate training and capacity building for long-term sustainability of decision support systems. Furthermore, web and cloud based solutions are becoming the “standard” approach for water management tools as it requires no local installation and allows fast implementation of new features or bug fixes. The project also observed the difficulty in developing globally applied solutions because local and regional knowledge is often required and preferred as the starting point for sustainable management of water resources



Oluf Jessen, delivering DHI perspectives and experiences on the project

Looking ahead to the coming years, it will be important to put emphasis on the following areas to ensure better usage of data in water management sector:

- Decisions should be driven by data
- Increased access to data will pave the way for new and more efficient use of data in water management
 - Machine learning, artificial intelligence, optimisation methods, etc.
 - Increased use of cheap sensors and satellite based information
 - Local enterprises will utilise data for new solutions
- Information sharing across national boundaries and agencies
 - Transparency in investments and solutions

All these will help create an optimised real-time control of water systems, which will help in mitigating extreme climatic events and so reduce risks associated with flooding, optimise water use and minimise spills, meet regulatory requirements on water quantity and quality and reduce costs for new water infrastructure.

Water management in years to come will therefore improve through the availability of smart management tools such as decision support systems. These systems need to be seamlessly operational across time scales and sectors, and need to be easily accessible through the cloud.

[Download the presentation](#)

3.2.2 IWA - perspective, experience and next steps (strategic recommendations)

Over years, there has been an increase in the number of extreme floods and droughts (exacerbated by climate change) influencing the quality and quantity of water resources, consequently drinking water supply.



Katharine Cross, delivering IWA perspectives and experiences on the project

Katharine Cross, Programme Manager with IWA explained that these impacts need to be mitigated at the earliest time possible, because they pose risk to public health, economy and the environment. To address these risks requires those responsible for water supply to improve their preparedness and planning for climate change impacts to ensure their resilience and ability to maintain their water service provision.

Despite the risk associated with climate change on water supply systems, addressing the impacts are not a priority for water utilities because it is often beyond their immediate control. Actions to address the impacts of flood or drought events are more reactive, and often with fragmented engagement with the catchment area. Furthermore, the water utility sectors are traditionally slow to adopt new methods and technologies due to a lack of incentives, risks from adoption (whether real or perceived) and siloes of data owners and departments.

Enabling access to climate data through remote sensing data provides valuable information on the upstream and downstream water resources conditions. Accessing such data (e.g. Climate information) is essential for improved operation, management and planning. However, the amount of data can be overwhelming, and the ability properly interpret the information challenging, not to mention, to integrate such information to inform operation and management of water systems. Water Safety Planning (WSP), recognised as the most effective means of ensuring the safety and acceptability of drinking water supply as it offers a systematic framework to manage risks by considering the impact of climate variability and change. For this reason, WSP presents water utilities with an entry point for a more prudent approach of considering climate change risks to the water supply system.

For WSPs to be effective, the right enabling environment is needed that cultivates catchment to tap thinking. This requires:

- Support from decision makers (to use appropriate tools, methodologies and information),
- Long-term investment on assets (infrastructure and other resources),
- Cross-sector approach that foster collaboration, sharing of knowledge and capacity,
- Combined use of satellite data with in-situ data to address biases and ensure more appropriate information for water quality monitoring and associated risk management,
- Involvement and buy-in from users from inception to ensure long-term sustainability.

Water utilities adopting a more climate resilient WSP will be better prepared for climate hazards, will be better placed to ensure a safe and secure water supply and improve health, economic productivity and livelihoods.

[Download the presentation](#)

3.3 Information for water management and planning

A panel discussion on “Information for water management and planning” was moderated by Peter Bjørnsen, UNEP-DHI. Each panelist gave a 5 minute perspective on data and information for water management and planning, and then a discussion followed guided by key questions outlined below

General (to all)

- What are some of the challenges around information within the context of water management and planning?

Dr. Gouping Zhang, World Bank

- What obstacles around information access and management need to be overcome across a catchment to address the changing global dynamics (e.g. climate change)?
- How does the World Bank help address these obstacles?

Mr. Leonard Sweta, RCMRD

- How could basin organizations, water utilities or other water users within the region utilize the services of IBM to improve water management and planning?

Mr. Chris Shitote, FewsNet

- What challenges have you encountered to consolidate data sets within the region?
- What are the drivers incentivising data sharing?

Dr. Sabiiti Geoffrey, ICPAC

- What challenges are there around information access and management which can impede the ability for cooperation on water management within the region?
- What is IGAD doing to address these challenges?



Panel representatives addressing information for water management and planning

Dr. Gouping Zhang, World Bank (WB)

For good management in the water sector, there are three crucial elements that need to be put in place to help achieve good management in the water sector. These include good investment, access to information and a well-established institutional framework.

Investments need to be well planned and informed. This means, having a prudent road map to help achieve the investment, and ensure it is sustained in the long haul. This will help mitigate water related risks as well as improve resilience in the water sector. Secondly it is important to have the right information and access to the right data before, during and after investing in projects. This helps in managing, running and monitoring projects properly; proper and timely information should be at the heart of every project in the water sector. Thirdly, it is crucial to put in place institutions which are well capacitated and informed to help implement and manage projects, and to have effective information sharing practices.

These three aspects are important to building resilience to the impacts of climate change. The WB has invested in a large portfolio of projects around climate resilience, including building and strengthening institutional capacity. The WB intends to leverage on these projects to help improve water management across sectors.

Mr. Chris Shitote, Famine Early Warning Systems Network (FewsNet)

Data sharing between institutions and countries has always been a big challenge in the water sector and in trying to effectively deal with climate change issues. In many cases having different data sources is an asset. For example, it is possible to look at the convergence of evidence, meaning looking at different sources but same data sets (e.g. rainfall), and try to compare. Where data sets match you have strong convergence of evidence and confidence to make a statement like this area is flood prone or not.

Limited access can be a huge setback in proper management and mitigation of the extreme events. This reduces the effectiveness of early warning systems put in place to help inform us about oncoming extreme events, as these systems rely on available and precise real-time data.

In Kenya, there is limited access to data in terms of ground or observed data as a result of few observatory centres and the lack of institutional capacity and unwillingness to share existing data. FewsNet, which is funded by the United States Agency for International Development (USAID), has tried to improve corporation amongst different sub-Saharan nations by providing freely available data and climate hazards (NDVI, temp, PET). FewsNet has tried to encourage the improvement of data sets through capacity building processes.

As a result, countries easily share some of their data sets, thereby enriching the already existing satellite data that is made available. During projects, and when funding is available, member states have the necessary resources to collect and check data which they can then share, however this is not enough. FewsNet signs agreements (Memorandum of Understanding or MoU) with institutions regarding data sharing to ensure data can still be accessed after the completion of a project. The MoU ensures that data is accessible from each member state, however it can be difficult to implement when the needed resources are not available. . Essential member states needs to see access to data and agreeing to share information as an asset itself.

Dr. Sabiiti Geoffrey, (ICPAC)

Apart from issues of limited data tools for the region, there are also low capacity levels both nationally and regionally. Furthermore, data sharing across countries is also a big issue in the region and catchment related data remains a major constraint, which needs to be addressed.

Changes to policy and regulation need to be more coordinated to ensure monitoring of water related issues is harmonised in the region. It is also difficult to allocate the appropriate resources in helping address the risks when the transition time between climate extremes is shortened. This prompts a need to effective regulation that can enable better management during and between extreme events.

ICPAC has tried to address some of these issues in the region through a number of initiatives. For example, data blending of remote sensing and in-situ data or building more partnerships between countries in terms of data sharing and collaboration to facilitate efforts in addressing climate change impacts.

ICPAC has also concentrated resources on research and assessment, highlighting climate risks and helping identify appropriate mitigation measures to address, for example, drought. ICPAC is also encouraging the aspect of co-production, where in case you generate a product you engage the user and know what form they need the data required in and for what purpose. This helps with data quality and relevance between the supplier and the user.

Mr. Leonard Sweta, Regional Centre for Mapping Resource for Development (RCMRD)

RCMRD was established to solely provide remote sensing data and services to member states, by creating a system that allows for information to flow to users. From 2017, RCMRD decided to shift its focus to users to provide feedback for further improvement and development of the mapping systems put in place. RCMRD produces land cover data that helps tackle issues of climate mitigation, food security and ecosystems development.

According to RCMRD, data acquisition is not a problem in the region. Rather the extent to which users completely rely on the data and analyse the data is an issue. The data needs to be in a manner that is useful for the people you want to serve, to encourage proper utilisation. There are a myriad of websites that do not align with information on the ground. There needs to be harmonisation of information, however, harmonising data is a challenge as the data and tools from each project or institution may be developed differently; there is no specific standard. Data users are therefore required assess what data is reliable and useful, yet such capacity is often lacking.

Tools put in place for climate change mitigation need to be properly availed to the people who will make good use of the tools. The right focus needs to be put on the development of technologies and data provision for users to ensure flood and drought issues in the region are addressed appropriately. In order to help improve on this challenge, service audit needs to be done before these technologies/tools and data are developed, so as to have a clear idea and vision on which issues to be dealt with and how.

3.3 Future Opportunities



Participants listen to discussions addressing the use of the Flood and Drought Portal to address hydro-climatic risks

The next panel, moderated by Yegor Volovik, included representatives from UN Environment and the key basin stakeholders in the project's three pilot basins: Lake Victoria Basin Commission (LVBC), Volta Basin Authority (VBA) and Hydro and Agro Informatics Institute (HAI), who helped establish and validate the Flood and Drought Portal, shared their experiences with the tool and possible future opportunities. The focus of the discussion was around reflections on the GEF-7 strategy and future opportunities for intervention. The guiding questions for discussion included:

1. In the strategy there are some priority areas under the freshwater objective (slide 9):
 - Information exchange and early warning
 - Regional and national cooperation on freshwater basins
 - Investments in water, food, energy and environmental security
2. From your perspective where does your country/region need support? What type of support is needed (e.g. capacity, equipment, etc.)?
3. What activities are of interest in the new strategy?

Yegor first set the stage with a presentation on key highlights from the GEF-7 strategy as a potential entry point for future intervention ([download the presentation](#)).

Dr. Sutat Watin, Hydro and Agro Informatics Institute (HAI)

There needs to be an increase in cooperation amongst basin stakeholders in order to address the extreme climatic issues like floods and droughts. Successful examples of capacity and equipment cooperation should be adopted, to help in mitigating the impacts of extreme climatic events.

Furthermore, it is important to make clear the link between water, food, energy and the environment. This will help reduce wastages in the water sector, through effective use of water resources as well as recycling of water. For example, Japan does not need more water because they carry out intensive recycling. Such approaches should be adopted and will go a long way in reducing wastages in the water sector.

Mr. Omari Mwanjiki, Lake Victoria Basin Commission (LVBC)

In combating climate change impacts in the Lake Victoria Basin, LVBC requires more financial support to help carrying out projects already put in place and those in the pipeline. Financial support needs to be increased both within the countries and regionally.

Based on the experience of LVEMPII, LVBC has identified activities that can help in basin management in the Lake Victoria Basin, these include:

- Promotion of green area for sustainable blue economy – focusing on fisheries (capacity building, data collection, fish monitoring)
- Pollution reduction into the Lake Victoria
- Resource efficiency (circular economy); in relation to industry
- Enhanced water security for fresh water ecosystems

Furthermore, LVBC has four areas of focus which will also help in management of water resources in the basin, these include:

- Strengthening cooperative management within a transboundary context ; for example around water quality
- Developing and building on existing Flood and Droughts tools using real time systems; for example, LVBC has developed climate tools with FewNet and should build on these and upscale further
- Aligning development activities with the state of the basin reports
- Regional investment planning to improve water quality management

Dr. Jacob Tumbulto, Volta Basin Authority (VBA)

The Volta Basin needs to have an observatory put in place to try and ensure sustainable utilisation of water resources in the basin. The Volta Basin Observatory therefore needs to be operational to help in monitoring key indicators of climatic change in the basin.

The information provided by the observatory will help advise managers on what plans to put in place and keep track of changes on natural resources in the landscape; for example vegetation cover and water resources. Support is also needed in the form of equipment and capacity building, for example, hydrological measuring equipment and training on use of the equipment for communication and analysis to help in the monitoring of the extreme climatic events in the basin.

A new strategy employed by VBA, is to bring stakeholders together to understand key issues concerning the basin. In such a way, stakeholders can come together around the observatory.

Joakim Harlin, UN Environment (UNEP)

Joakim stressed that for increased impact, there needs to be increased coordination between stakeholders, making it a fundamental component within the water sector and beyond. It is important to have an integrated approach to help address and contribute to GEF7, for instance the GEF strategy and the fresh water strategy align, because they are linked to the SDGs.

The fresh water strategy framed under the SDGs and has 4 main components, which also present future opportunities to integrate the methodology and tools developed under the Flood and Drought Management Tools project and for water resources management at the basin level. The 4 main components include:

- Fresh water ecosystem health
- Ambient water quality
- IWRM
- Environmental dimension related to risks (floods and droughts)

3.4 Using the Flood and Drought Portal to address hydro-climatic risks



Panel representatives addressing hydro-climatic risks

The third panel focused on how the outputs the of Flood and Drought Management Tools will be used to address hydro-climatic risk. The panel was chaired by Dr. Silver Mugisha, National Water and Sewerage Company, Uganda, and included representatives from the 3 pilot basins. The following questions were used to generate discussion after a short perspective from each panellist.

General questions

- What are the hydro-climatic risks in your basin? How are you using data and information to plan and prepare for these risks?
- How do organisations in your basin share information?

- How is this information used to prioritise investments/actions?
- How are you using or might use the applications in the Flood and Drought Portal to support planning?

Dr. Ali Said Matano, LVBC

- What is your experience with engagement across countries in the Lake Victoria Basin?
- What potential is there to engage around a common platform such as the Flood and Drought Portal?

Dr. Jacob Tumbulto, VBA

- What capacity and knowledge is needed to effectively apply tools such as the Flood and Drought Portal, for effective management and planning of water resources in the Volta Basin?

Dr. Sutat Weesakul, HAI

- What alternatives to the existing practice of water management and planning in Thailand, can/is the Flood and Drought Management Tools project outputs bring to the Chao Phraya and HAI?

Mr. Omari Mwanjiki, Lake Victoria Basin Commission (LVBC)

In the Lake Victoria Basin, there are a lot of challenges associated with flooding and drought. For example, falling lake levels is causing issues around water quality and availability. The collection and access to data within the basin can be useful to assess and monitor conditions within the basin in terms of water quantity and quality.

LVBC intends to use the Flood and Drought Portal to disseminate relevant information and also work with FewsNet to help develop mobile technology to better inform farmers and other water users within the basin, especially on climate-related issues. LVBC started a programme called [Adapting to Climate Change](#) to trigger valuable lessons for future project interventions, their scaling-up and replication of good practices in Lake Victoria Basin and beyond. One of the outputs is to see how to disseminate information to the pilot project areas using mobile technology. LVBC also intends to undertake a vulnerability assessment, in conjunction with other existing tools.

LVBC is keen to explore how to roll out the Flood and Drought Portal to other stakeholders and how to downscale the systems in order for the tools to be relevant at the community level. Providing information which is analysed with communities and other stakeholders can ensure that they are well informed to take appropriate decisions.

Dr. Jacob Tumbulto, Volta Basin Authority (VBA)

Flooding and drought are two familiar events experienced in the Volta Basin, for example the low-lying areas around the river system are often affected by flooding. Information from the Flood and Drought Portal can give an idea of the flooding situation downstream of the Bagre Dam in Burkina Faso or flooding in Mali from rains in Burkina Faso. There is often a misconception that flooding in the north of Ghana is a result of spilling of Bagre Dam. However, even without dam releases, flooding occurs with heavy rainfall. The tool can be used to help explain this to the authorities and the communities.

Furthermore, the applications can support basin planning by better informing the TDA/SAP process. The tools will enable water resource managers to evaluate planning options to ensure suitable investments in the basin.

VBA has had an overall good experience with the FDMT tool, as it has helped VBA in crisis planning, as well as a successful dam and irrigation operation in the basin.

Dr. Sutat Watin, Hydro and Agro Informatics Institute (HAI)

In 2015, Thailand went through a severe drought, experiencing 15 percent lower rainfall than the average. The impacts could have been properly addressed with information to help decision making. However, this was not the case, with people not recognising or understanding the severity of the issue and not seeing the value of water.

A major challenge in Thailand is that the National Hydrological Council has many data sets, however, this is not collated in a standard format and is distributed on a given and get basis. The council also provides daily hydrological reports for the Prime Minister Operation Centre. The reports are used for improved management and data dissemination to the local and provincial levels for flood and drought management.

All this has changed in the recent past, with the introduction of the Flood and Drought Portal, which is being used for flood and drought monitoring in Thailand. Reports are generated using the Reporting application which pulls information from the Data and Information application. The information obtained is sent to all stakeholders. This has helped in providing the required technological support for drought management and ensuring all stakeholders are aligned in terms of the information received and the plan moving forward.

HAII has also done extensive work on validating the accuracy of the satellite data provided in the Data and Information application. This was done to ensure the information provided in the drought report is useful for decision making. The bias process was done by validating the satellite information with observed data during the 2015 drought.

[Download the presentation](#)

Key highlights from the panellists were the need to simplify the applications for all users, and also to make the applications more user-friendly. It is also essential to ensure the applications resonate with the problems the practitioners in the water sector are facing. This will go a long way in ensuring the use of the technical applications to help deal with the issues that arise in the basin, and assist in mitigating extreme climatic events.

3.5 Water supply issues and challenges

As the local key stakeholders in the project, the water utilities in Lake Victoria Basin, also shared the issues and challenges around water supply and the added burden of climate change on their operations. Where possible, they highlighted the steps taken to surmount these challenges and what needs to be done to address future impacts. Mr. Kizito Masinde, IWA moderated the panel discussion with representatives from NWSC (Uganda), KIWASCO (Kenya), and MWAUWASA (Tanzania). The following questions were used to focus discussion following from 5 minute initial introductions from each panellist.

General questions

- What are the key climate-related risks to water supply that your utility faces?
- What is the role of Water Safety (and security) Planning for water supply and how is this improving the resilience of water utilities to climate risks?

Dr. Silver Mugisha, NWSC

- How can utilities work together in the Lake Victoria Basin to improve water quality, reduce flooding impacts and manage water scarcity?
- How can your utility (and others) apply smart water management solutions across a basin to better plan and manage the water resources?

Mr. Meck Manyama, MWAUWASA

- How is your utility currently accessing climate information?
- What type of supporting mechanisms, resources, tools etc. are needed to further support uptake and integration of climate information in planning?

Mr. George Odera, KIWASCO

- What information is needed to better plan and manage source waters within the context of climate change?

- What are the existing options to access and integrate relevant climate information to address climate risk and so improve planning and management of source water? What more is needed?



Utility representatives from the pilot basin addressing the water supply issues and challenges

Dr. Silver Mugisha, National Water and Sewerage Corporation (NWSC)

NWSC carries out joint monitoring with other stakeholders in other sectors, and shares information and best practices. However, when there is a problem, the speed of response needs to be improved. Collaboration is a key element in flood management. As water utilities are not directly involved in this process, they are greatly affected. Collaboration between NWSC and other agencies such as KCCA is therefore crucial.

NWSC believes that to support flood forecasting agencies, the Flood and Drought Portal would be valued. The tool can provide information on the potential for a flood to occur through short- and long-term planning. Beyond this, the knowledge needs to be shared and managed collectively to ensure appropriate and effective flood and drought management.

In order to effectively manage extreme climatic events, it is important to focus on three key areas:

- Being proactive (e.g. plan trees, wetland conservation)
- Venturing into reuse technology due to the finite nature of fresh water resources
- Understanding key issues in flood and drought management

Mr. Meck Manyama, Mwanza Urban Water and Sewerage Authority (MWAUWASA)

MWAUWASA has benefited from the Flood and Drought Portal by using the information provided for planning and addressing water supply challenges arising from extreme events; for example the impact on infrastructure that influences their operational capacity.

Extreme climatic events have, in the past, caused problems in MWAUWASA's area of operation in many ways. Declining water levels in Lake Victoria have led to deepening of the water abstraction point by the utility. Heavy rains have led to the breakdown of water pipeline systems, which take days to maintain, leading to water shortage to consumers and a reduction in the quality of the water supplied.

The introduction of the Flood and Drought Portal will therefore help MWAUWASA improve their ability to address extreme climatic events. For MWAUWASA, WSP implementation is still constrained by financial limitation, as there are often high cost of materials and equipment due to ad-hoc and unprepared planning in response to the negative impacts of climate change. Accessing the right information, which is made available through the Flood and Drought portal, this issue can be addressed

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Mr. George Odero, Kisumu Water and Sewerage Company (KIWASCO)

Implementing Water Safety Planning (WSP) has been an uphill task for KIWASCO, however this is being tackled by better understanding how WSPs can help to get buy in at the national level and selling the idea to the local leaders.

Some lessons learned by KIWASCO is that in order to effectively deal with climate change and sustainably manage water resources it is also important to be equipped with climate information, such as precipitation, to help in designing interventions in the catchment. The information is also for climate change mitigation and adaptation. It is important to have information on vegetation cover, drought assessment and land use data to help manage the water resources better.

Capacity building and training are also of great importance. As part of supporting programmes under WSP, capacity building activities can be carried out to help with knowledge sharing and benchmarking to share best practices in the basin. Acquiring such knowledge will help improve management and planning of the water resources and also equip KIWASCO with the right tools to be ready for future extreme events.

Data and information sharing among the relevant stakeholders is needed to help make the WSP process easier and efficient, for a better management of climate change risks.

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3.6 Conclusion

The event “Planning for Floods and Droughts: Reflections and Future Opportunities” was an opportunity to showcase the project outputs through the lens of key project stakeholders and partners involved. It also provided a stage to hear about the experiences of stakeholders outside of the project such as the World Bank, IGAD, FewNet who are contributing to improving our ability to address climate change impacts.

The GEF-7 strategy sees the importance of extreme events and the need to address this. Inadequate access to climate, hydrological and other data required for effective decision-making has left communities and organisations unable to properly prepare and plan appropriate management techniques as a method of protection. The FDMT project is one of the interventions through which GEF is getting involved.

There are increasingly sophisticated smart water management and monitoring tools which allow water managers to access information on current and forecasted climate conditions. The Flood and Drought Portal is a good example of such a tool, enabling organisation engaged in the management of water resources to recognise and address flood and drought risks and to improve the resilience and cooperation within transboundary basins and amongst end-users. Knowing the global hotspots of flood and drought risk, and quantifying this risk, can ensure there is information that can warn and prepare communities to handle the worst climate-related events that come their way.

It was interesting to hear from the utilities working within the pilot basins, on how they are using or planning to use the portal and the package of technical applications. Both DHI and IWA have projects which will continue to use the portal and develop it further, whilst working with some of the same stakeholders to further build on the portal through various initiatives.

Key lessons learned from the project have been the need to involve users in the development of tools for decision making and the need to have support from the top management and administration, whilst bringing the users together. Also important is the ease of access to data, and also the improvement of knowledge and capacity on how to effectively use the data. The FDMT project has focused on developing and testing a methodology with a package of technical applications to integrate climate information into planning. These tools will evolve and are part of the solution to address the challenges of climate variability and change. These tools will also play an important role in influencing behaviour change and accepting new data sources and information needed to improve planning.

Moving forward, the project and its outputs contribute to the larger agenda of the Sustainable Development Goals. For example, As flood and drought events are a consequence of global climate change, the project contributes to SDG 13 in strengthening resilience against the impacts of climate related hazards and natural disasters (target 13.1), and encourages improved preparations and effective decision-making based on climate data and forecasting of hazards to be incorporated into national plans (target 13.2).

The project also responds to the Sendai Framework for Disaster Risk Reduction adopted on March 18, 2015. The framework has the primary role to reduce disaster risk but that responsibility should be shared with other stakeholders including local government, the private sector and other stakeholders. It aims to reduce disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.



Participants during the event at the UN Conference Centre, Gigiri, Nairobi, Kenya

Annex 1 – Agenda

Time	Item
Flood and Drought Management – Future opportunities	
08:00-08:45	Registration
09:00-09:15	Welcome remarks by UNEP Representative
09:15-09:40	Opening remarks and keynote by GEFSEC – Video address
09:40-09:50	Flood and drought management Tools project overview <ul style="list-style-type: none"> • Key information about the project • Outcomes and achievements
09:50- 10:30	Katharine Cross, IWA – Perspective, experience and next steps (strategic recommendations) Oluf Jessen, DHI – Perspective, experience and next steps (strategic recommendations)
10:30-11:00	Break
11:00-12:00	<u>Panel discussion</u> – Information for water management and planning <ul style="list-style-type: none"> • Dr. Guoping Zhang, World Bank • Dr. Chris Shitote, Famine Early Warning Systems Network • Dr. Sabiiti Geoffrey, IGAD Climate Prediction and Applications Centre • Mr. Leonard Sweta, Regional Centre for Mapping of Resources for Development (RCMRD) <p>Each panellist provides a 5 minute perspective, followed by a moderated discussion.</p> <p>Moderator: Peter Bjørnsen, UNEP-DHI</p>
12:00-13:00	<u>Panel Discussion</u> – Future Opportunities Key highlights from GEF-7 strategy, and potential thematic areas of further intervention(s). <ul style="list-style-type: none"> • Dr. Sutat Weesakul, Hydro and Agro Informatics Institute • Eng. Omari Mwinjaka, Lake Victoria Basin Commission • Dr. Jacob Tumbulto, Volta Basin Authority • Ms. Lis Bernhardt, Programme Officer <p>Moderator: Yegor Volovik, UN Environment</p>
13:00-14:00	Lunch
Flood and Drought Management: Reflections	
14:00-14:45	<u>Panel discussion</u> – How outputs of Flood and Drought Management Tools will be used to address hydro-climatic risk <ul style="list-style-type: none"> • Mr. Omari Mwanjiki, Lake Victoria Basin Commission • Dr. Jacob Tumbulto, Volta Basin Authority • Dr. Sutat Weesakul, Hydro and Agro Informatics Institute, Thailand <p>Moderator: Dr Silver Mugisha, National Water and Sewerage Corporation, Uganda</p>
14:45-15:30	<u>Panel discussion (Focus on Lake Victoria)</u> – Water supply issues and challenges (using the Flood and Drought Management Tools) <ul style="list-style-type: none"> • Dr. Silver Mugisha, National Water and Sewerage Corporation, Uganda • Mr. Manyama Meck Manyama, Mwanza Urban Water Supply & Sewerage Authority, Tanzania • Mr. George Oluoch Odero, Kisumu Water and Sewerage Company Limited, Kenya <p>Moderator: Kizito Masinde, IWA</p>
15:30-15:50	Close – UN Environment

Annex 2 – Participants List

Title	Name	Organisation
Project Management Unit and support staff		
Mr.	Oluf Jessen	DHI
Ms.	Katharine Cross	International Water Association (IWA)
Mr.	Kizito Masinde	International Water Association (IWA)
Mr.	Raul Glotzbach	International Water Association (IWA)
Mr.	David Omolo	International Water Association (IWA)
Mr.	Yegor Volovik	UN Environment (UNEP)
Participants		
Mr.	Erastus Muturi	Thika Water and Sewerage Company (THIWASCO)
Ms.	Tabitha Gachanja	Thika Water and Sewerage Company (THIWASCO)
Mr.	John Thotho	Thika Water and Sewerage Company (THIWASCO)
Ms.	Mary Obiero	Church World Service (CWS)
Mr.	Michael Kendagor	Church World Service (CWS)
Mr.	Chris Shitote	Famine Early Warning Systems Network (FewsNet)
Ms.	Julia Gathu	Drilling for Life
Mr.	Vhari Prasad	IGAD Climate Prediction and Application Centre (ICPAC)
Dr.	Geoffrey Sabiti	Intergovernmental Authority on Development (IGAD)/ IGAD Climate Prediction and Application Centre (ICPAC)
Mr.	John Owino	International Union for Conservation of Nature – Eastern and Southern Africa Regional Office (IUCN ESARO)
Mr.	Melchior Elser	2030 Water Resources Group (2030 WRG)
Mr.	Meck Manyama	Mwanza Urban Water Supply And Sanitation Authority (MWAUWASA)
Mr.	George Oluoch Odero	Kisumu Water and Sewerage Company (KIWASCO)
Mr.	Joakim Harlin	UN Environment (UNEP)
Mr.	Peter Bjornsen	UN Environment (UNEP)
Ms.	Lis Bernhardt	UN Environment (UNEP)
Mr.	Nick Greenfield	UN Environment (UNEP)
Dr.	Gouping Zhang	World Bank (WB)
Dr.	Watin Thanathanpon	Hydro and Agro Informatics Institute (HAI)
Mr.	Sutat Weesakul	Hydro and Agro Informatics Institute (HAI)
Dr.	Jacob Tumbulto	Volta Basin Authority (VBA)
Mr.	Omari Mwinjaka	Lake Victoria Basin Commission (LVBC)
Ms.	Waswa Rose Malot	Regional Centre For Mapping Resource For Development (RCMRD)
Mr.	Leonard Sweta	Regional Centre For Mapping Resource For Development (RCMRD)
Mr.	Reuben Ngessa	Water Resources Authority (WRA)
Ms.	Elisabeth Wambui Mwangi	Nairobi City Water and Sewerage Company (NSWC)
Mr.	Mark De Blois	UPANDE
Mr.	Job Changwony	Water Resources Authority (WRA)
Dr.	Silver Mugisha	National Water and Sewerage Corporation (NWSC)
Mr.	Imran Jalakhan	Siemens
Prof.	Dan Olago	University of Nairobi
Mr.	Tom Ogol	Stockholm Environment Institute
Mr.	Joseph Matere	Food and Agriculture Organization (FAO)
Mr.	Albert Mwaniki	The Nature Conservancy (TNC) / Muranga County Government
Ms.	Lilian Waithaka Njeri	Oakar Services Limited