



## FLOOD & DROUGHT MANAGEMENT TOOLS

### Awareness and knowledge exchange: Volta Basin Report

12 February 2016

Meklin Hotel

Accra, Ghana



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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 UNEP, with the International Water Association (IWA) and DHI as executing agencies. The project is developing a computer software-based decision support system (or planning DSS) 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, and 3 pilot basins (Volta, Lake Victoria and Chao Phraya) have been identified for development and testing of the planning DSS.

Understanding how to use and apply the information developed through the planning DSS is seen as a vital aspect of the future operational use and sustainability of the FDMT project. Therefore, capacity development with key stakeholders (e.g. basin organisation and utilities) focusing on what the information from the planning DSS means and how to apply across different scales, is an important step in ensuring the future use and sustainability of the developed methodology.

As the planning DSS is developed, the project is holding a series of awareness workshops for commissioners, senior advisors, policy makers and decision makers, across scales, to:

- Provide an overview of the relevance of the planning DSS for providing scientifically sound information for managing floods and drought
- Explain the meaning and relevance of the planning DSS outputs
- Develop an understanding of how to use and apply the information in decision making
- Develop and implement follow up mechanisms to continue to engage the target group

### ***Awareness and knowledge exchange Feb 12<sup>th</sup>, 2016***

Increasing frequency and severity of flood and drought events drives an increasing need to improve resilience within basins and for this to become a critical part of water management plans. A computer software-based decision support system (or planning DSS) can support the decision making processes of organisations managing the impacts of flood and drought events. Important in this venture is the availability of data and access to this information to make more sound-based decisions in planning.

The one day awareness workshop focused on decision-making processes and the importance of data for planning. Discussion helped to enhance the levels of understanding around the capabilities and potential uses of the FDMT planning DSS in facilitating the inclusion of information about floods, droughts and future scenarios into planning across scales.

The workshop provides an opportunity to gather feedback and a better understanding of how decisions on drought management are made in the Volta Basin at different scales and where the gaps lie with regards to data accessibility.

The awareness workshop provided an opportunity to demonstrate and discuss the importance of data and information sharing and to explore how data could be used to better inform planning processes.

*Presentations from the event will be available via the project website.*

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Il existe un sentiment d'urgence croissant concernant la nécessité d'améliorer la résilience dans les bassins fluviaux, et d'en faire un élément essentiel de la planification de gestion de l'eau. L'augmentation de la fréquence et l'imprévisibilité des inondations et des sécheresses est une

importante préoccupation autant à l'échelle transfrontalière que locale, ainsi que d'autres facteurs causant l'appauvrissement et la dégradation des ressources en eaux partagées.

Le projet 'Outils de gestion des inondations et des sécheresses' - The Flood and Drought Management Tools (FDMT) project (<http://fdmt.iwlearn.org/>) - est financé par le Fonds pour l'environnement mondial (FEM) Eaux Internationales (EI) et mis en œuvre par le PNUE, en collaboration avec *The International Water Association* (IWA) et le DHI, en tant qu'organismes d'exécution. Le projet vise à développer un système informatique de soutien décisionnel (SSD) qui permettra une meilleure intégration des informations sur les inondations et les sécheresses lors de la planification pour les organisations des bassins et les services publics. Le projet est mis en œuvre de 2014 à 2018, et trois bassins pilotes (Volta, Lac Victoria et Chao Phraya) ont été identifiés pour le développement et les essais du SSD.

Comprendre comment utiliser et appliquer l'information développée par le SSD est considérée comme un aspect essentiel de l'usage opérationnel futur et la durabilité du projet FDMT. Par conséquent, le renforcement des capacités des parties prenantes (par exemple de organisations des bassins et des services publics) en mettant l'accent sur la signification de l'information fournie par le SSD et l'application de celui-ci sur différentes échelles, est une étape importante pour assurer l'usage futur et la durabilité de la méthodologie développée.

Lors du développement du SSD, le projet organisera une série d'ateliers de sensibilisation à l'intention des commissaires, des hauts conseillers, des responsables de politiques et des décisionnaires afin de :

- Présenter la pertinence du SSD et ses informations scientifiquement fiables pour la gestion des inondations et des sécheresses;
- Expliquer la signification et la pertinence des résultats provenant du SSD;
- Développer une compréhension de l'utilisation et de l'application des informations lors des prises de décisions;
- Développer et mettre en œuvre des mécanismes de suivi pour continuer à engager le groupe cible.

#### ***Atelier d'échange de connaissance et de sensibilisation (12 Février, 2016)***

L'augmentation de la fréquence et de la gravité des inondations et des épisodes de sécheresse amène un besoin croissant d'améliorer la résilience au sein des bassins afin que cela devienne un élément essentiel des plans de la gestion de l'eau. Un système de soutien décisionnel peut aider les processus de décision des organisations qui gèrent les impacts des événements d'inondation et de sécheresse. Il est important que les données soient disponibles et accessibles pour planification afin prendre des décisions fondées.

L'atelier de sensibilisation d'une journée a porté sur les processus de prise de décision et de l'importance des données pour la planification. Les discussions ont contribué à améliorer le niveau de compréhension concernant les capacités et les utilisations potentielles du SSD du projet FDMT afin de faciliter l'intégration des informations sur les inondations, les sécheresses et les scénarios futures dans la planification à différentes échelles.

L'atelier est une opportunité pour recueillir des commentaires sur l'utilisation du SSD et mieux comprendre le processus des décisions sur la gestion de la sécheresse dans le bassin de la Volta à différentes échelles et identifier les lacunes en ce qui concerne l'accessibilité des données.

De plus, cette atelier est une opportunité de démontrer et de discuter de l'importance des données et des informations partagées et d'explorer comment les données pourraient être utilisées pour mieux informer le processus de planification.

*Les présentations de l'événement vont être disponibles via le site web du projet FDMT.*

## 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 UNEP, with the International Water Association (IWA) and DHI as the executing agencies. The project is developing methodologies and tools within a decision support system (or planning DSS) to facilitate the inclusion of information about floods, droughts and future scenarios into Integrated Water Resources Management (IWRM) planning, Water Safety Planning (WSP), Transboundary Diagnostic Analyses (TDA) and Strategic Action Plans (SAP). The project is being implemented from 2014 - 2018, and 3 pilot basins (Volta, Lake Victoria and Chao Phraya) have been identified for development and testing of the planning DSS.

The project is responding 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 IW focal area of the GEF has 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 developing a decision support system that supports the integration of information on floods and droughts into planning across scales. The project will integrate information on climate including floods and droughts for planning at both transboundary and national basin and local (specifically water utilities) levels by providing tools for both scales within a single planning DSS.

The planning DSS being developed is a computer software-based system containing a number of 'tools' with different technical functionality. The planning DSS is being tested and validated with available data at both basin and local levels in the 3 pilot basins; however it will be available for all other GEF IW basins. This also includes training modules available at the end of the project to ensure that methods can be applied to other basins. The aim is to develop an approach that interfaces with existing planning practices including TDA/SAP, IWRM planning or WSP.

## 3. Awareness and knowledge exchange workshop

### 3.1 Overview of awareness and knowledge exchange workshop

Understanding how to use and apply the information being developed through the DSS is seen as a vital aspect of the future operational use and sustainability of the Flood and Drought Management Tools project. Therefore, capacity development with key stakeholders focusing on what the information from the planning DSS means and how to apply this information across different scales is an important step.

The project is holding a series of awareness workshops for commissioners, senior advisors, policy makers, decision makers, etc. to provide the following:

- Overview of the relevance of the DSS in providing scientifically sound information for managing floods and drought
- Develop an understanding of how to use and apply the information (output) for decision making
- Develop and implement follow up mechanisms to continue to engage the target group

#### Objective and outcomes

The objective of the workshop was to enhance the levels of understanding by those focusing on water management, including utilities, and basin and catchment organisations of the capabilities and potential uses of the FDMT DSS in supporting planning around flood and drought management.

The expected outcome of the workshop was to improve stakeholder's understanding on how information from a DSS can be used in decision-making around flood and drought management planning across scales and the importance of data. For the project, this is an opportunity to ensure that the outcomes from the DSS are imbedded into the actual workflow, and position the planning DSS as a tool to be used in decision-making processes. The overall objective of the awareness workshops is to ensure high level buy-in, making sure that efforts made on the ground are not undermined by choices made by decision-makers.

#### Target group

The target group of this awareness workshop are institutes and groups of people working on addressing the impacts of climate change. Workshop attendees are utilities and basin and catchment organisations. A full list of participants can be found in Annex 2.

### 3.2 Awareness and knowledge exchange

On February 12<sup>th</sup>, 2016, the FDMT project held an Awareness and knowledge exchange workshop at the Miklin Hotel, Accra Ghana.

Increasing frequency and severity of flood and drought events drives an increasing need to improve resilience within basins and for this to become a critical part of water management plans. A computer software-based decision support system (or planning DSS) can support the decision making processes of organisations managing the impacts of flood and drought events. Important in this venture is the availability of data and access to this information to make more sound-based decisions in planning.

#### Decision making and planning for flood and drought events

Decisions are made by water resource planners (at basin and local level) without perfect knowledge of the future. Planning is the process of deciding how to solve a specific issue and decision making methods help to find the ideal decisions to formulate a plan to address the issue.

The planning DSS will help guide users in a workflow approach through a decision making process by providing the tools to perform the analysis needed in the decision making process taking into account uncertainty.

In groups, participants discussed what decisions are made to prepare and respond to drought/flood events, who makes or is involved in the process and how the decisions are implemented. The groups then discussed what types of outputs from the different tools in the planning DSS would be useful in decision making and who would use the outputs and how they would be used. To provide further input in the development of the planning DSS, discussion on additional functionality or support would be useful for users using the planning DSS.

The groups were asked to focus on a particular event and address the questions for that event. The tables below summarise the main points from the discussions.

Group 1 (B)	Group 2 (C)	Group 3 (A)
<i>What decisions were made to prepare and respond to a recent drought/flood event (and who made them)? How were the decisions implemented?</i>		
<p>Specific event: flooding in the White Volta.</p> <p>Floods in the White Volta are not just a result of the releases from the Bage Dam, but also due to an increase in rainfall.</p> <p>When water reaches a certain level, the information is shared by the Water Resources Commission (WRC) with the Basin Management Board, consisting of different institutions. For example, information is shared with the National Disaster Management Organisation (NADMO) who decides on how to best disseminate the information.</p> <p>There is also a Regional Disaster Committee in place consisting on a number of organisations. They are tasked with issues around evacuation</p> <p>The different organisations in the basin will have their own plan to manage the impacts of flood and drought events.</p> <p>Regarding large dams, the government makes the decisions. When we talk to multi-purpose dams, then the different sectors give input but the relative ministry makes the decision.</p> <p>Ghana Water Company Limited (GWCL) monitor the water level at the dam. If the water is below the normal they inform the head office and interventions</p>	<p>There is a committee of organisations that address the 7 points below:</p> <ol style="list-style-type: none"> <li>1. What the expectation is in the future</li> <li>2. Education and sensitisation</li> <li>3. Desilting of drains</li> <li>4. Receiving rainfall events</li> <li>5. Identifying risks</li> <li>6. Development of Early Warning Signs (EWS)</li> <li>7. Spilling of excess water form dams</li> </ol> <p>Operations department of the committee is prepared to respond to disasters and information on floods is disseminated to affected communities.</p> <p><u>Q/A</u> There is a Volta early warning system used during 2012/2013 that was developed with support from the World Bank. A second phase is underway to improve the system and improve the lead time and that is operational and being tested. There is also a system being developed by NADMO under the CREW project: Community resilience for early warning. This system is operating in 10 pilot districts in Ghana where early warning for flood and drought is being implemented. A Web document has been developed connecting regional offices enabling the sharing of information in real time.</p>	<p>Regarding flooding, there have been a number of instances. For the discussion the flooding in September 2009 was discussed. The flood occurred in Burkina Faso, which recorded more than 300 mm of water – flood is nicknamed the 1<sup>st</sup> of September.</p> <p>Metrological Service (present in all regions) is working hard to provide information. However during the flooding event, the information was provided late so areas prone to flooding were already flooded – they know the areas so need to evacuate the people living there as quick as possible and provide relief items.</p> <p>Decisions tend to come from above: Government to ministry then to the Meterological Services and relief services of the water company (e.g. L'Office National de l'Eau et de l'Assainissement, ONEA) when the provision of water is at risk.</p> <p>There are tools that already provide the needed information to plan in Burkina Faso. For example, CONASUR has been developing a tool to respond to flooding. There are other tools with the Metrological Service knows as the Weather Bulletin</p> <p>Other agencies are trying to develop additional tools for enhance and improve existing tools, such as the CRAS model.</p>

		The tools with respect to the planning DSS, in the project, will be used to improve planning. The more tools they have the more capability they have to arm themselves and manage the impacts of flood and drought events.
<i>What type of outputs from the different tools be used in decision making? Who would use them and how would you use them?</i>		
<p>Seasonal forecasting is shared yearly, which gives and overview of the general situation and provides information for countries to develop or update their plans.</p> <p>The Hydrological Services Department have access to a model established (through the World Bank) to forecast flooding in the White Volta. They share the information with NADMO, WRC and the Volta River Authority (VRA), but not with GWCL.</p> <p>There are dam safety regulations in place. Furthermore, when building new water infrastructure, the Volta Basin Authority (VBA) must be informed and there should be no objection from the other countries.</p> <p>Drought is monitored by water levels at dam; this is done, for example, by GWCL. At regional level, GWCL can ration water based on information on water demand, ensuring that the people get enough water. If the situation is a lot worse (water level is too low), the head office is informed who share the information with NADMO who can provide GWCL with an alternative.</p> <p>The FDMT tools can help provide better predictions and forecasting ) which can be used to better inform decision-making processes</p> <p>The information is used by:</p> <ul style="list-style-type: none"> <li>• WRC (technical inputs in development plans)</li> <li>• Ministry of Food and</li> </ul>	<ul style="list-style-type: none"> <li>• Early Warning Systems (EWS)</li> <li>• Education – increased awareness</li> <li>• Drainage of excess water</li> <li>• Enhanced information delivery</li> <li>• Flood risk maps – flood prone areas and safe havens identified</li> </ul> <p>NADMO will use the outputs to better coordinate the activities of all agencies</p> <p><u>Q/A</u> In terms of forecasting, the tools that were explored in the Technical Training held in Accra Ghana (8-11 February 2016) that can be very useful to know if a drought or flood could be coming</p>	Weather Bulletin

<p>Agriculture (MoFA) and Ghana Irrigation Development Authority (GIDA)</p> <ul style="list-style-type: none"> <li>• NADMO</li> <li>• Utilities (e.g. GWCL)</li> <li>• VRA</li> </ul>		
<p>What else would be useful?</p>		
<p>Issues with data integration – information comes from various sources so there is a critical issue in ensuring no mistakes or misinformation is used in the decision-making process.</p>	<p>Relief services to affected people: It is not just about sending the information but also helping in terms of ensuring the basic needs are still available and counselling is provided to those that need it.</p> <p>Surveying of the people that are affected by the event to better understand the impacts on the communities.</p>	<p>In addition to the tools, there is a need for early warning systems. Just as important is the need for financial capacity to respond to potential flood or drought events.</p> <p>You can always be prepared, but you can never have a zero impact on humans on environment. However, if there is an emergency fund then the capacity to minimise the impact on people can be improved.</p> <p>Furthermore, the current tools that are being used need to be fine-tuned and further developed to ensure that they work better. With respect to management, there are gaps. In addition, if the tool needs to cover a given space/region where information is lacking, then the tool is not 100% useful.</p> <p><u>Q/A</u> The flood in September was terrible and, as was mentioned, although some form of warning was given, there had been a difficulty in managing the impacts due to a lack of experience. Furthermore, there was no exact measure of how much rainfall was expected, making it difficult to plan.</p> <p>After the flood, there was a need to address the management of information obtained from various models and existing tools.</p>

Data availability for flood and drought management

Over the course of the 4 day Technical Training held from the 8<sup>th</sup> to 11<sup>th</sup> of February, a reoccurring issue was around the availability of data for flood and drought management. While some station data is available, often the quality of data is low, there is missing data and the data is not validated or is not easily accessible.

For this reason and because the project has a global scope, the project is making use of remote sensing data. Remote sensing data is freely available and almost available in real time. Furthermore, there are several data sets available for the 10 to 15 years.

Discussion focused on global and local data availability and use of the data in flood and drought management. The discussions focused on how global data (from remote sensing) would be used and applied within the organisations present and how the collection of local data could be promoted. The table below provides the key points during the group discussions.

Group 1 (B)	Group 2 (C)	Group 3 (A)
<i>Global data</i> <i>How would you use freely available regional or global data? What are some examples of how you would apply this within your organisation?</i>		
<p>To make projections (using rainfall data such as TRMM).</p> <p>Water balance analysis (rainfall, evaporation).</p> <p>Location of treatment plants (looking at where temperature, evaporation have a smaller impact on treatment plants; i.e. reducing water loses in reservoirs).</p> <p>Helps in budgeting water supply projects</p> <p>Research purposes</p>	<p>TRMM or GPM (satellite data) can be used for early warning systems for the White Volta</p> <ul style="list-style-type: none"> <li>• FEWS-Volta</li> <li>• CREW-EWS</li> </ul> <p>Se of Digital Elevation Models (DEM) – for downscaling and validation, delineation of basins, calibration of models and for environmental and water resource monitoring.</p> <p>land use and land cover (LULC) data</p> <p>Global Soil Water Index (SWI) to assess crop water requirements.</p> <p>The data can also be used for flood forecasting, drought forecasting and hydrological modelling (and other models).</p>	<p><i>There is a need to put in place proper mechanism to collect and disseminate satellite data.</i></p> <p>Need information on land use</p> <p>Rainfall pattern of neighbouring countries as this impacts areas resources in Burkina Faso (Burkina Faso shares sub-basins with neighbouring countries). Climate data; from countries sharing basins, is therefore important.</p> <p>Using high resolution images to see where the water bodies are and observe changes in the water bodies. Burkina Faso does not have water coming into the country. Most of the water in Burkina Faso leaves the country serving other (they are the catchment).</p>
<i>Local data</i> <i>How could further collection of local data be promoted? Through cheaper sensors, better dissemination of data, investments?</i>		
<p>Sensitisation of decision making or policy making on the value of data.</p> <p>Investment in data collection – there have been experiments in the use of drones to monitor water levels (this is a possibility if there are not financial constraints).</p> <p>Signing Memorandum of Understanding (MoU) between organisations can help facilitate data sharing.</p> <p>Ensuring data integrity and facilitating better data storage.</p>	<p>Need to move from a manual to automated systems of collecting data, e.g.:</p> <ul style="list-style-type: none"> <li>• Real time transmission</li> <li>• Data loggers</li> <li>• Radars</li> </ul> <p>Increase financing from the central government for continued data collection.</p> <p>Re-building of data collection infrastructure.</p> <p>Internally generated funds – enable institutes to use their own money as there are many clearance procedures that hinder progress.</p>	<p>Identify a network with meteorological stations to have tele- transmission.</p> <p>Dissemination of information will therefore be more efficient.</p> <p>Can take advantage of possibility around aerial images (e.g. aircraft) which is quicker.</p> <p>Need to have a strong server to enable the sharing of data.</p> <p>Legal provision to know how to share the data should be established and accepted by all.</p> <p>Operationalise the Water Information Management</p>

<p>Adapting to local conditions (talk of sensors and how they are designed).</p> <p><u>Q/A</u> Investments should come from the governments. This is why it is important to sensitise government officials on the importance of data for decision making. There is support from projects to do this, but this is not sustainable (there are gaps between projects; when one ends and when another begins). The government wants data (often they are the first to ask for it), however they do not provide the funds to get the data.</p> <p>In Africa, there is a need to find the means to solve their own problems, rather than waiting for project to come and support them.</p> <p>There are technicians and engineers in Africa, so there should not be a need to seek financing from outside. This can give institutions in the country more power.</p> <p>The short-term solution is seeking projects for support in addressing issues. However, the long-term Africa need to take its own destiny into its own hands).</p>	<p><u>Q/A</u> VBA is working with members states to improve their data. They encourage countries to share data among themselves directly, but they are also able to do this through VBA</p> <p>In Ghana (for example for GWCL) the meteorological office provides data if there is an official request for a short period, otherwise they have to pay for the information. This is similar for ONEA.</p> <p>NADMO receive data free on the weather. The meteorological office wants to get money from those who make a profit from the data they have (e.g. consultants)</p>	<p>System, for example, any water leaving the water system should be configured.</p>
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Another hot topic during the week in Accra was around issues with sharing of data, across scales and across countries; most of the basins in the project are transboundary in nature. The groups discussed what could be done to ensure that data is easily shared across organisations. The table below summarises the group discussions.

Group 1 (B)	Group 2 (C)	Group 3 (A)
<i>What can be done to ensure that data is shared across organisations, stakeholders easily?</i>		
Establishing MoUs	<p>Establishing a legal framework for data sharing.</p> <p>Develop a data portal for stakeholders where they can easily access the data</p> <p>Sub-regional organisation (VBA, OMVS) to spear head the sharing of data</p>	<p>Connect the government services with other organisations in the regions. This can be used to ensure that stations in the country function as a whole and is an opportunity to share information guarded by the regions.</p> <p>For water company operating in</p>

		<p>the same basin, complementary information system can be useful. This can help identify the gaps and how to fill them</p> <p>The water sector should be able to finance the water sector and not be told by external projects what to do.</p>
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## Stakeholder experiences

### [Management of Water Resources in ONEA](#)

*Boureima NAPO - L'Office National de l'Eau et de l'Assainissement (ONEA)*

The National Water and Sanitation Office (ONEA) is a state corporation established by a decree in 1985. ONEA operates under the technical supervision of the Ministry of Water and Sanitation (MEA) and is managed by a Board of Directors.

ONEA abstracts 85% surface water (11 abstraction points from dams, rivers, lakes and sources) and 15% ground water (about 290 boreholes) to ensure its consumers have access to potable water.

To ensure that ONEA continues to supply water to its consumers, ONEA is determined to take better care of its facilities and improve its management of water resources (protecting both surface and ground water resources needed in achieving its mandated objective).

From 1997 to 2001, Burkina Faso experienced the onset of a drought and on the 1<sup>st</sup> of September 2009, a devastating flood. These events have pushed the need to improve the planning around flood and drought management and preparedness for the impacts for organisations like ONEA..

ONEA was using GEOGIS software to manage ground water, however, the system is now outdated. The software is supported by a machine but it is out of use. Failed attempts have been made to repair the system, however ONEA was able to get the data that was stored on the system. The data included:

- Time of pumping water
- Water level
- Store monthly water level
- Parameters such as physio-chemical properties of the water
- Store ground water information

At the time of its use, data collection was done manually, which was cumbersome (largely due to transport issues) and managing the software was difficult. At the end of the day, the use of the system was stopped, now they use a GTZ related system to determine the water level at dams.

In the pipeline is a plan to put in place a new database, SIGEREX, to monitor ground water and surface water resources in the country. Data received from dams and wells through the system is processed, indicators are identified and the outputs analysed are provided to the decision makers.

### Q/A

Using the tool developed by GTZ, the water level is determined. Concerning sedimentation levels, there is a project ONEA has. This is important to address because though water levels appear high, the water finishes quick. In All the dams we have the water level has gone down. At Ziga dam, there has been a drop in water storage over the past 9 years, from 200 million cubic meters to 180 million cubic meters. There is a need to know what the situation is at the dams in order to better plan and manage.

The data they have is put in a report and this report can be shared.

[Development and Application of Water Safety Planning and how it can be used to Address Floods and Droughts in GWCL](#)

*John Eric Kwofie - Ghana Water Company Limited (GWCL)*

Ghana Water Company Limited (GWCL) is responsible for the provision of potable water in Ghana. GWCL was established on 1 July 1999, following the conversion of Ghana Water and Sewerage Corporation into a state-owned limited liability company under the Statutory Corporations (Conversion to Companies) Act of 1993.

There is a long history of flooding in Ghana and over the last 35 years has seen a drought in 1983 and the start of one this year (evident by a drop in reservoir levels in Breman Asikuma, Nsawam, Wiineba and other reservoirs). These events have impacted the operations of GWCL.

GWCL currently observes a number of measurements for flood and drought management, including:

- Daily reservoir level
- Daily volume of raw water abstracted
- Water quality (throughout the system)

Flood and droughts are a key hazard impeding the ability of GWCL to supply potable water to its consumers. The information obtained, in conjunction with visual inspection and expert opinion are various tools used in GWCL's management of flood and drought impacts.

There is value in adopting the FDMT project as it will help bring several stakeholders involved in the management of floods and drought together to devise more coordinated management and communication of decision and action plans.

The FDMT support of the Water Safety Plan (WSP) process, in particular connecting the water supply systems will be useful in ensuring enough water is supplied to the consumers. The project is an opportunity to show how issues at the catchment level affect different users within the basin, pushing the need put in place measures to deal with the issues.

Q/A

As GWCL collects and analyses data, the information is given to the media in order to inform communities of possible flooding or drought situations (among other potential issues).

GWCL has to contend with a number of issues, some of which are aggravated by flooding and droughts events and others due to activities within the catchment. Siltation has been an issue affecting the operation of infrastructure. At dams, slipways have been built in order to manage the levels. Weed control at the intake points is done manually and sand weaning activities near to the intakes continues to affect the quality of water abstracted.

Furthermore, the distribution infrastructure system of GWCL is old, largely a result of financial constraints. On occasion, GWCL staff inspect the system and carry out maintenance work. The maintenance on GWCL's infrastructure is essential if they are to provide a continuous supply of water.

[Water Resources Management in the White Volta Basin](#)

*Aaron Bundi Aduna - White Volta*

The White Volta is an arm of the Water Resources Commission (WRC) implementing Integrated Water Resources Management (IWRM) activities to regulate and manage the use of water resources in the basin and coordinate and inform relevant policies.

The White Volta Basin has a single rainfall regime in a year from April/May to October with a peak in August/September. Over 80% of the total annual rainfall pours over just four months (June to September). During the dry season (November to March), there is very little to no rainfall. The impacts of flood and droughts introduce hazards, shocks and stresses impacting the socio-economic environment.

For IWRM planning, WRC relies on institutions that are mandated to collect data and information for their planning for flood and drought management. For example, they need to rely heavily on VBA with regards to transboundary issues, and local government and ministries, NGOs, etc. around implementation. However, in most cases collaboration only exists within the framework of a project, beyond the project lifetime, collaboration reduces (e.g. WRC and Agence de l'Eau de Nakanbé).

The FDMT is a useful tool to improve the IWRM planning and help reduce flood and drought related issues and ensure decision on water use allocation have a scientific basis.

#### Q/A

At the basin level, there needs to be a clearer picture of the basin's status as well as an understanding of the roles and responsibilities. There needs to be information on water use: water for hydro power generation, water supply (how much water is being used in large communities and small communities), as well as on water quality, etc. This will enable organisation managing the water resources to plan and move forward.

Weed management is part of WRC's responsibility; under Act 522, they are mandated to regulate and come up with policies to manage weed growth. Their role, however, is not to physically clear weeds. This should be done by the one managing or using a resource, following the guidelines and policies put in place by WRC; for example the utilities whose intake points are affected by weed growth. GWCL monitors water quality, part of this is assessing what is fuelling the growth of the weeds and the impact this has on the water that is being abstracted.

Within the basin there are other organisation trying to deal with the varying degree of issues (weed growth, sand weaning, etc.). The concerns at the basin level impact several stakeholders. Therefore, addressing the issues should include all the relevant stakeholders and not just WRC.

#### [Water Resources Management, Data and Tools in Black Volta Basin](#)

*Joachim Ayiwe ABUNGBA - Black Volta*

The Commission seeks to establish river basin boards across the country and is currently working on establishing the Black Volta. As the case with the White Volta, the Black Volta would be a branch of Water Resources Commission (WRC) adopting the Integrated Water Resources Management (IWRM) approach for the management and regulation of fresh water bodies in the Black Volta Basin; the trans-national river system that stretches across Mali, Burkina Faso, Ghana and Cote d'Ivoire.

There is a long list of socio-economic and policy related issues impacting water resources in the basin, this has included flood and drought events resulting from climatic variability. In the northern part of Ghana (including the Black Volta Basin), flooding occurs on a yearly basis.

There are laws and regulations in place to manage water resources; Buffer Zone policies, National Dam Safety Unit principles and quality assurance assessments). Furthermore, the Black Volta is currently developing a water resource management plan to address the issues within the basin. Currently a baseline assessment for the IWRM approach is taking place. Once complete, the implementation process will begin.

The baseline assessment for the IWRM plan is supported by a number of tools and methods. [Water Evaluation and Planning System](#) (WEAP), is a widely used Decision Support System for integrated water resources management and policy analysis. In the last quarter of 2015, a multi-criteria analysis approach was used for decision making. Black Volta makes use of a number of other tools including CROPWAT, SeaTool and FEWS and expert opinion to support the baseline assessment process of the IWRM development and implementation plan..

#### Q/A

The data already collected by the WRC will be integrated in the Water Resources Information System (WRIS). SeaTool is used to help prioritise the issues. All tools and all the data and information collected feature in the plan (intervention plan) or policies that are developed.

In Ghana, to abstract water you need a permit. The water use charges are annual. The amount of water that can be abstracted is defined on the permit. Once you discharge any waste into a water body, you will need a permit for that as well and for WRC to give the green light or not. This approach is used to manage water pollution. Of course there is illegal pollution

In Burkina Faso, there is a law in place that forces those using water to pay tax. This money is used to finance the development of water resources and the water sector as a whole. In Ghana,

Within Ghana, there are 46 stations, only of which are in the Black Volta. With support from the European Union (EU), they have started monitoring observed data. WRC is now part of the assembling process, however analysis is don't by external parties (e.g. water researchers). The next step will be to have WRC staff trained to do the analysis with support from the experts. Over time the complete process will be done by WRC, but this process will rely largely on the financial capacity of WRC.

[Rôle de l'Agence de l'Eau du Nakanbe dans la Gestion des Inondations et Secheresses](#)  
Adama ILBOUDO - Agence de l'Eau de Nakanbé / SP/PAGIRE

Nakanbe is part of the Volta Basin.

As with the case of the other water agencies, the mission is the same, to support aquatic zones especially during extreme weather conditions natural disasters. The agency is required to

- Come up with management schedules for all basins and sub-basins.
- Preserve areas where resources are abstracted, develop knowledge and information on water resources.
- Develop partnerships.

Natural disasters are sudden. There needs to be measures put in place to respond quickly to the impacts, especially with the onset of climate change. Rainfall is sudden and intense, so need to plan and manage the water in the dams. Need to calculate the volume of water used by different sectors and identify how to prioritize in what sector.

The agency uses a satellite system accessed through the national directorate of water information. They receive different types of data. Across the country, there is a continued monitoring system, providing meteorological data, water related data; including the flow from dams, rainfall levels, water resources, socio-economics, water levels. All data from the various systems enables the agency to plan and anticipate any extreme weather condition that may occur.

Currently, the agency is putting together a comprehensive plan, the plan will assist in:

- Mapping out flooded areas to inform areas on where best to settle – marking non-settlement areas.
- Dissemination of information is disseminated.
- Establishing emergency rescue units.
- Setting up technical committees.

There are also initiative such as installation of stations, surveys and studies to put in place in an early warning system.

The agency has been collaboration with Nakanbe. With the White Volta, collaboration has been trough PAGEV, but has been lacking possibly because of the current political situation. There was a regional minister who encouraged collaboration between the bordering regions of Burkina Faso and Ghana.

Collaboration has not stopped, there has been continued sharing – information in upstream water levels between WRC and DGRE.

[Aperçu Sur l'Agence de l'Eau du Mouhoun, Missions, Action Contre la Secherresse et les Inondations](#)

*Benjamin KONANE - Agence de l'Eau de Mouhoun*

The agency covers 46% of Burkina Faso, about 96,000 km<sup>2</sup>. Burkina Faso does not receive water from other countries; most water from Burkina Faso feeds its neighbouring countries.

For Mahoun, some of the problems impacting water resources were identified as follows: illegal mining, livestock, drought and agricultural practices. The causes could also be a result of climate change, disappearance of different water resources and deforestation. There is a big concern as the rains fall in a 3-4 months period and nothing after that, this is a concern for the river in Mahoun, which is perennial. Water falls in a 3-4 months and nothing after that.

Decision making tools have been developed for the upper Mahoun area using the MIKE BASIN model. Furthermore, implementation of different guidelines and recommendations for their basin management plan (Master Plan for Water Development and Management, SDAGE), the first one in Burkina Faso, which has legal aspects.

For the management of resources, the plan pushes for consultation with the different users and partners (see presentation) in the basin, establishment of a water police, establishing monitoring systems for different sources, among other items. For example interventions were put in place to prevent desertification (e.g. reforestation and introducing some structures). The agency has worked with communities to remove weeds and have also set up protected areas and are aiming to establish fences to prevent water contamination.

Through the water police, established at the regional level under the responsibility of an attorney with support from technical agents and legal frameworks, efforts are made to sensitize and raise awareness. There is a judiciary body that controls awareness and makes not of the different crimes against established legal instruments.

Autonomy, under DGRE, provides Mouhoun with some conditional freedom to manage their own resources. However, it is not completely autonomous as they receive funding from the state and employ staff from the state.

Water charges – The agency has been working to introduce water charges, however, they have not been able to become fully operational. Water users are however taxed, and the money is used for the management of water resources and the water sector. For example, large mining industries are required to pay 200 CFA for every 1m<sup>3</sup> of water and for drinking water, this is 50 CFA.

There is an interagency solidarity fund established to facilitate the sharing of funds across agencies. However it is not clear who received money. For Mouhoun they would use the funds to keep the monitoring stations functional.

#### [Contributions de l'Agences de l'Eau du Gourma a la Gestion des Inondations et / ou des Sécheresses](#)

*OUEDRAOGO Oussenii - Agence de l'Eau du Gourma*

Agence de l'Eau du Gourma covers the region in the Eastern part of Burkina Faso, covering part of the Niger and Nakanbé Basin – three cross-boundary basins (include the Volta).

The agency has contributed immensely to mitigate, through sensitization, the impacts of natural disasters. In 2015, there was a serious water shortage during the dry season. Together with ONEA an awareness creation campaign was organised for the people to understand what is happening and how to cope with water shortage in the city.

With regards to flooding, between August and September there are always floods between 2 communities around two dams (Bugre and Tapwa). The water agency, with the local communities go and measure water levels at the dams periodically. As water level increases upstream provide information is provided downstream to enable them to take the necessary actions.

In the basin there is hydroelectricity dam which supplies power to the country; Kompienga dam. There have been no flood issues but water varies downstream so SONABEL, the national electricity company, needs to inform population when there will be releases as it can have local impacts (e.g. keep children safe from playing by the river).

The agency tries to gather information depending on the time of the year. Often this is most important when heavy rainfall is expected. They make use of radio and telephone to disseminate information to communities.

Recommended actions during medium and long term (see presentation). In view of the challenges that the Gourma faces in the prevention and management of floods and droughts, it plans in the medium-term to:

- Strengthen the capacity of its staff on monitoring dams and rivers during floods;
- Develop / enhance the communication capacity during flood or drought periods;
- Educate people on the risks associated during flood and drought events.

In the long run, the agency will:

- Develop management tools (SDAGE and SAGE)
- Improve the monitoring network of water resources
- Make better use of appropriate decision support tools developed by basin organizations to which it belongs (i.e. (Niger Basin Authority (NBA) and VBA)

#### Conclusion and wrap-up

There is a growing sense of urgency around the need to improve resilience within basins, and for this to become a critical part of water management plans. This realisation has come as the frequency and unpredictability of floods and droughts has increased. Critical in making progress is the ability to access and use information to inform planning and decision making processes and for stakeholders within basins to share information and collaborate on ensuring complementary efforts to manage flood and drought impacts.

The awareness workshop provided an opportunity to demonstrate and discuss the importance of data and information sharing in planning and to explore how various data could be used in planning.

## Annex 1 – Agenda

<b>Friday, February 12<sup>th</sup>, 2016</b> <i>Knowledge exchange and feedback session</i>		
08:30-09:00	Registration	
09:00-09:15	Objectives and purpose of awareness workshop – what we are looking for and why	IWA/DHI
09:15-09:45	Discussion groups - Decision making around Flood and Drought events in the Volta Basin	IWA/DHI
09:45-10:00	Feedback and discussion	
10:00-10:30	Break	IWA/DHI
10:30-11:00	Discussion groups – Data availability and use for flood and drought management	IWA/DHI
11:00-11:15	Feedback and discussion	IWA/DHI
11:15-12:00	Presentations (10 min) from each Water utility followed by a discussion  1. Boureima NAPO - L'Office National de l'Eau et de l'Assainissement (ONEA) 2. John Eric kwofie - Ghana Water Company Limited	
12:00 – 13:00	Lunch	
13:00 – 15:00	Presentations (10 min) from each basin organization followed by a discussion  1. Aaron Bundi Aduna - White Volta 2. Joachim Ayiwe ABUNGBA - Black Volta 3. Adama ILBOUDO - Agence de l'Eau de Nakanbé / SP/PAGIRE 4. Benjamin KONANE - Agence de l'Eau de Mouhoun 5. OUEDRAOGO Oussené - Agence de l'Eau du Gourma	Chair: DHI
15:00-15:15	Wrap up	DHI/IWA
	Closing words	VBA

\*All workshop material and developed content will be compiled and disseminated to all participants.

## Annex 2 – Participants

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