FLOOD & DROUGHT MANAGEMENT TOOLS

Volta Basin

Stakeholder Summary Report

Executive Summary

Overview

The **Flood and Drought Management Tool (F&DMT) project** is funded by the Global Environment Facility (GEF) International Waters (IW) and implemented by UNEP, with IWA and DHI as the executing agencies. The project aims at developing methodologies and tools including decision support systems (DSS) to incorporate information about floods and droughts and likely climate scenarios into integrated water resource management (IWRM) planning, Water Safety Planning (WSP's) and Transboundary Diagnostic Analyses (TDAs). The project is being implemented from 2014-2018, and three pilot basins (Volta, Lake Victoria and Chao Phraya) have been identified for development and testing of the methodologies.

The F&DMT Project defines a need to develop a methodology that works both on a transboundary level and the local level. GEF International Waters projects have planning tools which focus at the transboundary level. However, decisions made at the regional level (basin) and the local level needs to be linked, the project looks to also address this aspect of inter-level communication. The methodology being developed will be an open access, meaning basin authorities, national authorities, utilities, etc. can take up the methodology and further develop to enhance their planning experience. The methodology will be flexible, i.e. stakeholders can develop their own indicators, are free to decide which models to use, pull experiences from other basins, etc.

The project will develop a DSS which will be tested and applied in 3 very different pilot basins; however the methodology will be available for all other basins. This also includes training modules available at the end of the project so that methods can be applied to other basins.

It is important to note that the F&DMT Project will not collect data or develop new models, however, tools will be put in place to assist stakeholders in monitoring the status of their basin. The project will utilise existing models and not develop something new. What the project will produce is a DSS that will assist basin level organisation and end users (i.e. utilities) in their planning processes and support the individual activities with specific tools, special attention will be given to flood and drought events.

Stakeholder meetings

The project started officially in June 2014 and had a 6 month inception phase during which the executing agencies had a series of stakeholder consultations in each basin. The consultations aimed to improve understanding of how the F&D project can improve the water planning in the three basins, to be used in formulating a detailed project description for the inception meeting. The meeting were also to determine which stakeholders were interested in actively engaging with the project.

The objectives of these consultations included:

- Key stakeholders understand and endorse the objective of the Flood & Drought project
- To understand issues the key stakeholders are facing during water planning, focusing on transboundary issues related to climate change, floods and droughts
- To understand the methods/processes which the basin organisations and utilities go through during planning, and tools they currently use in planning
- To identify other projects or initiatives that we can work with that could potentially fill issue of data collection and knowledge gaps of the basin
- To gather feedback on the proposed methodology for the F&D project

The project will work with the Volta Basin Authority (VBA) at the transboundary level. However, much of the information that will be needed in the decision support system to be developed by the project will need to come from national level organisations. In Burkina Faso, the water management authority is the General Directorate of Water Resource (DGRE) and Permanent Secretariat of the Action Plan for Integrated Water Resource Management (SP-PAGIRE). In Ghana, the responsible organisation is the Water Resource Commission. The project will also engage with the other 4 countries in the Volta Basin through the VBA.

Although the Volta basin contains 6 countries, the project will concentrate on Burkina Faso and Ghana. This is mainly due to the limited resources in the project, and the fact that these two countries

occupy around 85 % of the basin. The remaining countries will indirectly be included through VBA and ECOWAS, and their coordinating role in the basin.

At the country level, other key agencies that the project will engage with to gather information and develop capacity will include the Hydrological Services Department (Ghana) and the Environmental Protection Agency (Ghana). There will also be exchange of information with the National Disaster agencies in the basin countries, especially to gather historical data of floods and understand how the DSS can contribute to improved long term planning to prepare for floods and droughts.

The project also will test the DSS with end users. The focus will be on urban areas, which are predominantly in Ghana and Burkina Faso in the Volta Basin. The utilities in Ghana and Burkina Faso are the Ghana Water Company Ltd, and the National Office for Water and Sanitation (ONEA), respectively. Other possible end users include the Ghana Irrigation Development Authority, who demonstrated strong interest in the project.

At the regional level, the project will work closely with ECOWAS for dissemination and collection of information as ECOWAS is well connected with the relevant countries. There is the potential opportunity for the DSS to be applied in other basins in the region.

There is a great need for improved communication between various institutions (across borders as well), in particular with the sharing of data. Data in itself is also lacking, and what data is available should be viewed with reservation, as this is not often reliable or validated.

There is the opportunity for the project to support the integration of information from different organisations and work with the various stakeholders to improve on their capacity to plan better for F&D events at their respective levels. The project also provides a unique opportunity to ensure collaboration and knowledge sharing between institutions and across scales (catchment to water utility).

Next steps

Following the stakeholder visit in Volta, the project team will have similar meetings in Lake Victoria (15 to 19th of September), and in Chao Phraya basin (6 to 10th of October). This will be followed by an Inception meeting with representatives from the three basins in November, in which the revisions to the project components (i.e. objectives, activities and deliverables, etc.) are addressed and shared among all stakeholders.

Using the outputs of the stakeholder consultations and inception meeting, DHI will coordinate with their internal research projects at as well as outside projects, and further develop the methodology which consists of the flood and drought decision support system. There will be follow up meetings within each basin in the next 6-12 months (during the first half of 2015) to verify the methodology and start testing among basins and end users (utilities).

Basin focal points (primarily IWA staff) will be used throughout the project, and will serve as a valuable local contact between the project team and the stakeholders. DHI will have direct contact with the key stakeholders, but keeping the focal points copied in any communication as they will be in a good position to further support continued cooperation.

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About the project

"Flood and Drought Management Tools" project – Katharine Cross, IWA
Project methodology and proposed deliverables – Oluf Jessen, DHI

Climate change is altering weather and water patterns around the world, causing increased floods in some areas and shortages and droughts in others. These floods and droughts have become increasingly common, more severe, and at the same time, less predictable than they used to be.

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 objective of the project is to improve the ability of land, water and urban area managers operating in transboundary river basins to recognise and address, as part of the Transboundary Diagnostic Analysis (TDA) / Strategic Action Plan (SAP), Integrated Water Resource Management (IWRM) plans and Water Safety Plan (WSP) processes, the implications of the increased frequency, magnitude and unpredictability of flood and drought (F&D) events.

The Flood & Drought Management Tools (F&DMT) project will develop methodologies, using tools and Decision Support Systems (DSS), to incorporate information about F&D and likely climatic scenarios (and using various channels of information and capacities) into IWRM planning, WSPs and TDAs. The methodology will be tested in 3 (pilot) basins (i.e. Volta Basin, Lake Victoria Basin and Chao Phraya Basin). The project will also engage with learning basins (e.g. Danube Basin, Nile River Basin) to feed the project with relevant information and best practices that we can use to further develop the methodology

The outcome will enable stakeholders to compile information, with models, indicators and existing planning methods, to develop future planning scenarios that are robust and resilient and pragmatic on both a regional basin scale and local scale for urban and industrial areas.

At the local scale, the WSP approach will complement wider basin planning as it provides risk assessment and management options within national boundaries as well as those in the wider river basin context.

It is important to note that the F&DMT Project will not collect data, however, tools will be put in place to assist stakeholders in monitoring the status of their basin. The project will utilise existing models and not develop something new, we are not in a position to develop new models to facilitate data generation. What the project will produce is a tool that will assist basin level organisation and end users (i.e. utilities) in their planning processes in the likelihood of a flood and drought events.

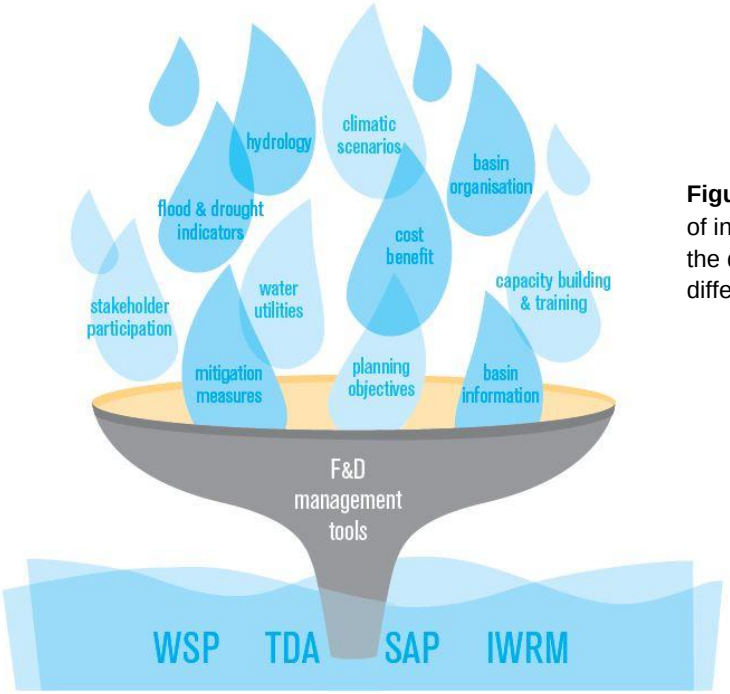

Figure 1. Infographic depicting the types of information and tools integrated into the decisions support system to support different types of planning

Project partners

The F&D Management Project is being implemented from 2014-2018, and is supported by the Global Environment Facility (GEF) trust fund with the United Nations Environment Programme (UNEP) as the implementing agency. DHI (technical coordinator – methodology, modelling, testing at basin level, guidelines) and the International Water Association (IWA) (outreach coordinator – stakeholder engagement, testing at local level, communication, capacity building) are the executing organisations.

The project will look to target a number of key stakeholders ranging from the regional–(transboundary) basin level to the local–utility level; i.e. transboundary river basin organisations, local authorities, water utilities, local and indigenous communities, urban and (agro) industrial water users and civil society groups.

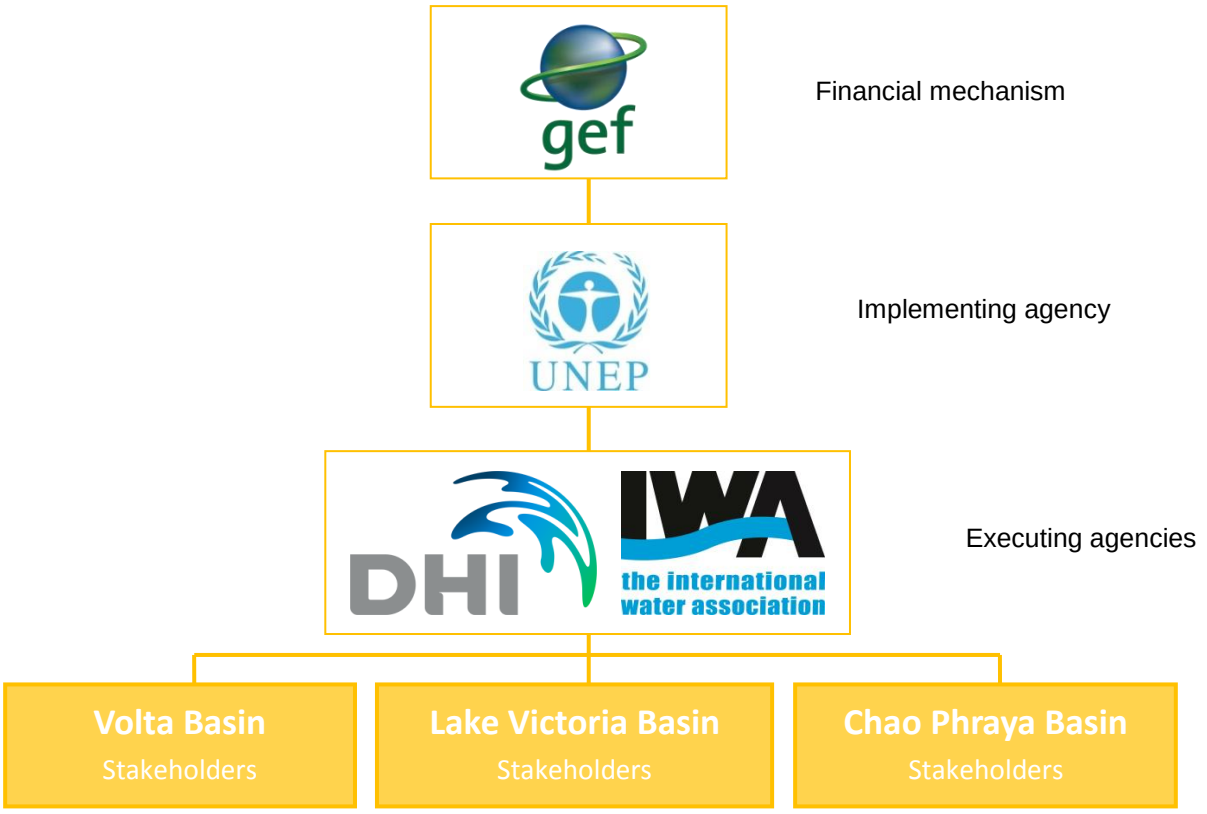

Figure 2. Partners involved in the F&DMT project

Stakeholder engagement

Table 1. Involvement and Benefits to project stakeholders

Project activity	Involvement	Benefits
Development of DSS	• Provide information sources • Indicate what outputs are needed	• DSS is designed to be applied by a variety of users
Testing DSS • Basin level • End user (utility level)	• Use test cases to tailor DSS • Use of DSS with available data to consolidate information on floods and droughts	• Generic DSS is tailored for specific user in each basin • Recommendations developed to use information in flood and drought management planning
Capacity building and training	• Training materials provided and use cases for future application	• Ability to train other users – future business case?
Communication and dissemination	• Networking with other users across basins to understand how to overcome gaps and challenges • Presentation of DSS application at key events	• Gain experiences and learning from other users and basins • Showcasing of basins and utilities

Stakeholder meetings

Volta Basin Stakeholders Meeting

IWA organized a series of meetings the week of August 18th focusing in Water Safety Planning and Mobile Phone Applications for Water Services. Details of these meetings can be provided separately on request. The opportunity was taken on August 21st with key stakeholders from the Volta Basin and representatives of other utilities in West Africa to hold a half day discussion on the Flood and Drought Management Tools project.

Presentations were given by VBA, CONASUR (National Council of Emergency Response and Rehabilitation) and Ghana Water. Discussions followed, focusing on how various utilities are responding to floods and droughts and how this is incorporated into their planning

Ghana has a high risk of weather related hazards – landslides, coastal erosion, urban floods, farmlands flooding, dry spells etc). Floods and droughts are of concern especially in the northern part of the country. There was a serious drought in 1982, and several major floods between 1991 and 2008. The current disaster preparedness has weaknesses. The operational institution for disasters is the National Disaster Management Organisation, which was established in 1996, and is under the Office of the President. Other relevant organisations are the Hydrological Services Department under the Ministry of Water Resources Works and Housing; the Ministry of Local Government, and Rural Development – Metropolitan, Municipal, and District Assemblies (MMDAs); the Irrigation Development Authority(IDA) under the Ministry of Food and Agriculture; Ministry of Finance; and National Development Planning. In order to improve flood and drought management there needs to be:

- Strong collaboration between riparian countries in floods and droughts
- Adequate and functional Early Warning Systems – Meteorology etc.
- Strong monitoring, and effective decentralisation of information gathering and sharing
- Trans boundary and regional cooperation
- Strict implementation of laws and MMDA bye-laws – land management
- Improved climate adaptation methods
- Develop technical capacity and knowledge system

Ghana Water Company Ltd works with the Water Resource Commission is in charge of all water resource in the country. They are linked to the VBA (the WRC are good to be in communication with as they have access to data which could be useful for the project). Most treatment plants are situated near water bodies (intakes), and measures have to be taken to ensure that they are not flooded, otherwise they have to close down. With regards to drought concerns - large gorges have been constructed to retain water for production to ensure the availability of water during the dry seasons. A specific project - Planning for Resilience in East Africa through Policy, Adaptation, Research, and Economic Development (PREPARED) is mainstreaming climate-resilient development planning and program implementation into the East African Community (EAC), Lake Victoria Basin Commission (LVBC), and Partner States' development agendas[1].

Disasters including floods and droughts are dealt with in Burkina Faso at the national level by CONASUR. In regards to water infrastructure – newly built water treatment plants take into account flood information but this has not been considered for older infrastructure. This became increasingly apparent during the severe floods in 2009. In Burkina Faso there are 16 priority sectors concerning management of disasters – each sector is managed by a sectoral lead (structure of the state) which is supported by a focal point (i.e. organisation, who can be either technical or financial partners or both). ONEA indicated that for water treatment plants, turbidity is a problem during the rainy season and there is planning for increasing chemical products. Committees are in place to secure chemical products, electrical plant, protect boreholes that are in flood prone areas, raise levels and take into consideration topography, technical measure to increase the concentration of disinfectants in the water. Evaporation is a source of water loss, so there have been efforts of reforestation around dams.

[1] http://www.tetratechintdev.com/index.php?option=com_k2&view=item&id=595%3Aplanning-for-resilience-in-east-africa-through-policy-adaptation-research-and-economic-development-prepared&Itemid=61&lang=us

Borehole rehabilitation is taking place; this will support situations where there are any water shortfalls, not just extreme drought.

General feedback on planning indicated difficulties because of uncertainty around meteorological and climate information. Nonetheless, the type of information that utilities need to improve planning includes flows, run-off, lake levels (if applicable) and water quality. It was emphasized that the wider catchment area is beyond the jurisdiction of most utilities and other government authorities are responsible. However, the utility is an end user and in order to provide good quality and quantity of water to customers' needs to understand the interactions from catchment to consumer.
A visit to the Ziga Dam, laboratory and treatment plant took place on August 22nd. See http://fdmt.iwlearn.org/en/news/visit-at-ziga-dam-burkina-faso-august-2014 for more details.

Volta Basin Authority (VBA)

Discussion with VBA and WASCAL, the following people participated in the meeting:

Name	Position	Email
Dr. Jacob Tumbulto	Director of VBA observatory	jwtumbulto@gmail.com
Dr. Charles BINEY	Executive Director of VBA	cbiney@gmail.com
Sanoussi Razaki	IWRM expert at VBA	sanoussi.raz@gmail.com
Dr. Boubacar Barry	WASCAL Coordinator in Burkina Faso	barry.b@wascal.org

URL: http://www.abv-volta.org:10000/abv2/

About VBA
For many years the Volta, as a large transboundary river system, was without any formal legal and institutional arrangement among the riparian countries for managing its resources. In order to to institute measures for sustainable transboundary management of the basin's resources, VBA was established.

VBA is tasked to:

- Promote permanent consultation tools among the basin's stakeholders,

- Promote the implementation of IWRM and the equitable distribution of benefits,
- Evaluate planned infrastructure developments that impact the water resources of the basin,
- Develop and implement joint projects and works and contribute to poverty reduction, sustainable development and socioeconomic integration of the sub-region.

Key minutes from meeting

- The VBA is a very young organisation (established 2006) and does not have full capacity. However, VBA has implemented 2 major projects – the Volta Basin Observatory and HYCOS.
- The VBO project has three components:
    - Baseline situation which identified gaps in the data (includes socio-economic information) – the TDA used information from this baseline study
    - Establishment of the WRMIS
    - Involvement of stakeholders in environmental monitoring
- The Volta HYCOS project was put in place to develop hydrological data at the national and regional levels
- VBA's Strategic Plan covers the major components of IWRM, Its mandate hinges around IWRM. This means that all the activities that are undertaken are for improved management of the water resources in the basin with the purposed of improving the socio-economic status of the basin and its population
- The Strategic Plan addresses the following:
    - Harmonisation
    - Knowledge
    - Stakeholders
    - Resources (including human)
- VBA, with the support of West African Science Service Center on Climate Change and Adapted Land Use (WASCAL) (who are mandated to provide reliable information to VBA), are in the process of finalising the Water Resource Information System (WRIS). The computerised tool will be based on data input provided by the member states. The project also contributes to:
    - Improving the network between countries
    - Assist countries to build national and regional hydrological information system – this is to ensure that a similar system is developed across the countries in the VBA.
    - Training – a number of training programmes are being planned. 2 particular trainings are important:
        - Hydrological modelling and flood forecasting (AGRIMET and French institute will carry out this training).
        - Use of remote sensing; use and monitoring (National Hydrological Services will take lead and this training should take place within the next 2 months).
- There are several data stations in the Volta Basin, however, these have not changed in the last years. There is a need to re-actualise these stations to update it to current trends. Furthermore, there needs to be improved knowledge on the river channel hydraulics; understanding how much water will be where (i.e. during a flood event) and where water will be limited (i.e. during a drought period). This would work best with an early warning system (beyond the scope of the F&D project) to know and understand areas that would be impacted during a F&D event.
- In the Volta Basin there are 7 ARGOS units as part of the GLOWA project, 6 in Ghana and 1 in Burkina Faso (Bagre). In Ghana they monitor the stations on a daily basis (data should be available via VBA). The data can be used for real time monitoring of flow. At the Bagre dam, SONABEL make the decision to spill based on the level of the dam, the real time flow measures can facilitate their capacity and knowledge on when a spill is required. This information is now shared with Ghana, giving them time to prepare for likely flooding.
- Within the riparian countries of the Volta Basin, there should be national focal structures that have representation from all various water related organisation. This is where the link to different end users (including utilities) exists. Furthermore, the VBA has national focal points, e.g. the Director of Water Resources Management in each country, who has some communication with water users at the local level. Eventually a sharing platform will be established to facilitate the transfer of information both ways, which should enhance the collaboration between VBA and utilities. Recently, the riparian countries are trying to establish sub-basin boards or agencies, but this process will take some time, especially in enabling

these basin authorities to establish some state of power. This can help further develop the communication between VBA and lower-level stakeholders.

- VBA has historical data that they can use to identify potential wet and dry spells based on rainfall patterns, however with changing climatic conditions, such data is not always reliable.
- The aim of VBA is to work with countries so that there is consistency in the hydrological data collected and ideally that they all use the same system
    - VBA is using Tiger-Net (http://www.tiger-net.org/index.php?id=45)
- Ground water resources are not well mapped. What is mapped is more localised and cannot be used to generalise. Furthermore, the rate of failure with regards to ground water abstraction is quite high because most aquifers are fractured. What groundwater is abstracted is primarily used for domestic supply. Groundwater is cleaner and healthier for domestic supply as reservoirs are likely to have guinea worm.
- The International Atomic Agency has done some groundwater assessment in the basin
- VBA has an interest in developing a system for flood early warning - the World Bank has supported such a project in the White Volta in Ghana – however the monitoring is weak
- There is also a need to map flood areas – this is important in order to manage irrigation systems. Currently, reservoirs are kept full so when floods do arrive, then the impacts are severe and flood waters need to be rerouted.
- Transboundary flood issues:
    - Between Burkina Faso and Ghana – releases from the Bagre dam affect communities downstream in Ghana
    - Between Burkina Faso and Mali – in the rainy season there is flood water and there are reverse flow to Mali

Future actions for F&D project

- Further discussion with WASCAL would be useful as they have knowledge on climate projections and models.
- Further collaboration should be made with VBA to get available data and understand where data is lacking.
- The F&D project should look into flood risk assessment as opposed to real time flood mapping. The project can coordinate with VBA (and WASCAL) in this respect.

Economic Community of West African States (ECOWAS)

Discussion with ECOWAS Water Resources Coordination Centre, the following people participated in the meeting:

Name	Position	Email
Ibrahim Babatunde Wilson	Director of WRCC ECOWAS	ibrwilson@yahoo.com
Innocent Ouedraogo	National Programmes Officer	ino@ecowas.int

URL: http://www.wrcu.ecowas.int/

About ECOWAS

WRCC is the technical department within the ECOWAS framework of coordination and monitoring of water resources within West Africa. The objective of WRCC is implementation of regional policy on water resources.

- WRCC played a role in the establishment of VBA
- Developed guidelines for the role of basin organisations in transboundary settings
- Developed action plan for implementation of water resource policy in West Africa
- WRCC seem to focus on the implementation of common policy and guidelines, and are focusing on the establishment of river basin organisations for the technical coordination.

Key minutes from meeting

- In West Africa alone, there are over 20 major basins. These basins are quite diverse; in one region it is very dry and in other extremely wet.
- A basin union is being established (however this is a long process). The basin union would provide national basin organisations (when fully established) with a platform to collaborate and communicate with one another across borders.
- Together with SIDA and GWP, ECOWAS is in the process of developing a project where issues of drought will be addressed.
- ECOWAS is working with the World Bank on a flood programme which is developing tools for the regional level
- During flood events, management (or the response to such an event) in several of the riparian countries is insufficient. This needs to be addressed at the regional level, implementing regulation with minimal tools that the countries can implement rather than a country to country response (with no communication across boarders). ECOWAS will coordinate at the regional level, but this process has yet to start.
- ECOWAS has established a secretariat of organs dealing with coordination and monitoring. There exist 3 organs: Water Resource Coordination Unit, Ministerial Council and Technical Advisory Committee – members states of ECOWAS, basin organisation, MANU region countries and the basin organisation of Chad are all engaged in one way or another through these 3 organs.

Future actions for F&D project

- Further discussion should be arranged with ECOWAS to define more concrete outcomes for the project.
- Throughout the project the F&D Project Team should work closely with ECOWAS for dissemination and collection information as ECOWAS is well connected with the relevant countries.

National Office for Water and Sanitation (ONEA)

Discussion with ONEA, the following people participated in the meeting:

Name	Position	Email
Moumouni Sawadogo	Directeur de l'Exploitation	Moumouni.sawadogo@oneabf.com
D. Francis Kere	Chef de Service Qualité Eau	dfrancis.kere@oneabf.com
Boureima Napo		boureima_napo@yahoo.fr

URL: http://www.oneabf.com/

About ONEA

ONEA is the state company responsible for drinking water and sanitation services and implementation of the National Procurement Programme Drinking Water and Sanitation (PN-AEPA) in urban areas.

ONEA is a contracted authority with the Government of Burkina Faso mandated to to carry out the PN-AEPA under the technical supervision of the Ministry of Agriculture, Water and Fisheries (MAHRH). Its scope of intervention extends to the majority of urban centres with over 10,000 inhabitants, although ONEA also manages smaller rural growth centres under lease contracts.

Key minutes from meeting

- Ziga, Bagre and Itengé dams are within the Nakambé basin. Ziga is currently their main source of water supplying the capital city of Burkian Faso (Ouagadougou). Bagré is operated by SONABEL (as it is primarily used for power generation), however they will soon be abstracting from the dam to supply drinking water. Itengé is also used for water supply; however, the dam completely dries up in March / April.
- ONEA wants to improve their ability to analyse water usage and predict variations in the climate that would ultimately affect the amount of available water. They are looking into climate change trends as dams experience loss of water to evaporation; however they are not yet able to map this. ONEA cannot dig in the dam to increase its capacity because there are also issues with infiltration, but they have no means of analysing this. They have a small basic balance model that they currently use.
- ONEA has been using Mike Basin, but this modelling software was too complex, the remaining people cannot use it anymore and there is not updated software so they have dropped it.
- They would like to have more prediction tools, specifically for flood forecasting, and use information from hydrological models that are widely used

- ONEA work with CONASUR, however CONASUR are more of a responsive unit. ONEA wants to be prepared and respond before an event occurs (e.g. if a flood event will occur, ONEA need to be aware of this in order to remove certain pumps and chemicals) and avoid damages in order to continue with their activities.
- ONEA is trying to define the quantity of groundwater abstraction, but this has not worked out very well. This job is the responsibility of another section of the ministry in charge of water but this does not work well. It is complicated to control everyone who has a borehole. There is not control or any regulation in place at the national level to monitor this. ONEA is looking to establish a set of guidelines of what about of water is safe to abstract for its sustainability.
- ONEA's interaction with the national basin organisations (that are still being established) is that they try to invoice ONEA for their water abstraction. However as they are not well established therefore they are not yet mature or have much authority to enforce such regulations or put a permit system in place.
- If ONEA spills at Ziga, they will inform the downstream area (including Bagré dam). If Bagré dam spill, it is up to SONABEL (who operate the dam) or the director in charge of water resources to communicate this with Ghana.

Future actions for F&D project

- With national basin organisation establishing themselves, it is necessary for the F&D Project Team to engage at that level (with National authorities as well), and define the desired capacity of their involvement in the project.
- The F&D Project Team should engage with SP-PAGIRE as they are in charge of integrated water resource management in the Burkina Faso – this is the national organisation equivalent to the Water Resource Commission in Ghana.
- Further collaboration with ONEA on developing tools for evaluating the water availability for both surface and groundwater resources.
- Further collaboration with ONEA can be established to provide guidance on where to invest in equipment.

International Union for the Conservation of Nature (IUCN)

Discussion with IUCN, the following people participated in the meeting:

Name	Position	Email
Jacques Somda	Programme Officer – Planning, Monitoring and Learning	jacques.somda@iucn.org

URL: http://www.iucn.org/

About IUCN

IUCN is dedicated to finding pragmatic solution to our most pressing environment and development challenges through the support of scientific research, global field projects globally and collaborating with governments, non-government organisations, United Nations agencies, companies and local communities to develop and implement policy.

IUCN has a strong water programme in which it brings together its extensive network of IUCN Members, experts, government and private sector partners to develop sustainable solutions to preserve our water resources.

Key minutes from meeting

- Past years IUCN has been engaged in the Dialogue on Large Dams. The dialogue is coming to an end to give basis to more concrete, on-the-ground activities such as identifying the various benefits that can be derived from dams. 'Water for Agriculture' is now the new phase of the initial dam project.
- IUCN's participation is more from an irrigation standpoint. However, there is no specific water management plan as they are primarily addressing issue around land tenure (in partnership with IIED. Designing and planning for irrigation systems is beyond their capacity.
- Downstream, IUCN has been involved in AGEF (a management project) to bring Burkina Faso and Ghana together to build a mechanism for the management of the Bagre dam – resulting in some improvement in the communication between SONABEL and the Water Resource Commission (they have meetings on how to manage the dam). It is now a well-established mechanism.
- IUCN also tries to bridge the gap between stakeholders and decision at the transboundary river, engaged in projects in the Oti River that flows to Togo.
- IUCN is also involved in the PAGE Programme aiming to improve the environmental governance; this is focused mostly on water governance. They will work with VBA and provide technical information and financial support to re-staff the VBA; more at the management level.
- IUCN is working with VBA, NBA and OMVS, and also with civil societies to help local communities understand the processes that are taking place at the higher level as they are the one experiencing the impact of the decisions made at the higher level.
- IUCN is working with ECOWAS to distil all the regional policies to NGOs so they can translate this into a language understandable to communities (to raise awareness for the communities on policies and regulations that affect them).
- IUCN contributes to the Users Committee to inform ECOWAS on dam and water catchment management issues and raise the voice of the local people to the regional or international meetings regarding water resources in Africa.
- IUCN is also working on strengthening the sub-basin agencies. In Burkina Faso IUCN is working closely with, for example, Nakambé to inform communities in the region on the benefit of restoring river banks and vegetation / forestry, assisting communities in their capacity to engage in such activities; they highlight the economic value of wetlands to inform why it is beneficial to restore the wetlands. Studies have been carried out to demonstrate or highlight the benefits of wetlands and what the negative impact would be if nothing is done. IUCN have therefore started developing a strategy management plan with regards to wetland management.
- Climate change projects that IUCN are involved in are not directly linked to water, mostly related to dry land area, in which they work in 5 countries (usually in the northern regions that are dry and where drought is a common issue), mainly on monitoring and evaluation and strengthening capacity for local communities to implement M&E in relation to adaptation.

Future actions for F&D project

- Keep IUCN informed on the progress of the project.
- Engage further with IUCN to discuss the Water and Wetland Project and go further into WEAP and how this is relevant to the F&D Project.

Global Water Partnership (GWP)

Discussion with GWP, the following people participated in the meeting:

Name	Position	Email
Felicite Vodounhessi	Regional Project Manager	felicite.vodounhessi@gwpao.org
Sidi Coulibaly	Communications officer	sidi.coulibaly@gwpao.org
Corneille Ahouansou	Project manager	corneille.ahouansou@gwpao.org

URL: http://www.gwp.org/

About GWP

The Global Water Partnership (GWP) is an international network open to all organisations working for better water security. Created in 1996 to foster the Integrated Water Resources Management (IWRM) approach, the GWP network comprises 13 Regional and 83 Country Water Partnerships, and a total of over 2800 Partner organisations in 164 countries.

We are meeting with the project manager of the Integrated Drought Management Programme (IDMP) in West Africa. The IDMP is a corporation between WMO (World Meteorological Organisation) and GWP, and the objectives are:

- Global frame-work for drought management, prediction and monitoring by networking new and existing programmes and activities worldwide.
- Guidelines and tools, including a Drought HelpDesk for the development of sound and appropriate drought policies and management plans by countries and regions
- Improved use of drought prediction services

Key minutes from meeting

- GWP is engaged in projects regarding drought. In partnership with WMO, GWP has a project to improve drought resilience in communities in West Africa – Integrated Drought

Management Programme in West Africa (IDMP-WA) http://www.gwp.org/en/gwp-in-action/West-Africa/. The project aims to achieve or address the following:

- Strengthen partnerships,
- Capitalise on community level experience,
- Critical review of existing national and regional plans,
- Develop investment plans and capacity building activities.

3 countries will be targeted and the knowledge gained will be shared in West Africa through the CWPs (Countries Water Partnership) as not all West African countries can be analysed.
GWP project: WMO develops the technical tools, as well as guidelines, a manual for drought management which reference the tools: http://www.droughtmanagement.info/guidelines-tools/
GWP is responsible to apply the tools in West Africa.

- In Burkina Faso there are no specific drought management plans at the national level but there is a "Programme d'Action National de Lutte Contre la Désertification" (National action Plan Against desertification): http://www.unccd.int/ActionProgrammes/burkina_faso-fre2000.pdf. The Ministry of Environment, Agriculture and Fisheries are the more likely institute responsible for drought related issues, but this is not well defined.
- GWP-MWO staff based network helps facilitate global coordination.
- Water, Climate and Development Programme (WACDEP) in Africa has a focus on demonstration projects. The programme has been created to support the integration of water security and climate change adaptation into development planning processes and the design of financing and investment strategies.
- GWP also supports the translation of information from the WRIS into a language that is understandable to end users (i.e. utilities through WSP).

Future actions for F&D project

- Further coordination with GWP-MWO staff based network as they have a global reach and can help with dissemination and gathering of relevant information for the project.
- Engage with the Challenge Programme on Water and Food (initiative with VBA and CGIAR)
- Suggestion was provided to communicate with Ghana Country Water Partnership.
- Contact WMO and discuss how the project could coordinate with the IDMP

National Committee for Emergency Assistance and Rehabilitation (CONASUR)

Discussion with CONASUR, the following people participated in the meeting:

Name	Position	Email
Ouédraogo Oussimane	Che du Département Etudes et Panification	oussiman@yahoo.fr

URL: http://www.conasur.bf/

About CONASUR

CONASUR is a public institution with humanitarian vocation that was set up in order to adopt a strategy for prevention and reduction of the disastrous effects of natural disasters in Burkina Faso. CONASUR is in charge of the implementation of rehabilitation programmes following periods of crisis (including flood and drought).They are also mandated to inform, sensitise and educate communities in the culture of prevention of natural hazards.

CONASUR is working with disaster risk reduction strategies (planning).

Key minutes from meeting

- CONASUR has 5 different departments. The Department of Study and Planning is most relevant for the F&D Project as they have historical data on past events (flood and drought) that have occurred. They take note of events based on a form they fill out.
- In preparation for flood and drought events, there is some collaboration with ONEA to put in place measures to deal with flood and drought events.
- Committees are in place to secure chemical products, power generation, borehole protection that are in flood prone areas, technical measure to increase the concentration of disinfectants in the water, etc.
- CONASUR has extensive records on previous flood events, and the related damage, in Burkina Faso.
- Considering drought management, compact units are put in place that is able to treat surface water. Mobile units are also available to treat small water bodies in rural areas. Borehole rehabilitation is taking place; this will support situations where there are any water shortfalls, not just extreme drought.

Future actions for F&D project

- Further discussion with CONASUR could be useful to get more information on what their needs are and how they can contribute to the project.
- The project would especially be interested in the information on previous flood events in Burkina Faso.

Ghana Water Company (GW)

We had two meetings with Ghana Water Company Ltd (GW).The following people participated in each meeting.

Name	Position	Email
Jonas Jabulo	Chief Manager (Water Quality Assurance)	jonasjab@yahoo.com
Evans Balaara	Chief Manager, Water Resources Management	eybalaara@hotmail.com

URL: http://www.gwcl.com.gh/

About Ghana Water

Main water utility in Ghana with more than 3000 full time staff.

Key minutes from the meetings

- GW operates on the basis of permits as all water is vested in the government. GW abstracts water for treatment (which they get a permit from the government). A permit is required for both ground water abstraction and surface. GW has a member who sits on the board of the Water Resources Commission (WRC). GW also sits on the Emergency Preparedness Board and provide direction on what are the priorities for the water utility.
- The institution that controls the resource is the Water Resource Commission (WRC) and there are basin organisations in place who manage the water at the national basin level. All basin have basin boards, they meet 4 times in a year.
- WRC are responsible for the planning while GW comes in as a utility provider, and may provide some support. GW initially was managing the water resources on their own, but this became too much, so the Government of Ghana created the WRC who took over this function.
- Water supply for domestic use is managed by Water and Sanitation Boards in rural areas which fall under the Community Water and Sanitation Agency. Water for agriculture is abstracted from irrigation dams constructed under the supervision by Ghana Irrigation Development Authority (GIDA).
- Abstraction without permits does occur, especially by private drillers. They require a permit to drill, but due to limited coverage, it is hard for WRC to keep track. If not dealt with, this can create an issue during droughts.
- Permits are given based on available knowledge, ground water levels, and number of boreholes. For illegal abstraction, there are laws and regulations in place that give WRC the power to arrest or take illegal drillers to court.
- As GW supplies a population of about 12-15 million people in both urban and per-urban areas, there is often difficulty in guaranteeing water supply for all of Accra. They are able to produce roughly 200,000m^3 a day (40 million gallons a day) and expect to construct a new plant on the Volta with the same capacity to meet growing demands in the future.
- Data sharing has proven rather difficult, yet it is an essential part of the operation of GW. As GW is responsible to the Ministry, they are obliged to share information; this also includes sharing with the WRC. Therefore for this project, it is essential that we communicate with the WRC as they are directly linked to the VBA and should have access to useful data and information.
- GW does not necessarily use a type of information system or tool to prepare for F&D events. This falls under the Hydraulic Department that looks at the flow of the rivers and have the available data.
- Ghana Water has lost 6 small dams due to drought (mostly due to the climate, vegetation lost due to farming, too much siltation). The dams are completely dry so now they have to look for alternative sources, e.g. boreholes. Ground water is primarily used in the north as the people depend on this source. The area bordering with Burkina Faso has more boreholes than southern part of Ghana due to the climatic conditions.
- Volta River Authority has the level of reservoirs which are published every day. (They should have this on their website, even the information of the Bui Dam).
- Ghana Water also tries to keep track of the various kinds of activities that are taking place in the basin, and the impact such activities will have on the quantity and quality of the water (e.g. fishing activities, mining activities).

- Ghana Water has a WSP for their systems, primarily with their treatment plants as that is of importance because it gets to the consumers first. Flood and drought events have to be considered in their WSP. There is no specific package or plan to address drought events. Flooding results in treatments plants and infrastructure becoming unusable resulting in interrupted supply.
- WSP is supposed to be from catchment to consumer. At the moment the catchment level is at the intake. The company cannot manage this further. However, now there is the WRC that plays that role, so this makes it easier to ensure the safety of the basin at the catchment level. WRC has the responsibility of the catchment planning.
- Water quality issues in relation to upstream and downstream use is not a major concern, the main issues is water availability. GW does not require much use of coagulants as the water quality meets WHO guidelines.

Future actions for the F&D project

- Further discussions with GW during the inception meeting are needed to fully understand how the project could coordinate activities with GW.
- The Water Resource Commission should probably be included in the discussions with GW, as the Water Resource Commission is responsible for the catchment planning.

National Disaster and Management Organisation (NADMO)

Discussion with NADMO, the following people participated in the meeting:

Name	Position	Email
Mr. Robert Atey Yeboah	HydroMet	robertateyyeboah@yahoo.com

URL: http://www.nadmo.gov.gh/

About NADMO

The National disaster and management organisation is the government agency that is responsible for the management of disasters as well as other emergencies in Ghana

NADMO performs specific functions which are all aimed at ensuring that in times of emergency, the government is ready to support relief efforts. These functions are:

1. Rehabilitation services for victims of disasters
2. Mobilization of people at various levels of society to support governmental programmes
3. Ensuring the preparedness of the country in the management of disasters
4. Coordinating the activities of various governmental and non-governmental agencies in the management of disasters.

The organisation's mandate includes response to earthquakes, floods and rainstorms, and market fires.

Key minutes from the meeting

- When we met the representative at NADMO, he was dealing with the expected spill from the Bagre Dam in Burkina Faso, and coordinating the warning system downstream in Ghana. They had been given a 2 day notice. NADMO know of the consequence of a spill, so they were in the process of understanding what the implications of the spill would be in order to communicate this to the upper and west and east region. Towards the end of the day they would have a rough idea of which areas will be affected, giving an indication of who needs to move from the area. The information they receive, regarding the impact from the spill, comes from WRC and other organisation. They are also monitoring the White Volta, so they receive information through various channels.
- There is a need for more storage mechanisms of excess water (i.e. dikes) so that these can be used during the drought periods, and there should be a means to be able to use this water in a different period.
- In the current situation the information that can be useful is perhaps an impact assessments/risk assessment of the area, to pinpoint the areas that are vulnerable; this is handled by the Hydrological Services Department.

Future actions for the F&D project:

- NADMO is an important stakeholder with respect to floods and should be kept informed on the progress of the project.

National Disaster and Management Organisation (CREW project)

Discussion with CREW project, the following people participated in the meeting:

Name	Position	Email
Dr. Kingsford Asamoah	Project Manager	kingasam@gmail.com

URL: www.crewghana.wordpress.com

Key minutes from the meeting

- The CREW project focuses on flood and drought
- CREW is based on the UN Hyugo Framework, with a focus on the priorities 2 and 4; knowing the risk and building capacity for early warning. NADMO deals with priorities 1, 3 and 5, which makes disaster risk a priority.
- The CREW identifies the risk through a simple formula: risk is proportional to hazard and vulnerability and disproportional to capacity (risk = hazard * vulnerability / capacity).
- A large part of the CREW work is early warning, so while they identify the risk and reduce the risk, one of the main components is early warning (with a lead time of about 2 days).
- The project is combining both scientific knowledge (HSD (runoff gauges, etc.), G-MET, etc.) with indigenous knowledge (validating this knowledge through a CREW technical working group form various universities, studying the local indigenous knowledge). For example, using satellite sources and risk mapping at the community level. They undertake analysis of what they have in terms of early warning and what they need to add to such a system. CREW wants to establish a model that Ghana can use.
- The expert group for project includes key agencies such as the Ghana Meteorological Agency and the Hydrological department.
- The project will also install gauges in order to get better and more detailed data (river flow, rainfall from G-MET).
- CREW is placing a lot of emphasis on data collection. They will establish a baseline and build on that. So they are looking to add data from where they can find it otherwise generate it themselves. All the data will be established online. They will have a data server and a

webserver, establish work stations (in each region) and every district will have a work station to help update the data. This should enable the project to record live what goes on in the various regions. In the next 90 days (3 months), they should have a web based system.

- With regards to community level communication, they are looking at how they can get the message of a potential hazard across to communities, e.g. the use internet; drumming if needs be, radio, etc. Eventually, the identification of how to communicate the information will be done for all communities in Ghana, but for now the project will start with the 10 hot spots.
- The CREW project is a 3 year project, with 1 year already gone. While it focuses on the 10 regions, the intention will be to scale-up.

Future actions for the F&D project

The CREW project should be kept informed of the project, and a future meeting should be planned to discuss the possibility to utilise the information gathered from the CREW project.

Hydrological Services Department (HSD)

Discussion with HSD, the following people participated in the meeting:

Name	Position	Email
Sylvester Darko	Operational hydrology of surface water	slykwesi@yahoo.com

URL: http://www.mwrwh.gov.gh/index.php/89-dept-agencies/158-hydrological-services-department-hsd

About HSD

The Hydrological Services Department is the national institution, under the Ministry of Water Resources, Works and Housing, with responsibility for monitoring all rivers and surface water bodies in Ghana, providing engineering consultancy services in hydrology, water resources, drainage engineering, sewerage engineering, coastal engineering and related fields.

The core functions of the organisation:

1. Design and establishment of hydrological networks
2. monitoring the national hydrological network for the collection and dissemination of hydrological data and information on all rivers, streams and surface water bodies;

3. Coastline recession monitoring
4. Design and supervision of construction of drainage, sewerage and coastal protection
5. Flood forecasting and control
6. Applied hydrology (assessment of water resources and their development potential and design of hydraulic systems

Key minutes from the meeting

- Flooding is a major issue especially in the Volta Basin. In 2007 and 2010, the northern part of Ghana was hit by serious floods which destroyed lives and property.
- A Dutch company (Royal HaskoningDHV) has developed an early warning system for the White Volta. The system has been operational but few challenges in terms of the data input, in particular with the boundary conditions for the model. The transmitting station transmits information via satellite (online station). There are 5 stations that transmit information, but there were a few problems that they are trying to resolve. The Station most upstream was removed because of risk of being flooded. With new funding from the World Bank, the 2nd phase of the project will deal with this and they will also use this funding to install more stations so that the lead time for the forecasting can be increased. Currently the project is on hold because of funding issues that need to be resolved.
- HSD is willing to share information of the real time system
- Ghana is experiencing drought in the north and flooding in the south. Climate change is further affecting the country. For the HSD, the project comes at a very opportune time, and they are therefore keen to make any information available.
- Seasonal forecast on drought and floods would be of interest for HSD
- Releases from Bagre dam is of key concern for HSD. The water level of the Bagre dam is monitored, and SONABEL are communicating the water levels from the Bagre.
- When Bagre dam plan to release, limited information is provided. They give a reason why there will be a release, usually because the maximum load is reached, however, the volume/amount to be released is not indicated, they simply provide an announcement that they will spill.
- Main issue they deal with are floods. In Ghana these are more devastating, but they also want to address the issue of drought which is an issue in the Northern Region. They want to use climate data to have better seasonal planning for drought conditions.
- They currently do not make much use of the WRMIS for the VBA

Future actions for the F&D project

- The ongoing real time system is of great interest for the project, as it could be integrated into the system.
- HSD might be able to assist with surface water information of value for the project.
- Tools for evaluating the impact of spills from Bagre dam should be evaluated.

Water Resource Commission (WRC)

Discussion with WRC, the following people participated in the meeting:

Name	Position	Email
Ben Ampomah	Executive Secretary	byampomah@yahoo.com
Adwoa Painstil	Water Quality Specialist	himapainstil@yahoo.com

URL: http://wrc-gh.org/en/

About Water Resource Commission

The Water Resources Commission (WRC) was established by an Act of Parliament (Act 522 of 1996) with the mandate to regulate and manage Ghana's Water Resources and co-ordinate government policies in relation to them. The Act stipulates that ownership and control of all water resources are vested in the President on behalf of the people, and clearly defines the WRC as the overall body responsible for water resources management in Ghana.

The mission of WRC is 'to regulate and manage the sustainable utilization of water resources and to coordinate related policies by combining our core competencies and hard work through effective participation, monitoring and awareness creation for socio-economic development of Ghana'

The functions of WRC include:

- Propose integrated water resources management plans to guide the utilization, conservation, development and improvement of water resources,
- Initiate, control and co-ordinate activities connected with the development and utilization of water resources,
- Grant water rights,
- Collect, collate, store and disseminate data or information on water resources,
- Engage water sector agencies to undertake scientific investigations, experiments or research into water resources,
- Monitor and evaluate programmes for the operation and maintenance of water resources,
- Advise pollution control agencies in Ghana on matters concerning the management and control of pollution of water resources.

Key minutes from the meeting

- WRC has two projects in the northern part of Ghana. One with commercial irrigation and another with the government.
- WRC is more concerned on the water availability and planning of water, which is probably more interesting for irrigation management, not so much water supply

Future actions for the F&D project

- WRC is an important stakeholder in Ghana and need to be kept informed on the progress of the project.

- WRC should be involved in the discussions with Ghana water as WRC are responsible for the catchment planning

Ghana Irrigation Development Authority (IDA)

Discussion with IDA, the following people participated in the meeting:

Name	Position	Email
Stephen Maclean	Deputy Director	Stevemacgh24@yahoo.com
Dominic Kofi Ampong	Head of Administration	domkay07@gmail.com

URL: http://mofa.gov.gh/site/?page_id=2976

About IDA
IDA started in 1977.

The functions of IDA are to formulate, develop and implement irrigation and drainage plans for all year round agriculture production in Ghana.

IDA is responsible for the following:
- Develop design standards for irrigation infrastructure.
- Designing irrigation infrastructure and related facilities e.g. dams, ponds, tube-wells, conveyance structures.
- Carrying out land-use planning in areas earmarked for irrigation development.
- Provide public irrigation facilities
- Provide technical services for the development of irrigation facilities.
- Providing technical and managerial services for effective use of irrigation facilities.

- Developing and disseminating adaptive irrigation technology.
- Liaising with other agencies to safeguard the health and safety of all people living within and around irrigation projects areas.

Key minutes from the meeting

- Through the design of irrigation systems IDA have data on rainfall levels; data that has been collected over years, access to G-MET data.
- Interest in tools as CropWat (FAO tool) or ClimWat to be considered in the project.
- Very interested in tools or capacity building within planning and design of irrigation schemes.

Future actions for the F&D project

- Follow up meeting during first half of 2015 to present the possibilities to use AquaCrop or CropWat.

Environmental Protection Agency (EPA)

Discussion with EPA, the following people participated in the meeting:

Name	Position	Email
Jewel Kudjawu	Natural water resources	jewel.kudjawu@epa.gov.gh
Cindy Badoe	Built environment	cuidyakuab@yahoo.com
Mr. Yaw Oppong-Boadi	Chief Programme Officer-UNFCCC focal point. Ghana	yaw.oppong-boadi@epa.gov.gh
Dr. Emmanuel Tachie-Obeng	Climate Change	etachieobeng@gmail.com

URL: http://www.epa.gov.gh/web/

About EPA

The EPA was formally established on 30th December, 1994 (Act 490) and given the responsibility of regulating the environment and ensuring the implementation of Government policies on the environment. The Environmental Protection Agency is the leading public body for protecting and improving the environment in Ghana.

Key minutes from the meeting

- EPA has a remote sensing unit, which may provide the project with data. F&D project would be very interested in working together with EPA on this.
- EPA engages in climate change education and capacity building. Relevant for the F&D project as the developed methodologies should assist water planners, and raise awareness of how to incorporate future changes (climate and human interventions).
- The EPA has climate trends for the past years. In terms of assessment the TDA has been finalised.
- EPA (and WRC) designed and implemented a buffer zone project for the Volta River as a protection mechanism. Could be interested for the F&D project to evaluate how the developed tools could assist in the impact assessment when a new protections mechanism is considered.
- WISEUP project (CSIR, specifically water research with WRI).

Future actions for the F&D project

- Meeting during 2015 with the climate and remote sensing group at EPA, to discuss how the project could assist the EPA and if EPA would have information of need for the project.

Additional stakeholders

We were also unable to meet some stakeholders; the General Directorate of Water Resource (DGRE) and Permanent Secretariat of the Action Plan for Integrated Water Resource Management (SP-PAGIRE).Another possible stakeholders to follow up with is the Permanent Interstates Committee for Drought Control in the Sahel - CILSS (http://www.cilss.bf/). In future, we will look to establish communication with the two in order to identify potential areas for collaboration.

Concluding remarks

The F&DMT Project defines a need to develop a methodology that works both on a transboundary level and the local level. GEF projects tend to look just at the transboundary level. Lately there has been a push to put emphasis on end users, such as utilities (this is also why IWA is involved). Decision made at the regional level (basin) and the local level needs to be linked, the project looks to also address this aspect of inter-level communication. The methodology being developed will be an open system, meaning basin authorities, national authorities, utilities, etc. can take up the methodology and further develop to enhance their planning experience. The methodology will be flexible, i.e. stakeholders can develop their own indicators, are free to decide which models to use, pull experiences from other basins, etc.

A one-size-fits-all concept does not work. Some countries are weak and others are strong; with regards to information, we need to ensure that no country is left behind regarding adaptability to climate change. A key part of the DSS is around data. DHI will look to use remote sensing and available data on the ground, to tailor to the situation of the country; tailor to the weak and the strong.

Therefore, the intention of the project is to develop a DSS which will be tested and applied in 3 very different pilot basins; however the methodology will be available for all other basins. This also includes training modules available at the end of the project so that methods can be applied to other basins. Learning basins are not basins in which this methodology exists and is taking place. They are used to feed the project with relevant information and best practices that we can use to further develop the methodology.

Much of the discussion with stakeholders was around data, and its availability and reliability. In Ghana, for example, global data sets are needed, however these need to be cross-checked in order to calibrate. This can be done with observed or ground data. In some cases ground data is available, but there needs to be improvements in this data source. Within the framework of this project, ground

data can be complemented with the use of remote sensing data. The IMS system built into the DSS can be such that stakeholders can make use of existing data, but where such data is limited, data from remote sensing or even climate stations can be used to get some more accurate readings.

Following the stakeholder visit in Volta, the project team will have similar meetings in Lake Victoria (15 to 19th of September), and in Chao Phraya basin (6 to 10th of October). This will be followed by an Inception meeting with representatives from the basin in November, in which the revisions to the project components (i.e. objectives, activities and deliverables, etc.) are addressed and shared among all stakeholders.

Using the outputs of the stakeholder consultations and inception meeting, DHI will coordinate with their internal research projects at as well as outside projects, and further develop the methodology which consists of the flood and drought decision support system. There will be follow up meetings within each basin in the next 6-12 months to verify the methodology and start testing among basins and end users (utilities).

Basin focal points (primarily IWA staff) will be used throughout the project, and will serve as a valuable local contact between the project team and the stakeholders. DHI will have direct contact with the key stakeholders, but keeping the focal points copied in any communication as they will be in a good position to further support continued cooperation.

Annex 1 – Participant list

Volta Basin Stakeholders meeting (21 August 2014)

Name	Last Name	Email	Company	Position	Country
Yamba Harouna Ouibiga	Ouibiga	dg@oneabf.com	ONEA	Managing Director	Burkina Faso
Yéréfolo	Mallé	yerefolomalle@wsafrica.org	WSA	Executive Director - WSA Foundation	Burkina Faso
Benjamin	Opoku	bopoku@usaid.gov	USAID	Environmental Compliance Specialist	Ghana
Teresa	Kuklinski	Kuklinski.Teresa@epa.gov	USEPA	International Program Manager	United States
Dakelgba Francis	Kere	dfrancis.kere@oneabf.com	ONEA	Chef Service Qualité de l'Eau	Burkina Faso
Mamadou Samba	Boiro	mboiro@segguinee.com	Société des Eaux de Guinée	Directeur du Système d'Informatique	Guinea
Oscar	Vivier	voscar623@yahoo.fr	Société des Eaux de Guinée	Chef Service Qualité de l'Eau	Guinea
Jonas	Jabulo	jonasjab@yahoo.com	Ghana Water Company Limited	Chief Manager (Water Quality Assurance)	Ghana
Cheikh	Sall	chsa@sde.sn	Sénégalaise Des Eaux	Director of Works	Senegal
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Clarence	Momoh	cmurraymomoh@yahoo.com	Liberia Water and Sewer Corporation	Manager Special Projects	Liberia
Michael Akyeamfo Forson	Forson	mforson@unicef.org	UNICEF	WASH Specialist (Water Supply & Quality)	United States

Name	Last Name	Email	Company	Position	Country
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David	Ogaram	David.Ogaram@nwsc.co.ug	NWSC - Jinja	WSP Team Leader	Uganda
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Simon	Lupuga	uwassakigoma@yahoo.com	Kigoma Urban Water Supply & Sanitation Authority	Managing Director	Tanzania
Mbike Jones	Lyimo	mblimo2000@yahoo.com	Kigoma Urban Water Supply & Sanitation Authority	Technical Manager	Tanzania
Mouhamed Fadel	Ndaw	Mfall@worldbank.org	WB - WSP	Senior Regional Water & Sanitation Specialist	Burkina Faso
Waltaji Terfa	Kutane	waltajit@et.afro.who.int	WHO Ethiopia Country Office	National Programme Officer	Ethiopia
Jacob W	Tumbulto	jwtumbulto@gmail.com	Volta Basin Authority	Director of Volta Basin Observatory	Burkina Faso
Oluf Zeilund	Jessen	ozj@dhigroup.com	DHI		Denmark
Boukerrou	Boukerrou	lboukerr@fiu.edu	USAID West Africa Water Supply, Sanitation Hygiene Program	Regional Director	Burkina Faso

Name	Last Name	Email	Company	Position	Country
De France	Jennifer	defrancej@who.int	WHO	Technical Officer - Drinking Water Quality	Switzerland
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Yared Legesse	Tongi	yar_iko@yahoo.com	WHO	Consultant, WSP Strategy and Implementation Guidelines for Ethiopia	Ethiopia
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Keely	Beck	oshaw@peacecorps.gov	Peace Corps	Peace Corps Volunteer – Health Sector	Burkina Faso
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Tom	Williams	Tom.Williams@iwahq.org	International Water Association	Programmes Director	
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Annex 2 – Organigram

Ghana