CTCN assistance in Ghana

Improving Resiliency of Crops to Drought through Strengthened Early Warning within Ghana

Summary report from the final National Workshop

18 April 2018 in Accra, Ghana

Report / Technical Note

April 2018

This report has been prepared under the DHI Business Management System certified by Bureau Veritas to comply with ISO 9001 (Quality Management)

Approved by

25-04-2018

X 

Oluf Z. Jessen
Head of Projects, Water Resources
Signed by: Oluf Zeilund Jessen

CTCN assistance in Ghana

Improving resiliency of crops to drought through strengthened early warning within Ghana Needs Assessment report

Summary report from the final National Workshop

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APPENDICES:

Acronyms and Abbreviations

CSIR	Council for Scientific and Industrial Research
CTCN	Climate Technology Centre & Network
GCF	Green Climate Fund
DHI	DHI - see more at www.dhigoup.com
EPA	Environmental Protection Agency
EWS	Early Warning System
GIDA	Ghana Irrigation Development Authority
GMET	Ghana Meteorological Agency
GWCL	Ghana Water Company Limited
GWP	Global Water Partnership
HSD	Hydrological Services Department
IWMI	Internal Water Management Institute
MoF	Ministry of Finance
MOFA	Ministry of Food and Agriculture
MSW	Ministry of Sanitation and Water
NADMO	National Disaster Management Organisation
NDA	National Designated Authority
NIE	National Implementing Entity
UNEP	United Nations Environment Programme
UNEP-DHI	UNEP-DHI Partnership – Centre on Water and Environment
VRA	Volta River Authority
WRC	Water Resources Commission
WRI	Water research institute


GREEN
CLIMATE
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CLIMATE TECHNOLOGY CENTRE & NETWORK

DHI

epa

WRC

Minutes from the final National Workshop

This document gives an overview of the content and main outcome of the final national workshop hosted by the Water Resources Commission in Ghana, which was held at Coconut Grove Regency Hotel in Accra on 18 April 2018.

1 Introduction

1.1 Project objective

The technical assistance funded by GCF readiness funds and CTCN relates to **improving resiliency of crops to drought through strengthened early warning within Ghana**. The objective is to facilitate transfer and capacity building for climate change adaptation focusing on dry season management and planning. The support has utilised existing knowledge and capacity and further developed and validated these for applications to local issues with focus on the northern Ghana.

GCF Readiness funds have also been allocated to this CTCN technical assistance in order to investigate the potential up-scaling of this project to a large scale GCF project to be implemented at the national level.

1.2 Project background

The technical assistance was initiated in October 2016 by an **Inception workshop** held in Accra. Based on feedback and discussions from stakeholder consultations a **Needs Assessment report** was prepared to present the objectives and requirements for the technical assistance. The recommendations have then been taken into consideration to draft a more detailed description of the proposed outcome in the **Technology specification report** delivered in February 2017.

Based on the outlined requirement the **Drought Monitoring and Early warning system for Ghana** has been developed and a first version was presented at a **national training** held in Accra in October 2017. This was the opportunity to give insight into the developed system and get feedback from the key stakeholders.

In October 2017, a **Second National workshop** was held at the Water Resources Commission in Accra to initiate the **GCF Readiness funds** that had been allocated to this CTCN technical assistance.

Following this workshop, the main applicant (WRC) supported by National experts has carried out a thorough review of the system followed by a validation of the performance of the system. The findings have been described in the **Technology Validation report** delivered in January 2018.

National experts have also assisted WRC to develop a **baseline assessment and gap analysis** of the drought management and forecasting in Ghana. In addition, a Climate **vulnerability assessment** of the agricultural sector has also been carried out. These outcomes constitute a basis to develop a draft **Concept Note** for the Green Climate Fund.

Please visit the CTCN project site[1] for access to all the project deliverables.

2 Main objective

The **Final workshop** marks the official end of the GCF readiness activities and presents the final outcomes of the GCF readiness activities and look towards a potential GCF full scale project implemented with UN Environment as the accredited implementing entity for GCF projects.

The **expected outputs** of the workshop is (1) knowledge of the key outcomes of the GCF Readiness fund activities within the key national organisations (2) national acceptance of the draft concept note for a future up-scaled GCF project and (3) agreement on the next steps in the application process.

3 Supporting documents

All the deliverables for the GCF Readiness activities supporting the CTCN Technical assistance are available at the CTCN project site.

In addition to these deliverables, a 2-page description of the GCF concept note has been distributed to the participants of the workshop (see Appendix 2).

4 Attendance

The following institutions participated in the workshop:

- Coalition of NGOs in Water and Sanitation (CONIWAS)
- Council for Scientific and Industrial Research, Water Research Institute (CSIR-WRI)
- Environmental Protection Agency (EPA)
- Ghana Meteorological Agency (GMet)
- Ghana Irrigation Development Authority (GIDA)
- Global Water Partnership, Ghana (GWP)
- Hydrological Services Department (HSD)
- Internal Water Management Institute (IWMI)
- National Disaster Management Organisation (NADMO)
- UNEP-DHI Partnership – Centre on Water and Environment (UNEP-DHI)
- University of Ghana (UG)

[1] CTCN project site https://www.ctc-n.org/technical-assistance/projects/improving-resiliency-crops-drought-through-strengthened-early-warning

- Volta River Authority (VRA)
- Water Resources Commission (WRC)

List of participants with contact details is shown in Appendix 1.

It should be noted that the following key organisations have been invited but could not attend the workshop due to other commitments:

- Ministry of Finance (MoF)
- Ministry of Food and Agriculture (MOFA
- Ministry of Sanitation and Water Resources (MSWR)
- Ministry of local Government and Rural Development (MLRD)

There was a separate meeting with the Ministry of Finance the day before the workshop to ensure their support and engagement in the next steps. The support from the Ministry of Food and Agriculture and Ministry of Sanitation and Water were ensured before the workshop through actively engagements from the Water Resources Commission.

5 Agenda

Final workshop Presentation of the project scope, objectives and outcomes		
Time	**Title**	**Responsible**
09.00 – 09.30	Registration	
09.30 – 09.45	**Welcome** Presentation of the objective with the workshop Presentation of participants	WRC
09.45 – 10.15	**Food security and water management in Ghana** Presentation of challenges and visions related to food security and water management in Ghana.	WRC
10.15 – 10.30	**Green Climate Fund, Ghana** • Presentation of the NDA office, Ghana • Objectives and responsibilities	NDA
10.30 – 11.00	Break	
11.00 – 11.30	**GCF full scale project** • National requirements supporting GCF full scale project • Concept for a GCF funded full scale project "Improving resilience of food security and water management to climate variability and change"	WRC
11.30 – 12:00	**UN Environment - Implementing entity for GCF** • Application process • Implementation and the role of UN Environment	UN Environment
12.30 – 13.00	**Discussion and agreement of next steps** • Official acceptance of GCF concept note • Agreement on next steps	WRC
13:00 – 14:00	Lunch	
14.00 – 14.30	**Green Climate Fund readiness activities** • Objectives • Achivements	DHI
14.30 – 15.00	**Technical outcome of GCF readiness activities** • Technical presentation of the Drought Early Warning and Forecasting Portal for Ghana	DHI
15.00 – 15.30	Closure	WRC

6 Minutes of the workshop

The workshop took place at the Coconut Grove Regency Hotel in Accra on 18 April 2018. A description of the different interventions and conclusions is given in the following section.

Time	**Activity**	**Lead**
9:00 – 9:45	**Welcome and Registration** Participants for the meeting went through the registration process.	All
9:30 – 9:45	**Opening** The Executive Secretary of the Water Resources Commission (WRC) welcomed all participants to the workshop and asked for their maximum contribution in making the program a success.	Mr. Ben Ampomah - WRC

9:45 – 10:00	**Introduction** Participants introduced themselves	All
10:00 – 10:30	**Presentation of the Workshop Objectives** Dr. Bob Alfa from WRC gave a first presentation outlining the activities for the day and the objective of the workshop. **Presentation of Food Security and Water Management in Ghana: Challenges and Vision** Dr. Bob Alfa then proceeded in describing the vision and challenges related to food security and water management in Ghana. This served as the basis for scope the needs of future projects. He mentioned the needs for 1. Water availability at all times in the year especially the dry season to ensure food security. A necessary part for this action is forecast information on drought 2. Inter-sectoral collaboration for the exchange of information and technical expertise. This will also enhance sustainability of projects and prevent always reinventing the wheel. 3. Ghana Water Vision, 2025 and the National Water Policy are adhered to. Some discussions followed the presentation.	Dr. Bob Alfa WRC
10:30 – 11:00	Break	All
11:00-12:30	**Presentation of the GCF Readiness fund activities** Oluf Jessen from DHI gave a presentation on the activities undertaken and outcomes delivered by the technical assistance since its initiation in October 2016. Mr. Jessen mentioned the strong stakeholder participation, interest and involvement in all training and workshops activities through the project duration. Finally, Oluf Jessen explained the next steps required by GCF to submit a Concept Note. After some discussion, it appeared that there was a general agreement to move forward with the project looking for a full-scaled GCF project. Peter Bjornsen from UNEP-DHI was representing UN Environment, which has been appointed Accredited Entity for implementing the GCF project. Peter Bjornsen enlightened participants on the processes involved in obtaining the full-scale GCF and the role of UN Environment in this process. He mentioned that another GCF concept note had been submitted with EPA in Ghana as the executing entity. The project is entitled: *Climate-resilient landscapes for sustainable livelihoods in northern Ghana*. Mr. Bjornsen explained the different options for complement this other GCF project. One of the options presented is the Simplified Approval Process (SAP), which is a less tedious process but serves a greater purpose. There were some questions and discussions, which were answered and noted. After the discussion, there was a general agreement to proceed with Simplified Approval Process in order to complement the other GCF project led by EPA. This option will help in fast-tracking the process for accessing GCF funds.	Dr. Bob Alfa WRC Oluf Jessen, DHI Peter Bjornsen, UNEP-DHI

12:30 – 13:00	**Presentation of the outcomes of the GCF Readiness fund** Oluf Jessen from DHI presented the status of the Readiness activities that have supported the CTCN Technical assistance. This included the outcomes of the technical assistance carried out by four national experts The pending activities to complete the expected outcomes of the GCF readiness fund were also presented.	Oluf Jessen, DHI
13:00 – 13:30	**Demonstration of the Drought Early Warning System implemented in Ghana** Bertrand Richaud from DHI demonstrated to the participants the online web portal, which is the key technical outcome of the technical assistance. He took members through the various applications and suggested that more people register on the system and use the tool freely accessible online. The link for the registration as well as the user guide will be shared after the workshop.	Bertrand Richaud, DHI
13:30 – 13:45	**Closing** After a general acceptance of the way forward, participants agreed to pay particular attention to 1. Sustainability of the project when the period ends. There is therefore the need to get the buy-in from government and the interest of the local users so they continue to use the products 2. Use the right terminology (as in dry spells as against drought) in the concept note. 3. Make outputs of projects accessible to the end users 4. Link up project to other existing projects which will enhance institutional collaboration, meeting actual needs and avoiding duplication of efforts as well as improving sustainability Mr. Ben Ampomah closed the meeting and thanked all the participants for the attendance and the quality of the interventions.	Mr. Ben Ampomah WRC

7 Key outcomes from the workshop

The workshop was very successful with participation of all the invited stakeholders. The key outcomes from the national workshop are:

- All the key national stakeholders are presented with the outcomes from the CTCN and GCF funded activities being implemented from October 2016 to April 2018.
- The participants acknowledged the importance of drought in Ghana and the need for technology supporting the staff at the key organisations related to drought management and early warning.
- There is a strong interest and support for future activities aiming at strengthening the national capacity and knowledge to handle and plan for future impacts related to climate variability and climate change.
- The participants acknowledge that future activities should not be limited to drought management but extended to management of dry spells or water scarcity in general with specific focus on climate resilient solutions for the water management and food production in Ghana.
- Activities relating to groundwater should be included as part of drought management
- The participants supports the appointment of UN Environment as the Accredited Entity for supporting Ghana in the application of a full size GCF funded project with the title “Improving resilience of food security and water management to climate variability and change”
- The participants supports the decision of submitting a concept note for GCF funding using the Simplified Approval Process as suggested by UN Environment. The selected process limits the budget to 10 mio. USD but increases the likelihood of a successful project application.

The implementing agencies would like to thank all the involved stakeholders for their actively and engaged commitment to the process and we will be looking forward to further collaboration in future projects.

8 Remaining activities

The final workshop marked the end of the technical development within the CTCN and GCF Readiness technical assistance. The remaining activities before closing the project are:

- **Lesson learned and recommendation report:** Lessons-learned report from the validation case and the initial use of the system in Ghana. This also includes description and design of gender relevant indicators, and identifying at-risk groups and recommendations to improve gender-relevant drought planning.
- **Roadmap documentation:** The roadmap document provides recommendations for national scale deployment and use of the early warning drought foresting technology deployment.
- **Draft GCF concept note**: Draft of a GCF Simplified Approval Process concept note based on the results and products of this technical assistance. The preliminary draft will serve as a reference document to present the project idea to accredited entities (national and/or international). The preliminary draft, prepared in coordination with and inputs from the NDE and WRC will be submitted to the NDA for approval by the technical committee.

APPENDICES

APPENDIX 1:
List of participants

S/N	NAME	ORGANIZATION	CONTACT / EMAIL
1	Maxwell Boateng-Gyimah	GWP – Ghana	0558584069 / boatgyimax2@gmail.com
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3	Maureen Abla Ahiafaku	GMet	0558392890 / maureenahiafaku@gmail.com
4	James Aggrey	WRC	0242272445 / jamgrey04@yahoo.com
5	Naa Koteikor Amar	GIDA	0244059151 / naa_koteikor@yahoo.com
6	Charlotte Norman	NADMO	0209875188
7	Oluf Jessen	DHI	ozj@dhigroup.com
8	Bertrand Richaud	DHI	ber@dhigroup.com
9	Peter Bjornsen	UNEP - DHI	pkb@dhigroup.com
10	Michael O. Kwakye	EPA	mokatk@gmail.com
11	Ben A. Sackey	VRA	Ben.sackey@vra.com
12	Marloes Mul	IWMI	m.mul@cgiar.org
13	Bob Alfa	WRC	bobalfa@yahoo.com
14	Joseph Baffoe	EPA	jabaffoe@gmail.com
15	Barnabas Amisigo	CSIR-WRI	0243947476 / barnyy2002@yahoo.co.uk
16	Ben Ampomah	WRC	0244874138 / byampomah@yahoo.com
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APPENDIX 2:
2-page summary of the GCF Concept note

CLIMATE CHANGE ADAPTATION

Food security and water management

GCF FUNDING PROPOSAL

Ghana

Implementing Entity: UN Environment
National Designated Authority: Mr. Frimpong Kwateng-Amaning, Director of the Real Sector, Ministry of Finance, Ghana
Duration: 4 years
Budget: 10 mio. USD
Technical Assistance planned by: UNEP-DHI Partnership

Improving resiliency of food security and water management to climate variability and change

GCF READINESS

The Green Climate Fund is capturing early results, best practices and lessons realized through the Readiness Programme.

The Water Resources Commission in Ghana requested GCF Readiness fund in 2017 to access technical assistance on improved preparedness for drought and increased capacity and technologies for early warning information with focus on Northern Ghana.

Through this support, the upscaling to Ghana has been addressed with a gap analysis and needs assessment to prepare for this proposed GCF support.

CHALLENGE

Agricultural production in Ghana is predominantly rain-fed and changes in rainfall pattern are having a serious impact on the country's productivity and economy. These changes have deepened rural vulnerability and increased land degradation and desertification. Current information and means for adequate planning are insufficient to prepare and cope with the extreme climate events.

GCF support

- **Strengthen institutional** and **technical capacity** for national water and drought management with focus on food security
- **Technology transfer** and **capacity building** for strengthened technical capability at national, regional and local level
- **Climate smart technologies transferred** to communities aiming at increasing the resilience of the food production and water management to climate change

INTENDED IMPACT

- Contribution to reduced crop losses and improved livelihood of farmers in Ghana
- Improved information provision on actions related to water management and farming practises to help farmers proactively take adaptive measures

THIS PROJECT ADVANCES:

Institutional and technical capacity for national water and drought management with focus on increasing the resilience of food production under climate change strengthened

TECHNICAL OUTCOMES

The proposed GCF project will deliver state-of-the-art technical solutions enabling national and local decisions makers to plan, implement and secure climate resilient solutions within the food and water sector.

The key technical outcomes from the proposed GCF project relates to:

Data and information management

- Analysis and reporting tools
- Satellite based data repository

Numerical weather prediction

- Prediction methods linking station and model based data

Numerical modelling

- Water accounting, crop yield and hydraulic modelling

Early warning and decision support

- Integration of data and modelling
- Scenario analysis tools and decision support system

Service Delivery Platform

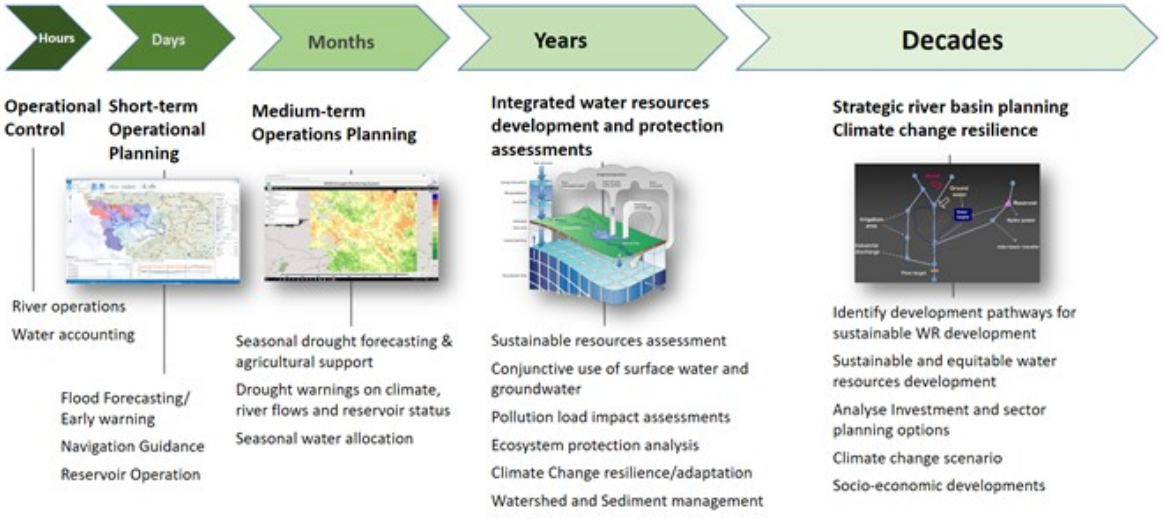
- Cloud based platform for weather and hydrological services
- Linkage between national and local planning

PROJECT OUTPUTS AND ACTIVITIES

The overall objective of the proposed project is to "Strengthen Institutional and technical Capacity at all levels with focus on improving resilience for food production and water management under climate variability/change". To achieve this goal, five project outcomes are recommended based on the gap analyses and needs assessments:

- **Institutional and technical capacity** for national water and drought management with focus on increasing the resilience of food production under climate change strengthened
- **Weather and hydrological services** through modernization/establishment of hydro-meteorological Observation and Information Systems developed.
- **Strengthened technical capability** at regional and national policymakers, technical officers and local communities improving resilience of food security and water management to climate change and variability.
- **Climate change adaptation technologies** transferred to communities through climate smart community based projects aiming at increasing the resilience of the food production to climate change.
- **Knowledge management frameworks** for the collection and maintenance of national and regional knowledge in climate change adaptation practices with respect to the resilience of food production to climate change improved.

Solutions Designed for Operation on Multiple Time Scales



APPENDIX 3: Presentations

WATER RESOURCES COMMISSION

FINAL WORKSHOP ON THE GCF READINESS SUPPORT ON - Drought Early Warning and Forecasting System: Improving resiliency of crops to drought through strengthened early warning

Bob Alfa
WRC

APRIL 18, 2018

COCONUT GROOVE HOTEL

Objectives of the project

The overall objective of the proposed project is to "Strengthen Institutional and technical Capacity at all levels with focus on improving resilience for food production and water management under climate variability/change

- Support farmers with timely and detailed information to minimise drought impacts
- Ensure availability of water for agriculture production
- Enhance awareness and expertise to use spatially distributed drought information
- Increase accessibility of drought-related data on relevant near real-time satellite information
- Strengthen institutional coordination for disseminating and the use of drought early warning information

Intended Impacts

- **Impact 1:** Contribution to reduced crop losses and improved livelihood of farmers in Ghana

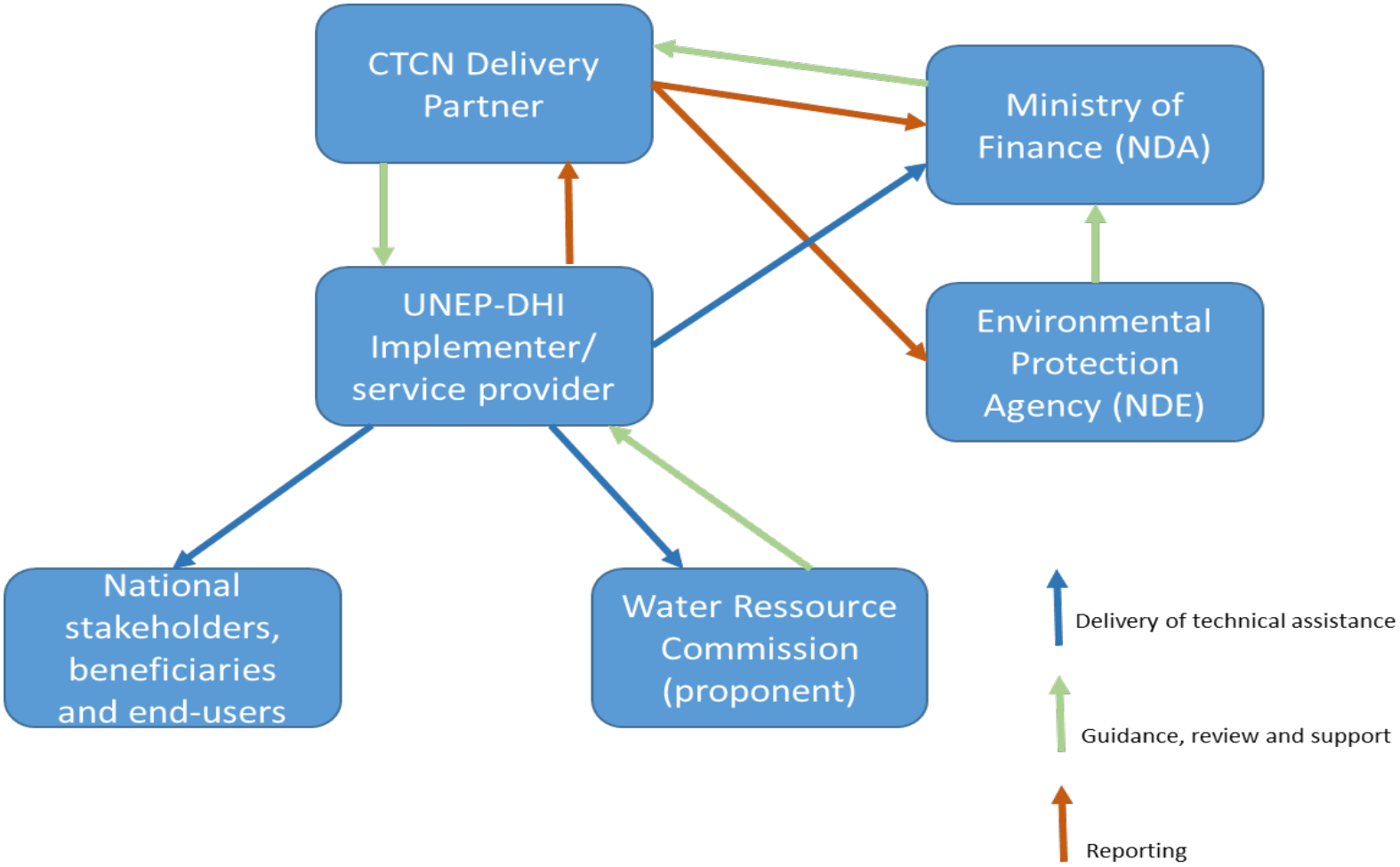
- **Impact 2**: Ensure water Availability for food production and economic development

- **Impact 3:** Improved information provision on drought characteristics to help farmers proactively take adaptive measures

- **Impact 4:** Contribution to Sustainable Development Goals (3, 5, 6 and 13)

WATER RESOURCES COMMISSION

Implementation arrangements



Objective of the Workshop:

- Present the current status of the GCF Readiness project on "Improving resiliency of crops to drought through strengthening early warning in Ghana"
- Present the ideas for the proposed upscaling of the current activities to a full size GCF project
- Collate and incorporate stakeholder views into the GCF Concept Note
- Outline the way forward

WATER RESOURCES COMMISSION

THANK YOU !!!!!!

WATER RESOURCES COMMISSION

FOOD SECURITY AND WATER MANAGEMENT IN GHANA:

CHALLENGES AND VISION

WATER FOR FOOD - CHALLENGES

- Ensuring availability of water for food security for all seasons
  - Climate risks gaining grounds especially in the savanna zone – floods and droughts
  - Increasing competition for water – economic growth and population growth
  - Degrading land and water resources
  - Demand for food is rising and shifting
- Inter-sectoral collaboration and coordination

Water Vision

- Ghana Water Vision, 2025
  - Global water vision 2050,
  - African Water Vision
  - African Union Policy Direction
  - Sustainable Development Goals (Goal 6)
- To have assured water and healthy water ecosystems for the present and future through an efficient and effective management system. Focuses on
  - ***water for food,***
  - water for people,
  - water for nature, and
  - integrated water resources management

Water For Food

Vision for the country is:

Availability of water in sufficient quantity and well managed for cultivation of crops, watering of livestock and sustainable freshwater fisheries, including fish production through aquaculture techniques to ensure food security.

Vision Elements

Elements that will lead to the vision realisation :

- Controlling the population and annual growth rate.
- Efficient use of fertilizers, high–yielding crop species and agricultural extension services.
- Application of technologies for forecasting onset of rains and climate elements and early warning systems for drought and floods.
- Harnessing and conservation of water to ensure its availability all year round.
- Water use efficiency techniques in agriculture and reducing transmission losses of irrigation water.

- Managing land use and controlling land degradation, including bush fires, to reduce soil loss and siltation of water bodies .
- Controlling water pollution, water weeds and waterborne diseases.
- Developing a pricing system and a mechanism for delivering irrigation water that is affordable to farmers and cost recovery on investment made in infrastructure.
- Utilising data and information on water cycle, land cover/use, soils and socio-economic elements for planning, design and development of agricultural schemes.

National Water Policy

Focus Area (3) – Water for Food Security

Policy objectives

- Ensure availability of water in sufficient quantity and quality for cultivation of crops, watering of livestock and sustainable freshwater fisheries to achieve sustainable food security for the country; and
- Ensure availability of water in sufficient quantity and quality to support the functions of the eco-systems in providing alternative livelihoods.

Policy Measures and/or Actions

- Support the establishment of micro-irrigation and valley bottom irrigation schemes
- Encourage the efficient use of fertilizers to reduce pollution of water bodies and ensure conservation of water.
- Promote and encourage water use efficiency techniques in agriculture and reduce transmission losses of water in irrigation systems; and
- Manage land use and control land degradation, including bush fires, to reduce soil loss and siltation of water bodies.

GCF full scale concept

Improving resilience of food security and water management to climate variability and change

in Accra, on the 18th of April 2018

Oluf Z. Jessen, Head of Projects, Water Resources, DHI

UN Environment-DHI Centre on Water and Environment

Agenda

Present the ideas for the proposed upscaling of the current activities to a full size GCF project

- **Project background**
- **Full size upscaling**
  - Proposed concept
- **Next steps**
  - Concept note
  - Funding proposal
  - Accredited Entity

Project background

Request from **Water Resources Commission** in Ghana through the **Climate Technology Network Center** and later the **GCF readiness funds** for technical assistance on:

- Improved **preparedness for drought**
- **Increased capacity and technologies** for improved and timely early warning information provided to the relevant sectors and organisations

Green Climate Fund (GCF) – readiness funds

Activity 1 – Stakeholders consultation

Present the scope of the project scope to a wide range of stakeholders in Ghana and identify the needs for improved dry season management technologies.

Activity 2 – Technology implementation

Develop the early warning and forecasting system and validating the use of it on a selected location within northern Ghana.

Activity 3 – Technology transfer and dissemination

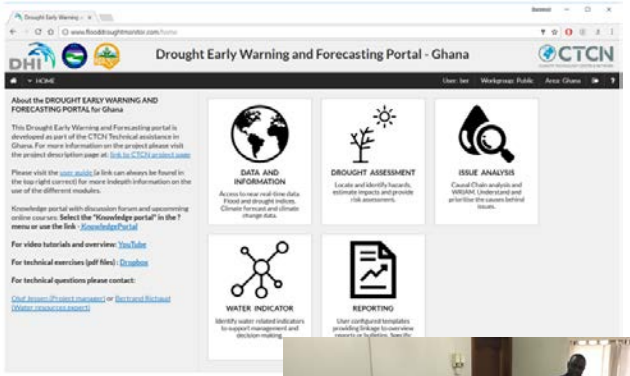
Ensuring the transfer of knowledge and technology to the local and regional stakeholders

Activity 4 – GCF upscaling

National Experts and development of GCF concept note

Project output

- Web based portal supporting drought management in Ghana
- Free and unlimited access to web based portal
- Technical training with 10 stakeholders providing local capacity for use of the web based tools
- National workshop with support for national implementation through CCF full scale project
- GCF concept note



https://www.ctc-n.org/technical-assistance/projects/improving-resiliency-crops-drought-through-strengthened-early-warning

Green Climate Fund (GCF) – readiness funds

National experts

CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

Drought early warning system

GREEN CLIMATE FUND

Road map for upscaling to full size GCF project

GCF full scale project: Improving resilience of food security and water management to climate variability and change

Green Climate Fund (GCF) – full size project

Title of GCF Project: Improving resilience of food security and water management to climate variability and change

Country: Ghana

Accredited Implementing Entity for GCF: United Nations Environment Programme (UN Environment)

Executing Entities: Ministry of Finance, Ghana with support from UNEP DHI collaboration center

Amount of Financing Requested: US$ 10 mio.

Green Climate Fund (GCF) – full size project

Objective:

"Strengthen the national capacity for dry season management with focus on improving the resilience of the food production and water management towards climate variability and change"

Green Climate Fund (GCF) – full size project

Outcomes:

1. **Strengthen the institutional capacity and the national mandate** for national water management and drought with focus on increasing the resilience of food production to climate change.
2. **Develop weather and hydrological services** through hydro-meteorological Observation and Information Systems Modernization.
3. **Improved resilience of food security and water management** to climate change and variability **through strengthened technical capability**– to regional and national policymakers, technical officers and local communities.
4. **Climate change adaptation technologies** transferred to communities through climate smart community based projects aiming at increasing the resilience of the food production to climate change.
5. **Improved knowledge management frameworks** for the collection and maintenance of national and regional knowledge in climate change adaptation practices with respect to the resilience of the food production to climate change.

Green Climate Fund (GCF) – full size project

Outcomes:

The proposed GCF project will deliver state-of-the-art technical solutions enabling national and local decisions makers to plan, implement and secure climate resilient solutions within the food and water sector.

The key technical outcomes from the proposed GCF project relates to:

- **Data and information management**
  - Improved data availability and management
- **Numerical weather prediction**
  - Prediction methods linking station and model based data
- **Numerical modelling**
  - Water accounting, crop yield and hydraulic modelling
- **Early warning and decision support**
  - Integration of data and modelling
  - Scenario analysis tools and decision support system
- **Service Delivery Platform**
  - Cloud based platform for weather and hydrological services
  - Linkage between national and local planning

Green Climate Fund (GCF) – full size project

Operational planning across time scales (national to local)

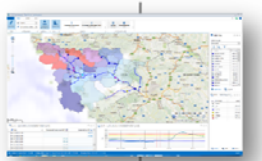
Hours | **Days** | **Months** | **Years** | **Decades**

Operational Control

River operations

Water accounting

Short-term Operational Planning

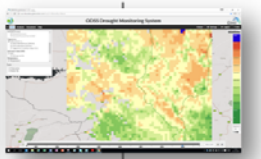


Flood Forecasting/ Early warning

Navigation Guidance

Reservoir Operation

Medium-term Operations Planning

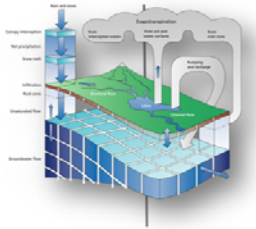


Seasonal drought forecasting & agricultural support

Drought warnings on climate, river flows and reservoir status

Seasonal water allocation

Integrated water resources development and protection assessments



Sustainable resources assessment

Conjunctive use of surface water and groundwater

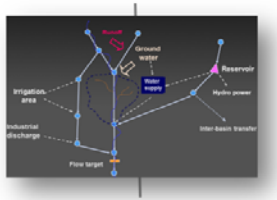
Pollution load impact assessments

Ecosystem protection analysis

Climate Change resilience/adaptation

Watershed and Sediment management

Strategic river basin planning Climate change resilience



Identify development pathways for sustainable WR development

Sustainable and equitable water resources development

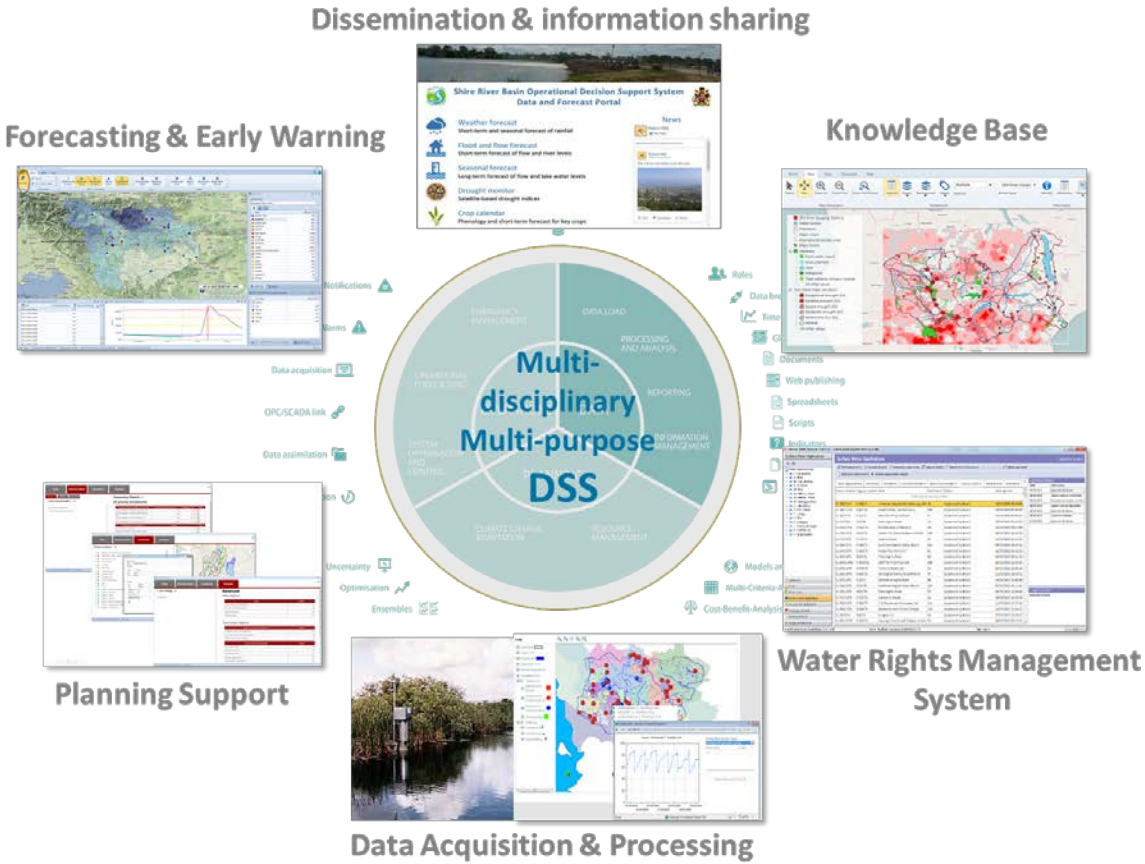
Analyse Investment and sector planning options

Climate change scenario

Socio-economic developments

Green Climate Fund (GCF) – full size project

Operational planning across time scales



Green Climate Fund (GCF) – Next steps

Accredited Entity:

UN Environment is proposed as the Accredited Entity

Concept Note:

- Develop draft concept note
- Review and edit by external consultant (C4)
- Engage national stakeholders
- Approval by technical committee (NDA office)
- Approval and submission by UN Environment
- Linkage to EPA concept

Funding proposal:

- Development and submission of funding proposal

Thank you

GCF Readiness activities

Improving resiliency of crops to drought and changing climate through strengthened early warning

in Accra, on the 18th of April 2018

Oluf Z. Jessen – DHI

Project background

Request from **Water Resources Commission** in Ghana through the **Climate Technology Network Center** and later the **GCF readiness funds** for technical assistance on:

- Improved **preparedness for drought**
- **Increased capacity and technologies** for improved and timely early warning information provided to the relevant sectors and organisations

Ghana

Applicant: Water Resource Commission
National Designated Entity: Mr. Joseph Amankwa Baffoe, Environment Protection Agency
Duration: 12 months
Status: Under implementation
Budget: 240,000 USD
Technical Assistance Planned by: UNEP-DHI Partnership
Implemented by: UNEP-DHI Partnership

Project objectives

- **Improving resiliency to drought and changing climate in Ghana**
- **Enhance the capacity** of relevant local government agencies to address drought related issues
- **Provide scientific based technology** for drought warning and forecasting within Ghana

Early warning and detection as part of a risk based approach

From crisis to risk management

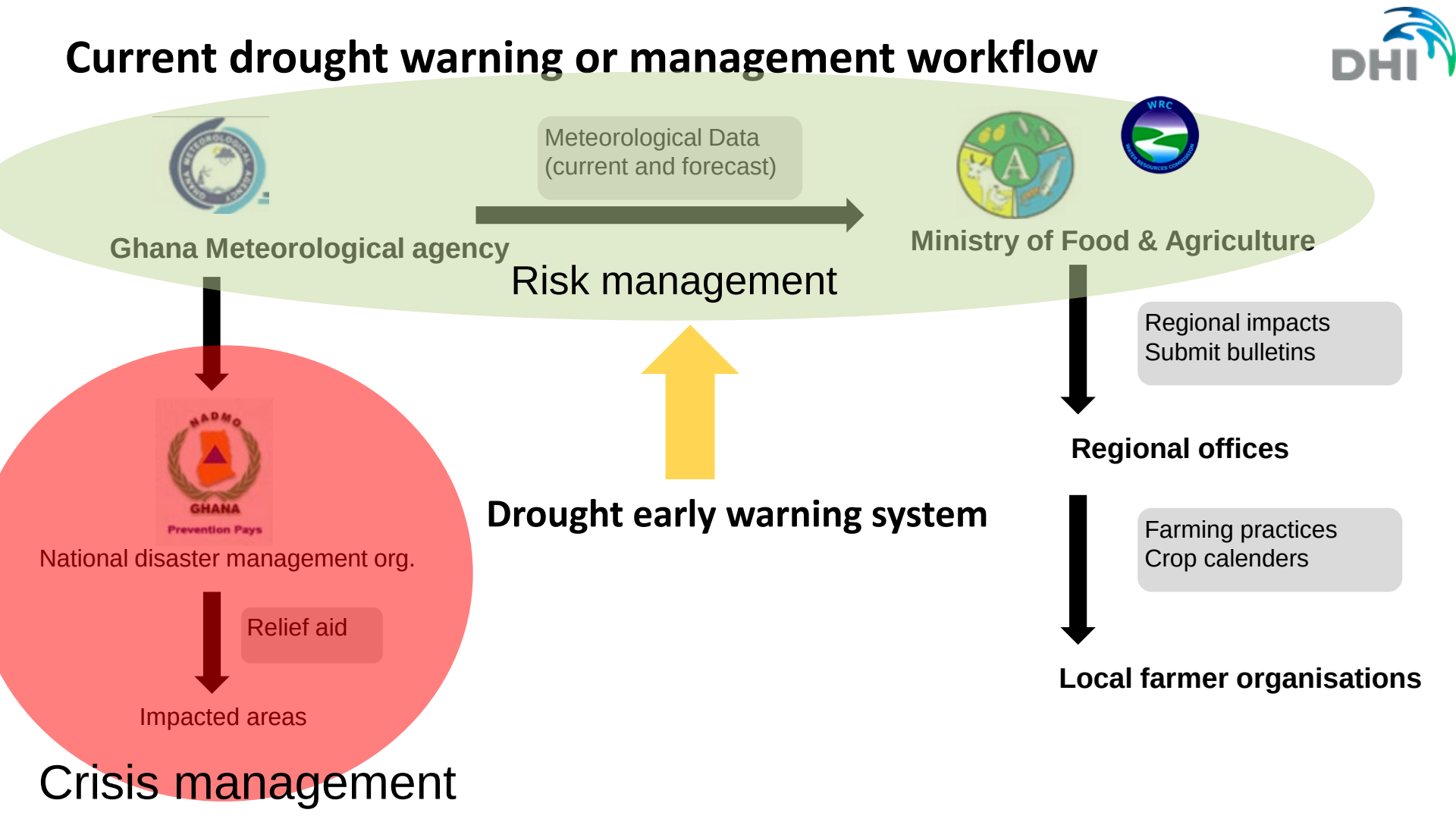
Proactive

Reactive

A need to develop risk-based drought management policies

Source: Adapted from National Drought Mitigation Center, http://drought.unl.edu

Current drought warning or management workflow



Project activities

Activity 1 – Stakeholders consultation

Present the scope of the project scope to a wide range of stakeholders in Ghana and identify the needs for improved dry season management technologies.

Activity 2 – Technology implementation

Develop the early warning and forecasting system and validating the use of it on a selected location within northern Ghana.

Activity 3 – Technology transfer and dissemination

Ensuring the transfer of knowledge and technology to the local and regional stakeholders

Activity 4 – GCF upscaling

National Experts and development of GCF concept note

Project deliverables

1. Minutes from National Workshop held on 26 October in Accra, Ghana
2. Needs assessment report
3. Technology specification report
4. Review report by WRC
5. Technology validation report
6. Technology description and user guide
7. Summary report of the technical training (Sep. 2017)
8. Summary report of the national workshop (Sep. 2017)
9. Lesson learned report (pending)
10. Roadmap for upscaling (pending)
11. GCF concept note (pending)

https://www.ctc-n.org/technical-assistance/projects/improving-resiliency-crops-drought-through-strengthened-early-warning

Project status - Activity 1 – Stakeholders consultation

National Workshop held on 26 October, 2016

Drought is a very relevant topic to support in Ghana as only few organisations and projects address drought management.

Scope for improving the existing drought monitoring and forecasting methodologies in Ghana

Important that the outcomes from the technical assistance supports the existing dissemination processes

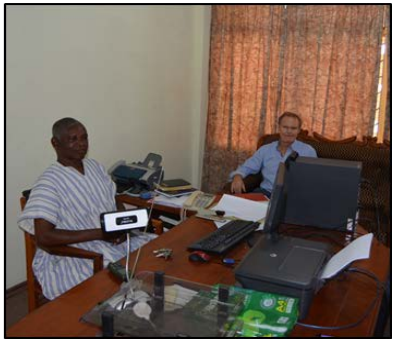
Participation by: Department of Earth Science, University of Ghana,
Environmental Protection Agency, Ghana Meteorological Agency,
Ghana Irrigation Development Authority,
Global Water Partnership, Ghana, Hydrological Services Department,
Ministry of Local Government and Rural Development,
National Disaster Management Organisation,
Ministry of Water Resources Works and Housing,
Ministry of Food and Agriculture, Volta River Authority,
Water research institute, Water Resources Commission

Project status - Activity 1 – Stakeholders consultation

Regional meetings

Meetings with relevant stakeholders in the Upper East region.

Focus on validation and testing of the drought early warning system



WRC Bolgatanga

MOFA Bolgatanga

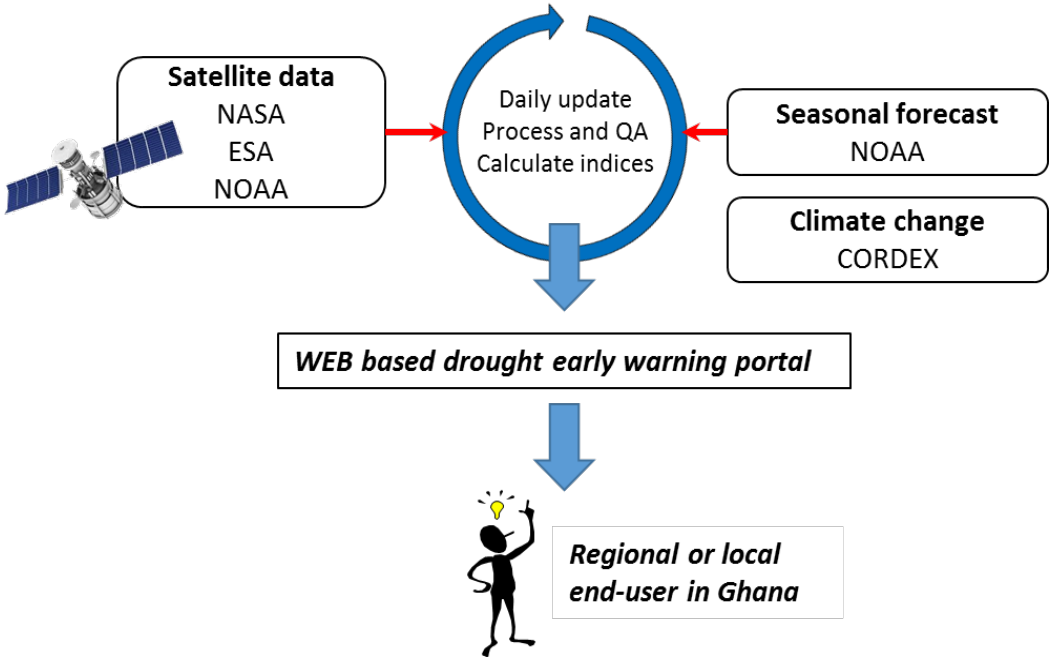
EPA Bolgatanga

Project status - Activity 2 – Technology implementation

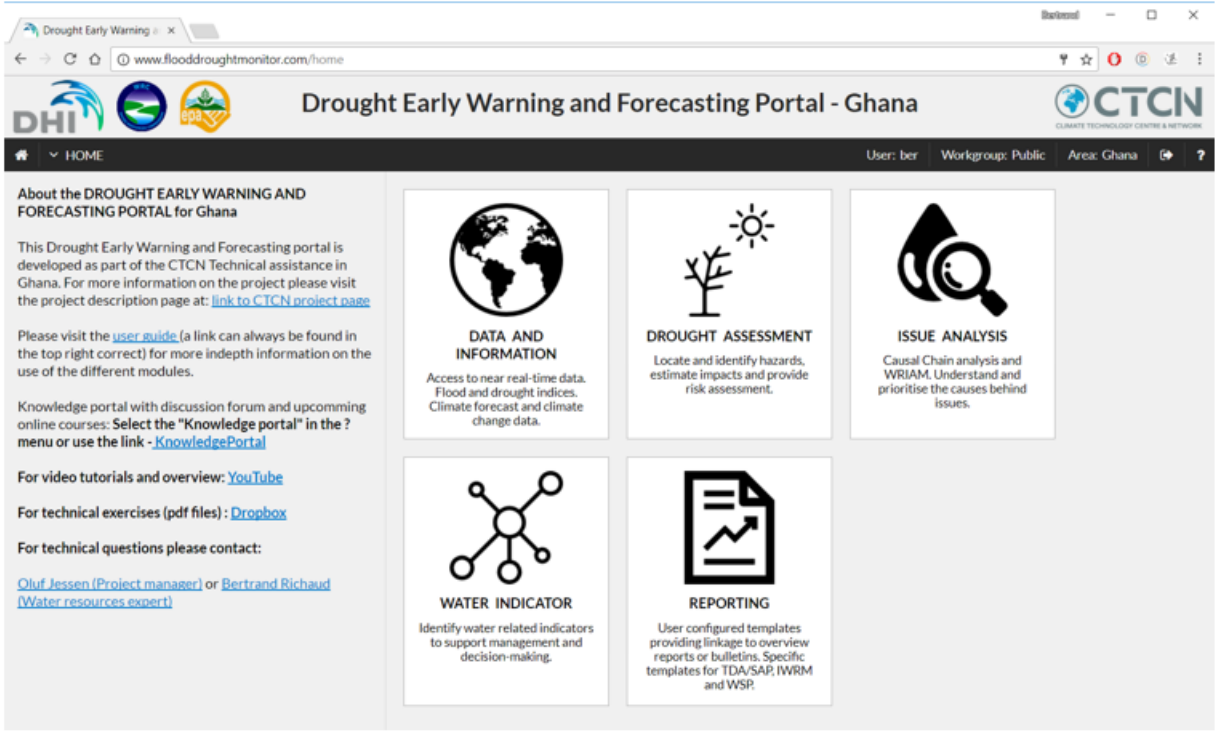
Web-based drought early warning and forecasting portal

Will serve several purposes for the end-users in Ghana with respect to drought management;

- a data and information provider,
- location of drought impacted areas,
- provide warnings for future drought events
- one of the key dissemination tools supporting the existing dissemination process

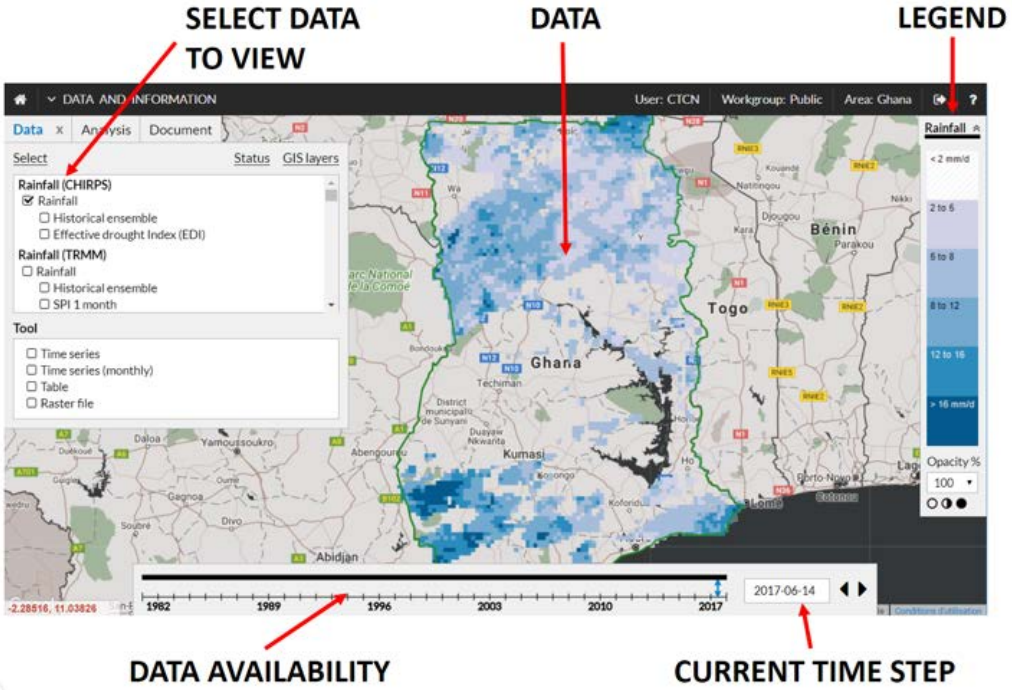


Project status - Activity 2 – Technology implementation



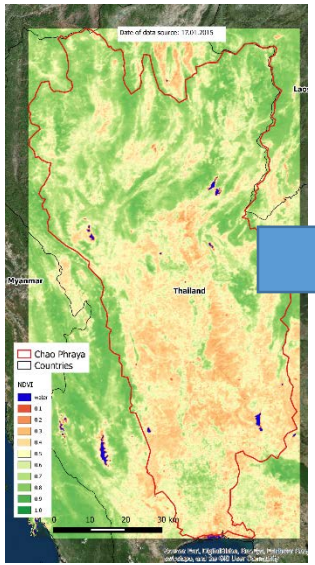
Project status - Activity 2 – Technology implementation

Web-based drought early warning and forecasting portal for Ghana



Project status - Activity 2 – Indices

Indices are essential for linking data with assessment



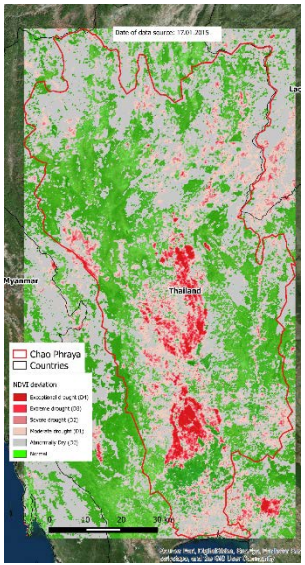
Satellite data

Index

How are the current values compared to the historical values?

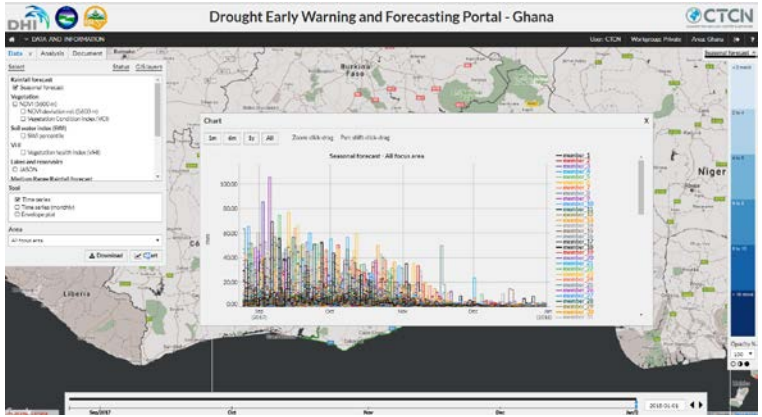
Expressed as a deviation, anomaly, percentile etc.

A number of different indices are maintained.



Classification

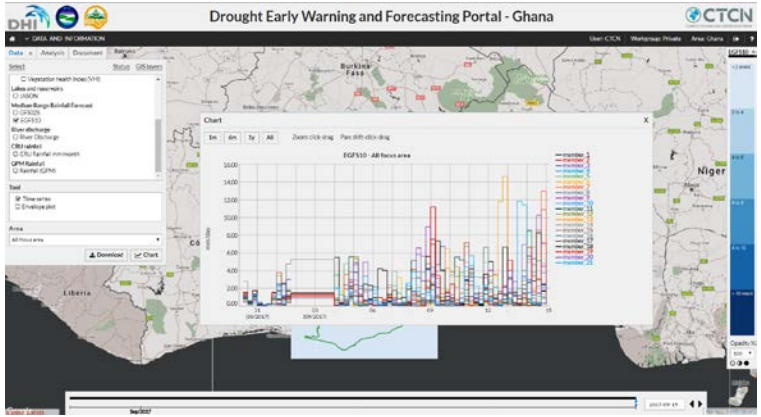
Project status - Activity 2 – Climate forecast



The Climate Forecast System (CFS) version 2.

It provides a 20-member ensemble forecast with 9-month lead time.

Spatial resolution: 0.5 degree

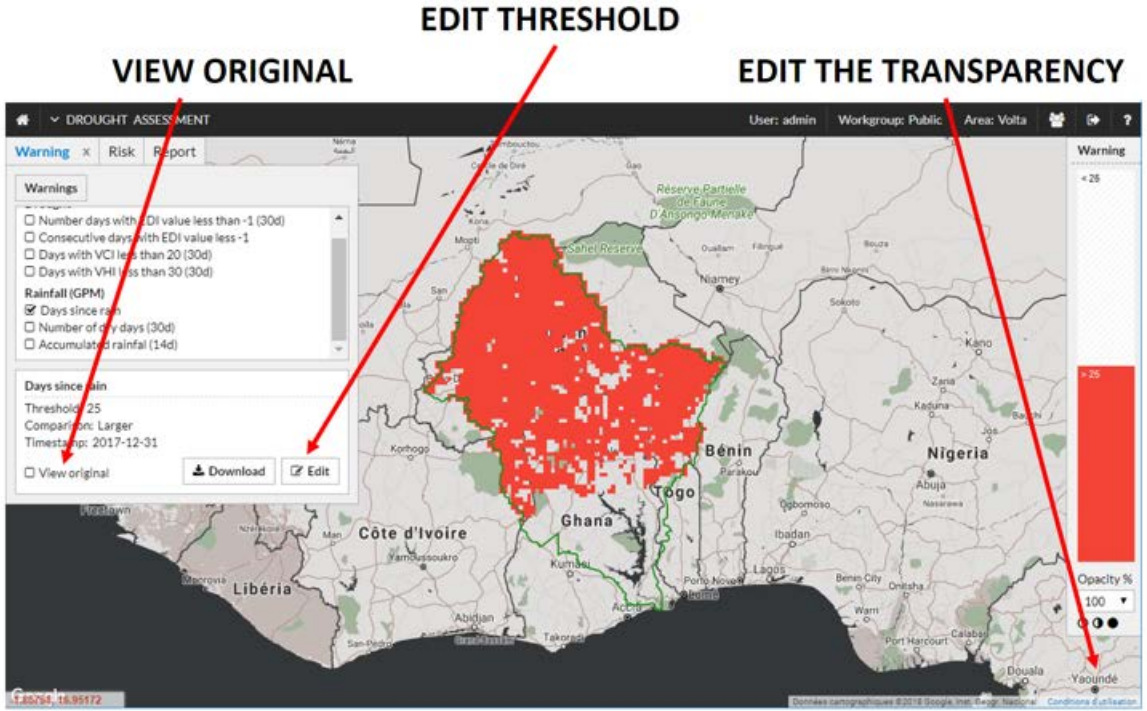


GEFS 1 degree 16 day probabilistic forecast (20 members).

NCEP Global Ensemble Forecasting System (GEFS) Global one degree Lat/Lon grid. Model runs are made at 0, 6, 12, 18 ... hours out to 378 hours (16 days).

Project status - Activity 2 – Drought Early Warning

Drought early warning based on user thresholds on drought indices



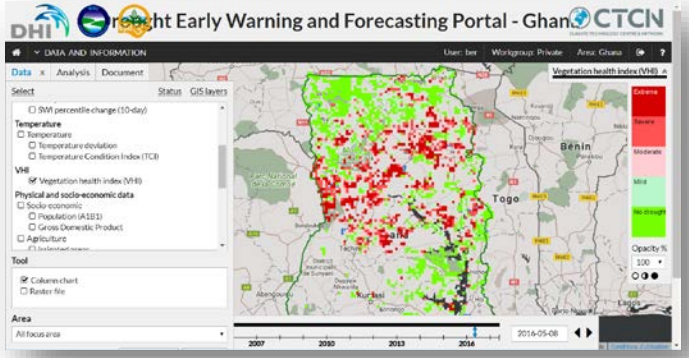
Project status - Activity 2 – Reporting

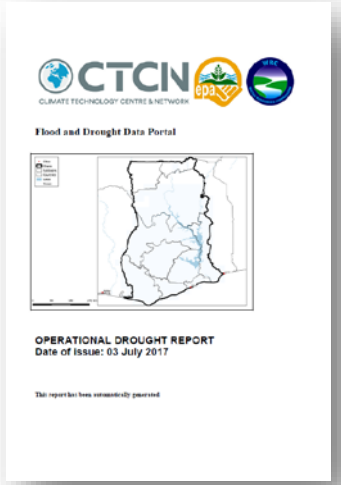
Objectives

- Configure reports for dissemination or results, warnings or information
- Flexible system allowing the user to configure and tailor reports

Outputs

- User configured reports or bulletins
- Automated submitted warnings





2 Climate status

Rainfall

Monitoring the rainfall in the basin to understand how the rainy season compares with previous year is vital to detect any signs of meteorological drought. The observation of rainfall provides a long-term historical data set since March 2000[3].

Historical rainfall

The historical rainfall dataset as called Climatology is yearly time series of the historical rainfall. The data might be used as rainfall ensembles for forecasted climate.

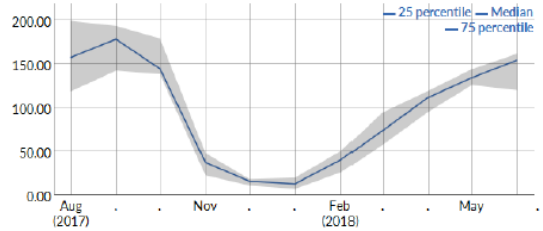


Figure 1 Historical rainfall averaged for the entire basin

The historical rainfall is summarised in a table where all monthly rainfall values are reported. The table gives an overview of the variation from month-to-month and year-to-year.

Table 2 Monthly rainfall average for the entire basin

Time	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Avg.	Min.	Max.
2000			55.7	106.0	141.6	154.4	109.7	183.9	144.7	97.4	22.7	9.0	102.5	9.0	183.9
2001	6.1	25.9	79.7	112.8	134.8	123.9	84.4	95.8	147.9	58.3	17.1	13.3	75.0	6.1	147.9
2002	15.8	19.0	55.8	118.5	144.3	157.6	184.4	145.6	108.6	139.6	35.0	17.1	95.1	15.8	184.4
2003	18.0	50.8	50.6	135.3	103.9	162.5	93.3	145.6	178.2	138.2	54.8	20.5	96.0	18.0	178.2
2004	26.4	51.3	62.0	113.0	118.5	80.4	141.6	200.6	206.6	140.3	50.2	16.5	101.5	16.5	206.6
2005	20.1	42.9	95.0	124.3	112.2	119.6	114.3	100.2	142.2	157.4	36.1	11.6	89.7	11.6	157.4
2006	54.0	33.7	68.5	98.0	186.7	154.2	112.1	118.4	177.4	163.1	18.8	10.8	99.6	10.8	186.7
2007	5.8	22.3	53.5	143.6	134.4	120.8	164.3	197.2	252.3	178.9	45.7	17.2	111.3	5.8	252.3
2008	5.3	25.9	116.2	73.6	208.8	134.0	187.5	247.2	203.7	160.7	16.7	29.3	117.4	5.3	247.2
2009	5.1	50.1	78.8	110.0	110.9	210.9	175.3	199.2	133.2	117.1	46.7	23.1	105.0	5.1	210.9
2010	12.8	52.5	67.1	119.1	133.4	161.1	117.8	224.7	205.4	227.2	47.6	13.3	115.2	12.8	227.2
2011	16.8	59.6	106.3	86.5	132.1	167.1	167.7	205.0	181.7	179.3	13.4	4.0	110.0	4.0	205.0
2012	9.5	47.3	47.3	100.8	151.2	156.7	129.4	92.1	188.8	211.9	48.0	19.1	100.2	9.5	211.9
2013	7.1	40.1	104.4	87.0	160.3	109.1	122.8	107.8	140.2	144.4	57.3	15.9	91.3	7.1	160.3
2014	26.3	28.6	94.5	118.8	123.8	161.8	134.4	157.3	190.2	124.4	56.6	11.0	102.3	11.0	190.2

[3] Rainfall observation is based on the Tropical Rainfall Measuring Mission (TRMM) product. It measures precipitation with a spatial resolution of 0.25 degree and temporal aggregation is don on the daily basis from 2000 to present. Source: http://trmm.gsfc.nasa.gov

The following maps show the SPI-3 month rainfall index for the latest season (4 months).

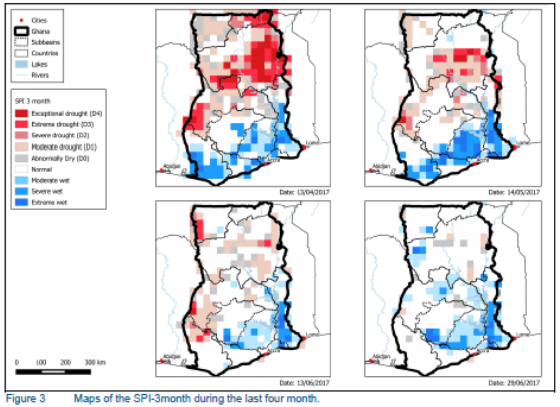


Figure 3 Maps of the SPI-3month during the last four month.

Temperature

Land surface temperature[4] is another parameter that is important to monitor to identify the progress of a drought.

Temperature deviation

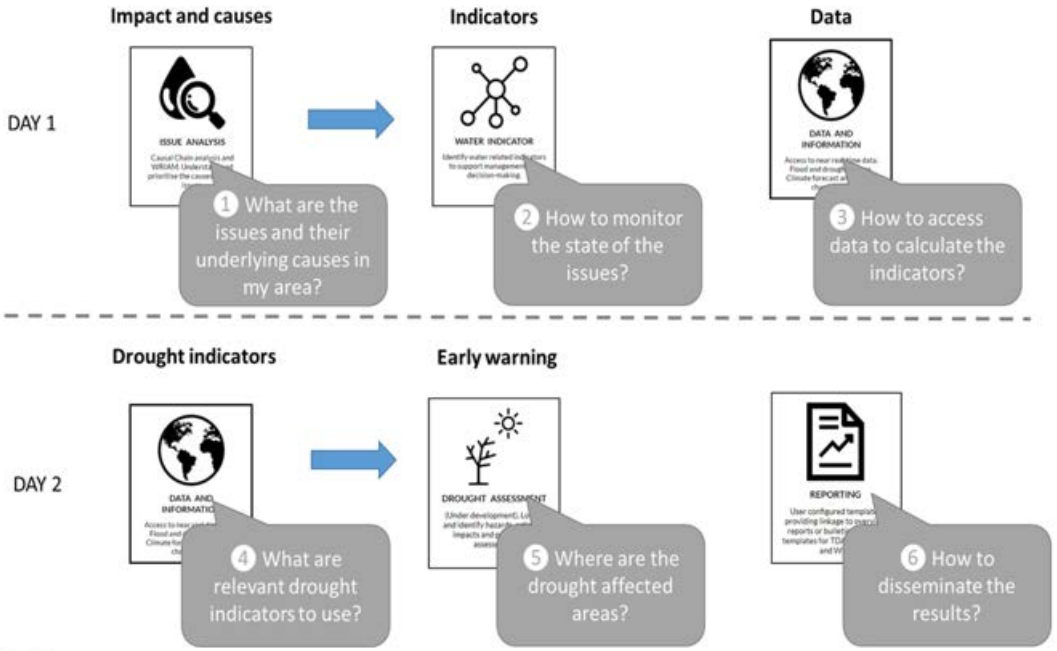
The temperature deviation is used as a drought index to describe the deviation of the temperature from the long-term mean. The deviation can be used to identify period and areas with temperature abnormally high, which could be harmful to crop during the growing season.

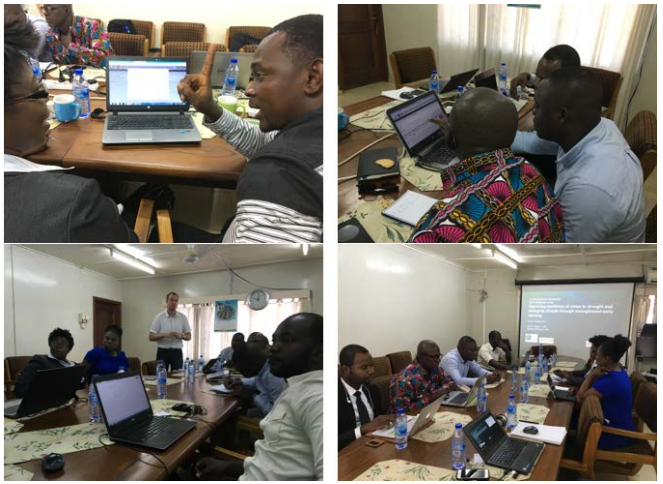
The following maps indicate the monthly temperature deviation for the latest season (4 months).

[4] Daytime land surface temperature is based on a MODIS satellite product, which is resampled to a 5 km resolution with an 8-day temporal resolution. Source: https://lpdaac.usgs.gov/dataset_discovery/modis/modis_products_table/mod11a1

Project status - Activity 3 – Stakeholders Training

Technical training (2 day) – September 2017





Participation by: Water Resources Commission, Water Resources Commission-Black Volta Basin
NADMO, Ghana Irrigation Development Authority, Environmental Protection Agency,
Hydrological Services Department, Ghana meteorological agency, Department of Agriculture

Project status - Activity 3 – National Workshop

National workshop – September 2017

- **The participants acknowledged the importance of drought in Ghana** and the need for technology supporting the staff at the key organisations related to drought management and early warning.
- There is a **strong engagement in the process of further developing** and distributing the developed portal among the stakeholders.
- **The Water Resources Commission will be the anchoring stakeholder** for the technology and will ensure that all stakeholders are kept updated and involved after the closure of the CTCN assistance.
- The NDA will work towards submitting one proposal from Ghana for a full size GCF funded project focussing on increased food security based on a combination of the existing concept notes.

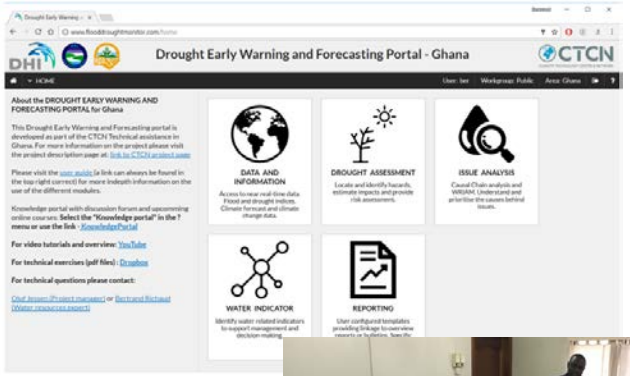
Participation by: Department of Earth Science, University of Ghana, Environmental Protection Agency, Ghana Meteorological Agency, Ghana Irrigation Development Authority, Global Water Partnership, Ghana, Hydrological Services Department, National Disaster Management Organisation, Ministry of Water Resources Works and Housing, Ministry of Food and Agriculture, Ministry of Finance, Water Resources Commission, White Volta, Water Resources Commission

Project status - Activity 4 – National experts

National expert	Deliverables
1 - James Aggrey (WRC)	• Report describing the testing and validation • Input to the developed GCF concept note on the component related to strengthening of the national capacity • Brief report describing the existing technical tools
2 - Maxwell Boateng-Gyimah (GWP)	• Brief note on the baseline assessment on the current institutional and technical state of drought management and forecasting in Ghana • Brief note on the gap analysis of the baseline condition • Brief note on the recommendations
3 - Joseph Amankwa Baffoe (EPA)	• Climate vulnerability assessment of the agricultural sector
4 - Bob Alfa (WRC)	• Review the current log frame and provide detailed comments on the activities and outputs • Technical services related to water resource or drought planning in Ghana • Draft version of completed sections of the GCF concept note

Project status - Summary

- Strong stakeholder engagement throughout the process
- Web based portal supporting drought management in Ghana
- Technical training with 10 stakeholders providing local capacity for use of the web based tools
- Free and unlimited access to web based portal
- National workshop with support for national implementation through CCF full scale project



Thank you