Volta Flood and Drought Management

ADAPTATION FUND

VFDM Project: "Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta Basin"

Training of Volta Basin actors on impact-based flood forecasting and the Integrated Bulletin in the MyDewetra-VOLTALARM Platform

From June 12 to 16, 2023 in Abidjan

Workshop report

Project implementing partners

WORLD METEOROLOGICAL ORGANIZATION

AUTORITE DU BASSIN DE LA VOLTA — VBA — VOLTA BASIN AUTHORITY

Global Water Partnership West Africa

With the technical support of:

cima RESEARCH FOUNDATION

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1. Introduction

On June 12th, 13 th, 14 th, 15 th and 16 th, 2023, the regional training workshop for actors in the Volta Basin on impact-based flood forecasting and the Bulletin integrated into the myDewetra-VOLTALARM Platform was held at the Hotel Les Résidences M'Maya in Abidjan.

The workshop is organized within the framework of the VFDM Project: “Integrating Flood and Drought Management and Early Warning for Climate Change Adaptation in the Volta Basin”, implemented by the consortium of partners including the World Meteorological Organization (WMO), the Regional Water Partnership West Africa (GWP-WA), the Volta Basin Authority (VBA) and funded by the Adaptation Fund.

This workshop recorded the participation of representatives of the Volta Basin Authority, the World Meteorological Organization (WMO), the Executive Secretariat of the Global Water Partnership in West Africa (GWP-WA), representatives of national hydrological and meteorological services, Civil Protection agencies, regional institutions (ECOWAS, AGRHYMET, WASCAL) and CIMA Research Foundation, technical partner of the workshop (Cf. Attendance list in appendix).

2. Day 1

1.1. Opening ceremony

The opening ceremony was chaired by the Representative of the Minister of Water and Forests of Cote D'Ivoire (GD Forest and Wildlife) and was punctuated by the following interventions:

- The Director of Hydraulic Development of Côte d'Ivoire (Coordinator of the National Focal Structure of the VBA in Côte d'Ivoire):

  He welcomed the participants and expressed his joy at seeing this regional workshop take place in Abidjan, Côte d'Ivoire. He mentioned the context of this training on the VOLTALARM MyDewetra, which is part of the Project "Integrating flood and drought management and early warning for adaptation to climate change in the Volta Basin ".

- The Representative of CIMA Foundation, Mrs. Anna Mapelli, welcomed the participants and urged them to participate actively in the training and in the practical exercises on the impact-based flood forecasting integrated into the MyDewetra-VoltAlarm platform.

- The Representative of the World Meteorological Organization, Mr. Ramesh Tripathi, greeted the participants and affirmed that Mydewetra-Voltalarm is an early warning system for floods and drought, one of the flagship results of the VFDM project which is financed by the Adaptation Fund

- The Executive Secretary of the Global Water Partnership (GWP-WA) Mr. Armand HOUANYE, welcomed the participants and urged them to be diligent and to participate

effectively in order to make this tool a support for decision on actions to be taken in case of floods and droughts.

- The Executive Director of the VBA Mr. Robert DESSOUASSI, after recalling the conclusions and recommendations of the regional workshop which took place in Lomé from January 25th to 27th, 2023, indicated his wish to see that they were taken into account for this workshop. He greeted the participants and welcomed them to this training workshop, from which he expected many satisfactory results in terms of getting started with the MyDewetra-VoltAlarm tool.
- The Representative of the Minister of Waters and Forests of Côte d'Ivoire, presiding over the opening ceremony, - at the start of his speech - welcomed the various participants and expressed the encouragement of the Minister of Waters and Forests who would have liked to be there but he was prevented for reasons related to the reception of the Congolese President on a friendly visit to Abidjan. He then set the context of the workshop, its importance in a context of climate change with adverse effects on people and nature.

Photo at the opening of the workshop

After the various speeches, a round of introductions was held. A family photo was then taken to immortalise the event.

Family photo

For the coordination of exchanges and group works, a presidium has been set up, composed as follows:

- President (RCI): Dr KOUASSI KOUAME Auguste;
- 1st Vice-President (RCI): Ahmed Lamine SOUMAHORO
- Rapporteurs:
  - ✓ Togo: Mr. A. Akim KEFIA DAROU
  - ✓ Burkina Faso: Mr. Rayimwendé ZOUNGRANA;
  - ✓ Mali: Mr. Adama MARIKO

1.2. Session 0: Presentation of the workshop

This working session was marked by:

- **The presentation and validation of the NC and the Agenda:**

  M NIAMPA Boukary dwelled on the context, objectives, expected results and methodology of the workshop before submitting the workshop agenda for validation by the participants.

- **A reminder of the main conclusions of the previous workshop of January 25-27, 2023 in Lomé** was made by Mrs. Anna Mapelli. These are the following:
  - ✓ **R01** CIMA Foundation**:** Take the necessary steps to make a first hydrological model available in June 2023;

- ✓ **R02** Consortium**:** Discuss with the Adaptation Fund for an agreement, in order to install new stations instead of rehabilitations (request from States) while promoting national skills;
- ✓ **R03** the Actors: Consider other sources of funding for the maintenance and future development of the myDewetra-VOLTALARM platform at the end of the project in 2024;
- ✓ **R04** CIMA Foundation: Consider, with the VBA, the possibility of reducing the number of workshops planned for 2023 from four to two, with longer durations to allow technicians to better master the tool;
- ✓ **R05** States and VBA: Harmonize the types of hydrometeorological stations (equipment) in the area of the Volta Basin for better operation and maintenance of equipment by technicians;
- ✓ **R06** CIMA Foundation: Establish a detailed roadmap for the implementation of the remaining activities under the project;
- ✓ **R07** Technical structures of the States: Make available to CIMA Foundation the georeferenced information available to improve the impact assessment;
- ✓ **R08** VFDM/ WMO: Support the development of the WRF model in Ghana for weather forecasting and to possibly serve as input data for the hydrological model;
- ✓ **R09:** The members of the consortium must consult each other to identify the financial resources and choose the equipment to be acquired.

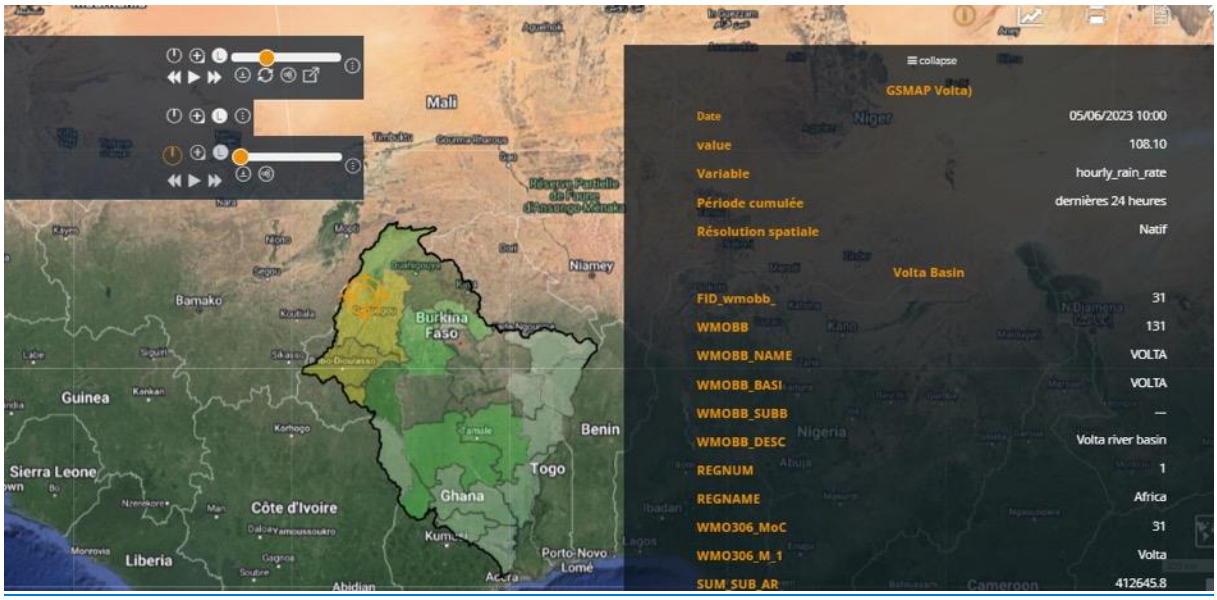
- **The presentation was followed by questions and answers on the recommendations and some advices, namely:**
  - Ensure that the level of implementation of the recommendations is raised, some of which are ongoing and others which will be implemented as part of the project's ongoing activities.
  - In relation to the installation of the new 14 hydrological stations:
    - ✓ Settle the issue related to the maintenance of the stations after the project;
    - ✓ How to link the different stations into a single system?
    - ✓ **Proposal for sustainable management:** the VBA and the States must jointly draw up a management plan for the 14 stations;
    - ✓ **Advice on purchase and installation by Mr. SALACK from WASCAL:**
      - Make sure of the Warranty (number of years);
      - Involve the participation of the technicians of the countries with the provider for the installation;
      - Request the availability of technical documents as well as spare parts at a better price.

- ✓ **Agrhymet advice:** Expertise in the installation of hydrological stations; pay attention that the data is generally stored only in the FTP of the manufacturer;
- ✓ **Ms FOFANA:** The type of station is as important as the provider's warranty;
- ✓ Accessibility to data by the VBA and the countries must be a reality.

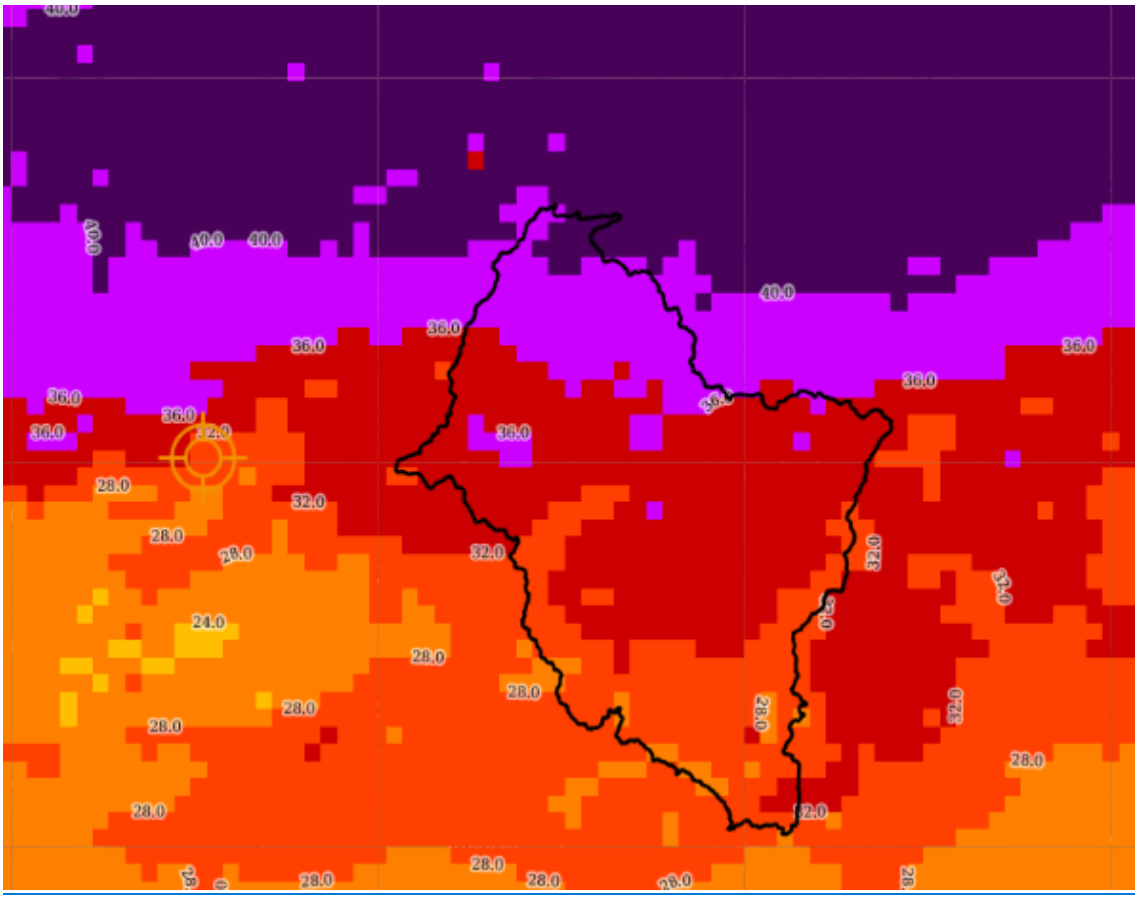
1.3. Session 1: Hydrometeorological monitoring and forecasting in VOLTALARM

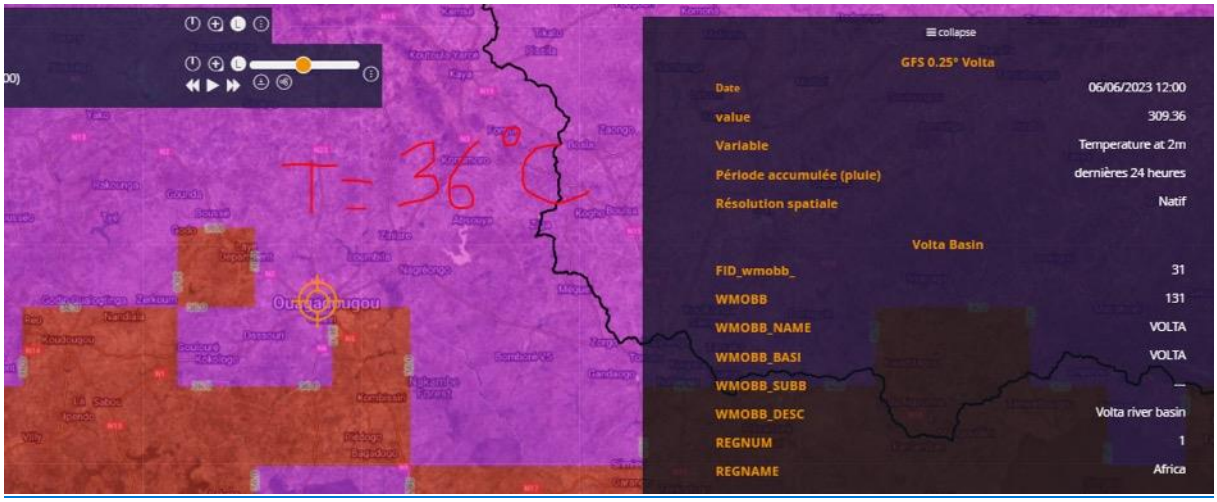
The session began with a technical presentation of the Mydewettra-VoltAlarm platform and followed by practical exercises:

- **Practical exercise 1:** Display of GSMAP VOLTA satellite data within the administrative limits of the Volta Basin for a cumulative rainfall on the last 24 hours by setting the system calendar from 04 to 5 June 2023. The following results were obtained:

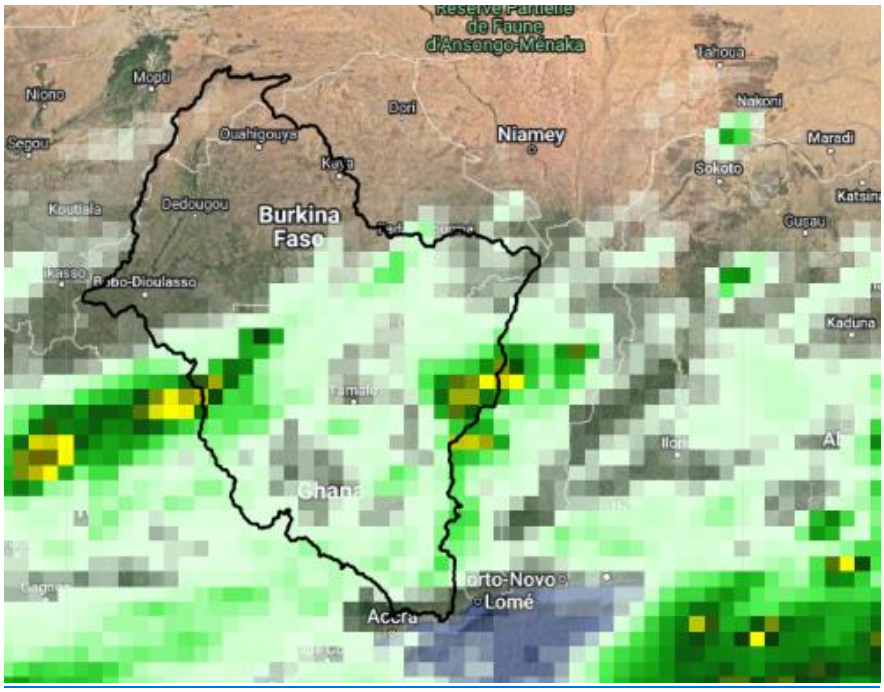


- **Practical exercise 2:** Temperature assessment (à Ouagadougou) at 2 m for June 06 at 12:00 p.m. with the GFS 0.25 VOLTA weather forecasting model with the system calendar set from June 04 to 5, 2023. The following results were obtained:

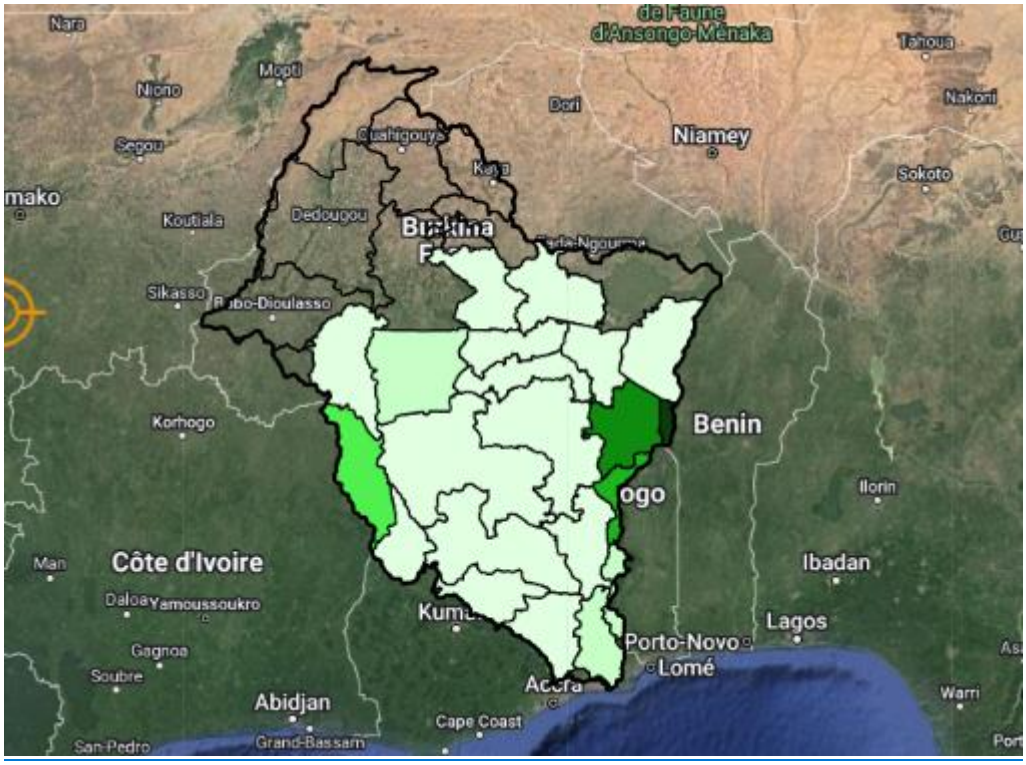




- **Practical exercise 3:** Cumulative rainfall forecast in 24 hours for the day of June 06 at 12:00 p.m. with the GFS 0.25 VOLTA weather forecasting model, setting the system calendar from June 04 to 5, 2023. The following results were obtained:



Result with spatial aggregation according to administrative boundaries



The question of the aggregation of rainfall at the level of administrative boundaries and sub-basins with more detailed resolution was raised. However, the value per pixel provided by the model could overcome the need for information at a very localized scale. A proposal to use the limited area models WRF UK has been made. Volunteers took it in turns to present the results of the various exercises.

1.4. Session 2: Flood forecast chain (FloodPROOFS) in VOLTALARM

CIMA foundation gave a presentation on the flood forecast chain (FloodPROOFS) in VOLTALARM based on the Continuum hydrological model:

Presentation of the different input data:

- ✓ Observation from the IMERG satellite product,
- ✓ weather forecast model

Presentation of the key elements taken into account in the hydro Continuum model (outputs available every morning at 7:00 UTC):

- ✓ Digital terrain model
- ✓ Soil characteristics for processing the infiltration
- ✓ Forcing meteorological data (ERA5 Clim model and GFS for forecasting, IMERG satellite data for observations)
- ✓ calibration
- ✓ OUTPUT: it provides a hydrograph for the reporting points already fixed on the modeled network

Conclusions in relation to possible future improvements of the operational hydrological forecasting chain implemented, based on the Continuum model:

- ✓ Possibility to add other reporting points on the modeled network according to the needs of the stakeholders
- ✓ IMERG data can be corrected with rain gauge measurements if meteorological authorities will provide real-time access to rain gauge data to CIMA Foundation
- ✓ Daily model status updates with real-time gauge measurements are possible, if national hydrological authorities will provide access to real-time hydrological data to the CIMA Foundation
- ✓ Integration of other input weather data (e.g. WRF model) when and if available

Appreciation, comprehension questions, suggestions from the ED of the VBA:

- ✓ Progress and improvement noted
- ✓ Is it possible to add new reporting points?
- ✓ Set up a sheet for a practical forecasting exercise with the Continuum model from start to end

Comprehension questions on technical aspects of the model

- ✓ Processing of boundary conditions with station data at the basin boundary;
- ✓ Is the model calibration over a period of 04 years sufficient?
- ✓ The calibration period must be different from the validation period;
- ✓ Question about thresholds and their identification

- ✓ The choice of dams
- ✓ Focus on rainfall simulation instead of low flow conditions

Answers to questions

- ✓ It will always be possible to add new reporting points according to the interest of the stakeholders
- ✓ Exercises using the FloodPROOFs flood prediction chain from start to end are already planned during the workshop
- ✓ Boundary conditions have been taken into account in the analysis of weather input data
- ✓ For the model calibration, the period with more data uniformity and completeness of the hydro stations provided by the stakeholders was taken into consideration
- ✓ During validation, for most of the points corresponding to the stations (for which data had been provided), the calibration period was excluded. Unfortunately, for some stations with series of observations that were too short, it was not possible to carry out this operation, and an indicative value over the entire available period was considered.
- ✓ The threshold values have been identified from the statistical analysis of the calibrated execution of the model in the historical period and the model integrates in the modeling also the most important dams present in the Volta basin.
- ✓ If there is real-time weather and hydro data available, it can be integrated into the model

1 Day 2

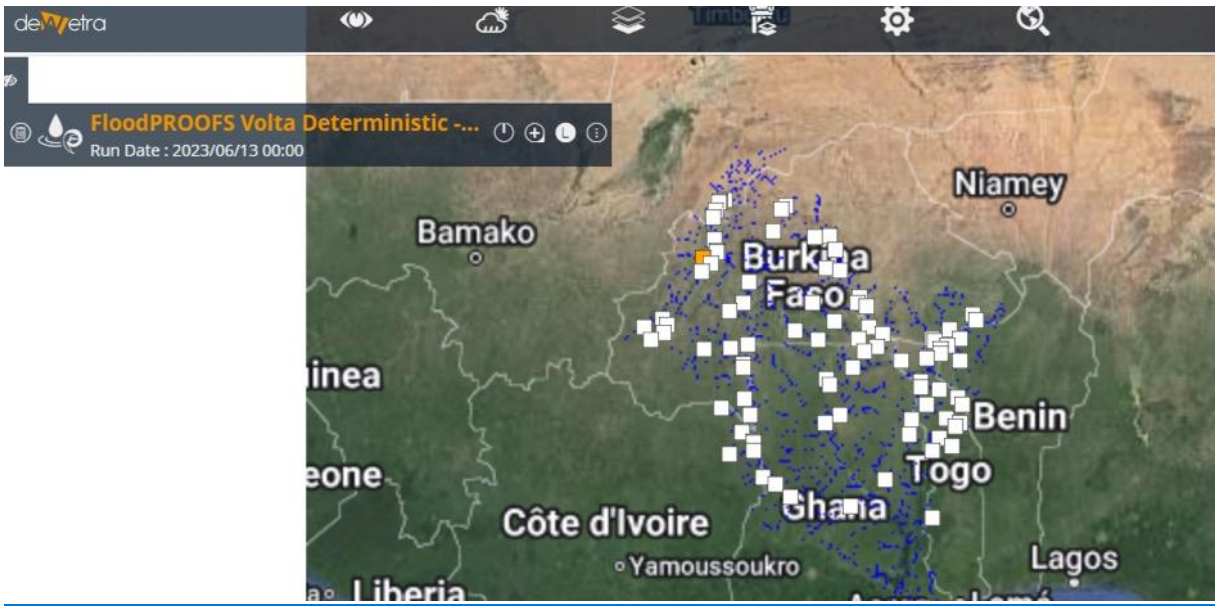
The second day began with the reading, amendment and validation of the Day 1 Report. This was followed by presentation sessions, practical work and discussions.

1.1 Resume session 2: practical exercise on the use of the FloodPROOFS system

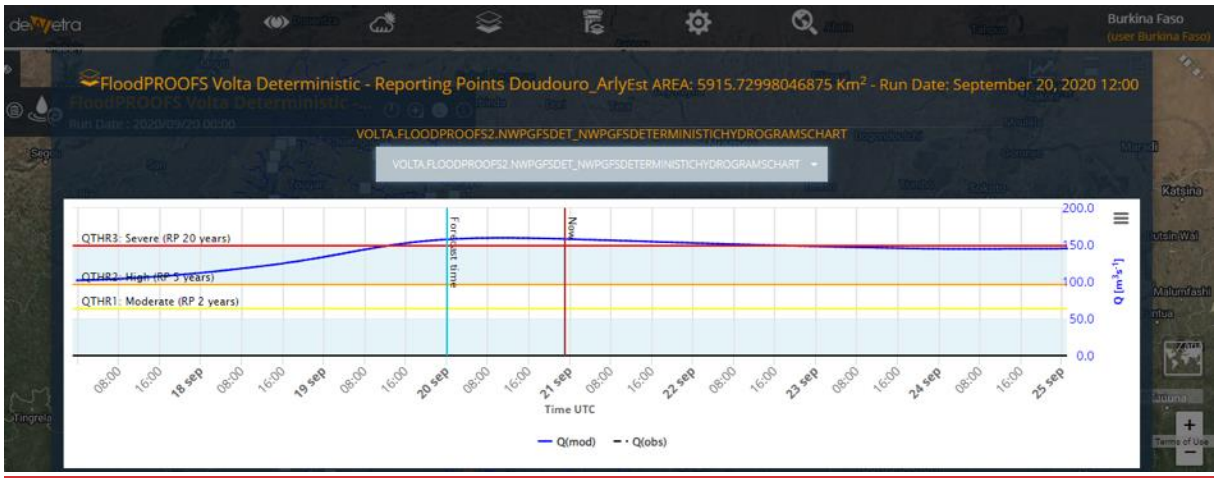
A summary of session 2 concerning the FloodPROOOFS flood forecasting system was made, with practical work to make participants familiarize with the various products.

Below are some illustrations of the results of the practical work which focused on the use of the FloodPROOFS system, designed by CIMA Foundation and allowing hydrological modeling at the scale of the Volta Basin.

First the participants were able to consult the product “FloodPROOFS Volta Deterministic – Reporting Points”.



By clicking on the different reporting points, it is possible to display the local hydrograph: the color of the points changes according to the severity of the floods (exceedance of the flow threshold values identified with statistical analyses).



The trainers indicated that the model is updated every day at 7 a.m.

A few comprehension questions were asked after this practical session followed by some extra comments:

- How is the Model performing?
- What interpretation is possible to make regarding the hydrograph produced by the model?
- Is it possible to know the water level and the flooded surface from the model?

Some suggestions were made:

- Avoid putting the observed data on the platforms because other unauthorized users may appropriate this data;
- Technicians can evaluate the model by making the comparison (proportion) between the values of the forecasts and the in-situ observations.

Answers to questions

- ✓ The results of the calibration and the general performance of the model were presented again based on the presentation made on day 1
- ✓ The model outputs enable to assess the evolution of the hourly flow over the horizon over the next 5 days for each reporting point, as well as whether threshold values are expected to be exceeded in the rest of the modelled network. The representation of the potentially flooded areas is made by coupling the results of the hydrological model with the results of a 2D hydraulic model. The corresponding product will be presented in the following session.

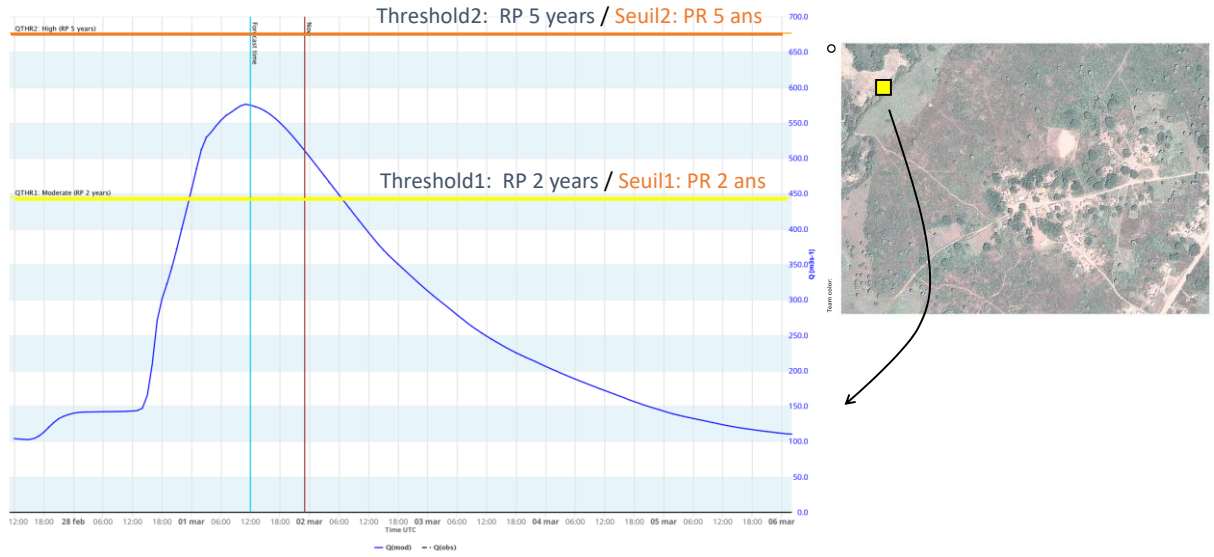
1.2 Session 4: Risk component and impact assessment for floods

A presentation was made by CIMA Research Foundation followed by comprehension questions and practical work.

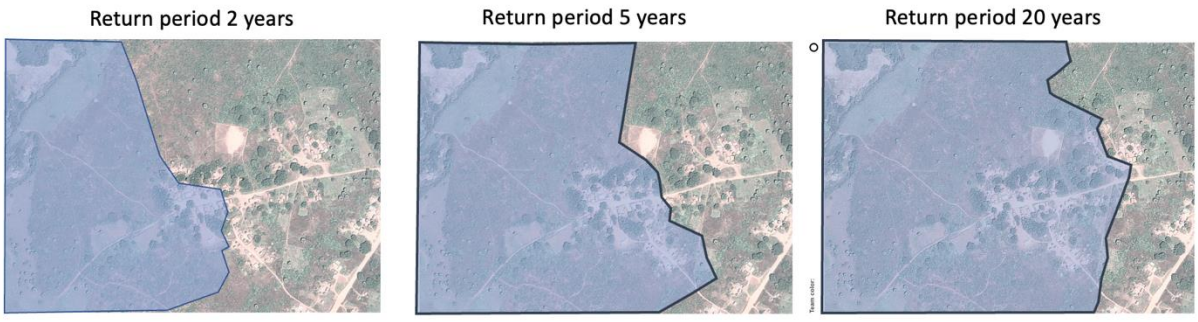
The presentation and practical work had the objective of taking up the key components of risk assessment (hazard, stock, exposure, vulnerability) to enable participants to understand and take ownership of the real-time impact assessment methodology implemented for the impact-based flood forecasting system.

Below are presented some results of the practical work of the exercise, designed expressly for the didactic purposes of this session with certain simplifications.

First the flood hazard conditions are assessed for a specific area with a reporting point of the hydrological forecast product FloodPROOFs: through the reporting points data it is possible to know if a certain threshold value (associated with a return period) is expected to be exceeded for the corresponding hydrograph within the next 5 days.

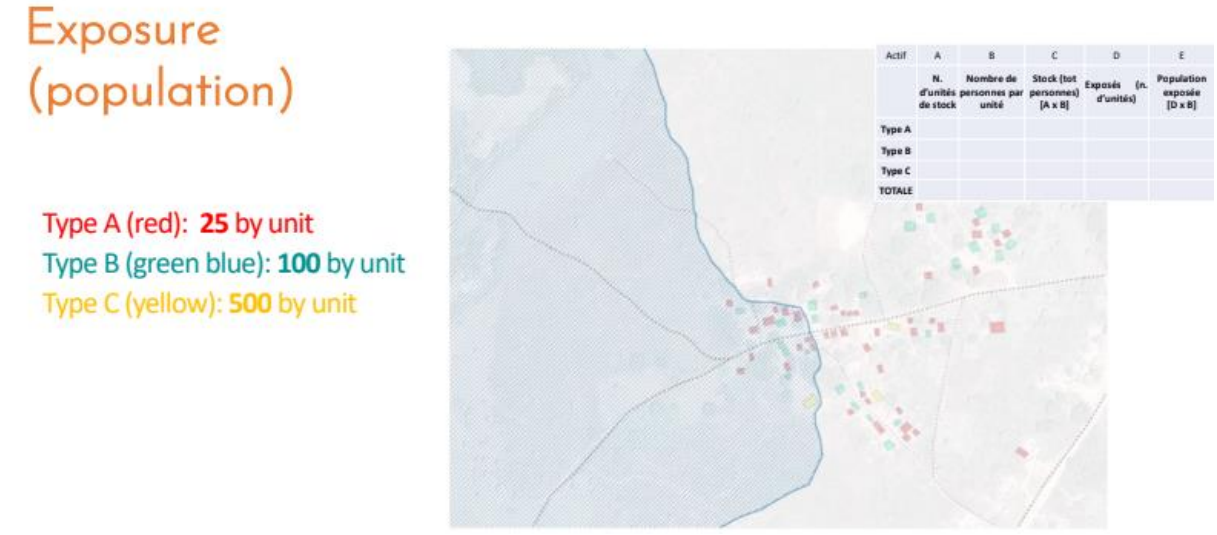


The participants were then able to associate a map of potentially flooded areas based on the return period of the threshold value exceeded according to the forecasts.



Once clearly identified the flood hazard scenario for the area of interest (e.g. 2 years return period), participants could assess the amount of population exposed to potential flood

conditions. Due to the didactic objective of the exercise, it was assumed that the buildings in the area could be grouped into three typologies, each with a fixed number of people inside.



Asset	A	B	C	D	E
RP = 2 years	No. of stock units	Number of people per unit	Stock (all people) [A*B]	Exposure (n.units)	Population Exposed (D*B)
Type A	46	25	1150	12	300
Type B	15	100	2400	6	600
Type-C	2	500	1500	1	500
TOTAL			5050		**1400**

Once the population exposed in the area of interest has been estimated, the components of vulnerability and coping capacity, together with the assumptions made to take them into consideration, have been presented:

- Vulnerability describes the degree of potential loss associated with a certain level of hazard. In the case of impact-based forecasts a vulnerability index is identified in relation to the return period of the flood hazard and it's applied as a multiplication factor to the exposed population to identify the quantity of people potentially affected (see column G in the following table)
- The coping capacity is taken into consideration as an average value among the values of the 6 countries of the Volta Basin according to the assessment of the INFORM project (https://drmkc.jrc.ec.europa.eu/inform-index). The INFORM project proposes values between 0 and 10 of lack of copingcapacity for each country in the world; the average value of this index for the 6 countries of the Volta Basin is divided by 10 and used as a multiplication factor to estimate the quantity of impacted population in absolute (column I) and relative (column L) terms (compared to the total population of the area).

Total stock (pers)	Total exposed value	F Vulnerability index	G Potentially affected people	H Lack of coping capacity	I Impacted population (absolute)	I Percentage of impacted population (%)
5050	3300	0.2	660	0.65	429	8.5

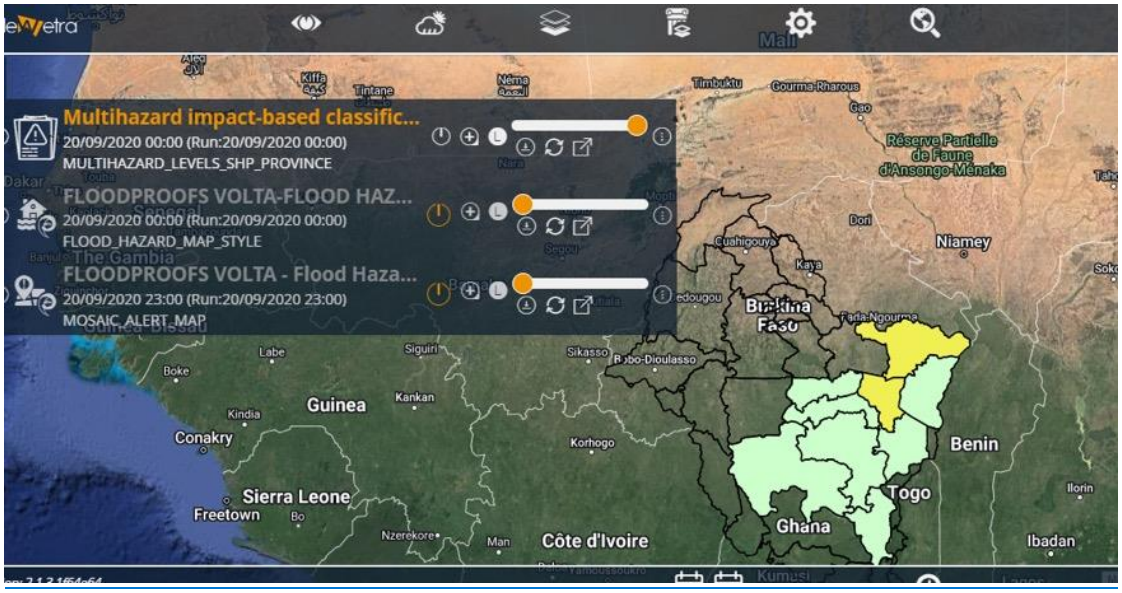
1.3 Session 3 and Session 5: impact-based extreme rainfall and flood forecasting

The CIMA Research Foundation recalled some elements concerning the impact-based forecasting of extreme precipitation, which had been the subject of the previous regional workshop held in Lomé from January 25 to 27, 2023. This was made to allow participants to be able to use the corresponding products during the following practical work.

Then, a presentation on impact-based flood forecasting was made by the CIMA Foundation, followed by comprehension questions and practical work. Volunteers have been appointed to correct the exercises.

The assessment of the potential impact related to the forecast of extreme rainfall and flood conditions is carried out with automatic routines which, on a daily basis, put in practice the methodology described in session 4 over the entire extent of the Volta Basin, based on hydrometeorological forecasts. Population impact results are presented in the myDewetra-VOLTALARM system through the "Multi-hazard impact based classification Volta" layer. The impact is estimated aggregated by administrative region in terms of the relative value of potentially impacted population (percentage of the total population of the administrative unit) and classified into 4 impact classes through threshold values.

Below is an example of the results of the practical work concerning the exploitation of the product "Multi-hazard impact based classification Volta" for a past event.



Some questions were asked:

- Who will manage the system at the end of the project?

- How to put on the platform the data of the new stations that will be installed in the Volta Basin?

Some suggestions were made answering to the questions:

- the myDewetraWorld system, which is the central engine of the VOLTALARM platform, will be managed and maintained through a partnership agreement between the VBA, the CIMA Foundation and the Italian Civil Protection. The platform server is planned to be migrated to a cloud service;
- A platform user guide should be made available to stakeholders;
- Data from the new hydrological stations that will be installed in the Volta Basin can be easily viewed in the myDewetra-VOLTALARM platform if they are integrated into the centralized MCH databases that WMO is installing in each country;
- A comparison of NBA and VBA tools shows a need to provide the VBA with tools capable of providing relevant information to the authorities.

1.4 Session 6: Introduction to drought monitoring

The objective of this presentation was to give an overview of the different products being developed for drought monitoring. The session was therefore devoted to:

- **Types of droughts:**
  - Meteorological Drought,
  - Agricultural drought,
  - Hydrological drought
- **Analysis of the drought hazard**
- **Standardized indices for drought monitoring:**

  the most challenging work is the identification of drought intensity thresholds to be linked, if possible, with the impacts observed on the exposed elements;
- **The methodology and the different drought products being developed for drought monitoring in the Volta:**

  The methodology taken into consideration provides for the identification of a combined indicator, which takes into account the conditions of meteorological drought (through the standardized indicator SPEI) and hydrological drought (standardized indicator SSMI).

2 Day 3

The third day started with the reading, amendments and validation of the Day 2 Report.

This was followed by questions that focused on Session 6 on the introduction to drought monitoring, namely:

- When will the drought monitoring product be available and operational?

- Can we agree on the analysis indices to be used for testing and monitoring the drought product?

Satisfactory answers to these questions were provided by the participants.

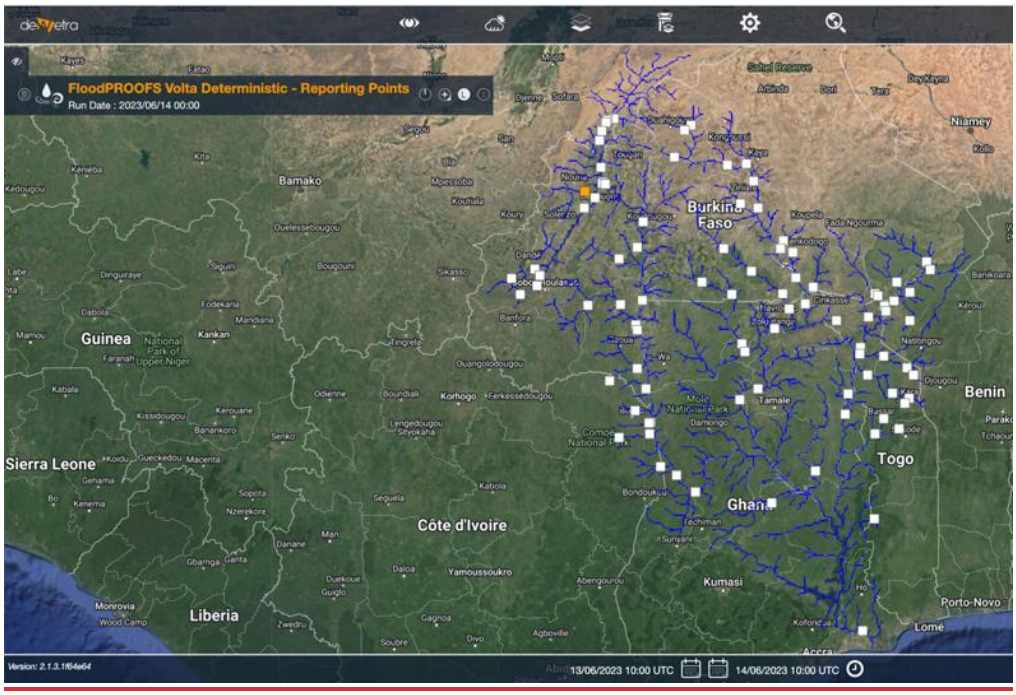
The main sessions of the day focused on the practical real-time use of the various operational products integrated into myDewetra-VOLTALARM for impact-based flood forecasting.

2.1 Resume Session 5: Practical use case of impact-based flood forecasting products

➢ **Operational uses of the FloodsPROOFS-Voltalarm product: practical case**

This presentation was made by Mrs. Anna Mapelli from CIMA Foundation, who indicated that all exercises should be done in real time using the daily outputs of the different impact-based flood forecasting products. The process is described as follows:

- ***Open FORECAST > Hydrological Model > FloodProofs Volta Reporting Points***



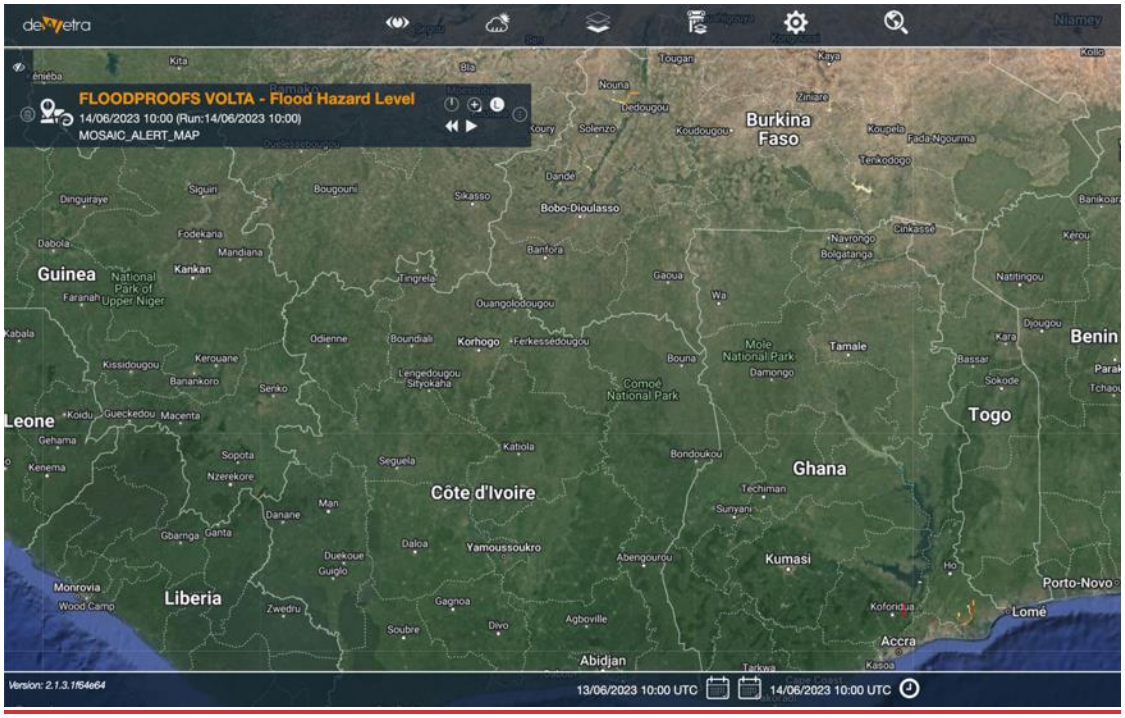
  - What is the name of the reporting point that is expected to reach the highest flood level? In which river basin? What is the predicted behaviour of the river flow in the section? Is it expected to increase or decrease?

Name	Watershed	Behaviour
Bourassou, Boucle of Mouhoun	Mouhoun (Volta)	Hydrograph reaches the orange level and the trend is decreasing

- Consider the reporting point located near the town of "Ouessa", on the border between Ghana and Burkina Faso. What is the name of this point? When is the flood peak expected? What will be the value of the peak?

Name	Hour of the peak	Peak value
Ouessa Bridge	06/15/2023 at 05:00	441.05 m3/s

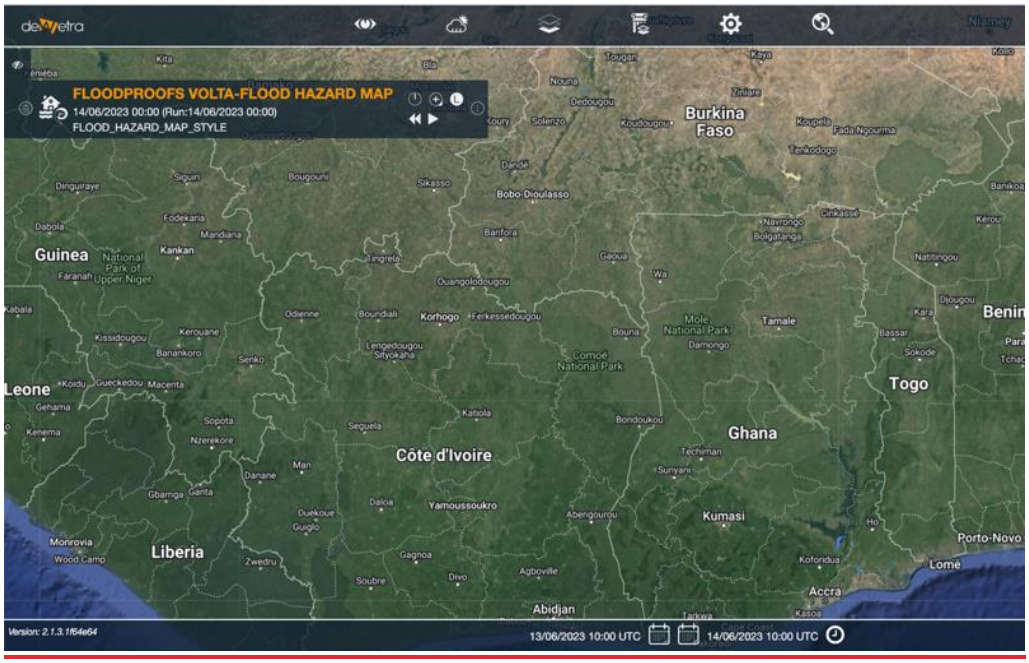
- ***Open FORECAST > HAZARD > FloodProofs Volta Flood Hazard Level***



- Besides the stretch of river we analyzed earlier, are there any other rivers above the red level? What region are they in?

Answer: Southern Ghana

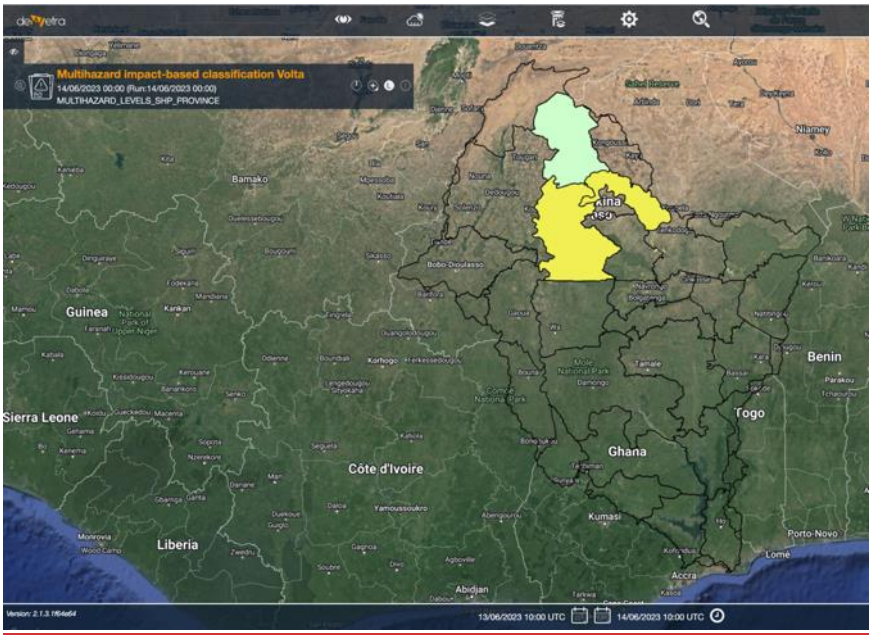
- ***Open FORECAST > HAZARD > FloodProofs Volta Flood Hazard Map***



  - According to the flood forecast, is the city of "Oterkpalu, Ghana" expected to be affected by floods? What about the city of "Bourasso, Burkina Faso"?

City	**Affected (Yes/No/Partially)**
Oterkpalu	Partially affected
Bourasso	Not affected

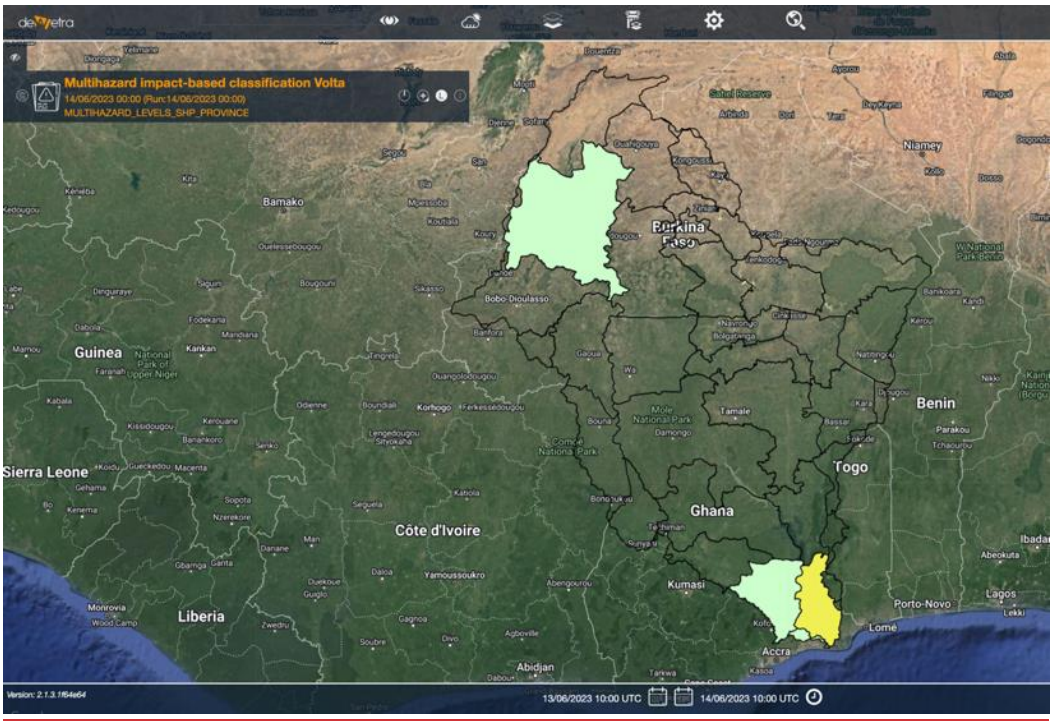
- ***Open FORECAST > IMPACTS > Multi-hazard Impact Based Classification Volta***
  - Consider the RAIN classification



Which regions are potentially most affected by heavy rains in the next five days? What is the total number of people potentially affected by heavy rains in these areas?

Region and country	**Level (green-yellow-orange-red)**	**Number of people potentially affected**
Koudougou (Burkina Faso)	Yellow	6362
Ouagadougou (Burkina Faso)	Yellow	1830

◦ Consider the FLOOD classification.



Which regions are potentially most affected by floods in the next five days? What is the total number of people potentially affected by floods in these areas?

Region and country	**Level (green-yellow-orange-red)**	**Number of people potentially affected**
Volta (Ghana)	Yellow	562

Clarifying questions were asked, namely:

- What is the date of the population census used on the platform?
- Does the platform take into account the demographic growth of the countries?

Satisfactory answers were given.

2.2 Session 5 - bis: Impact-based flood forecasting products at the sectoral level

Following these exercises, other impact-based flood forecasting products for different sectors, made available on the platform, were presented; namely :

- *Open FORECAST > IMPACTS:*

  >FLOODPROOFS VOLTA-AFFECTED CROP: for impact-based flood forecast results on agricultural areas

  > FLOODPROOFS VOLTA-AFFECTED GRAZING LAND: for impact-based flood forecast results on grazing areas

  > FLOODPROOFS VOLTA-AFFECTED PROTECTED AREAS: for impact-based flood forecast results on protected areas

  > FLOODPROOFS VOLTA-AFFECTED ROADS: for impact-based flood forecast results on road networks

2.3 Session 7: Early warning and bulletins

This presentation was made by Mr Nicola Testa of CIMA Foundation. The points covered include:

- ✓ Introduction: 4 pillars for EWS;
- ✓ Advice for a successful warning (coordination of all stakeholders);
- ✓ Key principles:
  - Codification of warning levels;
  - Exploitation of the bulletin for a rapid and coordinated response among the actors involved (meteo, hydro, civil protection)
- ✓ Sharing the current warning procedure existing at national level
- ✓ Amendment of the format of the bulletin and sharing of experience in EWS.

Each country made suggestions for amendments to the format of the bulletin:

MALI:

- Add on the Bulletin, a page for the analysis of food-EWS;
- Correct the name of MALI-METEO and put it all in capitals.

BENIN:

The bulletin does not meet expectations:

- The bulletin information is not accurate;

- The affected population does not appear on the bulletin;
- The hazard type is not defined;
- The white color is not defined in the legend.

BURKINA FASO:

- The date of production of the bulletin is not specified;
- Acronyms and abbreviations are not defined;
- No comments and advisories on the Bulletin;
- The white color is not defined in the legend.

COTE D'IVOIRE :

- The date of realization of the bulletin is not specified;
- The white color is not defined in the legend.

TOGO:

- The date of production of the bulletin is not specified;
- Correct the name of the Togo meteorological service into ANAMET
- Detail the data acquisition method.

GHANA:

- Correct the validity period on the bulletin (5 days)
- Put on the bulletin a hydrograph on the hydrological situation in order to see the trend;
- Put on the bulletin the hydrographic network of the basin;
- The white color is not defined in the legend;
- Specify the scale of expected rainfall;
- Set up a feedback mechanism for the impact of the bulletin.

VBA:

- Specify the regions and localities impacted on the Bulletin;
- Detail the information on the bulletin.

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- Put on the bulletin the context of the bulletin elaboration;
- Put on the bulletin the comments and advisories.

WASCAL:

- Do the colors proposed on the bulletin allow civil protection agencies to issue and raise the warning?

- With the current configuration of the bulletin is it possible to see the impact level or the hazard level?

GWP-WA:

- Specify the type of risk on the bulletin;
- Enhance the warning bulletin by adding impacts, affected populations, flooded area, affected roads, protected areas affected;
- Include in the bulletin the information on thresholds that have been exceeded in each country;
- Give instructions to the populations on the level of risk.

ECOWAS:

- Highlight on the bulletin the names of the localities affected;

Executive Director-VBA:

- Have the maximum of pages for the bulletin;
- Facilitate the understanding of the bulletin for users;
- Agree on the frequency of the bulletin issuance;
- Highlight the parameters on the bulletin (hydro-meteo indicators): current situation, evolution compared to the warning thresholds, trends, propagation time of the flood wave, localities affected;
- Put the bulletin in word format to facilitate its modification.

Frank and constructive exchanges made it possible to clarify the points of divergence.

Following the discussions, it was agreed to:

- Develop a bulletin in the format and frequency proposed by the CIMA foundation (frequency to be defined);
- Think about developing a more flexible format that can also be used with a variable frequency, which depends on the evolution of the situation of the hazard severity.

The activities for the rest of the day focused on the practical handling of the Bulletin tool on the platform, user names and passwords were personalized and given to the hydro-meteo services of each country.

3 Day 4

Before starting the session of the fourth day, the report of the third day was presented and amended.

This was followed by discussions on the two types of bulletin proposed. After the discussions, it was agreed to:

- Maintain the bulletin format available on the myDewetra-VOLTALARM platform;
- Define the frequency of production of this information bulletin;
- Think about a proposal for a warning bulletin in a word format to be issued with variable frequency in the event of a critical evolution of the hazard, to be proposed to the countries;

Some questions also caught our attention, namely:

AGRHYMET: is there not a possibility of having a free format (for administrative formalities)?

To end this part, the ES of GWP-WA made us understand that at the end of this training we will not necessarily have a final format for the bulletin; it is a question of testing the product and having amendments and improvements to propose on the product made available by the CIMA Foundation in the myDewetra-VOLTALARM platform.

This was followed by a review of the recommendations, in which some points were corrected.

The day's work focused on a simulation exercise of the co-production and issue of the bulletin according to an inter-institutional procedure proposed at sub-regional level.

3.1 Session 9: Simulation of production and issuance of the Heavy Rain and Flood Bulletin: Practical case

This presentation was made by Ms. Anna Mapelli of CIMA Foundation and focused on:

- **The roles** of various actors in the production of the Bulletin, proposed as follows:
  - **The VBA:** Coordination; opening of the bulletin; General comment and information on water resources (especially at transboundary level); Closing of the bulletin; Dissemination of the bulletin to relevant national stakeholders.
  - **National meteorological agencies:** analysis and comments of weather conditions (precipitation) and impacts on its own national portion; Discussion with counterpart agencies of neighboring States Parties (if necessary for consistency).
  - **National hydrological agencies**: analysis and comments of hydrological conditions (floods) and impacts on its own national portion; Discussion with counterpart agencies of neighboring States Parties (if necessary for consistency).
- **The procedures to be followed for the production of the Bulletin:**
  - The VBA checks the availability of the data that will feed the bulletin ("MultiHazard impact-based classification Volta" layer);
  - The VBA is opening a new bulletin for the benefit of the various national meteo and hydro agencies;
  - The analysis of the different products available is carried out by the national meteo and hydro agencies;
  - Each hydrological and meteorological agency writes comments in relation to its national portion and its field of competence (with the possibility of visualizing the whole Bulletin outline on the platform);

- Harmonization can be made between the Meteo and Hydro structures thanks to the functionality of the platform which makes it possible to see in real time the contributions to the bulletin of the other stakeholders;
- Each structure validates its contribution to the bulletin;
- The VBA will proceed to a synthesis and publication of the final bulletin to be sent automatically via email through the platform.

It should be remembered that a deadline is given to the countries to react for the production of the Bulletin.

Following this practical phase, observations were made on the Bulletin, followed by general comments:

- The level of administrative division proposed does not make it possible to specify the localities impacted by the hazard;

- The socio-political reality changes a lot in our countries therefore a dynamic management of local shapefiles is necessary to take into account future changes;

- It is necessary to allow the access to the visualization aspect of the Bulletin product in the platform for the recipient institutions (civil protection, and other partners);

- **It was recalled that the color code refers to the levels of impact on the population and not to the level of hazard**;

- Compare the outputs of Mydewetra-VOLTALARM products with other forecast products such as FANFAR for example;

- Define a procedure for modifying the Bulletin;

The participants then discussed the distribution and dissemination of the Bulletin:

- The Information Bulletin will be sent by email to the countries and to all Hydro, Meteo and Civil Protection actors;

- The warning bulletin will be sent to the national focal structures for sharing through the procedures and channels already existing in the countries and for the activation of the existing decision-making mechanisms;

Ghana presented to the participants its own product for impact-based forecast (Weather Forecast Risk system) and the related bulletin to provide a reference of the impact legend used.

Discussions were also made on the colors to put definitively on the bulletin, it was agreed as follows:

- Green color: no impact, Pop_impacted=0

- Yellow color: low impact;

- Orange color: medium impact;

- Red color: high impact.

4 Day 5

On the fifth day of the workshop, the report of the fourth day was presented and amended by the participants.

4.1 Session 10: Results simulation exercise of the realization and issue of the bulletin

Each civil protection actor from the 06 countries gave his own assessment of the bulletin issued through the MyDewetra platform during the practical session on day 4.

- BENIN: Yellow level allows monitoring to be activated and the warning is triggered in the event of a red level. Information is disseminated to local authorities.
- TOGO: We suggest highlighting on the bulletin the numbers of flooded populations, roads, and buildings for an operational response.
- GHANA: Will there be a simulation exercise to know how the exercise will be done exactly? Can we have an idea of the work and useful information to be possibly integrated into the bulletin?
- COTE D'IVOIRE: We work with partners SODEXAM, CHU located in the Basin.
- BURKINA FASO: The information contained in this bulletin allows us to issue a warning from the red level. It could be useful to include information on access roads affected and number of affected populations.
- MALI: Change the name of MALI-METEO; Add a page for food-EWS analysis.
- ECOWAS: Include data on infrastructure, roads, occupation data.

After the discussions, it was agreed that:

- The warning bulletin is drawn up every Tuesday and Friday;
- The deadline for writing by the national meteo and hydro agencies is set at 12 (noon);
- a WhatsApp group could be created for the exchange mechanism between stakeholders;
- The period of validity is fixed at 5 days;
- If there is no foreseen risk, national structures can do nothing;

During this session, the process of designating focal points was also discussed, which will then be formally proposed by the VBA to the line ministries in each country.

4.2 Session 11: Next Steps/ Roadmap

- First bulletin issue: June 19-23, 2023
- Adjustments to bulletin format: June 19-30, 2023
- Intermediate technical follow-up online session: July 17-21, 2023

- Integration of data from local stations for visualization in VOLTALARM: July-September 2023 (linked to the operationalization of the MCH in the countries);
- Intermediate online drought monitoring meeting: September 2023

4.3 Session 12 VFDM project update and next steps

The project has three components; upcoming activities include:

- Finalization of the development of the flood an drought risk reduction and management strategy for the Volta Basin
- System testing
    - 7 pilot areas to test flood forecasting
    - 3 pilot sites for droughts

Link for project information: https://www.floodmanagement.info/volta-basin/

Also, certificates were symbolically presented to some of the participants, and then shared also with others.

4.4 Closing ceremony

All the officials wanted to thank the participants for their effort throughout this training and thanked also the trainers and the team who worked for all the logistics put in place within the framework of this workshop.

- Mr DESSOUSSI Robert, Executive Director of the VBA, was delighted with the workshop and the strong recommendations made to the VBA, the countries and the technicians. The workshop provided training on the myDewetra-VOLTALARM tool, which will undoubtedly provide a solution for warnings in the Volta Basin, especially thanks to the integration of more refined models with better resolution (compared with existing models) and a greater impact in the development and implementation of a warning bulletin in the Volta Basin.

- Dr. KOUASSI KOUAME Auguste, National Focal Structure of VBA Côte d'Ivoire representing the Minister of Water and Forests, took the floor to thank all the participants in turn, and also welcomed the choice of Côte d'Ivoire to host these joint workshops.

Finally, on behalf of Minister Dr. KOUASSI KOUAME declared the ceremony closed.

4.5 Conclusions and recommendations

After 5 days of work and reflection, the participants jointly drew up a test bulletin, and agreed on a bi-weekly bulletin (Tuesday and Friday). This bulletin is to be drawn up by the national hydrological and meteorological structures. The VBA is responsible for validating and publishing the bulletin.

At the end of the five days of work, the following recommendations were made:

Recommendation 01: It is proposed to CIMA Foundation to assess the feasibility of training administrators in the 6 countries of the Volta basin for the entry of observation data from new automatic stations into the myDewetra-VOLTALARM platform.

Recommendation 02: Feedback on the system from stakeholders at the next meeting (verification); plan for CIMA remote assistance, assess the possibility of setting up a regular exchange framework.

Recommendation 03: Drought monitoring test (compared to historical data) to be carried out based on monthly indicators;

Recommendation 04: Make available to CIMA foundation, the shapefiles of the hydrographic network of the countries with the name of the rivers;

Recommendation 05: Make available to the Ghanaian delegation, the documents for their translation into English before the holding of each session;

Recommendation 06: The Hydro and Meteorological Services of each country are asked to consult each other during the production of the bulletins;

Recommendation 07: It is asked to the Hydro services of the countries, to determine the warning thresholds of the stations in order to introduce them in the database of the platform.

5 Appendices

5.1 List of participants

N°	NOMS ET PRENOMS	STRUCTURE	PAYS	FONCTION	CONTACTS/MAIL
1	ROBERT YAOUVI DESSOUASSI	ABV	BURKINA FASO	DIRECTEUR EXECUTIF	robertdessouassi@gmail.com +226 77 71 97 97
2	KOKOU ARMAND HOUANYE	GWPAO	BURKINA FASO	SECRETAIRE EXECUTIF	armand.houanye@gwpao.org +226 70 20 03 23
3	ANNA MAPELLI	CIMA	ITALY	CHEF DE PROJET	anna.mapelli@cimafoundation.org
4	Dr. KOUASSI KOUAME AUGUSTE	MINEF	COTE D'IVOIRE	CORDINATEUR SFN	kouameauguste@yahoo.fr
5	FOFANA RAFATOU	ABV	BURKINA FASO	DIRECTRICE DE L'OBSERVATOIRE DU BASSIN DE LA VOLTA	rafatoufofana.abv@gmail.com +226 70 82 45 83
6	OUATTARA NAHOUA	MINEF	COTE D'IVOIRE	CHARGE DE COMMUNICATION DGRE	nahouaouattara754@gamil.com +225 07 49 23 23 31
7	OUATTARA PENIFANA AWA	MINEF	COTE D'IVOIRE	COMPTABLE SFN	ouattara.penifana79@gmail.com +225 07 48 04 05 51
8	ODI NEE DANDOU C. ZITA CLARISSE	MINEF / DPARE	COTE D'IVOIRE	ATTACHEE ADMINISTRATIVE	zita.dandou@yahoo.fr 07 07 10 57 73
9	DIALLO OUSMANE EPSE DJIGBO	MINEF / DPARE	COTE D'IVOIRE	ADJOINT ADMINISTRATIF	ousmydiallo94@gmail.com 07 77 92 09 18
10	SEU MALE EPSE DJAMA	MINEF / DPARE	COTE D'IVOIRE	AGENT	estherseu8@gmail.com +225 07 49 84 80 81
11	SAWADOGO WENDYAM LAZARE	ANAM	BURKINA FASO	DIRECTEUR	sawadogolazare@gmail.com +226 70 30 31 63
12	TRAORE IBRAHIMA	MALI-METEO	MALI	PREVISIONNISTE	ibrahimatraor7@gmail.com +223 70 71 71 95
13	MARIKO ADAMA	DIRECTION NATIONALE DE L'HYDRAULIQUE	MALI	CHEF SECTION EAU DE SURFACE	adamamariko111@gmail.com +223 74 52 64 62
14	HAMATAN MOHAMED	AGRHYMET	NIGER	EXPERT HYDROLOGUE	m.hamatan@yahoo.fr

N°	NOMS ET PRENOMS	STRUCTURE	PAYS	FONCTION	CONTACTS/MAIL
15	MAIGA KOLADO	DGPC (PROTECTION CIVILE)	MALI	PREVISIONNISTE (DGPC)	koladopompier1@gmail.com
16	ESSIS BOUAI PHILIPPINE	SODEXAM	COTE D'IVOIRE	STAGIAIRE	essisphilippine10@gmail.com
17	TEBLEKOU MAXIME	GWP-AO	BURKINA FASO	CHARGE DE PROGET	maxime.teblekou@gwpao.org
18	COLONEL ZONGO KOUDOUGOU ABEL	DGPC	BURKINA FASO	DPR	zabelius@yahoo.fr +226 75 12 28 68
19	OUEDRAOGO TAPSOBA CHRISTINE	DGRE	BURKINA FASO	DEIE	tctapsoba@yahoo.fr +226 70 40 23 06
20	ZOUNGRANA RAYIM WENDE	ANAM	BURKINA FASO	PREVISIONNISTE	rayimwendz@yahoo.com
21	FOFANA VAKABA	SODEXAM	COTE D'IVOIRE	PREVISIONNISTE	vakaba.fofana@sodexam.ci
22	BAZOUN JANVIER	PRAI-MFD-CEDEAO	GUINEE CONAKRY	EXPERT EN CHARGE DE L'ORRNC	bazdamou@gmail.com
23	AGBOTO ABLA	ANAMET	TOGO	PREVISIONNISTE METEO	ablaagb@yahoo.fr +228 91 97 56 41
24	KEFIA DAROU ABOUDOUL-AKIM	ANAMET	TOGO	GEOGRAPHE CLIMATOLOGUE	kefiaakimhamid5@gmail.com +228 91 81 19 29
25	SEYNI SALACK	WASCAL	BURKINA FASO	RTC / WASCAL	salack.s@wascal.org
26	AKAKPO YAKINI	ANPC / TOGO	TOGO	HYDROGEOLOGUE	yakini88@yahoo.fr +228 90 74 64 68
27	KONLANI GNINPALE	DRE /MEHV	TOGO	DIRECEUR	konlani2005@yahoo.fr
28	ETOH K. SALOMON	DRE /MEHV	TOGO	HYDROLOGUE	dzoh2001@yahoo.fr +228 90 24 87 25
29	CHARLOTTE NORMAN	NADMO	GHANA	DIRECTOR	charlottenorman72@yahoo.ie
30	ERIC MUALA	WRC	GHANA	PRINC. OFFICER	ericmuala25@gmail.com
31	RICHARD ABUGRI ABAARE	GHANA HYDRO AUTHORITY	GHANA	HYDROLOGIST	abaarerichard@yahoo.com
32	JOSHUA ASA MOAH	GHANA MET AGENCY	GHANA	METEOROLOGIST	joshuaasamoah19@gmail.com

N°	NOMS ET PRENOMS	STRUCTURE	PAYS	FONCTION	CONTACTS/MAIL
33	SYLVESTER DARKO	GHANA HYDRO AUTHORITY	GHANA	HYDROLOGIST	sylvester.darko@.gov.gh
34	VIGNON OLGA E. A	METEO-BENIN	BENIN	METEOROLOGUE	olgavignon@gmail.com
35	ANATO BORIS P.	METEO-BENIN	BENIN	DPROM	banato@meteobenin.bj
36	TOSSOU GILDAS	DG EAU	BENIN	C/SREPR	giltosfr@yahoo.fr
37	DOSSOU MARTIAL	DG EAU	BENIN	C/ SUEC	samumax@yahoo.fr
38	DAOUDA TRAORE	DNH	MALI	CHEF DIVISION	ddsspdnh@gmail.com +223 76 38 73 03
39	Mme FATOUMATA SANGHO	MALI-METEO	MALI	DIRECTRICE INFRASTRUCTURES ET PREVISIONS METEOROLOGIQUES	mdsangho80@gmail.com +223 76 07 43 99
40	SOUMAHORO AHMED LAMINE	SODEXAM (METEO-CI)	COTE D'IVOIRE	CHEF BUREAU HYDROMETEOROLOGUE	lamine.soumahoro@sodexam.ci +225 07 89 80 61 19
41	DENE SALIFOU	ABV	BURKINA FASO	EXPERT IT	dene.abv@gmail.com
42	BROU KOUACOU ERIC OLIVIER	ONPC	COTE D'IVOIRE	CORDINATION OPERATIONS	brouecricbko77@gmail.com
43	KOUAKOU KOFFI TRESOR	ONPC	COTE D'IVOIRE	CHEF DE GARDE	kouakoutresor2017@gmail.com
44	LIBERTINO ANDREA	CIMA	ITALY	FORMATEUR	andrea.libertino@cimafoundation.org
45	NICOLA TESTA	CIMA	ITALY	FORMATEUR	nicola.testa@cimafoundation.org
46	TRIPATHI RAMESH	WMO	SUISSE	VFDM PROJECT MANAGER	RTRIPATHI@WMO.INT
47	ANON M. GUILLAUME	MINEF / DPARE	COTE D'IVOIRE	CHAUFFEUR	+225 01 40 20 64 84
48	OUYA JEAN MARIE DUREL	ABV	BURKINA FASO	DAF	jmouya.abv@gmail.com +226 64 70 88 25
49	SAMUEL OWUSU ANSAH	GMET	GHANA	METEOROLODIST	ansahsamuelowusu2014@gmail.com
50	ZONGO GERARD	DGRE	BURKINA FASO	CHEF DE SERVICE	zongo.gerard@gmail.com

					+22676575794
51	**NIAMPA BOUKARI**	**ABV**	**BURKINA FASO**	**CTP.VEDM**	niampaboukary@yahoo.fr
52	**OUATTARA EDOUARD PETIN**	**DIRECTION HYDROLOGIE**	**CI**	**SOUS-DIRECTEUR**	Kinada.ouatidriss@gmail.com 0708136318