



ADAPTATION FUND

*FLOOD FORECASTING BULLETINS and
DROUGHT MONITORING BULLETINS*
for Early Warning in the Volta basin
TECHNICAL REPORT

Executing partner:



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Acronyms

CDI	Combined Drought Index
CIMA	International center for environmental monitoring
ECMWF	European Centre for Medium-Range Weather Forecasts
EWS	Early Warning System
FAPAR	Fraction of Absorbed Photosynthetically Active Radiation
Flood-PROOFS	Flood PRObabilistic Operative Forecasting System
GFS	Global Forecast System
PDF	Portable Document Format
SPEI	Standardized Precipitation-Evapotranspiration Index
SPI	Standardized Precipitation Index
SSMI	Standardized Soil Moisture Index
SWI	Soil Water Index
VBA	Volta Basin Authority
VFDM	Volta Flood and Drought Management
VOLTALARM	Regional early warning platform for the Volta basin
WMO	World Meteorological Organization

Introduction

Within the framework of the Volta Flood and Drought Management (VFDM) project, it was foreseen the customization and implementation of a dedicated tool for the co-production and issuance of early warning bulletins for floods and drought under the myDewetra-VOLTALARM EWS (Early Warning System), integrating the results of the impact-based flood forecasting system based on the Continuum hydrological model, and the results of the drought combined index, developed for the drought monitoring in the Volta basin and based on available global satellite datasets.

The implementation of both type of bulletins, to be elaborated through the Bulletin application integrated into the myDewetra-VOLTALARM EWS platform, have been designed for supporting early warning and decision-making both at transboundary and local level (according to mandates and protocols existing in the 6 riparian countries).

A participatory approach have been used and discussion and coordination meetings have been be realized to collect needs and requirements from all the stakeholders to carry out the necessary IT activities to customize and adapt the Bulletin tool for regional and national use in the Volta Basin countries.

Hydrologists and meteorological forecasters, as also agricultural focal points, from the national and regional stakeholders have been actively involved in the design of the bulletin templates, the functionalities of the dedicated app and the procedures for the production and issuance. Furthermore, the experts of national civil protection agencies have been also involved as main beneficiaries of the bulletins in order to improve the effectiveness and usefulness of the bulletins for decision-making and anticipatory actions at national and local level.

This participatory approach has been identified and used in order to guarantee full understanding of the process and long-term sustainability, even beyond the project duration, of the myDewetra-VOLTALARM EWS and the bulletins issued through it.

The aim of this document is to present the work realized by CIMA to design templates, customize the functionalities of the bulletin tool and define the roles and procedures for the elaboration and issuance of flood and drought bulletins by both regional (VBA) and national stakeholders through the myDewetra-VOLTALARM EWS platform.

Impact bulletin for extreme precipitation and floods

Real-time impact estimation for population is the main information considered for the co-production of an impact-based warning bulletin covering the whole Volta basin for extreme precipitation and floods.

The bulletin template has been co-designed with local stakeholders and it has the following structure:

- A first page with three maps, referring to impact on population due to hydrometeorological conditions forecasted for the next 5 days:
 - impact of extreme precipitation,
 - impact of riverine floods
 - a combined assessment of impact of precipitation and floods, showing the highest level of impact between the two hazards considered

The first page also includes a text component which is the general outlook on the Volta basin produced by the Volta Basin Authorities highlighting main elements coming from the analysis of national stakeholders

- A second page with
 - For every impact level, an automatic list of regions having an estimate of impact falling in that same impact class due to heavy rainfall
 - A text box with comments and analysis of heavy rainfall hazard and impact conditions from each national meteorological agency of the 6 riparian countries of the Volta Basin
- A third page with
 - For every impact level, an automatic list of regions having an estimate of impact falling in that same impact class due to riverine flood
 - A text box with comments and analysis of riverine flood hazard and impact conditions from each national hydrological agency of the 6 riparian countries of the Volta Basin

An example from a bulletin issued in September 2023 is presented hereafter.

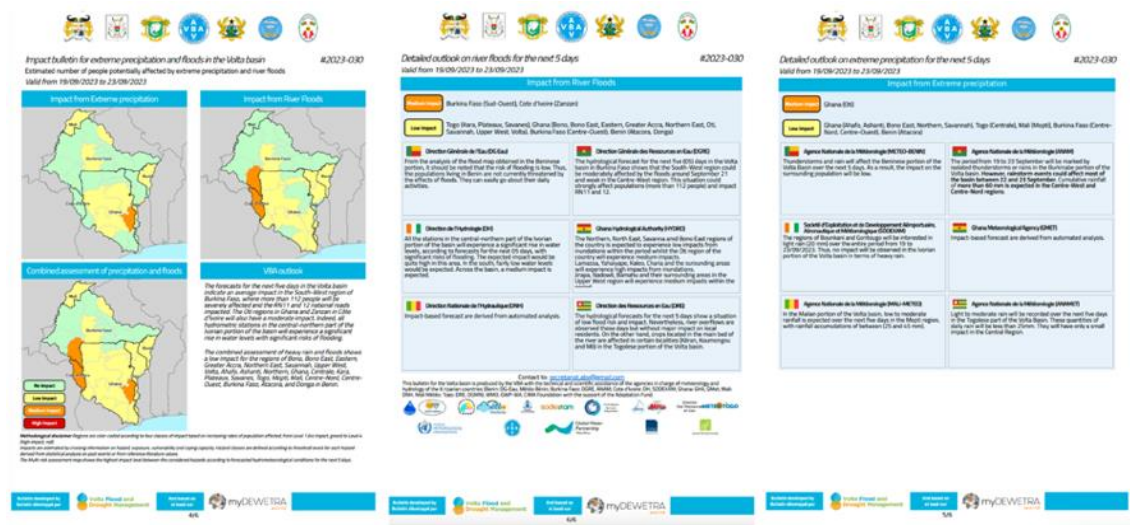


Figure 1: The Impact bulletin for precipitation and floods in the Volta basin co-produced and issued on 19th September 2023.

Impacts are estimated cross-referencing information on the hazard, exposure, vulnerability and coping capacity. Hazard classes are defined for each hazard based on threshold values from the statistical analysis of past events, historical model run or reference values from the literature. Through the combination of hazard, exposure, vulnerability and coping capacity information, for each cell grid an estimated number of people potentially affected by extreme precipitation and river floods is calculated daily in real-time. People potentially affected is aggregated by administrative units (level 1) and the relative impact (percentage of people potentially affected compared to the total population of the administrative unit) is also calculated with the following formulas.

$$Impact_{admin} = \sum (Impact_{pixels_in_admin})$$

$$Relative\ Impact_{admin} = \frac{\sum (Impact_{pixels_in_admin})}{PopTot_{admin}}$$

Regions are color-coded into four impact classes based on increasing rates of population affected, from level 1 (no impact, green) to level 4 (high impact, red).

The four warning classes are based on thresholds of absolute and relative values of impact on population, has been defined together with national and regional stakeholders.

Impact Level	Value Impact
Green: No Impact	0 people
Yellow: Low Impact	< 0.5% admin unit pop
Orange: Medium Impact	< 5% admin unit pop or > 10k people
Red: High Impact	> 5% admin unit pop or > 50k people

Figure 2: Color-coded warning classes of impact for the Extreme Precipitation and Floods bulletin in the Volta basin.

Procedure for the issuance of impact-based rainfall-flood bulletin

The bulletin is co-produced by the VBA (coordinator) and the national meteorological and hydrological agencies through the Bulletin tool, integrated into the myDewetra-VOLTALARM platform.

A procedure for the elaboration and dissemination of the bulletin has been developed with participatory approach and it defines the following roles:

VBA

- Coordination
- Opening the bulletin
- General comment resuming highlights from national agencies 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 comment on meteorological conditions (rainfall) and impacts about its own national portion
- Discussion with peer agencies of neighboring State parties (if needed for sake of coherence)

National hydrological agencies

- Analysis and comment on hydrological conditions (floods) and impacts about its own national portion
- Discussion with peer agencies of neighboring State parties (if needed for sake of coherence)

The procedure has been conceived for having 2 bulletins produced every week, on Tuesday and Friday, during the monsoon season (May to November). During dry season, in case of unexpected critical conditions, VBA could request to national agencies to contribute for the issuance of a bulletin on demand.

The procedure foresees the elaboration starts from 07.30 am and it concludes with the dissemination at 2.00 pm. It is composed by several steps a:

1. T0 = 07.30 am – 08.00 am (VBA)

VBA verify presence of the layer of multi-hazard impact-based assessment in myDewetra-VOLTALARM

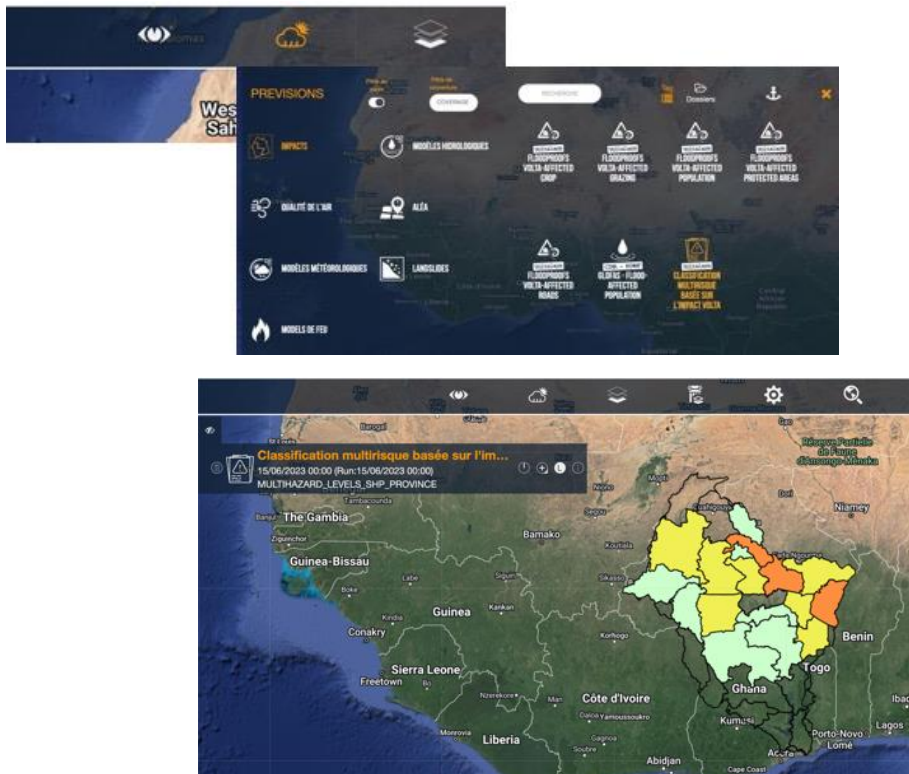


Figure 3: Verification of availability of the layer of multi-hazard impact-based assessement in myDewetra-VOLTALARM

2. T0 = 8.00 am (VBA)

VBA opens a new bulletin

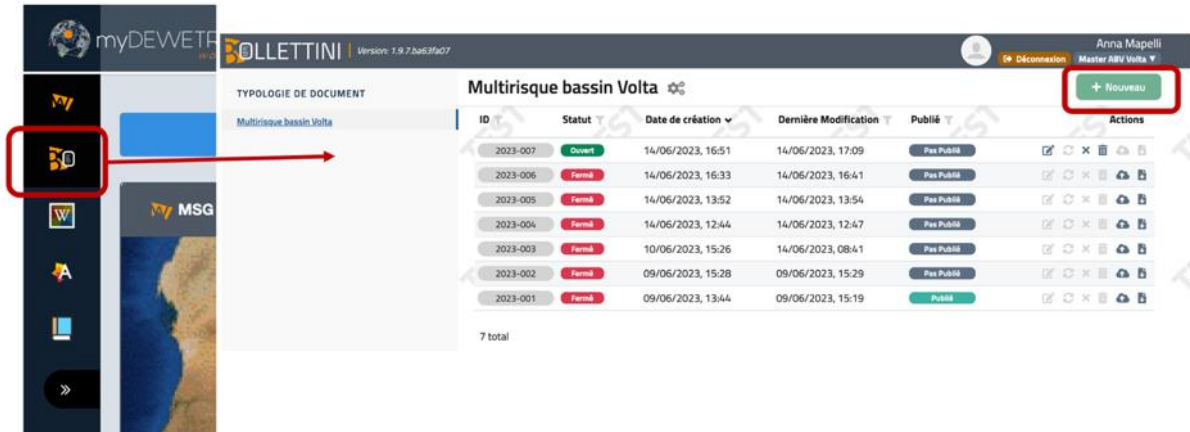


Figure 4: Opening of a new bulletin for extreme precipitation and floods in the Bulletin tool integrated within myDewetra-VOLTALARM.

3. T1 = 08.00 am – 12.00 am (Meteo agencies)

Meteorological agencies analyze the forecasts and impact-based assessment for rainfall available on myDewetra-VOLTALARM and also other data available (local data, other models in use, etc...)

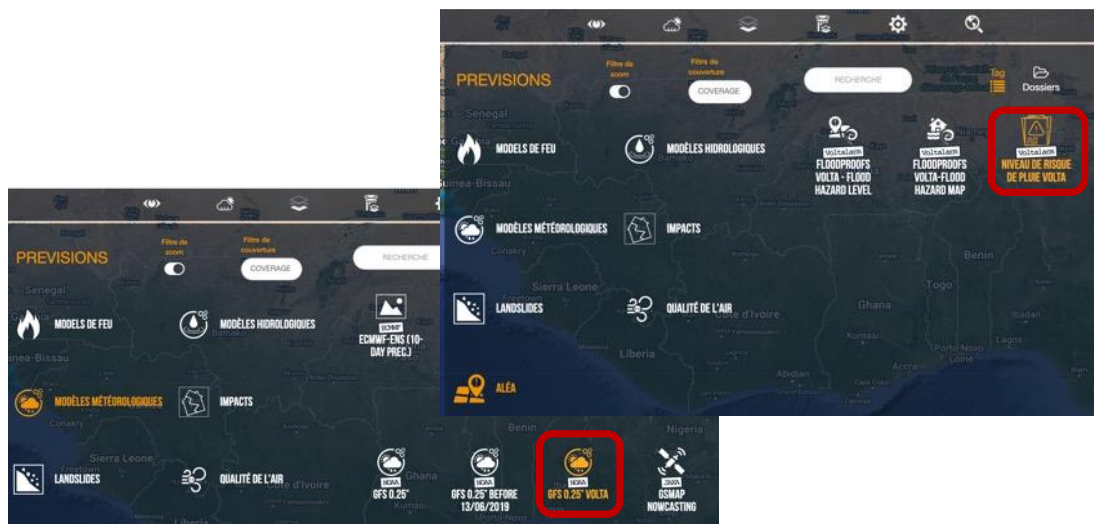


Figure 5: Layers on forecast of hazard conditions for rainfall available in myDewetra-VOLTALARM.

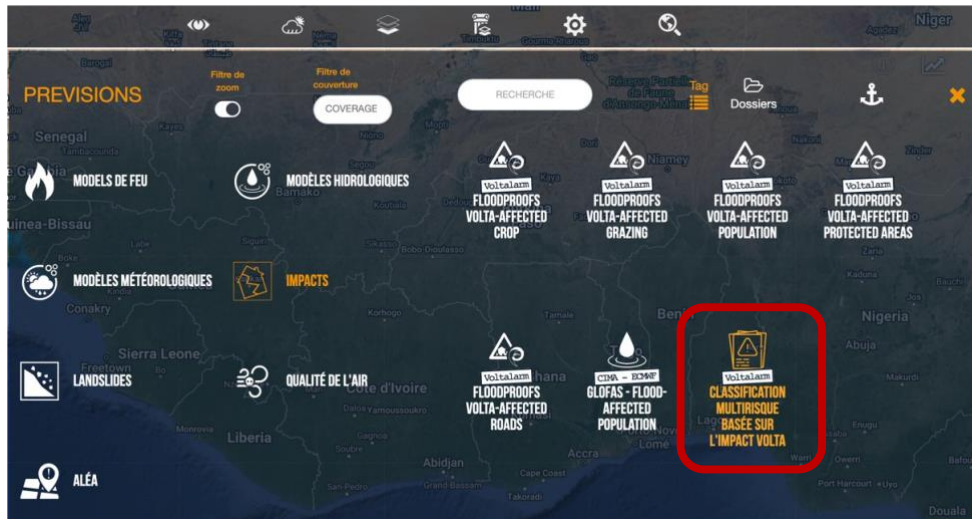


Figure 6: Layer with impact assessment from rainfall over the next 5 days available in myDewetra-VOLTALARM.

4. T1 = 08.00 am – 12.00 pm (Hydro agencies)

Hydrological agencies analyze the forecasts and impact-based assessment for floods available on myDewetra-VOLTALARM and also other data available (local data, other models in use, etc...)

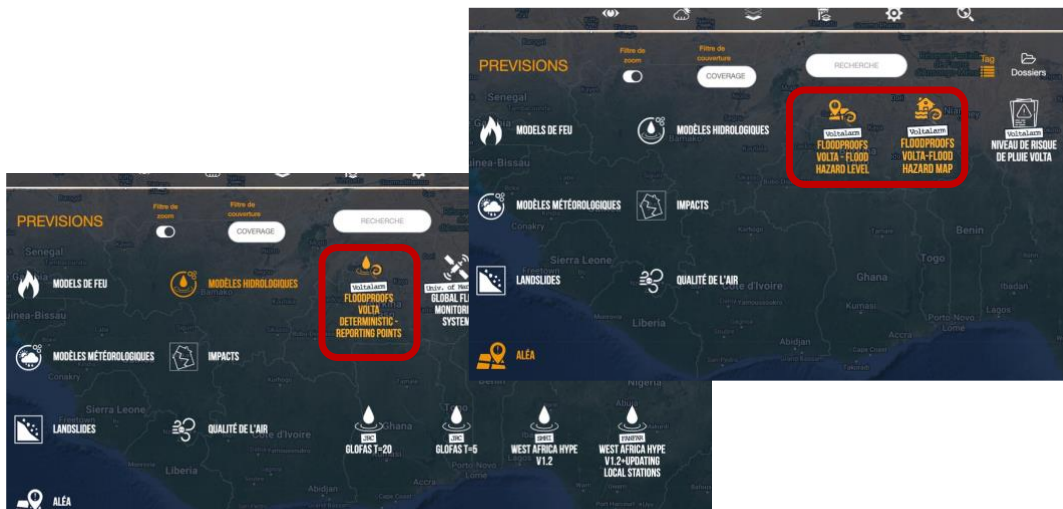


Figure 7: Layers on forecast of hazard conditions for floods available in myDewetra-VOLTALARM.

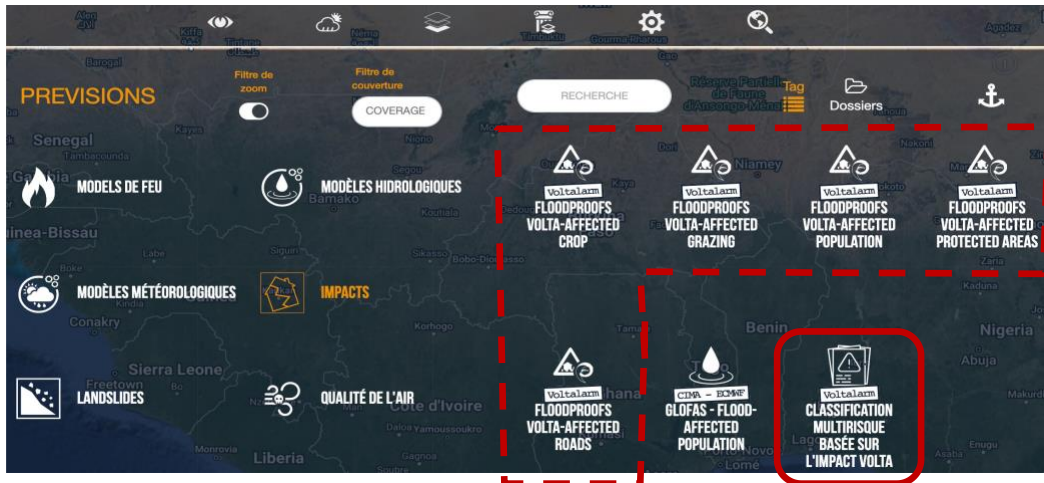


Figure 8: Layers with impact assessment from floods over the next 5 days available in myDewetra-VOLTALARM.

5. T1 = 10.00 am - 12.00 pm (Meteo and Hydro agencies)

Every national meteorological and hydrological agency make access to the opened bulletin (through the dedicated and customized Bulletin tool) and note down its own analysis and comments over the situation in its national portion

ID	Stato	Data Creazione	Ultima Modifica	Publicato	Azioni
2023-007	Aperto	14/06/2023, 16:51	14/06/2023, 17:09	Non Pubblicato	[Edit]
2023-006	Chiuso	14/06/2023, 16:33	14/06/2023, 16:41	Non Pubblicato	[Edit]
2023-005	Chiuso	14/06/2023, 13:52	14/06/2023, 13:54	Non Pubblicato	[Edit]
2023-004	Chiuso	14/06/2023, 12:44	14/06/2023, 12:47	Non Pubblicato	[Edit]
2023-003	Chiuso	10/06/2023, 15:26	14/06/2023, 08:41	Non Pubblicato	[Edit]
2023-002	Chiuso	09/06/2023, 15:28	09/06/2023, 15:29	Non Pubblicato	[Edit]
2023-001	Chiuso	09/06/2023, 13:44	09/06/2023, 15:19	Publicato	[Edit]

Figure 9: Access to the edition mode of the opened bulletin for extreme precipitation and floods from the Bulletin tool integrated into myDewetra-VOLTALARM (e.g. Togo hydrological agency configuration).

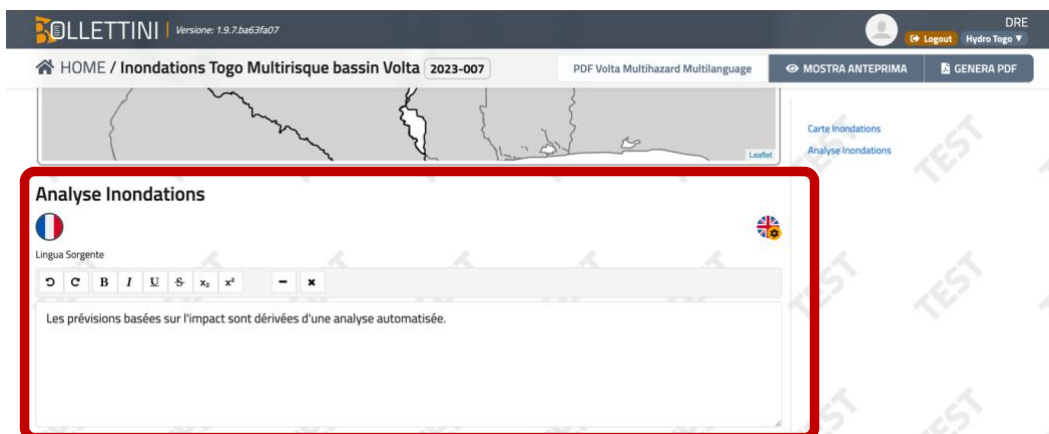


Figure 10: User interface for the edition of map and text box of extreme precipitation and flood bulletin in the Bulletin tool for a customized version for an hydrological agency (e.g. Togo one).

If a national agency does not consider necessary to include a dedicated analysis (e.g. no particular impact conditions highlighted), the bulletin will come out with a pre-defined sentence for the respective text box, saying that the impact-based forecast are derived from automated analysis.

6. T1 = 08.00 am – 12.00 pm (VBA)

Meanwhile the national agencies work on their contributions to the bulletin, the VBA make access to the setting tool for verifying, adding or modifying the email addresses of the recipients

The screenshot shows the main interface of the Bulletin tool. At the top right, the user is identified as Anna Mapelli with a 'Déconnexion' button and a dropdown menu for 'Master ABV Volta'. The main heading is 'Multirisque bassin Volta' with a settings gear icon highlighted by a red box. Below this is a table with columns: ID, Statut, Date de création, Dernière Modification, Publié, and Actions. The table contains 8 rows of data, with the last row (ID 2023-001) having a 'Publié' status. A '+ Nouveau' button is located at the top right of the table area.

ID	Statut	Date de création	Dernière Modification	Publié	Actions
2023-008	Ouvert	15/06/2023, 09:57	15/06/2023, 11:14	Pas Publié	[Icons]
2023-007	Fermé	14/06/2023, 16:51	15/06/2023, 09:33	Pas Publié	[Icons]
2023-006	Fermé	14/06/2023, 16:33	14/06/2023, 16:41	Pas Publié	[Icons]
2023-005	Fermé	14/06/2023, 13:52	14/06/2023, 13:54	Pas Publié	[Icons]
2023-004	Fermé	14/06/2023, 12:44	14/06/2023, 12:47	Pas Publié	[Icons]
2023-003	Fermé	10/06/2023, 15:26	14/06/2023, 08:41	Pas Publié	[Icons]
2023-002	Fermé	09/06/2023, 15:28	09/06/2023, 15:29	Pas Publié	[Icons]
2023-001	Fermé	09/06/2023, 13:44	09/06/2023, 15:19	Publié	[Icons]

Figure 11: Button for accessing the setting tool for the recipient mailing lists for extreme precipitation and floods bulletin from the main user interface of the Bulletin tool.

The screenshot shows the 'Destinataires des e-mails' setting tool. At the top left, there is a 'RETOUR' button. The main heading is 'Destinataires des e-mails'. A red dashed box labeled '1' highlights a text input field containing 'email@abc.com' and a 'Ajouter' button. To the right, there is a list of existing email addresses, each with a trash icon for deletion. At the bottom right, there are two buttons: 'Annuler' and 'Enregistrer', with the 'Enregistrer' button highlighted by a red dashed box labeled '2'.

Figure 12: The setting tool for recipient mailing list of extreme precipitation and flood bulletins and functions for adding and saving new addresses.

7. T2 = 12.00 pm – 1.30 pm (VBA)

VBA makes access to the opened bulletin, it verifies that all national agencies have contributed to the bulletin (via the Preview function). If it's not the case, VBA can check if any agency might need extra-time to contribute via a dedicated whatsapp group created for transboundary EW coordination with national focal points.

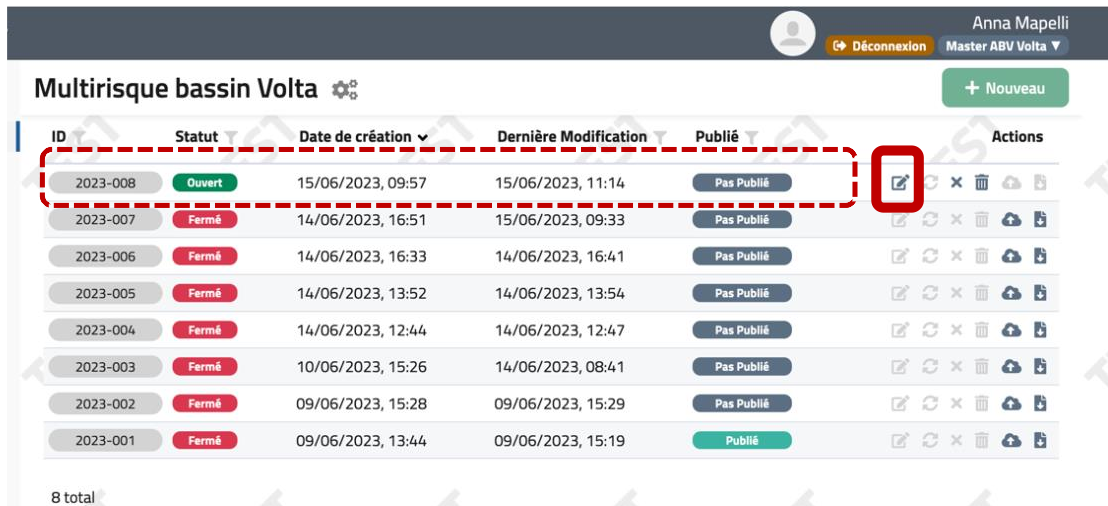


Figure 13: Access to the opened bulletin for extreme precipitation and flood for edition from the VBA configuration of the Bulletin tool.

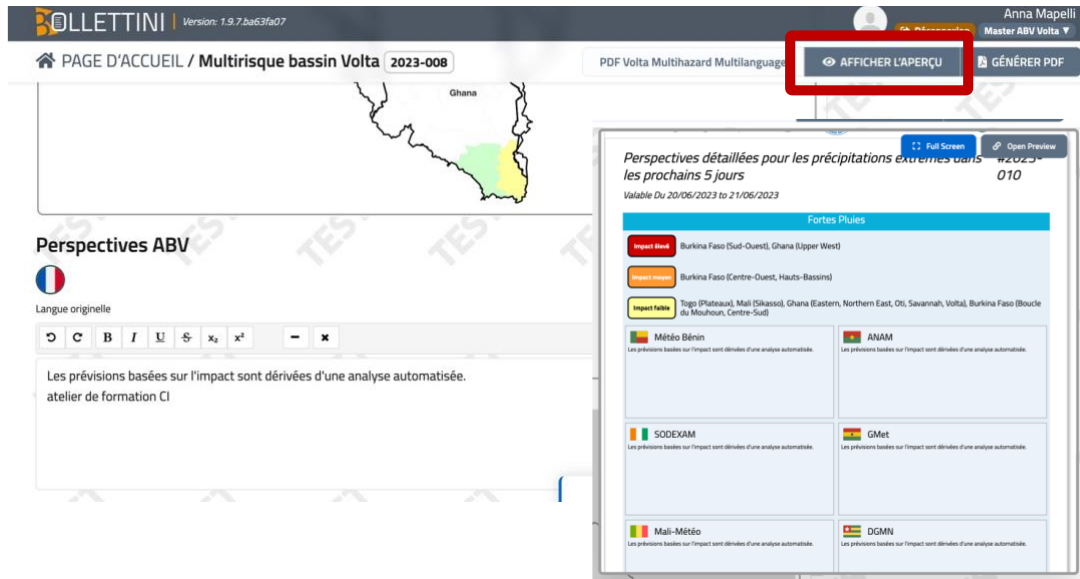


Figure 14: Use of Preview function to verify if national agencies contributed to the extreme precipitation and flood bulletin

Finally, VBA can note down its own contribution summarizing main elements from national contributions to provide a general overview of the situation for the entire Volta basin.

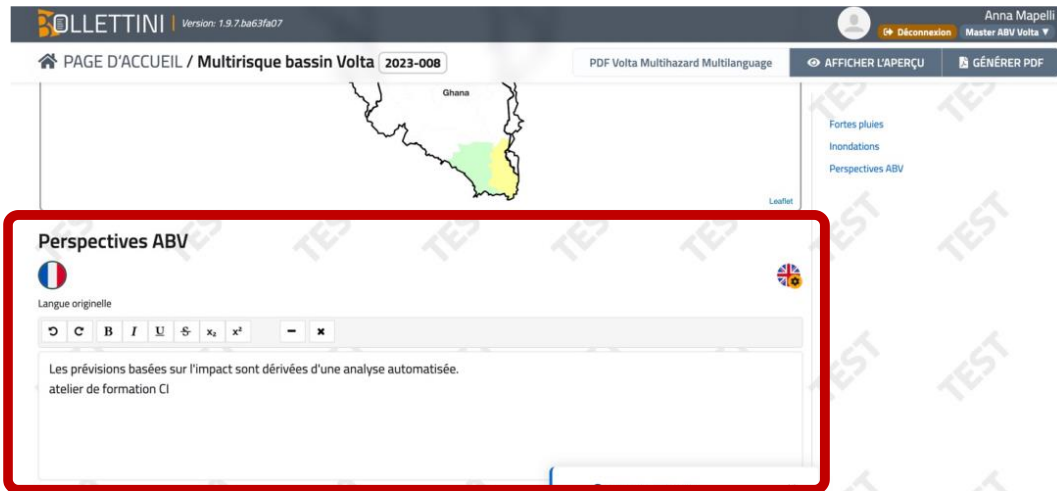


Figure 15: User interface for comments from VBA on extreme precipitation and floods bulletin within the Bulletin tool

8. T3 = 1.30 pm – 2.00 pm

VBA realizes the final review of the bulletin, it closes the bulletin (no more modification is possible) and it disseminate it via email to the recipients through the dedicated function for semi-automatic transmission

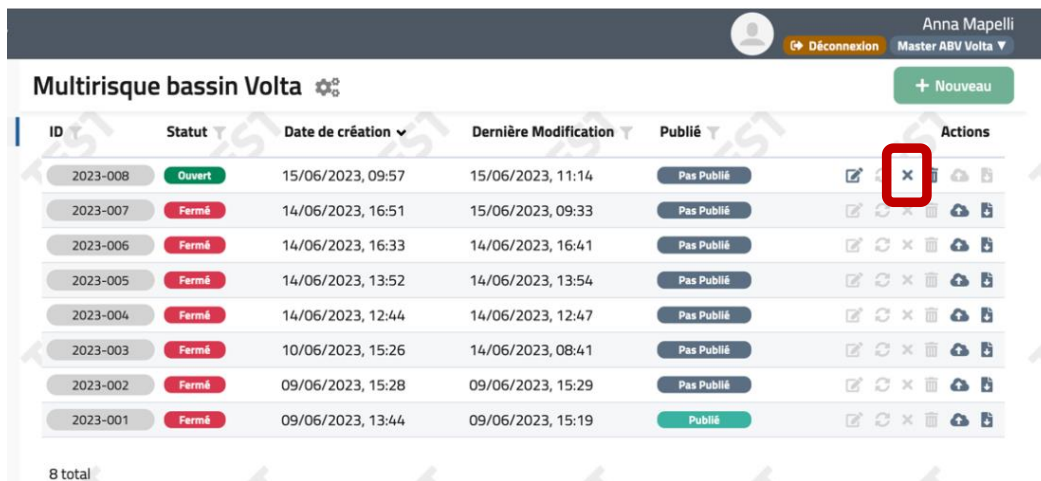


Figure 16: Closure of the bulletin.



Figure 17: Dedicated function for the semi-automatic dissemination via email.

The Bulletin tool has been adapted and customized according to the stakeholders roles and the defined procedure. All the stakeholders can access simultaneously to the Bulletin tool and contribute to the open document according to its own mandate and role, being able to visualize in real-time the contributions of the other stakeholders.

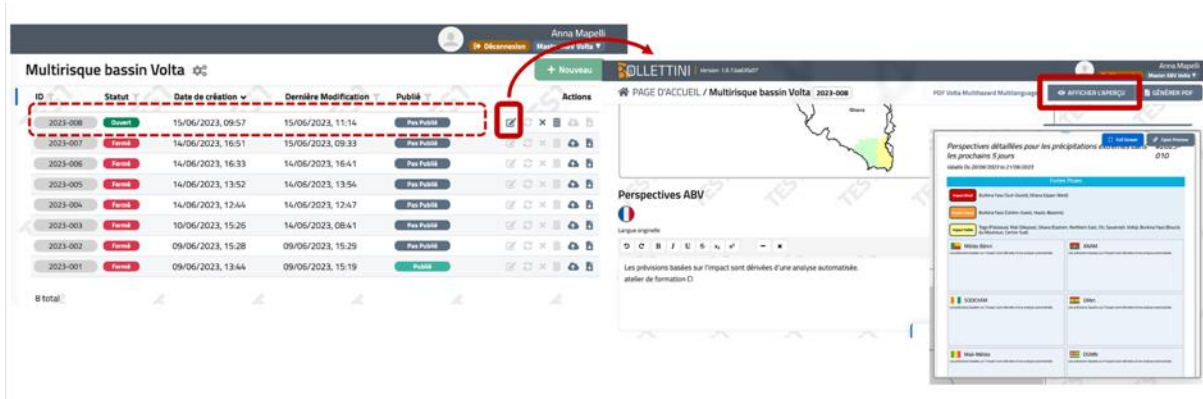



Figure 18: The Bulletin tool for the VBA, allowing the edition VBA outlook and real-time access in view-mode to the contributions of the national agencies through the Preview functionality.

The defined procedure has been tested and implemented during the last rainy season and from June to November 2023 a total of around 50 co-produced bulletins have been issued (see Annex 1 for some examples of bulletins and full list of bulletins produced with the Bulletin tool). Those bulletins have been produced twice per week (every Tuesday and Friday) autonomously by national stakeholders under the coordination of VBA and they have been shared via email by the VBA, throughout the dedicated functionality of the Bulletin tool, to all the national meteorological, hydrological and civil protection agencies plus other relevant stakeholders.

For the rainy season of 2024, an updated version of the bulletin template has been released after consultation with local stakeholders. The updated template included a fourth page where a summary of the methodology and issuance procedure is provided and the page is concluded with the acknowledge disclaimer and institutional logos. An example of a bulletin issued in 2024 is provided in Annex 1.



Note méthodologique sur l'évaluation d'impact

Les régions sont codées par couleur selon quatre classes d'impact basées sur des taux croissants de population affectée, du niveau 1 (pas d'impact, vert) au niveau 4 (impact élevé, rouge).

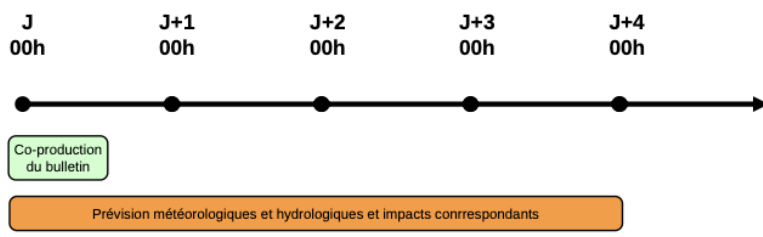
Les impacts sont estimés en croisant les informations sur l'aléa, l'exposition, la vulnérabilité et la capacité d'adaptation. Les classes d'aléa sont définies pour chaque aléa en fonction de valeurs seuils issues de l'analyse statistique d'événements passés ou de valeurs de référence issues de la littérature.

La carte d'évaluation multirisque montre le niveau d'impact le plus élevé entre les aléas considérés en fonction des conditions hydrométéorologiques prévues pour les 5 prochains jours.

Niveau Impact	Valeur Impact
Vert: Pas d'Impact	0 personnes
Jaune: Impact Faible	< 0,5% de pop de l'unité admin
Orange: Impact Moyen	< 5% de pop de l'unité admin ou > 10k personnes
Rouge: Impact Élevé	> 5% de pop de l'unité admin ou > 50k personnes


Procédure et remerciements

Le bulletin est issu deux fois par semaine, le mardi et le vendredi, à 13h30 GMT grâce au travail de co-production entre les agences météorologiques et hydrologiques des 6 pays riverains et l'Autorité du Bassin de la Volta (ABV). Il fournit une aperçu à l'échelle d'unités administratives de niveau 1 des prévisions d'impact sur la population pour les prochains 5 jours lié aux conditions prévues de fortes pluies et d'inondations fluviales.




Contactez: secretariat.abv@gmail.com

Ce bulletin pour le bassin de la Volta est réalisé par l'ABV avec l'assistance technique et scientifique des agences en charge de la météorologie et de l'hydrologie des 6 pays riverains (Bénin : DG-Eau, Météo Bénin ; Burkina Faso : DGRÉ, ANAM ; Côte d'Ivoire : DH, SODEXAM ; Ghana : GHA, GMet ; Mali : DNH, Mali Météo ; Togo : DRE, DGMN), OMM, GWP-WA, Fondation CIMA avec le soutien du Fonds d'Adaptation.



Bulletin developed by
Bulletin développé par



And based on
et basé sur




Figure 19: example of the fourth extra page included in the updated template of the bulletin.

Drought monitoring bulletin

Every month, the various drought monitoring indexes (SPI, SPEI, SSMI, CDI, FAPAR – with or without phenological mask) are calculated for different time aggregation and corresponding maps are available on myDewetra-VOLTALARM.

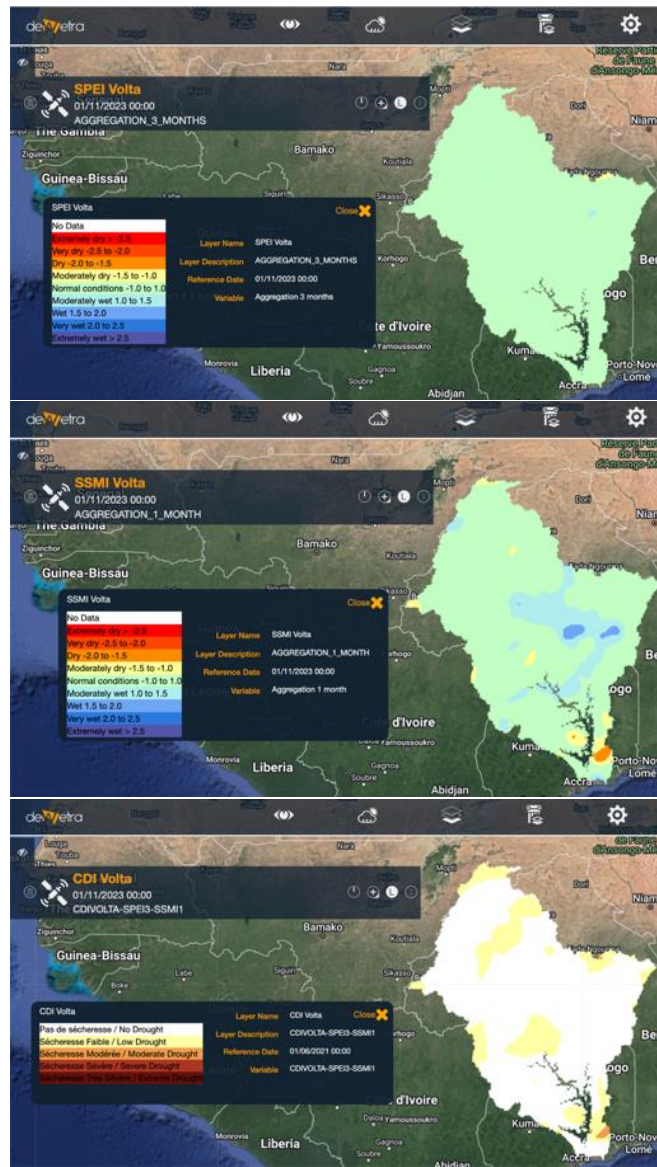


Figure 20: SPEI-3 months, SSMI-1 month and CDI of October 2023.

Considering the information provided by the drought monitoring indexes, a participatory approach have been carried out with local stakeholders to define the bulletin template and the procedure for issuing a regular monthly drought bulletin for the Volta basin. The bulletin includes the map of the Combined Drought Index with the four severity levels and it is co-produced by the VBA (coordinator) and the national meteorological, hydrological and agricultural agencies through the Bulletin tool, integrated into the myDewetra-VOLTALARM platform.

The bulletin template has been co-designed with local stakeholders and it has the following structure:

- A first page with
 - one map, referring to drought hazard conditions of the previous month based on the Combined Drought Index (CDI)
 - a text component which is the general outlook on the Volta basin produced by the Volta Basin Authorities highlighting main elements coming from the analysis of national stakeholders
 - the acknowledge disclaimer with all institutional logos
- Pages from 2 to 7 with same structure repeated for every riparian country, including:
 - The map of the national portion representing the drought hazard conditions of the previous month
 - A text box with comments and sectoral analysis from the national meteorological agency
 - A text box with comments and sectoral analysis from the national hydrological agency
 - A text box with comments and sectoral analysis from the national agricultural focal point/department

An example from a bulletin issued in February 2024 is presented hereafter.

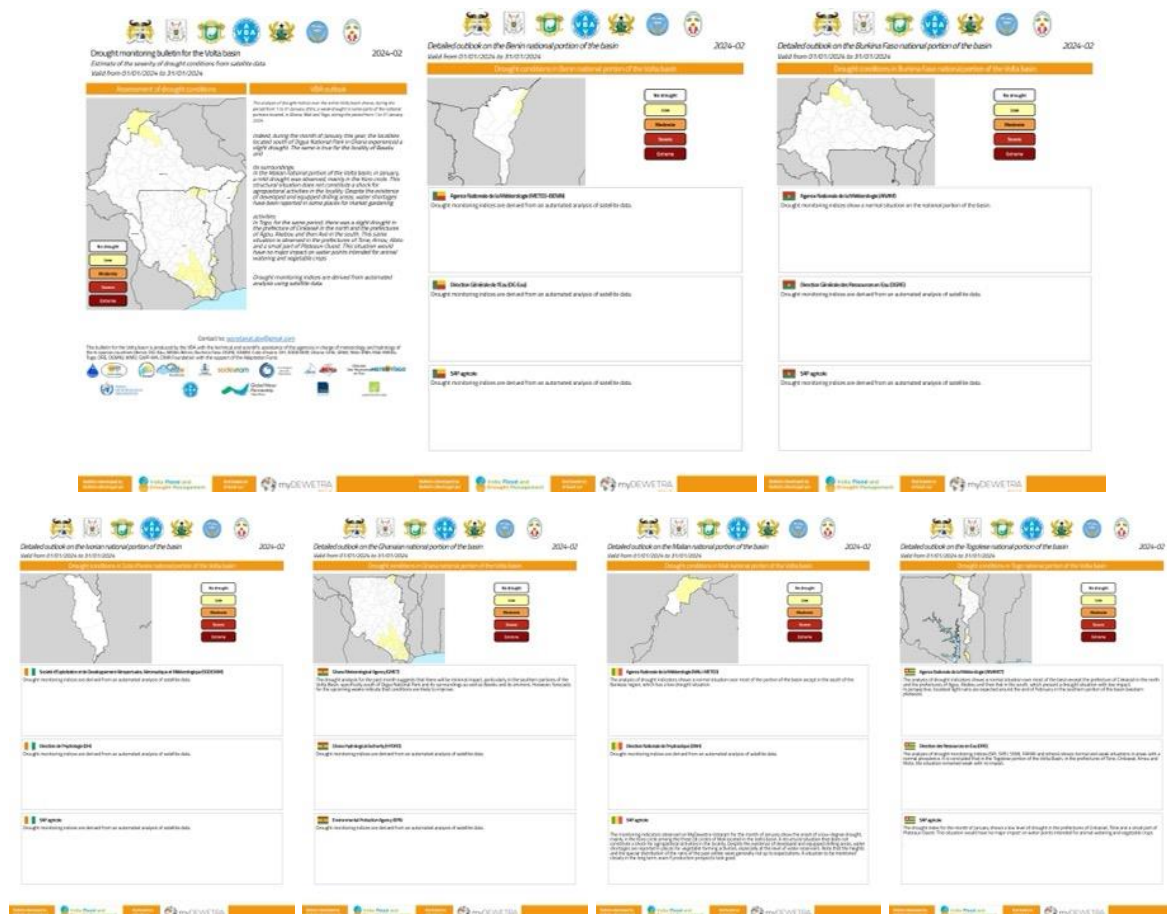


Figure 21: Example of the drought monitoring bulletin template for the Volta basin.

Procedure for the issuance of drought monitoring bulletin

A procedure for the elaboration and dissemination of the bulletin has been developed with participatory approach and it defines the following roles:

VBA

- Coordination
- Opening the bulletin
- General comment resuming highlights from national agencies and information on water resources (especially at transboundary level)
- Closing of the bulletin
- Dissemination of the bulletin to relevant national stakeholders

National agencies

- Sectoral analysis and comment on drought conditions about its own national portion
- Discussion with peer agencies of neighbouring State parties (if needed for sake of coherence)

The procedure has been conceived for having 1 bulletin produced every month on the drought conditions as per the monitoring via satellite data on the previous month, along the entire year.

The procedure should be carried out on the third week of the month, starting from Wednesday morning at 08:30 am, and ending on Thursday afternoon at 4:00 pm.

The procedure is composed by several steps a:

1. Day 1, T0 = 08.30 am – 09.00 am (VBA)

VBA verify presence of the CDI Volta layer (combined index for monitoring drought conditions) in myDewetra-VOLTALARM

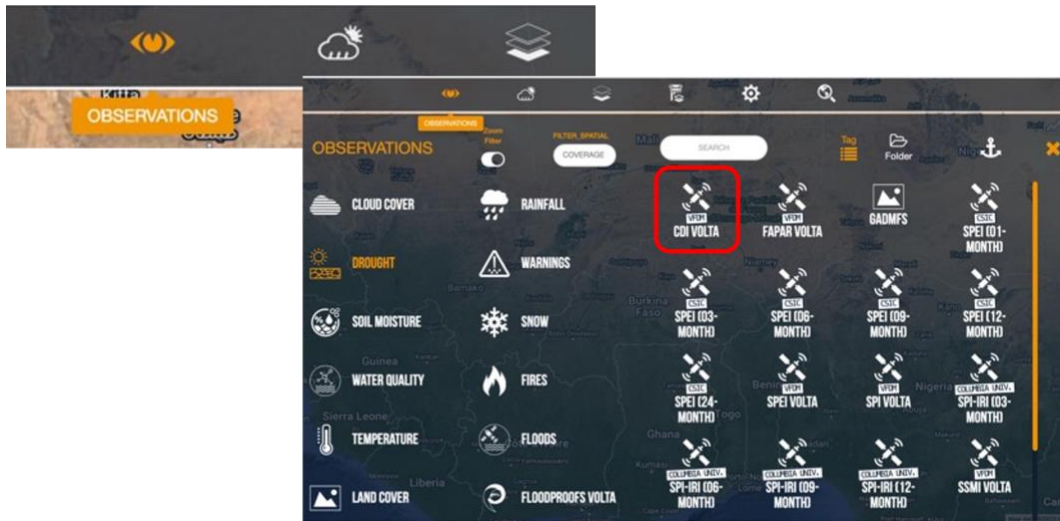


Figure 22: Verification of availability of the CDI layer in myDewetra-VOLTALARM

2. Day 1, T0 = 9Day.00 am (VBA)

VBA select the type of bulletins in the Bulletin tool (Drought Volta basin) and opens a new bulletin

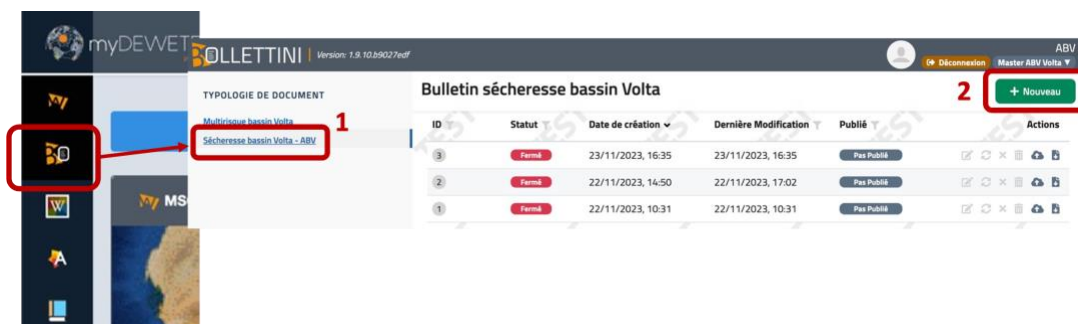


Figure 23: Opening of a new drought bulletin in the Bulletin tool integrated within myDewetra-VOLTALARM.

3. Day 1 and Day2, T1 = 09.00 am – 2.00 pm (National agencies)

National agencies analyse the Volta drought monitoring indexes monthly-based (SPI, SPEI, SSMI, FAPAR, CDI) + daily soil water index (SWI) from Copernicus, available on myDewetra-VOLTALARM, and also other data available (local data, other indexes in use, etc...)

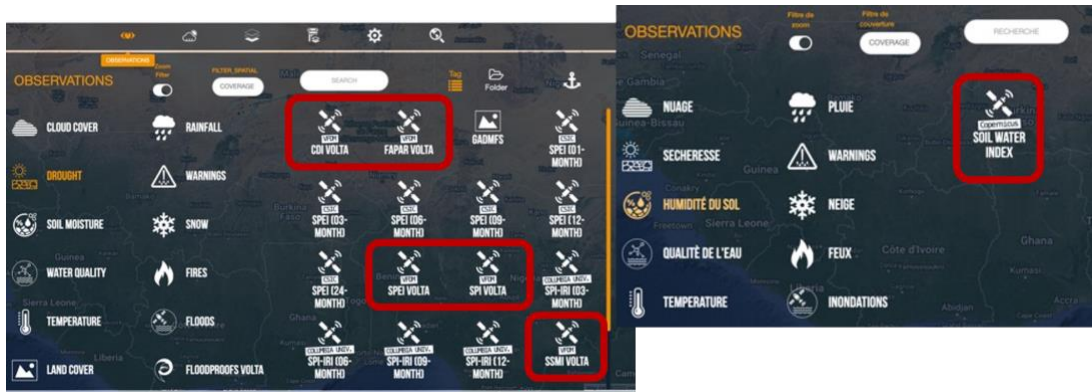


Figure 24: Drought monitoring layers available in myDewetra-VOLTALARM.

National agencies can also analyse the rainfall forecast cumulated for next 10 days (ECMWF), GFS Volta rainfall forecast (next 5 days) and also other data available (local data, seasonal forecast, other model in use, etc...) if they want to provide an overview of any worsening of improving future trend for drought conditions.

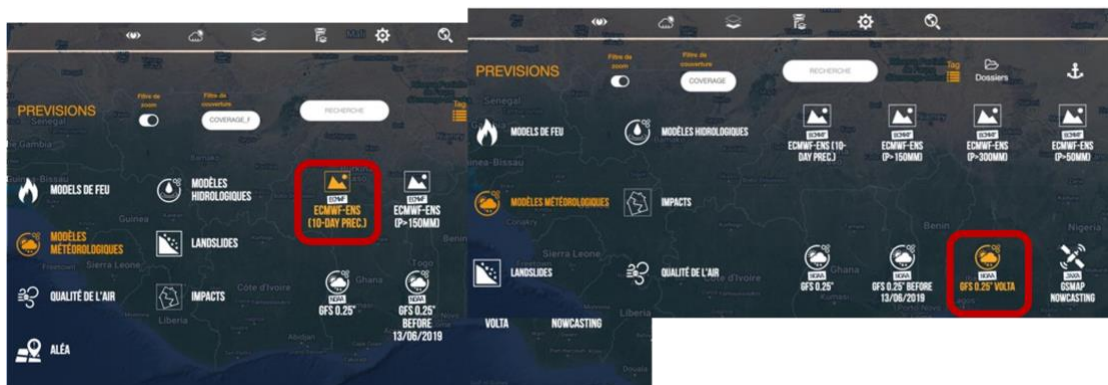


Figure 25: Layers with rainfall forecast available in myDewetra-VOLTALARM.

4. Day2, T1 = 09.00 am – 2.00 pm (National agencies)

Every national meteorological, hydrological and agricultural agency make access to the opened bulletin (through the dedicated and customized Bulletin tool) and note down its own analysis and comments over the situation in its national portion

ID	Stato	Data Creazione	Ultima Modifica	Publicato	Azioni
2023-007	Aperto	14/06/2023, 16:51	14/06/2023, 17:09	Non Pubblicato	[Edit Icon]
2023-006	Chiuso	14/06/2023, 16:33	14/06/2023, 16:41	Non Pubblicato	[Edit Icon]
2023-005	Chiuso	14/06/2023, 13:52	14/06/2023, 13:54	Non Pubblicato	[Edit Icon]
2023-004	Chiuso	14/06/2023, 12:44	14/06/2023, 12:47	Non Pubblicato	[Edit Icon]
2023-003	Chiuso	10/06/2023, 15:26	14/06/2023, 08:41	Non Pubblicato	[Edit Icon]
2023-002	Chiuso	09/06/2023, 15:28	09/06/2023, 15:29	Non Pubblicato	[Edit Icon]
2023-001	Chiuso	09/06/2023, 13:44	09/06/2023, 15:19	Publicato	[Edit Icon]

Figure 26: Access to the edition mode of the opened drought bulletin from the Bulletin tool integrated into myDewetra-VOLTALARM (e.g. Burkina Faso meteo agency configuration).



Figure 27: User interface for the edition of map and text box for drought bulletin in the Bulletin tool for a customized version for a meteo agency (e.g. Burkina Faso one).

If a national agency does not consider necessary to include a dedicated analysis (e.g. no particular drought hazard conditions highlighted), the bulletin will come out with a pre-defined sentence for the respective text box, saying that the drought monitoring indexes are derived from automated analysis based on satellite data.

5. Day 2, T1 = 09.00 am – 2.00 pm (VBA)

Meanwhile the national agencies work on their contributions to the bulletin, the VBA make access to the setting tool for verifying, adding or modifying the email addresses of the recipients

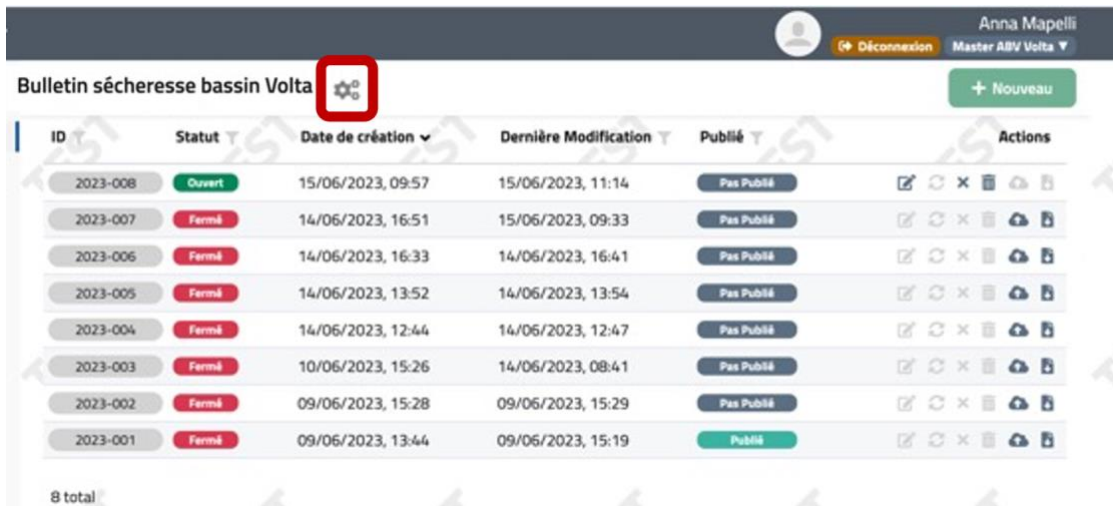


Figure 28: Button for accessing the setting tool for the recipient mailing lists for drought bulletin from the main user interface of the Bulletin tool.



Figure 29: The setting tool for recipient mailing list of the drought bulletin and functions for adding and saving new addresses.

6. Day 2, T2 = 2.00 pm – 4.00 pm (VBA)

VBA makes access to the opened bulletin; it verifies that all national agencies have contributed to the bulletin (via the Preview function). If it's not the case, VBA can check if any agency might need extra-time to contribute via a dedicated whatsapp group created for transboundary EW coordination with national focal points.

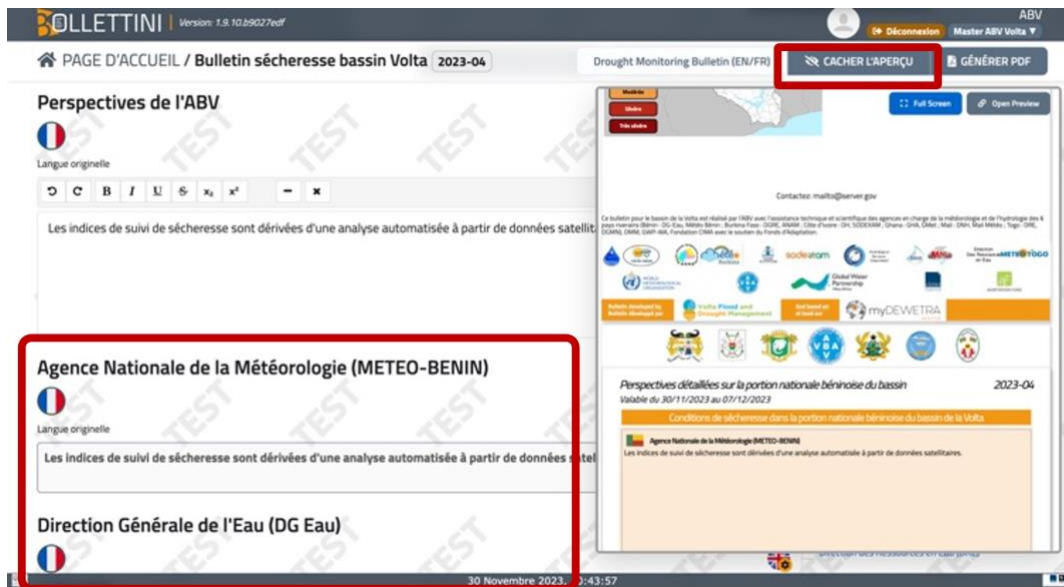


Figure 30: Use of Preview function to verify if national agencies contributed to the drought bulletin.

Finally, VBA can note down its own contribution summarizing main elements from national contributions to provide a general overview of the situation for the entire Volta basin.

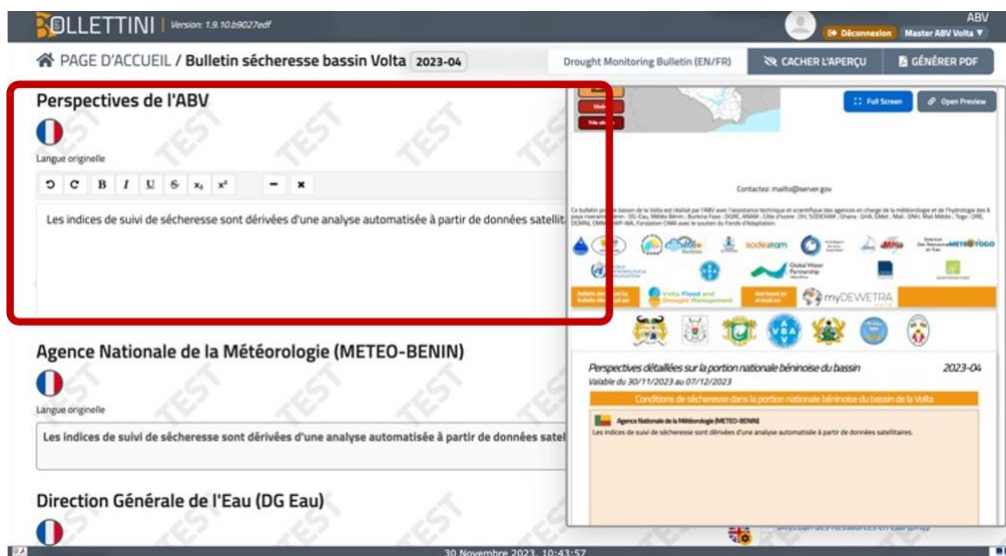


Figure 31: User interface for comments from VBA on drought conditions within the Bulletin tool

7. Day 2, T3 = 4.00 pm – 5.00 pm

VBA realizes the final review of the bulletin, it closes the bulletin (no more modification is possible) and it disseminate it via email to the recipients through the dedicated function for semi-automatic transmission, with same functions as per the extreme precipitation and flood bulletin.

As per the impact-based bulletin for extreme precipitation and floods, the Bulletin tool has been adapted and customized according to the stakeholders' roles and the defined procedure. All the stakeholders can access simultaneously to the Bulletin tool and contribute to the open document according to its own mandate and role, being able to visualize in real-time the contributions of the other stakeholders.

The defined procedure has been tested and implemented starting from December 2023 and every month a drought monitoring bulletin have been issued with a total so far of 6 bulletins (see Annex 2 for some examples of bulletins and full list of bulletins produced with the Bulletin tool). Those bulletins have been produced autonomously by national stakeholders under the coordination of VBA and they have been shared via email by the VBA, throughout the dedicated functionality of the Bulletin tool, to all the national meteorological, hydrological, agricultural and civil protection agencies plus other relevant stakeholders.

After collecting feedback from local stakeholders in December 2023, CIMA team has been working to implement some improvements to the drought monitoring system:

- Further investigation on satellite data to be used as sources for indexes calculation to shorten as much as possible the time lag from the end of the month and the issuance of the monthly bulletin
- Development of automatic routines for the calculation of indexed at 10-days frequency instead of on monthly basis
- Elaboration of an upgraded version of the various indexes (SPI, SPEI, SSMI and FAPAR anomaly) and particularly of the Combined Drought Index, integrating also the FAPAR anomaly condition
- Analysis and identification of exposure and vulnerability data to be considered for implementing an impact-based methodology for drought monitoring in the Volta basin
- Implementation of an impact-based drought monitoring system providing information on potential impact for population and agricultural sector with 10-days
- Adaptation and update of the drought bulletin template and the Bulletin tool according to technical and scientific improvements implemented.

The different improvements have been presented and discussed with local stakeholders through online meetings and communications from January to May 2024. The full configuration of the impact-based drought monitoring system and the corresponding updated version of the Bulletin tool and bulletin issuance procedures is under finalization, and it will be officialized in the final training in June 2024.

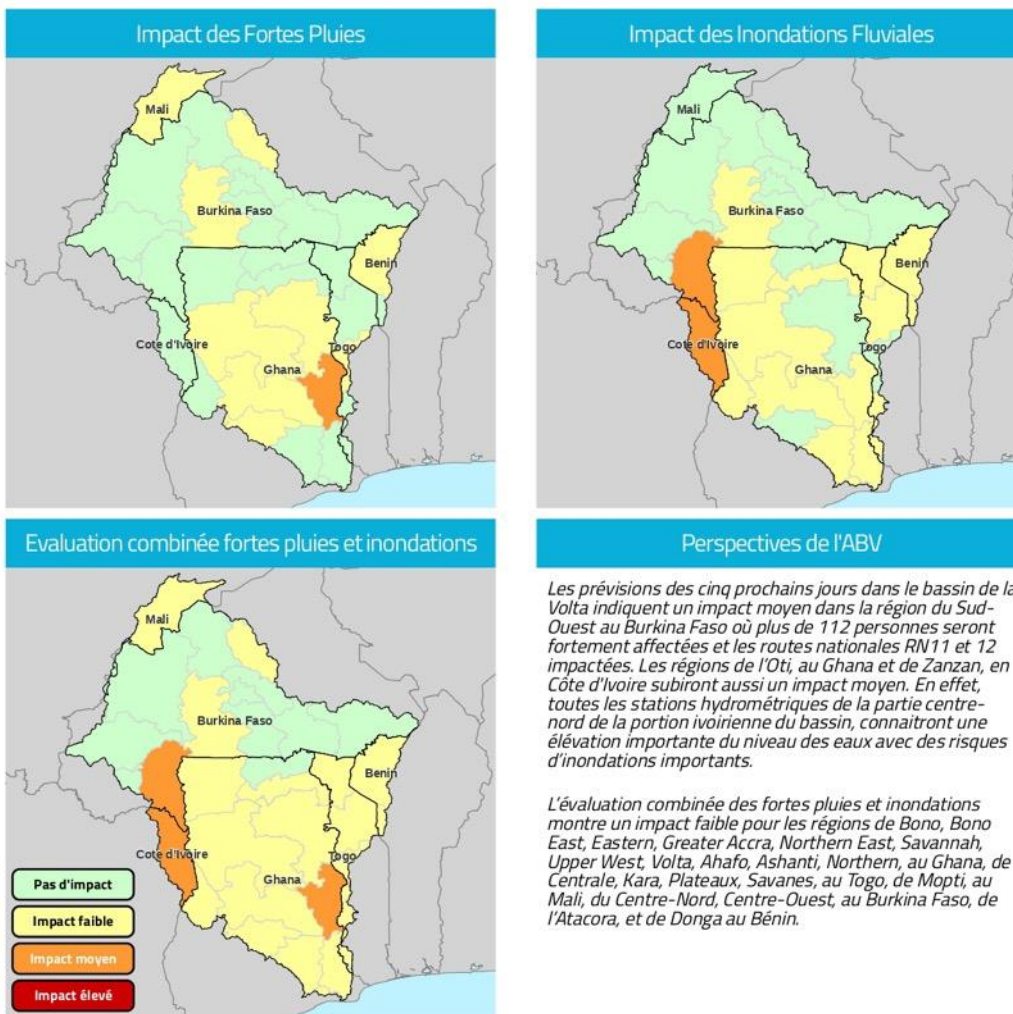
Annex 1 – Examples and list of flood bulletins issued in 2023

Hereafter an example of the bulletin issued on 19th September 2023, in both languages (French and English).

FRENCH VERSION



Bulletin d'impact pour fortes pluies et inondations dans le bassin de la Volta #2023-030
 Estimation du nombre de personnes potentiellement touchées par les fortes pluies et les inondations fluviales
 Valable du 19/09/2023 au 23/09/2023



Les prévisions des cinq prochains jours dans le bassin de la Volta indiquent un impact moyen dans la région du Sud-Ouest au Burkina Faso où plus de 112 personnes seront fortement affectées et les routes nationales RN11 et 12 impactées. Les régions de l'Oti, au Ghana et de Zanzan, en Côte d'Ivoire subiront aussi un impact moyen. En effet, toutes les stations hydrométriques de la partie centre-nord de la portion ivoirienne du bassin, connaîtront une élévation importante du niveau des eaux avec des risques d'inondations importants.

L'évaluation combinée des fortes pluies et inondations montre un impact faible pour les régions de Bono, Bono East, Eastern, Greater Accra, Northern East, Savannah, Upper West, Volta, Ahafo, Ashanti, Northern, au Ghana, de Centrale, Kara, Plateaux, Savanes, au Togo, de Mopti, au Mali, du Centre-Nord, Centre-Ouest, au Burkina Faso, de l'Atacora, et de Donga au Bénin.

Note méthodologique Les régions sont codées par couleur selon quatre classes d'impact basées sur des taux croissants de population affectée, du niveau 1 (pas d'impact, vert) au niveau 4 (impact élevé, rouge).
 Les impacts sont estimés en croisant les informations sur l'aléa, l'exposition, la vulnérabilité et la capacité d'adaptation. Les classes d'aléa sont définies pour chaque aléa en fonction de valeurs seuils issues de l'analyse statistique d'événements passés ou de valeurs de référence issues de la littérature.
 La carte d'évaluation multirisque montre le niveau d'impact le plus élevé entre les aléas considérés en fonction des conditions hydrométéorologiques prévues pour les 5 prochains jours.



Perspectives détaillées pour les fortes pluies dans les prochains 5 jours
Valable du 19/09/2023 au 23/09/2023

#2023-030

Impact des Fortes Pluies

<p>Impact moyen Ghana (Oti)</p>	
<p>Impact faible Ghana (Ahafo, Ashanti, Bono East, Northern, Savannah), Togo (Centrale), Mali (Mopti), Burkina Faso (Centre-Nord, Centre-Ouest), Benin (Atacora)</p>	
<p> Agence Nationale de la Météorologie (METEO-BENIN) Des orages et de la pluie toucheront la portion béninoise du Bassin de la Volta les 5 prochains jours. En conséquence, l'impact sera faible sur la population environnante.</p>	<p> Agence Nationale de la Météorologie (ANAM) La période allant du 19 au 23 septembre sera marquée par des orages ou pluies isolés sur la portion burkinabé du bassin de la Volta. Toutefois, des manifestations pluvio-orageuses pourraient intéresser la majeure partie du bassin entre le 22 et le 23 septembre. Les cumuls de pluies pouvant excéder 60 mm sont attendus dans les régions du Centre-ouest et du Centre-nord.</p>
<p> Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météorologique (SODEXAM) les régions du Bounkani et du Gontougo seront intéressées par des pluies faibles (20 mm) sur l'ensemble de la période du 19 au 23/09/2023. Ainsi aucun impact ne sera observé dans la portion ivoirienne du bassin de la Volta en terme de forte pluie.</p>	<p> Ghana Meteorological Agency (GMET) Les prévisions basées sur l'impact sont dérivées d'une analyse automatisée.</p>
<p> Agence Nationale de la Météorologie (MALI-METEO) Dans la portion malienne du bassin de la Volta, l'on prévoit des précipitations d'intensité faible à modérée au cours des cinq prochains jours dans la région de Mopti enregistrant des accumulations de pluie comprises entre (25 et 45mm)</p>	<p> Agence Nationale de la Météorologie (ANAMET) Des pluies faibles à modérées seront enregistrées au cours des cinq prochains jours sur la partie togolaise du Bassin de la Volta. Ces quantités de pluie journalière seront inférieures à 25mm. Elles n'auront que d'impact faible dans la région Centrale.</p>



Perspectives détaillées pour les inondations fluviales dans les prochains 5 jours #2023-030
Valable du 19/09/2023 au 23/09/2023

Impact des Inondations Fluviales

Impact moyen Burkina Faso (Sud-Ouest), Cote d'Ivoire (Zanzan)

Impact faible Togo (Kara, Plateaux, Savanes), Ghana (Bono, Bono East, Eastern, Greater Accra, Northern East, Oti, Savannah, Upper West, Volta), Burkina Faso (Centre-Ouest), Benin (Atacora, Donga)

Direction Générale de l'Eau (DG Eau)
De l'analyse de la carte des inondations obtenue dans la portion béninoise, il est à noter que le risque d'inondation est faible. Ainsi, les populations vivant dans la béninoise ne sont pas pour l'instant menacées par les effets d'inondations. Elles peuvent vaquer aisément à leurs activités quotidiennes.

Direction Générale des Ressources en Eau (DGRE)
La prévision hydrologique sur les cinq (05) prochains jours dans le bassin de la volta au Burkina Faso montre que la région du Sud-Ouest pourrait être moyennement impacté par les inondations autour du 21 septembre et faible dans la région du Centre-Ouest. Cette situation pourrait affecter fortement les populations (plus de 112 personnes) et impacter les RN11 et 12.

Direction de l'Hydrologie (DH)
Toutes les stations de la partie centre-nord de la portion ivoirienne du bassin, connaîtront une élévation importante du niveau des eaux selon les prévisions des 05 jours prochains avec des risques d'inondations importants. L'impact attendu serait assez élevé dans cette zone. Dans le sud, des niveaux d'eau assez bas seraient attendus. Sur l'ensemble du bassin, on s'attend à un impact moyen.

Ghana Hydrological Authority (HYDRO)
Les régions du nord, du nord-est, de la savane et de Bono East du pays devraient connaître de faibles impacts des inondations au cours de cette période, tandis que la région d'Oti du pays connaîtra des impacts moyens. Lamassa, Yahaiyape, Kaleo, Charia et les régions environnantes seront fortement touchées par les inondations. Jirapa, Nadowli, Bamahu et leurs environs dans la région de l'Upper West connaîtront des impacts moyens au cours de cette période.

Direction Nationale de l'Hydraulique (DNH)
Les prévisions basées sur l'impact sont dérivées d'une analyse automatisée.

Direction des Ressources en Eau (DRE)
Les prévisions hydrologiques des 5 prochains jours donnent une situation de risques d'inondation et d'impact faibles. Néanmoins, on observe des débordements des rivières en ces jours mais sans impact majeur sur les riverains. Par contre, les cultures se trouvant dans le lit majeur du cour d'eau sont touchés dans certaines localités (Kéran, koumongou et Mô) de la portion togolaise du bassin de la volta.

Contactez: secretariat.abv@gmail.com

Ce bulletin pour le bassin de la Volta est réalisé par l'ABV avec l'assistance technique et scientifique des agences en charge de la météorologie et de l'hydrologie des 6 pays riverains (Bénin : DG-Eau, Météo Bénin ; Burkina Faso : DGRE, ANAM ; Côte d'Ivoire : DH, SODEXAM ; Ghana : GHA, GMet ; Mali : DNH, Mali Météo ; Togo : DRE, DGMN, OMM, GWP-WA, Fondation CIMA avec le soutien du Fonds d'Adaptation.



ENGLISH VERSION

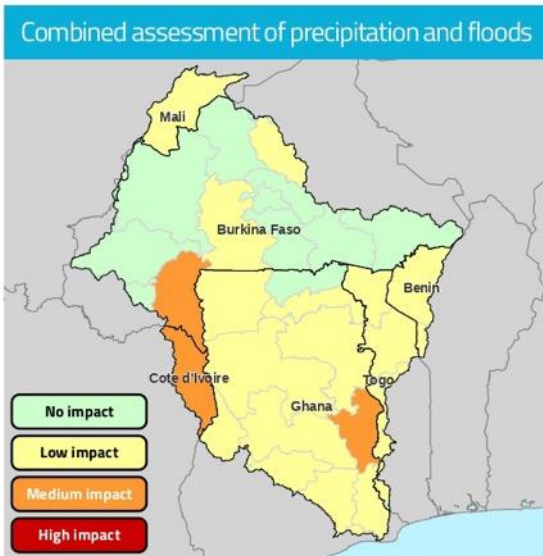
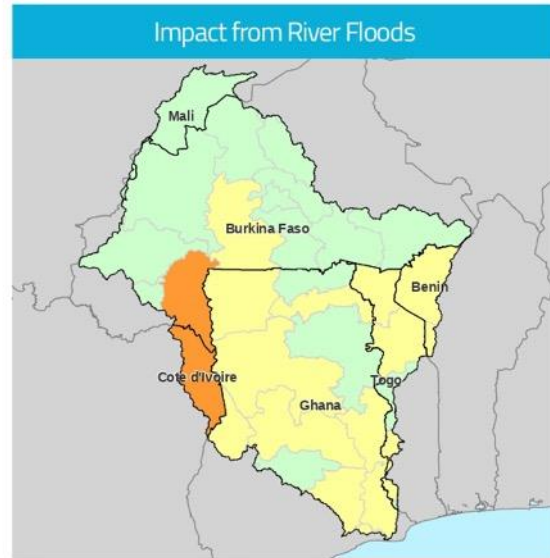
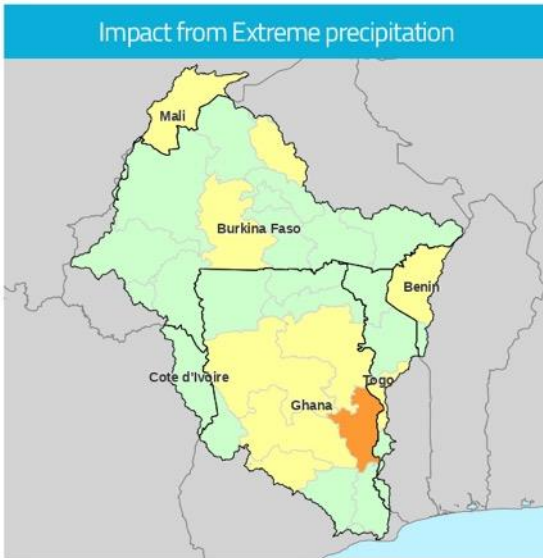


Impact bulletin for extreme precipitation and floods in the Volta basin

#2023-030

Estimated number of people potentially affected by extreme precipitation and river floods

Valid from 19/09/2023 to 23/09/2023



VBA outlook

The forecasts for the next five days in the Volta basin indicate an average impact in the South-West region of Burkina Faso, where more than 112 people will be severely affected and the RN11 and 12 national roads impacted. The Oti regions in Ghana and Zanzan in Côte d'Ivoire will also have a moderate impact. Indeed, all hydrometric stations in the central-northern part of the Ivorian portion of the basin will experience a significant rise in water levels with significant risks of flooding.

The combined assessment of heavy rain and floods shows a low impact for the regions of Bono, Bono East, Eastern, Greater Accra, Northern East, Savannah, Upper West, Volta, Ahafo, Ashanti, Northern, Ghana, Centrale, Kara, Plateaux, Savanes, Togo, Mopti, Mali, Centre-Nord, Centre-Ouest, Burkina Faso, Atacora, and Donga in Benin.

Methodological disclaimer Regions are color-coded according to four classes of impact based on increasing rates of population affected, from Level 1 (no impact, green) to Level 4 (high impact, red).







Impacts are estimated by crossing information on hazard, exposure, vulnerability and coping capacity. Hazard classes are defined according to threshold levels for each hazard derived from statistical analysis on past events or from reference literature values.

The Multi-risk assessment map shows the highest impact level between the considered hazards according to forecasted hydrometeorological conditions for the next 5 days.



Detailed outlook on extreme precipitation for the next 5 days
Valid from 19/09/2023 to 23/09/2023

#2023-030

Impact from Extreme precipitation	
<p>Medium impact Ghana (Oti)</p>	
<p>Low impact Ghana (Ahafo, Ashanti, Bono East, Northern, Savannah), Togo (Centrale), Mali (Mopti), Burkina Faso (Centre-Nord, Centre-Ouest), Benin (Atacora)</p>	
<p> Agence Nationale de la Météorologie (METEO-BENIN) Thunderstorms and rain will affect the Beninese portion of the Volta Basin over the next 5 days. As a result, the impact on the surrounding population will be low.</p>	<p> Agence Nationale de la Météorologie (ANAM) The period from 19 to 23 September will be marked by isolated thunderstorms or rains in the Burkinabe portion of the Volta basin. However, rainstorm events could affect most of the basin between 22 and 23 September. Cumulative rainfall of more than 60 mm is expected in the Centre-West and Centre-Nord regions.</p>
<p> Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météorologique (SODEXAM) The regions of Bounkani and Gontougo will be interested in light rain (20 mm) over the entire period from 19 to 23/09/2023. Thus, no impact will be observed in the Ivorian portion of the Volta basin in terms of heavy rain.</p>	<p> Ghana Meteorological Agency (GMET) Impact-based forecast are derived from automated analysis.</p>
<p> Agence Nationale de la Météorologie (MALI-METEO) In the Malian portion of the Volta basin, low to moderate rainfall is expected over the next five days in the Mopti region, with rainfall accumulations of between (25 and 45 mm).</p>	<p> Agence Nationale de la Météorologie (ANAMET) Light to moderate rain will be recorded over the next five days in the Togolese part of the Volta Basin. These quantities of daily rain will be less than 25mm. They will have only a small impact in the Central Region.</p>



Detailed outlook on river floods for the next 5 days
 Valid from 19/09/2023 to 23/09/2023

#2023-030

Impact from River Floods

- Medium impact** Burkina Faso (Sud-Ouest), Cote d'Ivoire (Zanzan)
- Low impact** Togo (Kara, Plateaux, Savanes), Ghana (Bono, Bono East, Eastern, Greater Accra, Northern East, Oti, Savannah, Upper West, Volta), Burkina Faso (Centre-Ouest), Benin (Atacora, Donga)

Direction Générale de l'Eau (DG Eau)
 From the analysis of the flood map obtained in the Beninese portion, it should be noted that the risk of flooding is low. Thus, the populations living in Benin are not currently threatened by the effects of floods. They can easily go about their daily activities.

Direction Générale des Ressources en Eau (DGRE)
 The hydrological forecast for the next five (05) days in the Volta basin in Burkina Faso shows that the South-West region could be moderately affected by the floods around September 21 and weak in the Centre-West region. This situation could strongly affect populations (more than 112 people) and impact RN11 and 12.

Direction de l'Hydrologie (DH)
 All the stations in the central-northern part of the Ivorian portion of the basin will experience a significant rise in water levels, according to forecasts for the next 05 days, with significant risks of flooding. The expected impact would be quite high in this area. In the south, fairly low water levels would be expected. Across the basin, a medium impact is expected.

Ghana Hydrological Authority (HYDRO)
 The Northern, North East, Savanna and Bono East regions of the country is expected to experience low impacts from inundations within the period whilst the Oti region of the country will experience medium impacts. Lamassa, Yahaiyape, Kaleo, Charia and the surrounding areas will experience high impacts from inundations. Jirapa, Nadowli, Bamahu and their surrounding areas in the Upper West region will experience medium impacts within the period.

Direction Nationale de l'Hydraulique (DNH)
 Impact-based forecast are derived from automated analysis.

Direction des Ressources en Eau (DRE)
 The hydrological forecasts for the next 5 days show a situation of low flood risk and impact. Nevertheless, river overflows are observed these days but without major impact on local residents. On the other hand, crops located in the main bed of the river are affected in certain localities (Kéran, Koumongou and Mô) in the Togolese portion of the Volta basin.

Contact to: secretariat.abv@gmail.com

This bulletin for the Volta basin is produced by the VBA with the technical and scientific assistance of the agencies in charge of meteorology and hydrology of the 6 riparian countries (Benin: DG-Eau, Météo Bénin; Burkina Faso: DGRE, ANAM; Cote d'Ivoire: DH, SODEXAM; Ghana: GHA, GMet; Mali: DNH, Mali Météo; Togo: DRE, DGMM), WMO, GWP-WA, CIMA Foundation with the support of the Adaptation Fund.

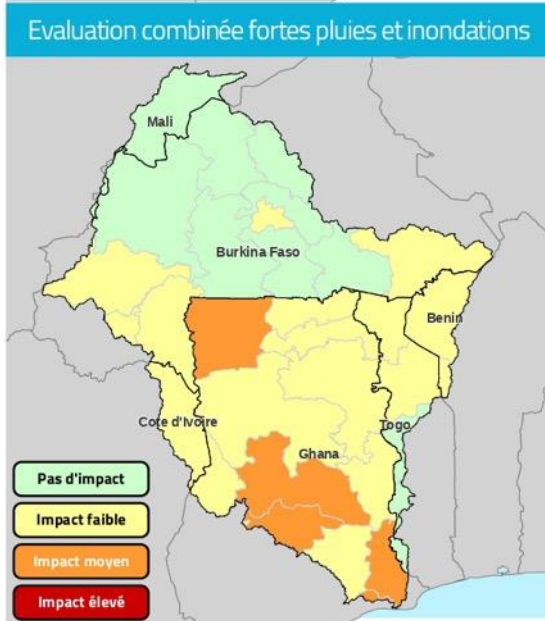
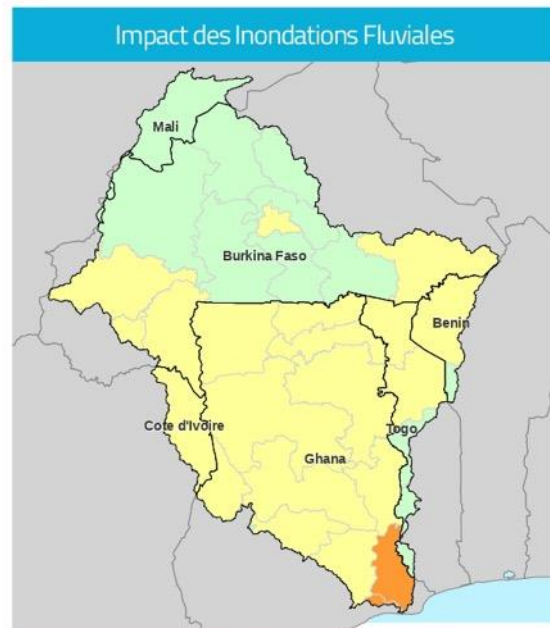
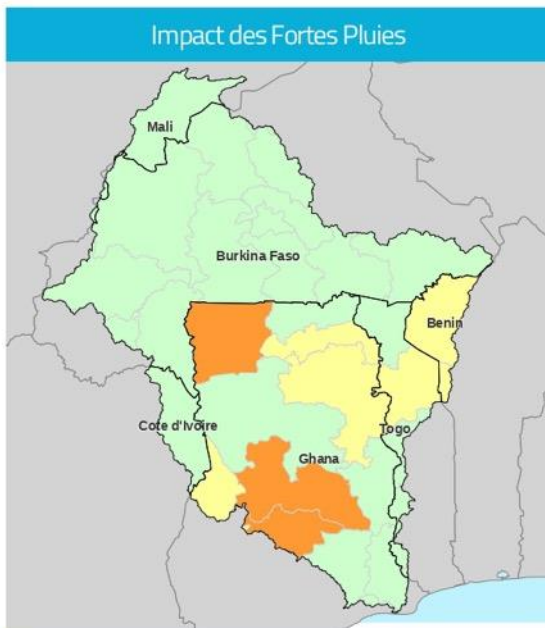


Hereafter an example of the bulletin issued on 10th May 2024, in both languages (French and English) with the updated template including the extra fourth page.

FRENCH VERSION



Bulletin d'impact pour fortes pluies et inondations dans le bassin de la Volta #2024-004
 Estimation du nombre de personnes potentiellement touchées par les fortes pluies et les inondations fluviales
 Valable du 10/05/2024 au 14/05/2024



Perspectives de l'ABV

L'évaluation combinée des prévisions des impacts des fortes pluies et des inondations, montre un impact faible dans les majeures parties des portions nationales du bassin de la Volta au Ghana et au Togo, au cours des cinq prochains jours.

Un impact moyen est prévu entre autres, dans les régions de Bono East (Atebubu, Prang, Kwame Danso) et de l'Upper West (Bulenga), au Ghana durant cette même période.







Les prévisions basées sur l'impact sont dérivées d'une analyse automatisée.



Perspectives détaillées pour les fortes pluies dans les prochains 5 jours
Valable du 10/05/2024 au 14/05/2024

#2024-004

Impact des Fortes Pluies

<p>Impact moyen Ghana (Ashanti, Bono East, Upper West)</p>	
<p>Impact faible Togo (Kara), Benin (Alibori, Atacora, Donga), Ghana (Ahafo, Bono, Northern, Northern East)</p>	
<p> Agence Nationale de la Météorologie (METEO-BENIN) Ces 5 prochains jours seront marqués par de faibles pluies à modérées qui n'auront pas d'impacts significatifs sur la population dans la portion béninoise du Bassin de la Volta.</p>	<p> Agence Nationale de la Météorologie (ANAM) Les prévisions basées sur l'impact sont dérivées d'une analyse automatisée.</p>
<p> Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météorologique (SODEXAM) Les prévisions des 05 prochains jours annoncent des quantités de pluies faibles à modérées comprises entre 10 mm et 25 mm dans la majeure partie des localités du Bounkani et Gontougo. Cette situation n'aura aucun impact dans l'ensemble de la portion ivoirienne du bassin de la Volta.</p>	<p> Ghana Meteorological Agency (GMET) Les trois premiers jours de la période de prévision pour la partie ghanéenne du bassin de la Volta devraient être caractérisés par de fortes accumulations de précipitations comprises entre 90 et 150 mm dans les régions situées autour de Bono East (Atebubu, Prang, Kwame Danso) et de l'Upper West (Bulenga) avec un impact moyen. Les zones connaîtront des précipitations relativement faibles, avec des impacts allant également de nuls à faibles.</p>
<p> Agence Nationale de la Météorologie (MALI-METEO) Les prévisions basées sur l'impact sont dérivées d'une analyse automatisée.</p>	<p> Agence Nationale de la Météorologie (ANAMET) Les prévisions basées sur l'impact sont dérivées d'une analyse automatisée.</p>



Perspectives détaillées pour les inondations fluviales dans les prochains 5 jours #2024-004
Valable du 10/05/2024 au 14/05/2024

Impact des Inondations Fluviales	
<p>Impact moyen Ghana (Greater Accra, Volta)</p>	
<p>Impact faible Burkina Faso (Cascades, Centre, Est, Hauts-Bassins, Sud-Ouest), Togo (Kara, Savanes), Benin (Atacora), Cote d'Ivoire (Zanzan), Ghana (Ashanti, Bono, Bono East, Eastern, Northern, Northern East, Oti, Savannah, Upper East, Upper West)</p>	
<p> Direction Générale de l'Eau (DG Eau) Les prévisions basées sur l'impact sont dérivées d'une analyse automatisée.</p>	<p> Direction Générale des Ressources en Eau (DGRE) La prévision hydrologique pour les cinq prochains jours dans le bassin de la Volta au Burkina Faso indique que les Cours d'eau restent à un niveau élevé, mais continuent de baisser dans les régions du Sud-Ouest et de l'Est. Il n'y aura pas d'impact sur les populations dans les régions du Sud-Ouest et de l'Est et dans l'ensemble du territoire du Bassin.</p>
<p> Direction de l'Hydrologie (DH) Les prévisions basées sur l'impact sont dérivées d'une analyse automatisée.</p>	<p> Ghana Hydrological Authority (HYDRO) Les prévisions basées sur l'impact sont dérivées d'une analyse automatisée.</p>
<p> Direction Nationale de l'Hydraulique (DNH) Les prévisions basées sur l'impact sont dérivées d'une analyse automatisée.</p>	<p> Direction des Ressources en Eau (DRE) Les analyses et les prévisions montrent qu'il n'y aura pas de risque d'inondation, les impacts seront faibles dans les régions de la kara et de la savane de la portion nationale du Togo.</p>



Note méthodologique sur l'évaluation d'impact

Les régions sont codées par couleur selon quatre classes d'impact basées sur des taux croissants de population affectée, du niveau 1 (pas d'impact, vert) au niveau 4 (impact élevé, rouge).

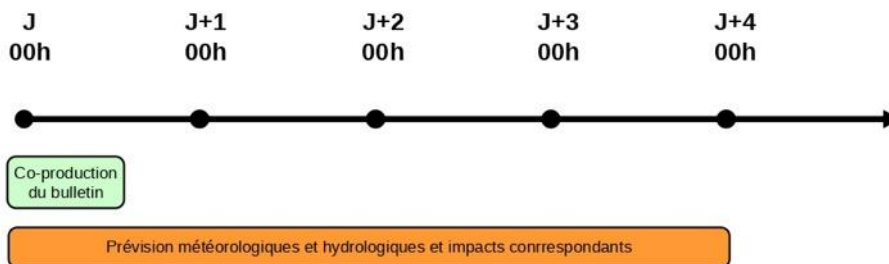
Les impacts sont estimés en croisant les informations sur l'aléa, l'exposition, la vulnérabilité et la capacité d'adaptation. Les classes d'aléa sont définies pour chaque aléa en fonction de valeurs seuils issues de l'analyse statistique d'événements passés ou de valeurs de référence issues de la littérature.

La carte d'évaluation multirisque montre le niveau d'impact le plus élevé entre les aléas considérés en fonction des conditions hydrométéorologiques prévues pour les 5 prochains jours.

Niveau Impact	Valeur Impact
Vert: Pas d'Impact	0 personnes
Jaune: Impact Faible	< 0,5% de pop de l'unité admin
Orange: Impact Moyen	< 5% de pop de l'unité admin ou > 10k personnes
Rouge: Impact Élevé	> 5% de pop de l'unité admin ou > 50k personnes

Procédure et remerciements

Le bulletin est issu deux fois par semaine, le mardi et le vendredi, à 13h30 GMT grâce au travail de co-production entre les agences météorologiques et hydrologiques des 6 pays riverains et l'Autorité du Bassin de la Volta (ABV). Il fournit un aperçu à l'échelle d'unité administratives de niveau 1 des prévisions d'impact sur la population pour les prochains 5 jours lié aux conditions prévues de fortes pluies et d'inondations fluviales.



Contactez: secretariat.abv@gmail.com

Ce bulletin pour le bassin de la Volta est réalisé par l'ABV avec l'assistance technique et scientifique des agences en charge de la météorologie et de l'hydrologie des 6 pays riverains (Bénin : DG-Eau, Météo Bénin ; Burkina Faso : DGRE, ANAM ; Côte d'Ivoire : DH, SODEXAM ; Ghana : GHA, GMet ; Mali : DNH, Mali Météo ; Togo : DRE, DGMN), OMM, GWP-WA, Fondation CIMA avec le soutien du Fonds d'Adaptation.



ENGLISH VERSION

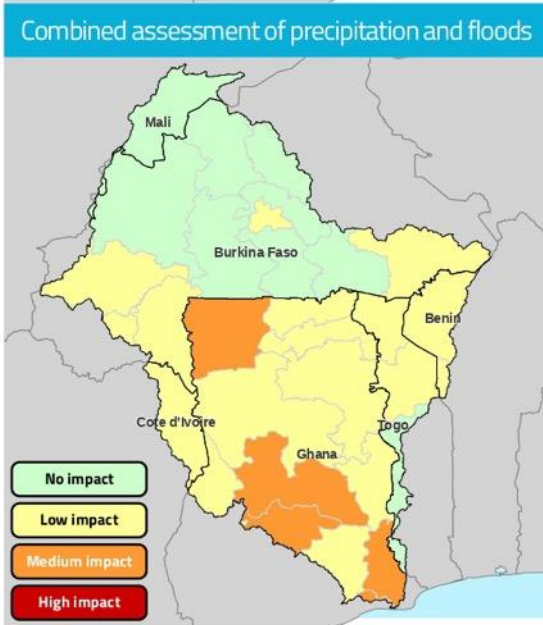
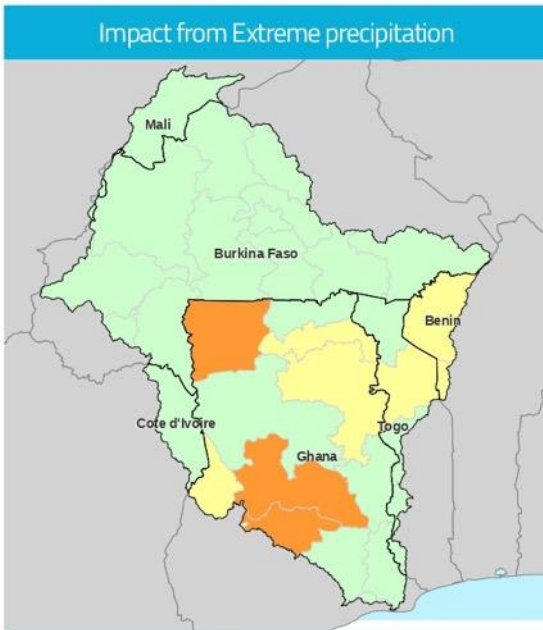


Impact bulletin for extreme precipitation and floods in the Volta basin

#2024-004

Estimated number of people potentially affected by extreme precipitation and river floods

Valid from 10/05/2024 to 14/05/2024



VBA outlook

The combined assessment of the forecasts of the impacts of heavy rains and floods, shows a low impact in most of the national portions of the Volta Basin in Ghana and Togo, over the next five days.

A medium impact is expected, among others, in the regions of Bono East (Atebubu, Prang, Kwame Danso) and Upper West (Bulenga), in Ghana during the same period.

Impact-based forecasts are derived from automated analysis.



Detailed outlook on extreme precipitation for the next 5 days
Valid from 10/05/2024 to 14/05/2024

#2024-004

Impact from Extreme precipitation	
<p>Medium impact Ghana (Ashanti, Bono East, Upper West)</p>	
<p>Low impact Togo (Kara), Benin (Alibori, Atacora, Donga), Ghana (Ahafo, Bono, Northern, Northern East)</p>	
<p> Agence Nationale de la Météorologie (METEO-BENIN) These next 5 days will be marked by light to moderate rains that will not have a significant impact on the population in the Beninese portion of the Volta Basin.</p>	<p> Agence Nationale de la Météorologie (ANAM) Impact-based forecast are derived from automated analysis.</p>
<p> Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météorologique (SODEXAM) The forecasts for the next 05 days indicate low to moderate amounts of rain of between 10 mm and 25 mm in most of the localities of Bounkani and Gontougo. This situation will have no impact on the entire Ivorian portion of the Volta basin.</p>	<p> Ghana Meteorological Agency (GMET) The first 3 days of the forecast period for the Ghana portion of the Volta basin is expected to be characterized by high rainfall accumulation ranging between 90 – 150mm in regions around Bono East (Atebubu, Prang, Kwame Danso), Upper West (Bulenga) with medium impact. The areas will have relatively low rainfall with impacts also ranging from No to Low.</p>
<p> Agence Nationale de la Météorologie (MALI-METEO) Impact-based forecast are derived from automated analysis.</p>	<p> Agence Nationale de la Météorologie (ANAMET) Impact-based forecast are derived from automated analysis.</p>



Detailed outlook on river floods for the next 5 days
Valid from 10/05/2024 to 14/05/2024

#2024-004

Impact from River Floods	
<p>Medium impact Ghana (Greater Accra, Volta)</p>	
<p>Low impact Burkina Faso (Cascades, Centre, Est, Hauts-Bassins, Sud-Ouest), Togo (Kara, Savanes), Benin (Atacora), Cote d'Ivoire (Zanzan), Ghana (Ashanti, Bono, Bono East, Eastern, Northern, Northern East, Oti, Savannah, Upper East, Upper West)</p>	
<p> Direction Générale de l'Eau (DG Eau) Impact-based forecast are derived from automated analysis.</p>	<p> Direction Générale des Ressources en Eau (DGRE) The hydrological forecast for the next five days in the Volta basin in Burkina Faso indicates that watercourses remain at a high level, but continue to decline in the South-West and East regions. There will be no impact on populations in the South-West and East regions and in the entire territory of the Basin.</p>
<p> Direction de l'Hydrologie (DH) Impact-based forecast are derived from automated analysis.</p>	<p> Ghana Hydrological Authority (HYDRO) Impact-based forecast are derived from automated analysis.</p>
<p> Direction Nationale de l'Hydraulique (DNH) Impact-based forecast are derived from automated analysis.</p>	<p> Direction des Ressources en Eau (DRE) Analyses and forecasts show that there will be no risk of flooding, the impacts will be low in the Kara and savannah regions of the national portion of Togo.</p>



Methodological note on impact evaluation

Regions are color-coded into four impact classes based on increasing rates of population affected, from level 1 (no impact, green) to level 4 (high impact, red).

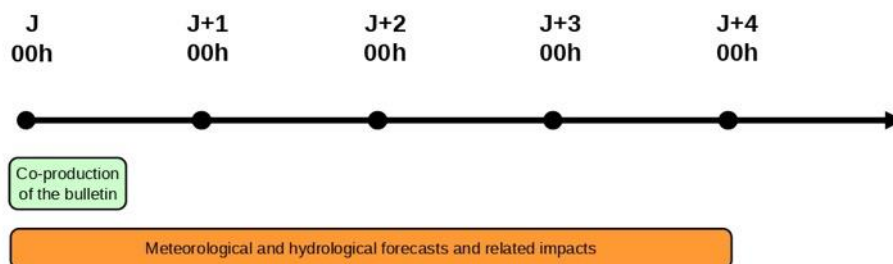
Impacts are estimated in cross-referencing information on the hazard, exposure, vulnerability and adaptive capacity. Hazard classes are defined for each hazard based on threshold values from the statistical analysis of past events or reference values from the literature.

The multi-hazard assessment map shows the highest level of impact between the hazards considered according to the hydro-meteorological conditions forecast for the next 5 days.

Impact Level	Value Impact
Green: No Impact	0 people
Yellow: Low Impact	< 0.5% admin unit pop
Orange: Medium Impact	< 5% admin unit pop or > 10k people
Red: High Impact	> 5% admin unit pop or > 50k people

Procedure and acknowledgments

The bulletin is issued twice a week, Tuesday and Friday, at 1:30 p.m. GMT thanks to the co-production work between the meteorological and hydrological agencies of the 6 riparian countries and the Volta Basin Authority (VBA). It provides a level 1 administrative unit scale overview of the population impact forecast for the next 5 days related to forecasted heavy rain and riverine flooding conditions.



Contact to: secretariat.abv@gmail.com

This bulletin for the Volta basin is produced by the VBA with the technical and scientific assistance of the agencies in charge of meteorology and hydrology of the 6 riparian countries (Benin: DG-Eau, Météo Bénin; Burkina Faso: DGRE, ANAM; Cote d'Ivoire: DH, SODEXAM; Ghana: GHA, GMet; Mali: DNH, Mali Météo; Togo: DRE, DGMN), WMO, GWP-WA, CIMA Foundation with the support of the Adaptation Fund.



List of the impact-based bulletins for extreme precipitation and floods issued during 2023 for the Volta basin.

Anna Mapelli [Déconnexion](#) Master ABV Volta

Multirisque bassin Volta

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ID	Statut	Date de création	Dernière Modification	Publié	Actions
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2023-005	Fermé	30/06/2023, 09:32	30/06/2023, 15:03	Publié	✎ ↻ ✕ 🗑️ 📄 📂
2023-004	Fermé	27/06/2023, 09:19	27/06/2023, 16:00	Publié	✎ ↻ ✕ 🗑️ 📄 📂
2023-003	Fermé	23/06/2023, 11:51	23/06/2023, 14:38	Publié	✎ ↻ ✕ 🗑️ 📄 📂
2023-002	Fermé	20/06/2023, 08:00	20/06/2023, 15:04	Publié	✎ ↻ ✕ 🗑️ 📄 📂
2023-001	Fermé	15/06/2023, 11:57	15/06/2023, 19:23	Pas Publié	✎ ↻ ✕ 🗑️ 📄 📂

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ID	Statut	Date de création	Dernière Modification	Publié	Actions
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2023-014	Fermé	28/07/2023, 09:44	28/07/2023, 15:56	Publié	✎ ↻ ✕ 🗑️ 📄 📂
2023-013	Fermé	25/07/2023, 09:54	25/07/2023, 14:40	Publié	✎ ↻ ✕ 🗑️ 📄 📂
2023-012	Fermé	21/07/2023, 09:40	21/07/2023, 14:05	Publié	✎ ↻ ✕ 🗑️ 📄 📂
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2023-010	Fermé	14/07/2023, 10:59	14/07/2023, 16:17	Publié	✎ ↻ ✕ 🗑️ 📄 📂
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2023-008	Fermé	07/07/2023, 14:25	07/07/2023, 16:55	Publié	✎ ↻ ✕ 🗑️ 📄 📂

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2023-016	Fermé	04/08/2023, 10:13	04/08/2023, 15:28	Publié	✎ ↻ ✕ 🗑️ 📄 📂

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








































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2023-029	Fermé	15/09/2023, 09:22	15/09/2023, 14:29	Publié	     
2023-028	Fermé	12/09/2023, 10:56	12/09/2023, 14:50	Publié	     
2023-027	Fermé	08/09/2023, 09:19	08/09/2023, 15:05	Publié	     
2023-026	Fermé	05/09/2023, 10:41	05/09/2023, 15:18	Publié	     
2023-025	Fermé	01/09/2023, 10:53	01/09/2023, 14:50	Publié	     
2023-024	Fermé	29/08/2023, 10:23	29/08/2023, 15:00	Publié	     

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






































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2023-038	Fermé	17/10/2023, 10:45	17/10/2023, 14:48	Publié	     
2023-037	Fermé	13/10/2023, 10:45	13/10/2023, 15:52	Publié	     
2023-036	Fermé	10/10/2023, 10:55	10/10/2023, 14:48	Publié	     
2023-035	Fermé	06/10/2023, 09:43	06/10/2023, 15:37	Publié	     
2023-034	Fermé	03/10/2023, 09:39	03/10/2023, 15:00	Publié	     
2023-033	Fermé	29/09/2023, 10:31	29/09/2023, 17:08	Publié	     
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Multirisque bassin Volta

















































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2023-045	Fermé	10/11/2023, 09:29	10/11/2023, 15:16	Publié	     
2023-044	Fermé	07/11/2023, 09:23	07/11/2023, 14:35	Publié	     
2023-043	Fermé	03/11/2023, 09:05	03/11/2023, 18:41	Publié	     
2023-042	Fermé	31/10/2023, 11:52	31/10/2023, 16:05	Publié	     
2023-041	Fermé	27/10/2023, 08:27	27/10/2023, 17:45	Publié	     
2023-040	Fermé	24/10/2023, 09:28	24/10/2023, 16:40	Publié	     

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Multirisque bassin Volta

+ Nouveau

ID	Statut	Date de création	Dernière Modification	Publié	Actions
2024-003	Fermé	07/05/2024, 08:30	07/05/2024, 18:13	Publié	     
2024-002	Fermé	03/05/2024, 10:34	03/05/2024, 21:39	Publié	     
2024-001	Fermé	30/04/2024, 11:19	30/04/2024, 20:32	Publié	     
2023-052	Fermé	01/12/2023, 10:38	01/12/2023, 14:23	Publié	     
2023-051	Fermé	28/11/2023, 08:07	28/11/2023, 17:22	Publié	     
2023-050	Fermé	24/11/2023, 09:18	24/11/2023, 15:40	Publié	     
2023-049	Fermé	21/11/2023, 09:28	21/11/2023, 14:20	Publié	     
2023-048	Fermé	17/11/2023, 16:39	17/11/2023, 16:40	Publié	     

63 total

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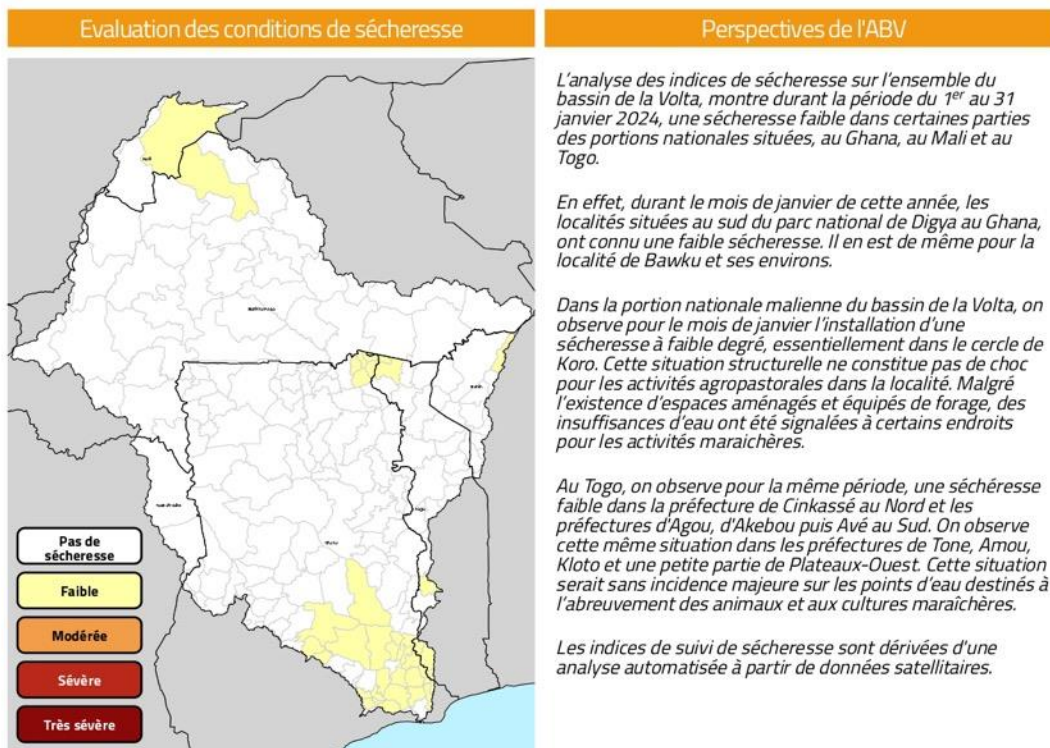
Annex 2 – Example and list of drought bulletins issued in 2023-2024

Hereafter an example of the bulletin issued in February 2024, in both languages (French and English).

FRENCH VERSION



Bulletin de surveillance de sécheresse dans le bassin de la Volta 2024-02
 Estimation des conditions de sévérité de sécheresse à partir des données satellitaires
 Valable du 01/01/2024 au 31/01/2024



Contactez: secretariat.abv@gmail.com

Ce bulletin pour le bassin de la Volta est réalisé par l'ABV avec l'assistance technique et scientifique des agences en charge de la météorologie et de l'hydrologie des 6 pays riverains (Bénin : DG-Eau, Météo Bénin ; Burkina Faso : DGRE, ANAM ; Côte d'Ivoire : DH, SODEXAM ; Ghana : GHA, GMet ; Mali : DNH, Mali Météo ; Togo : DRE, DGMN), OMM, GWP-WA, Fondation CIMA avec le soutien du Fonds d'Adaptation.





Perspectives détaillées sur la portion nationale béninoise du bassin
Valable du 01/01/2024 au 31/01/2024

2024-02

Conditions de sécheresse dans la portion nationale béninoise du bassin de la Volta



- Pas de sécheresse
- Faible
- Modérée
- Sévère
- Très sévère

Agence Nationale de la Météorologie (METEO-BENIN)

Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.

Direction Générale de l'Eau (DG Eau)

Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.

SAP agricole

Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.



Perspectives détaillées sur la portion nationale burkinabè du bassin
Valable du 01/01/2024 au 31/01/2024

2024-02

Conditions de sécheresse dans la portion nationale burkinabè du bassin de la Volta



 Agence Nationale de la Météorologie (ANAM)

Les indices de suivi de sécheresse montrent une situation normale sur la portion nationale du bassin.

 Direction Générale des Ressources en Eau (DGRE)

Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.

 SAP agricole

Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.



Perspectives détaillées sur la portion nationale ivoirienne du bassin
Valable du 01/01/2024 au 31/01/2024

2024-02

Conditions de sécheresse dans la portion nationale ivoirienne du bassin de la Volta



- Pas de sécheresse
- Faible
- Modérée
- Sévère
- Très sévère

Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météorologique (SODEXAM)
Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.

Direction de l'Hydrologie (DH)
Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.

SAP agricole
Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.



Perspectives détaillées sur la portion nationale ghanéenne du bassin
Valable du 01/01/2024 au 31/01/2024

2024-02

Conditions de sécheresse dans la portion nationale ghanéenne du bassin de la Volta



Ghana Meteorological Agency (GMET)

L'analyse de la sécheresse du mois dernier suggère que l'impact sera minime, en particulier dans les parties sud du bassin de la Volta, en particulier au sud du parc national de Digya et de ses environs, ainsi que de Bawku et de ses environs. Cependant, les prévisions pour les semaines à venir indiquent que les conditions devraient s'améliorer.

Ghana Hydrological Authority (HYDRO)

Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.

Environmental Protection Agency (EPA)

Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.



Perspectives détaillées sur la portion nationale malienne du bassin
Valable du 01/01/2024 au 31/01/2024

2024-02

Conditions de sécheresse dans la portion nationale malienne du bassin de la Volta



Agence Nationale de la Météorologie (MALI-METEO)

L'analyse des indicateurs de sécheresse montre une situation normale sur la majeure partie de la portion du bassin sauf dans le sud de la région du Bankass qui présente une situation de sécheresse faible.

Direction Nationale de l'Hydraulique (DNH)

Les indices de suivi de sécheresse sont dérivées d'une analyse automatisée à partir de données satellitaires.

SAP agricole

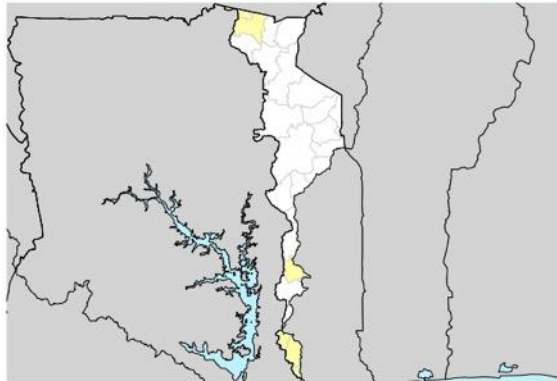
Les indices de suivi observés sur myDewetra-VOTARAM pour le mois de janvier montrent l'installation d'une sécheresse à faible degré, essentiellement dans le cercle de Koro parmi les trois (3) cercles du Mali situés dans le bassin de la Volta. Une situation structurelle qui ne constitue pas de choc pour les activités agropastorales dans la localité. Malgré l'existence d'espaces aménagés et équipés de forage, des insuffisances d'eau sont signalées par endroit pour les activités maraichères surtout au niveau des retenues d'eau. A noter que les hauteurs et la répartition spéciale des pluies de l'hivernage passée n'ont pas été à hauteur de souhait dans l'ensemble. Une situation à suivre de près à long terme même si les perspectives de productions s'annoncent bonnes.



Perspectives détaillées sur la portion nationale togolaise du bassin
Valable du 01/01/2024 au 31/01/2024

2024-02

Conditions de sécheresse dans la portion nationale togolaise du bassin de la Volta



Agence Nationale de la Météorologie (ANAMET)

L'analyse des indicateurs de sécheresse montre une situation normale sur la majeure partie de la portion du bassin sauf la préfecture de Cinkassé au nord et les préfectures d'Agou, d'Akebou puis Avé au sud qui présentent une situation de sécheresse d'impact faible. En perspective; des pluies faibles localisées sont entendues vers la fin février dans la portion sud du bassin (ouest des plateaux).

Direction des Ressources en Eau (DRE)

L'analyse des indices de suivi de sécheresse (SPI, SPEI, SSMI, FAPAR et autres) montre des situations normale et faible par endroit à prédominance normale. On conclue que dans la portion togolaise du bassin de la volta, dans les préfectures de Tone, Cinkassé, Amou et Kloto la situation est restée faible sans impact.

SAP agricole

L'indice de sécheresse du mois de Janvier montre un niveau de sécheresse faible dans les préfectures de Cinkassé, Tône et une petite partie de Plateaux-Ouest. Cette situation serait sans incidence majeure sur les points d'eau destinés à l'abreuvement des animaux et aux cultures maraichères.

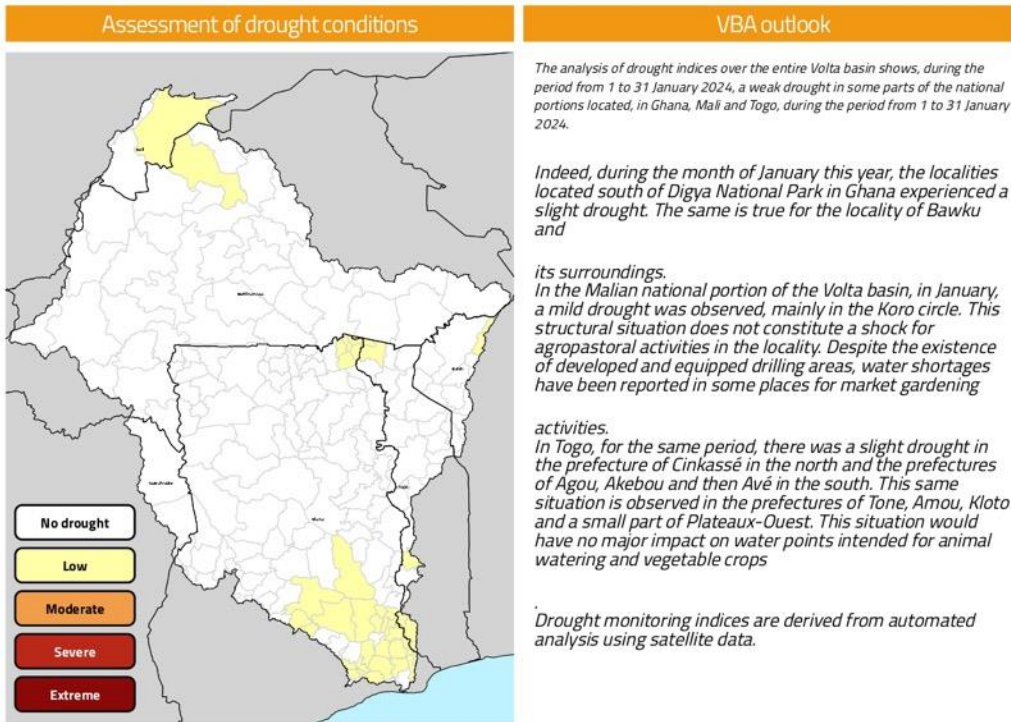
ENGLISH VERSION



Drought monitoring bulletin for the Volta basin

2024-02

*Estimate of the severity of drought conditions from satellite data
Valid from 01/01/2024 to 31/01/2024*



Contact to: secretariat.abv@gmail.com

This bulletin for the Volta basin is produced by the VBA with the technical and scientific assistance of the agencies in charge of meteorology and hydrology of the 6 riparian countries (Benin: DG-Eau, Météo Bénin; Burkina Faso: DGRE, ANAM; Cote d'Ivoire: DH, SODEXAM; Ghana: GHA, GMet; Mali: DNH, Mali Météo; Togo: DRE, DGMN), WMO, GWP-WA, CIMA Foundation with the support of the Adaptation Fund.





Detailed outlook on the Benin national portion of the basin
Valid from 01/01/2024 to 31/01/2024

2024-02

Drought conditions in Benin national portion of the Volta basin



- No drought
- Low
- Moderate
- Severe
- Extreme

Agence Nationale de la Météorologie (METEO-BENIN)
Drought monitoring indices are derived from an automated analysis of satellite data.

Direction Générale de l'Eau (DG Eau)
Drought monitoring indices are derived from an automated analysis of satellite data.

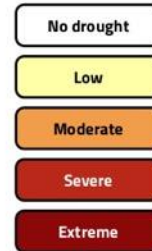
SAP agricole
Drought monitoring indices are derived from an automated analysis of satellite data.



Detailed outlook on the Burkina Faso national portion of the basin
Valid from 01/01/2024 to 31/01/2024

2024-02

Drought conditions in Burkina Faso national portion of the Volta basin



 Agence Nationale de la Météorologie (ANAM)

Drought monitoring indices show a normal situation on the national portion of the basin.

 Direction Générale des Ressources en Eau (DGRE)

Drought monitoring indices are derived from an automated analysis of satellite data.

 SAP agricole

Drought monitoring indices are derived from an automated analysis of satellite data.



Detailed outlook on the Ivorian national portion of the basin
Valid from 01/01/2024 to 31/01/2024

2024-02

Drought conditions in Cote d'Ivoire national portion of the Volta basin



- No drought
- Low
- Moderate
- Severe
- Extreme

Société d'Exploitation et de Développement Aéroportuaire, Aéronautique et Météorologique (SODEXAM)
Drought monitoring indices are derived from an automated analysis of satellite data.

Direction de l'Hydrologie (DH)
Drought monitoring indices are derived from an automated analysis of satellite data.

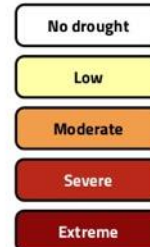
SAP agricole
Drought monitoring indices are derived from an automated analysis of satellite data.



Detailed outlook on the Ghanaian national portion of the basin
Valid from 01/01/2024 to 31/01/2024

2024-02

Drought conditions in Ghana national portion of the Volta basin



Ghana Meteorological Agency (GMET)

The drought analysis for the past month suggests that there will be minimal impact, particularly in the southern portions of the Volta Basin, specifically south of Digya National Park and its surroundings as well as Bawku and its environs. However, forecasts for the upcoming weeks indicate that conditions are likely to improve.

Ghana Hydrological Authority (HYDRO)

Drought monitoring indices are derived from an automated analysis of satellite data.

Environmental Protection Agency (EPA)

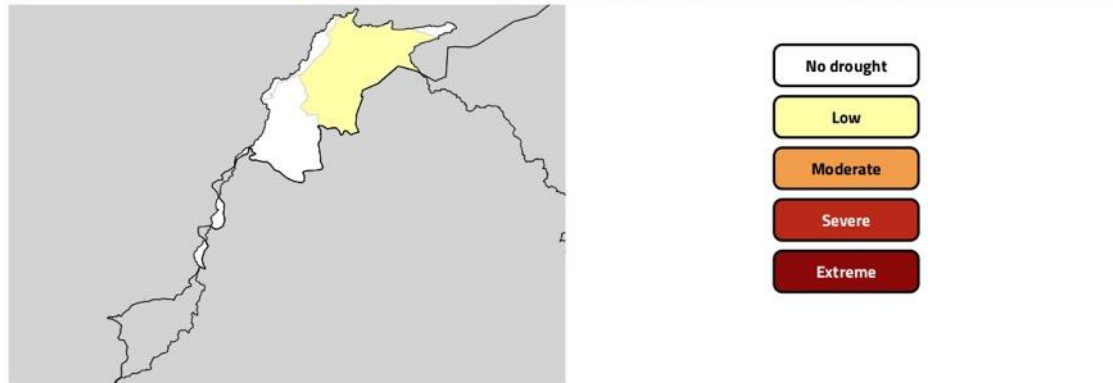
Drought monitoring indices are derived from an automated analysis of satellite data.



Detailed outlook on the Malian national portion of the basin
Valid from 01/01/2024 to 31/01/2024

2024-02

Drought conditions in Mali national portion of the Volta basin



Agence Nationale de la Météorologie (MALI-METEO)
The analysis of drought indicators shows a normal situation over most of the portion of the basin except in the south of the Bankass region, which has a low drought situation.

Direction Nationale de l'Hydraulique (DNH)
Drought monitoring indices are derived from an automated analysis of satellite data.

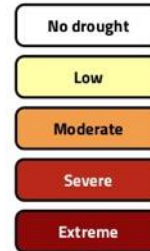
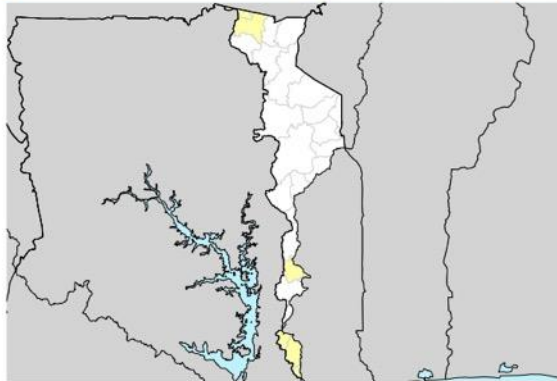
SAP agricole
The monitoring indicators observed on MyDewetra-Votaram for the month of January show the onset of a low-degree drought, mainly in the Koro circle among the three (3) circles of Mali located in the Volta basin. A structural situation that does not constitute a shock for agropastoral activities in the locality. Despite the existence of developed and equipped drilling areas, water shortages are reported in places for vegetable farming activities, especially at the level of water reservoirs. Note that the heights and the special distribution of the rains of the past winter were generally not up to expectations. A situation to be monitored closely in the long term, even if production prospects look good.



Detailed outlook on the Togolese national portion of the basin
Valid from 01/01/2024 to 31/01/2024

2024-02

Drought conditions in Togo national portion of the Volta basin



Agence Nationale de la Météorologie (ANAMET)

The analysis of drought indicators shows a normal situation over most of the basin except the prefecture of Cinkassé in the north and the prefectures of Agou, Akebou and then Avé in the south, which present a drought situation with low impact. In perspective; localized light rains are expected around the end of February in the southern portion of the basin (western plateaus).

Direction des Ressources en Eau (DRE)

The analysis of drought monitoring indices (SPI, SPEI, SSMI, FAPAR and others) shows normal and weak situations in areas with a normal prevalence. It is concluded that in the Togolese portion of the Volta Basin, in the prefectures of Tone, Cinkassé, Amou and Kloto, the situation remained weak with no impact.

SAP agricole

The drought index for the month of January shows a low level of drought in the prefectures of Cinkassé, Tône and a small part of Plateaux-Ouest. This situation would have no major impact on water points intended for animal watering and vegetable crops

List of the drought monitoring bulletins issued monthly from December 2023 for the Volta basin.

Anna Mapelli

[Déconnexion](#)

[Master ABV Volta](#)

Bulletin sécheresse bassin Volta + Nouveau

ID	Statut	Date de création	Dernière Modification	Publié	Actions
2024-05	Fermé	22/05/2024, 16:31	24/05/2024, 14:11	Publié	✎ ↻ ✖ 🗑️ 📄
2024-04	Fermé	23/04/2024, 17:03	25/04/2024, 20:43	Publié	✎ ↻ ✖ 🗑️ 📄
2024-03	Fermé	20/03/2024, 10:16	21/03/2024, 17:00	Publié	✎ ↻ ✖ 🗑️ 📄
2024-02	Fermé	15/02/2024, 12:03	16/02/2024, 17:12	Publié	✎ ↻ ✖ 🗑️ 📄
2024-01	Fermé	17/01/2024, 10:50	19/01/2024, 12:04	Publié	✎ ↻ ✖ 🗑️ 📄
2023-03	Fermé	21/12/2023, 10:54	22/12/2023, 16:02	Pas Publié	✎ ↻ ✖ 🗑️ 📄
2023-02	Fermé	30/11/2023, 18:23	30/11/2023, 18:23	Pas Publié	✎ ↻ ✖ 🗑️ 📄
2023-01	Fermé	30/11/2023, 13:06	30/11/2023, 17:22	Publié	✎ ↻ ✖ 🗑️ 📄

8 total