Eawag
Überlandstrasse 133
8600 Dübendorf
Switzerland
Phone +41 (0)58 765 55 11
www.eawag.ch

Dr. Francisco Silva Pinto
Dr. Judit Lienert
Environmental Social Sciences (ESS)
Cluster Decision Analysis
Direct Phone +41 (0)58 765 52 91
Francisco.SilvaPinto@eawag.ch

STAKEHOLDER FEEDBACK REPORT
FANFAR Workshop 2

@ Ange Hill Hotel, 9-12 April 2019, Accra, Ghana

Francisco Silva Pinto, Judit Lienert, Jafet Andersson

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Authors	Francisco Silva Pinto (francisco.silvapinto @ eawag.ch) Judit Lienert (judit.lienert @ eawag.ch) Jafet Andersson (jafet.andersson @ smhi.se)
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Summary

The FANFAR project (rein**F**orced cooper**A**tion to provide operatio**N**al **F**lood forecasting and **A**lerts in West Af**R**ica), funded by the European Commission (2018-2020), aims to foster reinforced cooperation between key West African and European organisations. The project focuses on developing a system according to West African user needs and priorities, identified through a set of workshops. The second workshop was hosted by the Hydrological Services Department of Ghana and took place at the Ange Hill Hotel (2019.04.09-12), in Accra, Ghana. Representatives from hydrological agencies and emergency management agencies on the regional and national level from 17 countries in West Africa contributed substantially to achieve the project goals. In this workshop, the main objectives regarding work package 2 were to further co-design the flood forecasting and alert system in West Africa by: 1) consolidating user objectives and preferences; 2) assessing the progress done on the FANFAR prototype systems since workshop 1; and 3) preparing the participants to test the system in 2019. Therefore, several activities were performed. To consolidate which objectives are important for the participants for developing a flood forecasting and alert system and how important those objectives are, several exercises were performed that allowed us to better understand the preferences. Regarding objectives, special importance was given to: ***high accuracy of information***; ***clear flood risk information***; ***reliable access to information***; and ***timely production, distribution and access to information***. The activities performed to understand the matching between expectations and the current development status of the FANFAR prototype systems for the flood forecast production; the (Hydrology-TEP), interactive visualization portal, integrated support systems, and flood risk communication features, allowed to focus on identifying possible improvements. The results obtained are promising and we look forward to continuing the co-design process and improve the systems in the next workshops.

1. Introduction

FANFAR (rein**F**orced cooper**A**tion to provide operatio**N**al **F**lood forecasting and **A**lerts in West Af**R**ica) is a project funded by the European Commission (2018 - 2020) with the overall aim to provide a short-term flood forecasting and alert pilot system for West Africa, through reinforced cooperation between key West African and European organisations (http://fanfar.eu/). A key focus of the project is to develop the system according to West African user needs and priorities, identified through a set of workshops. After the first workshop in Niamey, Niger, the second workshop took place in Accra, Ghana, and the main results regarding work package 2 are herein reported. Representatives from hydrological agencies and emergency management agencies on the regional and national level from 17 countries in West Africa contributed substantially to achieve the project goals. These participants came from Benin, Burkina Faso, Cape Verde, Gambia, Ghana, Guinee, Guinee Bissau, Ivory Coast, Liberia, Mali, Mauritania, Niger, Nigeria, Sierra Leone, Chad, Togo, and Senegal. A member of a fellow flood forecast and alert project in West Africa also participated, the ANADIA - Niger project. The FANFAR Workshop 2 welcomed 48 participants from 21 countries, including the consortium members from Europe.

The aim of the second workshop was to further co-design the flood forecasting and alert system in West Africa. Regarding working package 2, this was promoted by consolidating user objectives and preferences, assessing the progress done on the FANFAR prototype systems, and preparing the participants to test the system in 2019. From those activities, the main goals were:

- to consolidate the list of objectives that the participants previously acknowledged as important for developing an operational flood forecasting and alert system (i.e. what the system

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should achieve), and to elicit preferences regarding those objectives; see **Section 2**;
- to understand the matching between expectations and the current development status of the FANFAR prototype systems for flood forecast production (Hydrology-TEP), visualization portal (fanfar.eu/), integrated support systems, and flood risk communication, see **Section 3**;
- to make preparations to test the FANFAR prototype systems in 2019; results are highlighted in **Section 4**.

2. Objectives for an operational flood forecasting and alert system

In order to achieve a consolidated list of objectives and elicit stakeholder preferences on those objectives, we first reviewed the Multi-Criteria Decision Analysis process (2019.04.09). Afterwards, the results from all related activities since Workshop 1 were highlighted, and the consolidated list of objectives was discussed (see Figure 1). New objectives proposed by the participants are very important, especially for the long-term sustainability after the FANFAR project ends in 2020. They are not included in the project-specific objectives in Figure 1; these are relatively narrow and therefore suitable to help with the current system development. The long-term sustainability objectives are discussed in other sessions throughout the project.

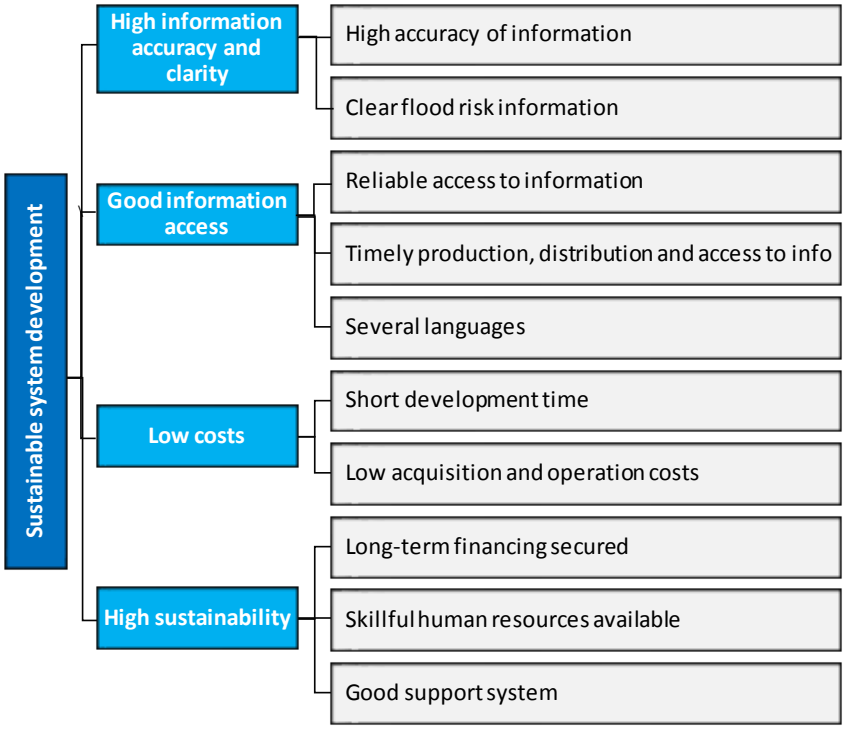

Figure 1. Consolidated list of objectives for developing an operational flood forecasting and alert system.

Following, the discussion of the objectives, several sessions took place to understand the differences in preference regarding each objective for all the stakeholders involved (2019.04.11). Across all sessions, the most important objectives were: ***high accuracy of information***; ***clear flood risk information***; ***reliable access to information***; and ***timely production, distribution and access to information***. These will be further revised and used to guide the system development process. They will allow to prioritize different system options according to user needs and preferences.

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3. Options to improve the FANFAR prototype systems

The developments made on the FANFAR prototype systems, Hydrology-TEP and visualisation portal (http://fanfar.eu/), were presented in detail to the participants (2019.04.10). This was followed by practical sessions where the prototypes were tested (2019.04.10-11). The integrated support systems as well as the flood risk communication components were also assessed. Hereby, the participants were asked to provide structured feedback regarding different aspects of the currently available system prototypes.

First, we highlight the main feedback received regarding the visualization portal (IVP) at http://fanfar.eu/ (Table 1).

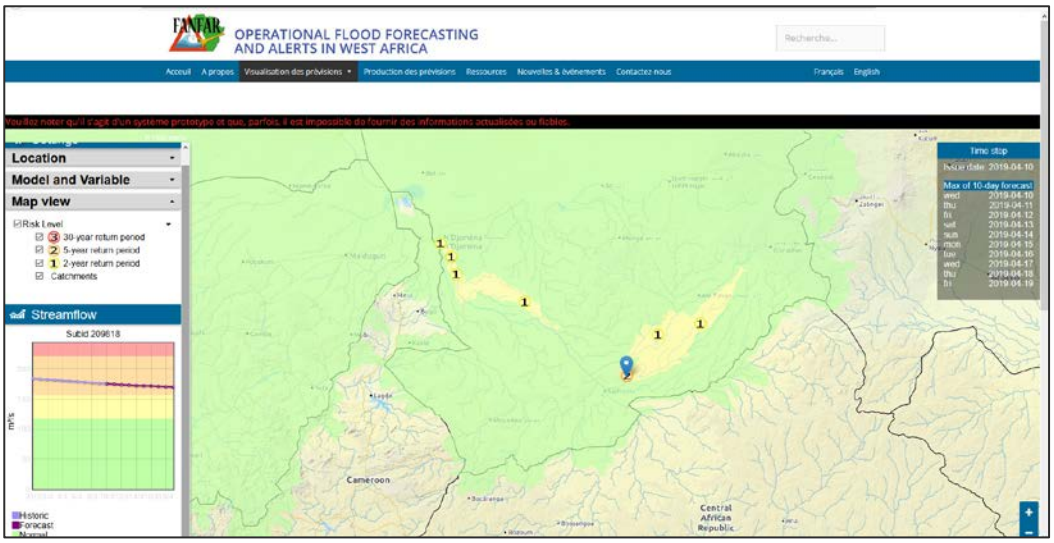

Table 1. Main improvement suggestions regarding the visualization portal at http://fanfar.eu/

Main suggestions	Remarks by FANFAR team
Location coordinates should be synchronized with the selected location	*Ok, good suggestion.*
The sub-basin boundaries and road networks should be provided on the forecast visualization map	*Ok, good suggestion.*
Visualization of stations and hotspots (e.g. previously identified areas)	*Ok, can be added if hot-spot and station data and coordinates are provided.*
Additional hydrological and flood risk information should be given (namely precipitation, water levels, road networks, and population)	*Precipitation: ok. Water level: we will attempt to provide it at all locations possible. Roads & population: can be added if suitable data is provided.*
Forecasts should be more accurate	*Yes. Our approach to improve accuracy is described here.*
System should function better with poor internet connections	*Our approach is to also make the information accessible through static images, emails and SMS.*
Map and graph download option	*Ok, good suggestion.*
System should be available in French and Portuguese	*Ok, good suggestion.*
Visualization of past forecasts (reforecasting)	*Reforecasting is available at the Hydrology-TEP platform.*
Visualize a mosaic forecast (i.e. best available forecast in each given location selected from the set of underlying models)	*Ok, good suggestion.*
Improve mobile web design	*Ok, good suggestion.*
Visualize which stations / countries / organizations provide data to improve the current forecast	*We will gladly do that once local data is made available operationally for the forecasts.*

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Second, we summarize the main suggestions regarding flood risks communication (Table 2).

Table 2. Main suggestions regarding flood risk communication (as visualized on the IVP, see above).

Main suggestions	Remarks by FANFAR team
Flood risk threshold definitions should be revised, e.g. (1) related to potential flood impacts to match disaster managers' needs (e.g. main infrastructure and population), and (2) translated to local warning thresholds defined at critical stations	*Ok, good suggestions.*
Provide flood risk maps at higher resolution (e.g. zooming to "street view" to see water level)	*FANFAR is a regional system. The underlying models only provide information down to sub-basin resolution. To obtain forecasted flood risk on local street-view level, it is necessary to couple the regional system with a local high-resolution hydraulic model. For example as done in the lower Sirba River in the ANADIA project (here).*
Introduce a map legend	*There is a legend below the hydrograph. But we will move it to make it more visible.*
Provide different types of flood risk (pluvial and fluvial)	*Good suggestion, so far FANFAR provides information about fluvial floods.*
Provide a downloadable report with information on flood risk and notifications.	*Good suggestion.*

Third, the main feedback received regarding the support systems is outlined (Table 3).

Table 3. Main improvement suggestions regarding the integrated support systems.

Main suggestions	Remarks by FANFAR team
Inclusion of video tutorials for training	*Ok, good suggestion.*
Provide a faster response and a telephone hotline	*Ok, good suggestions. That can be added if/once FANFAR becomes a fully operational 24/7 system with additional finances for such support. So far FANFAR is a pilot system, with support available here: http://fanfar.eu/support/*
Develop simple user manuals	*User manuals are available for each system component at the FANFAR Knowledge Base (http://fanfar.eu/support/). Suggestions on how to simplify them can be submitted through the Forum or Help Desk.*

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Fourth, we highlight the main suggestions received regarding the Hydrology-TEP (Table 4).

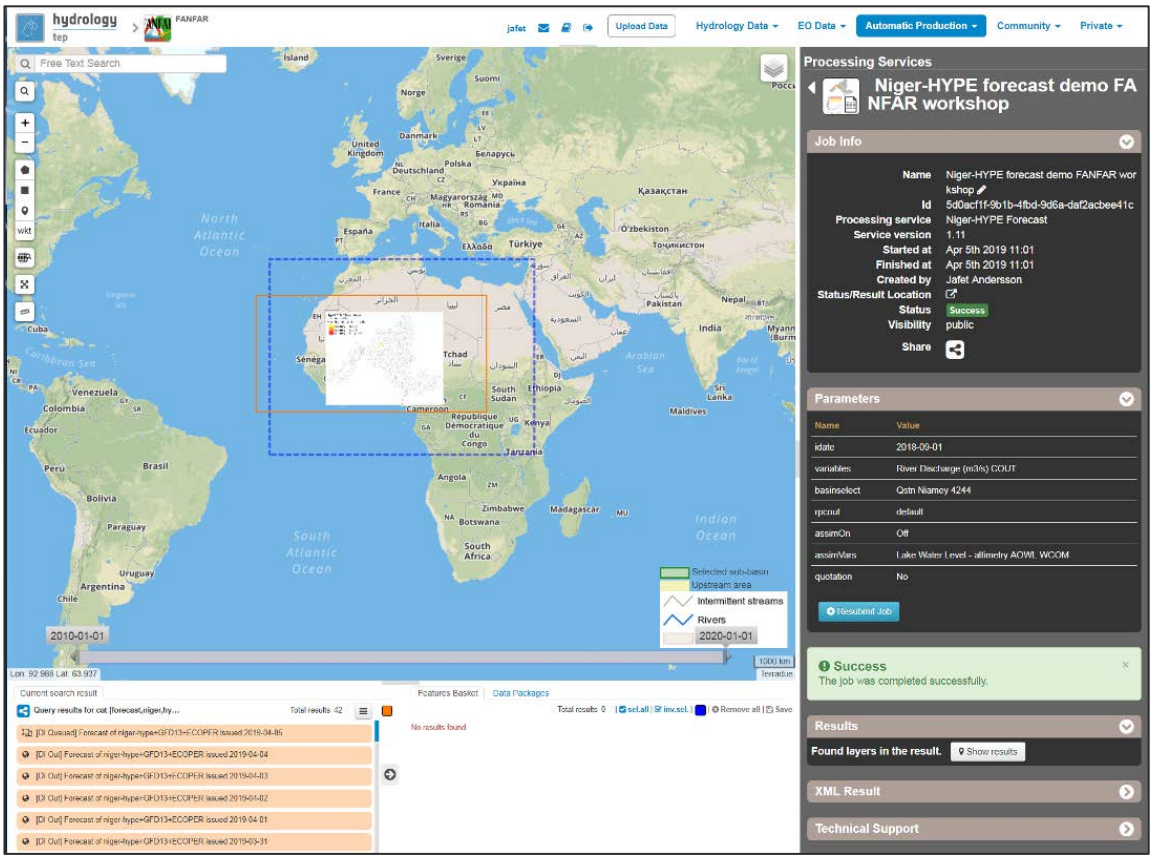

Table 4. Main improvement suggestions regarding the Hydrology-TEP.

Main suggestions	**Remarks by FANFAR team**
Visualization of additional stations	*Possible if additional station data is provided*
System should display more indicators such as water balance, water quality, precipitation, and temperature	*Ok, more outputs will be added. Note that water quality information is outside the scope of FANFAR.*
System should be available in French and Portuguese	*Ok, good suggestion.*
Coordinates should be given when visualizing a location	*They are available at the bottom left of the map.*
Easier generation of hydrographs (e.g. as a pop-up)	*Hydrograph pop-up graphs are produced only for the selected output sub-basins. A user guide on how to select output sub-basins is available here.*
Simplify procedure to download forecast and hindcast data	*The data can be downloaded from the "Current search results". A user guide on how to do this is available here.*
Hype model accuracy needs to be improved (peaks and baseflows are not sufficiently accurate)	*Yes. Our approach to improve accuracy is described here.*

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4. Stakeholder participation in follow-up activities, concluding remarks and acknowledgements

One of the goals of this workshop was to prepare the participants for the upcoming rainy season in 2019. In order to achieve this goal, clear and practical actions to be developed during the upcoming season were discussed (2019.04.12). The most important actions include: **continue to provide data for the prototype systems; send regular feedback; and test the reception of alert notifications by SMS and e-mail**.

The outcome of the interactions regarding working package 2 and promoted during the second FANFAR workshop in Accra, Ghana in April 2019 was compiled. It will be used to technically improve the FANFAR systems to better correspond to the users' needs and preferences. This will allow for a fuller integration and adaptation of the FANFAR flood forecast and alert system to West African conditions.

There was a high commitment of all stakeholders to actively participate in the FANFAR system refinement process in Workshop 2. For the FANFAR consortium, this is an important step towards a sustainable uptake of a flood forecast and alert system. Indeed, the results are very promising.

We wish to express our gratitude to all participants for their time, their valuable contributions and their patience and open-mindedness to go along with our methods and participate in all the different activities. We also thank our host the Hydrological Services Department of Ghana for the hospitality, and we thank the European Union for funding (Horizon 2020 / Grant Agreement 780118).

We look forward to the continued discussions with participants to further improve the FANFAR flood forecast and alert system in the next workshops.

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