ANNEX I: Terms of Reference for development of a website and mobile application to disseminate flood warnings

1. Introduction

The development of the website and mobile app to disseminate flood warnings is one of the deliverables of Task 4 to improve crisis communication and management which is part of the bigger project to Develop and implement a Flood Forecasting and Warning System for Hoi An and Vu Gia-Thu Bon River Basin.

The main objective of the project "Development and Implementation of Flood Forecasting and Warning System for Hoi An and VGTB Basin" is the improvement of the forecasting and warning services as well as the response capacity of the government and society to reduce the impact of meteorologically induced natural hazards in the Vu Gia-Thu Bon river basin area.

To improve the flood warning dissemination from forecasters to provincial/district/communal commanding committees and from these committees towards the businesses and the citizens a website and app needs to be developed. The website will be developed as a progressive web application allowing the website to work on any platform that uses standard compliant web-browsers. In this way the website can also be used as an app on a mobile device through a standard web-browser.

2. Website and App requirements

A. General information

The website/app should serve different types of end-users such as staff from commanding committees as well as businesses and citizens. The staff from the commanding committee are typical administrators of the website/app, whereas communities, municipalities and businesses and citizens typical viewers of information. The website should be designed in such a way that it's easy to use for the end-users.

The website/app will be installed and hosted on a local server (or when agreed upon with client in a cloud server e.g. form e.g. Viettel) at Quang Nam Provincial Steering Committee for Disaster Prevention and Control (DARD). Preferably the website/app needs to be integrated within the website of DARD (http://pctt.quangnam.vn/). In addition, the website/app should also be integrated within the website of the municipality of Hoi An.

The FFWS at the provincial hydromet center runs automatic workflows that will generate data and information that will be used as input in the website/app. The data and information are accessible through a REST and WMS service (FEWS PI REST and FEWS WMS Service).

The website/app enables flood forecast and warning dissemination from the FFWS forecasting system to DARD, to district, city and citizens and provides the following information products.

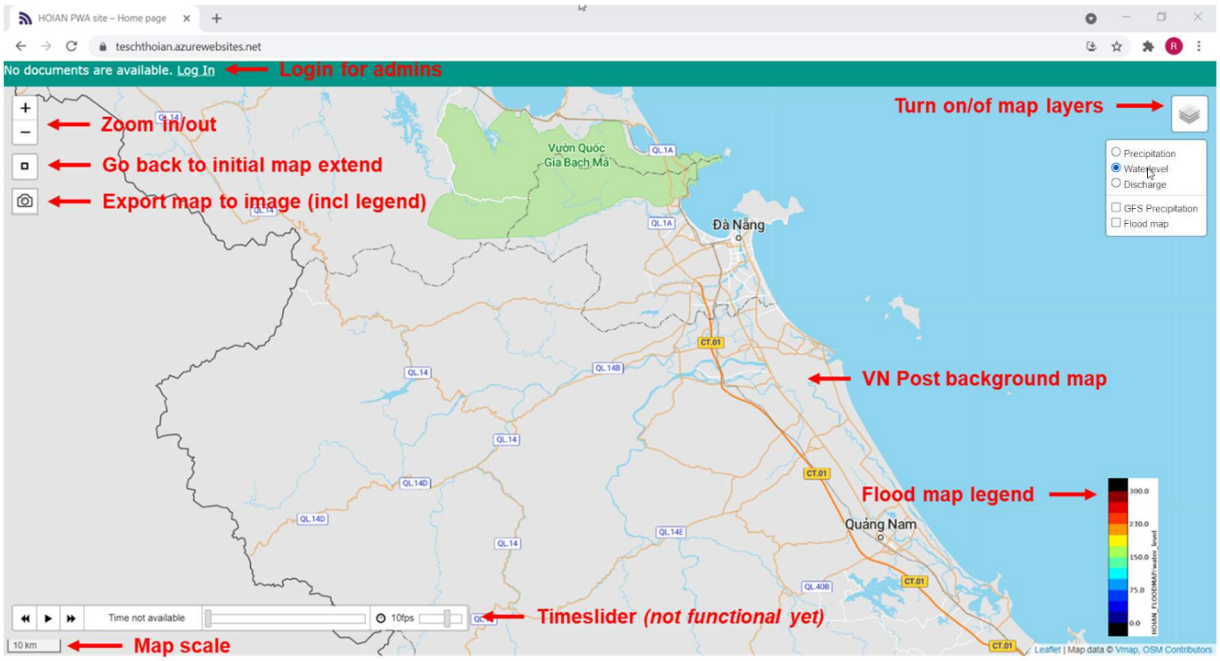
Interactive map with:

- Locations of meteorological (rainfall) stations, hydrological stations, reservoirs
- Maximum flood map in the forecast duration
- Background map (for orientation)

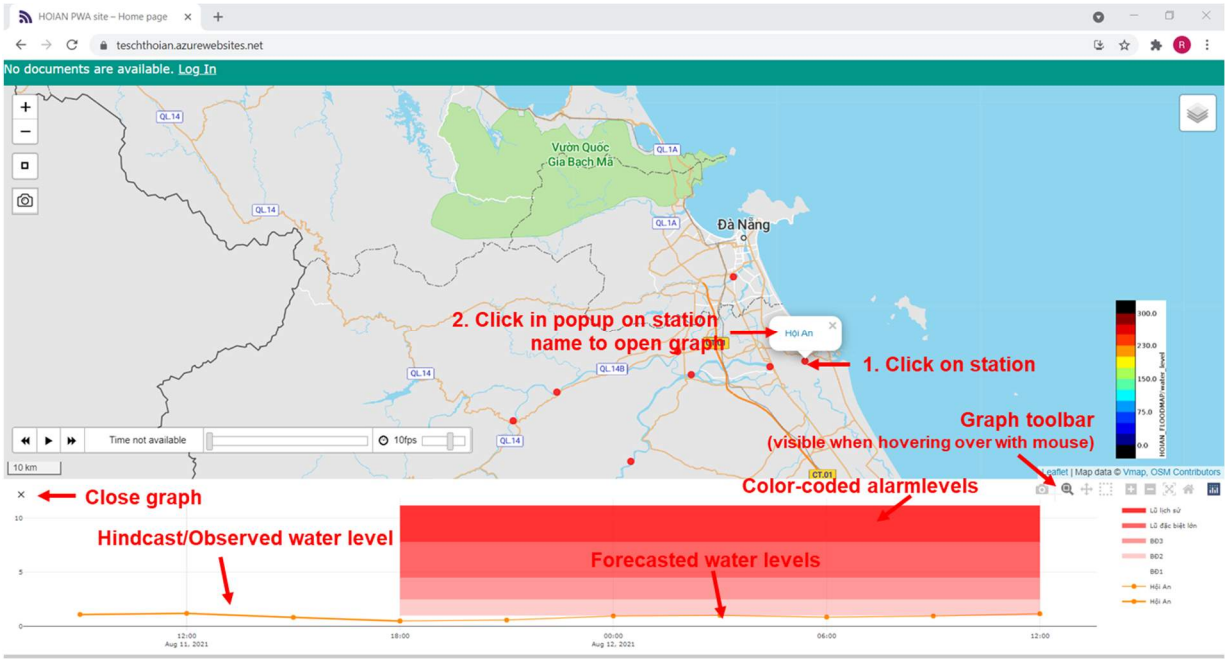
Interactive timeseries data: graph show the timeseries of observed data, hindcast, forecast

- Hydrological stations: observed and hindcast water level and forecast water level
- Rainfall stations: observed rainfall (3 days) and forecast rainfall (10 days)
- Reservoirs: observed inflow, outflow through spillway, outflow through hydropower plant, reservoir water level

Documents / text based information: Approved flood and warning bulletins including disaster levels and guidance/recommendations for communities, citizens, business to take precautions and mitigation actions.
Example mockups (see also rapid prototype https://teschthoian.azurewebsites.net):



Interactive map



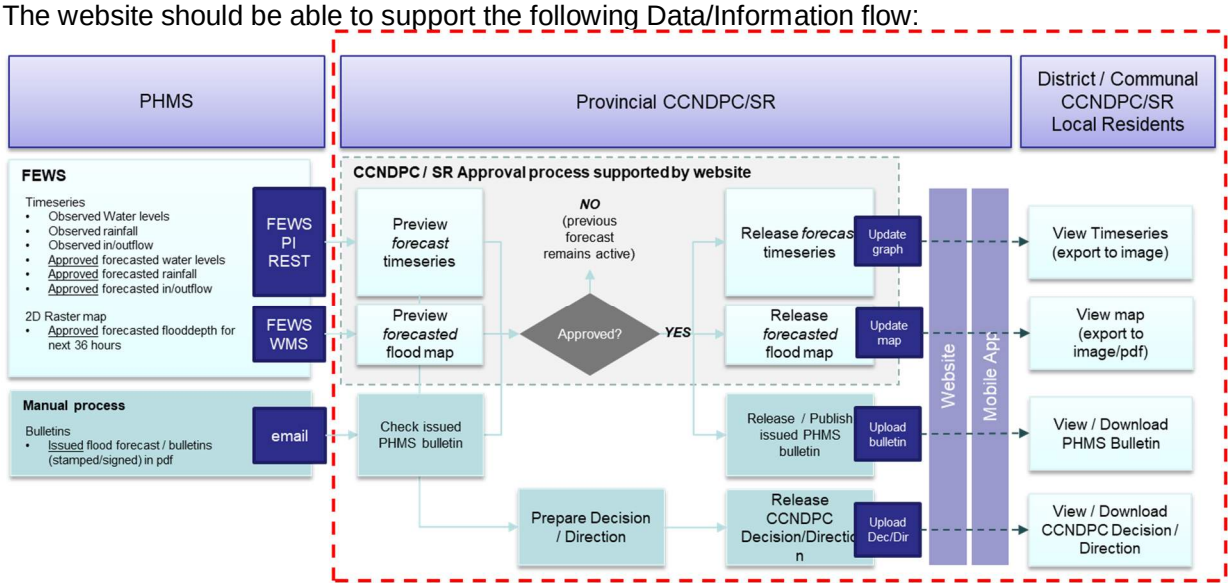
Interactive timeseries data

The website/app should at least have the following general tools/functions of the website/app:

- By clicking on a hydromet station a timeseries graph opens showing the observed/hindcast and forecasted datapoints. The graph allows to zoom in/out and explore datapoints. The user can export the graph as an image (e.g. jpg).
- In the map it should be possible to select multiple measuring stations (Ex. selecting 2 or 3) and displaying data of these stations on the same graph in order to compare stations.
- Popup window to show the flood depth when the cursor moving
- "Toolbar" or buttons that:
    - show rainfall (filter stations list, show rainfall stations on map),
    - show water levels (filter station list and show map with water depths),
    - show reservoir in and outflow,
    - show flood bulletins and guidelines.
- There needs to be an administrator interface (login required) to update/upload data and perform regular website/app maintenance activities
- Ability to upload bulletins as pdf's

B. Support a review and approval workflow

The website should be able to support the following Data/Information flow:



The provincial hydromet service is using FEWS to run simulations and produce forecasts. For those stations that are connected to the network, timeseries of observed water levels and observed rainfall are made available through the FEWS PI REST service. Where and if available the in- and outflow of reservoirs is also made available through FEWS PI REST. Only approved timeseries of forecasted water levels, rainfall for a selected set of stations and in/outflow for reservoirs is made available through the PI REST service. The approved forecasted flood depth map is made available through the FEWS Web Map Service. FEWS produces a prefilled flood forecast/warning bulletin. With a manual process this bulletin is finalized (signed) and issued by the PHMS and emailed to DARD.

During a flood event the website allows DARD to preview the forecasted timeseries and forecasted flood map. The official issued bulletin is received in the email. All information is reviewed, and DARD approves the release of the forecasted timeseries, the forecasted flood map and the PHMS bulletin. The new flood forecast and warning is published and released to the general public. The website is now showing the new forecasted timeseries in updated graphs, the new flood map. The PHMS bulletin is uploaded as a pdf /image file. If the DARD decides not to approve the forecasted information, then the website will keep the previous forecast as the active

one. In parallel DARD is preparing Decisions and Directions for the district and communal CCNDPC/SR as well as the local residents. After release the decision/direction uploaded as a pdf/image to the website.

C. Functional requirements (FR)

User group: Public users (District Commanding Committee, Local people: Citizens, international tourists, businesses, etc.)
Listed requirements apply to both website & app unless mentioned otherwise.

FR-001	There is no need to login. Public users can access the
FR-002	User should be able to see if there is a flood warning in effect and when the latest warning information was released.
FR-003	Turn on and of layers with locations for (1) water level stations, (2) precipitation, (3) reservoirs, (4) 2D flood map (5) 2D rainfall forecast map (6) suitable satellite and/or street map background map. The locations for hydromet stations are represented by pins. The water level stations are color coded in accordance with the applicable maximum forecasted alarm levels. Rainfall stations are color coded by maxim forecasted rainfall severity.
FR-004	Users can zoom and pan on the map and go back to the initial map extend. On the app they can recenter the map to my location.
FR-005	Users can click/select station locations to view latest observations and forecast info in a chart. - Water level: The graph shows 3 days of observed water levels (or hindcast) and for daily forecasts a 3 day water level forecasts and during flood event a 24 hours forecast. The chart should also display the station specific alarm levels with same color codes as used for the stations locations on the map. - Precipitation: graph shows observed and forecasted rainfall. Rainfall severity classes should be shown in the graph as well. - Reservoirs: observed water level and discharge. The actual set of parameters to be shown in the graph needs to be agreed with DARD and FFWS Development team. User can click/select on multiple stations and the chart should show the observations and forecasts for these selected stations in the same graph.
FR-006	Chart with observation data and forecasts can zoom in, out. Provide chart value when hovering over graph and create an image export of the graph.
FR-007	Users should be able to easily view the latest flood warning bulletin / guidance note that is issued by DARD (view decision or direction note).
FR-008	When hovering over the station locations on the map the station name is shown
FR-009	The rainfall forecast map is the same map/layer that is used by FFWS to generate the forecast
FR-010	The flood map is color coded by water depth and shows the maximum flood depth in the next 24 hours. When clicking on the flood map the user gets a popup with the maximum water depth at that location.
FR-011	User should get a push notification when new forecast is released or when observed rainfall, waterlevels for a specific station reach an alarmlevel treshold. It will need to be investigated to what extend web push notifications with a progressive web application are possible on iOS and Android devices. Bidder needs to include in his proposal how this is done. Bidder needs to come up with an alternative if this cannot be achieved out of the box.

User group: Administrators (DARD)
Listed requirements apply only to website. There are no administrator requirements for the app.

FR-012	Login
FR-013	Change password
FR-014	Website provides a facility to support workflow to approve or reject new forecast. - Be able to preview new released forecast information by FFWS (PHMS): both timeseries and flood map. - Reject: old daily/flood forecast remains in effect - Approve: old daily/flood forecast is replaced with the new one, charts and maps are updated, all app users are notified that new forecast is in effect.
FR-015	Website has a facility to prepare/upload a flood warning bulletin that is issued and released by DARD.
FR-016	Logout

The software development company needs to take into account that additional functional requirements may be added based on client feedback. This flexibility needs to be built into your offer.

D. Technical requirements

Website/App
The prototype that is currently available is running python django and a java ncwms server which are both install with conda and running on a docker container. The python part is very light and doesn't need many resources but the java part is a bit more expensive to run.
An image of the OS is used to deploy the container which take around 1GB. The deployed image with the conda environment with django and java is about 3GB. The disk space constrains to deploy to website is mostly due to the OS that will be used. Whatever you use Linux or Windows, 100GB of disk space is largely enough.

The website needs to be setup as a progressive web application in order to run on any platform that uses a standards-compliant browser, including both desktop and mobile devices.

The website/app will be installed and hosted on a local server at Quang Nam Provincial Steering Committee for Disaster Prevention and Control (DARD). The software development company therefor needs to work with others Line Agencies (up to 3 LAs) to integrate the developed Web/App to their current IT infrastructure and web applications.

It is possible to deviate from the technical approach taken in the prototype. In that case the software development company should propose the technical solution and their approach to development and deployment in their offer.

E. Non-functional requirements:

Performance	Website should be responsive and load times for maps and graphs should be fast.
Security	Needs to meet the requirements for integration of website / mobile app into DARD's Quang Nams website/server

Recoverability	Arrangements need to be made to back up the application data and the forecast data like the data retrieved from the FEWS (backup the database) and other media files like documents that are uploaded.
Maintainability	Setup a repository for version control (e.g. GitHub)
Usability	Website needs to be able to support Dual language with Vietnamese as the primary language and English as the secondary language.

F. Required Resources and experience

The software development company should propose staff for the following positions:
- Solution Architect
- UX/UI Designer
- Front-end Software engineer
- Back-end Software engineer

JavaScript/html5 is required and Django/python experience is preferred.
The Software development company needs to demonstrate that they have at least 5 years' experience in development and successful deployment of similar type of progressive web applications preferably for government agencies.

G. Hardware constrains

For the exact hardware constrains the developer get into contact with the IT company that currently manages Quang Nam's website.

It's recommended to have the following minimum configuration:
- 8 CPU (or vCPU)
- 8 GB of RAM
- 100 GB of disk
- OS Windows or Linux, but docker is required

3. Work package (WP)

The developer is asked to provide the following work package:
WP1. Solution design
WP2. Full development of website and mobile app
WP3. Provide an operational draft version of website and mobile app and provide JV access
WP4. Improve operational draft version based on feedback JV
WP5. Deployment of website and mobile app remotely
WP6. Provide 2 day training (including O&M training session)
WP7. Provide user manual and technical documentation in English and Vietnamese
WP8. Provide O&M from the installation up to 1 April 2024, with service levels during regular office hours

4. Deliverables

The mobile app developer is asked to deliver the following products/services:
D1. Solution design: description of the approach, architecture, functions & UI/UX design
D2. Draft version of the website and mobile app based on the technical requirements
D3. Final version of the website and mobile app: An improved version of the drafts
D4. Deployment of website and mobile app remotely
D5. 2 day training
D6. Documentation
D7. O&M

5. Time schedule

Project start date: 1 December 2021

Week number	Duration (weeks)	Deliverable
0-1	2 weeks	WP1 / D1
2-5	3 weeks	WP2 - WP3 / D2
6-8	3 weeks	WP4 / D3
9	1 week	WP5 / D4
10	1 week	WP6 - WP7 / D5 - D6
>11	(till 01/04/2024)	WP8 / D7

Dates are indicative and need to be agreed on during contract negotiations.
Please provide a detailed list of activities / tasks including your estimated person-days for each activity.

6. Payment schedule

1st instalment: 10% payment after both parties agreed on Solution Design (D1)

2nd instalment: 30% after Deliverables for WP1, WP2 & WP3 (D2: Draft version) are accepted by Client and JV

3rd instalment: 30% after Deliverables for WP4 (D3) are accepted by Client

4th instalment: 30% after Deliverables for WP5, WP6, WP7, WP8 (D4, 5, 6, 7) are accepted by Client