DFID – GFDRR Challenge Fund

PHASE II FINAL REPORT TEMPLATE: INCLUDING MONITORING SELF-ASSESSMENT

Please address the following in narrative form, as applicable, to your project.

I. Name of project, target country(ies), USD amount and time frame of Phase II grant

Name	Public Online Media for Flood Response at the Tanzania Red Cross Society
Target country	Tanzania
USD Amount	$150.000
Timeframe	April-December 2017

II. Please provide updates on this project since the submission of inception report

Since the submission we first drafted and agreed on the individual functions of the tool, written down in the use-case specifications. Next, we started the main work which was the actual development of the tool, among which:

- Review online media data availability and potential for scraping per region of Tanzania (set-up queries, access repositories).
- Connection of online (social) media data (Twitter, Jamiiforums and Whatsapp) set to the API and implementation of event detection
- Additional front-end development for the integration of the new sources
- Back-end improvements for robustness and speed issues (the internet at TRCS is slow and needed to be compensated)
- Semantic analysis of the online media content for event detection (using a combination of supervised and unsupervised machine learning)
- Review datasets Earth2Observe to obtain historical hydro-meteorological data for impact forecasting.
- Correlation analysis of hydro-meteorological data and newspaper retrievals FloodTags
- Front-end development for the impact forecasting application
- Software documentation and software manual (tooltips)

Thereafter we went to Tanzania for the second time to handover the software and provide the necessary training. The software has been operational since then.

III. Description of tool, approach, toolkit

First, we would like to start with a brief explanation of the tools that we developed in this project. Thereunder the questions a) through f) will be answered.

Two tools were developed:

1. FloodTags Dashboard: A system and online dashboard to monitor and analyze flood information from online (social) media
2. Impact Forecasting App: An online impact forecasting tool, that translates meteorological forecasts into estimates of flood impact

> ***"This tool provides us with an online way of collecting information on flooding. Just by looking at it from our desk, we can see the level of damage, the water levels, people that call out for help harvested from the different media considered in the tool"***
>
> (Renatus Mkaruka, Head of Disaster Management at the Tanzania Red Cross Society)

FloodTags Dashboard

The first tool enables the Tanzania Red Cross Society (TRCS) to monitor and analyze flood information from a variety of online media sources. It uses flood related data from international sources such as Twitter, but also draws from local sources of data, being the flood information shared by Red Cross members and volunteers through WhatsApp and the Tanzanian social medium JamiiForums. The system monitors and analyzes the data, and distributes the analysis results through an online dashboard (see figure on the next page).

In case a flood event is detected (i.e. thresholds are exceeded indicating a flood), users who have subscribed to alert emails, will receive a notification in their inbox. They can then go to the online dashboard, and review all incoming flood information in real-time. In addition, this dashboard can be used to analyze historic online flood information as well. Users can select data based on publishing date and source of the data. Also, they can filter information by refining it to information about locations, searching by specific keywords, or only showing data from areas where heavy rainfall was observed. In summary, this dashboard allows users to quickly get an overview of all available online flood information, and analyze this information in detail.

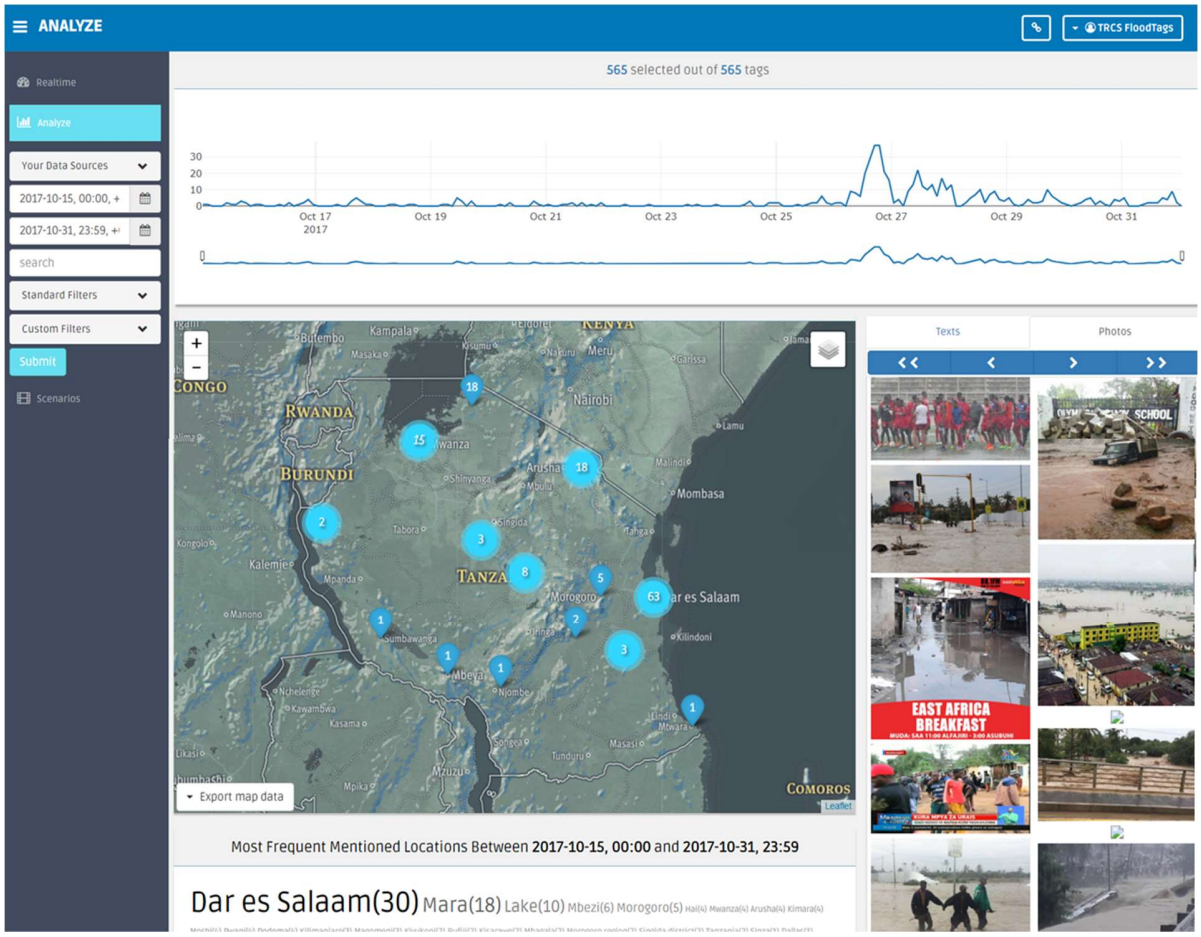


Figure: Screenshot of the FloodTags Dashboard clearly showing the floods in Dar Es Salaam end of October

Impact Forecasting App

While the first tool provides the TRCS information about what is going on in real-time, the second tool is aimed at providing forecasts. It enables TRCS staff to forecast the expected impact of a flood event, based on severe weather alerts, made by the Tanzania Meteorological Agency (TMA). In the online tool, the user fills in the province of interest, the current condition of the area, and the forecast amount of rainfall, following thresholds generally used by TMA (see below figure). The tool will then search for similar situations in the past, and calculate the expected impact from news articles about this past situation. This provides impact estimates to the user, such as the number of casualties of an event or people evacuated. Additionally, users of the tool can follow the links to the news articles, to get an in-depth overview of the past event.

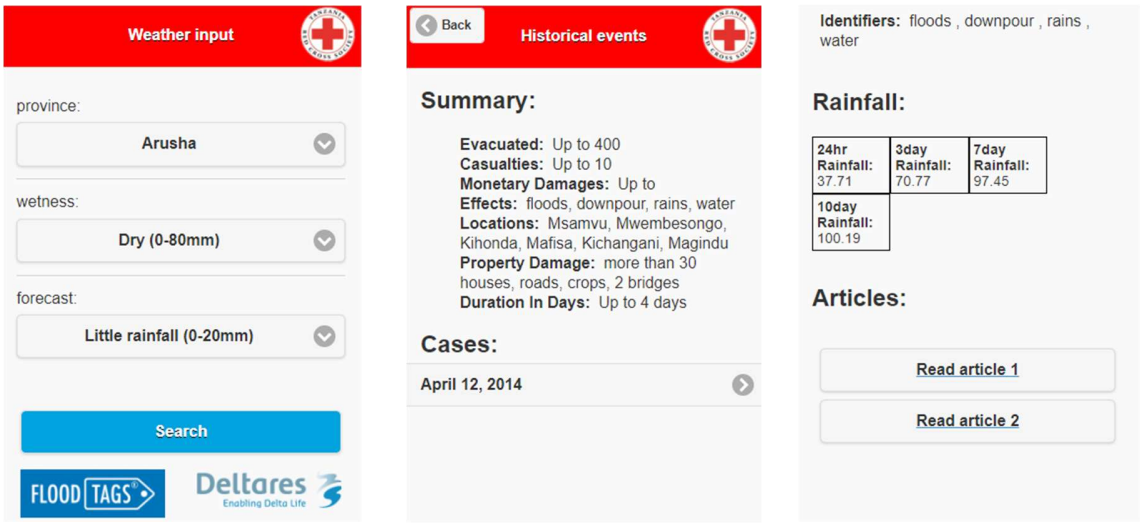


Figure: Screenshot of the Impact Forecasting App

a. *Was it demand-led? If yes, how?*
b. *Did you work with local beneficiaries in Phase II to develop your tool? If yes, how many local beneficiaries and how were they involved?*

Since they are much related, we would like to answer these two questions together. To ensure that the tools to be developed connect to demand, we first of all invited the end user (Tanzania Red Cross Society) to be part of our consortium. In this way we are certain that TRCS will be able to fully effectuate their needs in the core requirements of our end product. Together with TRCS, in early stage we also interviewed other potential beneficiaries, including the Tanzania Meteorological Agency. We also consulted with the World Bank to understand what other initiatives are ongoing and to which we may possibly connect and to ensure we are not duplicating efforts. Finally, we connected to the DMD (government Disaster Management Department under Prime Minister's Office). This is all meant to make sure that any developments are led by demand from end-users.

Within the inception of CF Phase II, the consortium (FloodTags, Deltares, TRCS) established a total of four prioritized use cases for a flood monitoring dashboard, and an additional use case for harvesting historical flood events from online media articles and meteorological data. This was done in a highly inclusive manner by conducting interviews with several staff members that operate at local level (Dar es Salaam) as well as regional level and national level. The staff interviewed included Grace Mawalla (TRCS, Dar es Salaam branch coordinator), Khamar Kashoro (TRCS, Communications and Documentarist officer), Lucy Swy (Branch-coordinator for Kilimanjaro and project manager / community manager for HIV and AIDS in six regions), Nyambiri Kimacha (disaster preparedness manager), and Vivaoliva Shoo (Manager disaster response department, and gender focal point). Note that Vivaoliva Shoo is the gender focal point for TRCS, she gave us insight in how gender inclusiveness is organized within TRCS.

Through the questionnaire and further elaboration by TRCS, the prioritized use cases for the online media to be used for flood response included:

- Use-case 1: The TRCS is able to detect the onset of floods in real-time
- Use-case 2: TRCS staff can get a good overview of social media posts about an event
- Use-case 3: TRCS staff can get a good overview of the messages that were shared by other TRCS personnel or volunteers about an event
- Use-case 4: The TRCS can receive/collect additional impact information for fund requests to donors (such as the disaster relief emergency fund, DREF).
- Use-case 5: TRCS staff receiving a weather alert understand better what the potential impact is.

More information on these use cases can be found in our document “Use-Case Specification: Online Media Monitoring” and “Use-Case Specification: Flood History Table”

Figure: Types of actions supported by the tools: Handing out food and water supplies (photo of Kilosa assistance after the floods in 2014)

c. What is 'new'? In other words, what did Challenge Fund monies support in Phase II?

The novelty within Phase II is that we demonstrated that the product, as established in phase I for the Philippines:

- can be scaled to other geographical locations (even those with little Twitter coverage)
- can be combined with active reported user generated content (we tested this via user groups in WhatsApp, which is highly effective) and
- can be used as input for impact forecasting

We carefully assessed what factors need to be considered whilst scaling the product to other locations, so that uptake in other regions can be pursued after this project. In this respect, the Phase II project delivered the following insights:

- Used media platforms: a very important consideration is that across countries, different social media platforms may be used. Within the Philippines, Twitter penetration is very high, and therefore Twitter was our main and only source for gathering information within the dashboard. In Tanzania however, the penetration of Twitter is relatively low. Instead, Whatsapp groups and a discussion forum called "Jamiiforums" is used a lot to communicate about flooding. Based on the use cases and requirements to fulfil these, we decided to start supporting ingestion of Whatsapp group messages and Jamiiforums. In contrast to 'passive listening', using Whatsapp data is a form of 'active engagement'.
- Language: Tanzania's main language is Swahili. The tools ability to language independently train algorithms for text recognition was very useful. However, the Impact Forecasting App only works for English language still. We need to see how the tool is used in the coming time, and conclude whether to invest in detection of events from Swahili newspapers, to add on to the English newspapers.
- The use-cases: The main functionalities of the tools are the same in Philippines and Tanzania (detecting floods and overview of situational awareness during floods). However how it is exactly used may differ per region. For instance, in Tanzania, using the information to support a DREF application stood more central than in the Philippines. Also, the active reporting by disaster managers and volunteers as is done now in Tanzania is a really different way of using the tool. Vice versa, The Philippines had a higher level of professionality with an extensive Operation Centre (OpCen) where the FloodTags dashboard is displayed. In Tanzania they do not yet have an OpCen, so various people will consult it from behind their own desks.
- Conclusively, the end-user itself. While the Philippine Red Cross is a strong party in Manilla with ample resources, the Tanzanian Red Cross has trouble keeping its head above water. We took the remarks of director Mkaruka seriously when he said financial resources for disaster management is a big problem in Tanzania. With it, our objective was widened from delivering the data to Red Cross, to really empower the TRCS with data, so that they can enforce their role as pivot in disaster management in Tanzania, and

hopefully draw additional funds from there. Until now, this enforcement seems to work. There are already a number of initiatives taken under the to-be-signed MoU between TRCS, Deltares and FloodTags, that can help TRCS with funds for the good work they do. More about the MoU below.

d. *How does it support risk identification and decision-making?*
e. *Discuss how it enables (or will enable) users to make more effective disaster management and resilience decisions.*

Within the transition phase of our products, we have elaborated in detail how the developed tools enforce the Red Cross to increase their ability to do their job more effectively and have a stronger position within Tanzania's disaster risk management arena. In the paragraphs below, we demonstrate this increase in capacity through a number of increased abilities. These were all brought forward by the Tanzania Red Cross Society.

Faster collection of information for application of emergency funds
With the data collection tools, TRCS can collect information for the Disaster Relief Emergency Fund (DREF) as well as other emergency funds much faster. For a DREF application, the following information needs to be collected:

- Where did the disaster happen?
- What impacts have occurred? This is to be expressed in indicators such as economic damage, people affected, and amount of people displaced.
- The source of the data used to collect this information. This is usually the government or the Red Cross itself (e.g. through information of their volunteering network).

A DREF application is meant for short term relief, to be able to give humanitarian services timely and effectively. It can then provide emergency relief funds for about 3 months, with a maximum of 300,000 CHF per request.

The dashboard can provide a solid basis for information collection for a DREF application says Renatus Mkaruka, who applies for such funds on average 2-3 times per year. It usually takes him about 6-7 days to prepare a DREF application he says, and it may take longer when a disaster occurs remotely. For instance, during an event in Morogoro recently, ground information collection took about 5 days. Through use of the dashboard, information can be collected directly from remote areas, and in an organized fashion. According to Mr. Mkaruka he should be able to reduce the required time for a DREF application to a few days only. This has two important implications:

- TRCS has a stock of two days of supplies that they can use. After these two days, the DREF fund is required to sustain the flow of relief supplies. At the moment, the DREF fund may come in quite late, due to the fact that it takes a lot of time to collect the

necessary information to apply for it. Therefore, the relief aid may be interrupted. It means that communities may be without aid for a given time resulting in higher negative impacts on communities.

- Second, TRCS has to submit a DREF application within 7 days of an event occurring. After this period, they cannot apply for DREF anymore. If they can collect the required information faster, TRCS can increase the amount of DREF applications, leading to more capacity to provide aid. For instance, during a recent event on 26 October 2017, no DREF was requested, although it may have been that with more information on the event, a DREF would have been requested. Because the event was too short, the collection of information did not work out. TRCS did use their own stocks, and there was no way to recover these stocks as they did not get any funding to do so. As said, at the moment TRCS requests a DREF on average 2-3 times per year for flood disasters. There is no limit to the amount of DREF applications, depending the disasters that require actions, TRCS may increase the amount of applications through the use of the dashboard, because they can harvest the required information much more efficiently.

There are also other funds available, such as the "Emergency Appeal" of the International Federation of the Red Cross, meant to provide technical, human and material resources, which can provide relief funds up to 1,000,000 CHF. Furthermore, there are promising bilateral funding resources by UNICEF, UNDP, and USAID that can be applied for. All these require good information of the situation on the ground. The dashboard can provide this information.

Reduced costs of information retrieval

In particular in remote areas, TRCS often sends a team out to recover the required information. Usually this is a team of about 5 persons, that is required to travel for a period of about 5 days to recover information. Sending out this team is no guarantee for a complete suite of information of the situation in the affected area, as sometimes teams come back without a clear narrative and without clear photos. The tool may save a considerable amount of mobilization money.

> ***"Now you can get so many photos, it is wonderful!"***
>
> (Renatus Mkaruka, Head of Disaster Management at the Tanzania Red Cross Society)

More targeted mobilization of resources

When TRCS has information timely and placed on a map, the mobilization of materials will also become more easy. Photos for instance, can help to assess the accessibility of roads and areas. In general, the dashboard will help to get a good picture of the disaster before sending out teams.

Figure: Building shelters in Mabwepande, after the floods in 2011

Information source to other relief agencies

We also identified that the collected information can be a good resource for other organizations dealing with relief. The Prime Minister's Office - Disaster Management Department showed great interest to use the tool within their newly established Emergency Operation and Communication Centre (personal communication with Charles Msangi, Disaster focal point).

Within Dar es Salaam, the dashboard may provide intelligence for the recently established DarMAERT collaboration. This is a group of actors that can decide upon disaster mitigating operations such as the policy and fire department within Dar es Salaam.

Research into the history of natural hazards

TRCS often hosts students from Ardhi University, that look for disaster data as basis of their research projects. Often this data is only limited available. The developed tools however can from hereon be used to assess information content on past natural hazard impacts. Using the tool their studies can be enriched, for instance for disaster risk management (DRM) students.

Knowing the past leads to better preparedness
Based on the historical event set, collected through online media articles, Deltares established a tool to assess what may happen with severe weather warnings, based upon evidence of past events. Knowing what could happen based on historical evidence leads to a better preparedness.

f. Describe the degree to which it is openly-available and how users can access it.

The solution is Open Source and provided as a Software as a Service (SaaS) by FloodTags, for which a subscription can be acquired. End-users of the SaaS may decide which individuals within or outside their organizations are granted access. The tools are accessible at the following locations:

Tool	Code	Web access
FloodTags	Bitbucket (bitbucket.org/floodtags)	dashboard.floodtags.com
Flood impact table (MIT license)	https://github.com/DELTAmats/tanzania_app/tree/master/ui	Via link on floodtags website

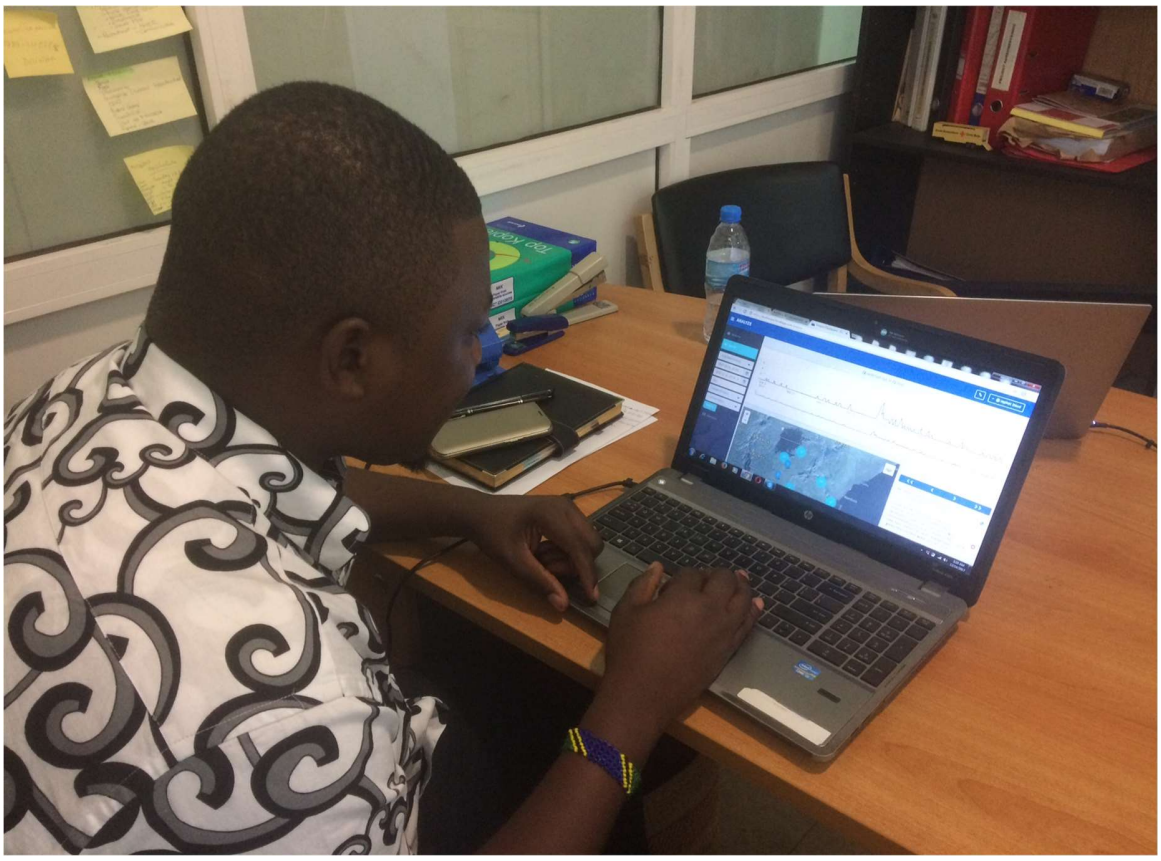


Figure: Red Cross Disaster Preparedness Manager Japhet Daud accessing FloodTags

IV. Description of partnerships (active in Phase II, but which could have started in Phase I), in particular those involving local partners.

Did you work in partnership(s) with a local partner(s)? If yes, please provide the name(s) of the local partner(s) and the nature/strength/sustainability of the partnership.

Within phase II, we partnered with the Tanzania Red Cross Society. This has been demonstratively positive, as we were able to entirely tailor our products to their needs, as well as exploring options to connect it to other agencies, related to disaster management (in particular DMD, DarMAERT, Tanzania Meteorological Agency and the World Bank). Red Cross' network with stakeholders is impressive and the tools' capabilities fulfil an important missing link in their communications: organization and mobilization of crucial on-the-ground knowledge of their volunteering network, as well as others sharing flood-related information online. Their volunteering network consists of several hundreds of volunteers within Dar es Salaam and beyond. Communication by these actors contains essential information on location, severity and impacts of flooding, which can assist TRCS to decide where and how to mobilize.

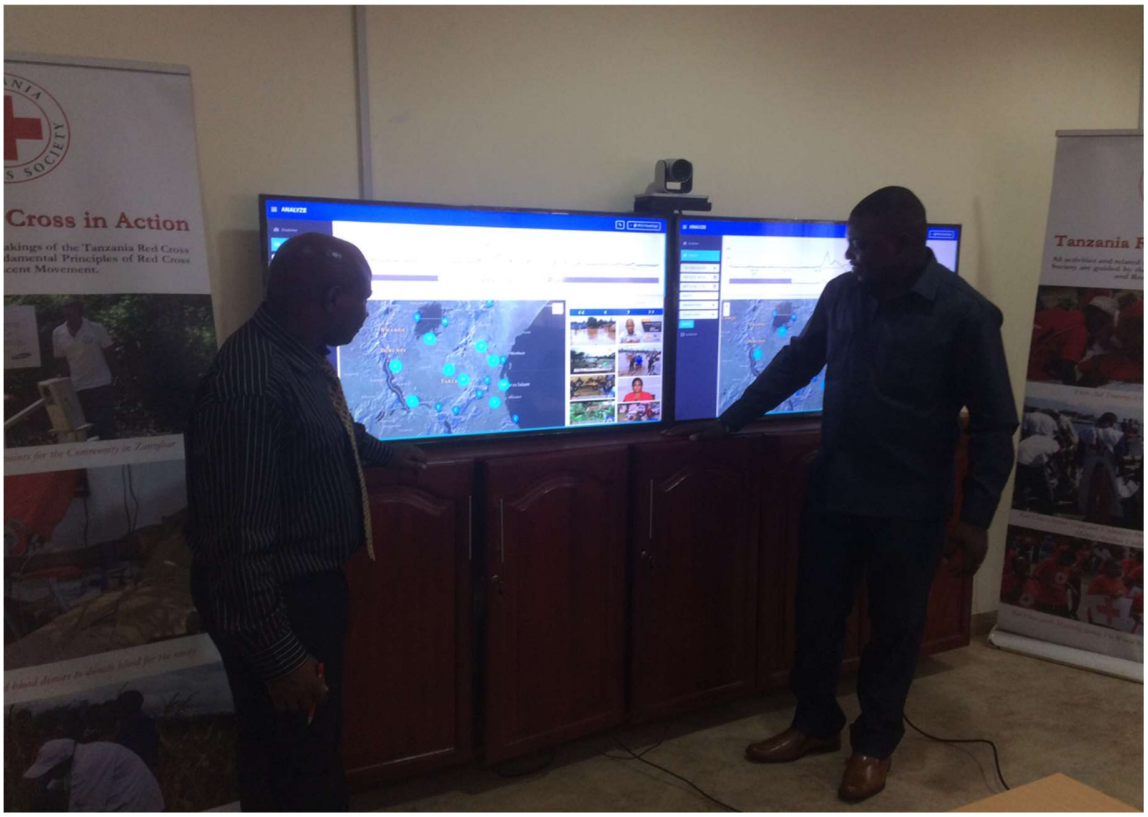


Figure: Japhet (Manager Disaster Preparedness) and Thomas (Manager M&E) testing out FloodTags on the screens in the conference room

During our last mission (11 - 14 December 2017), we established a relationship that will last longer. Together with Deltares, we will work on further integration of the dashboard and historical flood impact table into a forecasting and early warning system, which combines state-of-the-art forecast models (as established during the parallel Challenge Fund project, led by Deltares "Participatory Terrain Data and Modelling") and situational awareness through the online media dashboard. Together we have decided to establish a tri-lateral Memorandum of Understanding. TRCS wishes to see the FloodTags / Deltares / TRCS partnership grow, and see if we can attract other partners to this. The potential to engage the new technologies developed within this CF project as well as the parallel CF project led by Deltares in Tanzania is very large, given that the development of DRM in this country is still at an early stage. The MoU will be a generic agreement demonstrating in which fields we will work together. These will include at least:

- Application of new technology in disaster management, using the CF project outcomes as a starting point
- Further development of situational awareness with public and social media
- Improving early warning and disaster preparedness capabilities together with strategic governmental and non-governmental parties
- Joint application of proposals to cover the above.

The MoU will describe the working relationships as well as the roles of the different parties within our partnership. We will also describe how we can support external developments, with external parties and use cases such as DarMAERT, the Emergency Operations Centre, and the transport sector or other potential users of our technology. Finally, we will write how we envisage to increase our sustainability and relationships with knowledge centers such as Ardhi University.

The availability of an MoU will make it much easier for us to establish proposals such as WISER and will make it easier to show a proof of our collaboration to external parties as well as funders.

Partnerships with external agencies will include the Prime Minister's Office – Disaster Management Department (PMO-DMD), keen to improve early warning by means of impact warning and establish monitoring of Sendai indicators. With our methods, the opportunities to establish flood impact warning systems are increasing and we are currently trying to secure funds to make steps in this direction with both TRCS and PMO-DMD. This proposal also fits very well with increasing the capabilities of both TRCS and the recently opened Emergency Operations Centre of PMO-DMD. We submitted a concept note for this for a WISER project to the UK Meteorological Office.

TRCS is part of the Dar es Salaam Multi-Agency Emergency Response Team, which is a combination of several agencies that can make decisions during disasters. DarMAERT is meant

to coordinate these actions. During our future collaborations based upon envisaged future funding, we will investigate how our tools can be embedded in the disaster management planning of DarMAERT, so that all related agencies can benefit from this. We will consequently effectuate this when we receive the mandate and funding to do so.

V. Description of capacity building of local stakeholders

a) Did you conduct training in Phase II for local communities or beneficiaries in the use of your tool? If yes, please describe the type of the training and the number/type of beneficiaries trained.

Yes, we gave two sessions on location in Dar Es Salaam. The first was more general about the background of the tools and about the new possibilities that it provides. The second was in-depth about the actual use of the tool and included also self-work. A total of ten people attended the sessions, all Red Cross staff, including management level.

Figure: Demonstration of the developed tools at TRCS HQ in Dar Es Salaam

b) *Did you measure change in knowledge as a result of your training? If yes, please provide results. Did you follow up in any way after the training to see if what you discussed was put into practice? If yes, please explain.*

We did not measure the change in knowledge. We did talk to the participants of course and noticed how they gradually improved their skills in using the tool. Whether the training was so important here is unsure. We designed the tools to be very user friendly and the participants found that the tool works intuitively. Above all, to be in a room together and just use the tool was what improved their skills most.

> ***"The possibilities of the tool kept me awake last night.***
> ***I am excited about how I can use FloodTags and improve my work"***
>
> (John Thomas Kinyagu, Head of Planning, Monitoring and Evaluation Unit)

On organizational level, together with Director of Disaster Management Department of TRCS Renatus Mkaruka, we investigated which organizational aspects must be changed to support to the uptake of the tool. As follows (note that some of these points overlap with our earlier points on requirements for uptake):

- First of all, two dedicated persons (Japhet Daud and Yona) were appointed to be the champions for the dashboard and historical flood impact analysis tool. They will completely familiarize themselves with the tool, push the tool forward to the branch offices and in general be the point for assistance for others. Where necessary they will connect to FloodTags back-office for support. We will organize a monthly skype call in the forthcoming three months (covering the rainy season) with these two staff members as well as other relevant staff that wishes to attend. The skype calls are required to provide opportunity to ask concrete questions about functionalities of the tools and to provide final feedbacks. TRCS has a fiber-optic internet connection, so this should work well.
- Second, a communications officer will be hired soon with TRCS. It will be his/her task to use the content delivered by the tool effectively for the TRCS website, Facebook page and even Twitter account. This way TRCS hopes to increase the visibility of the work of the Red Cross, attract new financiers, volunteers and reporters. Also, the communication officer will advocate for volunteers and staff to expand working with Twitter as an open way of communication in disasters. Hopefully, the total content from-the-ground will increase, giving those affected better perspectives.

- A WhatsApp group with 36 members at the moment of writing, has been setup to immediately start contributing centralized content in the dashboard. Japhet Daud has been appointed to be administrator for this WhatsApp group.
- The procedure to write DREF will from hereon include consulting the Dashboard for evidence of flood events. Following this, TRCS expects to be able to do more, better and quicker DREF applications. At a later stage, this can be monitored if this is indeed achieved.
- What also changes is that, up till now in the disaster-relief-recovery cycle, TRCS produces data that they cannot store and usually two weeks after a disaster response, all information on the event is lost. The reason is that before, TRCS did not have a way to collectively store event information. Now with the dashboard and modus operandi with the Whatsapp group, TRCS has the ability to collect and store data. For historical analyses, they can now provide an overview of the past 10 years from events covered by media. From hereon, the organization can base new decisions on historical data.

> ***"If we can use these tools effectively, we are going to change our organization"***
>
> (Japhet Daud, Disaster Preparation Manager)

VI. Did you leverage private or public sector resources?

If yes, please describe the source of the leverage as well as the total USD amount of combined cash and in-kind contributions. If relevant, please describe the nature of your relationship with the source(s) of leverage.

We leveraged the project with a grant of TKI (Topconsortia voor Kennis en Innovatie) of a total of 70.000 EUR. In addition, FloodTags invested additional time on the project to connect Whatsapp and Jamiiforums appropriately (additional 25 days), to secure robustness of the tool (additional 10 days) and to support the flood history detection with the required scientific research (7 days, as part of PhD preparation for Erkan Basar). With additional management cost this made a total in-kind contribution to the project of 47 days.

VII. How did your project consider gender in any aspect of project planning or implementation? Was a gender analysis or assessment conducted?

If yes, did your project address any gap identified in the assessment? If yes, please describe how. All Phase II projects are required to integrate gender into their work. Please use what you wrote in your inception report on gender as the starting point for this section.

The main action we took was to include TRCS within the consortium. The Tanzanian Red Cross Society is an inclusive organization, not only by gender but also by age and ethnic background. The TRCS promotes gender equality and takes gender informed action. There is a gender focal point at the TRCS (Viva Oliva), promoting gender equality of the programs within the Red Cross, and the actions at the branch offices. Within the disaster management group, 50% of staff are women. Women are encouraged to apply for jobs. For the volunteers they strive for a ratio of 50% men 50% women. However, there is also much to be done. For instance, within the newly created Whatsapp group, of 41 people there are only 7 women. Viva is now taking action to increase this number. Another dimension is the harvesting of the online media. In Phase I we concluded that further research to sex-disaggregation of online media data is desirable. It may be utilized for better, more inclusive disaster response. However, further discussions on this potential did not result in formulation of a concrete project or action, yet. There is still much to be done.

VIII. Discussion of how tool or approach can be brought to scale in the future

In the past year we managed to increase functionality and robustness to a satisfactory level and we are happy that the tool has been taken into operations in Manilla and Dar Es Salaam. Hopefully Indonesia will follow soon. The importance of this is that our product has exceeded the level of acceptance and from hereon we can build on it to create even more impact. What is needed for further uptake now is

- marketing of the existing tool, and
- onward development of the product to create even more impact

Marketing Plan

At this moment we do not have a detailed marketing plan yet for the upscaling of the product. With the product as mature as it is, this is now the first priority. We are working on a marketing plan with assistance from business strategy consultants of ViaWater (a Dutch subsidy for starters). Current focal areas are:

- Sharpening of the business proposition: We charge for development and configuration hours, and next we deliver the hosting and maintenance almost at cost price. Reason is that in our sector it is relatively easy to realize funds to build something (capital and resources for projects) and very hard to sustain solutions (continuation by end-users after projects). We fitted our business model to this reality and tested it on a number of local-based Clients, with good results. However, before a large upscaling activity, we need to think through how the business proposition behaves at scale. For instance, while staff of Red Cross Societies look at a starting price of EURO 5.000 as considerable but manageable, more high-level staff (e.g. financiers in headquarters) may consider such a price unrealistic, even unprofessional. Another question is how do we deal with user accounts outside organizational boundaries (a client provides a user account or even data

to a non-client) or how do we charge data traffic and number of requests (work with price schemes). *This request to GFDRR: Do you have ideas on how to get high-level feedback to our business proposition? From within the World Bank, or even outside? Any help is welcome.*

- Higher entry and striving for four anchor Clients: Currently we proved the concept on a relatively low organizational level (e.g. the national societies). This is perfect in the phase of pivoting and improving the product. However, in the next phase of consolidation and scaling, we want to have discussions on a higher level, with the advantage for instance for the Red Cross that we can reach many more national societies at one time. As basis for solid growth and impact generation, we strive to four of such anchor Clients (paying customers that stand close to its development). This is ambitious for where we are now, but certainly the direction in which we want to go. *This request to GFDRR: Do you have people in your networks that could mirror on this? Any feedback is welcome.*
- Organizational adjustments (for FloodTags): Our current organization with seven people is much capable of doing the projects that we do. However growing as we do, and with the ambition to scale, things may need to change. To support us in these changes we are now in the process of forming a Board of Advisors. These should help us in our priority settings, open up networks and, very important, build trust with our anchor customers. *This request to GFDRR: As financier, would you know of any other requirements or 'wants', that make it easier to adopt a tool, or work with an organization? Accreditations, quality assurance, organizational structure etc.?*

There are many more components to the marketing plan of course, like improving the advertising via the website and social media channels etc. However, these three we wanted to mention as these stand at the core of scaling the product. About advertising, *do you have ideas on how we can better advertise for the uptake of the tool?* Two suggestions came already from Edward Anderson in Dar Es Salaam:

- To share the results during a session of Urban Resilience Africa, end of August in Tanzania. We talked to Renatus and he may be available to present.
- To mention the tool as potential resource in ToRs of the World Bank. Edward is going to do this at least for one of those. *Are you planning to create another Impact Story poster, that Edward can refer to? Otherwise we planned to create a blogpost that can function as such.*

Product Development Plan

As mentioned under IIIc, in this project we carefully listed the lessons in bringing the tool to other geographic regions. One accomplishment is that we took the difficult hurdle of creating impact in a country with very little Twitter data. This lowers the threshold in scaling significantly. Secondly, we expanded to active engagement via Whatsapp. FloodTags now takes in actively reported messages from disaster managers and volunteers in Tanzania. With these

adjustments, scaling is even easier, underlined by the current projects that we are doing or are in preparation of doing. Further, our ambitions for the future are:

- To support faster and easier connection of new online media sources as well as user generated data from community reporting tools. Therefore, we want to further extend upon the modular setup of the system. This makes it easier to adapt to local communication habits, and reduce the effort to extend our tool into regions where global social media such as Twitter and Facebook have a very limited user base.
- To use more auxiliary datasets in validating incoming flood reports. Besides the rainfall observations, MODIS satellite imagery and elevation data that are currently in use, we aim to add sources such as satellite data from Sentinel-1 and sea level data. This will provide additional insight into the reliability of incoming reports.
- To add more functions for the user to understand the extent of the flood. Besides the work done by Deltares to facilitate real-time flood mapping on the basis of LIDAR combinations, we just started a collaboration with NASA that should lead to real-time flood mapping by social media based satellite tasking.
- To widen the reach of our tool. Until now we have mainly focused on floods, although we see great potential in using online and user generated data for other purposes, such as drought or conflict monitoring.
- To improve our event detection algorithm, making it operate across languages, which reduces our detection time. Our aim is to have a single algorithm that is able to detect new floods starting anywhere in the world, within a matter of minutes.
- To improve a user's interaction with our online dashboard, by providing them more possibilities to add information and enrich, validate or reject existing flood reports or events. This will extend our dashboard from a data visualization and filtering tool, to a true data management system, that can be used to easily interact with, add, change and store information.

Specifically for Tanzania, TRCS suggested a number of extended functionalities to get even more from the tool. We agreed that as a partnership we will look for more leveraging to improve the tools for TRCS. Extended functionalities include:

- Add new data sources (in order of importance): SMS, Kobo Datacollect (app used by volunteers, provide M&E data to Red Cross' PMERL Unit), Facebook, Instagram,
- Add possibility to add observations as a user of the Dashboard (allow user to create new tags individually or a batch via an excel file)
- Link the TMA website to the Dashboard (so that FloodTags' users can see the TMA warnings and later on compare them to what happened on-the-ground).
- Add scenarios: Similar to the Philippine Red cross, the TRCS would like to see a scenarios tab that shows the tweets on top of the areas that are flood prone.

IX. What were main points of learning from this phase of the project?

Lesson: The time-pressure under which we worked created a strong partnership
The project had a very short time-path, and in addition we had worries about the available human resources at the TRCS (we identified this early on as a risk). This was a big challenge. However, thanks to the close collaboration of the partners this did not affect the results of the project. A special thanks here to Nyambiri who kept supporting project as a volunteer (even though she left TRCS for another job at the World Bank) and to Renatus who managed to bring a great new team together. At the same time at FloodTags and Deltares we made sure that the project was easily transferable (a concept which is easily understood, and software user interface that is quick to comprehend). As partners we now stand very close to each-other, with the mentioned MoU as a result. Perhaps not despite, but even thanks to the pressure cooker we were in.

Lesson: Centralizing TRCS in our efforts created a strong sense of ownership
At FloodTags we like to follow the energy and ally with organizations that are ambitious. In this project the strategy proved successful. Although we had our hiccups, the enthusiasm and motivation of the local partner TRCS stayed, which made that problems could be overcome. TRCS has a clear ambition to make a change. By enabling them, their enthusiasm spread the project results to other organizations. Most importantly the TMA and DMD are two organizations that feel assisted and empowered by the TRCS, which enforces Red Cross' position in disaster management in Tanzania. The ownership of the tools is large.

Lesson: TRCS chose the functional WhatsApp despite robustness risks
We had worries about the available data for Tanzania and for this reason we also connected to Jamiiforums that has interesting content during floods. But during our first mission the TRCS got very excited about the possibilities of WhatsApp. Despite the teams' reservations (it has significant downsides, among other that we cannot guarantee its robustness), more and more ideas came up on how the tool would be effective with WhatsApp. The ship could not be turned anymore. Very important to mention here though is the following:

- The way we use WhatsApp is not yet supported by the WhatsApp company. They are currently working on providing a API for this purpose, also explained here and here. What the conditions and price will be is still unknown.
- Until the time that Whatsapp supports how we use it, we cannot guarantee its robustness. Whatsapp can at any time change its endpoints, cancelling the connection to the FloodTags dashboard. In case this happens, the data can still be exported to FloodTags via 'export chat' (so no data is lost), but it just doesn't work in real-time anymore.

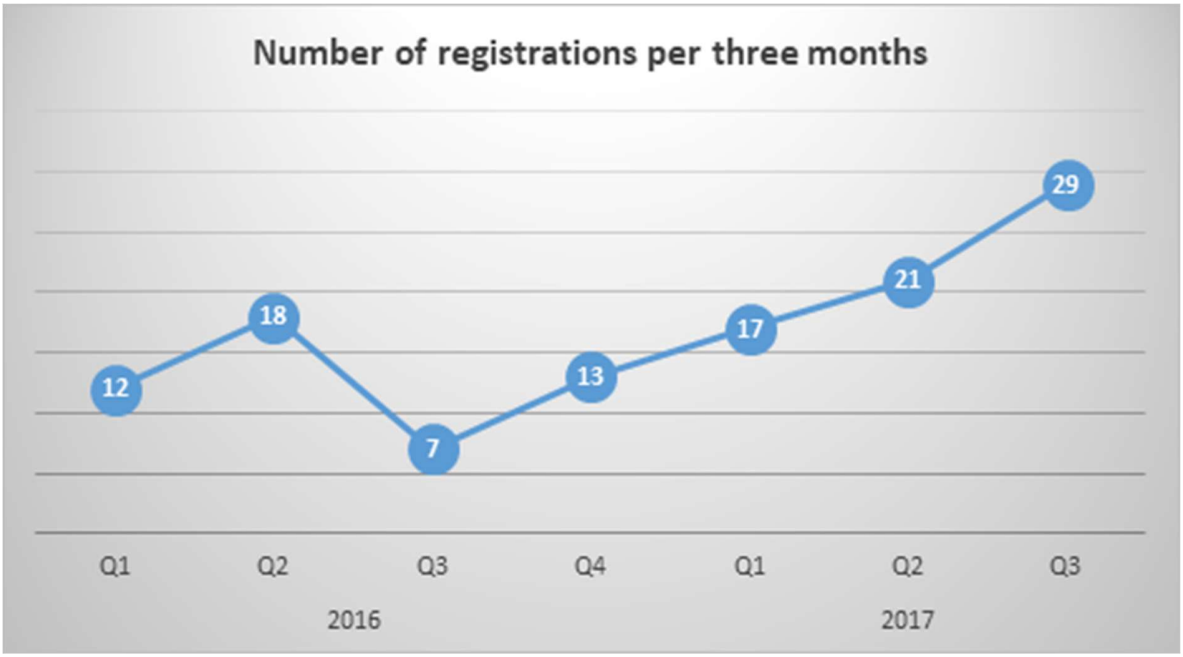
X. Additional Monitoring Data regarding Tool Uptake

a) *Is your tool openly available to the broader user community? If yes, please provide the name of the platform.*

Yes, it is available upon request to a broader user community. The data can be accessed to and used via the FloodTags API (Application Program Interface) on api.floodtags.com or the dashboard (dashboard.floodtags.com). The code of FloodTags itself can be accessed to via Bitbucket (bitbucket.org/floodtags) after submitting a request to info@floodtags.com.

b) *How many downloads of your tool have occurred throughout both Phase I and Phase II? How is this being measured?*

We have a steady growth of registrants (see below graph, until Q3). A registrant is someone interested in the concept and wants to know more. Total number of registrants is 350 since 2014. The promotion of the Philippines' and Tanzania project also led to several new customers, as explained under the next question.



c) *How many decision makers have accessed your tool throughout Phase I and Phase II? Of these, how many access your tool on a regular basis? How is this measured? (it can be through conversations, email, direct observation or another way)*

In the past year, with the success story of the Philippines and the ongoing work in Tanzania, we acquired the following assignments:

- Implementation of FloodTags at the Philippine Red Cross: Continuation of Phase I that was supported by the Challenge Fund, to bring the tool to operations. Client: Partners for Water (under Dutch Economic Affair Department). We monitor the use of the Dashboard by PRC (via analytics we set up). They monitor the Dashboard at least once a day (during cold phases). During floods it is more often.
- By American NGO 'The Nature Conservancy': Implementation in Indonesia together with the Global Disaster Preparedness Centre and the Red Cross.
- The 'Watersnood Museum' in Zeeland, The Netherlands (as part of their permanent exhibit)

Meanwhile, new requests for the software are coming in. Among other for Cambodia/ Lao PDR/ Myanmar (with DRFI of World Bank), Kenya (with Hivos), Global (with NASA), Bangladesh (with CDCS) and The Netherlands (Dutch Public Works). Also, we are now working on a new product in Mali, supported by ViaWater with as counterpart Meteo Mali. This is a subsidy, so of a different nature than the three assignments, but nevertheless the local stakeholders are very interested in FloodTags and we are working towards an implementation at Meteo Mali. Besides Meteo Mali there are a number of other organizations interested in Mali, among them SNV (to provide assistance to pastoralists).

As for Tanzania, we talked to DMD (see photo below) who are interested 1. to use the Dashboard tool in their emergency operation room and 2. to use the flood history to fulfil their disaster mapping requirements to the Sendai Framework. DMD already strongly depends on the disaster data from the network of TRCS and via the Dashboard they hope to even receive more information for their operations. Also, we spoke with TMA (the met service) who would like feedback from the system after they send out warnings. We will follow up with both DMD and TMA in the next few months.

Conclusively, we discussed the tool with the World Bank in Dar Es Salaam (Edward Anderson). We spoke about the potential use of FloodTags for the transportation line BRT, for nation-wide risk assessment efforts of the World Bank, and we were linked to "Code for Africa", an NGO about to start a flood management project in Kyela. We are following this up with them as well.

Figure: Meeting between the project (Red Cross, Deltares, FloodTags) and Charles Msangi of the DMD (Disaster Management Department under Prime Minister's Office)

d) *Have any policies, plans or investments been informed/influenced by your tool? If yes, please provide a bit more detail on how your tool has informed/ influenced investment/policy/plans; if possible, provide USD amounts of local budgetary changes or other investments. If the influence was policy-based, please describe the policy change your tool informed. If the influence was in planning, please provide detail.*

We are not aware of such influencing by our tool, beyond the scope of what we reported above (e.g. using the tool to support requests for DREF).

e) *Was your sustainability goal for the project achieved? Please provide the metric used and explain the results achieved.*

What we wanted to achieve is a Minimum Viable Product that TRCS could start using immediately. We are happy to share that we achieved this. TRCS accepted the tool and started using the tool in December 2017. The required organizational changes were prepared, and we reconfirmed with the TRCS that recurrent costs of operations and maintenance of the tool will be 5,000 EUR per year, starting January 2019 (a reasonable price says TRCS).

f) Do you have an exit strategy for your project? If yes, please explain.

The TRCS does not need help to sustain this, except us hosting and maintaining the SaaS, so FloodTags and Deltares can safely exit at any time. In case Deltares and FloodTags need to exit fully (not even offering the SaaS anymore), the Red Cross can choose to host and maintain the service themselves, or request another company to do so, using the existing FloodTags' code.

XI. Please detail how the budget was spent through the course of phase II?

See below table:

	GFDRR Funded	In kind Funded	Other Funded	Expenditure
CONSULTING SERVICES				
(fees, travel, per diem)	6.300		1.800	8.100
TASK TEAM SUPERVISION				
Jurjen Wagemaker	22.678	4.930		27.608
Hessel Winsemius	21.000		10.000	31.000
Patricia Traumbauer	11.200		18.200	29.400
Gaston Nina (repl. Boortman)	5.445	3.630		9.075
Felix van Deelen (repl. Boortman)	5.445	3.630		9.075
Erkan Basar	42.108	5.082		47.190
Tom Brouwer	10.890	18.150	20.000	49.040
Nyambiri Kimacha	8.400			8.400
Frederiek Sperna Weiland	11.200		20.000	31.200
DISSEMINATION				
(Translation, editing, publication, etc.)	-	-		
LOGISTICS				
(Training, workshops, cons, etc.)	-	-		
GOODS AND WORKS				
OTHER				
Meeting/ Communication	1.800	-	-	1.800
Liguistic expert	2.000	-	-	2.000
Webserver	1.500	-	-	1.500
Indirect Cost	-	-	-	
TOTAL	**149.966**	**35.422**	**70.000**	**255.388**

Table: Budget and Expenditure of the Phase II project

XII. Please attach any additional project related documents you may have to the final report.

The resulting Dashboard for the Tanzanian Red Cross Society can be found at dashboard.floodtags.com. The data can be accessed via and downloaded from the FloodTags API (Application Program Interface) via api.floodtags.com. And the documented code of FloodTags Software can be found on bitbucket.org/floodtags.