

# A flooding early warning system for all in Benin

The introduction of a community early warning system for flooding by the project PSL Eay in the Ouémé river's lower basin



# FLOOD EARLY WARNING SYSTEM

The flood is an annual appointment for the communities living in the Lower Ouémé Valley, who are used to saying "With the flood, it's a problem, without the flood it's still a problem; let's stay alert". At the local level, communities have developed individual and traditional practices of flood risk monitoring. Unfortunately, their practices are becoming less and less effective as floods appear more and more suddenly and violently. Recurrent floods aggravated by climate change are causing increasingly costly losses and damage.



EWS Benin and Community EWS – Everybody is warned !

Early Warning Systems (EWS) are a means of reducing disaster risks, including floods. They are at the heart of measures to limit the loss of lives and livelihoods of people. EWS exist at different levels, which are ideally interdependent, ranging from the community level through the national level to international monitoring systems. Since 2014, the government has developed the Benin EWS (national) in 21 municipalities identified as being at risk of flooding. It is an instrument for disaster risk reduction, through the dissemination of warnings that allow for the adoption of prevention and response measures to mitigate shocks.

EWS consist of a series of organized monitoring mechanisms or actions that collect information on potential hazards, including flooding, in a given location in order to trigger timely and coordinated responses.

An effective EWS contains four essential components:

1. Flood risk and vulnerability mapping
2. Flood risk monitoring and communication of warnings
3. Strengthening the capacity of communities to respond
4. Synergy between stakeholders at different levels: community, municipal and national



Mapping of risks and vulnerabilities to flooding



Flood risk monitoring and communication of alerts



Strengthening the capacities of communities to respond



Achieving synergies between stakeholders

These four components ensure a coherent and comprehensive method of anticipating and responding to water levels.

The effectiveness of an Early Warning System (EWS) lies in the proper transmission of information and actions. Even with the national EWS in place, the distance between the national level and the communities poses a challenge. Every delay in the transmission of information in a severe flood situation

can result in loss of life. It is recognized that in the past, at the communal level, technical services and authorities are often not informed in time of the realities of flooding and flooding experienced by people in vulnerable and remote localities. This limits preventive actions and the organization of relief for people affected by flood disasters. Similarly, the warnings issued by EWS Benin through the National Civil Protection Agency (ANPC) are not sufficiently relayed in time by the municipal platforms to the populations of certain localities, which are quite numerous.

In order to strengthen the populations in their alertness and to contribute to the effectiveness of the national EWS, the PSL Eau project has committed to developing a Community EWS (C-EWS) connected to the national EWS. The EWSC covers 33 villages and districts in the municipalities of Zè, Sô-Ava, Abomey-Calavi and Sèmè-Podji. The system is thus a bottom-up system connected to the national level, so that a flow of information from the bottom to the top and vice versa is established, with a positive effect on the dissemination of information and alerts, and the organization of timely actions.



### C-EWS installed - a four-pronged approach

Given the components of an effective C-EWS, the project was obliged to adopt an approach that contained several synergistic components. These are four components that individually play an important role in alerting the population to floods, but which, taken together, give the community an effective and sustainable warning system.

As the general approach of the project is based on the valorization of local initiatives or endogenous responses to the water problems experienced by the populations, each of these components was always implemented through dialogue and collaboration with the local populations and with the advisory assistance of EWS Benin and the ANPC. The local communities and the deconcentrated services of the State were therefore closely involved in the development and implementation of the C-EWS.

The four components are:



#### 1. Risk and vulnerability mapping

In the process of developing the C-EWS, knowledge of risks and vulnerabilities to flooding is paramount. To this end, participatory mapping was the first step. It consists of a series of participatory data collection and analysis activities in the villages of the floodplain. To this end, focus groups were held with the inhabitants, interviews were conducted with resource persons and local authorities, observation walks and site visits were organized. At the end of these activities: the risks and vulnerabilities of the communities to floods are listed and the determining factors are defined; the endogenous strategies for monitoring floods are known and the response capacities of the communities are identified, thus the strengths and weaknesses are retained; the sites for the installation of the beacons are identified and volunteers are pre-identified to participate in the training of the actors on the C-EWS process. Technological means such as GPS, the Android tablet with the Kobo collection application and photographic supports were of great use in participatory mapping.



## 2. Installation of warning beacons

The objective of this component was to improve the monitoring of rising water levels by installing reinforced concrete beacons with warning strips to give the population a reference of the water level, the corresponding risks and the attitudes to have. An apparently simple action, but which in reality required quite some preparation and technical support.

The participatory approach and process of risk and vulnerability mapping was crucial in mobilizing the population in 33 villages and neighborhoods of the target municipalities, and resulted in the valorization of the know-how of the local populations who are in a constant dynamic of flood risk monitoring. By coupling this local knowledge with a hydrological map, the project and the populations were able to identify localities and key sites for monitoring rising waters.

In addition, during the flood periods of 2020 and 2021, volunteers in each target village, with the support of the PSL Eau (distribution of paint cans and training), made flood markings on several reference elements (building, trees, etc.). These multiple markings are made at the moment when the water begins to enter the village, then when it reaches the halfway point, when it floods the whole village, and the moment when travelling on foot or by canoe becomes very dangerous for the inhabitants, especially the vulnerable. In parallel with these marking activities, topographic levelling was carried out at the lowest water entry points of the villages or settlements.



With the participatory mapping of risks and vulnerabilities done and the markings of the high-water marks made, the project obtained all the data and the geo-referencing of the location points of the future beacons. As soon as the land rights were clarified, the masonry work was carried out for the realization of the beacons, i.e. the prefabrication of the bases, the pouring and the finishing of the beacons.



Prefabricated beacon bases



Cast of the beacon



Final and color-stripped beacon



As soon as the masonry work is finished, the markings made by the people and the topographical data are transferred by the surveyor to each beacon. After that, the warning bands are defined in a participatory way and painted in green, yellow, orange and red colors.

It should be noted that the color code was also defined in a participatory manner in a stakeholder workshop (the population, literacy trainers, radio presenters, mayoral department heads, EWS Benin, ANPC and PSL Eau team).

A total of 25 reinforced concrete beacons painted with warning bands are installed and coupled with information panels on the attitudes to adopt. Talking sessions are organized in the villages and localities where the beacons are installed and on the local radio to disseminate information on the beacons, their role, how to read them, what the warning bands mean, and therefore the attitudes to adopt accordingly.



### 3. Mobile pre-alarm application

The beacons give an immediate overview of the water level and carry the awareness message, only to people in the vicinity of the beacons. A mobile application makes it possible to send the available information in real time to the technical services and the authorities at municipal and national level. It is this information feedback that we call "pre-alert". Let's remember that in the national EWS system, the competence to disseminate the alert, i.e. "the message or signal that warns of an imminent danger" is attributed to the ANPC.

After an inventory of information and communication systems for warning about hazards in general, and floods in particular, the mobile application was developed. Accessible to communities, it allows them to communicate on water levels and damage and to receive messages and alerts in real time from the municipal and national levels.

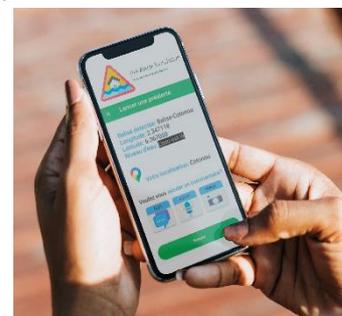
It is a simple, practical application that is accessible to anyone with an Android phone. It is adapted to illiterate populations, in the sense that the pre-warning broadcast is essentially based on images, audio and video. It was designed with ideas from the grassroots communities and advisory assistance from key actors such as General Water Directorate (DG Eau) and ANPC, not to mention the involvement of the Disaster Risk Reduction and Climate Change Adaptation Focal Points (DRR-CCA FP, PF RRC-ACC in French) of the target municipalities. It is developed by a team of consultants recruited by the PSL Eau team.

To launch a pre-alert, the possibility is given to accompany it with a voice message, a text, a photo or even a video. The existence of beacons with colored alert zones is a condition for the functioning of the application. When the application is opened, a search is carried out to identify the nearest geo-referenced beacon. It appears with the colors green/yellow/orange/red, with messages that describe the water level and the attitudes to have. To avoid false pre-warnings, a person outside the perimeter of the beacon, which is set at 1.5 km, cannot send a pre-warning message.

Once the application was launched, designated members of local platforms, members of socio-economic groups, opinion leaders, mayoral focal points and other stakeholders were introduced to its use and ownership, and are now able to help others use it. All these steps have enabled the operationalization of the mobile application, which can be downloaded free of charge from Play Store, under the name « [Pré Alerte Inondation](#) » (Pre-flood alert). After installation, in less than three gestures, the pre-warning is launched.

*"This early warning system is a stroke of genius orchestrated by VNG International. Before, we used to get caught out by the flood, but with the teachings and indicative colors on the beacons, we are warned and take steps to significantly reduce the risks and losses associated with floods and flooding."*

**- a representative of the commune of Zê**





#### 4. Local DRR-CCA platforms

The institutional anchoring of the C-EWS at the local level is done through the Local Platforms for Flood Risk Reduction and Adaptation to Climate Change (PLRRC-ACC). The PLRRC-ACC is indeed a body created by Decree No. 2011-834 of 30 December 2011, on the creation, composition, attribution and functioning of the National Platform for Flood Risk Reduction and Adaptation to Climate Change in the Republic of Benin, in its article 6 which states that :

*“The National Platform is represented at the municipal level by the Municipal Platform (PCRRC-ACC) and at the village or city district level by the Local Platform (PLRRC-ACC), chaired by the village or district chief. The roles and missions of the PLRRC-ACC are: disaster prevention, communication and awareness, emergency preparedness and response, resource mobilization, social protection and gender.”*

In sum, the local platform is a legal obligation. It is responsible for taking measures and actions to avoid or minimize the adverse effects of flooding.

To take these decisions, the members of the local platform use, among other things, the information derived from the water level at the beacon, the information, advice and measures disseminated by the PCRRC-ACC focal points of the town hall through the mobile application "Pre-flood alert" and the alerts disseminated by the ANPC through the same mobile application. This is a concrete idea of synergy built with the national level and the different relevant institutions from the data of the mobile application of "pre-flood alert".

In order to operationalize these platforms, to be installed by the mayors of the communes, workshops with stakeholders were organized to define the modalities, tools and responsibilities. Thus, after receiving the minutes of the designation of the members of a local platform, the mayor submits them to the Municipal Council for deliberation, after which he or she issues a decree establishing the platform. The members of the 25 PLRRC-ACCs designated within the framework of the PSL Eau project are waiting for this recognition by the municipal authority. While waiting for this official recognition, the designated members of the local platforms have benefited from organized training on the roles and missions of the local platforms, participatory group work approaches, first aid and disaster response, etc.

The formalization of the different local platforms through municipal decrees, their networking to promote horizontal learning between them, their integration into the larger network of the national EWS and the National Civil Protection Agency (ANPC) for advisory assistance, quality assurance and sustainability of results are challenges to be met.

**Result: 128,867 people in the PSL Eau intervention area are aware of and effectively applying EWS mechanisms, and the number of people expressing knowledge of EWS peaks at over 60% in 2021, compared to 6.5% in 2019 at project start-up.**

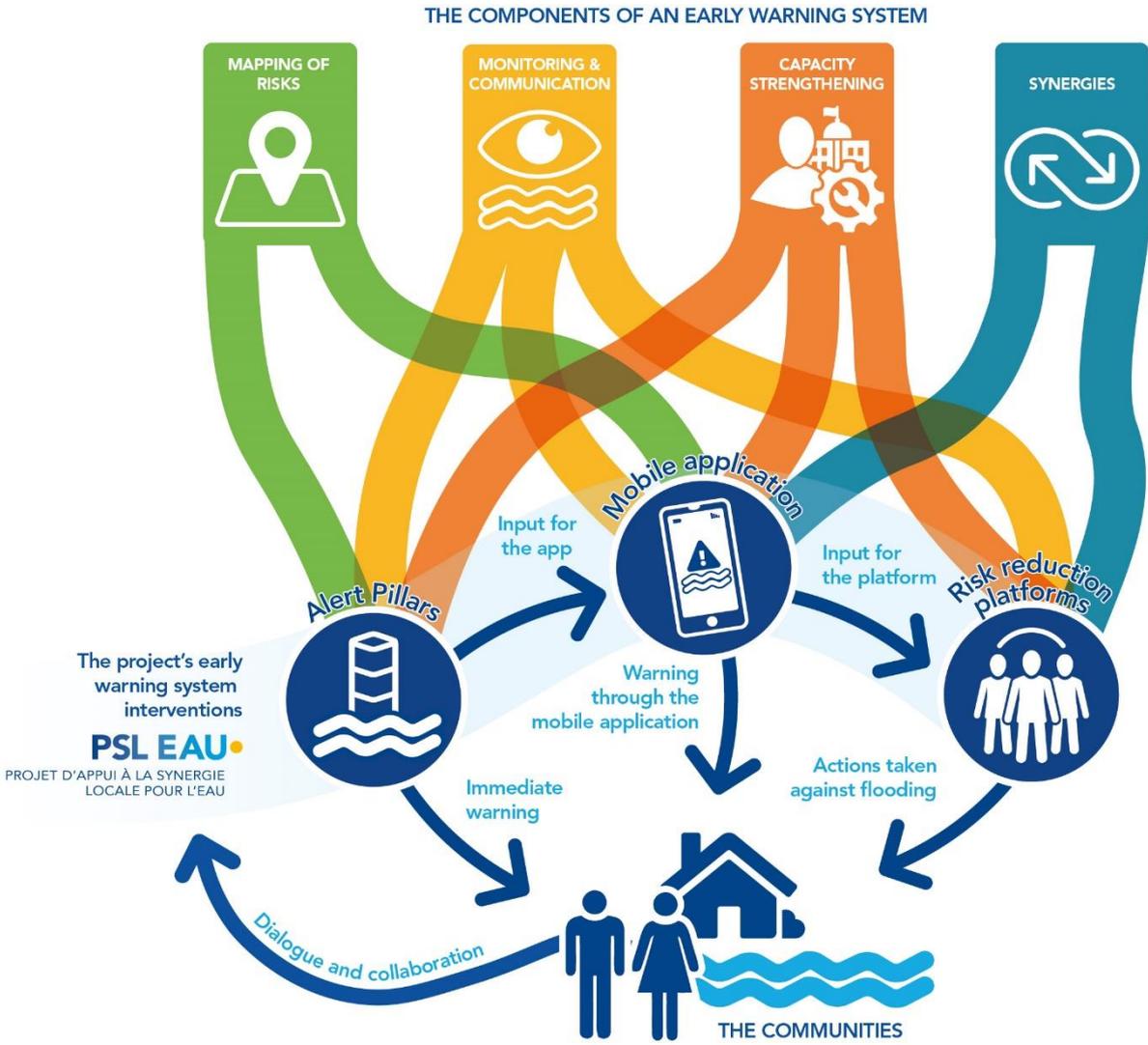
Now, when locals see a flooded beacon, they can send a pre-alert through the app and add a comment. Since its launch, more than 200 pre-alerts have already been sent. Despite the early arrival and high level of the 2021 flood, communities have been monitoring the water level, taking many anticipatory measures and communicating to people in neighboring areas. Men, women and young people got better organized: most of the crops, fields and animals were saved and houses were raised or reinforced.

Users' words:

*"With the beacons, even if a flood came and exceeded that of 2010, we don't think that we will have new disasters in So-Ava in the future. Moreover, the town hall intends to support the communities in the maintenance of these beacons."*

*"The inhabitants of Akpomey testified that the beacon has enabled them to avoid loss of life this year; this is not the case in the neighboring village where the flood caused damage in terms of human losses."*

Communities hosting a beacon today have an effective C-EWS that touches on the four components described at the beginning of this document:



The end result of the C-EWS reaches **128,867 people** in the project's intervention municipalities, which is double the target set for the project. Thus, from 6.50% of people who had a good knowledge of the Early Warning System and were putting it into practice in 2019, we have moved to a value of 60.32% of people in 2021. With the significant reduction of losses noted by the populations at the end of the project, we can conclude that this EWS really contributes to the resilience of the populations to floods.

## Sustainability

The process of developing a C-EWS and connecting it to the national EWS has successfully passed the testing phase and has just entered the completion and consolidation phase. Ultimately, sustainability is primarily addressed through the inclusion of local actors and integration with national institutions. Members of the local platforms being built have also received capacity building to continue the dialogue with the population. However, the management of pre-alerts by the DRR platforms at the commune level, their supervision by the town halls, and the assumption of responsibilities for the maintenance of the installed beacons remain challenges for the consolidation of the system and the scaling up.

At the national level, the inclusion of DG Eau, the national EWS Focal Point and ANPC from the beginning has ensured integration at the national level. They have already expressed satisfaction with the system, and use it as a good practice that is fairly advanced, but nevertheless feasible in the Benin context.

## The real lesson learned is not made of concrete!

Early Warning Systems are a means of reducing the risk of natural disasters. There is no single concept of EWS, as the system must be adapted to the specific hazards and hydro-meteorological and geological conditions. The system implemented by PSL Eau can be copied in the target region, but not blindly. It is essential to deploy all four components at the same time, without restriction, otherwise the expected results will not be achieved. Scaling up beyond the initial region may be confronted by challenges that were not relevant to that initial area.

It is easy to overlook the real lessons learned from this action. The added value is not in the construction of the beacons, or the development of a mobile application. The real lesson is the importance of **including local people** in these apparently technical actions. Communities are already in a constant dynamic with local hazards. Even if their initiatives have not been effective, they represent a valuable resource of local information. Their participation and inclusion in the different stages of action are essential to achieve the final result and guarantee their sustainability.

Flooding (or other hazards) requires technical interventions to prevent disasters, alert communities and limit the loss of property and life. However, the technical nature of these interventions cannot be used as an excuse to neglect the participation of the targeted communities. The experience of the PSL Eau project therefore clearly shows the need for a participatory approach to complement technical interventions.