



Organization of
American States

Community-Centered Flood Early Warning Systems in the Central American Isthmus and the Dominican Republic

Towards a Regional Platform for their Financial and Institutional Sustainability

Department of Sustainable Development

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Context

After almost two decades of technical cooperation in community-centered flood early warning systems (EWS) in the Central American Isthmus and the Dominican Republic, the lack of a harmonized methodology for designing and implementing these systems is evident.

The vast number of organizations that design and implement community-centered flood EWS has resulted in a lack of national and regional consistency amongst the existing policies and procedures, as reflected in various methodologies and manuals that are in use today. This, in turn, hampers the ability of national institutions to coordinate efforts among communities, municipalities and regional governments, as well as NGOs and cooperation agencies.

The General Secretariat of the Organization of American States (GS/OAS), through its Department of Sustainable Development (OAS/DSD), has been providing technical advice on flood EWS in several small valleys in Central America for decades.

OAS/DSD began implementing the Central American Small Valley's Flood Alert and Vulnerability Reduction Program (SVP) in 1995 with support from the European Community Humanitarian Aid Department (ECHO), the Republic of Ireland and the Republic of Turkey. During this initial cooperation, the SVP was implemented in over 20 valleys in Honduras, Guatemala and Nicaragua.

The following are conclusions from the latest intervention:

- 1) There is an evident lack of public policies, strategies and guidelines for the development of community-centered flood EWS;
- 2) The sustainability of these systems relies mainly on international financial aid, which, when discontinued, results in the interruption of the operation of the systems;
- 3) The vast majority of the flood EWS lack basic hydrological studies, which constrains the capacity of the systems to provide adequate warning times;
- 4) There is an overlap of competencies in operating the different components of EWS, particularly in contingency planning pertaining to communicating early warnings and preparedness;
- 5) There is a lack of coordination among NGOs, which prevents the replication of best practices and the sharing of data and information for increasing warning times; and



- 6) There are limitations in the use of technologies that may help to generate more precise weather forecasts, such as information gathered by telemetric stations and/or by remote sensing systems capable to produce rainfall models based on cloud density and altitude, atmospheric pressure, and other atmospheric parameters.

Figure 2. Experts Roundtable "Community-centered Early Warning Systems for floods (EWS): The Central American experience" sponsored by INDM. March 2010, OAS Headquarters, Washington DC
 Source: Wilkferg Vanegas



Figure 1. After the flood, Storm associated with Tropical Storm Ida, 2009, Ilopango, El Salvador
 Source: Claudia de Windt

In 2008, with the support of the Government of Germany, SVP extended its efforts to the remaining countries in the Central American Isthmus and the Dominican Republic.

In the end, the sustainability and the successful implementation of community-centered flood EWS will depend on the formulation and execution of sound public policy and good governance that ensures accountability across all government sectors and levels, as well as all segments of society, and effective coordination. Furthermore, constructing (and/ or strengthening) a national system for risk management that incorporates all relevant actors and promoting appropriate national legislation reform will significantly improve the sustainability of community-centered flood EWS.

Flood EWS: Decision-support systems to save lives and livelihoods

An early warning system is an important element of a (preparedness and) response system to natural phenomena. It is essential that the alert be communicated on time and that the local population understands and reacts appropriately to the alert. In order for the abovementioned actions to take place, the local populations must have confidence in the system and the local authorities must have the necessary information and tools to support the decision-making process that a flood EWS entails. In implementing flood EWS the following five criteria must be met:

- 1) The hydrological regime of the basin, in which the flood EWS operates, must be well known and understood;
- 2) A system to observe and monitor rainfall and river levels must be in place, including the ability to transmit this information to a processing center;
- 3) The system must be able to disseminate the information and communicate the threat to the populations at risk (via sirens, radio, TV broadcast, Short Message Service, or door to door);
- 4) There must be a capacity to respond; and
- 5) Local governments must take command of these systems from their inception, forging individual community member participation through training and direct involvement in their maintenance and operation.

And above all, one must understand what a flood EWS is all about. Flood EWS are not communication systems, observation and monitoring networks or organized communities. They are all of the above and more. Hence, in the Central American Isthmus, many of the flood EWS installed and in operation do not meet these criteria. In most cases, the flood EWS meet one or two, at the most, hampering the ability of local communities and governments to provide timely alerts or early warnings.

Generally, two types of flood EWS are recognized. The first is operated by the national hydro-meteorological services, known as centralized flood EWS, and the second is operated by communities, and is known as community-centered flood EWS.

Centralized flood EWS generally tend to be high-tech systems that require technical expertise to observe and monitor meteorological phenomena and produce accurate flood forecasting. Additionally, they are expensive, complex, require active maintenance, have high maintenance costs, and are prone to theft when communities are not actively involved in their installation, maintenance and vigilance. In addition to the high cost of the systems, the lack of technical expertise is usually the largest impediment to implementing these systems. The operation of these systems demands professionals with advanced knowledge and training, capable to develop hydro-meteorological models and to interpret the information from the processing centers outside of the capital cities.

The professionals, who are generally located in the capitals, are crucial in broadcasting advisories and warnings in advance of alerts. Due to the number of complex stages that the information must pass through before arriving to the end users, the lack of coordination between the data providers, the various agencies responsible for delivering advisories and early warnings, and the various levels of government, may make the difference between life and death.

On the other hand, the **community-centered flood EWS** generally tend to be a simpler, low-cost system, characterized by the use of low-tech equipment, which is operated by community members who are responsible for observing and monitoring the meteorological phenomena as well as issuing the alerts.

Community-centered flood EWS are based on the active participation of volunteers from the communities living in the basin where the flood EWS are installed. Volunteers are not only active in the response efforts, but also participate in prevention and mitigation.

The community-centered approach has a number of benefits. Chief among the advantages is the fact that it is inexpensive and requires little technical expertise. Thus, it is more sustainable in the context of vulnerable local communities. When local authorities and the population participate in implementing the flood EWS, it leads to a greater sense of ownership and understanding. If, for example, radios are installed in a community, as part of a larger flood EWS, the radios can serve a variety of purposes, such as health emergencies, important municipal meetings or transmitting other important community-related messages. In turn, the community members will incorporate the use of radios into their daily lives, ensuring the sustainability of the entire system.



Figure 3. Community volunteer in EWS supported by the SVP and developed by CARE El Salvador, San Felipe, El Salvador
Source: CARE El Salvador

The notion of **community-centered flood EWS** goes in line with the wide call made by the international community around the need to focus on “people-centred EWS”, where warning systems must recognize human needs and human behavior, and must be developed with local participation from both women and men (see box below).

<p style="text-align: center;">RISK KNOWLEDGE</p> <p style="text-align: center;"><i>Systematically collect data and undertake risk assessment</i></p> <p>Are the hazards and the vulnerabilities well known?</p> <p>What are the patterns and trends in these factors?</p> <p>Are risk maps and data widely available?</p>	<p style="text-align: center;">MONITORING AND WARNING SERVICE</p> <p style="text-align: center;"><i>Develop hazard monitoring and early warning services</i></p> <p>Are the right parameters being monitored?</p> <p>Is there a sound scientific basis for making forecasts?</p> <p>Can accurate and timely warning be generated?</p>
<p style="text-align: center;">DISSEMINATION AND COMMUNICATION</p> <p style="text-align: center;"><i>Communicate risk information and early warnings</i></p> <p>Do warnings reach all those at risk?</p> <p>Are the risks and the warnings understood?</p> <p>Is the warning information clear and useable?</p>	<p style="text-align: center;">RESPONSE CAPABILITY</p> <p style="text-align: center;"><i>Build national and community response capabilities</i></p> <p>Are response plans up to date and tested?</p> <p>Are local capacities and knowledge made use of?</p> <p>Are the people prepared and ready to react to warnings?</p>

Table 1. The Four elements of People – Centered Early Warning System
Source: UNISDR, Platform for promotion of Early Warning (PPEW)



Figure 4. Field Work during the regional workshop for hydro surveyors presented by OAS/DSD, in collaboration and with the support of WMO and IDEAM of Colombia, November 2009, Viejo River, Nicaragua.

Source: Workshop participant

In the context of **sustainability**, it is important that the flood EWS are seen as credible in the eyes of the municipalities and communities that the flood EWS serve. With that in mind, there is a need for more hydrological studies of small basins, especially in the micro-basins, whereby little or no information concerning historical rainfall and river levels exists and the information must be extrapolated from information for larger basins in the area.

This may result in imprecise information and, in turn, in a flood EWS that is not adequately calibrated, resulting in preliminary warnings that are not particularly accurate and thus the credibility of the flood EWS is diminished in the eyes of the populations that the flood EWS are meant to be serving. Furthermore, the systems need to be operated by community members who are perceived as trustworthy, so as to ensure that the use of radios and other essential equipment is not abused.

Local communities have been observing rain fall and river levels over the past ten or twenty years. However, that data has not been collected or passed on to any data center for building observation data series. Integrating this data into the national observation and monitoring networks would allow for populating observation data series in small valleys, and consequently developing more accurate models at local level.

Yet, in order to integrate local observation data series collected by community members, rain and water level gadgets must be standardized and observers must be properly trained under a single national system.

Community-centered and Centralized Systems: Not two alternatives, but one single system for only one purpose

In the end, community-centered flood EWS and centralized flood EWS are not mutually exclusive. By the contrary, they must work together as a single one, embracing the notion of “people-centered early warning systems”. It must be recognized that there is a need to have community members actively involved in all phases of EWS and that all pertinent government agencies, all levels of the government – from national to local – as well as all segments of the civil society – including NGOs religious organizations and private enterprise, must share information and coordinate their responsibilities and functions. Media, in all its forms, need also be given special consideration as a key stakeholder in EWS at all levels.

Furthermore, the availability of high-tech data and information must be capitalized on, so as to provide for weather advisories capable of increasing preparedness times, which is especially relevant in the Central American Isthmus and the Dominican Republic, where flash floods are particularly common. Participation of the local communities in the maintenance and vigilance of telemetric stations and sensors must be sought and promoted, as well as in the ground-truthing of models based on their own observations and memories of past events.

In Central America, there is an estimated 80 flood EWS that are officially registered. And while these systems operate within municipalities or national territories, we must recognize the transboundary nature of these hydro-meteorological phenomena, which oftentimes affects residents across municipal and international borders. In fact, 60%-70% of all basins at risk of flooding in the Central American Isthmus are transboundary, which require the consensus and joint action of a number of municipalities from multiple countries.

Furthermore, communities that are located upstream, and oftentimes at higher altitudes, generally have little to gain by installing a flood EWS because floods do not affect them as much as those living downstream at lower altitudes. However, all communities and municipalities in a given basin need to be involved in the flood EWS. This is to warn communities downstream of imminent floods ahead of time so that they can prepare themselves effectively and efficiently, and to save upstream communities from the post-disaster stress imposed in their health and education systems, as well as in their economies and livelihoods.

Communities do not live in isolation and therefore consideration for the other municipalities as well as communication with them is essential in order to ensure the sustainability of the basin-wide flood EWS as a whole, and the well-being of all.

In addition, communities upstream can make a difference by helping reduce erosion processes that result from extensive deforestation and slash-and-burn agricultural practices. While flood EWS will always be necessary, mitigating the adverse impact of these unsustainable practices will result in increasing concentration and flooding times, and minimizing floods in the low-lying areas, downstream.



Figure 5. Evacuation of people on account of the flooding of the Hondo River, caused by tropical depression # 16, Douglas Village, Belize November 2008
Source: Ramón Frutos

The Road Ahead

The SVP experience stresses the need to implement community-centered flood EWS, and to get all community members involved from the early stages of vulnerability assessment, risk identification, observation and monitoring of the phenomena, and contingency planning and preparedness, to the delivery of the alert and response. In addition, the SVP's latest findings indicate that in some small valleys, given the short-time available to respond, efforts need to be centered in preparedness and response; while flood EWS need to be calibrated to provide adequate time to respond, once the alert is given. Flash-floods are predominant in the Central American Isthmus and the Dominican Republic, which prompts us to seek innovative solutions and integrate weather advisories and early warnings to increase preparedness time.

SVP seeks to develop practical, low-tech and affordable solutions, with the involvement of all members of the community, while integrating forecast information gathered through high-tech systems, such as Doppler radar, satellite and aerial imagery and telemetric hydro-meteorological networks capable of providing weather advisories.

The following five (5) priority actions constitute the crucial next steps towards the sustainability of flood EWS in the Central American Isthmus and the Dominican Republic:

- 1) Building institutional capacity (adequately supported by legislation and policies);
- 2) Hosting a series of regional workshops and meetings to share best practices and lessons learned (and to promote the standardization of the methodologies of data collection, analysis and issue warnings);
- 3) Consolidating a Thematic Regional Platform for Early Warning;
- 4) Creating a proactive dissemination strategy; and
- 5) Implementing efficient program management.

Based on the described strategy for the sustainability of the progress observed in the region, efforts should be centered on consolidating a region-based thematic platform. The thematic partnerships generally have a common aim in seeking to develop and link technical expertise in the thematic area of focus with the concerns of policy makers and practitioners.

Their activities include issue formulation, advocacy, networking, coordination, information exchange, good practice guidance, capacity development, and joint program work. They have been an important source of expert guidance and a conduit for providing information on initiatives and roles in disaster risk reduction.

While only component C of this strategy refers specifically to the “consolidation of the Regional Platform”, all the other four (4) priority actions are designed to build enabling conditions for the sustainability of the results and the long-term operation of the thematic Platform.

The Thematic Regional Platform must be built on the basis of strong national government institutions and sound inter-institutional arrangements at the national and local level, with the involvement of local, national and international stakeholders. Thus, component A provides for its foundation.

Regional workshops and inter-agency meetings will support the exchange and sharing of experiences, so as to build the necessary ‘buy-in’, ownership, and self-identification of all stakeholders with the Platform.

Dissemination and communication of outputs, outcomes and needs will be critical to building a sense of ‘community’ of the Regional Platform.

Thematic Platforms and the ISDR system

Following the adoption of the Hyogo Framework for Action (HFA), a number of steps were taken to strengthen the ISDR system to support the implementation of the Framework, as provisionally described in the Background and Discussion Papers on the Strengthening of the ISDR System. One of the proposed elements of the strengthened ISDR system is the concept of “thematic platforms”. This term is used to describe a partnership mechanism through which ISDR partner organizations can collaborate and provide guidance on particular themes that are relevant to the reduction of disaster risk and the implementation of the Hyogo Framework. It derives partly from the earlier idea of forming “clusters” of organizations to provide coordinated support for the implementation of each of the Hyogo Framework’s five Priorities for Action.

The thematic platform concept also draws on the experience of a range of existing multi-stakeholder partnerships linked to the ISDR system that focus on specific themes related to disaster risk. These partnerships address such things as risk identification, early warning, El Niño, drought, floods, water risks, wild-land fires, environment, climate change, education, disaster recovery and capacity development. In the Americas, there are efforts to build a thematic platform on education and one thematic platform on urban risk.

These thematic platforms are designed to integrate global technical expertise, regional concerns and national capacities within the thematic areas of focus. They contribute their expertise to the Global Platform processes in support of national and regional efforts to implement the Hyogo Framework for Action (HFA).

Source: Thematic partnerships for disaster risk reduction and the development of ISDR Thematic Platforms. ISDR Policy Note, June 2008.

Towards a Regional Platform for Community-centered Flood EWS in the Central American Isthmus and the Dominican Republic



Figure 6. Regional Platform – Preparatory meeting, February 2009

Source: Pablo González

A Regional Platform for Community-centered Flood EWS in the Central American Isthmus and the Dominican Republic will contribute to the consolidation process of the Regional Platform for Disaster Risk Reduction in the Americas, and the implementation of the National Platforms (NPs) under the UN International Strategy for Disaster Reduction (UNISDR) and the Hyogo Framework for Action (HFA). Ensuring harmonization and streamlining, the structures and processes, and overall planning framework of the Regional Platform for Disaster Risk Reduction in the Americas, as part of the UNISDR system and HFA, will be considered as elemental to the design and implementation of a Regional Platform for Community-centered Flood EWS in Central America and the Dominican Republic.

In March of 2009, the First Session of the Regional Platform in the Americas yielded key recommendations for the implementation of the National Platforms. Amongst which perhaps the single most relevant was the need to build the NPs on the basis of *objective-specific* and *goal-oriented* thematic platforms.

National Platforms should be nothing but national mechanisms or networks capable to convene all government sectors and levels, as well as all segments of the civil society –including non-governmental organizations and private enterprises, for the common purpose of reducing the risk to disasters. And while this definition is conceptually well formulated, it poses a huge challenge in convening a wide range of stakeholders in any State, as risk reduction is a responsibility of all.

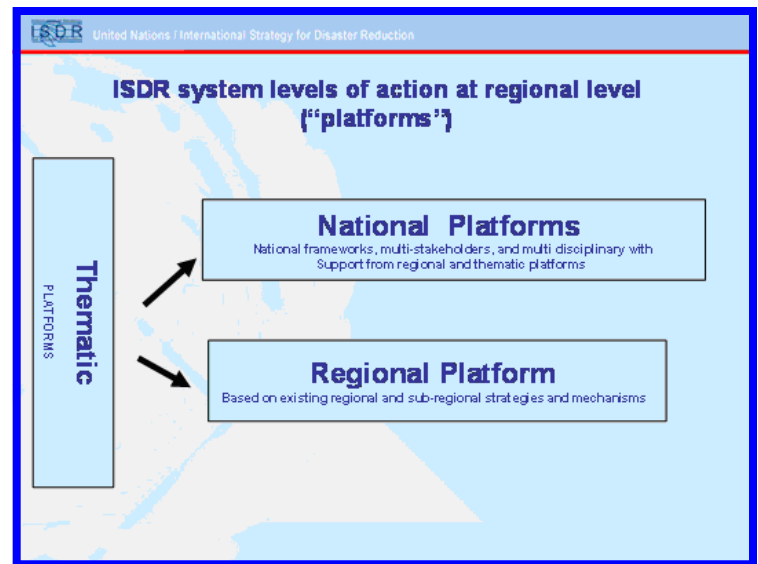


Figure 7. ISDR system levels of action at regional level
Source: UNISDR

Objective-specific and goal-oriented thematic platforms, on the other hand, provide for a clear identification of ‘purpose’ and stakeholders, as well as a clear understanding of roles and tasks to be undertaken by all parties involved. The National Systems for Flood EWS are then essentially national platforms for the purpose of providing timely early warning in a sustainable fashion – financially and institutionally.

Flood EWS must be implemented within a broad Disaster Risk Reduction approach and strategy, as their effectiveness and efficiency will highly depend on the ability of all stakeholders of mitigating the adverse impact of natural phenomena over human settlements and economic and social infrastructure.

Reducing erosion and sedimentation loads, which results in the expansion of flooding areas, as well as in land and mudslides, is critical to the implementation of flood EWS. Planning the occupation of the land and its use, the conservation of soils, and the execution of disaster mitigation measures –such as building levees and water-diversion channels, must be well integrated within the design, operation and calibration of flood EWS.

In the end flood EWS may save lives and personal belongings, but will never protect the livelihood of vulnerable communities, them alone, if national and local governments, NGOs and private enterprises, and the communities as a whole, do not work together for reducing their vulnerability and building more resilient societies.

A challenge that remains is to increase the participation of productive sectors –such as hydro-power dam operators, airport and ports operators, tourism operators and providers, and large agriculture industries, among others, who make use of hydro-meteorological data and information, so they can contribute to the expansion of observation and monitoring networks beyond the specific purpose of their businesses. It will be only when these vulnerable communities are part of national economies, when these systems can reach their financial and institutional sustainability, and be effective and efficient beyond saving lives.

A Regional Flood EWS Platform and the Regional Disaster Risk Reduction Platform can be mutually beneficial in many ways, including facilitating information dissemination and exchange, networking practitioners at local, national and regional levels, facilitating south-south cooperation on EWS, helping to link the networks of EWS, Disaster Risk Reduction and also climate change, and also providing a global broader scoped network on Disaster Risk Reduction to community level experts and practitioners in the field.

In January of 2005, 168 UN member states gathered at the World Conference on Disaster Reduction in Kobe, Japan, endorsed the Hyogo Framework for Action (HFA), pledging to make major efforts to reduce their disaster risk by 2015.

The HFA recognizes the need for a “substantial reduction of disaster losses, in lives and in the social, economic and environmental assets”, as well as on the need for mechanisms to assist them towards this end. The Hyogo Framework for Action serves as the basis for guiding government and international organizations that make up the UN system and the International Strategy for Disaster Reduction (ISDR) system in disaster risk reduction initiatives.

It identifies three strategic goals as follows:

1. The integration of disaster risk reduction into sustainable development policies and planning;
2. Development and strengthening of institutions, mechanisms and capacities to build resilience to hazards; and
3. The systematic incorporation of risk reduction approaches into the implementation of emergency preparedness, response and recovery programs.

And five priorities for action:

1. Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation;
2. Identify, assess and monitor disaster risks and enhance early warning;
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels;
4. Reduce the underlying risk factors; and
5. Strengthen disaster preparedness for effective response at all levels.



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