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# STRENGTHENING EARLY WARNING SYSTEMS IN THE CARIBBEAN

## DOMINICA

## HAZARD, VULNERABILITY, AND RISK STUDY FOR FLOODS

PRIOR KNOWLEDGE AND IDENTIFICATION OF RISK

MONITORING AND WARNING SYSTEMS

DISSEMINATION AND COMMUNICATION

RESPONSE CAPACITY

# STRENGTHENING EARLY WARNING SYSTEMS IN THE CARIBBEAN DOMINICA

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# ACRONYMS

**CDEMA »** Caribbean Disaster Emergency Management Agency

**CEWS »** Community Early Warning Systems

**DIPECHO »** Disaster Preparedness Program of the European Civil Protection and Humanitarian Aid Operations

**DRR »** Disaster Risk Reduction

**ECHO »** European Civil Protection and Humanitarian Aid Operations

**EU »** European Union

**EWS »** Early Warning System

**GIS »** Government Information System

**GIS »** Geographic Information System

**HIP »** Humanitarian Implementation Plan

**HVR »** Hazard, Vulnerability, and Risk

**IFRC »** International Federation of Red Cross and Red Crescent Societies

**IN-MHEWS »** International Network for Multi-Hazard Early Warning Systems

**LAC »** Latin America and the Caribbean

**MDE »** Digital Elevation Model (Spanish Acronym)

**NEPO »** National Emergency Planning Organization

**ODM »** Office for Disaster Management

**SAGA »** System for Automated Geo-scientific Analyses

**SSC »** South-South Cooperation

**SVG »** Saint Vincent and the Grenadines

**UNDP »** United National Development Program

# 1. INTRODUCTION

The Caribbean region is highly prone to natural hazards such as hurricanes, floods, volcanic and seismic activities, droughts and forest fires. The increasing impact of global climate change and the risk posed by a range of natural, environmental and technological hazards are among the Caribbean's most critical development problems. The past decades have been marked by an intensification of the impact of disasters, such as destruction of livelihoods and communities, as well as a setback in development gains.

Due to the high levels of vulnerability, there is a broad recognition of the need to strengthen capacity for preparedness, response, and recovery, and integrate risk reduction measures into development paths to create safe, resilient and sustainable communities and States in the Caribbean. As one component to reducing risk, the Caribbean Comprehensive Disaster Management (CDM) Strategy 2014 – 2024 prioritizes integrated, improved and expanded community early warning systems.[1] This focus is reinforced by the Sendai Framework for Action which calls for enhanced disaster preparedness.[2] Likewise, UNDP's Strategic Plan 2018 – 2021 aims to strengthen resilience to crisis and shocks and support countries with assessments, planning tools and mechanism so that gender-sensitive and risk-informed prevention and preparedness solutions are available to limit the impact of natural hazards.[3] Reducing risk and building resilience is a theme that cuts across the Sustainable Development Goals.

As identified in the ECHO Humanitarian Implementation Plan (HIP) 2017, preparation and response capacities in the Caribbean have improved. However, the need for further action to address preparedness capacities, reinforce Early Warning Systems (EWS) and foster exchanges between countries and linkages with regional institutions is crucial. The HIP specifically highlighted that "collaboration between countries on Early Warning Systems to exchange on good practices should be

1. Priority Area 4, Outcome 3, Regional CDM Strategy 2014 – 2024 https://www.cdema.org/cdm
2. Priority Area 4, Sendai Framework for Disaster Risk Reduction 2015 – 2030. https://www.unisdr.org/we/coordinate/sendai-framework
3. Outcome 3, Signature Solution 6, UNDP Strategic Plan 2018 – 2021 https://strategicplan.undp.org/

fostered" and stressed that the "compilation of DRR tools and processes endorsed at national and regional level, led by national systems in coordination with the CDEMA, EU Delegations and other development actors" are priority areas for action.

Thus, Antigua and Barbuda, Dominica, Dominican Republic, Saint Lucia and Saint Vincent and the Grenadines (SVG) set out to improve their Early Warning Systems (EWS) through an 18-month project financed by European Civil Protection and Humanitarian Aid Operations (ECHO). The *"Strengthen Integrated Early Warning Systems for more effective disaster risk reduction in the Caribbean through knowledge and tool transfer"* project sought to strengthen EWS components and close priority gaps at a national level, contributing to the integration of national and community EWS, and addressing sustainability and national ownership of EWS.

The country level actions were supported by UNDP, International Federation of the Red Cross and Red Crescent Societies (IFRC), and the Caribbean Disaster Emergency Management Agency (CDEMA), who embraced a partnership approach and helped reinforce the efforts to realize a more integrated EWS and enhance disaster risk reduction at the regional, national and community level.

The project also aimed to increase access to tools and knowledge of EWS at a regional, national and regional level, through development of, improvement to, and translation of models, methodologies and toolkits to distinct contexts. Emphasis was put on knowledge transfer and exchange, allowing actors to leverage the expertise that exists in the Caribbean to reduce disaster risk and foster stronger linkages between countries exposed to the similar risks.

This case study details the South-South Cooperation (SSC) process and activities between Dominica and Cuba. Based on the EWS Checklist analysis and the Gap Report, Dominica identified risk analysis for floods as a specific gap that could benefit from Cuban expertise. Cuba offered to adapt and share the Hazard, Risk and Vulnerability (HRV) study methodology; Cuban institutions and specialists prepared packages and trainings and accompanied Dominican institutions in implementing a pilot project that addressed identified deficiencies in the early warning system. This document provides a systematization of the results, lessons, processes and tools used in the process of transferring knowledge and capacity between Dominica and Cuba.

This document is intended to be read together with, and complemented by, the *Strengthening Early Warning Systems in the Caribbean* and *Strengthening Early Warning Systems in the Caribbean: South-South Cooperation* documents.

# 2. CONTEXT

In the last several decades, Dominica has made advances in strengthening its disaster preparedness measures. However, the impact of Hurricane Maria – a category 5 storm that hit in September of 2017 - provoked a reassessment of the country's state of readiness to prevent, prepare and respond to major emergencies.

Dominica is in the Eastern Caribbean island chain. It has one of the highest concentrations of "live" volcanoes in the world and more than 26 mountains in a geographical space of 468 square kilometres, with 146 kilometres of coastline. The island is comprised mostly of tropical rainforest, with 365 rivers and an annual rainfall average of 10,000+ millimetres, ranking Dominica among the wettest islands in the Eastern Caribbean. The island sits approximately 80 kilometres from the fault line of the overriding Caribbean tectonic plate and the subducted Atlantic tectonic plate. These characteristics render the island extremely vulnerable to multiple geological and hydro-meteorological hazards. Historically, the most common hazards have been tropical storms, hurricanes, landslides, flash floods, fire, drought, and earthquakes of mostly volcanic origin.

The national coordinating authority for emergencies and disasters in Dominica is NEPO (National Emergency Planning Organization), composed of 120 members of the public and private sector who play a key role in disaster risk reduction. The Office for Disaster Management (ODM) operates as the Secretariat to NEPO. It has the primary responsibility for planning, organizing, and coordination disaster management measures, based on the principles of prevention, mitigation, preparedness, response and recovery. In this role, ODM is the lead for coordinating EWS.

# 3. DEMAND & OFFER

## 3.1 The Demand

**Initial Identification of Needs:** The first step in any type of south-south exchange is to have a clear analysis of the problem. The analysis can include a situational analysis, that is, the disaster profile and overall development context of the country, and a capacity analysis, examining the installed social, political and institutional capacities and the gaps in those capacities. A national analysis and defined national priorities to address the identified problems ensures any type of support is aligned and demand driven.

In the case of early warning systems, the demand articulated by Dominica for its collaboration with Cuba stemmed from the national EWS assessment (see *Strengthening Early Warning Systems in the Caribbean*) process during April and May of 2018, detailed in its resulting national MHEWS Gap Report and MHEWS Improvement Plan, whereby a series of priorities to address those gaps were put forward.

**Scoping Mission:** Following this, a country mission of Cuban experts visited Dominica in June 2018; the mission was composed of the Head of Cooperation of the Cuban Civil Defence, the Cuban National Coordinator of Hazard, Vulnerability and Risk (HVR) Studies, and the UNDP regional project coordinators. The mission met with relevant actors from the disaster management system to discuss the identified needs and priorities and assess them through the lens of the Cuban EWS model; they took the processes, structures and capacities, as well as the overall topography, vulnerabilities and risk profile of the country in account. The Cuban team met the Office of Disaster Management (ODM), Meteorological Services, Health, Police, Fire service, the Red Cross, Telecommunications Office, Dominica Amateur Radio Club Inc., Government Information Service (GIS), the Air & Sea Port Authority, as well as local government representatives.

The scoping mission included the following elements of ***assessment***:

**a)** Review of the national disaster management structure and system.

**b)** Review of the types of risk and hazard maps. In Dominica, these consist mainly of national-scale level hazard maps for floods, strong winds, quakes, and volcanic eruptions; one finding was that these would benefit from a standardized methodology for multi-risk analysis studies at both national and community level to inform sustainable planning.

**c)** Review of the forecasting capacities. Forecasting is mostly generated at a national or two-region scale; the mission noted that these would benefit from downscaling to micro-regions as well as improved public forecast reports.

**d)** Site visits to assess EWS equipment, including river gauges, sea level gauges, and seismograph and weather stations, where some gaps were observed: some hydrometeorological stations were out of use; some river gauges were damaged; and, the seismological station required new technology.

**e)** Visits to those vulnerable communities that were more frequently affected by flooding during the rainy season.

**f)** Discussions on identified gaps and areas of support in priorities areas where Cuba had a corresponding expertise.

This diagnostic analysis led to identifying potential areas of collaboration:

- Standardized studies to analyse risk, HVR executive reports, and/or risk scenarios
- Early Warning Points
- Technical assistance to improve the forecasting services and forecast reports
- Volunteer Observers
- Document and information exchange on disaster risk reduction curricula, municipal and national plans, communication protocols, Risk Reduction Management Centres, and other models that could be useful references

**Solutions Package:** Based on the Priority Actions listed in Dominica's MHEWS Roadmap, complemented by additional inputs and information collected during the scoping mission, Cuba prepared a Solution Package with several options for south-south transfer. The Cuban SSC Expert Committee, established to coordinate this process, guaranteed the preparation of the solution package and the design of actions and technical assistance. UNDP, with its DRR, gender and knowledge management experts, reviewed materials for quality control, and helped facilitate the exchange between the two countries.

The Solutions Package for Dominica offered four ***options of support:***

**1)** Volunteer River Observation

**2)** Establishment of Early Warning Points

**3)** Hazard, Vulnerability and Risk (HRV) Studies

**3)** Weather Forecasting

**Identification of Leading Recipient Organization and Team:** Ideally the MHEWS Roadmap tool would identify the main institution(s) for each priority result. Once a priority action has been selected for implementation through south-south cooperation, the lead recipient institution would be confirmed. If the institution that would implement the activity is different than the disaster coordinating authority, then said institution would be involved in tandem with the disaster management authority from the inception in defining and implementing the initiative.

In the case of Dominica, there was not a leading institution which corresponded precisely to the selected priority action (HVR study). Therefore, the ODM took on the role, given that the task fell under the mandate of the Ministry for Environment, Climate Resilience, Disaster Management and Urban Renewal. ODM convened and engaged other relevant agencies and actors, who according to their respective mandates, had an interest in strengthening capacity in multi-disciplinary risk analysis.

The day-to-day coordination, planning and organization of the initiative was carried out by a consultant, hired to support the ODM. The consultant worked in the ODM office to guarantee information flow, agreement, and decision-making at each step. The ODM and the consultant functioned as the recipient team, liaising with Cuba and UNDP.


**Implementing Partner:** UNDP was the implementing partner that supported Dominica. Its role was two-fold: it facilitated all exchanges between Cuba and Dominica, and ensured that tools, training and methods used by the offering country were properly adapted to the context, time available, and language of the recipient country.

**Preparing SSC Priority Action Proposal:** The Solutions Package was received by Dominica and the options presented were discussed within the ODM, taking into account the implementation timeframe and budget available. Dominica selected the HVR study applied to "flooding due to intense rains"; ODM prepared a proposal and was allocated $ USD 21,942 for implementation. A detailed work plan was then prepared in coordination with the Cuban SSC Expert Committee and UNDP.

**Selecting a Community:** An analysis of the potential communities for the pilot was conducted, using three criteria:

- A small community in geographical size and population that could be easily covered and analysed as a training exercise
- A community that had enough geomorphological, bathymetric, drainage, run-off, structural and planimetric data of its basin available, so a minimum of hazards and vulnerabilities could be modelled
- A community that was frequently affected by flooding from intense rains

Using these criteria, the Bath Estate Community in the Roseau River Basin was selected for the HRV study.

**Engaging stakeholders:** As part of the methodology to engage a wide range of key actors, a sensitization session was carried out virtually with the Cuban team, UNDP and 13 heads of agency departments, many the same as those who had participated in the national EWS gap assessment. The session familiarized agencies with the overall Cuban model and HRV methodology, and how the south-south initiative would transfer it; it highlighted the importance of nominating the right staff for the training, as these individuals would then go on to establish a multi-disciplinary team and replicate the methodology throughout the communities. This discussion created more commitment from national counterparts.

**Selecting a Multi-disciplinary Group of Trainees:** A multidisciplinary group was formed with 13 experts from several key institutions, such as Physical Planning, Meteorological Services, Ministry of Education - Social Welfare Division, Office of Disaster Management, and the Dominica Red Cross. The criteria for trainees included:

- GIS experts
- Hydrological, climatological, meteorological and architectural technicians
- Education, welfare, environmental health, and disaster officers, and local government and social affairs technicians

# 3.2 The Offer – Hazard, Vulnerability and Risk Study (HVR) for Floods

In the last six decades, Cuba's focus on prevention and preparedness has contributed significantly to the country's capacity to protect citizens, property and goods during disasters. Its integration of risk reduction into disaster management and development planning is recognized as offering the region many lessons, which has led to several initiatives to systematize, adapt and transfer its best practices to other countries.

The tool, the Hazard, Vulnerability and Risk Study, is fundamental to the integration of risk reduction in planning and development. The HVR Study constitutes a process of investigation, identification, characterization, quantitative and qualitative estimation of the hazard, vulnerability of exposed elements, and risks. The studies are carried out at the local level to enable risk management; the results are expressed in maps and reports in a language accessible to all actors.

The sequence for conducting HVR studies is summarized as follows:


The methodology can be applied to multiple hazards, including flooding from intense rains, coastal flooding, strong winds, drought, and landslides; each hazard has a specific methodological guidance and results in a separate study. In this sense, it differs somewhat from the multi-hazard approach espoused by the Sendai Framework and the MHEWS Checklist. However, with some planning and additional investment, studies can be combined, applied jointly, or superimposed in a single geographic zone to reflect the different hazards. For the specific case of Dominica, the Floods from Intense Rains HVR Study methodology would seek to generate the following:

## HVR-Floods from Intense Rains

### PRODUCTS IT GENERATES:

- Standardized procedures for collecting and organizing information and developing HVR research to ensure homogeneous measurements and analysis in all territories.
- Risk of floods from intense rains calculations for different return periods
- Flood hazard from intense rains maps; exposed elements, vulnerability and risk maps, using Geographic Information Systems (GIS)

### SCOPE OF THE STUDY:

- Analysis and evaluation of hydrographic basins; results are expressed at provincial, municipal and community levels; the working scale is 1:25 000 or higher

### PRE-REQUISITES:

- System for Automated Geoscientific Analyses (SAGA); Geographic Information System (GIS
- Sufficient data available regarding historical flooding, rainfall, drainage, geomorphology, soil, land use, infrastructure, and municipality limits (See the complete list of data needed for a full HVR Flood Study in the Toolbox)
- An accurate digital elevation model (MDE) with a spatial resolution of 10 m or less pixels

### SUMMARY OF THE METHODOLOGY:

**Flood Hazards**

- Characterizes the site that is susceptible to flooding by generating a hazard scenario map
- Determines when the flooding event will take place by calculating its return period
- Estimates the intensity of the event by combining the severity with the degree of susceptibility to hazard and rain intensity that can cause it.
- Maps the fluvial topographic zone and shows the different levels that the potentially flooded areas could reach.

**Vulnerability**

- Structural vulnerability: Evaluates the resistive capacity of buildings to the destructive forces of floods. It is based on the damage factor, that certain types of construction can suffer according to their technical constructive state, and the exposure factor, related to their proximity to the riverbed.
- Non-structural vulnerability: Assesses the effects that the vital networks of the territory under study may suffer.
- Social vulnerability: Measures the tendency of social factors, such as population density and vulnerability perception, to influence potential damage of losses.
- Ecological Vulnerability: Assesses fragile ecosystems, protected areas, and ecologically sensitive areas that may be affected.
- Economic Vulnerability: Assesses the value of production in the flood areas, against the implementation of disaster risk reduction measures and costs associated with response.

**Risk**

- Determines the risk of occurrence for flooding, by calculating total vulnerability to a hazard combined with the likelihood of occurrence of a hazard. It allows for the determination of three levels of risk: low, medium, and high risk, which allows for planning and decision-making tailored to zones under each risk level.

# 4. ADAPTATION

The HVR methodology - which is based on the calculation and modelling of hazards, vulnerabilities, and risk through computational hydrology algorithm - is standardized but can still be applied to different contexts.

Adaptation of the HVR training, based on the recipient country's context, requires clear and timely communication of the data needed, and the provision of said data by the recipient country; this data is then revised by the offering country, so that training and practical exercises can be adapted to these variables. Due to lack of data availability on the Roseau River Basin, the HVR study was limited to the calculation of structural, non-structural and social vulnerabilities. Knowing this in advance allowed the trainers to design and plan the training sessions accordingly.

Other elements that might need to be adapted are the community perception surveys; these could be simplified and adjusted to consider local culture to encourage participation. Sufficient time is required to revise the materials and make the necessary adjustments jointly, drawing on input from both offering and recipient actors. In this case, the questionnaires were revised as part of the training sessions. Participants tested the survey on each other, tweaked the wording, and practiced how to approach and explain it to the community members they would interview.

Another element that might need adaptation is the filling in of the questionnaires during the interviews. In Dominica, electronic survey by phone/tablet apps (e.g. Open Data Kit) have been used in other social research initiatives and censusing; these apps directly upload the answers on a platform, making it more efficient and less time consuming, particularly for larger-scale applications. An important consideration would be the level of computer literacy of the survey pollsters. In the case of HVR studies, surveys are usually carried out by technical specialists with a background in information systems and social research who, in principle, could use such online applications; adding a session on electronic data collection to the training could be considered. The task of choosing which online survey app is most suitable would be the responsibility of the recipient country.

# CONTENT OF THE HVR FLOOD TRAINING

### General
- Conceptual Framework: reconciliation of concepts used in disaster risk studies

### Flood Hazard due to Intense Rains
- Introduction to the modeling of flood hazard due to intense rains
- Modeling the hazard of flooding due to intense rains: data and programs needed for modeling

### Vulnerabilities
- Indicators for calculating structural vulnerability
- Data and information necessary for the study of structural vulnerability
- Indicators for the calculation of non-structural vulnerability

### Social vulnerability
- Indicators for the calculation of social vulnerability
- Study of risk perception using surveys

### Field trip
- Expedition by the Roseau river basin: observations and information gathering in flood areas for vulnerability studies. Validation of hazard map and perception survey application

### Preparation of the Report
- Review and organization of existing information, cartography and data gathered in the field
- Completion of the flood hazard map and flood hazard report due intense rains
- Completion of vulnerability calculation and vulnerability study report
- Processing of risk perception survey and preparation of perception report
- Joint session of all teams for the compilation of reports and calculation of risks, and the production of a single consolidated HVR report

Another more obvious adaptation is language; the methodologies, formats, questionnaires, and learning materials need to be available in the language of the recipient country. The offering country is responsible to ensure that all the material is available in the local language, not only during the training but beforehand, so they can be revised and adjusted by the recipient lead institution.

In addition to printed material, it would be ideal to select trainers that are fluent in the language of the recipient country. If this is not possible, then the recipient country needs to coordinate and hire interpreters well before the training, so they are familiar with the agenda and materials.

## TOOLBOX

- Cuba Methodologies for Determining Disaster Risks at Local Level: HVR for Flood from Intense Rains (pag.11-32)
- Drafting Procedures for HVR Study Reports
- HVR Flood Training:
  - Presentation - GIS Tools and applications in risk management
  - Presentation Determination of flood areas by MDT (Spanish)
  - Presentation Calculation of vulnerable elements to flooding by intense rains (Spanish)
- List of Data needed for HVR Flood Study
- Dominica HVR Flood Study for Roseau River Basin and Bath Estate: Report

# 5. TRANSFER

To transfer the HVR Study methodology, a seven-day training was delivered by a Cuban team of experts to the multi-disciplinary group between November 19 – 27, 2018.

Key technical staff from Meteorological Services, Physical Planning, the Social Welfare Division, Local Government Department, the Dominica Red Cross, the Ministry of Education, and the ODM were trained on the HVR methodology, piloting it in the selected community in the Roseau River Basin, and producing a study.

Depending on the specialties of the trainees and the availability of data, the trainees were divided into two working groups. The Cubans used methodological guidelines for the HVR studies, the SAGA Manual, formula matrixes, questionnaires, formats, and power points presentations as supporting tools to transfer skills.

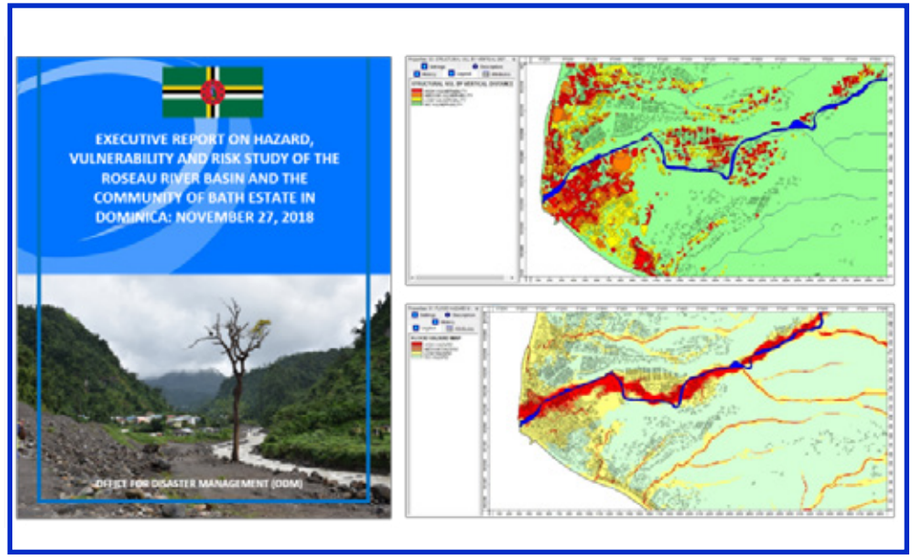
One group focused on assessing social vulnerability, conducting a community mapping exercise with a random sample of community volunteers. During the application of the questionnaire, trainees were organized in teams of two, one to ask the questions, the other to observe and record. A Cuban expert accompanied each team to provide advice at any point.

The other group, who had previous knowledge of GIS, was instructed on the use of the SAGA software and the variables for hazards and structural and non-structural vulnerabilities; they generated GIS maps of the Roseau River and the nearby communities. This team validated the maps through field visits and measurements of the depth, vertical distance, and flood height of the river. Taking the hazard and social assessment calculations, the groups then calculated the risks and prepared the report, using the templates under the guidance of the trainers.

The main challenges experienced were related to the duration of the training (seven days); the short length made it difficult to both transmit and absorb large amount of knowledge. The training length was limited due to budget and staff availability. To mitigate such challenges, it would be important to be more precise in the objective and scope of the training, have enough time to realize the objectives, and budget accordingly. Selecting trainees with prior knowledge, isolating priority or basic elements of the HVR manual to be transferred, and providing pre-reading, videos, and e-learning assignments could also be used to make the training more efficient.

# 6. RESULTS

- A Hazard, Vulnerability and Risk Study of the Roseau River Basin and the Community of Bath Estate in Dominica was produced with readily usable maps for decision-makers and the community, including:
  - Final Risk Map
  - Structural Vulnerability by Flow Speed
  - Structural Vulnerability by Flow Speed: Close-Up Sectional View
  - Structural Vulnerability by Vertical Distance: Close-Up Sectional View
  - Structural Vulnerability by Vertical Distance
  - Non-Structural Vulnerability by Roads
- A multidisciplinary group of 13 specialists were trained in HVR Flood Studies




# 7. SUSTAINABILITY

- ***Institutional Location and Mandate:*** Going forward, the mandate, responsibility and periodicity for conducting HVR Studies needs to be established in the official and legal statutes of the ODM and related agencies, in its institutional functions, including assigning a unit and/or personnel for this task.

- ***Replication of Hazard Mapping:*** A strong indicator of the continuation of the HVR efforts in Dominica is a hazard mapping initiative that has been planned for the basin in the Point Michele community, to be undertaken by Physical Planning, Land & Surveys, Agriculture and Forestry agencies; it will serve as a test of their ability to replicate the methodology, using trained human resources and existing tools. If successful, it could lay the groundwork for using the methodology across the entire national territory and justify the allocation of budget for this purpose. To realize a full HVR exercise, it would be necessary to draw on trained staff from other agencies, complete the vulnerability analysis, and establish a coordinating entity, such as ODM or NEPO.

- ***Improvement of GIS:*** In the framework of the "Sustainability Dialogue on the Multi-Hazard Early Warning System in the Commonwealth of Dominica", held on January 9th 2019, Permanent Secretaries and technical leads of agencies discussed the possibility of creating a common GIS platform and improving real-time hydro-meteorological and landslide information to feed into it. This would contribute to the country's capacity to replicate and institutionalize HVR studies for the country at large.

- ***Learning and Sharing:*** Dominica documented and systematized the initiative to inform future upscaling; a local consultant produced an Activities and Lessons Learned Report as well as audio-visuals related to the initiative.

# 8. LESSONS AND RECOMMENDATIONS

| LESSONS LEARNED | RECOMMENDATIONS |
|---|---|
| Through the HVR training and the pilot study, key data gaps were observed, particularly the level of resolution of spatial and bathymetric data for localized hazard mapping. | *Precise Data Generation:* Support the generation of more precise, higher resolution spatial and bathymetric data to create hazard maps at scale on the island. |
| The level of expertise of the Cuban trainers and their capacity to transmit the knowledge, making the linkages between the hazards and social vulnerabilities clear, was considered a major success. | *Knowledge Transfer:* Base the SSC on best practices from an offering country where methodology and expertise has been evaluated for effectiveness; the knowledge has been packaged for transfer; and where technical specialists have been prepared to transmit knowledge. |
| The use of a community for the practice exercise was deemed more effective than using case studies. | *Community Participatory Training:* Always use real-time communities to carry out HVR studies and training exercises, as it allows for context-specific training and validation of the hazard mapping, and structural and social vulnerability in situ with the community. |
| The strategy of sensitizing and engaging decision-makers at the start of the HVR transfer was a factor of success. This included a videoconference with Cuba and meetings with the Heads of Department and the Permanent Secretary, leading to institutional cooperation, and the nomination and availability of relevant staff for the trainings. | *Engaging Decision-Makers:* Maintain a sensitization session with decision-makers; make this a fixed step of any standardized HVR study or SSC transfer. |

| LESSONS LEARNED | RECOMMENDATIONS |
|---|---|
| The coordination between the Cuban SSC Expert Committee and the organizing team in Dominica during the formulation of the Solution Package (formulated by Cuba) and Priority Action proposal (formulated by Dominica) could have been reinforced by establishing a feedback process whereby both instruments were developed, revised and provided with feedback from both partners before the final versions. This would have allowed for a better integration between the demand and offer. | *SSC Committee:* Create a SSC committee in the recipient country, comprised of the leading recipient institution and a few other key agencies, so that proposals can be drafted, revised and discussed jointly inside the country. Work with the offering partner on the offer of solutions and revision of proposals for the quality of the results, the indicators of success, and the potential to build capacity. |
| Given the methodology of HVR studies, the elements that are feasible for adaptation and transfer depend on the available data in the country. The data availability will inform the types of maps and calculations the trainees will carry out and therefore influence the training agenda and design of the exercises. All data should be obtained at least two weeks prior to the training to allow for adequate revision and adjustments to the training agenda. | *Preparatory Data Sharing:* Provide the trainers with all the preparatory data from the recipient country at least 2 weeks prior to the training, including all necessary data for HVR. Begin data collection at the earliest possible moment, as much of the required data is dispersed across several agencies (planning, environment, etc.). Use shared online folders directly between the offering and recipient country, as this is the most effective tool for sharing data. |
| The *Methodological Guidelines for the HVR Study* was a critical element of the transfer. Additional precision in the rest of the training material would have maximized learning further, especially more didactical tools, and learning objectives per session, among others. | *Methodological guidelines:* Strengthen the training material with additional elements, such as:<br>• A brief module learning guide for each session - containing learning objectives of the session, brief summary of the methodology and topics of the session, and a session-specific bibliography (at least one key mandatory reading source).<br>• A more detailed guide on the content and presentation of information of the HVR Study Executive Report format<br>• One English translated HVR study sample from Cuba<br>• A Social Vulnerability Questionnaire guide on how to implement and rank social vulnerability.<br>• More emphasis and explanation on how to select, process, and analyse the preliminary data before the study, during the training, and in the methodology.<br><br>Provide these guides, as well as the bibliography and other relevant material, to participants with sufficient time ahead, allowing for clear expectations and preparation for the training. Include pre-reading, videos, or e-learning assignments to further strengthen the training. |

| LESSONS LEARNED | RECOMMENDATIONS |
|---|---|
| From perspective of the transfer and adaptation, success depends significantly on a constant and fluid coordination between the offering and recipient countries. It requires multiple scheduled work sessions to prepare a detailed work plan, jointly revise and adapt the training material prior to any visit and work out all logistical details in a timely manner. If left only to one or two videoconferences and email exchanges the finer details will not get worked out and the transfer will be less effective. | Multiple work sessions: Hold at least 3 virtual work sessions between the offering country and the recipient country, to detail the following elements:<br>• A planning session: Jointly develop and revise a detailed work plan, determining all transfer activities and the desired results of each (e.g. fact-finding missions, trainings, technical assistance, etc.), key milestones, indicators and monitoring responsibilities, reporting and documenting responsibilities, detailed schedule, and budget.<br>• An adaptation session: Hold a session to jointly revise the training agenda and all the learning material, to ensure that each session has a study guide and organized bibliography; that sessions and content are adapted to the time available; that the training has been adapted according to available data; and that all materials are translated, as necessary.<br>• A logistical session: Discuss in detail all logistical and organizational needs related to travel, translation, community visits during field visits, meeting rooms, and supporting material. |
| A good practice was to carry out a training evaluation to gather feedback and recommendations for future training. In addition, SSC transfers should incorporate tools to measure acquisition of skill/knowledge with an initial (baseline) and end-result levels (target achieved), so that achievement of the capacity development aims can be effectively measured. This way, the initiative can demonstrate its results as 'acquired capacities' rather than just number of persons trained. | *Feedback:* Include the following in all trainings:<br>• A training evaluation, given to participants at the end.<br>• Specific indicators on level of knowledge, skill or capacity (functional or technical) of the trainees applied before and after. One method to do so would be to apply a test before and after or incorporate a point system through the completion of tasks for each module. Trainees would then have 'passed' the course and demonstrably absorbed the knowledge. |
| The engagement of the community members was positive and key to ensuring the success of the social vulnerability-perception survey exercises and the validation of hazards maps. Sharing the results of the study with the community afterwards is a good practice for encouraging engagement in subsequent efforts and as a matter of accountability. This was not accomplished fully and should be reinforced in the future. | *Community Selection:* Finalize selection of the community early in the timeline to facilitate preparation of the community, leaders, and the community profile. Schedule the community focus group activity in the late afternoon / early evening for better attendance. Select households for interviews beforehand and assign trainees to field teams in advance. |
| One of the elements that made the training difficult was the language barrier, despite the presence of simultaneous interpreters. Knowledge transmission would be easier with English speakers. | *Translation:* Take into consideration the number of working groups when selecting the number of translators needed. Translate all presentation materials one week beforehand and send these to the translation team, so they can be familiar with the topics and terminology. |


# 9. CONCLUSION

Together with Antigua and Barbuda, Dominican Republic, Saint Lucia, and SVG, Dominica has advanced in policy making for early warning systems, through analysis of gaps and planning a roadmap forward. This process has reinforced countries' understanding and identification of the strengths and gaps in their early warning systems, the standards for people-centred multi-hazard systems, and promoted commitment to addressing potential risks and threats with prioritized actions plans.

These efforts were supported by Cuban technical assistance, leveraging tested tools and methods, and promoting engagement between countries sharing similar context and exposure to hazards. In Dominica, the training and application of the Cuban Hazard, Risk, and Vulnerability study methodology for intense rains aimed to strengthen EWS Pillar One - Identification of Risk. This experience provides solid lessons and recommendations for planning and implementing future knowledge transfers in Dominica or other islands. It also lays the foundation for upscaling the model to other river basins on the island or to other hazards, providing authorities and decision-makers with the risk analysis necessary to provide effective and integrated early warning to the communities.

This systematization aims to make a fruitful contribution to the region's knowledge on early warning systems and to global knowledge on South-South Cooperation practices.