



NAME OF PROJECT:	Enhancing the Effectiveness of Information and Communication Technology Applications and Tools for Disaster Management in the Caribbean Region
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START DATE:	July 2007
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PROJECT DURATION	18 months
IMPLEMENTING AGENCY:	Caribbean Disaster Emergency Response Agency (CDERA)
COLLABORATING INSTITUTIONS:	University of the West Indies (Seismic Research Unit and Disaster Risk Reduction Centre); National Disaster Organizations of CDERA Participating States
FUNDING AGENCIES:	IDRC; CDERA; UWI; National Disaster Organizations
ESTIMATED BUDGET:	BD\$ 930,716 (IDRC BD\$ 704,211 ; CDERA and Collaborators BD\$226,505)

1) Introduction

During the 1990's, the decade for disaster reduction, there has been a shift in disaster management planning and practice, from an almost exclusive focus on disaster preparedness and response to an approach which embraces mitigation activities, including risk reduction. To assist in the definition of this paradigm shift within the Caribbean Region, the United States Agency for International Development Office of Foreign Disaster Assistance (USAID/OFDA) and the United Nations Development Programme (UNDP) collaborated in supporting a project with CDERA to define a Comprehensive Disaster Management (CDM) Strategy and Framework, which emphasizes the link between development and disasters and promotes sustainable development through the building of resilient communities. CDM received endorsement at the highest regional level, the Caribbean Community (CARICOM) and in CDERA Participating States in 2001. This Strategy and Results Framework identifies five intermediate results, which taken together are aimed at achieving sustainable development through CDM. Intermediate Result (IR) 4 has a stated focus of "Preparedness, response and mitigation capability is enhanced and integrated". The CDM also recognized the critical importance of information and

identified this as a cross cutting theme. This project proposal falls under IR 4 and supports the cross-cutting information objectives within the Strategy and Framework.

The CDM Strategy and Framework is currently under review. This review process which is in completion stages has refined the original IRs into four priority outcome areas for the region, namely:

- √ OUTCOME 1: Enhanced institutional support for CDM Program implementation at national and regional levels
- √ OUTCOME 2: An effective mechanism and programme for management of comprehensive disaster management knowledge has been established
- √ OUTCOME 3: Disaster Risk Management has been mainstreamed at national levels and incorporated into key sectors of national economies (including tourism, health and agriculture)
- √ OUTCOME 4: Enhanced community resilience in CDERA states/ territories to mitigate and respond to the adverse effects of climate change and disasters

The CDM revision process is also expected to elaborate a regional donor programme based on the revised Strategy. This is currently being elaborated.

Initial findings from the review process indicate that information and communication technology applications for solution driven disaster management application will be given a high level of priority within regional disaster management programming.

2) Problem and Justification

Development Problematique

The Caribbean region is one which is traversed by a diverse set of geologic features including deep ocean trenches, underwater volcanoes, plate boundaries and fault lines. These have the potential to spawn a variety of hazards which – though having statistically a low probability can result in high impact especially in Small Island Developing States (SIDS) with a high percentage of its population living on or near the coast.

Over the last 500 years, tsunamis rank as the fourth most lethal of the natural phenomena to have affected the Caribbean islands. Potentially destructive tsunamis occur at a rate of about 1-2 per century in the Caribbean. While this is relatively low, tremendous population growth and rapid increase in coastal development has lead to increased vulnerability and consequently risk to tsunamis. Increased risk to tsunamis warranted the implementation of similar programs to reduce the impact of future events but factors such as historically low impact and scarcity of resources inhibited such undertakings.

The Sumatran catastrophe of December 26, 2004 has demonstrated the potential destructive power of tsunamis and has in the process qualified the risk exposure that a region faces without a suitable risk reduction program. Following the catastrophe, CARICOM's Community Council determined that CDERA should support regional efforts to establish a Tsunami and Coastal Hazards Warning System (TCHWS) on behalf of the CARICOM Member States. The Caribbean and adjacent regions as a whole are now

coordinating through the IOC/ICG to implement a TCHWS, including long term mitigation measures and a program to educate and prepare the region for future events.

Across the region, many programs have been established to reduce the risk associated with the more frequent of the natural hazards such as hurricanes. Where applicable and feasible early warning systems have also been established. A variety of national and regional mechanisms are used in the Caribbean region to manage risk from natural hazards. Despite these efforts, increasing urbanization and greater concentration of key infrastructure and population centres along coastal areas have contributed to an increase in the level of vulnerability and risk from natural hazards in the region. It is estimated that the population of the insular Caribbean has grown from about 7 million in 1900 through 23 million in 1960 to almost 40 million at the end of the last century. High levels of poverty and unplanned or ill-conceived development have also contributed to growing vulnerability.

Early Warning Systems currently exist for the monitoring of natural hazards with the greatest potential to impact negatively on vulnerable island communities in the Eastern Caribbean. These Early Warning Systems currently are characterized by:

1. The presence of a monitoring network with trained professional staff to provide advice to disaster management officials with little use being currently made of residents of vulnerable island communities who are often the first to observe and therefore potentially able to monitor the impact of hazardous events.
2. A focus on slow onset hazards such as hurricanes and little focus on EWS for fast onset hazards such as Tsunami.

Although tsunamis (and other coastal hazards) cannot be prevented, community and emergency preparedness, timely warnings, effective response and public education taken together can mitigate their impact.

How ICT Applications and Tools Support Regional Efforts

The role of Information and Communication Technologies (ICT's) for disaster management was initiated at the regional level with the initiatives of the Pan Caribbean Disaster Preparedness and Prevention Project (PCDPPP) during the 1980's with the provision of *inter alia* HF radios to strengthen telecommunications links among its 16 member states in the event of hazard impact. Since that time, a plethora of ICT options have emerged, and combined with the more longstanding ICT options of Amateur (HAM) radio, and fixed telephone, offer opportunities to enhance the effectiveness of early warning. Emerging technologies include internet, Geographic Information Systems (GIS), mobile telephones, cell broadcasting, addressable satellite radio and HAM PACTOR. The wide range of options available have not to a large extent been researched within our region to determine the most appropriate technologies to utilize for specific situations. More extensive research is therefore required to provide a robust basis for the specific choice of innovative ICT options within various disaster management scenarios including early warning systems for fast onset hazards. Such research must be relevant to current national and regional priorities and address hazards which are of greatest concern to the people of the region and by extension, the political directorate.

Over the past decade information and communication technology (ICT) has also improved prospects for the rapid acquisition of information on the impact of hazards at the

community level. Unfortunately, the acquisition of such data remains a significant challenge in the region and not all Caribbean institutions involved in disaster management have been able to utilize these opportunities. The technologies are available but the challenge has been cost, reliability, latency and lack of research on the application and effectiveness of the alternative options available.

Notwithstanding the overwhelming support now bestowed for tsunami risk reduction, there are some crucial challenges to be met in order to make such a program successful. A significant gap exists at the level of development of national components required to interface with the regional system. Information and Communication Technologies (ICTs) have improved prospects for solving technical problems such as through applications such as the use of Geographical Information Systems (GIS) for hazard mapping and modeling; use of web-based data sources to facilitate research on disaster management and searchable databases for hazard information but not all Caribbean Countries have been able to fully utilize these opportunities.

This proposal therefore seeks to identify and test innovative ICT applications that could contribute to enhance the effectiveness of Disaster Management practices in the Caribbean, focusing particularly on the following key issues:

- (a) ICT contributions to supporting national notification protocols within Early Warning Systems in the Caribbean region.
- (b) The application of ICTs for community knowledge and support in the collection of information post event.

3) Objectives

a. General Objective

The general objective of the project is to enhance the effectiveness of Disaster Management practices in the Caribbean region through the identification and testing of innovative Information and Communication Technologies (ICTs) applications.

b. Specific Objectives

- i. Objective 1:
To identify and assess the effectiveness of innovative ICT tools in national notification protocols for fast onset hazards in the Caribbean, with a focus on e-messaging, amateur Ham radio and GIS (Geographic Information Systems) applications.
- ii. Objective 2:
To test and analyze the role of ICTs to strengthen community knowledge and support in the collection of post event information for earthquake in the Eastern Caribbean
- iii. Objective 3:
To develop a set of policy recommendations in the form of a strategic paper, aimed at enhancing regional strategies to respond to natural hazards with the use of ICT tools and applications

4. Methodology

Objective 1: Identify and assess the effectiveness of innovative ICT tools in national notification protocols for fast onset hazards in the Caribbean, with a focus on e-messaging, amateur Ham radio and GIS (Geographic Information System) applications.

(a) Research Design: -

(1) Conduct a regional research assessment and documentation of the existing ICT tools currently being implemented in the Caribbean region for Early Warning Systems and damage assessment, with a view to identifying successful practices that may be utilized for fast onset hazards.

Early warning systems are multi-sectoral, multi-institutional and multi-level structures which make use of forecasts to respond in an efficient manner to any large scale major disaster event.

Early warning is a process which involves three types of actors:

Scientific & Technical institutions, which are in charge of studying and monitoring natural events to provide models which can be used to forecast events in terms of intensity, time, and geographical span.

National/Civil Organizations, which are in charge of establishing operations frameworks related to preparedness and response in case of events.

Communities, which must understand the nature of the hazards, their possible intensities and ranges, and react according to preset guidelines provided by the civil defense institutions in conjunction with authorities.



The analysis will include (a) a general mapping of existing ICT applications being utilized in the region, as well as (b) a more in-depth exploration of the following key applications for EWS:

- a. E-messaging for national notification protocols in Jamaica. This system was developed as a result of a number of challenges associated with the paper based system. These included difficulties with retrieving information for the preparation of reports, handwriting, assigning accurate times, misfiling and archiving. Whilst this system is in existence, the first step in this research initiative would be a comprehensive documentation of this application which would add to the regional body of knowledge on ICT applications for EWS.

The project will seek to document the experience of Jamaica in developing and using this indigenous methodology/technology with a view to replicating it across CDERA Participating States.

The system:

- √ Allows for the prioritization of in-coming calls to the NDO
- √ Is web-based and password protected
- √ Assigns time to each incoming call, so that a "time bomb" is activated to show lack of activity and ensure that each ticket is addressed.
- √ Allows the information for the preparation of Situation Reports to be easily accessed
- √ Allows for an interface with Cable and Wireless, so that a real time messaging alert system is facilitated
- √ Negotiations are underway to implement this interface whereby the public can text a word (eg 1. *hazard*) and determine the areas at risk; (eg 2. *shelter*) and determine the nearest shelters or number of shelters available.

- b. Amateur Radio with PACTOR (Data packets over radio) utilization for national notification whereby national disaster organizations may through pre designated amateur radio operators/stations disseminate warning messages which are then relayed to other amateur radio operators via other modes such a HF, VHF radio or other public broadcast systems. This system would be an additional dimension of the overall EWS in selected states. The value of High Frequency (HF) radio to national emergency communication networks in the Caribbean has been re-emphasized following the very active 2004 hurricane season in the Caribbean. One significant advantage of the HF networks is that use is free. More advanced technology, namely the PACTOR data mode and enhanced modems have the potential to significantly enhance the effective data communication in the Caribbean region. PACTOR is a method of sending digital information via radio. The focus state will be selected based on existing utilization of this system. Current knowledge on the use of the system in the region identifies Trinidad and Tobago as one of the known CDERA Participating States which utilizes this system.
- c. GIS application for EWS in three selected CDERA Participating States. The research study will seek to determine which if any GIS applications are being utilized in CDERA Participating States which incorporate digital products of recent projects such as the Caribbean Disaster Management Project (CADM) and the Caribbean Hazard Mitigation Capacity Building Programme (CHAMP)

Participating States will be selected for study based on criteria which will include: Reflecting the geographical scope of the CDERA Participating States; Consideration of representation based on territory size; EWS which capture the broadest possible range of hazards including hurricane and flood.

(b) Demonstration Pilots on key ICT applications:

1. Selection process of pilot implementing states:

- a. **Development of criteria** for the selection of a total of **three (3) States** for the piloting of the three selected ICT applications above. Criteria for country selection to include:
- Existence of relevant trained human resources/personnel and baseline databases competency
 - Willingness of country to support the process through in-kind support to the initiative.

- Demonstrated commitment of the pilot states through letters of commitment
- b. **Selection process:**
CDERA Participating States will be invited to submit expressions of interest to participate in the initiative. A committee comprising selected members of the CDERA Information and Communication Systems Committee (ICSAC) will support the CDERA Coordinating Unit in the identification of the selected pilots based on the criteria above.

2. Development of a plan of action:

- Within each selected pilot country, a **plan of action** for the implementation of the pilot ICT applications will be developed. This will be undertaken through the work of three Caribbean Consultants with each consultant being an expert in their respective subject area. Each Consultant will conduct an initial consultation in the pilot site, and will interact with the implementing team in each country.
- This PoA will include detailed timelines for implementation, roles and responsibilities, detailed tasks and outcomes, among others.

3. Local training sessions on the ICT application:

A training session will be provided to the selected national level team in each country identified with the support of National Disaster Coordinators. Ideally, the national team identification will seek to integrate this work into the work of an existing committee at the national level. For example, in the GIS pilot, utilization of the National GIS Committee would be appropriate for consideration to build national ownership and promote sustainability.

4. Testing of the applications in the (3) selected states

In the case of the Amateur with PACTOR application and the E-messaging system, the testing of the application will take the format of national exercise scenarios where national teams will be required to follow required protocols and test the pilot applications through the utilization and review of how well the mechanism worked. Testing will be a follow on activity from the training and plan of action workshop. The Amateur HAM application involves the sourcing of PACTOR software, and dedicated radio equipment as follows: Amateur HAM Radio with E-mail PACTOR including a TNC Unit and dedicated HF, VHF, and UHF radios.

b) GIS Application for EWS will involve the provision of hardware, ARC/IMSARC/SDE ESRI software and 3 day training for personnel in the selected pilot state. One pilot state will be selected for this application.

c) Expansion of the E-messaging system will involve the installation of the Jamaica designed software and training of selected personnel in its use. One pilot state will be selected for this application.

5. Pilots Monitoring:

In each case, the pilot's implementation will be followed-up, monitored and the progress documented. The analysis of the pilots will be based on the development of appropriate indicators of effectiveness including weighting. Issues such as reliability (did the technology work); and transmission time (how much time elapses between the issuing of the warning from the national level to receipt at the local level?) will be taken into account. The utilization of Monitoring and Evaluation methodologies such as **Outcome Mapping**¹ will be considered by the project team.

6. Documentation:

The process of the three pilots implementation will be documented by the selected Consultants (**production of three case studies**) with the aim of capturing lessons learned and challenges faced, identify the role and potential of innovative ICT approaches and applications, and provide recommendations for improvements/development of similar technologies in CDERA member states that could be considered at the policy level.

Objective 2: *To test and analyze the role of ICTs to strengthen community knowledge and support in the collection of post event information for earthquake in the Eastern Caribbean*

a) Conduct an assessment of the current utilization of ICT applications in damage assessment process for earthquake in the Eastern Caribbean via administering Earthquake Intensity Forms currently in use at the Seismic Research Unit (SRU) of the University of the West Indies.

After the impact of significant earthquake impacts in the region it is critical to have the ability and capacity to quickly harness impact data at the community level. The analysis of data gleaned from this process will also yield important information to inform preparedness actions for subsequent events. Felt impact data will be harnessed by community persons through the administering of earthquake intensity forms which capture data on time, date, location of person when impact was felt and description of effects. The results of intensity surveys can be used as a proxy of instrumental data on ground response to earthquakes and can provide us with valuable information that can be used to guide builders in constructing earthquake resistant structures. It will give the community a direct role in collecting scientific data that can make a difference in mitigating the effects of future earthquakes. Further information on what intensity means etc can be found at the following websites

http://www.uwiseismic.com/Earthquakes/eq_monitoring.html#Anchor-MEASURIN-48543
or <http://earthquake.usgs.gov/learning/faq.php?categoryID=2&faqID=28>

¹ Outcome Mapping is an IDRC supported methodology that characterizes and assesses the contributions development programs make to the achievement of outcomes. Outcome Mapping can be adapted for use at the project, program, or organizational levels as a monitoring system or it can be used to evaluate on-going or completed activities. It takes a learning-based and use-driven view of evaluation guided by principles of participation and iterative learning, encouraging evaluative thinking throughout the program cycle by all program team members. More information at (http://www.idrc.ca/en/ev-26586-201-1-DO_TOPIC.html)

In the past, collection methods utilizing these forms were via the print media (newspapers). This had the drawback of being costly and posed a level of challenge in the retrieval of information contained within the forms. Currently the process of capturing intensity data does not involve the use of any ICT tools and technology with the exception of telephone interviews for verification purposes and to a limited extent, use of the internet for posting completed intensity forms. This initiative will facilitate the training of persons in the community on the use of selected ICT applications to facilitate the completion of these forms.

b) The identification of successful practices and tools that could be replicated/scaled-up in the region.

c) Implementation of two pilot projects in order to test the relative effectiveness of selected ICT applications in supporting the data harvesting process post-earthquake impacts. Currently the data harnessing process is manually done in the field, is time consuming and it is difficult to submit the completed forms via traditional post or facsimile services. The application of GIS technology on a web based platform would greatly enhance both the data entry and dissemination process and also reduce duplication and inaccuracies.

One community in each of two pilot states will be selected to test the relative effectiveness on utilizing the ICT options of internet, BlackBerrys and Palm Treo for data collection post earthquake. Pilot states will be selected based upon the history of high frequencies of earthquake activity. The main criteria will therefore be the incidence of felt events since we need to have events which require intensity surveys to be done. Also less quantifiable factors such as local support/conditions, likelihood of having community participation etc will be considered. This will facilitate testing of the ICT effectiveness in real scenarios. Based on current data on earthquake frequency, Trinidad will be selected as well as one of the islands in the northern part of the Eastern Caribbean e.g. Antigua & Barbuda/Dominica

(a) As part of the implementation of this pilot, there will be a **training session** for community leaders and disaster management officials in the use of the selected ICTs of internet, BlackBerry and Palm Treo. This will involve an explanation of the intensity form and what are the kinds of information needed as well as training on how the ICT application works. The SRU will also provide a background information on the seismicity of the area, highlighting the importance of the information to be collected and giving a clear indication of how and when it should be collected and sent in to the SRU. Two training sessions would be undertaken. One at the beginning of the initiative to explain the ICT application and how it works, the intensity forms and the second to assess the effectiveness of implementation once a survey has been done.

Both the initial training (planned to be a two day session) and the assessment sessions (proposed as a one day session) will be conducted by personnel from the SRU, the agency responsible for implementing this objective of the project. This initiative would be undertaken at the national level in collaboration with National Disaster Coordinators (NDCs) who will support the process through the provision of technical guidance on project implementation including the identification of appropriate communities, approaches to project implementation and making logistical arrangement of training sessions.

The research into the ICT will involve a determination of the most appropriate method to collect and send the data collected to the SRU. Issues to be factored into making this determination will include the cost effectiveness of the ICT option, maintenance costs and potential for sustainability following project closure.

(b) The pilot's implementation will also involve the establishment of mechanisms for ongoing monitoring and review. The Outcome Mapping Methodology² will be implemented to develop the appropriate indicators and conduct the monitoring process.

(c) Production of one case study:

The process of the pilot's implementation will be documented with the aim of capturing lessons learned and challenges faced, identify the role and potential of innovative ICT approaches and applications, and provide recommendations for improvements/development of similar technologies in CDERA Participating States that could be considered at the policy level.

Methodological principles for pilots:

- a. Participation of community users of the earthquake intensity forms and ICT applications in order get their requirements and their feedback on the ongoing technical developments;
- b. Focus on the potential replicability of the applications at the broader regional level with a view to developing standard or generic solutions that can be applied to other hazards in other territories.
- c. Use open source software that is re-useable and applicable to other hazards.
- d. To utilize ICT options for earthquake intensity data collection with a view to decreasing system maintenance costs whilst improving reliability, scalability and interoperability.
- e. Promote the project to the broader scientific and user community

Objective 3: *To develop a set of policy recommendations in the form of a strategic paper, aimed at enhancing regional strategies to respond to natural hazards with the use of ICT tools and applications*

This objective involves the preparation of a **Strategic Paper** directed at Caribbean policy makers, addressing the importance of ICT tools and approaches, key lessons learned through the pilots implementation, policy recommendations and suggested strategies for the regional replicability/scale-up of successful approaches/pilots, articulation of efforts among countries and stakeholders as they relate to/or could be facilitated by ICTs. This Strategic Paper will be informed by the regional scalability of proven models/successful pilots and ICT applications.

² http://www.idrc.ca/en/ev-26586-201-1-DO_TOPIC.html

Dissemination of Results:

1. Final Regional Project Workshop:

The main venue through which project outcomes will be shared and disseminated consist of a regional level workshop to be convened at the end of the project cycle of 18 months.

Objectives:

- Disseminate among a key audience the project results.
- Raise awareness among regional participants and participating organizations with current ICT applications for disaster management in the Caribbean region;
- Promote dialogue on the potential of successful pilots/proven models that could be scaled up, promoting networking and interaction among disaster management officials, agencies and other participants.

Participants:

Invitees to the workshop will include representatives from the National Disaster Organizations of the CDERA Participating States as well as representatives of selected national, regional and international organizations which work in ICT.

Funding from this project will be utilized to support thirty representatives from national and regional organizations.

Location:

To be hosted by CDERA, organized in coordination with IDRC officials in charge of this activity. Workshop duration is proposed to be two days and located in one of the pilot states. Trinidad is recommended.

2. (4) Case Studies on the pilots.

Opportunities will be identified to facilitate the sharing of case studies at relevant international fora. Case Studies will also be reproduced by the CDERA Coordinating Unit under the project and distributed to partners and other non-pilot CDERA Participating States.

3. Creation of a Web page about this project in CDERA` s Domain

All the information on the project's implementation, pilots, case studies etc will be placed on a series of web pages linked to the main CDERA website at www.cdera.org/. These pages are to be developed from the onset of the project, so as to promote transparency and be more effective in terms of the dissemination of the information at the regional level.

Expected Results

Objective 1

- i. Three pilots implemented
- ii. Three case studies developed
- iii. A regional workshop
- iv. An assessment of utilization of selected ICT applications and tools for EWS and damage assessment in the Caribbean Region
- v. Identification of successful practices in the use of ICT applications and tools for EWS and damage assessment in the Caribbean Region
- vi. Increased understanding of national disaster managers, (country level disaster management professionals) of the potential use of ICT applications and tools for EWS and damage assessment

Objective 2

- i. Two pilots implemented
- ii. One Case study
- iii. Improved understanding of the existing assessment system utilized by the SRU
- iv. Identification and documentation of successful practices
- v. Enhanced mechanism for the rapid acquisition of information on hazards between monitoring institutions and disaster management officials
- vi. Improvement of the monitoring, preparation and response phases of natural hazard events

Objective 3

- i. A strategic policy paper

7. Institutions

a. Caribbean Disaster Emergency Response Agency (CDERA)

The executing agency is the Caribbean Disaster Emergency Response Agency (CDERA) headquartered in Barbados. CDERA was established in September 1991 by an Agreement of the Conference of Heads of Government of the Caribbean Community (CARICOM) as the CARICOM agency and focal point for disaster management in the CARICOM countries. CDERA is well positioned to execute this process, as the agency has functioned as the manager of stakeholders in the regional disaster management process, and has a record of managing multi-year, multi-stakeholder projects and programs. Several regional projects have been implemented through CDERA, and the CDM Strategy has provided a framework through which significant investment for regional projects is being channeled.

b. University of the West Indies

i. Disaster Risk Reduction Center

The DRRC, established in 2005 is to be recognized as a multi disciplinary center of Excellence in the field of Disaster Management. The DRRC is intended to

1. Provide the leadership that drives the rationalization, integration, and development of all initiatives in disaster management cycle within the University.
2. Mobilize resources, to supplement those provided by the University, to advance UWI's Disaster Management Programme.
3. Develop partnerships and other collaborative mechanisms that allow the University, its students and staff to maximize the effectiveness of their interventions in disaster management to advance sustainable development in the region.

ii. Seismic Research Unit (SRU)

The Seismic Research Unit of the University of the West Indies is the agency responsible for monitoring earthquakes and volcanoes for the English-speaking islands of the Eastern Caribbean as well as the Dutch islands of Saba, St. Eustatius and St. Martin. Scientists at the Unit maintain a volcanic surveillance and warning system in these countries, conduct research on the distribution and frequency of earthquakes in the Eastern Caribbean and provide advice on earthquake and volcano related issues to governments of the contributing countries. Close links are also maintained with similar organisations in the region such as the Institut de Physique du Globe de Paris (IPGP) which is responsible for volcanic and earthquake monitoring in the islands of Martinique and Guadeloupe, the Fundacion Venezolana de Investigaciones Sismologicas (FUNVISIS) and the Universidad de Oriente (UDO) which monitor earthquakes in Venezuela. In addition to providing services in volcanology and seismology to the governments of the contributing countries, the Unit also provides consultancy services in various aspects of Applied Seismology, Engineering Geophysics and Geology to both local and international insurance companies and civil engineering establishments

8. Evaluation

- a. Baseline data for the research will be generated through case study information which will be captured at project start up. Performance indicators will be developed during the outcome mapping training session which will be facilitated by IDRC within the first quarter of project implementation. Evaluation of this research initiative will be undertaken by an independent evaluator and will consist of a final evaluation. This will be informed by baseline data and performance indicators developed.

9. Indicative Timeline

	Activity	Year 1 Q 1	Year 1 Q2	Year 1 Q 3	Year 1 Q 4	Year 2 Q1	Year 2 Q2
	OBJECTIVE 1						
1	Research Assessment						
2	Sharing of Findings – Regional Workshop						
3	Criteria Development for Pilots						
4	Conduct training and develop Plan of Action for System implementation in Pilot States						
5	Testing of Application and Tools						
	OBJECTIVE 2						
6	Assessment of existing SRU system						
7	Research assessment of ICT application for damage assessment in selected states						
8	Pilot State selection						
9	Training of community leaders and officials						
10	Practical Exercises designed to test knowledge of Community persons on use of forms, techniques, technology						
11	Monitoring and review mechanisms						
12	Recommendations Report						
	PROJECT MANAGEMENT						
13	Implementation Plan						
14	Outcome Mapping Training						
15	Final Evaluation						