



## Report of the workshops in Saint Lucia, Saint Vincent and the Grenadines, Dominica, Grenada and Belize.



Possible use cases, people met and follow-up ideas

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## 1. Introduction

This document contains the report of the workshops that were carried out in the period May and June 2014 in the 5 target countries of the CHARIM project. The involvement of the stakeholders from the 5 target countries (Dominica, Saint Lucia, Saint Vincent and the Grenadines, Grenada and Belize) is considered very important for the development of the Caribbean Handbook for Risk Information Management (CHARIM).

Initially at the start of the project only one workshop was foreseen where participants from the 5 countries would come together in one location in order to discuss the project objectives, the data situation in their countries, the possible use-cases and plan the follow-up work. On the request of the consortium led by ITC a request was made to change this into separate visits to each of the 5 countries, which has the following benefits:

- It allows to get to know many more people in each of the countries, as we can organize a workshop per country where all interested staff from the ministries of Physical Planning and Public Works can participate, leading to lower costs, and better understanding of the local situation;
- Visiting the countries separately will allow the project team and the WB team to get a much better idea of the local situation and visit the potential use case areas during a fieldwork.

Therefore it was decided by the World Bank team to organize separate meetings in the 5 target countries.

- May 19-20: Saint Lucia
- May 22-23: Saint Vincent
- May 26-27: Dominica
- May 29-30: Grenada
- June 24-25: Belize.

These meetings had the following aims:

- Present the aims and objectives of the CHARIM project, and the project team;
- Get to know the stakeholders from the target countries, and obtain an idea of their daily work and how they apply hazard and risk information;
- Discuss the possible use cases that relate to ongoing or future projects where hazard and risk information should be used;
- Discuss the available data and the data requirements;

The World Bank team was responsible for approaching the participants and for arranging the logistics of the visits. The project consortium was responsible for presenting the use cases, use of several questionnaires (one for each participant individually, presented at the end of the report, and one for the use cases) and present the data availability. This report will present the results of the meetings, which consisted of one day workshop and one

## 1.1 Invitation letter

The invitation letter is shown below, which contains the overall programme of the meetings.

### *Caribbean Risk Information Program*

#### **Objectives and schedule for kick-off workshops**

##### **OVERVIEW**

The World Bank is initiating the Caribbean Risk Information Program with a grant from the ACP-EU Natural Disaster Risk Reduction Program. Over the next 12 months, a consortium led by University of Twente ITC will be responsible for conducting capacity-building workshops, generating training materials, and creating hazard maps to expand the capabilities within participating infrastructure and spatial planning ministries to use hazard and risk information for decision-making. To facilitate this work, the World Bank and ITC are planning 2-day kick-off workshops in each country.

##### **OBJECTIVES**

- To introduce the project motivation, timeline, and main activities
- To understand better the activities and needs of engineers, planners and GIS staff involved in infrastructure and planning decisions
- To identify key contact persons for the coordination of future activities and missions
- To better understand each country's flood and landslide hazards through discussion
- To understand the current level of incorporation of flood and landslide hazard considerations into planning and design processes
- To better understand what is needed to improve the planning and implementation of risk reduction measures and how the project could address these needs
- To identify possible use case examples and to visit these locations with local experts. Possible use cases could provide examples on the following topics:
  - ✓ relocation or reconstruction of public assets
  - ✓ retrofitting of assets
  - ✓ safe locations for new infrastructure
  - ✓ flood mitigation and slope stabilization works
  - ✓ land use planning
  - ✓ early warning systems
  - ✓ emergency response
- To have a better understanding of the roles and responsibilities of the various government units involved in risk reduction
- To assess availability and accessibility of data that may be relevant to the project

##### **PARTICIPANTS**

###### **ITC Consortium:**

- **Workshops held in Saint Lucia, Saint Vincent and the Grenadines, Dominica, and Grenada:**  
Cees van Westen (Landslide Expert, ITC), Victor Jetten (Flood Expert, ITC), Charisse Griffith-Charles (Regional Coordinator, UWI Trinidad and Tobago), Tarick Hosein (Case Study Coordinator, UWI Trinidad and Tobago)

- **Workshop held in Belize:** Heather Bell (Flood Specialist, Pacific Disaster Centre), Erin Hughey (Disaster Specialist, Pacific Disaster Centre), Jeanna Hyde-Hecker (Case Study Coordinator, EnviroSense), Mark Brussel (Transportation Engineer, ITC)

**World Bank:** Fernando Ramirez Cortes (Task Team Leader), Melanie Simone Kappes (Disaster Risk Assessment Specialist), and Daniel Wright (Disaster Risk Management Analyst)

**Host Country Governments:**

- **Day 1:** Chief Engineers/Planners, Engineers/Planners in technical roles, GIS Experts, and others who would benefit from project (through workshops, handbooks, etc.).
- **Day 2:** Reduced audience—Engineers/Planners or others who can help facilitate, enhance, and benefit from the discussion during field visits (Chief Engineers/Planners are also encouraged to participate if time permits)

**DESIRED COORDINATION SUPPORT FOR KICK-OFF WORKSHOPS**

The World Bank team is coordinating with the ministries of Planning and Works in each country. We would greatly appreciate ministerial assistance with the following points:

- We would appreciate assistance in identifying a meeting space for approximately 15-20 participants for Day 1 of each workshop. If no space is available in governmental buildings, we would appreciate suggestions for other locations. The room would preferably have PowerPoint presentation capability.
- We would appreciate assistance with obtaining transportation for day 2 of each workshop. If the ministries cannot provide transportation, we will arrange for private transportation.
- We would appreciate recommendations for lunch meal options.
- We would greatly appreciate that one representative from the Physical Planning and one from the Works side could give, during about 15 minutes each, a brief outline of the country situation, challenges, and status quo regarding floods and landslides. A PowerPoint presentation is optional.

**WORLD BANK CONTACT INFORMATION**

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**PRELIMINARY CALENDAR**

Saint Lucia	May 19-20, to be confirmed
Saint Vincent and the Grenadines	May 22-23
Dominica	May 26-27
Grenada	May 29-30
Belize	To be determined



## PRELIMINARY SCHEDULE FOR KICK-OFF WORKSHOP

Day 1		
09.00 – 09:15	Opening and introduction of participants	World Bank team and local organizer
09.15 – 10:00	Introduction to the project. <i>Objective: Provide background of the project, objectives, main activities, and timeline</i>	World Bank team
10:00 – 10:30	Introduction to “use cases” as a learning tool <i>Objective: Give examples of use of hazard and risk information for decision-making</i>	ITC: Cees van Westen
10:30 – 11:00	Coffee break	
11:00 – 11:30	Presentation of a flood use case example	ITC: Victor Jetten
11.30 -11.45	Table of content of the handbook	ITC: Cees van Westen
11.45 – 12.00	Example of the questionnaire	UWI: Charisse Griffith
12.00 – 12.30	Filling in questionnaires by the participants	
12:30 – 13:30	Lunch	
13:30 – 14:00	Introduction to the country and the problems related to natural hazards, risks and planning <sup>1</sup>	Country representatives, facilitated by ITC
14:00-14:20	Reporting on the findings of the questionnaire and discussion	UWI: Charisse Griffith
14:20 – 15:00	Brainstorming session <i>Objective: define possible use cases for the country</i>	All, facilitated by UWI: Tarick Hosein
15.00 – 15.15	Tea break	
15:15-15.45	Presentation of use cases and discussion	All, facilitated by UWI: Tarick Hosein
15:45 – 16:15	Discussion on hazard and risk data requirements for use cases, inventory of data availability, and needs for data collection. Data sharing.	All, facilitated by ITC Cees van Westen
16.15 – 16.45	Wrap-up session <i>Objectives: determine the use cases that will be considered, define the areas that will be visited on following day, planning for future activities</i>	ITC: Victor Jetten





Day 2		
09:00 – 09:30	Presentation and discussion on the sites that will be visited	Country representatives
09:30 – 12:00	Visit to the first use case site. Discussion in the field on the problems, the possible solutions, data requirements	All
12:00 – 13:00	Lunch break	
13:00 – 16:00	Visit to the second/third use case area. Discussion in the field on the problems, the possible solutions, data requirements	All
16:00 – 17:00	Wrap-up meeting: discussion and planning of future work	All, facilitated by ITC

<sup>1</sup> We would greatly appreciate if one representative from the Physical Planning and one from the Works side could give, during about 15 minutes each, a brief outline of the country situation, challenges and status quo regarding floods and landslides.

## 2. Saint Lucia

The workshop in Saint Lucia was organized on May 19-20 2014. On May 19 the workshop was organized in the Ministry of Public works, and on May 20 a field visit was organized in which only 3 of the participants (Mrs. Renata Philogene-McKie, Mr. Jude Regis and Mr. Ovid Martyr) participated only for the first 2 hours. This chapter presents the participants, the places visited and a description of the possible use cases. The results of the questionnaires are presented in section 9.1. the world Bank team consisted of Melanie Kappes and Daniel Wright, and the consortium team of Cees van Westen and Victor Jetten (ITC-UT) and Charisse Griffith-Charles and Tarick Hosein (UWI).

### 2.1 Participants of the workshop in Saint Lucia

Name and position	Photo	E-mail	Telephone
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<b>Nigel Marshall</b> Spatial data manager. Consultant for GeoNode. Department of Survey and Mapping Ministry of Physical Development		nigel.marshall@govt.lc	4685085 4877186
<b>Laurina Raoul</b> Civil engineer. Ministry of infrastructure. World Bank funded projects		lraoul@gosl.gov.lc	7173767 4684371
<b>Marcathian Alexander</b> IT Officer, Ministry of Physical Development		marcathian.alexander@govt.lc	?

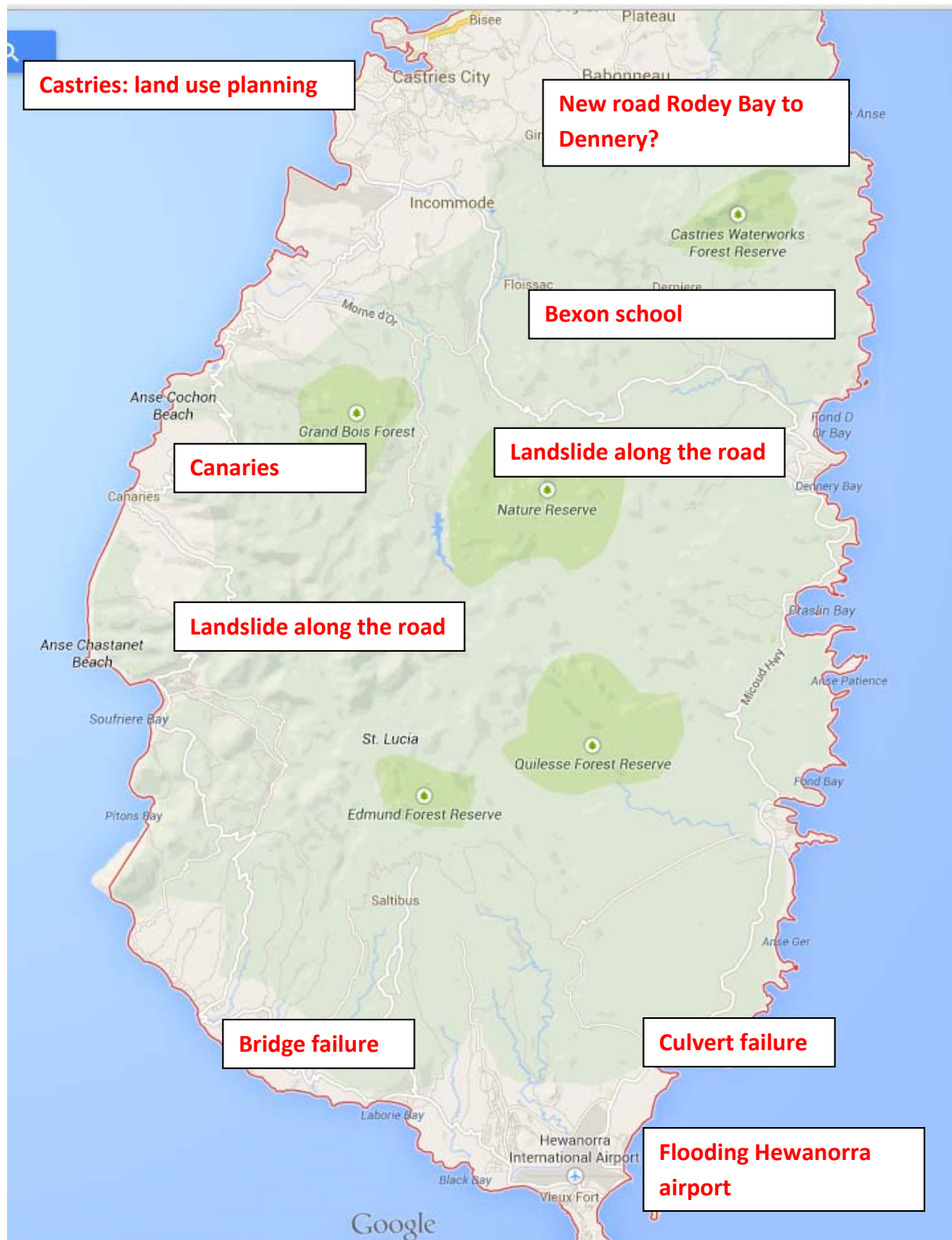
<b>Renata Philogene-McKie</b>  Civil Engineer for Survey Unit / GIS project		rphilogene@gosl.gov.lc	7217141 4684377
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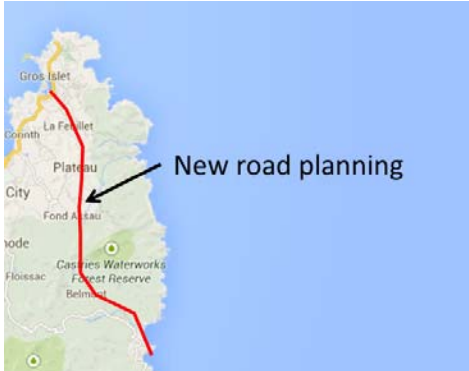


Frank....	Driver		7186444
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## 2.2 Map of Saint Lucia with indication of places visited during the fieldwork

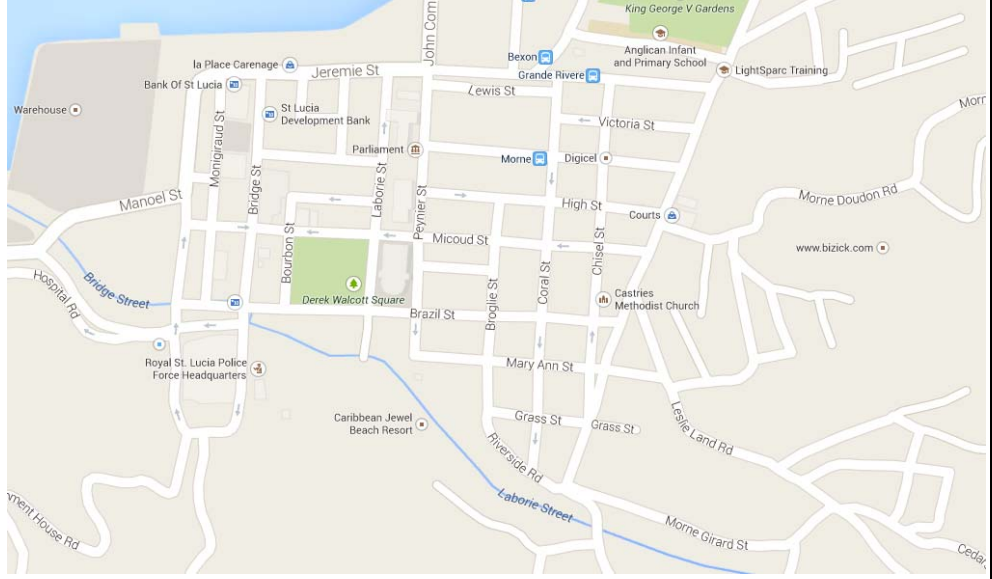








## 2.3 Points visited during the fieldtrip / possible use cases

Problem	Details
Road planning in northern part to connect to Dennery (NR 1)	<p>We have TOR available. There is now a consortium that made a first preliminary assessment.</p> 
Bexon School: relocation / retrofitting / flood protection? (NR 2)	<p>Alternatives for solving the problem of the damage to the school.</p> 
School retrofitting: Canaries (NR 3)	<p>School in Canaries was hit by a flash flood and thrown off its foundations. What would be the best way to protect schools that are in vulnerable locations?</p> 
Multi-hazard risk reduction for Castries	<p>Courthouse and Treasure area. Relocation of public assets Retrofitting (Jeremy Street) Flood mitigation Early Warning</p>



	
<p>Flood problem in Southern airport</p>	<p>The Hewanorra International airport was flooded in 2013 due to problems in diverting a stream around the airport.</p> 
<p>Bridge design: temporary or permanent</p>	<p>Several bridges have been washed out during the 2013 event. The question is: should these be rebuilt with permanent structures? For which return period flood? Or could it be more cost effective to replace them with temporary bridges?</p> 
<p>Culvert design</p>	<p>Along the main road from</p>

	
<p>Landslides affecting the main road between Castries and Dennery</p>	<p>The main road from Castries to Dennery is severely affected by landslides in a critical section.</p> 
<p>Flood Early Warning system in Corinth</p>	<p>Flood Early Warning System (FEWS) for Corinth, which has been developed together with JICA and CDEMA, 3 year programme, community, Corinth River, waterlevel</p>

## 2.4 Follow-up activities in Saint Lucia

Person	What
Jude Regis	<ul style="list-style-type: none"> <li>Flood hazard assessment report and data for the Bexon area</li> <li>Landslide risk assessment for the national highway project made by a UK company.</li> </ul>
David Alphonse	<p>He is the main contact person for GIS in Saint Lucia. He provided most of the data to the WB team.</p> <p>Further information to verify with him:</p> <ul style="list-style-type: none"> <li>Flood Early Warning System (FEWS) for Corinthe, which has been developed together with JICA and CDEMA, 3 year programme, community, Corinth River, water level</li> <li>+</li> </ul>
Nigel Marshall	<p>He is a consultant for reviving the GeoNode. It would be good if he is contacted by Manzul Hazarika (GeoNode specialist in the project). He is working on a framework document with protocol information.</p>
Karen Augustin Reinata	<ul style="list-style-type: none"> <li>Discuss with them the current procedure for planning including the EIA process and asks them existing regulations</li> </ul>
Renata	<p>Discuss the road planning project further as possible use case</p>
Ovid Martyr	<p>He is involved in a project that is collecting field data on building use, based on the footprints. Some people work on this, but only part-time, and they only go 1 day in the field per week at the most. They are still working in the northern part of the island. We should ask the exact legend they are using</p>
T,b,d, Dawn French	<p>Contact with NEMO :</p> <ul style="list-style-type: none"> <li>Flood Early Warning System (FEWS) for Corinthe, which has been developed together with JICA and CDEMA, 3 year programme, community, Corinth River, water level</li> <li></li> </ul>
Laurina Radul And Renata McKie	<p>She promised to help with finding cheap accommodation for the students</p>
Daniel Wright	<ul style="list-style-type: none"> <li>Rainfall radar data for the 2013 event</li> <li>Report on the 2013 event</li> </ul>
	<ul style="list-style-type: none"> <li>Traffic density information should come from Ministry of Transportation.</li> <li>Census data: what is the lowest level of aggregation that is accessible?</li> <li></li> </ul>

### 3. Saint Vincent

The workshop in Saint Vincent was organized on May 22-23 2014. On May 22 the workshop was organized in the Ministry of Physical Planning, and on May 23 a field visit was organized in which a large group of the participants participated in the morning and Mr. Desmond Shallow in the afternoon. This chapter presents the participants, the places visited and a description of the possible use cases. The results of the questionnaires are presented in section 9.3. the World Bank team consisted of Melanie Kappes and Daniel Wright, and the consortium team of Cees van Westen and Victor Jetten (ITC-UT) and Charisse Griffith-Charles and Tarick Hosein (UWI).

#### 3.1 Participants in the workshop in Saint Vincent



F.l.t.r: Melanie Kappes, Tarick Hosein, Andy Baptiste, Charisse Griffith-Charles, Cornelius Lyttle, Duane Allen , Daniel Wright, Dornet Hull, Danroy Ballantyne, Franklyn Haynes, Desmond Shallow, Gertheyn Bascombe, Homé Prince, Victor Jetten, Anthony Bowman.

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Howie Prince	Director NEMO	<a href="mailto:nemosvg@gmail.com">nemosvg@gmail.com</a>	784-4562975
Franklyn Haynes	Civil Engineer, Dep. Of transportation	<a href="mailto:Frankloon2000@yahoo.com">Frankloon2000@yahoo.com</a>	456-1111 ext 327
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Dornet Hull	GIS Officer (Planning)	<a href="mailto:ppuhilp@yahoo.com">ppuhilp@yahoo.com</a>	7844571588 ITC GFM3 alumnus





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### 3.2 Map of Saint Vincent with indication of places visited during the fieldwork





### 3.3 Points visited during the fieldtrip / possible use cases

Problem	Details
Belmont landslide	<p>Large landslide destroyed the main Eastern road. The use would look into alternatives for road planning.</p> 
Planning of resettlement areas. (e.g. Manning village)	<p>A resettlement village for moving people out of the coastal hazard zone was made in a sloping terrain. A landslide killed one of the people in these houses. Use case: how to design resettlement villages taking into account multi-hazard and risk.</p> 
Road improvement along very steep cliff along the Western highway	<p>The western highway runs through some very steep sections which have a cliff towards the sea on the downslope side and landslides from the upper side. How to remediate these?</p>



	 
<p>Flash flood problems in the East (..) and West part (Vermont)</p>	<p>The 2013 Christmas eve storm caused a flashflood taking out bridges and destroying several homes. The aim of the use case would be to make land use zonation that takes flood levels into account.</p> 



	
<p>Effect of slash and burn wildfires on flood and landslides</p>	<p>Saint Vincent has a lot of fire problems by farmers who set fire on vegetation to create new agricultural lands. These may lead to increased flood and landslide problems. This is more in relation with the ministry of forestry.</p> 

Specific points:

- Building footprint for whole country. Some of the participants told us it is available.
- Rainfall data for airport
- Flood early warning study for Roseau: cross sections along river and flood modelling results
- Geological map
- Land cover map. There is perhaps a land cover map from 1984.
- What will be the base map? Local coordinate system or move to WGS84?
- Transformation from old to new will be done by WB consortium.
- Rainfall data: there is more on this?

## 4. Dominica

The workshop in Dominica was organized on May 26-27 2014. On May 26 the workshop was organized in the Ministry of Land Management close to the Physical Planning, and on May 27 a field visit was organized in which a large group of the participants participated the whole day. This chapter presents the participants, the places visited and a description of the possible use cases. The results of the questionnaires are presented in section 9.2. the World Bank team consisted of Melanie Kappes and Daniel Wright, and the consortium team of Cees van Westen and Mark Brussel (ITC-UT) and Charisse Griffith-Charles and Tarick Hosein (UWI).

### 4.1 Participants in the workshop in Dominica



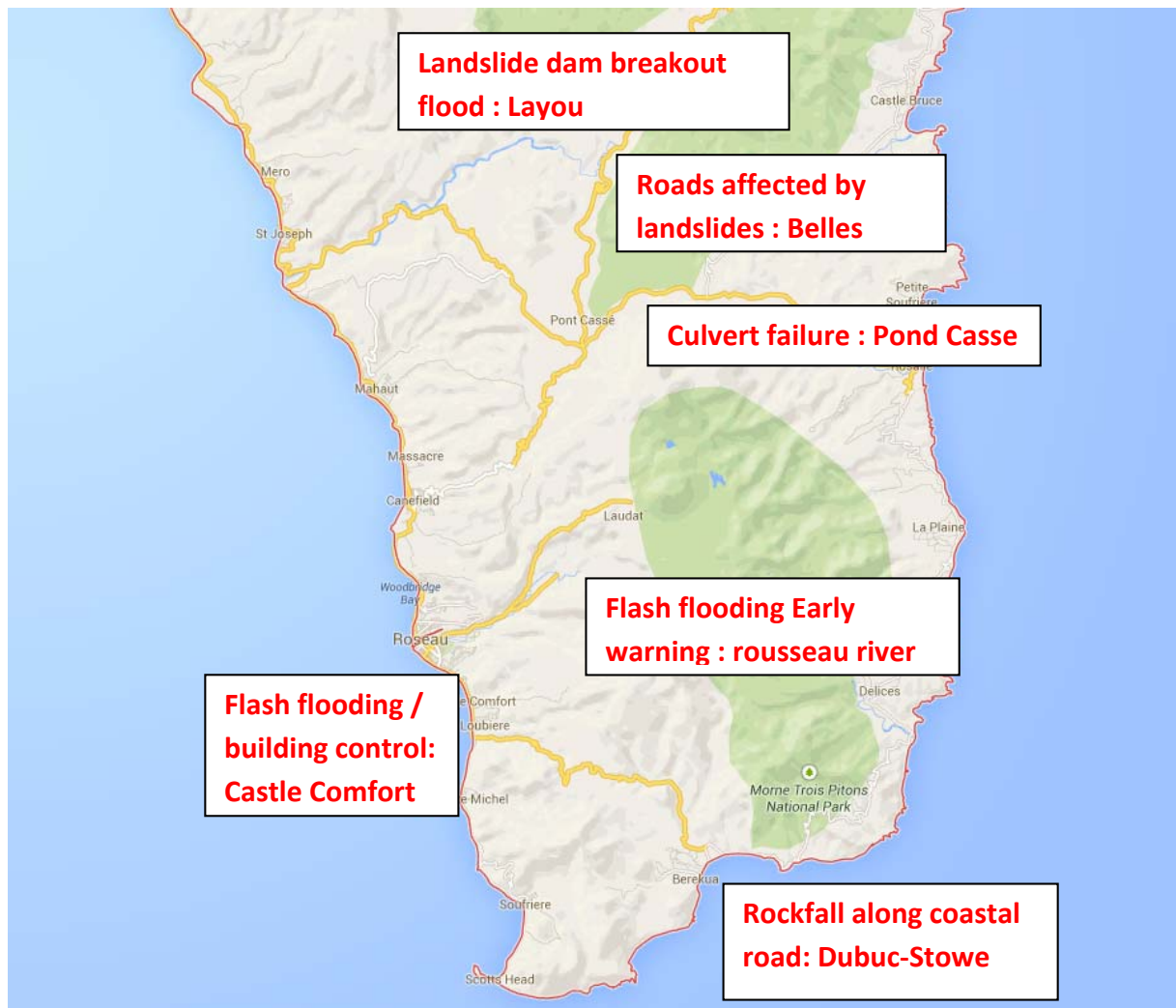
From left to right: Tarick Hosein, Annie Edwards, Melanie Kappes, Charisse Griffith-Charles, Terbby Edwards, Emile B. Lancelot, Miguel StVille, Nicole S. Tyson, Naomi Dorival, Jodie Dublin, Daniel Wright, Malcolm Belle, Lyn Baron. Not in the photo: Cees van Westen

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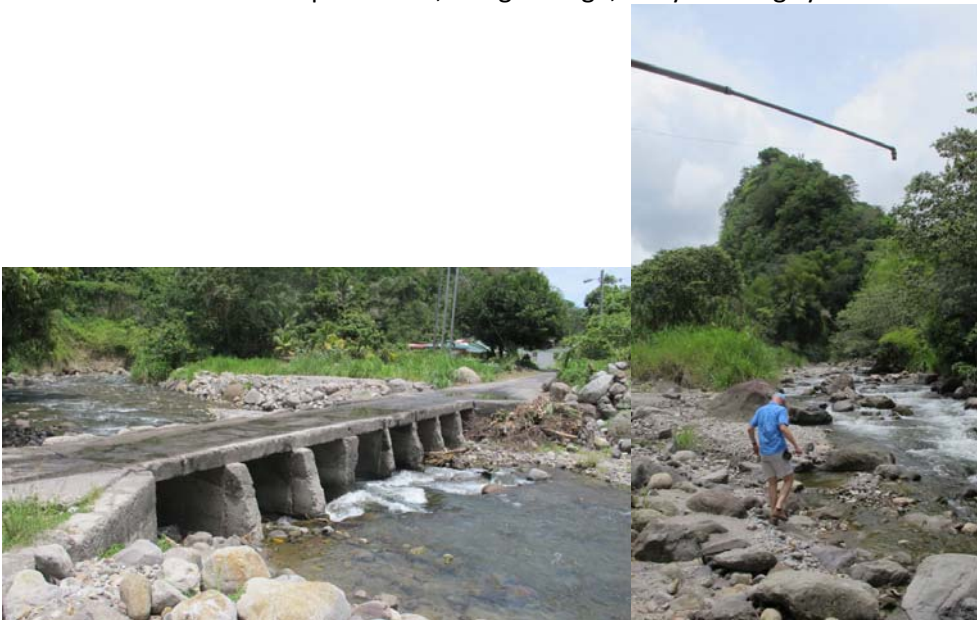
## 4.2 Map of Dominica with indication of places visited during the fieldwork








### 4.3 Points visited during the fieldtrip / possible use cases

Problem/ topic	Details
General: using hazard and risk information for the building permit system.	The building control system in Dominica has certain problems. Only 75 % of the people generally comply with the rules, and 25 % violate them and built without permission. After that it is difficult to make changes and lawsuits may take a lot of time. The current building control system also doesn't take into account hazard and risk information. The aim of this use case would be to show how hazard and risk information could be used in zoning maps that would, together with other restrictions, would indicate to the building control unit and the general public where buildings are allowed and where not.
Generation of national physical developmen t plan	Currently a consultant from Canada is developing the national physical development plan. In the TOR (which we should still get) emphasis is given on the inclusion of hazard and risk information, and on climate change effects. However, the consultant is going to use existing data for that, which may not be very reliable. Also the work seems to be done without direct interaction with the physical planning department. The aim of this use case is to show how hazard and risk information could be included in a national land use plan.
Castle Comfort area: Design of flood mitigation works (nr 1)	<p>The Stream in Castle Comfort area has had a flash flood in Dec 2013. Many buildings were constructed directly along the banks of the river</p> 
Road protection against rock fall and coastal erosion, Dubuc- Stowe. (nr 2)	A road section in the south of the island is located between the sea and very steep cliffs with conglomerates. Regularly rocks from these cliffs fall down, and they have injured people and damaged vehicles. The road is an important connection between a number of villages. The objective of this use case would be to analyse the various alternative for solving this problem.

	
Roseau river Nr 3	<p>The upper catchment area of the Roseau river was also affected by the 2013 floods. Although the city wasn't flooded, several building in the upper area were, also because of the under design of the bridges. An Early Warning System was installed but it doesn't function anymore due to lack of organizational commitment. This use case would look at: Flood protection, bridge design, early warning systems.</p> 
Layou River landslide Nr 4	<p>A large landslide occurred here in 2010 (?) or earlier, causing the damming of a river. The dammed lake grew and broke out in 2010 (?) causing a lot of destruction in the downstream part. The landslide is still good visible from a distance. What is the chance of a repetition of such an event?</p>

	
<p>Landslide mitigation along roads: Belles Nr 5</p>	<p>The road network in Dominica suffers from a number of problematic landslides. The aim of this use case is to evaluate which stabilization options would be best suitable in which case?</p> 



	 The top photograph shows a paved road with a significant section of the surface missing, exposing the underlying structure. Two people are standing on the road, one on the left and one on the right, providing a sense of scale. The bottom photograph shows a road intersection where a new concrete culvert is under construction. Several vehicles, including a blue van and a red car, are stopped on the road. The surrounding area is lush with green vegetation.
<p>Road culvert washout near Pond Casse 6</p> <p>N</p>	<p>A culvert was washed out during the 2013 Christmas eve event. A new culvert is under construction.</p>





## 5. Grenada

The workshop in Grenada was organized on May 29-30 2014. On May 29 the workshop was organized in the National Stadium, with an opening by the minister of Public works, and on May 30 a field visit was organized in which a large group of the participants participated the whole day. This chapter presents the participants, the places visited and a description of the possible use cases. The results of the questionnaires are presented in section 9.4. the World Bank team consisted of Fernando Ramirez, Melanie Kappes and Daniel Wright, and the consortium team of Cees van Westen and Mark Brussel (ITC-UT) and Charisse Griffith-Charles and Tarick Hosein (UWI).

### 5.1 Participants of the workshop in Grenada



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Cariwin website: 216.110.113.11

Username: demo

Password: demo

Website should contain the Water Information System, with WebGIs,.

Aris telephone: 1-473- 404-2927



Mujeeb telephone: 1-473-414-6385






## 5.2 Map of Grenada with indication of places visited during the fieldwork






### 5.3 Points visited during the fieldtrip / possible use cases

Problem	Details
Unfavourable location of the main hospital in St. George	<p>The main hospital in Grenada is located on a very unfavourable location in St. George. The hospital is very difficult to reach by road. The access roads are very steep, and fire trucks and ambulances have great difficulties in reaching the hospital, also due to frequent traffic congestion in the centre of the town. Apart from the accessibility the hospital is also unfavourably located as it is located on a steep slope, and has many stairs. Fire hydrants are insufficient, Part of the area is exposed to rock fall hazard, and the lower part of the hospital may be exposed to tsunami waves. Relocation of the entire hospital would be the best option. The aim of this use case is to analyse the factors that are of importance in deciding whether the best option is relocation, and if so which factors should be considered for new siting.</p> 
Richmond hill home for the Elderly	<p>The Richmond home for the elderly, located on the top of Richmond hill, houses about 100 patients. The building is in a deplorable state, and part of the building is destroyed after Hurricane Ivan. Through some donations by international donors some repairs have been made, but still the situation is quite problematic. The building is located on the foot of a cliff, which appears to be stable, but also presents some cracks. Drainage is inadequate and sewage water is drained directly on the slope. The hospital doesn't have a proper access road, and cannot be reached by fire trucks in the case of a calamity. The objective of this use case is to evaluate how the building could be rehabilitated, by analysing the stability of the structure, proposing proper drainage, and through an access road. Also relocation could be an option, although this is not as problematic as is the case for the hospital.</p> 

	
<p>St. Johns river, and river road section of St. George</p>	<p>The St. Johns river runs through the northern part of St George between the cemetery and the stadium. The river road that runs along it is one of the important roads to reach the city centre. It has been flooded on a number of occasions, and also several small landslides have place that have reduced the road width in some places to only one. The aim of this use case would be to analyse the best design for the bridges and the river protection walls along this river.</p> <div>  </div> <div>  </div>
<p>Landslides near Concord</p>	<p>Location where a single large rock came down in January 16 1991 and hit a minibus, killing 14 passengers. The site has been stabilized using a ring net that has been fastened with rock bolts and soil nailing.</p>



	
<b>Flood in Geoyave</b>	<p>Geoyave has been affected by flooding in 2011. The flood seriously affected the houses in the town, and damaged two bridges. There is a programme planned for reconstruction of the two bridges, and for river training.</p>  



<b>Flooding in Victoria</b>	<div> </div> <div> </div> <div> <p>The village of Victoria is located in the bend of a river coming from Mt. Saint Catherine, which had experienced frequent flooding. With the help of Chinese funding the channel has now been stabilized using Gabions. Victoria is also quite vulnerable to tsunamis generated by the nearby underwater volcano Kick 'm Jenny. They have carried out tsunami evacuation simulations. The volcano is under close surveillance by the Caribbean Seismic network, and has currently a low state of activity.</p> </div>
<b>Flooding in Grenville</b>	<p>Also in Grenville the area is frequently flooded, due to local rainfall flooding. Also the nearby river (which is the largest one in Grenada) may flood.</p>
<b>Early Warning system</b>	<p>With the help of JICA a flood early warning system has been installed with river height measurements using laser, a threshold that sets off SMS alerts. The system is still working. But it is not clear if it had produced an accurate warning thus far. Along the road there are spots where several cars were washed out by the river.</p> <div> </div>

## 6. Belize

The workshop in Belize was organized on June 24-25 2014. On June 24 the workshop was organized, and on June 25 a field visit was organized in which a large group of the participants participated. This chapter presents the participants, the places visited and a description of the possible use cases. The results of the questionnaires are presented in section 9.5. The World Bank team consisted of Melanie Kappes and Daniel Wright, and the consortium team of Mark Brussel (ITC-UT), Jeanna Hyde (Envirosense) and Mark Trigg (University of Bristol).

### 6.1 Participants of the workshop in Belize



From left to right: Jan Meerman, Jeanna Hyde-Hecker, Andrew Wade, Daniel Wright, Melanie Kappes, Irving Thimbriel, Mark Brussel, Gina Young, Mark Trigg, Tenielle Williams, Marion Cayetano, David Diego, Ann Gordon, Eugene Palacio.

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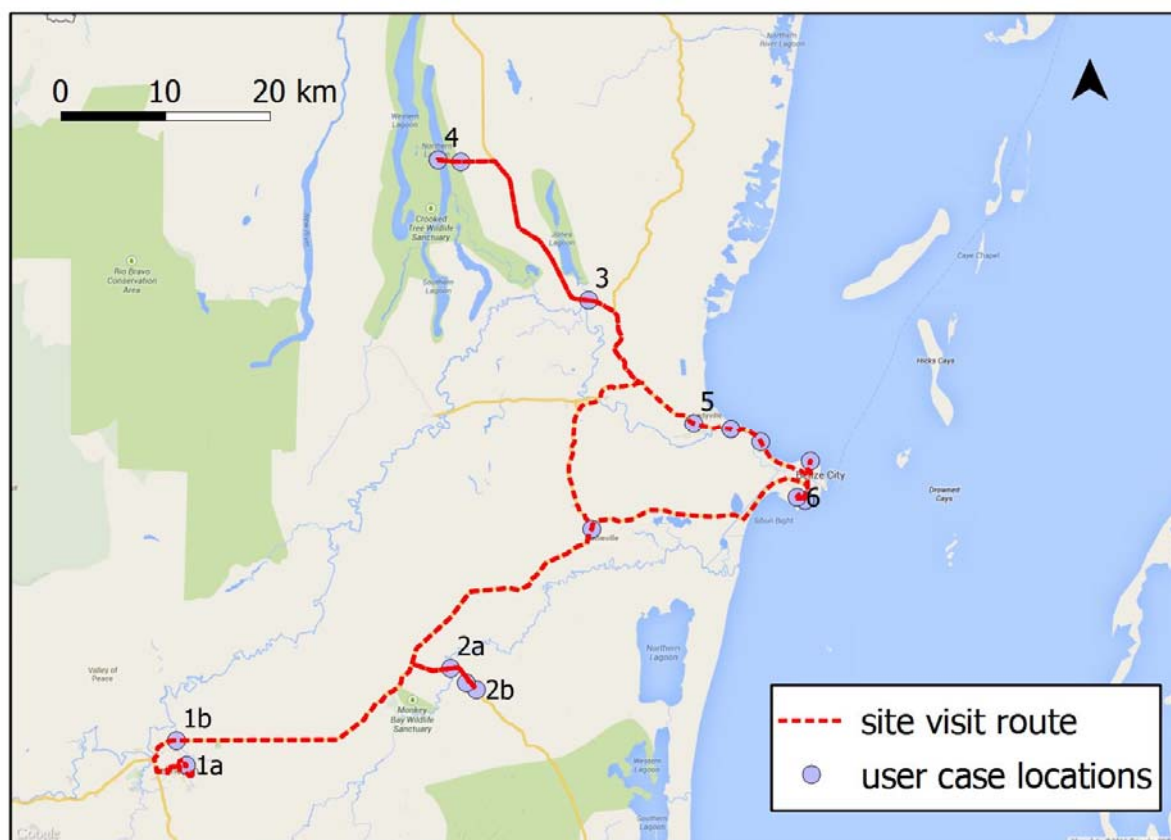
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## Report of the workshops in 5 target countries

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## 6.2 Map of Belize with indication of places visited during the fieldwork.



## 6.3 Locations visited during the fieldtrip / possible use cases

Problem/ location	Details
1. Local drainage problems in Belmopan 10 cents creek	 <p><b>Expanding urban development 10 cents creek</b></p> <p>The 10 cents creek in Belmopan receives a large proportion of the water draining out of the city and its surroundings. Two locations along this creek were visited. In the first location at the North East of Belmopan (point 1a on map), the creek is going through agricultural land, however, housing development is ongoing to the west of the creek. Buildings are encroaching upon the river and regular flooding in the area occurs. The required reserve of 90 ft on either side of the river is not observed. Cutting of trees and other vegetation has contributed to flash floods in this location and the second location.</p>



	<p>In the second location (1b) the 10 cents creek underpasses the highway between Belmopan and Belize city. In this area regular flooding occurs (a few times per year) in which the road is being overtopped and Belmopan is being disconnected from Belize city. The MOWT is developing a programme to address the problem through river training measures and potentially installation of larger culverts. It is not certain whether these measures will provide a solution, as no hydrological/hydraulic analysis seems to have been done. The situation may be more complex than it is considered at the moment.</p>	 <p>10 cents creek where it underpasses the highway</p>
<p>2. Coastal highway (Manatee Highway)</p>	 <p>Bridge over the coastal highway</p>	<p>Along the coastal highway two problem locations were visited. In the first location (2a) the river crosses the coastal highway. Although a bridge is constructed, the level of the bridge is sufficiently high, the flood reaches such a height that the adjacent lying parts of the road on either side of the bridge get flooded regularly when the river flows over the banks. As a result the road is blocked for several days which is a problem in particular for the trucks that use it to get to the Harbour South.</p>


In the second problem location (2b), the coastal highway runs adjacent to a coconut plantation NE of the road and rice fields SW of the road. The plantation is suffering a loss of harvest due to flooding; apparently 10% of the harvest is lost after 2-3 days of standing water in the orchard. The owners of the plantation have constructed a levee in the road reserve to protect their trees, leading to a flooding of the road. Although the government is remedying this situation, the underlying problem of flooding on the plantation has not been solved. Also flooding of the road takes place due to insufficient capacity of culverts.

Road adjacent to the bridge is much lower and gets flooded regularly



Illegally constructed embankment and dug canal

3. Highway Belmopan – Belize	On this highway, there are a couple of problem locations, where the road is flooded as a result of high waters. A bridge at a location halfway the Belmopan Belize city highway suffered from frequent submerging and bypassing flow. As a solution the bridge was lifted for about 1 metre, however the road still occasionally floods.
4. Crooked Tree wildlife sanctuary	<div> </div> <p>Crooked Tree is a wildlife sanctuary with a village of around a 1000 inhabitants that is located in between two lagoons (. It is connected by gravel road to the Northern Highway.</p> <p>The village itself suffers from flooding for extensive periods of time (2-3 months per year) and so does the road. During this period the village can only be accessed by boat. A ferry service is in operation to shuttle people to and from the connection to the Northern</p> <p>Highway, the costs of which are exceeding half a million US\$ a year on petrol. Hydrological, the situation is complex. The lagoon system gets fed by its surrounding catchments, but, in part of the wet season it also gets fed by the Belize river through reverse flow in the</p> <p>4. Lagoon with Crooked Tree village in the background</p> <p>Black Creek (Jun to Jan). The only outlet of the lagoon system is also the Black creek</p> <p>to the Belize river (Jan to May). Some people claim that the road dividing the southern lagoon is causing more flooding, others say that the flooding was of a similar nature prior to the construction of the road. An option that is being considered is the development of a causeway, a road on stilts that should guarantee a continuous road connection in case of flooding, however, this will be a costly affair.</p> <div> </div> <p>View on the causeway that divides the eastern lagoon</p>
5. Ladyville	Parts of the Ladyville area are swampy. Typical problems are land subsidence, leading to vertical settling of houses. Other locations suffer from a lack of drainage and are regularly flooded. In one area in particular that is frequently flooded, the Belikin beer factory is developing an extension. As a result it is expected that the road and the settlement located across the road are more frequently flooded than is now the case. Given the infrastructure assets in the area the Ladyville area is considered an important area for protection.

<p>6. Belize City</p>	<p>Belize city, lying directly on the coast and protruding into the sea, is under direct threat of hurricanes. Also in none hurricane years (normal rainy seasons), several sections of Belize city are regularly flooded. As a result the city suffers from damages to infrastructure, prolonged waterlogging and a deteriorating health situation. This is particularly the case in the South of Belize that contains a zone where informal settlement is taking place in a marshy and flood prone area.</p>	 <p>Low quality housing in swampy area</p>
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#### 6.4 Other potential use cases mentioned by the participants:

- The development of a loss estimation module, first at sector level (infrastructure, agriculture, fisheries, housing, tourism, health, environment, education), then integrated.
- The acquisition of Lidar data for the whole country. Many participants pointed out the need for better elevation data to be used in creating more accurate hydrological models as input in design of infrastructure, spatial planning, facility location etc. etc.
- The conceptual development of an early warning system based on a combination of a flood model and a monitoring/observation network

#### 6.5 Some concluding notes

Most of the sites (1-4) that were visited relate to the problem of excessive flow that cannot be handled by the culverts and bridges in place. thereby causing flooding and severe damage.

Potential use cases Belize

Rather than selecting one or other particular location, we are thinking of the following use cases, based on discussions in the workshop, field observations and visits to the organisations involved.

1. Use case on national flood mapping
2. Use case on hydrological and hydraulic approaches for culvert design
3. Use case on loss estimation
4. Use case on land use planning, in particular the land subdivision process

We think the use cases should be more topic/theme/problem oriented rather than oriented to a specific location/project. This has the following advantages:

- Emphasis on the generic problem addressed and the approaches needed to address them, illustrated for a particular location, but the location is not leading
- More easy to build a generic educational approach for the use cases
- Easier for people in other countries to recognize/use the use case
- Less dependence on data



## 7. Follow up

This section discusses the different components related to the follow-up of the workshops in the five target countries.

### 7.1 Generation of Google Drive and communication with stakeholders

After the workshop the participant's e-mails were checked and were grouped in groups according to the countries. The participants were invited to join a Google Drive where the relevant information for their country would be stored. The participants received the following e-mail:

**From:** Westen, C.J. van (ITC)  
**Sent:** zaterdag 31 mei 2014 20:18  
**To:** 'Lyn Baron'; 'Jodie Dublin'; 'Naomi Dorival'; 'Miguel StVille'; 'Annie Edwards'; 'Emile B. Lancelot'; 'Malcolm Belle'; 'Nicole S. Tyson'; 'Terby Edwards'; 'Nick LaRocque'; 'Kendell Barrie'  
**Cc:** Tarick Hosein (Tarick.Hosein@sta.uwi.edu); Charisse.Griffith-Charles@sta.uwi.edu; Jetten, V.G. (Victor, ITC); 'Daniel Wright'; 'Melanie Kappes'; Brussel, M.J.G. (ITC)  
**Subject:** FW: Workshop World Bank Project on Caribbean Handbook for Risk Information Management

Dear colleagues,

On behalf of the teams from the World Bank, ITC and UWI I would like to thank you very much for your participation in the workshop which was held in Dominica last week (and the very interesting field visit). We have learned a lot from your input in the workshop and the fieldvisit that will help us very much in making the handbook tailored to the problems related to the use of hazard and risk information in planning and solving problems in the infrastructure. We have outlined a number of possible use cases for the book. The presentations that were given during the workshop can be accessed through Google Drive for which you will receive an invitation shortly. The link is : <https://drive.google.com/folderview?id=0B6gyrSGI2YSURFo5RFIENjBIWmM&usp=sharing>

We also intend to use the Google Drive for exchange of information in the coming period. We will post also reports that we have found related to landslides and flooding in your country, and later on we are also planning to upload GIS data there.

The workshop was the first of a series of activities in which we would like to have your involvement. We foresee the following activities in the coming period:

- Tarick Hosein and Charisse Griffith-Charles will be contacting you in the coming period in order to plan a follow-up visit. During this visit they would like to meet a number of you personally. Tarick will work on the GIS data and the satellite images for your country. He will homogenize the data that is already available, and will also make requests for missing data. He will also make the high resolution satellite data available to you. Charisse will discuss with a number of you the regulations and procedures that you are currently using for planning and design of infrastructure, and she will also discuss the use cases in more detail. They are planning a follow-up visit in the coming month.
- In the second half of September we are planning a workshop in Saint Lucia for participants for the 5 target countries in the project (Saint Lucia, Dominica, Saint Vincent and the Grenadines, Grenada and Belize). During this workshop we would like to present and discuss with some of you the detailed contents of the handbook and the use cases.
- Also in the second half of September we hope to carry out longer fieldwork to support you in the development of GIS data for the use cases. The plan is to come with 8 MSc students to the region for a period of 1 month. We are considering to let them work in several islands. Also several of my colleagues are planning to come as the supervisors of the MSc students. Tarick and Charisse will also approach you for your help in finding cheap accommodation for the students, and we hope that some of you are also willing to be involved in the field data collection.
- From end October we hope to invite 2 people from each of the 5 target countries to come to ITC in the Netherlands to work out some of the use cases, together with us and the MSC students.

Once again, we would like to thank you for your participation and we look forward to a successful collaboration.

With kind regards,

Cees

Several of the participants replied and expressed their interest to collaborate in the project.

### 7.2 Follow-up visits by UWI staff to 4 island countries.

The partners from the University of the West Indies will proceed with follow-up visits to the 4 island countries in the coming month with the aim to:

- Complete the data acquisition phase, and collect the data that is still missing. For each of the countries a list was made with the missing data, and reports, which were mentioned in the workshops, but which we do not yet have. Tarick Hosein will be in charge of doing this work.



- Provide the stakeholders with very high resolution satellite images. Tarick Hosein will also give them the properly references high resolution images that we obtained for the 4 island countries.
- Homogenize the data, adapt the coordinate systems to make the maps fitting, produce and generate the best DEMs for the countries. This will be done by Tarick Hosein.
- Prepare a document with an overview and analysis of the land management and land use policies and regulations in the five countries. This will be done by Charissse Griffith-Charles. Discuss these with the stakeholders. A first visit was made to Saint Lucia.
- Discuss the final use cases with the stakeholders.

Later on it was decided that follow-up visits were not required and that contacts could be made through SKYPE , e-mail and telephone between the UWOL partners and the various countries.

### 7.3 Follow-up visits in Belize.

Visits to the following organisations were made, primarily to discuss data issues, use cases and ideas for staff training. A total overview of the data situation will be provided within a few days.

### 7.4 MSc research topics

There are 8 MSc students that will be carrying out their MSc research in relation with the CHARIM project. The aim is to form two groups of 4 MSc students, which will do 2 fieldwork on one island, and 2 weeks on another. This way they would cover the four islands and their work can be used for working out the use cases.

Student	MSc topic
Diana Patricia Lozano Zafra (Female, Colombia) <a href="mailto:d.p.lozanozafra@student.utwente.nl">d.p.lozanozafra@student.utwente.nl</a>	National scale landslide susceptibility and hazard maps for the Caribbean Island of Dominica and Saint Vincent, what can be done with incomplete data?
Andreas Christoffer Lundegaard (Male, Denmark) <a href="mailto:a.c.lundegaard@student.utwente.nl">a.c.lundegaard@student.utwente.nl</a>	Flood hazard assessment and transport network vulnerability on St. Vincent and Grenada
Jovani Yifru Bogale (Male, Ethiopia) <a href="mailto:jovaniyifrubogale@student.utwente.nl">jovaniyifrubogale@student.utwente.nl</a>	National Scale Landslide Hazard Assessment Along the Road Corridors of Dominica and St. Lucia
Chishala Mulenga (Male, Zambia) <a href="mailto:c.mulenga@student.utwente.nl">c.mulenga@student.utwente.nl</a>	Influence of weathering on geotechnical properties of road-cut slope mass and embankment fill in Saint Lucia and Saint Vincent
Anne Chinyere Uwakwe (Female, Nigeria) <a href="mailto:a.c.uwakwe@student.utwente.nl">a.c.uwakwe@student.utwente.nl</a>	Methodology for the characterization of elements-at-risk for physical vulnerability to natural hazards and exposure analysis in Saint Lucia. Case study: Castries City
Mujeeb Alam (Male, Pakistan) <a href="mailto:m.alam@student.utwente.nl">m.alam@student.utwente.nl</a>	Application of hazard and risk information in spatial planning in Grenada

Xsa Anacio Cabria (Female, Philippines) <a href="mailto:x.a.cabria@student.utwente.nl">x.a.cabria@student.utwente.nl</a>	Weathering and its contribution to rock falls in the pyroclastic rock masses along coastal road cuts in Dominica and Saint Vincent
Rahmat Aris Rratomo (Male, Indonesia) <a href="mailto:r.a.pratomo@student.utwente.nl">r.a.pratomo@student.utwente.nl</a>	Response of Flash Flood Behaviour to Hazard Reduction in a Small Island: a Case Study in Grenada

The table below indicates the periods in which the students and supervisors are planning to stay in the four islands.

	St Vincent	St Lucia	Dominica	Grenada
Diana Patricia Lozano Zafra (Colombia)	20/09 – 04/10		04/10 – 18/10	
Andreas Christoffer Lundegaard (Denmark)		20/09 – 11/10		11/10 – 18/10
Jovani Yifru Bogale (Ethiopia)		20/09 – 04/10	04/10 – 18/10	
Chishala Mulenga (Zambia)	20/09 – 04/10	04/10 – 18/10		
Anne Chinyere Uwakwe (Nigeria)		20/09 – 18/10		
Mujeeb Alam (Pakistan)				21/09 – 18/10
Rahmat Aris Rratomo (Indonesia)				21/09 – 18/10
Xsa Anacio Cabria (Philippines)	20/09 – 04/10		04/10 – 18/10	
<b>Supervisors</b>				
Robert Hack (ITC)	24/09 - 4/10	9/10 – 13/10	4/10 – 9/10	
Victor Jetten (ITC)	27/09 - 4/10		4/10 – 8/10	8/10 – 11/10
Cees van Westen (ITC)	27/09 – 04/10	20/09 – 24/09	4/10 – 8/10	24/09 – 27/09
Nanette Kingma (ITC)	30/09 – 03/10	20/09 – 30/09		
Mark Brussel (ITC)	27/09 – 04/10			21/09 – 27/09
<b>Other project partners</b>				
Tarick Hosein (UWI)	20/09 – 24/09 and 28/9 - 04/10			
Charisse Griffith-charles	28/9 – 4/10			
Naveed Anwar (AIT)	30/09 – 04/10	27/9 – 30/09	04/10 – 8/10	
Manzul Hazarika (AIT)	27/09 – 04/10			

Colours:

	First half (22/09 – 04/10)
	Second half (06/10 – 18 /10)
	Workshop (29/09 – 03/10)

## 7.5 Collaboration with the British Geological Survey

ESA and the World Bank (WB) have been collaborating under the umbrella of the “Earth Observation for Development” initiative - branded Eoworld - since 2008.

The form of this collaboration has been to develop, produce and deliver limited-scale examples of EO-based information products that respond specifically to the geo-information requirements of on-going World Bank projects. ESA provides the financial and technical capacity to procure the information products on an open competitive basis from the leading European and Canadian EO service providers (companies).

Within this cooperation a pilot study for the five Caribbean countries has been defined between the European Space Agency (ESA) and the World Bank. The following activities have been defined:

- **Service 1: Land use/land cover mapping** will be delivered over AOI-A (Saint Lucia, 615 km<sup>2</sup>), AOI-B (Grenada, 364 km<sup>2</sup>) and St Vincent & Grenadines.
- **Service 2: Hazard mapping to support landslide risk assessment** will be delivered over AOI-A (Saint Lucia, 615 km<sup>2</sup>) and B (Grenada, 364 km<sup>2</sup>) as per the Statement of Work. WB & ITC suggested covering all three AOIs but the DoW requires covering AOI-A & B. Following the request from WB & ITC to have products with a better scale than 1:20 000, 50% of AOI-A (Saint Lucia) will be performed at a scale of 1:10 000. The subdivision will be agreed with the WB TTL and users (and ITC) during the SRR. Note that moving from 1:20 000 to 1:10 000 is multiplying by almost four the burden on data analysis, so the request from WB & ITC has been taken on board but there are cost implications (on ESA). It is understood that AOI-A is the one with the most pressing landslide risk hazard/exposure/vulnerability higher than AOI-C or B). The service will include:
  - Landslide inventory mapping over the Area of Interest; shall seek to capture as far as possible: information on landslides: this includes the location and, where known, the date of occurrence and types of observable landslides
  - Generation of a Digital Elevation Model (DEM) generated using EO data (such as SPOT or ASTER, etc.) or other EO or non-EO data to be proposed by the bidder
  - Ground truth in St Lucia and Grenada: collecting in-situ measurement to support the landslide hazard mapping over the AOI...
- **Service 3: Generation of a Detailed Digital Elevation Model.** The DEM over Belize may be upgraded to Elevation30 (10m Z) instead of the Aster GDEM. The precise DEM will be based on Pléiades triplet data (or stereo data). The location of the precise DEM footprint needs to be provided by WB ASAP (Action 1 on WB).

The pilot has three phases; service review; service production (incl. map delivery and site visit to present/explain results); user feedback (stakeholder and users). WB project users are in the loop in addition to ITC to make sure that the space technologies we are going to demonstrate is fit for their purpose.

The Contractor of ESA (This service will be carried out by the British Geological survey) will not bypass ESA and WB and will only contact ITC or the user via ESA and the World Bank.

ITC and BGS have held a first SKYPE meeting and decided to collaborate closely in this work. They also agreed to meet during the Understanding Risk Forum in London.



## 8. Compilation of the results of the personal questionnaires in the 5 countries.

### 8.1 Questionnaire Saint Lucia: collated

#### GENERAL INFORMATION

Your name	Your e-mail	Your telephone number	Where do you work? What is your job?
			<b>Physical planner, civil engineer</b>

#### YOUR MAIN TASKS

Nr	Short Description of your three main tasks related to your job that relate to natural hazards and risk & planning	Does this task require that you have knowledge on:				
		Engineering design (Yes/No & comment)	Planning (Yes/No & comment)	Natural hazards (Yes/No & comment)	Risk (Yes/No & comment)	GIS (Yes/No)
1	<b>Development Approval</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		<b>For structural integrity.</b>		<b>Data not current</b>		<b>But not existing. Done by other section</b>
2	<b>Development control</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
						<b>Multi-criteria analysis</b>
3	<b>Developing planning policies</b> <b>Public sensitisation</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No

3	Assessing bridge and culverts conditions Supervising engineer Decision making	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
3	Preparation of topographical and cadastral maps Supervision Sit on flood and drought committee	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
3	Land management Land leasing Enforcement of regulations	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
3	Coordinating data relating to hazards, risk, disaster Developing standards for GIS development Facilitating training for staff	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
3	IT support	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
3	Management of flood mitigation and landslide risk assessment. Slope stabilisation	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No

	Road planning, design and maintenance					
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# INFORMATION REQUIREMENTS

Could you please list the main information requirements, for which of the three tasks that you indicated above this is needed, and also indicate whether these are available?

Important	What type of information is required ordered from most important to least important	For which tasks is this needed	Is this available to you?	If available in what form/detail?
Most . . . . . . . . . Least	LAND USE PROPOSALS PLANS	1	NO	
	CURRENT DATA ON RISK MODELLING		NO	
	INFRASTRUCTURE PLANS – WATER, ROADS, ELECTRICITY		NO	
	GIS		NO	
	ZONING /LAND USE PLANS		YES	MAPS POLICIES
	HISTORICAL BACKGROUND		SOMETIMES	INSTITUTIONAL MEMORY, REPORTS
	SURROUNDING LAND USE/APPROVED DEVELOPMENTS		YES	REPORTS
	SUSCEPTIBILITY TO NATURAL HAZARDS		SOMETIMES	REPORTS
	HYDRAULIC DATA		INCOMPLETE	DIGITAL
	SOIL DATA		NO	
	LAND INFORMATION DATABASES		NO	MAINLY ANALOGUE
	CURRENT USER INFORMATION		NO	
	METADATA		YES	
	RAINFALL INTENSITY			
	DESIGN STANDARDS FOR ROAD , DRAINAGE			PAPER
	MAINTENANCE STANDARDS		NO	
	GEOLOGICAL DATA			PAPER
	HAZARD MAP			
	RISK MANAGEMENT			

	<b>GPS SURVEYS. LOCATION OF CULVERTS</b>		<b>GIS IN PROGRESS</b>	
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### **MOST URGENT PROBLEMS THAT NEED TO BE ADDRESSED**

Nr	Can you indicate what you consider the most urgent problems that need to be addressed in your country in order to effectively reduce the vulnerability of the island's infrastructure and people to natural disasters?
1	<b>UPGRADING THE ROAD NETWORK, ENFORCEMENT OF PLANNING POLICIES, UNPLANNED DEVELOPMENT, POLITICAL INTERFERENCE</b>
2	<b>ZONING, PUBLIC AWARENESS, DEFORESTATION</b>
	<b>DATA AND ACCESS TO REAL TIME DATA</b>
3	<b>CREATION AND MANAGEMENT OF LAND INFORMATION DATABASES, ADEQUATE MONITORING ACCURATE KNOWLEDGE OF THE REAL PHYSICAL GEOGRAPHIC ECONOMIC AND SOCIAL CONDITIONS</b>

### **PREVIOUS PROJECTS**

No doubt there have been several previous projects related to hazard and risk assessment, and the use of risk information in planning in your country. Could you give your opinion on these?

What have been the main contributions from these projects	What were the problems involved in using the results?
<b>INFORMS POLICIES</b> <b>MAPS PREPARED</b> <b>KNOWLEDGE OF TYPES OF PROBLEMS THAT CAN BE MONITORED</b> <b>DEVELOPMENT OF HAZARD MAPS, WIND VULNERABILITY MAPS, FLOOD VULNERABILITY MAPS</b> <b>CREATION OF A NATIONAL CONTROL REPOSITORY FOR GEOSPATIAL DATA</b> <b>DESIGN AND IMPLEMENTATION OF STRUCTURAL SOLUTIONS TOWARDS RISK REDUCTION</b> <b>DEVELOPMENT OF FLOOD HAZARD MAPS FOR THE MARC/BEXON AREA</b> <b>DEVELOPMENT OF LANDSLIDE HAZARD MAP AND RISK ASSESSMENT OF THE PRIMARY ROAD NETWORK</b>	<b>TOO SMALL SCALE, PROJECTS NOT ROLLED OUT.</b> <b>MAPS ARCHIVED AND NOT USED. DATA NOW OUTDATED.</b> <b>SCALEABILITY, INFRASTRUCTURAL AND OTHER RESOURCE CAPACITY</b> <b>LACK OF ADEQUATE TRAINING AND TECHNOLOGY</b>  <b>LACK OF GIS</b>  <b>INADEQUATE MAINTENANCE</b> <b>LACK OF PERSONNEL, LACK OF TRAINING</b> <b>PLAN TO MOVE FORWARD WITH THE DATA</b>



**SOURCE OF INFORMATION NOT ALWAYS VERIFIABLE**

## NEEDS

What is needed to improve the planning and implementation of risk reduction measures and how this project could address these needs?

What is needed?	How could the project address these needs?
<p><b>UPDATED ISLAND WIDE VULNERABILITY MAPS</b></p> <p><b>BETTER INTEGRATION OF DRAINAGE OF NEW DEVELOPMENT INTO EXISTING SYSTEMS</b></p> <p><b>TRAINING OF TECHNICAL STAFF IN DEVELOPING AND USING VULNERABILITY MAPS IN ASSESSMENTS AND DESIGNS</b></p> <p><b>ENFORCEMENT OF BEST PRACTICES IN AGRICULTURE AND CONSTRUCTION</b></p> <p><b>POLITICAL WILL</b></p> <p><b>LEGISLATION</b></p> <p><b>ENFORCEMENT</b></p> <p><b>UPDATING AND MODELLING</b></p> <p><b>DATA SHARING AMONGST MINISTRIES</b></p> <p><b>AWARENESS OF STUDIES</b></p> <p><b>HARDWARE AND SOFTWARE</b></p> <p><b>IDENTIFICATION OF PERSONS TO BE TRAINED</b></p> <p><b>AWARENESS, MAINSTREAMING, CULTURE</b></p>	<p><b>PROVIDE DETAILED AND UPDATED MAPS</b></p> <p><b>RECOMMEND AREAS OF TRAINING FOR TECHNICAL STAFF</b></p> <p><b>FUNDING AND ENCOURAGEMENT</b></p> <p><b>PROVIDE PROPER TRAINING</b></p> <p><b>THE HANDBOOK</b></p> <p><b>EMPHASISING CONSULTATION AND PLANNING MEETINGS</b></p>

## 8.2 Questionnaire Saint Vincent and the Grenadines: collated

### GENERAL INFORMATION

Where do you work? What is your job?
<b>CW&amp;H water resources department, collection and analysis of hydromet data.</b> <b>Director NEMO</b> <b>Ministry of Transport &amp; Works</b> <b>GIS tech – Physical Planning</b> <b>Civil Engineer</b> <b>Ministry of Agriculture – soil and water conservation officer</b> <b>Forestry Department</b>

### YOUR MAIN TASKS

Nr	Short Description of your three main tasks related to your job that relate to natural hazards and risk & planning	Does this task require that you have knowledge on:				
		Engineering design (Yes/No & comment)	Planning (Yes/No & comment)	Natural hazards (Yes/No & comment)	Risk (Yes/No & comment)	GIS (Yes/No)
1	<b>Data Collection</b> <b>Data Analysis</b> <b>Flood Analysis</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes	No	Yes	Yes	No
		Yes	No	Yes	Yes	No
2	<b>National coordination of major emergencies and disaster</b> <b>Planning for disaster at different levels – mapping, mitigation</b> <b>Training of personnel in DRR</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes	Yes	Yes	Yes	Yes
		Yes	Yes	Yes	Yes	Yes
3	<b>Infrastructure design</b> <b>Assisting other ministries with project development</b> <b>Construction contract administration</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes	Yes	Yes	Yes	Yes
		Yes	Yes	Yes	Yes	Yes
		yes	yes	yes	yes	yes

3	<b>Levelling and topographic surveying</b> <b>Mapping spatial data on GIS</b> <b>Infrastructure design, measurement, drawings</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes	Yes	no	Yes	no
		Yes	no	Yes	Yes	Yes
3	<b>Preparing geospatial data</b> <b>Supervising field work</b> <b>Presenting and storing geospatial data</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
		no	Yes	Yes	Yes	Yes
		Yes	Yes	Yes	Yes	Yes
3	<b>Spatial data management</b> <b>Coordination of spatial data in GIS</b> <b>Supporting the Physical Planning Unit in Development Control and Planning</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
			no			Yes
			no			Yes
3	<b>Development control</b> <b>Forward planning</b> <b>Planning approval</b>	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes	Yes	Yes	Yes	Yes
		Yes	Yes	Yes	Yes	Yes
3	<b>Design roads, bridges, buildings</b>	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
		Yes	Yes	Yes		
3	<b>Construction of drains</b> <b>Planting grass to minimise soil loss</b> <b>Construction of terraces</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
		Yes	Yes	Yes	Yes	Yes
		Yes	Yes	Yes	Yes	Yes
		yes	yes	yes	yes	yes

### INFORMATION REQUIREMENTS

Could you please list the main information requirements, for which of the three tasks that you indicated above this is needed, and also indicate whether these are available?

Important	What type of information is required ordered from most important to least important	For which tasks is this needed	Is this available to you?	If available in what form/detail?
Most . . . . . . Least	<b>HYDROMET DATA</b>		<b>YES</b>	<b>DIGITAL -EXCEL</b>
	<b>SLOPE STABILISATION AND CONTROL</b>		<b>NO</b>	
	<b>WATERSHED MANAGEMENT</b>		<b>YES</b>	<b>DIGITAL</b>
	<b>HAZARD AND RISK MAPS</b>		<b>NO NOT ALL</b>	<b>SOME PAPER MAPS</b>
	<b>PLANNING REGULATIONS, BUILDING CODES</b>		<b>YES SOME</b>	
	<b>SCOPE OF WORKS, CODES</b>		<b>YES</b>	<b>PAPER</b>
	<b>TOPOGRAPHIC MAPS, SHAPE FILES, GPS</b>		<b>YES</b>	<b>DIGITAL</b>
	<b>ZONING, GEOSPATIAL, HISTORICAL, CURRENT</b>		<b>SOMETIMES</b>	<b>TEXT, MAPS</b>
	<b>LANDSLIDE FLOODING, POPULATION DISTRIBUTION, MARINE DIVERSITY, STORM SURGE</b>		<b>YES</b>	<b>DIGITAL</b>
	<b>LAND TENURE, MAPPING, SETTLEMENT, WATERSHED LOCATION, SOIL TYPE, BOUNDARY, SLOPE, POPULATION, INFRASTRUCTURE</b>		<b>YES</b>	<b>DIGITAL</b>
	<b>SURVEYING, BUILDING CODES</b>		<b>YES</b>	<b>DIGITAL</b>

### MOST URGENT PROBLEMS THAT NEED TO BE ADDRESSED

Nr	Can you indicate what you consider the most urgent problems that need to be addressed in your country in order to effectively reduce the vulnerability of the island's infrastructure and people to natural disasters?
1	<b>ENCROACHMENT OF THE WATERSHEDS, LEGAL CONTROL AND IMPLEMENTATION, PLANNING CODE, ZONING, LAND USE POLICY</b>
2	<b>INFORMAL CONSTRUCTION, INFORMAL SETTLEMENT ESP ALONG WATERWAYS, LACK OF AWARENESS OF HAZARDS, AVAILABILITY OF MAPS</b>
	<b>BATHYMETRY FOR MAINLAND AND ALL ISLANDS, RAINFALL DATA, WIND, CURRENT, WAVE DATA</b>
3	<b>BUILDING ON FLAT LAND OR ONLY GENTLY SLOPING, COASTAL PROTECTION, MAINTENANCE OF ROADS AND BUILDING INFRASTRUCTURE</b>
	<b>AWARENESS, LOCAL ADAPTATIONS, MAINTENANCE OF INFRASTRUCTURE, USE OF SPATIAL DATA</b>
	<b>REVISED HAZARD MAPS, MORE ACCURATE DATA, IN COUNTRY KNOWLEDGE OF HAZARD MODELS</b>

## PREVIOUS PROJECTS

No doubt there have been several previous projects related to hazard and risk assessment, and the use of risk information in planning in your country. Could you give your opinion on these?

What have been the main contributions from these projects	What were the problems involved in using the results?
<p><b>FLOOD RISK MITIGATION IN THE MARRIAGUA AREA.</b></p> <p><b>ISLAND WIDE FLOOD RISK MITIGATION STUDY</b></p> <p><b>RDVRP ESTABLISH GIS UNIT</b></p> <p><b>FOLLOW THROUGH ON STUDIES EG FLOOD MITIGATION FOR KINGSTOWN AND ARNOS VALE</b></p> <p><b>ESTABLISH FUNDING AGENCIES, CDB ETC</b></p> <p><b>EQUIPMENT, DATA, TRAINING</b></p> <p><b>LEARNING HOW TO SOLVE PROBLEMS, COLLECT DATA, USE SOFTWARE.</b></p>	<p><b>LACK OF REPORTS. EQUIPMENT SET UP BUT NOT MAINTAINED.</b></p> <p><b>NOT WIDELY CIRCULATED OR USED.</b></p> <p><b>NO REAL FOLLOW UP TO ENSURE SUSTAINABILITY.</b></p> <p><b>FUNDING</b></p> <p><b>GOVERNMENT WILL</b></p> <p><b>POOR IMPLEMENTATION/USE OF RESULTING DATA /STUDY INFO</b></p> <p><b>MAINTAINING EQUIPMENT</b></p> <p><b>REPORTS SELDOM REACH THE TECHNICAL PERSON</b></p> <p><b>WORKSHOP LENGTH INADEQUATE FOR DEEP LEARNING.</b></p>

## NEEDS

What is needed to improve the planning and implementation of risk reduction measures and how this project could address these needs?

What is needed?	How could the project address these needs?
<p><b>THE FLOW OF INFORMATION FROM PROJECTS ESPECIALLY WHEN THE RELEVANT AGENCIES ARE INVOLVED</b></p> <p><b>TRAINING OF PERSONNEL.</b></p> <p><b>GREATER COLLABORATION OF AGENCIES EG NEMO CONTRIBUTION TO THE PHYSICAL PLANNING PROCESS.</b></p> <p><b>MAPS (HAZARD, RISK) AT SCALES THAT CAN ASSIST COMMUNITY PLANNING</b></p> <p><b>PROJECT TO RETROFIT HOUSES</b></p> <p><b>RETROFITTING OF EMERGENCY SHELTERS OR BUILDING NEW ONES.</b></p> <p><b>EXPERIENCE OF OTHER COUNTRIES TO SUPPORT LOCAL IMPLEMENTERS (APPRENTICESHIPS)</b></p> <p><b>REGIONAL INTEGRATION.</b></p> <p><b>INCORPORATE STUDIES IN DAILY WORK</b></p> <p><b>POLITICAL SUPPORT</b></p>	<p><b>SUPPLY REPORTS TO THE RELEVANT AGENCIES</b></p> <p><b>ATTACHMENTS AT VARIOUS UNIVERSITIES AND AGENCIES INVOLVED.</b></p> <p><b>REDUCE PROPERTY DESTRUCTION FROM HAZARDS</b></p> <p><b>DEVELOP CONFIDENCE, CAPACITY FOR IMPLEMENTATION</b></p> <p><b>FORMULATE AN EASY DATA SHARE, KNOWLEDGE TRANSFER MECHANISM.</b></p> <p><b>EDUCATE MEMBERS OF PARLIAMENT AS TO THE IMPORTANCE OF PROJECTS SUCH AS THIS TO NATION BUILDING</b></p>



### 8.3 Questionnaire Dominica: collated

#### GENERAL INFORMATION

Where do you work? What is your job?
<b>Physical planning division GIS technician</b> <b>Ministry of Public Works, civil engineer</b> <b>Road and engineering surveyor</b> <b>Civil engineer</b> <b>Development control officer</b> <b>Senior engineer</b>

#### YOUR MAIN TASKS

Nr	Short Description of your three main tasks related to your job that relate to natural hazards and risk & planning	Does this task require that you have knowledge on:				
		Engineering design (Yes/No & comment)	Planning (Yes/No & comment)	Natural hazards (Yes/No & comment)	Risk (Yes/No & comment)	GIS (Yes/No)
1	<b>Data Collection, mapping</b> <b>Maintain land information databases</b> <b>Creating maps</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		no	No	no	No	yes
		Yes	yes	no	No	yes
2	<b>Infrastructure development</b> <b>Emergency response</b> <b>Infrastructure assessment</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes	Yes	Yes	Yes	no
		Yes	Yes	Yes	Yes	no
3	<b>Site inspection, slope stability/protection works, drainage works</b> <b>Structural designs of government buildings</b> <b>Assessment for vulnerable areas</b> <b>Implementation of project.</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes	Yes	Yes	Yes	no
		Yes	no	Yes	Yes	no
		yes	yes	yes	yes	no

3	<b>Review development applications and subdivision proposals</b> <b>Prepare TOR for environment impact assessment</b> <b>Review EIA documents</b> <b>Enforce planning law regulations and standards</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		no	Yes	yes	Yes	no
		no	yes	Yes	Yes	no
		no	yes	yes	yes	yes
3	<b>Survey and mapping vulnerable areas and damaged areas post disaster</b> <b>Settout staking survey and mapping of features</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
		yes	Yes	no	no	no
		no	no	no	no	no
		no	no	no	no	no
3	<b>Identification and design of infrastructure, retrofitting, rehabilitation</b> <b>Infrastructure assessment</b> <b>Storm hazard response</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes	yes	Yes	Yes	Yes
		Yes	no	Yes	Yes	Yes
		yes	yes	yes	yes	no
3	<b>Reviewing building plans</b> <b>Site inspections</b> <b>Development control</b>	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes	Yes	no	Yes	no
		Yes	Yes	Yes	Yes	no
		yes	yes	yes	yes	no
3	<b>Road and drainage design</b> <b>Building structural design</b> <b>Project management and planning</b>	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
		Yes	Yes	Yes	Yes	Yes
		Yes	Yes	Yes	Yes	Yes
		yes	yes	yes	yes	yes

## INFORMATION REQUIREMENTS

Could you please list the main information requirements, for which of the three tasks that you indicated above this is needed, and also indicate whether these are available?

Important	What type of information is required ordered from most important to least important	For which tasks is this needed	Is this available to you?	If available in what form/detail?
Most . . . . . Least	DESIGN CODES		SOME	BRITISH AMERICAN
	CAPACITY (PRIVATE AND PUBLIC)		SOME	LOCAL
	PREVIOUS DATA (HISTORICAL)		NO	
	GEOTECHNICAL DATA	DESIGN	NO, SOMETIMES	FROM OLD ISOLATED PROJECTS – HARD COPY
	RAINFALL DATA	DESIGN	YES	LIMITED TO SPECIFIC LOCATIONS
	RIVER FLOW DATA	DESIGN	NO	
	SPATIAL DATA	ASSESSMENT	NO	
	SOIL TYPE		YES	DIGITAL
	DRAINAGE PATTERNS		YES	DIDGITAL
	HAZARD RISKS		NOT ALWAYS	DIGITAL AND KNOWLEDGE
	HISTORICAL CLIMATIC DATA		NOT ALWAYS	DIGITAL
	LAND USE PLANS, REGULATIONS		YES	DOCUMENT
	PROPERTY STANDARDS AND BUILDING CODES		YES	DOCUMENT
	PROPERTY TITLES/OWNERSHIP		YES	PAPER
	TOPOGRAPHIC MAP		YES	CAD FILES
	SURVEY PLANS		YES	CAD FILES
	FLOOD AREAS, ZONING		NO	
	FLOOD RISK		OUTDATED INFORMATION	HARD COPIES, RECENT DATA FROM AIRPORTS
	ZONING AND LAND USE		YES	MAPS GIS

### **MOST URGENT PROBLEMS THAT NEED TO BE ADDRESSED**

Nr	Can you indicate what you consider the most urgent problems that need to be addressed in your country in order to effectively reduce the vulnerability of the island's infrastructure and people to natural disasters?
1	<b>ZONING, REGULARISATION OF SQUATTERS, LAW ENFORCEMENT RELATING TO SETTLEMENT</b>
2	<b>DATA COLLECTION AND MANAGEMENT, PROPER PLANNING AND IDENTIFICATION OF VULNERABLE AREAS ON THE ISLAND, TRAIN AND EQUIP STAFF IN GIS AND OTHER SOFTWARE</b>
	<b>MORE FORWARD PLANS OF DEVELOPMENT ACTIVITY. STRICTER ENFORCEMENT OF LAW, REGULATIONS, AND STANDARDS. PUBLIC AWARENESS. GREATER COLLABORATION BETWEEN PLANNING AND PUBLIC WORKS, EASIER ACCESS TO HAZARD VULNERABILITY DATA AND CLIMATIC INFORMATION</b>
3	<b>UNRELIABLE SURVEY GEODETIC NETWORK, MINIMAL USE OF GIS FOR ANALYSIS FOR DISASTER MITIGATION, LACK OF MODERN EQUIPMENT SOFTWARE TO ANALYSE DATA</b>
	<b>POLICING AND ENFORCEMENT OF PLANNING POLICIES, LAWS AND REGULATIONS. REGULAR ASSESSMENT OF INFRASTRUCTURE, TIMELY REPAIR, RETROFITTING, UPGRADE</b>
	<b>SQUATTING IN HAZARDOUS AREA, PUBLIC AWARENESS</b>
	<b>LARGE SCALE DEVELOPMENT AND DEFORESTATION IN THE INTERIOR OF THE ISLAND</b>
	<b>COMPREHENSIVE LAND MANAGEMENT POLICY, INADEQUATE DATA FOR MAKING INFORMED ENGINEERING AND PLANNING DECISIONS, HUMAN CAPACITY TO COLLECT AND ANALYSE AND UTILISE DATA</b>

### **PREVIOUS PROJECTS**

No doubt there have been several previous projects related to hazard and risk assessment, and the use of risk information in planning in your country. Could you give your opinion on these?

What have been the main contributions from these projects	What were the problems involved in using the results?
<b>HAZARD MAPS, FLOOD, LANDSLIDE, WIND AND SEA SURGE</b> <b>THE AWARENESS OF IMPROPER PRACTICES AS RELATED TO SETTLEMENTS AND BUILDING</b> <b>ESTABLISHMENT OF GIS MAPPING</b> <b>IMPROVED DATA</b>	<b>DATA ACCURACY, DATA AVAILABILITY, OUTDATED DATA</b> <b>ACCESS TO DATA</b> <b>PROGRAMMES DONE IN ISOLATION</b> <b>BADLY PLANNED STUDIES SO DESIGN NOT ADEQUATE</b>

## NEEDS

What is needed to improve the planning and implementation of risk reduction measures and how this project could address these needs?

What is needed?	How could the project address these needs?
<b>IMPROVED COORDINATION</b> <b>UPDATED DATASETS</b> <b>INCLUDE HAZARDS AND RISK INFORMATION IN PLANNING PROCESSES</b> <b>NEW LEGISLATION AND ENFORCEMENT BY THE NECESSARY GOVERNMENT BODIES</b> <b>ENFORCEMENT OF STANDARDS AND CODES</b> <b>MAPPING OF EXISTING DISASTER ZONES</b> <b>MAPPING OF AREAS SUSCEPTIBLE TO DISASTER</b> <b>INCORPORATION OF DISASTER RISK REDUCTION INTO LAND USE PLANS</b> <b>NEW GEODETIC NETWORK, NEW EQUIPMENT, SOFTWARE</b> <b>LESSONS LEARNT</b> <b>TRAINING</b> <b>NATIONAL LAND USE PLAN</b>	<b>NEW ADEQUATE DATASETS WILL BE COLLECTED</b> <b>CAPACITY BUILDING</b> <b>HANDBOOK CAN BE USED AS A GUIDE FOR SEVERAL MINISTRIES DEPARTMENTS</b> <b>GIVE LIGHT TO THE ILLS OF IMPROPER PRACTICES AS RELATED TO ZONING AND SETTLEMENT</b> <b>ASSIST WITH TECHNICAL EXPERTISE, LEGISLATION, PROCUREMENT OF EQUIPMENT</b> <b>HANDBOOK, GUIDELINES, CASE STUDIES OF SIMILAR PROJECTS</b> <b>IDENTIFY DATA GAPS AND HOW TO CLOSE THESE GAPS</b>



## 8.4 Questionnaire Grenada: collated

### GENERAL INFORMATION

Where do you work? What is your job?
<b>Ministry of Health – Senior Planning Officer</b> <b>Physical Planning Unit – Senior Planning Officer</b> <b>Physical Planning Unit – Junior Building Inspector</b> <b>Ministry of Works – Engineer, Roads Department</b> <b>Ministry of Agriculture – Developer Risk Reduction plans</b> <b>Physical Planning Unit, Ministry of Works – Reviewing Development Applications</b> <b>Physical Planning Unit – Planning</b> <b>Physical Planning Unit – Senior Building Inspector</b> <b>Physical Planning Unit – GIS Technician</b>

### YOUR MAIN TASKS

Nr	Short Description of your three main tasks related to your job that relate to natural hazards and risk & planning	Does this task require that you have knowledge on:				
		Engineering design (Yes/No & comment)	Planning (Yes/No & comment)	Natural hazards (Yes/No & comment)	Risk (Yes/No & comment)	GIS (Yes/No)
1	<b>Development of Health Facilities Designs</b> <b>Maintenance of buildings</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		yes	yes	yes	yes	no
		Yes	yes	no	yes	no
		yes	yes	yes	no	yes
2	<b>Shelter inspection and monitoring</b> <b>Responding to environmental impacts</b> <b>Planning and mitigation preparedness</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes	Yes	Yes	Yes	no
		no	Yes	Yes	Yes	no
		no	yes	no	no	yes
3	<b>Analyse information for community planning</b> <b>Collect data for land use planning</b> <b>Analyse data on land use planning</b> <b>Analyse data on hazard event</b>	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		no	Yes	Yes	Yes	Yes
		no	Yes	no	no	Yes
		no	yes	yes	yes	Yes

3	Monitoring building development too close to rivers, roads Monitoring squatting	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes Yes	Yes yes	yes Yes	Yes Yes	Yes yes
3	Project design, management, implementation, monitoring,	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
		yes	Yes	Yes	Yes	Yes
3	Developing risk management and risk reduction plans for the agriculture sectors	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes Yes	yes yes	Yes yes	Yes yes	Yes Yes
3	Development control Building application approval Formulation of local area plans, Heritage conservation planning	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> yes <input type="radio"/> No
		Yes Yes yes	Yes Yes yes	no Yes yes	Yes Yes yes	no no no
3	Production of GIS maps Creating, maintaining geospatial databases	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
		no no no	Yes Yes yes	Yes Yes yes	Yes Yes yes	Yes Yes yes

## INFORMATION REQUIREMENTS

Could you please list the main information requirements, for which of the three tasks that you indicated above this is needed, and also indicate whether these are available?

Important	What type of information is required ordered from most important to least important	For which tasks is this needed	Is this available to you?	If available in what form/detail?
Most . . . . . . Least	TOPOGRAPHY, SURVEY PLANS		YES	PAPER MAP
	ENVIRONMENTAL IMPACT ASSESSMENT		YES	
	DESIGNS FOR NATURAL DISASTER		YES	
	AS BUILT DESIGNS		NO,	
	PREVENTATIVE MAINTENANCE PLAN		NO	
	HAZARD DATA		NO	
	HAZARD MAPPING		NO	
	VECTOR CONTROL DATA		YES	STATISTICS
	WATER QUALITY		NO	
	EXCRETA DISPOSAL		YES	COMMUNITY
	EXISTING LAND USE		NO	
	DEM		NO	
	POPULATION		YES	TABLES
	PARCELS		YES	SHAPE FILES
	BUILDING FOOTPRINTS		YES	SHAPE FILES
	RAINFALL		YES	TABLES
	TIDAL		NO	
	SOIL			SHAPE FILES
	VEGETATION		YES	SHAPE FILES
	ZONING		NO	
	SOIL TYPE		YES	DATASETS
	SLOPES		YES	MAPS
	SOIL STRENGTH		YES	
	SOIL STABILITY		YES	
	RAINFALL DATA		YES	
	LIST OF PERSONS VULNERABLE		YES	PAPER

## Report of the workshops in 5 target countries

	TYPES OF ITEMS AT RISK		NO	
	TYPES AND LEVELS OF VULNERABILITY		NO	
	LIST OF HAZARDS THEY ARE VULNERABLE TO		YES	PAPER
	SPATIAL REPRESENTATION OF THE VULNERABLE PEOPLE		NO	
	LAND USE MAP		NO	
	ZONING MAP		NO	
	HAZARD MAP		NO	
	POPULATION STATISTICS		SOME	PAPER
	GEOGRAPHICAL DATA		SOME	MAPS, PHOTOS
	LOCATIONS		SOME	MAPS
	ROADS		SOME	MAPS, DOCUMENTS
	COASTAL ZONE DEFINITION		NO	
	ADMIN BOUNDARIES, BASE INFO		YES	SHAPE FILES
	IMAGERY		YES OUT OF DATE	IMAGERY
	HAZARD AND RISK		OUT OF DATE	SHAPE FILES

## MOST URGENT PROBLEMS THAT NEED TO BE ADDRESSED

Nr	Can you indicate what you consider the most urgent problems that need to be addressed in your country in order to effectively reduce the vulnerability of the island's infrastructure and people to natural disasters?
1	EMERGENCY EXIT FOR RICHMOND HILL HOME FOR THE ELDERLY
2	EMERGENCY ROAD FOR GENERAL HOSPITAL
	ENFORCEMENT OF BUILDING CODE
3	KEEPING ABREAST OF LATEST ENGINEERING AND MITIGATION TECHNOLOGIES AND INCORPORATING SAME INTO NATIONAL FRAMEWORK
	IDENTIFICATION OF HIGH RISK AREAS IN THE COUNTRY
	A GOOD DEM FOR SCIENTIFIC MODELLING AND ANALYSIS
	A LAND POLICY TO GUIDE DEVELOPMENT
	WELL-DEVELOPED HAZARD MAPS
	CONSTRUCTION OF BUILDINGS TOO CLOSE TO RIVERS ROADS
	BUILDINGS NOT MEETING BUILDING CODE
	BUILDING ON STEEP SLOPES

	<b>SQUATTING</b>
	<b>SETBACK IN COASTAL AREAS</b>
	<b>LACK OF DISSEMINATION OF INFORMATION ON RISK TO HAZARDS</b>
	<b>INCREASE IN STAFF TO MONITOR DEVELOPMENT AND STAFF CAPACITY</b>
	<b>LEGISLATION, POLICY, ENFORCEMENT</b>
	<b>PUBLIC AWARENESS</b>
	<b>SQUATTER SETTLEMENTS CHATTEL BUILDINGS</b>
	<b>HILLSIDE DEVELOPMENT</b>
	<b>ILLEGAL DEVELOPMENT</b>
	<b>POLICIES AND PROGRAMMES FOR MORE OPTIONS FOR BUILDING</b>

#### PREVIOUS PROJECTS

No doubt there have been several previous projects related to hazard and risk assessment, and the use of risk information in planning in your country. Could you give your opinion on these?

What have been the main contributions from these projects	What were the problems involved in using the results?
<b>IDENTIFICATION OF AREAS OF WEAKNESS IN RISK MANAGEMENT</b> <b>THEY HAVE BEEN USED IN LOCAL AREA PLANS</b> <b>BRIDGE DESIGN BASED ON LOCAL KNOWLEDGE</b> <b>HAZARD SHAPE FILES</b> <b>ONLINE WATER MANAGEMENT SYSTEM</b>	<b>SOME RECOMMENDATIONS NOT ADDRESSED DUE TO LACK OF FUNDS</b> <b>THE SCALE WAS NOT ADEQUATE</b> <b>FILES BECAME OUTDATED</b> <b>SYSTEM IS BARELY USED</b>



## NEEDS

What is needed to improve the planning and implementation of risk reduction measures and how this project could address these needs?

What is needed?	How could the project address these needs?
<p>TECHNICIANS IN THE AREA OF RISK REDUCTION</p> <p>THE USE OF GREEN TECHNOLOGIES</p> <p>TEMPLATES FOR FUTURE REFERENCE IN THE PLANNING PROCESS</p> <p>PUBLIC CONSULTATION</p> <p>LAND USE POLICY AND ZONING</p> <p>ENFORCEMENT OF LEGISLATION</p> <p>CURRENT INFORMATION</p> <p>ONGOING COLLECTION OF DATA</p> <p>LIST OF SOURCES OF READILY AVAILABLE DATA ON HAZARD RISKS</p> <p>CURRENT INFORMATION</p>	<p>TRAINING FOR TECHNICIANS</p> <p>DEVELOPMENT OF STRATEGY</p> <p>REVISIT DRAWING BOARD</p> <p>CREATION OF TEMPLATE</p> <p>ENFORCING ZONING</p> <p>PUBLIC EDUCATION</p> <p>REVIEWING LEGISLATION</p> <p>PROVIDE ACCESS TO MORE RELEVANT DATA</p> <p>BETTER UNDERSTANDING OF PROCEDURES THAT MAY BE USED IN DIFFERENT SITUATIONS OF HAZARD AND VULNERABILITY</p> <p>CREATE LIST OF READILY AVAILABLE DATA ON HAZARDS AND RISKS ONLINE</p> <p>PROVIDE CURRENT DATA</p>

## 8.5 Results of the questionnaires for Belize: collated.

### YOUR MAIN TASKS

Nr	Short description of your three main tasks related to your job that relate to natural hazards and risk & planning	Does this task require that you have knowledge on:				
		Engineering design (Yes/No & comment)	Planning (Yes/No & comment)	Natural hazards (Yes/No & comment)	Risk (Yes/No & comment)	GIS (Yes/No)
1	Review applications for private subdivisions. Mapping of Land & other natural resources Coordinate climate change activities  Susceptibility mapping Housing committee after disasters Consulting services various projects natural resources management	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
		LUA has an engineer no	y	y	y	Y
2	Supervise development of Municipal Development plans and their implementations. NSDI Development & implementation Review and validate products from assessments (vulnerability & adaptation) for quality assurance and control Vulnerability assessments Mitigating at local and national level	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
		Done by consultants  Y - basic knowledge	y	y	y	y
3	Review application for coastal construction  Management of LIC Provide technical guidance and support to the National Climate change office Communicate strategies and maintenance of communication for disaster management Participating in planning workshop and committee	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> yes <input type="radio"/> No
		Would like to have but designs are done by engineers and architects. y	Sometimes; policies are driven by local authorities. y	Hurricanes & storms, sea level rise, climate change. y	Hurricanes & storms, sea level rise, climate change.	y

					Y	
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# **INFORMATION REQUIREMENTS**

Could you please list the main information requirements, for which of the three tasks that you indicated above this is needed, and also indicate whether these are available?

Important	What type of information is required ordered from most important to least important	For which tasks is this needed	Is this available to you?	If available in what form/detail?
<p><b>MOST</b></p> <p>.</p> <p>.</p> <p>.</p> <p>.</p> <p>.</p> <p>.</p> <p>.</p> <p><b>LEAST</b></p>	<p><b>DETAILED ELEVATION DATA</b></p> <p><b>CADASTRAL</b></p> <p><b>WATER RESOURCES INVENTORY —</b></p> <p><b>GROUND/SURFACE</b></p> <p><b>HYDROLOGIC DATA</b></p> <p><b>WATER QUALITY</b></p> <p><b>BATHYMETRIC</b></p>	<b>1, 2</b>	<p><b>NOT DETAILED</b></p> <p><b>PARTLY</b></p> <p><b>SURFACE WATER</b></p> <p><b>AVAIL BUT NOT FOR</b></p> <p><b>ENTIRE COUNTRY</b></p>	<b>.SHP, CAD, HARDCOPY</b>
	<p><b>DETAILED FLOOD RISK</b></p> <p><b>WATERBODIES &amp; RIVERS</b></p>	<b>1, 2</b>	<p><b>NOT DETAILED.</b></p> <p><b>REQUIRES LOCAL</b></p> <p><b>KNOWLEDGE</b></p>	<b>.SHP</b>
	<b>DRAINAGE PATTERNS</b>	<b>1,2</b>	<b>NO</b>	
	<b>POTENTIAL SEA LEVEL RISE</b>	<b>3</b>	<b>NO</b>	
	<b>LAND COVER — BUILT UP AREAS</b>	<b>2</b>	<b>SOME</b>	<b>.SHP</b>
	<b>LAND USE DATA</b>	<b>1</b>	<b>SOME</b>	
	<b>STORM SURGE</b>		<b>NOT ACCURATE</b>	<b>.SHP</b>
	<b>TENURE AND PARCEL INFO</b>		<b>DIFFICULT TO</b>	
	<b>TIDE SURGE DATA</b>		<b>NO</b>	
	<b>BASIC INFO FOR POPULATION TO UNDERSTAND HOW HAZARDS WILL IMPACT THEIR DAILY LIVES.</b>			

### **MOST URGENT PROBLEMS THAT NEED TO BE ADDRESSED**

Nr	Can you indicate what you consider the most urgent problems that need to be addressed in your country in order to effectively reduce the vulnerability of the infrastructure and people to natural disasters ?
1	<b>LEGISLATIVE – OVERLAPPING/CONTRADICTION, OR NO MANDATE FOR PLANNING WHERE PLANNING IS OCCURRING. NEED FOR BETTER PLANNING, BUILDING POLICIES &amp; ENFORCEMENTS.</b>
2	<b>CULTURE – PEOPLE REFUSE TO MOVE AWAY FROM HIGH RISK/EXPOSED AREAS</b>
3	<b>DATA AVAILABILITY – TYPE, SCALE, RESOLUTION ARE INADEQUATE OR NON EXISTENT</b>
4	<b>ECONOMICS – BUILDING FOR RESILIENCE IS EXPENSIVE</b>
5	<b>EDUCATION FOR GENERAL PUBLIC ON RISKS AND IMPROVED COMMUNICATION AND COORDINATION BETWEEN WEATHER FORECASTERS/DISASTER MANAGERS &amp; GENERAL PUBLIC</b>
6	<b>FLOODING AND DRAINAGE PROBLEMS</b>
7	<b>NEED FOR ADAPTATION STRATEGIES AND INCENTIVES FOR FARMERS, RESIDENTS ETC.</b>
8	<b>NEED FOR DESIGN CODES.</b>

### PREVIOUS PROJECTS

No doubt there have been several previous projects related to hazard and risk assessment, and the use of risk information in planning in your country. Could you give your opinion on these ?

What have been the main contributions from these projects	What were the problems involved in using the results?
<p><b>PLANNING INTERVENTION ARE BASED ON EXISTING DATA WHICH IS INADEQUATE</b></p> <p><b>DEVELOPMENT OF HAZARD MAPS FOR AREAS OF THE COUNTRY</b></p> <p><b>GREY LITERATURE</b></p>	<p><b>PLANNING ZONES WERE GENERALIZED</b></p> <p><b>POOR RESOLUTION MAPS. RESULTS INCONSISTENT WITH PAST OBSERVATIONS (UNREALISTIC. BATHYMETRIC DATA NEEDED.)</b></p> <p><b>IMPLEMENTATION/PRACTICABILITY</b></p> <p><b>TOO MANY ASSUMPTIONS FOR MAKING DESIGNS CAUSING PROBLEMS AFTERWARDS</b></p>

### NEEDS

What is needed to improve the planning and implementation of risk reduction measures and how this project could address these needs?

What is needed?	How could the project address these needs?
<p><b>HIGHER RESOLUTION OR GREATER DETAIL IN MODELING FLOOD RISK;</b></p> <p><b>WOULD BE GOOD TO BE ABLE TO MODEL STRUCTURAL AND AGRICULTURAL RELATED IMPACTS DIRECTLY RESULTING FROM INTENSE STORMS</b></p> <p><b>MODELING SEA-LEVEL RISE TO ASSIST IN COASTAL PLANNING.</b></p> <p><b>MORE ON GROUND DATA COLLECTION/VALIDATION</b></p> <p><b>RAINFALL DATA IN REMOTE AREAS (E.G. MAYA MOUNTAIN AREA)</b></p> <p><b>RIVERFLOW DATA</b></p> <p><b>BETTER COORDINATION BETWEEN MINISTRIES FOR SHARING AND COLLECTING DATA</b></p>	<p>all</p>