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The Caribbean Regional Climate Outlook Forum (CariCOF) Wet Season 2016 Report

*Roseau, Dominica
30-31 May 2016*



Introduction

Since the 2012 Caribbean Climate Outlook Forum (CariCOF), the Caribbean Institute for Meteorology and Hydrology (CIMH) has been coordinating climate forecasting activities leading to a consistently growing body of forecasters contributing to the monthly production of consensus-based seasonal climate outlooks, with engagement of the user community that allows awareness-building within those sector communities. In collaboration with hosts, The Dominica Meteorological Services and other partners - the World Meteorological Organization (WMO), the American People through the United States Agency for International Development (USAID), the Department of Environment Canada, the International Research Institute for Climate and Society (IRI), the University of Arizona - the 2016 Wet Season CariCOF focused on the disaster risk reduction and the health sectors. It was at this forum that the Ministry of Health of Dominica launched its Climate Change and Health Vulnerability Assessment.

A training session for meteorologists and climatologists took place on May 25th to 28th, prior to the forum on May 30th to 31st. Refer to [Appendix A](#) for a list of participants.

Welcome Remarks

The forum was opened by Mr. Adrian Trotman, Chief of Applied Meteorology of the Caribbean Institute for Meteorology and Hydrology (CIMH). Mr. Trotman welcomed all participants to the forum where the focus is on health and Disaster Risk Reduction. He also made special recognition of the National Meteorological and Hydrological Service (NMHS) partners on the Caribbean Climate Outlook Forum (CariCOF) as well as the climate-sensitive sectors and donors represented.

Dr. David Farrell, Principal of CIMH, in his welcome thanked the Government of Dominica for hosting the forum and also thanked the participants for taking time out to attend the session. He stated that the CariCOFs helped governments to tailor their decision making processes to mitigate drought during the most recent drought, now the focus would be to mitigate the impacts of a threatening La Niña. With one the areas of focus of this CariCOF being health, Dr. Farrell mentioned that air quality is one of the causes of pre-mature deaths world-wide.

Mr. Tyrone Sutherland, Director of the Caribbean Meteorological Organisation (CMO) echoed the sentiments of the importance and relevance of the CariCOF. CariCOF is especially pertinent for such an island as Dominica with its high vulnerability. He further emphasised that any weaknesses in our systems unveiled during disasters (such as with Dominica during the passage of Tropical Storm Erica) are not attributed to the fact that we, the experts, do not know what we are doing. The plan of CMO is to improve communication between the English speaking and



Dutch speaking Caribbean islands. Mr. Sutherland also noted the fact that the rest of the world looks at the Caribbean and CIMH for the work being done. He encourages all involved to keep up the good work.

The Honorable Miriam Blanchard, Dominica's Minister of Public Works and Ports was also in attendance during the opening ceremony. She welcomed all participants to Dominica and stated that the country was still in recovery after the passage of Tropical Storm Erica in 2015, which caused widespread devastation and loss. Weather events pose serious challenges across the region and governments find themselves having to divert funding in order to prepare for such events. Minister Blanchard mentioned that climate change and climate variability is seen as high priority for all governments and as Dominica enters another hurricane season the relevant authorities must ensure early warning information are made available. She is anticipating the recommendations coming out of this year's wet season CariCOF.

Presentations

Wet/Hurricane Season Climatology in the Caribbean - the 2015 Season in Retrospect (Wazita Scott, Assistant Climate Forecaster, CIMH)

Ms. Scott presented the regional climatology of the wet/hurricane season and also gave an overview of what occurred during the 2015 season. Territories across the region share similar climatologies for rainfall and temperature. The characteristics of the region's climate are attributed to the migration of the Inter-Tropical Convergence Zone (ITCZ), changing in the strength of and northward migration of the sub-tropical (Bermuda-Azores) high pressure, sea surface temperatures, and the migrating of tropical waves and other disturbances (which can develop into tropical cyclones).

The National Oceanic and Atmospheric Administration (NOAA) predicted 6 to 11 named storms, 3 to 6 hurricanes and 0 to 2 intense hurricanes for 2015. This was a good prediction as 11 named storms, 4 hurricanes and 2 intense hurricanes were observed for 2015.

Ms. Scott also looked at the drought that gripped the region during 2015-2016. This phenomenon caused severe drying across the region and by November 2015 Antigua was almost 100 per cent desalination dependant as their largest dam had no exploitable surface water. 2015 was also the driest year on record at many stations in Barbados resulting in water outages in parts of the island; Governments (St. Kitts and Guyana) had to ration water; and millions of dollars lost due to impacts on the agriculture sector in Belize. This drought was



attributed to a strong El Niño (the second strongest on record), which will probably be replaced by La Niña (bringing opposite impacts) in 2016.

Products developed by the [Caribbean Drought and Precipitation Monitoring Network](#) (CDPMN) are integral in monitoring the water status across the region. The Standardized Precipitation Index (SPI), which gives an idea of the degree of dryness or wetness of an area, showed very dry conditions over six and twelve month periods in 2015. This coincided with the observed rainfall received for the same periods.

2016 Wet/Hurricane Season Forecast (Annie Carrette-Joseph, Dominica Meteorological Service)

In presenting the 2016 wet/hurricane season forecast Ms. Carrette-Joseph discussed the 2016 probabilistic forecast for the El Niño Southern Oscillation (ENSO), which plays an important role in the regions weather. The ENSO forecast produced by NOAA suggests a 52 per cent chance of La Niña conditions developing during the June-July-August period and remaining throughout 2016.

Drought conditions experienced during 2015 will gradually be alleviated as the wet/hurricane season advances. By August 2016 there is likely to be no drought concerns for most of the region. However, on the long term, by November 2016, some drought concerns may be re-established in some territories of the Lesser Antilles.

The June to August and (September to November) rainfall outlooks suggest above to normal conditions for most of the region. The above normal rainfall accumulations can be attributed to the higher chance of extreme rainfall events but with a chance of fewer than normal wet days across some territories. This forecast has implications of increasing surface wetness, increasing disruption of outdoor activities (but less often than usual), recharging of water reservoirs after a prolonged drought, and flash flood potential.

The June to August and September to November temperature outlooks suggest above to normal conditions across the region.¹

The 2016 hurricane season is forecasted to be more active than in the past 3 years according to Gray et al, Tropical Storm Risk, the Weather Channel, and NOAA all being above the normal (10 named storms). Some predictions were well above the 5.6 average for hurricanes, with the Tropical Storm Risk making a prediction of 9.

Discussion about Forecast:

- Dr. David Farrell (CIMH): The forecast which has implications of landslides relates to the planning sector. Are there any plans in place for Dominica (water sector) to avert what transpired previously (during Tropical Storm Erica)?

¹ CariCOF Outlooks can be obtained from the [Regional Climate Centre, CIMH](#)



- Response: No. (The country is) not equipped.
- Dr. Farrell: Are Disaster Management personnel aware of the geological hazards? Are they better prepared to monitor?
 - Response (Antigua and Barbuda): We have been monitoring
- Mr. Joth Singh (USAID): Decision makers do not have information to influence decisions – this was an identified gap. One crucial thing missing is vulnerability mapping.
- Dr. Farrell: Given the predictions, is it possible to get a sense of Early Warning Systems (EWS) – are they in tact? Do you need help getting them together?
 - Mr. Brian Dyer (Nevis): Nevis has recently installed a flood management system.
 - Velda Joseph, NEMO, St. Lucia: St. Lucia implemented three EWS, two of which are for flood prone areas and we are now looking to implement a multi-hazard flood prone system in the Denery area. Systems have not yet been tested and we hope that they will be able to withstand the impacts and provide what the country would need.

Breakout Groups

Participants were placed into groups representing (i) agriculture and water resources, (ii) health and (iii) disaster management. They were asked to consider the implications of the forecast and state what else is needed for their sector to respond to such eventualities. See [Appendix B](#) for a summary of presentations.

Health Implications of Climate Variability and Change (Dr. Peter Berry, Health Canada)

The key question in Dr. Berry's presentation was "Are we adapting fast enough?" According to NOAA the change in climate is unequivocal and 2015 has been the hottest year on record. The challenges to adaptation (e.g. one area/region warming faster than another) prompts us to understand the warming as it is imperative to reduce impacts.

There is a growing knowledge of health impacts from climate change through literature and the projected climate change will exacerbate many health risks that already exist. In increasing the resiliency of health systems these areas should be acted on: climate-informed health planning; health and climate capacity development; emergency preparedness and management; vulnerability, capacity and adaptation assessment; and integrated risk monitoring and early warning. Health Canada has improved its resiliency to heat in several ways: deliver heat-health messaging to support personal adaptation; conduct research into heat-health science to address knowledge gaps; disseminate information for health care workers through clinical training; and expand heat alert and response systems across Canada.



Comments

Mr. Tyrone Sutherland (CMO): Bush fires should be thought of in a big way in the future due to their health implications.

A Knowledge, Attitudes and Practices Survey on Climate Change and Health in Trinidad (Kerresha Khan, UWI St. Augustine)

Ms. Khan presented the findings of a preliminary study on Knowledge, Attitudes and Practices (KAP) on climate change and health in Trinidad. The objective of the study was to utilize a KAP survey to determine the perceptions of the relationship between climate change and certain aspects of health of persons residing within the East West corridor in Trinidad.

The methodology involved using a convenience sample and an online portal. Data was analysed using SPSS² v21 and 201 questionnaires were analysed. In a question to assess the public's definition of climate change, 73 per cent of the interviewees were unable to give a correct answer, even though they revealed that their information was obtained from libraries. The remaining 27 per cent received their information from media, family/friends or their own perception. Ninety five (95) per cent of the interviewees thought that climate change was indeed occurring, while approximately 70 per cent thought that small islands faced the biggest threats. When asked if they thought that they contributed to climate change, 68 per cent replied yes, 21 per cent replied no and 11 per cent were unsure.

Most interviewees thought that climate change will affect weather patterns, water supply, and health. The highlighted message was that the knowledge gap on the basics of climate change needs to be closed in order to truly tackle the resulting health issues. There is also need to re-educate the educators and middle aged population with regards to the basics of climate change and vector mitigation in such a way that the information is mainstreamed and easy to assimilate.

Heat Early Warning Systems (Hannah Nissan, IRI)

In her presentation Dr. Nissan alluded to the fact that heat is one of the most dangerous climate hazards for human health, but most people are unaware of how serious it can be. Apart from human health heat impacts the economic, energy, infrastructure, agriculture and tourism sectors.

In demonstrating an early warning system for heat, Dr. Nissan indicated that it sits within a wider heat health action plan the following stages:

- Level 0: long term planning – all year
- Level 1: heat wave and summer preparedness program
- Level 2: Heat wave forecast – alert readiness
- Level 3: heat wave action
- Level 4: major incident – emergency response

² Statistical Package for the Social Sciences



The fact that heat stress is not just temperature dependant but is also influenced by humidity, wind and solar radiation, a method to measure heat stress would take these parameters into consideration and give an idea of what the temperature feels like (apparent temperature). In setting temperature thresholds one must be mindful that critical temperatures for increased mortality vary significantly among different regions and ideally thresholds should link to mortality and not to climate.

Dr.. Nissan left some questions for the region to ponder?:

- How serious are the effects of heat on human health?
- Who are the vulnerable people and how can we reach them?
- What is the role of day-time vs. night-time heat?
- How important are wind speed and humidity?
- What are the regional and seasonal variations?
- Does the mortality rate accelerate for longer duration heat waves?

Questions/Comments:

Mr. Sylvester St. Ville (MOH, Dominica): The issue is with the mortality and morbidity data. How can we get past identifying whether an illness or mortality is as a result of heat stress?

There are methods to get around this. You can compare the average mortality rate with the excess mortality rate.

Mr. Ian Wallace (Trinidad and Tobago): Trinidad had two hot spell warnings this year, however there were no specific impacts.

Towards Developing Heat Alerts for the Caribbean: A Possible Framework (Dr. Cedric Van Meerbeeck, CIMH)

Dr. Meerbeeck in his presentation addressed the concerns surrounding heat in the Caribbean. These concerns included edema, rash, cramps, fainting, hyponatremia, exhaustion and stroke. With a forecast from the CariCOF outlooks, intense heat is expected to be a reality in many places until October, especially during dry spells.

A possible prediction framework for the Caribbean in respect of heat alerts and response systems would involve answering these questions:

- What are our thresholds? This requires having data on health outcomes (morbidity and mortality) as well as climate.
- Do we choose to use the ambient temperature or the apparent temperature for heat prediction? With the fact that (i) temperature data is widely available, but temperature does not vary much between seasons; (ii) the combination of temperature and humidity shows a much greater fluctuation between seasons; and (iii) wind exposure does significantly reduce heat exposure; using temperature alone would not be sufficient for heat stress alerting.



The risk posed by heat waves over a specific season can be higher or lower depending on (i) overall heat; (ii) the number of heat waves in the season and (iii) the duration of the heat wave. These three outlooks could form the prediction framework for heat waves.

Questions/Comments:

Mr. Sylvester St. Ville (MOH, Dominica): what is the impact of heat in the Caribbean? Developing a product should go toward prevention of morbidity.

Dr. David Farrell (CIMH): the Caribbean is moving towards older populations. We need to look at the demographic shifts. For example, Barbados is moving toward an older population.

Mr. Tyrone Sutherland (CMO): the apparent temperature has been raised across the meteorological community. There would have to be some level of education for people to understand and get used to indices.

Early warning is not just monitoring and predicting but also education and awareness, we can raise awareness of the long term effects of heat.

Mr. Adrian Trotman (CIMH): he believes that there is significant enough evidence of heat impact. If there are no mortalities it is almost certain, whether it be human or animal, that energy costs would be impacted tremendously.

IRAP and Climate Services Support in the Caribbean (Zackry Guido, University of Arizona)

The objective of the IRAP project is to foster adaptation and resilience to climate variability and change by supporting decision making and risk management through improved design, production and provision of climate information. This objective is realized through the understanding of vulnerability, co-producing relevant climate information, improved systems through evaluation, and building local and internal capacity.

In a case study of Jamaica Coffee, weather and climate services were provided to improve the coffee industry. This was a three year project with contributors such as IICA (Inter-American Institute for Corporation on Agriculture), JCIB (Jamaica Coffee Industry Board), CIMH, MSJ (Meteorological Service of Jamaica) and UWI (University of the West Indies, Mona Campus). The project identified products that would be useful to the industry – (i) weather timescales impact decision making, sub-seasonal and seasonal products are also important, and (ii) the development of a fire risk index would inform decisions regarding slash and burn activities.

The barriers to the widespread use of climate information are (i) a lack of trust in the forecasts, and (ii) inefficient dissemination processes.



Another study was conducted in Jamaica on the economic impact of seasonal rainfall forecasts in Jamaica. In this study, farmers who did not have access to climate information faced a 72 per cent loss in production compared to 54 per cent for those who received climate information via text messages.

The presenter posited that climate services can be effective if demand driven and the benefits can be enhanced by using a layered approach.

Questions/Comments:

Mr. Sherrod James (Antigua and Barbuda, NODS): What was the format used in texting information to the farmers?

Mr Glenroy Brown (Jamaica): the text message provided to the farmer was a free service translating weather and climate information to their level. Capacity was built for the farmers via going into the community and teaching meteorological terms to the farmers. A dedicated weather line was also made available to the farmers.

Adisa Trotter (Dominica): I Congratulate the Jamaica Meteorological service and Extension services along with their partners on the successes. He also stated that agro-meteorological bulletins are not embraced as they should and there is a need to have the economic value (in losses) included going forward.

Dr. Roché Mahon (CIMH): CIMH is working on the ground (and institutional) level with stakeholders and a consortium has been created to assist in co-developing, co-designing and co-delivering sector specific products.

CariCOF Theatre

The now customary theatrical production was delivered by some of the CariCOF members. In this performance the planned attack of the “mosquito” was foiled by an effective early warning system that was developed thereby reducing health impacts due to climate. This demonstrated the effectiveness of having an early warning climate system in place.

Towards Developing Tailored Climate Information Products for the Caribbean Health Sector (Dr. Roché Mahon and Shelly-Ann Cox, CIMH)

CIMH will provide, along with partners, two new enhanced sector specific bulletins. These are being co-developed with regional consortium partners and will deliver key messages and headline impacts, along with a summary of the CariCOF outlooks.

There were five options proposed for the production and dissemination of the bulletins:

- Option 1: a monthly static bulletin jointly produced by CIMH and sectoral partners
- Option 2: a monthly static bulletin produced solely by CIMH



- Option 3: an interactive bulletin produced quarterly and jointly produced by CIMH and sectoral partners.
- Option 4: using the existing sectoral bulletins (option 3) and supplemented by jointly produced key messages in existing sectoral bulletins.
- Option 5: jointly produced key messages featured in a new or existing climate section of existing sectoral bulletins.

IRI Disaster Risk Management Session (Ashley Curtis, IRI; Dr. Cedric van Meerbeeck, CIMH; and Denyse Dookie, IRI)

The focus of this presentation was that of disaster resilience. Arising out of collaboration with CIMH and IRI products such as extreme wet spells outlooks were developed. Sector representatives were presented with questions they should consider as the outlook is being presented to them:

- What is the extreme wet spell outlook?
- What kinds of decisions in my sector could this inform? Think of an example of a severe disaster with intense rainfall in your country.
- Who is making these decisions and how can this information reach them?
- What are the barriers to use this information?

Research on disasters in the Caribbean done by the IRI showed that 8.5 per cent more of the population was affected on Mondays due to heavy rainfall events. In some cases this had a negative effect on annual GDP due to people affected by such events. Intuition was also a factor in the severity of the disaster where there was limited preparedness over the weekend. To enhance this research the preparedness process needed to be analysed. Participants were grouped according to sectors with an attempt to answer the following questions.

Is the preparedness process different over the weekends and if so what is the difference?

How do gaps (coordination, communication, awareness) affect disaster resilience? How can we close these gaps?

The Caribbean Weather Impacts Group (CARIWIG) Project (Ottis Joslyn, CCCCC)

In his presentation Mr. Joslyn provided the participants with an overview of the Caribbean Weather Impacts Group (CARIWIG) Project. The fact that our climate has changed and continues to change is the main premise for this project. This change in turn demands SMART action:

- S: supports sustainable development goals
- M: multi-prolonged
- A: at scale (regional and local)
- R: research driven
- T: targeted (key sectors: agriculture, water, health etc.)



The steps in the development of the CARIWIG portal involved (i) working with regional stakeholders to determine their specific requirements with a focus on water, agriculture and coastal protection sectors; (ii) developing a web-based user interface which provided easy access to Caribbean data to support climate information needs; and (iii) work with regional stakeholders and decision makers to demonstrate the usefulness of climate information and the value of the climate data portal in decision making – as well as training in its use.

The CARIWIG portal enables the user to develop information at a regional level, conduct simulations as well as download data and graphical information. The tools available such as the Weather Generator (WG), the Simple Model for the Advection of Storms and Hurricanes (SMASH) and the Caribbean Drought Assessment Tool (CARIDRO), have been tested in various countries. The WG provides information for a single point location and is comparable to what is observed at the weather station. It can be used by impact models in the same manner in which the models use historical weather data. The SMASH model provides multiple scenarios of “realistic” rainfall rates and wind speed data in relation to a tropical cyclone over any part of the Caribbean. The data is potentially useful to several sectors and the tool lends itself to individual and institutional application and can be considered an important planning and decision making tool. The CARIDRO tool can be used to help assess the potential risk of different kinds of drought in the future. The different timescale possibilities (3-month, 6-month, 36-month etc.) enable the identification of types of drought.

Climate Change and Health Vulnerability Assessment Launch

Welcome remarks (Dr. David Farrell, Principal CIMH)

Dr. Farrell in his address thanked the government of Dominica for being the health exemplar to the rest of the world in linking health sector to the climate.

He also made mention that CariCOF’s re-establishment came about as a result of the 2009-10 drought and since then they have been able to acquire resources, with thanks to donor partners. Following this launch Dr. Farrell hopes to see long-lasting partnerships being built, from which the other sectors would benefit as well.

Dr. Farrell concluded by challenging Dominica to continue to be a focal point on health so that other Small Island Developing States (SIDS) would learn and benefit from such.

Assessment of Climate Change and Health Vulnerability and Adaptation in Dominica (Sylvester St. Ville, Ministry of Health, Dominica)

Mr. St. Ville of the Ministry of Health, Dominica presented the key findings of an assessment done on climate change and health vulnerability and adaptation in Dominica. The priority areas of the assessment were, vector-borne diseases, waterborne and water-related diseases, foodborne diseases, food security, and extreme weather events (through a Case Study of Tropical Storm Erika). The



assessment was done via literature review, time series analysis of weather and health associations, key informant interviews, survey and risk matrix, and modelling of health risks.

Below is a summary of the findings of the assessments:

- There is a correlation between rainfall and temperature to the mosquito vector for dengue and chikungunya, with an increase in outbreaks during the wet season. It is further expected that climate change will increase the risk of vector-borne diseases.
- The number of gastroenteritis cases increased between 1993 and 2014. This analysis was conducted on children under the age of five. There was found to be a correlation between both dry and wet periods, however with differing lag times.
- Leptospirosis cases increase with increasing rainfall. There were a large number of cases of leptospirosis in 2011.
- Tropical storm Erika caused outbreaks such as fever and gastroenteritis.

Adapting to challenges arising due to climate change will be affected by:

- Socio-economic status (this still remains a significant challenge)
- Indigenous populations (lower adaptive capacity with 49% of the population being poor and higher rates of food security among the Kalingo population)
- Lower education levels and lack of awareness about transmission of vector-borne diseases
- Lower adaptive capacity among farmers

Dominica Climate and Health Vulnerability and Assessment Next Steps (Dr. David Johnson, Chief Medical Officer, Dominica)

Following the report of the assessment on climate change and health vulnerability and adaptation in Dominica, Dr. Johnson presented the following recommended next steps:

- Develop a National Adaptation Plan (NAP) for health. This plan would set the policy for climate and health and be adopted at the highest level of government. It would focus on other vulnerabilities not defined on the vulnerability and assessment including: air quality; solid waste systems; adaptation strategies.
- Establish an entity to drive the climate and health agenda
- Digitize health and climate data
- Continue studies to assess the impact of climate on vector ecology and biology, water and water related conditions.
- Establish mechanisms for the routine flow of information between those who produce and those who need the data for decision making.
- Develop an early warning system for climate sensitive diseases. This will require greater collaboration between CIMH, Dominica Met Services, WMO and the Ministry of Health.



- Build the capacity of the health service personnel to take up the responsibility for integrating climate and health.
- Build upon the Smart Hospital Initiative to ensure that health care facilities are climate smart.
- Pass climate change legislation to institutionalize climate adaptation among all sectors but particularly Health.
- Adopt the National Land Use Policy
- Review and implement Disaster Risk Reduction policies and disaster response by the Ministry of Health and Environment.
- Adopt a policy of waste to energy
- Source funding for implementation of these recommendations.

Minister's Address

The Honourable Dr. Kenneth Darroux, Minister of Health, Dominica extended a warm welcome to all participants to the island of Dominica, which bore the brunt and fury of Tropical Storm Erika. The Minister reported that Erika left almost 1.5 billion Eastern Caribbean dollars in damage in its wake. The information presented in this climate and health vulnerability assessment will enable managers to make good decisions as we deal with climate change. WMO estimates an additional 140 deaths per year as a result of climate change, and countries not significantly contributing to global warming are feeling the effects most. The Minister further noted that climate change plays a role in basic health, for example affecting clean air, and he shares his interest in facing these challenges. The Hon. Darroux expressed his gratitude to all who contributed to the assessment and production of the report.



Appendix A – Attendee List

	Affiliation	Last Name	First Name
1	Antigua Met Service	Destin	Dale
2	Aruba Met Service	Irausquin	Lothar
3	Bahamas Met Service	King	Arnold
4	Barbados Met Service	Murray	Brian
5	Belize Met Service	Cumberbatch	Catherine
6	Cayman Islands Met Service	Porter	Avalon
7	Curacao Met Service	Boekhoudt	Joffrey
8	Dominica Met Service	Joseph	Annie
9	Dominica Met Service	Bryan	Ashar
10	Grenada Met Service	Tamar	Gerard
11	Guyana Met Service	McPherson	Eron
12	Haiti Met Service	Etienne	Emmanuel
13	Jamaica Met Service	Brown	Glenroy
14	Martinique Met Service	Gibier	Florian
15	St. Kitts Met Service	Rohan	Didier
16	St. Lucia Met Service	Willie	Shem
17	St. Maarten Met Service	Etienne-Leblanc	Sheryl
18	St. Vincent Met Service	Neverson-Jack	Desiree
19	Suriname Met Service	Mitro	Sukarni
20	Trinidad & Tobago Met Service	Aaron	Arlene
21	University of the West Indies Jamaica	Jones	Jhordanne
22	Caribbean Institute for Meteorology and Hydrology (CIMH)	Trotman	Adrian
23	Caribbean Institute for Meteorology and Hydrology (CIMH)	van Meerbeeck	Cedric
24	Caribbean Institute for Meteorology and Hydrology (CIMH)	Stoute	Shontelle
25	Caribbean Institute for Meteorology and Hydrology (CIMH)	Kirton-Reed	Lisa
26	Caribbean Institute for Meteorology and Hydrology (CIMH)	Scott	Wazita
27	Caribbean Institute for Meteorology and Hydrology (CIMH)	Applewhaite	Andrea
28	Caribbean Institute for Meteorology and Hydrology (CIMH)	Cox	Shellyanne
29	Caribbean Institute for Meteorology and Hydrology (CIMH)	Mahon	Roche
30	Caribbean Institute for Meteorology and Hydrology (CIMH)	Cuthbert	Shireen
31	Caribbean Institute for Meteorology and Hydrology (CIMH)	Depradine	Wayne
32	Caribbean Institute for Meteorology and Hydrology (CIMH)	Farrell	David
33	International Research Institute for Climate and Society (IRI)	Mason	Simon
34	International Research Institute for Climate and Society (IRI)	Nissan	Hannah
35	Health Canada	Berry	Peter
36	Columbia University	Allen	Teddy
37	Caribbean Farmer's Network (CaFAN)	Abraham	Norville
38	Caribbean Agricultural Research and Development Institute (CARDI)	Hall-Hanson	Rasheeda
39	Caribbean Public Health Agency (CARPHA)	Clauzel	Shermaine
40	Caribbean Community Climate Change Centre (CCCCC)	Joslyn	Ottis



41	Caribbean Disaster Emergency Management Agency (CDEMA)	Pierre	Donna
42	Caribbean Meteorological Organisation (CMO)	Sutherland	Tyrone
43	Caribbean Tourism Organisation (CTO)	Layne	Davina
44	Caribbean Water and Wastewater Association (CWWA)	Aquing	Patricia
45	National Office of Disaster Services (NODS), Antigua and Barbuda	James	Sherrod
46	National Emergency Management Agency, (NEMA), St Kitts & Nevis	Dyer	Brian
47	National Emergency Management Organisation (NEMO), St Lucia	Joseph	Velda
48	National Disaster Management Agency (NADMA), Grenada	Dickson	Samantha
49	Grenada Health	Ramkhelawan	Dhanraj
50	St Lucia Health	Anthony	Louise
51	Caribbean News	Wallace	Ean
52	St Maarten Health	Richardson	Cylred
53	Cuba Health	Valdes Ramirez	Odalys
54	Office of Disaster Preparedness and Management (ODPM), Trinidad	Ramkissoon	Candice
55	Caribbean Media Corporation (CMC)	Richards	Peter
56	Gleaner Jamaica	Cunningham	Anastasia
57	Suriname Health	Resida	Lesley
58	Organisation of Eastern Caribbean States (OECS)	Isaac	Cornelius
59	Belize Health	Bodden	John
60	University of the West Indies, Trinidad	Khan	Kerresha
61	Antigua Health	Mannix	Julienne
62	United States Agency for International Development (USAID)	Singh	Joth
63	Pan American Health Organisation (PAHO)	Edwards	Sally
64	Columbia University	Curtis	Ashley
65	Columbia University	Dookie	Denyse
66	IRAP - University of Arizona	Guido	Zack
67	IRAP - University of Arizona	Greene	Christine
68	Department for International Development (DFID) Caribbean	Harvey	Alex
69	Ministry of Health, Dominica	St. Ville	Sylvester
70	Ministry of Agriculture, Dominica	Trotter	Adisa
71	Ministry of Tourism, Dominica	Maxwell	George
72	Ministry of Agriculture, Dominica	Brumant	Ricky
73	CARDI, Dominica Branch	Etienne	Dorian
74	Fisheries Division, Dominica	Warner	Makeda
75	DOWASCO, Dominica	Williams	Magnus
76	Department of Local Government, Dominica	Joseph	Steve
77	Environmental Unit, Dominica	Bertrand	Maria
78	DURP, Dominica	Guiste	Collin

Appendix B: Break-Out Group Responses

Health

Negative implications from the rainfall forecast:

- Mosquito breeding sites
- Flooding
 - o Surface water contamination (giving rise to gastroenteritis and leptospirosis)
 - o Population displacement
 - o Disruption in health facilities
 - o Food contamination
 - o Food security threatened
 - o Interrupted sanitation services
- Reoriented resource allocation
- Direct impact of landslides
- Infrastructure damages
- Psycho-social impacts

Positive implications from the rainfall forecast:

- Food security (end of drought)
- Water availability improved
- Reduced dust (reduced respiratory diseases)

Implications from the temperature forecast:

- Heat stress
- Pressure of health symptoms
- Exacerbated health conditions for vulnerable people
- Increased circulation of viruses
- Increased transmission rates of vector-borne diseases

What do we need?

- Vulnerabilities
 - o Who
 - o Infrastructure
 - o Health implications of vulnerabilities in other sectors
- Develop early warning systems for health (long and short term)
- Climate outlook
 - o Summary does not include heat information or wet days
 - o Unsure before seeing the newsletter



Disaster Management

Implications of the forecast:

- Flash flooding
 - o Implementing early warning system
- The need to look at the hydro-meteorological hazard
 - o Planning
 - o Advising sectors
 - o Look at projects and prioritize
- The need for public education outreach
 - o Focus on activities for public
 - o Early warning will identify gaps
 - o Focus on community based early warning system
- Working with regional and community based disaster risk groups to ensure readiness
- Scenario planning (DEWTRA)
 - o To determine implications
- Look at response
 - o Risk reduction

What else is needed?

- Model for hurricanes
 - o Potential for rainfall amounts
 - CCCCC's scenario tool
- DEWETRA training for new disaster risk reduction person/ critical mass training

Mixed Group:

Implications of the forecast:

- Maintenance of sites (infrastructural and natural)
- Systems for infrastructure had been badly affected (Dominica) and thus they remain very vulnerable to heavy rains.
- Out-filling of facilities
- Corporation with other stakeholders on rapid response mechanisms

What else is needed?

- Heat and other information needs to reach the persons in a timely manner

