

**The Trinidad & Tobago In-Country Workshop:**  
**Mapping Provider Capacity and User Needs for Climate Services**  
**REPORT**



**Trinidad and Tobago Civil Aviation Authority**  
**Caroni North Bank Road, Piarco**  
**12th February, 2016**

## **Executive Summary**

One of the main tasks of the Trinidad and Tobago Meteorological Service (TTMS) is to advance meteorological services including climate services by providing high quality and effective services that serve to enhance decision making on climate related issues at the national level. The TTMS, the Caribbean Institute of Meteorology and Hydrology (CIMH) in collaboration with the World Meteorological Organisation (WMO) conducted a mapping of the Climate Services provided by the TTMS in Trinidad and Tobago. This report is based on the activities of the mapping exercise and is accompanied by an annex of the results from a questionnaire that was given to participants to baseline the TTMS capacity as a climate service provider. It aimed to capture users' needs and to create a database of information to better address the specific needs of sectorial user of climate services in Trinidad and Tobago now and in the future.

Mapping of the climate services provided by the Trinidad and Tobago Meteorological Service allowed for an assessment of the level of climate services provided by the TTMS in terms of quantity and quality. The TTMS is engaged in climate services that are aligned to national needs, targeted policy support actions and programs but absent is a robust climate research programme. Its climate services program is based on both official and ad-hoc collaborations and initiatives between the TTMS and its stakeholders including partner-agencies, where there are instances of existing memorandums of understanding or letters of agreement. The climate services program has as a key component, a National Climate Outlook Forum (NCOF) as part of its interface with users of its products to build awareness and understanding, as well as initiation of new products. The program also provide specialized as well as generalized climate services to the water resource management, finance, agriculture, health, disaster risk management, energy, construction, tourism, air transport and other sectors, as well as to the public in general.

Emanating from the mapping exercise, stakeholders became more aware and appreciative of the weather and climate services provided by the TTMS and highlighted the value of joint activities between the TTMS and stakeholders. The TTMS climate services contribute to building the country's climate resilience through enhanced cooperation and coordination between stakeholders across most sectors and the TTMS as climate services provider. These collaboration activities have developed an efficient climate service production system and structure. The mapping of the TTMS climate services enabled the TTMS to realize the level at which it was achieving its goals of being relevant and user friendly, improving the knowledge base among stakeholder for climate services, informing of on-going climate service activities within the TTMS and enhancing decision-making capacities on various levels with regards to climate services. It also enabled the TTMS to be cognizant of the gaps that needed to be closed, including an enhanced climate services research program, greater outreach to build awareness and making the services more accessible. Overall, the mapping exercise was a success but showed that the TTMS had even more services to initiate and accomplish if it was to fully satisfy users' needs.

## **Glossary of Acronyms and Abbreviations**

ASTT	Agricultural Society of Trinidad & Tobago
CARDI	Caribbean Agriculture Research and Development Institute
CariCOF	Caribbean Regional Climate Outlook Forum
CARPHA	Caribbean Public Health Agency
CCREEE	Caribbean Centre for Renewable Energy and Energy Efficiency
CDEMA	Caribbean Disaster Emergency Management Agency
CHTA	Caribbean Hotel & Tourism Association
CIMH	Caribbean Institute for Meteorology and Hydrology
CNMG	Caribbean News Media Group
CSWT	Climate Services Work Team
CTO	Caribbean Tourism Organization
CWWA	Caribbean Water and Wastewater Association
DRR	Disaster Risk Reduction
EMA	Environmental Management Authority
EWISACT	Early Warning Information Services Across Climate Timescales
GFCS	Global Framework for Climate Services
IICA	Inter-American Institute for Cooperation on Agriculture
MPU	Ministry of Public Utilities
NAMDEVCO	National Agriculture Marketing and Development Corporation
NWRHA	North West Regional Health Authority
ODPM	Office of Disaster Preparedness and Management
TEMA	Tobago Emergency Management Agency
TTMS	Trinidad and Tobago Meteorological Service
UWI	University of the West Indies
WMO	World Meteorological Organization
WRA	Water Resources Agency

## **Introduction**

On February 12, 2016 the Trinidad and Tobago Meteorological Service (TTMS) a division of the Ministry of Public Utilities (MPU), the Caribbean Institute for Meteorology and Hydrology (CIMH) and the World Meteorological Organisation, held an in-country workshop at the Trinidad and Tobago Civil Aviation Administrative Complex, Piarco, Trinidad, to map user needs for climate information and services in the Agriculture, Water, Health, Disaster Risk Management, Energy and Tourism sectors of Trinidad and Tobago. The workshop was also used to - baseline Trinidad and Tobago Meteorological Service institutional capacity to deliver climate services to these sectors. The Trinidad and Tobago version of mapping climate services provider's capacity and user needs for climate services is part of a global effort to establish the systematic development and delivery of climate services in the Caribbean, as well as, other regions, and to implement activities that enhance the capacities and mechanisms for climate services production and delivery under the WMO.

Attendance to the consultation by partners and stakeholders was broad with representation from various sectors including: water, drainage, disaster risk management, health, agriculture, and energy sectors. Representative included experts and decision makers from various government ministries and agencies, academic institutions, and Non-Government Organisations (NGO), namely: Agriculture Society of Trinidad and Tobago (ASTT), Ministry of Agriculture, Land and Fisheries Division, Ministry of Energy and Energy Industries, National Agriculture Marketing and Development Corporation, North West Regional Health Authority, Office of Disaster Preparedness and Management, Trinidad & Tobago Electricity Commission, University of The West Indies, Water Resources Agency, and Trinidad & Tobago Civil Aviation Authority. A full list of the participants is attached as Appendix 1.

The consultation advocated the ongoing efforts to establish the systematic development and delivery of climate services in Trinidad & Tobago by optimizing the quality, quantity and application of climate products and services across interrelated sectors, as part of a collaborative initiative under the WMO led Global Framework for Climate Services. It was envisaged that information and open dialogue during the consultation would further advance the necessary partnerships required to enhance the efficiency in sectoral users' decision-support systems for climate risk management and adaptation strategies in Trinidad and Tobago.

One of the main tasks of the Trinidad and Tobago Meteorological Service is to advance meteorological services including climate services by providing high quality and effective services that serve to enhance decision making on climate related issues at the national level. This report constitutes the activities and discussion emanating from the mapping exercise and is accompanied by the results from a questionnaire that was given to participants to baseline the TTMS capacity as a climate service provider. It aims to capture users' needs, to create a database of information to better address the specific needs of sectorial users of climate services in Trinidad and Tobago now and in the future. It is accompanied by the agenda outlining the list of activities during the consultation as Appendix 2.

## **Trinidad & Tobago In-Country Workshop**

### **1.0 Opening of the Seminar**

1.1 The opening session was chaired by Mrs Camille Hall, Corporate Communication Officer, TTMS who welcomed the participants and introduced members of the head table that included Dr. Cedric Van Meerbeek, Climatologist, CIMH, Dr. Roché Mahon, Post-Doctoral Researcher, CIMH, Mrs Arlene

Aaron-Morrison, Assistant Director (Ag.) TTMS and Mr Kenneth Kerr, Climatologist, TTMS. The Chair then invited Mrs Aaron-Morrison to bring greetings on behalf of the Director of the TTMS.

1.2 Mrs. Aaron-Morrison greeted the attendees and indicated that the TTMS along with the (CIMH) embarked upon improvement in the quality and quantity of climate products and services in the structure of the Global Framework of Climate Services. She stated that continuous observation, monitoring and research of the climate, based on historical data and current trends, needed more efficient dissemination in order for the relevant information to reach the most vulnerable and those at risk.

Mrs. Aaron-Morrison disclosed that over the last two years the significant increase in the demand for climate information by the public, decision makers and stakeholders, as well as the increased awareness of society to climate variability and change has shifted the TTMS climate services from not just data analysis and management but also towards provision of customized climate products and application tools. Through a customized climate information system that targets users, the TTMS is able to provide standardized and customized climate products and services. The reception and usability of the ambit of services require collaboration among partners and stakeholders in firstly assessing current capabilities to establish a baseline functionality of the TTMS. This assessment would place the TTMS into one of the following categories: Category I, the provision of basic climate data services and information products; Category II, the provision of essential climate data services and products; Category III, the provision of comprehensive climate data services and products; and Category IV, provision of advanced climate services and products. Mrs. Aaron-Morrison concluded that benefits can also be reaped rather than just focusing on risk management, and encouraged the full and careful participation of those in attendance.

1.3 Dr. Cedric Van Meerbeeck presided over an icebreaker, where each attendee was asked to introduce themselves briefly and to compare themselves to one of four climate occurrences from among a heat wave, drought, flood or wildfire. Once concluded, Dr. Van Meerbeeck highlighted two things from this icebreaker: that these hazards affect us all and that they are inevitable. He concluded that unless there was collaboration among all stakeholders, the effects of these hazards will not be mitigated.

## **2.0 SESSION I - International, Regional and National Context of Climate Services - Dr. Cédric Van Meerbeeck and Dr. Roché Mahon (CIMH)**

2.1 Dr. Van Meerbeeck gave an overview of the Global Framework for Climate Services (GFCS). He showed how the Caribbean Regional Climate Capacity can be advanced through a concept of combining Science and Policy in an information chain that brings together the provision of Climate Information Products and National Emergency response mechanisms, to create Early Warning Information Systems (EWIS). Dr. Van Meerbeeck stated that this concept has resulted in shifting the paradigm of the TTMS from the provision of information to the provision of a climate product that is a service.

In Dr. Van Meerbeeck presentation he highlighted the Five Pillars of the GFCS: (1) User Interface Platform, where discussion takes place to identify and solve problems from data stored in, (2) Climate Services Information Systems, which were collated via, (3) Observations and Monitoring, as well as, (4) Research, Modelling and Prediction. He stated that Pillar (5), Capacity Development, was meant to be the foundation of the GFCS implementation plan that linked and supported the four other pillars to provide climate information and services from months, years and decades to solve problems from the global scale to local and community level. Dr. Van Meerbeeck pointed out that a major challenge in providing climate services was in translating what is a good climate outlook output from the science side to user information for appropriate sectoral decision-makers He stated that the delivery of information needs to

be tailored to a sector and should include likely impacts and information on how to respond. Dr. Van Meerbeeck showed climate information and products generated at the CIMH that are tailored by themes. He demonstrated this by using, drought alert maps accompanied by tables of drought levels which allow users to take suggested action to protect their resources. The protection of these resources, Dr. Van Meerbeeck acknowledged, needs assessment within sectors and between sectors. He concluded by stating that implementation of Drought Plans and Policy for the region is currently ongoing to achieve a Caribbean Drought Early Warning Information System.

2.2 Dr. Roché Mahon in her section of the presentation reiterated the need for sector-specific climate information and highlighted that new products may not always be necessary but rather adjustments to generic products can enhance a sector's decision making processes, and through continual adjustments based on collaboration with sectors, the ultimate goals of the GFCS can be achieved.

Dr. Mahon mentioned that the CIMH had developed a six-step methodological approach towards the development of Early Warning Information Services Across Climate Timescales (EWISACT). This approach has been initialised in January 2015; steps one and two involve the establishing of governance mechanisms, base-lining and monitoring sectoral needs and capacity respectively. The preprocess is currently at Step three which deals with establishing steps one and two where they do not exist, or improving existing sector specific impact prediction. Step four deals with co-developing, testing and validating of climate products, while step five is concerned with the integration of products within Decision Support Systems. Finally, step six strengthens both the Meteorological Service's capacity to provide and the user's capacity to absorb and utilize climate information.

Dr. Mahon illustrated that steps one and two resulted in a consortium of Caribbean Institutes whose purpose is to work in tandem with National institutions to deliver climate products. This consortium is centered around the Caribbean Institute for Meteorology and Hydrology (CIMH) which is in charge of weather, water and climate, and comprise: the Caribbean Disaster Emergency Management Agency (CDEMA) in charge of Disaster Relief Management; the Caribbean Agricultural Research and Development Institute (CARDI) managing Agriculture; the Caribbean Water and Wastewater Association (CWWA) in charge of Water; the Caribbean Public Health Agency (CARPHA) managing Health; the Caribbean Tourism Organization (CTO)/the Caribbean Hotel & Tourism Association (CHTA) in a joint partnership in charge of Tourism and , the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE), which was recently inaugurated to deal with sustainable energy issues and activities in the region.. Dr. Mahon noted that at the national level in Trinidad and Tobago a network similar in structure was already established in the form of a Climate Services Work Team (CSWT) chaired by the TTMS and the Office of Disaster Preparedness and Management which augurs well for further pioneering the GFCS in moving on to the remaining steps of the methodological approach in developing the EWISACTs concept locally.

2.3 Mr. Kenneth Kerr - presented on 'Meteorological and Climate Services Delivery of the TTMS: Past, Present and Future'. He made the point that Meteorological Services Division (MSD) was a Science based organization that utilizes cutting edge technologies to observe, monitor and conduct research into weather and climate and that the weather and climate service provided by the MSD may be either of "supply" or "demand" types. Mr. Kerr pointed out that the MSD provision of climate services included three levels, namely processed climate data, climate products generated from the data, including climate monitoring tools and indicators, and climate information which included guidance, support, training, interacting with users, among others. He showed a wide range of climate services tailored specifically for

sectors that were provided by the MSD. These included products, information and services for the water, agriculture, health, aviation, disaster risk management, construction- engineering, rural and urban planning, finance and energy sectors.

Mr. Kerr also demonstrated that the MSD was engaged in Capacity Building through a number of avenues, including hosting National Climate Outlook Forums, conducting training workshops with key stakeholder agencies, providing climate science advice to the Government's financial arm in terms of transferring the country's excessive rainfall and severe weather events risk. In addition to these, the TTMS in collaboration with the ODPM had established a Climate Services Work Team with the aim of promoting climate services use in sectorial disaster risk management decisions. He demonstrated that the TTMS was making greater contribution by way of interventions at national, regional and international workshops, conferences and meetings. Mr. Kerr added that the TTMS was engaged in developing additional climate products such as the GIS-based products for lightning tracking (Energy), Sargassum warning (Tourism, Fishing, Marine) and search and rescue (National Security), all of which would enable the MSD to further enhance its provision of climate services.

2.4 Several questions and requests were asked of Mr. Kerr, pertaining to the MSD current and future products such as currents of the ocean (from Atlantic LNG member), and information with respect to tides and waves for the energy sector, and historical data of storm paths (from Civil Aviation Authority member) that can assist with performing more informed decision making in these sectors. He indicated that the TTMS was willing and able to respond.

### **3.0 SESSION II – Sectoral Applications of Climate Information Products and Services – Dr. Cédric Van Meerbeek (CIMH)**

3.1 Dr. Van Meerbeek presented on the sectoral application of Climate products and services. He highlighted that droughts can be as costly to the Caribbean region as a hurricane event, hence the need to be prepared to mitigate all effects. Effects range from the reduction in crop production such as a 30% harvest reduction in Haiti and an 11% reduction in the Dominican Republic over 2015, to water outages in Barbados and in St. Kitts & Nevis, where water was not sold to cruise ships since September 2015, thus reducing visitations to an economy that is tourism-dependent. In issuing climate products that express variability against a normal, it requires understanding by the receiving sectors; therefore education plays an important role in the Region, going forward. This process, he emphasised, is not a one way transmission, and results in digestible services such as: Communication Products (CariCOF Caribbean Climate Outlook Newsletter, Agroclimatic Bulletins); Technical Tools (Monthly Weather Summaries, Caribbean Climate Database, Caribbean DEWETRA Platform); and Technical Products (CariCOF Drought Alert Outlook, CariCOF Wet Days and Wet Spells Outlook).

3.2 Dr. Mahon enquired of the attendees which climate products were already in use within their sectors. It was noted that while temperature and rainfall outlooks were used by many present, the drought outlook was new information, and of great interest.

3.3 Uses of Climate Services – Mr. Keith Meade, Water Resources Agency (WRA). Mr. Meade discussed WRA's role in the monitoring and managing of the country's water resources: hydrological monitoring; water allocation; water resource assessment; hydrological analysis and forecasting; data dissemination; public awareness training to key stakeholders. Mr. Meade provided insight into how the climate information, products and services obtained from the MSD (monthly rainfall forecasts at all impounding reservoirs, daily weather forecast, quarterly rainfall and temperature outlook, etc.) factor into

applications by the WRA in Reservoir Projections, Flood Forecasting, and Identification of seasonal changes. Reservoir Projections of Navet, Hollis and Hillsborough Reservoirs were presented. Mr. Meade concluded that due to surface water comprising 65% of the WRA's water supply, which is brought by precipitation the MSD climate information, products and services are critical, utilized, and depended upon by the Water Resource Agency.

3.4 Uses of Climate Services – Ms. Dhano Sookoo (Agricultural Society of Trinidad & Tobago). Ms. Sookoo explained that the climate information from the TTMS helped in the planning and production in Agriculture and Food Security. She pointed to use of the MSD climate products for agriculture in the sector and the benefits derived including enabling more efficient water conservation practices which were implemented in the sector. She also stated that based on the MSD climate information some farmers were now using drip irrigation system instead of sprinkler system, which allowed water to directly and efficiently reach plants' roots and this has translated into better yields observed in some instances..

Based on the climate information provided, members of the Agricultural Society of Trinidad & Tobago (ASTT) were able to increase their export capacity by using regional information and applying this with respect to planning, production and export. As an example Ms. Sookoo cited the case where information was provided ahead of time on drought occurring in places like Barbados and other countries in the region, which enabled the ASTT members to increase production in particular commodities (watermelon, tomatoes, pumpkins, etc.) that were exported to meet demands in the tourism sector in those countries.. She also stated that because of the MSD information was also obtained from the WRA, which helps in adequate and efficient planning and development for the Agricultural Sector in the country.

3.5 – Video recording of farmer Frank A video of an interview with Farmer Frank was also shown to the participants. This video demonstrated how the climate information and products produced by the MSD brought added value to the planning and decision making for farmer Frank and other farmers. The video showed that Farmer Frank implemented a drip irrigation system based of the MSD climate outlook six months ahead of time for a dry season that was going to be drier than normal as a result of possible El Nino conditions.

#### **4.0 SESSION III – ENSO Past and Present – National Implications – Mr. Kenneth Kerr (TTMS)**

4.1 Mr. Kerr presented on the El Niño Southern Oscillation (ENSO) phenomenon and how it has impacted Trinidad and Tobago's climate historically. He stressed that the El Niño phenomenon provided very good predictability for the Caribbean region which allowed the MSD to provide useful climate outlooks ahead of time. He said this was important because in the past ENSO had negative consequences on the region. He highlighted that, the 1997-1998 El Niño event resulted in a harsh local dry season that impacted the Sugar Industry in Trinidad & Tobago significantly through increased wildfires and similarly the 2010 El Niño event held great influence on the 2010 dry season such that extremely dry and hot conditions resulted in Trinidad and Tobago experiencing large acreage of forest and bush fires. He mentioned that El Niño often influenced dry-spell or drought like conditions locally during the dry season and that this has consequences such as an increase in the number of consecutive dry days, an increase in the number of hot days and nights and increases in bush fire potentials. Therefore each sector should have a plan of action to mitigate the impacts of El Nino, as all sectors will inevitably be affected.

4.2 Following this presentation participants were asked to indicate how the El Niño affected their sectors, and how would they benefit from the early warning. Responses demonstrated that increased planning and strategy were undertaken with respect to water consumption in some companies in the Energy sector. This



was due to advance notice by the MSD three-month rainfall predictions which showed lower than usual values which allowed for investment in a desalination plant to ensure water requirements were met. The Climate Services Work Team (CSWT) representative mentioned that at on-going CSWT meetings, discussions were had on the drought conditions.

#### **SESSION IV – Base-lining Provider Capacity and User Needs**

5.1 Chaired by Dr. Cédric Van Meerbeeck (CIMH), a questionnaire was distributed to the participants of the conference with the following summary:

QUESTIONNAIRE	Section A – General information on attendee and organization
	Section B – Decision making capacity in organization
	Section C – Usage of weather and climate information
	Section D – Sustainability

This questionnaire was intended to create a database of information to better address the specific needs of sectoral users of Trinidad & Tobago in the future.

#### **6.0 SESSION V – Way Forward – Ms. Shelly Bradshaw, Mitigation Manager, ODPM**

6.1 Ms. Bradshaw began by stating that the session was focused on discussing options for strengthening national governance of the climate services agenda. To introduce this, Ms. Bradshaw invited Mr. Kerr to provide insight into the formulation and rationale of the work of the CSWT as Chair of the CSWT. Mr. Kerr stated that the CSWT was formulated to act on synergies of the GFCS and the Sendai Framework for Disaster Risk Reduction (DRR) where common themes exist. Particularly, the CSWT aim is to provide a platform at the national level to streamline climate services for disaster risk reduction in all the sectors as well as act as another the conduit through which key stakeholders in key climate sensitive sectors could engage in dialogue that leads to sector specific tailor-made climate services in keeping with the principle of the GFCS User Interface Platform (UIP) pillar.

6.2 He stated that the CSWT will enable key climate sensitive sectors to directly or indirectly consider climate services into their respective decision making. In keeping with the UIP the CSWT will enable climate service awareness building The CSWT was meant to be a bottom up approach that seek to bring together a cross cutting of sectors where climate services for DRR can be taken and fused for decision making with a view towards build capacity in the various sectors to act on and streamline climate services in their decision making. He concluded by stating that persons and sectors that are better prepared can better act in decision making.

6.3 Ms. Bradshaw posed to the participants the point that given the limited funding available, more could be achieved if all sectors come together to achieve greater resilience in the country and asked the question: What can be done in the next one to three years to strengthen national governance of the climate services agenda.

6.4 Dr. Roché Mahon (CIMH) stated that from a regional perspective, what is occurring in Trinidad & Tobago with respect to climate services is very unique especially in the English speaking Caribbean with perhaps the exception of Jamaica and in her view Trinidad and Tobago was ahead in the entire region. She explained that she would like to showcase the TTMS as a regional example of great practice on the climate services agenda. She added that it was a good opportunity for the attendees to contribute in carrying forward this agenda in Trinidad & Tobago.

6.5 Mr. Kerr (TTMS) reminded the participants that climate services is about providing information on weather and climate on climate change to key sectors/decision makers tailored to meet the sectors'/users' needs and really has a component that speaks to feedback in a major way. This he indicated would aid in the climate services being provided as well as developing new climate services, should an organization require a particular service.

6.6 Mr. Jacob Roosevelt, Agricultural Engineer, Ministry of Agriculture, explained that the CSWT was a step in the right direction since it will allow more persons to become aware of the products and services of the TTMS. He added that he incorrectly assumed that the TTMS only kept a record of rainfall data and was completely unaware of other services, for example, the dry season outlook. He followed this by indicating that the Ministry of Agriculture can aid the TTMS in providing information such as in crop production over the years, as well as other information which is easily available.

6.7 Mr. Kenneth Kerr (TTMS) responded by indicating the importance of integrating from a policy perspective climate services into the planning and operations of the Ministry of Agriculture as well as into not the farming production aspect, including use of climate services through Agricultural Extension Officers.

6.8 Mr. Prakash Ragbir, ICT Manager, NAMDEVCO, stated that information sharing on crop pricing and inflation circulation are some of the service that are available and these are used by the Central Bank. Production information data from NAMDEVCO consists only of a few years of data but can be provided. In response to a question from Mr. Kerr, Mr Ragbir indicated that flooding data can

6.9 Mr Kerr (TTMS) stated that the CSWT at its last meeting conducted a situational analysis among member sectors to determine what was being done in each sector based on the MSD dry spell outlook. This provided some feedback from the different sectors on what was being done in their respective sectors.

6.10 Dr. Cedric Van Meerbeeck (CIMH) stated that a drought plan must consider all sectors and cannot be answered in one sector but across the entire country. He stated that CIMH can attempt to support the country with drought planning strategies and drought policy advice that may be required. What is included, according to Dr. Meerbeeck, is not only an overview of what is the problem of drought but also what are the early warning products that can help trigger the action plans and right drafts of the drought plan and drought policy. This is due to the consideration for water availability and where it is most and best needed.

6.11 Mr. Kerr (TTMS) explained that one of the deliverables of CSWT for 2016 was a policy document which could be used as a national drought policy.in the event that the need arise for one.

6.12 Mr. Aldon Jasper, Operations Officer, Coast Guard, stated that it is important to ensure that the decision makers in the CSWT can speak on behalf of their organization. He stated that a s a gap analysis will ensure that all key sectors are represented in the CSWT to create the necessary synergy needed to make progress on the climate services agenda.

6.13 Mr. Kerr (TTMS) replied that institutions not present at previous meetings were specifically targeted to ensure their cooperation in future meetings. Mr. Kerr explained that what would be more practical was that the same representative from a sectorial organisation should attend meetings with an alternate, in order to have consistency and continuity of information throughout the process.

6.14 Mr. Ragbir (NAMDEVCO) added that with respect to transmission of information to the farmers, in his experience SMS messaging is one of the best means of dissemination. It may be the fastest and most effective way in relaying the information as opposed to checking the online website as the majority of farmers are not computer literate or equipped with Smart Phones.

6.15 Edric Harry, Policy Analyst and Planning Specialist, Inter-American Institute for Cooperation on Agriculture (IICA) said that information can also be relayed to the soil scientists, entomologists, etc. who can further help with the understanding of the data. They can use this data to see how it can further assist society by interpreting information as it impacts on the farming committee.

6.16 Mr. Aldon Jasper (Coast Guard) stated that even though there is a body of knowledge in terms of scientific information that is available, making the information user-friendly and translating the information so that persons can understand and appreciate is always challenge. Therefore it needs to be communicated in a form that people can interpret which is best suited for their needs whether it is providing maps, charts, etc.

6.17 Ms. Bradshaw (ODPM) in bringing the session to a close explained that there is a need to recognize the CSWT provides a novel way in which scientific information for various sectors can be presented in a way that is usable to persons unfamiliar with such information. She stated that utilizing such information can allow sector users to increase their understanding of their sector and the partners with whom they work. Ms. Bradshaw calls for the capacity of information sharing between sectors to increase which can lead to the formation of a better relationship and understanding of each other's needs. Ms. Bradshaw told representatives that they needed to help the TTMS and CIMH to understand their sector and also what can be provided with respect to Climate Services to aid in progress in each sector. Mr. Kerr added that representatives needed to continue educating one another more about their sectors. The workshop concluded with the TTMS extending thank you to the CIMH for facilitating the workshop, which aimed to benefit the Caribbean region as a whole.

## **Conclusion**

It is clear that the Trinidad and Tobago Meteorological Service (TTMS) is engaged in climate services that are aligned to the country's needs, targeted policy support actions and programs but absent is a robust climate research programme. Furthermore, the TTMS approaches its climate services program through both official and ad-hoc collaboration and initiatives. The TTMS therefore contributes to and supports a range of activities related to the use and provision of climate services. These Services include provision of climate data, products, information, knowledge and expertise as it pertains to understanding and informing decision making at the national level in the areas of climate related adaptation, mitigation, impacts, vulnerability and risk assessment and management.

Even so, stakeholders are still seeking information about changes, consequences and other possible outcomes related to climate impacts. These stakeholders come from a number of sectors including stakeholders from the energy sector which is the main contributor to the country's Gross Domestic Product. Several stakeholders indicated an appreciation for the wide range of information, products and expertise provided by the TTMS but conceded that there was a gap on the awareness among stakeholders on the extent of the products available and the wide reach of climate services. Another gap highlighted was the need for greater sector specific climate related studies that can inform product development for users and decision support related to the management of risks. At the same time, emanating from the consultation is the knowledge that a number of important stakeholders including policymakers, managers,

engineers, practitioners, researchers from the energy, agriculture, water, health, aviation, drainage, disaster risk management sectors, as well as the media, the public and students regularly use the TTMS climate services in ways that added value. While the climate service provided by the TTMS is based on science, there needs to be a stronger element of sector related input, users' requirements, capacity building in terms of use and interpretation of climate information and integrating climate impact data into the delivery of sectorial services.

## Appendix 1

## List of Participants

NAME	JOB TITLE	ORGANIZATION
<b>Caribbean Institute for Meteorology and Hydrology</b>		
Dr. Cédric van Meerbeeck	Climatologist	CIMH
Dr. Roché Mahon	Postdoctoral Researcher	CIMH
<b>Trinidad &amp; Tobago Meteorological Service</b>		
Mrs. Arlene Aaron-Morrisson	Deputy Director (Ag.)	TTMS
Mr. Kenneth Kerr	Chief Climatologist (Ag.)	TTMS
Ms. Camille Hall	Corporate Communications Officer	TTMS
Ms. Narisha Ramnarine	Communications Assistant	TTMS
Mr. Kevin Sahai	Research Assistant	TTMS
Mr. Dev Singh	Research Assistant	TTMS
Mr. Kashif Jacob	Research Assistant	TTMS
<b>Agriculture</b>		
Ms. Dhano Sookoo	President	Agricultural Society of Trinidad and Tobago
Ms. Shureen Hosein	Member	Agricultural Society of Trinidad and Tobago
Mr. Edric Harry	Policy Analyst and Planning Specialist	IICA
Mr. Kahlil Hassanali	Research Officer	Institute of Marine Affairs
Mr. Rajesh Ragoon	Medical Entomologist	IVCD
Mr. Roosevelt Jacob	Agricultural Engineer I	Ministry of Agriculture, Land & Fisheries
Mr. Prakash Ragbir	Manager ICT	NAMDEVCO
<b>Disaster Risk Reduction</b>		
Ms. Christal Mapp-Reid	Project Engineer	NIDCO
Ms. Shelly Bradshaw	Mitigation Manager	ODPM
Ms. Jainey Herrera	Research Assistant	ODPM
Mr. Aldon Jasper	Operations Officer	Trinidad & Tobago Coast Guard
Mr. Dave Isaac	Fire Station Officer	Trinidad & Tobago Fire Service
Mr. Mervyn Layne	Assistant Chief Fire Officer (Ag.)	Trinidad & Tobago Fire Service
<b>Energy</b>		
Mr. Micheal Scipio	Marine Manager	Atlantic LNG
Ms. Megan Murray	Associate Professional	Ministry of Energy & Energy Industries
Ms. Zahra Cielto Bowrin	Environmental Assistant	Ministry of Energy & Energy Industries
Mr. Allan Deonarine	HSE Specialist	Petrotrin
Ms. Janice Dookharan	Snr. HSE Specialist	Petrotrin
Ms. Shiria Ali	Safety Inspector	Trinidad & Tobago Electricity Commission

Ms. Shawnette Harris-Reid	Snr. Planning Engineer – Research & Support	Trinidad & Tobago Electricity Commission
Mr. Curtis Fraser	Air Traffic Management Officer - ATMO	TTCAA
Mr. Robert Rooplal	Air Traffic Management Officer - ATMO	TTCAA
<b>Health</b>		
Ms. Devika Motilal	Manager Health & Safety	NWRHA
Prof. Dave Chadee	Prof. Environmental Health	UWI
Ms. Kerresha Khan	Researcher	UWI
<b>Tourism</b>		
<b>Water</b>		
Mr. Shastri Gunness	Drainage Engineer	Drainage Division
Mrs. Jacqueline Bailey-Howell	Chief Engineer	Drainage Division
Mr. Keith Meade		WRA
Ms. Patricia Massiah-Payne	Assistant Hydrologist	WRA
<b>Media</b>		
Mr. Verne Burnett	Associate Editor	Newsday
Mr. Ean Wallace	Weather Anchor	CNMG
Mr. Negel Alexander	Camera	CNMG

## Appendix 2      Agenda Outline

TIME	SESSION	RESOURCE AGENCY/PERSON
8:30 – 9:00	Arrival and registration	All
9:00 – 9:05	Welcome remarks	Arlene Aaron-Morrison (TTMS)
9:05 – 9:15	Introduction of participants/Icebreaker	TTMS and CIMH
9:15 – 9:30	<b>Session 1</b> International, regional and national context of climate services	The GFCS and the Caribbean RCC approach to the delivery of user-oriented climate information, products and services
9:30 - 9:50	(Chair: Camille Hall, TTMS)	Meteorological and Climate Service Delivery of the Trinidad & Tobago Meteorological Service: Past, Present and Future
9:50 – 10:00		Discussion
10:00 – 10:15	<b>Coffee break</b>	
10:15 - 10:35	<b>Session 2</b> Sectoral applications of Climate Information Products and Services	CIMH Early Warning Information Products: An Overview (with examples of regional and national level use)
10:35 – 10:50	(Chair: Roché Mahon, CIMH)	The Use of Climate Early Warning Information in climate sensitive sectors -Water Sector -Agricultural Sector
10:50 – 11:00		Discussion
11:00 – 11:15	<b>Session 3</b> ENSO and Early Warning	ENSO Past and Present - National Implications
11:15 – 11:35	(Chair: Roché Mahon, CIMH)	Discussion on on-going and expected climate impacts
11:35 – 11:55		Reporting out on User Driven Early Warning Information solutions
11:55 – 12:40	<b>Lunch</b>	
12:40 – 1:40	<b>Session 4</b> Baselining provider capacity and user needs	Baselining User Needs - Data Collection Session
1:55 – 2:10	(Chair: Cédric Van Meerbeeck, CIMH)	Provider Capacity to deliver climate services in the Caribbean: A Preliminary Baseline Assessment
2:10 – 2:20		Discussion
2:20 – 2:30	<b>Coffee break</b>	
2:30 – 3:15	<b>Session 5</b> Way Forward	Discussion on options for national governance of the climate services agenda
3:15 – 3:20	(Chair: Shelly Bradshaw, ODPM)	Close