# ICCS 4

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# Abstracts

## Table of Contents

# Abawi, Yahya

## Development of a Decision Support Tool to Inform, Educate and Provide Early Warning of Disease Outbreaks in Developing Countries

The link between climate variability and diseases such as malaria, dengue, cholera and other vector-water borne diseases in developing countries is well documented. The recent outbreak of Ebola virus in West Africa is also thought to be associated with a significant change in climate patterns from a very dry to a very wet season bringing abundance of wildlife and potential carriers of the disease closer to human population. Despite this link and the advances in technology such as GPS, mobile phone and internet, the use of these technologies as an early warning system to inform policy makers and educate at-risk populations has received little attention. The rapid adoption of the internet and mobile technology in developing countries provides an opportunity to develop early warning systems for effective dissemination of information to prevent and or manage disease outbreaks. In this paper we develop an initial framework that provides guidelines for information and health education through a combination of disciplines in climate science, education, psychology, marketing and mobile technology. The approach is discussed using case studies in developing countries. The findings of this study could assist future communication strategies and avenues to prevent and or manage disease outbreaks.

# Abawi, Yahya

## A Decision Support System for drought monitoring and early warning in South-West Pacific

Climate variability in the Pacific is a combination of seasonal, inter-annual and decadal phenomena related to variations in the Southern Pacific Convergence Zone (SPCZ), the Inter-tropical Convergence Zone (ITCZ), the El Niño-Southern Oscillation (ENSO) and the Inter-decadal Pacific Oscillation (IPO). Of these, ENSO is the most dominant phenomenon affecting the climate of many Pacific Island countries and causing large variations in seasonal and inter-annual rainfall. Drought is a major hazard facing the agricultural and water resource sectors of the Pacific and is usually associated with El Niño events in the south-west Pacific (Fiji, Vanuatu, Samoa, Tonga, PNG, Solomon Islands, Southern Cook Islands) and La Niña events in central and eastern equatorial Pacific (Tuvalu, Kiribati and northern Cook Islands). Lessons learned from past droughts demonstrate the need for effective and timely forecasting of drought, early warning systems, response strategies and quantitative measures of drought. A Decision Support System was developed to produce forecasts of rainfall based on the relationships between Sea Surface Temperature (SST) anomalies in the Pacific Ocean (or the Southern

Oscillation Index) with historical rainfalls. To identify major drought events, time series of rainfall percentiles for a range of accumulation periods (representing meteorological, agricultural and hydrological droughts) were used to define early warning of 'drought' (< 40 percentile) and drought episodes (<10 percentile). For each region, it was found that warning events that lead to drought repeatedly occurred during particular ENSO phases. Results were then used to develop an ensemble forecast of 'droughts' based on the 'current' ENSO phase as an early warning system. The application of these results in the management of water resources, health, agriculture and renewable energy in small Pacific Islands countries are discussed in this paper.

## Alcoz, Silvana

### Drought risk management from seasonal climate forecasts

Responding to the National Emergency System (SINAE) call, at the end of October 2010, for institutions at the national and department level to respond to the negative precipitation anomaly expected since mid 2010, the National Water Directorate (DINAGUA) decided to develop a wide-span institutional participation strategy in the Department of Canelones, identifying the hydrologic risk using indicators of future water availability, and combining it with the local expertise on the vulnerability of users in relation to the demand of water for human and animal consumption, all to help the decision making process in the definition of the necessary measures for each institution to undertake.

## Allen, Teddy

### Integrating interviews into climate based research: how Caribbean farmers drive synoptic climatology diagnostic and rainfall prediction activities

The user perspective can be a valuable link in climate applications research. Interviews or surveys that integrate the human perception can complement physically based research to produce often unexpected results. This concept is illustrated during a field campaign initially designed to understand how rainfall variability in the mid-summer impacts Caribbean farmers. The results from direct farmer interviews in Jamaica, Dominica, and Trinidad suggest that the Caribbean "mid-summer drought" does not affect farmers equally throughout the Caribbean. Instead, the mid-summer depression in rainfall has the greatest impact on Jamaican farmers while having little consequence with farmers in Trinidad and Dominica. Moreover, discussions revealed that collectively farmers from each island are more concerned with the timing and duration of the early season rainfall during the late spring. These farmers revealed greater value in diagnosing and predicting early season rainfall rather than the initial research question focusing on the prediction of the Caribbean mid-summer drought. Including the farmer

interview process into the research method allowed us to make two major conclusions: 1) mid-summer drought prediction should be focused on the western Caribbean and 2) diagnosing and predicting early season rainfall during the late spring has more utility for Caribbean farmers that seek to maximize their strategies during the first growing season. Diagnosing the dynamical forcings for springs rains in the Caribbean and investigating their predictability have been a major results from integrating farmer responses into the overall physically driven research.

## Anderson, Glen

### Mid-level assessment: Climate forecasting in Kazakstan

Under the USAID-funded Climate Resilient Wheat Project, an assessment of the current suite of climate services products to support decision-making in the wheat sector was conducted. A range of options were identified including strengthening the monthly and seasonal forecasts, improving the drought index, and incorporating climate information in the wheat yield forecasts that are prepared at the beginning and throughout the growing season.

## Anderson, Glen

### Economic valuation of climate services activities

This session will take initial steps in developing the scope of work for a study to assess current and future climate service activities in Rwanda, based on the methodologies highlighted in the forthcoming book Forecast Value: Economic Assessment of Meteorological and Hydrological Services, which has been produced by a joint working group organized on behalf of the World Meteorological Organization, the World Bank, and the CSP Working Group on Economic Valuation.

## Arnott, James

### The rugged path to effective decision support: insights from users, practice, and theory in mountain and coastal areas

A growing body of case studies and a rich literature of theory exist on what makes for effective climate-related decision support systems (DSS). Still, more work is needed in connecting the theoretical underpinnings of successful decision support to on-the-ground experiences in wide ranging biophysical and socioeconomic contexts. Furthermore, the capacity to develop relevant insights from the comparison between case studies is essential for effective dissemination of lessons from site-specific examples to the broader community of climate services providers and users. The research outlined here—drawing from observations of structured encounters between DSS designers and users in a diverse set of human and physical geographies (i.e.

mountain and coastal areas)—promises to add greater clarity and practical guidance to the theory and technique of DSS development. Over the course of 2013, the Aspen Global Change Institute and the Climate Service Center hosted a diverse set of stakeholders from mountain and coastal communities to explore the conditions and practices needed for effective climate-related decision support. Connecting this active set of users of climate information with designers of DSS and other research fields provided a rich opportunity for observing the interface between providers and users of climate information in practice. The result of this effort reinforced the already observed need for enhanced usability of such tools and sustained interaction between researchers and practitioners. In addition, the discussions surfaced novel ideas about "dialogue support tools" as a decision support resource and the need for moves toward integrative structures in both research *and* planning/decision-making. Results from the AGCI/CSC dialogues, connections to ongoing examples in research and practice, and insights to inform future work in the determination of what constitutes effective DSS will be presented.


## Ayal, Desalegn

### Indigenous Biotic Climate Forecasting Among the Borana Smallholders

Indigenous climate forecasting based on inference of biotic signs is not new to smallholders. This study assesses how traditional climate forecast experts among the Borana smallholders make climate forecast based on a reading of intestinal, plant and animal body languages readings. Questionnaires, field observation, FGD and interview were employed to obtain relevant data. Field data was corroborated with data obtained from the National Metrological Agency. The different signs and symbols used by traditional experts to make climate forecast were examined in relation to the scientific explanation of those signs and symbols. Besides, the study compared the oral data depicting the climate forecasting made over the last 27 years with instrumental rainfall records of Standardized Precipitation anomaly over similar period. Unlike the highly descriptive approach of previous researches, this article provides a critical analysis to explain why the claims different biotic traditional climate forecasting practices should not be accepted or dismissed at face value before repeated observation and scientific experimentation. It pinpoints the interpretations of the various biotic signs by traditional experts and how the same signs are understood by experts of modern science. However, this study suggests that in recent years most indigenous biotic climate forecasting methods can hardly be endorsed given their inherent faults. Furthermore, the study explains how public confidence in the veracity of indigenous climate forecasting skills is gradually eroded to the extent that traditional 'experts' are being treated with contempt by the society. This article proposes how the predicaments of smallholders could be reduced through a better management of climate forecast information.

## Barrios, Camilo

### Climate Smart Agriculture- Reducing uncertainty on what, and when to grow rice in Colombia

In Latin America, the increasing climate variability has become a challenge for farmers as traditional landmark knowledge is not as useful as it used to be. Seasons (rains) are not taking place in the same time as before, and crops are experiencing more extreme climatic events. As a result, average yields of rice in Colombia have dropped (from 6t/ha in irrigated rice before 2009 to 5t/ha today) and the sector didn't manage to recover them. New approaches are required to provide farmers with updated and relevant information to support them in the decision making process, and make them more resilient to climate change. Novel use of ICTs and the possibility of following the principles of Big Data for capturing, analyzing and sharing large amounts of information in agriculture offer an alternative to approaches based on small scale studies. We used artificial neural networks (ANNs) and clustering techniques to analyses commercial harvest monitoring data from the rice sector in Colombia, combined to climate information at a daily resolution. We identified main climatic limiting factor in several rice producing areas, and characterized the response to climate of different cultivars. We then linked our results to seasonal forecasts to generate recommendation for rice growers in two regions on what will work best by the end of 2014.The methodology proved its capacity to generate relevant insights about the rice system by using commercial data (noisy but numerous) . This study is the first step towards a complete Decision Support System (DSS) for farmers in Latin America that will also include soil and management factors. We developed a two way information system to support the data capture, based on a web platform, an android app and a cloud-hosted SQL database.

## Blamey, Ross

### Supporting & developing climate service practitioners

Given the public position climate service providers are in, there is a need to further refine climate service activities and assist those currently working in the field. Identifying the attributes or skills of a well-rounded climate service provider remains a challenging task.  It does raise the question whether it is even possible to determine what the recommended background of an individual working in climate services requires?  De Elĺa puts forward the suggestion that building well-rounded climate scientists, equivalent to "family doctors" in medicine, could be a solution.  This may alleviate some of the pressure on climate scientists turned service providers, particularly around aspects of communication. However, guidelines on the recommended scientific background of climate service providers are near non-existent, but are potentially something that could be of great use. It is proposed that at ICCS4, a session is dedicated to identifying common ground amongst the climate service providers regarding skill requirements of those involved in the field of climate services.  This may even go some way to developing a common code of practice amongst climate service providers. The

session will contain a few key presentations followed by a facilitated discussion session in break-out groups. These break-out groups will focus on the actions of climate services providers and how those actions translate into consequence in user decision-making. The purpose of the session is to explore the complex world of climate services and the demands and challenges it places on providers. It could broaden the mind-set of the group and potentially identify a set of recommendations to put forward to the general climate services community that might act as a pre-cursor to a climate services code of practice. Such recommendations would add valuable support to providers in the complex area of user engagement.

## Boulanger, Jean-Philippe

### Climate services for wind farm production: Experience of a start-up in Argentina

ECOCLIMASOL is a start-up created in 2011 to design and implement climate risk management solutions for public and private institutions. ECOCLIMASOL is a spin-off of public research. In particular, its founder, Dr. Jean-Philippe Boulanger, has dedicated 20 years to climate research in CNRS and IRD in France, coordinating, from the University of Buenos Aires, two European projects (FP6 and FP7; CLARIS LPB; www.claris-eu.org) on climate change in La Plata Basin and adaptation strategies in agriculture and hydrology. In the framework of an Argentinean public-private consortium (CONICET-CIMA-ECOCLIMASOL), the public company CAMMESA, ensuring the dispatching of electric production in Argentina, hired CIMA-ECOCLIMASOL to provide high-resolution wind farm production forecasts. In a first part, we will describe the different steps, which allowed ECOCLIMASOL to creating a fully tailored operational forecast system, competitive at international level, result of a high investment, despite a small structure and a very low income from CAMMESA. In a second part, we will discuss how difficult it is for a local start-up to enter in a market of climate services concentrated in few international actors and how national decisions can either impede or foster the growth of climate services provided by local private companies, and thus the creation of highly-qualified jobs for professionals formed by internationally recognized universities. We will also focus on the importance of establishing a synergy between public and private institutions, which is key to strengthen the growth of climate services in emerging countries and to generate private highly-qualified job opportunities.

## Brasseur, Guy

### The Earth Academy: Concept and Projects

The Earth Academy develops research and educational networks/partnerships that integrate knowledge and build capacity on questions related to the Earth System, and specifically human-driven climate and other environmental changes, their impact on the socio-ecological systems, and the societal transformations required to address these changes. The Academy will develop as an international network on research and

education institutions interested in capacity building. Several nodes (regional offices) will be established in South America, Africa, Asia, Europe and North America where training sessions and think tanks will be organized. The Academy will support each year approximately 10 Fellows. These junior professionals are future leaders identified by the Academy in different parts of the world, who will work together on some challenging interdisciplinary Earth system problem. They will cooperate with institutions that are part of the Academy's network.The Earth Academy, currently in its development phase, could act as a vehicle for educational activities originating from climate services and support the mission of the Climate Service Partnership.

## Brown, Glenroy

### Climate products for the agricultural sector: the Jamaican Context

The agricultural sector is vulnerable to severe weather events; climate variability will continue only increase this vulnerability. Information products which could enhance the decision-making process were developed through a collaboration between the Meteorological Service, Jamaica and the Ministry of Agriculture and Fisheries (MoAF). One of the main products which was developed through this collaboration was the drought forecasting tool which was a first for the region. Through the Caribbean Climate Outlook Forum (CariCOF) lead by the Caribbean Institute for Meteorology and Hydrology (CIMH) and International Research Institute for Climate & Society (IRI) this tool has now been replicated for the Caribbean region. Dissemination and training in the utilization of these products were also addressed through collaboration between ACDI VOCA, Rural Agricultural Development Authority (RADA) and the Meteorological Service. While only a few farmers and extension staff have been exposed to the products the responses have been very promising and we believe that buy in on a larger scale is possible with the intervention of MoAF through implementation of policies and provision of funding to integrate these products into operational activities.

## Cal, Adrián

### Sistema de monitoreo ambiental por seccional policial

El éxito y la sostenibilidad de las empresas agropecuarias están fuertemente asociada al constante incremento de su competitividad. Esto requiere que los productores incorporen nuevas tecnologías y que integren a su gestión nuevos elementos que permitan una mejor planificación y disminución de los riesgos. Las circunstancias climáticas adversas es uno de los principales riesgos asociados a la producción agropecuaria. El desarrollo de sistemas de información que contribuyan a la planificación e implementación de medidas anticipatorias para el manejo de riesgos climáticos resulta de importancia relevante. El objetivo del Sistema de Monitoreo Ambiental por Seccional Policial (SIMASP) es tener disponible información al nivel de la unidad administrativa de seccional policial de variables que contribuyan a la gestión de

riesgos climáticos en la producción agropecuaria. Estas variables son: agua no retenida en el suelo, NDVI, porcentaje de agua disponible en el suelo, y productividad primaria aérea neta. Esta información está disponible online y es de libre acceso para todo público.

## Carr, Edward

### Co-producing with whom?

Engaging, understanding, and working with the end-users of climate services are all essential to the design of products that deliver salient, credible, and legitimate information. Such efforts, however, raise the question of how to identify and characterize end users such that their experiences, ideas, and needs can be incorporated into the design of climate services. Drawing on lessons from work in Mali, Senegal, and Zambia, I argue that the broadest productive definition of end-users are those who make decisions about climate-sensitive activities – often livelihoods activities – among the target population. Identifying these users requires particular forms of information: what are the climate-related livelihoods activities among the targeted user population, who is responsible for what decisions and activities in those livelihoods, and what factors enable and constrain these decisions and activities? Thus, co-production begins with rigorous field-based inquiry among the intended beneficiaries of climate services to identify who to engage in the co-production of climate services, and how best to foster that engagement.

## Carr, Edward

### Really effective…for 20% of the men: Lessons for Climate Services from Mali

The findings of the Humanitarian Response and Development Lab's (HURDL) assessment of Mali's Agrometeorological Advisory program suggest that the decisions of a very small, highly gendered subset of its intended beneficiary population are informed by these advisories. At the same time, these findings suggest that those using the advisories follow them very closely, even after years of use in which they have been more and less accurate. This oddly contradictory finding points to the need for deep evaluations of climate service impacts, and raises questions of how to interpret similarly contradictory findings of future climate service assessments.

## Chaumont, Diane

### Communicating with the VIA community:  A guidebook on climate scenarios

The reality of climate change is forcing decision-makers to evaluate the risks, vulnerabilities and opportunities which are associated with a changing climate. This requires users to become better equipped at understanding and using climate information. The goal of the guidebook on climate scenarios is to help decision-makers

to familiarize themselves with different types of climate information so that this information becomes increasingly incorporated into an adaptation framework. The guide is geared to all those involved in climate change adaptation, from the early stages of awareness to those concerned with implementing adaptation measures. The document is organized around three main sections. The first presents a unique way of classifying climate information using a decision-tree. This tool is used to orient users toward three broad categories of climate information, namely basic, intermediate, and detailed, which are based on numerous factors such as the use of the information, the climate variables of interest, and the spatial and temporal scales over which the information is needed. The second section presents a catalogue of different formats that can be used to personalise and tailor climate information to different users, based on their expertise and personal preference, for instance. This section aims to help users better analyse different types of climate information products and to better evaluate the usefulness and the limitations of the climate information that is presented to them. Finally, a third section explains numerous climate modeling concepts. Overall, the guide highlights how all climate information, regardless of its complexity, can serve to make decisions. What is important is to choose the correct information for the appropriate purpose.

## Choularton, Richard

### Food Security Climate Resilience Facility (FoodSECuRE)

WFP is developing the Food Security Climate Resilience Facility (FoodSECuRE). This multilateral, multi-year, replenishable fund is designed to financially and programmatically support community-centred action to reinforce and build climate resilience. FoodSECuRE will trigger: (1) Early action based on climate forecasts. FoodSECuRE will use seasonal climate forecasts to trigger funding for community-level resilience building before climatic shocks occur (e.g. 3-6 months before a failed harvest). Activities may include the scaling-up of nutrition programmes and high quality asset creation or repair. (2) Post-disaster resilience building. FoodSECuRE will provide predictable multi-year funding for resilience interventions following a climate disaster. This will ensure operations do more than simply support recovery from a particular disaster; and build resilience, food security and nutrition in the face of growing climate risks.

## Ciganda, Carmen

### Mercosur Strategy on Climate Change & Health

The Mercosur Strategic Action "Protecting Human Health Effects of Climate Change" aims to strengthen the capacity of the Mercosur bloc to assess and monitor vulnerability, risks and health impacts due to climate change. The strategy defined five lines of action which are: evidence, advocacy, partnerships, resources and adaptation.

One advance toward the development of the strategy was a training course for climate and health professionals, academics, and members of meteorological services of Mercosur countries; this course was organized in partnership with the Inter-American Institute for Global Change Research, the Uruguay Ministry of Health, and PAHO in 2011 under the overall coordination of the International Institute for Climate and Society of Columbia University in New York. This course demonstrated the commissioning strategy, where the use of partnerships, awareness, and training of human resources led to the development of seed projects including "Climate variability and it's likely impacts on the health of cities in Latin America: Buenos Aires, Santiago, Montevideo, Salto, and Manaos;" and "Behavioral diagnosis of communicable diseases in relation to climate variability in border towns between Brazil and Uruguay."

## Coelho, Caio

### Developing climate monitoring services to address challenging users questions

Users ranging from the general public, the media, applied sectors (e.g. agriculture and water resources) and high level governments are constantly looking for answers for a number of climate related questions relevant to their activities, decisions and strategic planning. This talk will describe the efforts currently undertaken at CPTEC/INPE to address some of the challenging questions these users constantly raise, particularly in terms of developing novel precipitation data-driven climate monitoring products to help answering these questions. Examples of precipitation products for the southeast region of Brazil, which is currently experiencing severe drought conditions with major impacts in water availability for public consumption, hydropower generation and agriculture, will be shown. These products were developed to help answering user questions such as: Has the region experienced drought condition in the past? When have similar drought conditions been observed in the past? What has been the observed precipitation pattern in the region in the last years? How severe/rare is the current drought? When does the rainy season typically start/end in the region? The development of climate monitoring services as illustrated in this talk to help better manage the risks of climate variability addressing these challenging user questions is aligned with two priority areas of the Global Framework for Climate Services (GFCS): water and agriculture.

## Cox, Shelly-Ann

### The Caribbean Climate Impacts Database and its role in disaster risk management

The Caribbean Climate Impacts Database (CID) is a comprehensive open-source geospatial inventory populated by historical impacts occurring as a result of climate variability and impacts caused by hydro-meteorological hazards. The CID also includes planning and response mechanisms used in the DRM sector in the form of Standard Operating Procedures. This database offers benefits to the DRM sector in the Caribbean

especially through its integration in the Dewetra Platform. The Dewetra Platform is a real time geospatial DSS that allows disaster managers to improve the effectiveness of sustainable planning. Including the CID on the platform provides evidence-based information to inform decision making and allows other pertinent information such as climate products and geographic information to be overlaid resulting in a comprehensive early warning information system across Climate Time Scales (EWISACTS).

# Crouthamel, Rick

## Historic hydrometeorological data most useful to a user may not yet be available

Over the past many years, climate services for the user community have focused on the scientific and operational applications that are based on available historic and current hydrometeorological data. For example, applications showing likelihood of mud slides, flash floods and other hydrologic tragedies use currently available digitized data such as three hourly and six hourly precipitation amounts from synoptic observations within specific basins as input to baseline their programs. Many of these programs, run by national meteorological and hydrologic services, and disaster preparedness agencies utilizing hundreds of cases, defined the height and timing of a flood crest based on these three and six hourly precipitation amounts over a river basin. For example, since the mid 1800s, millions of analog precipitation charts existed throughout the world having recorded and archived continuous precipitation rates and accumulations from tens of thousands of locations. Until recently, the world climate services community had to ignore these detailed records for there was no easy and accurate way to digitize those analog data and their applications had to rely on the 3 and 6 hourly synoptic precipitation amounts. However, within the past six months, a program called "Weather Wizards" has been developed to use crowd-sourcing techniques to digitize these analog precipitation charts with precipitation amounts delineated in intervals as short as 15 minutes. So within the next year, specialists will have rainfall amounts and intensities available as input to their applications at 15 minute intervals rather than the previous 3 or 6 hour periods. This much more detailed data will open up scores of new or modified applications to benefit the user community. However, if we merely ask the user community what information they need to apply to their own situations, they will invariably relate their needs to the data they know are readily available for they have no way of knowing what will be available within the next few months. Thus, before we can proceed with soliciting ideas from the user community as to how our climate services/applications can best benefit them, the user community must be educated in not only the data and applications that are currently available but also in the data and applications that will soon be made available to them. Educating the user community is an on-going dynamic process that necessitates constant dialogue with the user community and the organizations which have direct regular contact with them.

# Dinku, Tufa

## Enhancing national climate services in Africa

The International Research Institute for Climate and Society (IRI,) in collaboration with National Meteorological Agencies and Regional Climate Centers, has been leading an effort to simultaneously improve the availability, access and use of climate information at the national level. This effort, named Enhancing National Climate Services (ENACTS), focuses on the creation of reliable climate information that is suitable for national and local decision-making. Data availability is improved by blending national observations with satellite and other proxies. Data access and use is improved by providing online tools for data visualization and download and training users. The online tools are integrated into the National Meteorological Services' web pages. The ENACTS approach has five major components:

1. Building technical capacity at the National Meteorology Agency to generate and use information;
2. Generating over a 30-year time series of rainfall and temperature data for every 4 km grid across each country;
3. Customizing and installing the very powerful IRI Data Library at the National Meteorology Agency;
4. Developing an online mapping service providing user-friendly tools for the analysis, visualization, and download of co-produced climate information products; and
5. Engaging stakeholders on the use of new products and services, training them on available tools, as well as incorporating their feedback and requirements into further product development.

The ENACTS approach overcomes traditional barriers in data quality and access. The spatially and temporally continuous datasets allow for characterization of climate risks at a local scale, and offer a low-cost, high impact opportunity with major potential to support climate resilient development. Making this type climate information available to the user community supports a suite of solutions that can shore up development gains and improve the lives of the most vulnerable in the face of climate variability.

ENACTS has so far been implemented in Ethiopia, Madagascar, Tanzania, Rwanda, and The Gambia at national levels, and at the regional level for the CILSS countries. It is expected to be implemented soon in Ghana, Mali and Burkina Faso.

## Genta, José Luis

### Intergovernmental Coordinating Committee of the La Plata Basin countries
The Intergovernmental Coordinating Committee of the La Plata Basin countries (CIC) – includes Argentina, Bolivia, Brazil, Paraguay and Uruguay – through its Framework Program for the sustainable management of its water resources, convenes and coordinates the academia, decision makers and users of the water resources of the 5 countries. It encourages the development and integration of the monitoring networks, the information system, and the tools to analyze the integrity of the hydrologic cycle from a basin perspective, incorporating the whole chain of stakeholders involved in climate services. This session will feature presentations from five meteorological and hydrological services of the La Plata Basin.

## Harding, Andrew

### Climate Services for Scottish Policy
Scotland funds three 'Centres of Expertise' to provide publicly funded research to Government policy makers, on Water, Animal Disease, and Climate. The last of these, ClimateXChange, has been providing Climate Services direct to Scottish Government since 2011, the same year as the establishment of the GFCS. The model used is a centralised service that pulls together a wide network of researchers in a highly tailored fashion to work with national level agencies, to answer 'call down' queries as they come in, and to scan the horizon for gaps in Scotland's adaptation capacity.

## Harding, Andrew

### Research Priorities for Policy Needs
For Climate Services, the policy context offers some unique challenges. Time constraints vary from the immediate to the short term, projects often revolve around the intersection of multiple agencies, and the context of work required is likely to change over the course of any given year. Long term capacity building may not always be welcomed by policy-focussed customers. The development of research for public needs must be carefully considered, constitute a (preferably inter-related) series of small to moderate victories, and be immediately useful to end users.

## Hardoy, Jorgelina

### Prevention & adaptation actions in the Riberas project: Advancing on local urban climate change agendas through multi-stakeholder collaboration

The Riberas project is a 3 year project that aims to: 1.analyze the impact of climate change and variability on coastal areas of the Rio de la Plata: Carmelo and Juan Lacaze (in Uruguay), Tigre and San Fernando (in Argentina); 2. Draft local climate change adaptation guidelines through a multi-stakeholder process. It is funded by IDRC and implemented jointly between IIED – América Latina and Amigos del Viento. The hypothesis that guides the research project is that a better understanding of local socio-environmental, economic and institutional conditions builds social capital, and together with improved collaborative work increases resilience and favors the implementation of CC adaptation plans. The project moves on the inter-phase between the generation and use of scientific information on local hydro-climatic dynamics and the identification of local adaptation measures (planned or spontaneous) developed within a changing context (urban development trends, institutional and socio-economic changes). The project generated a local information base (hydro-meteorological, socio-institutional, economic, and urban) which was validated with different participating stakeholders. The project also looked into the socio-institutional framework operating in the four selected municipalities in an attempt to analyze existing capacity to support effective climate change adaptation and identify what else is needed. Based on project findings, we used key activities prioritised my community members (such as developing people centred early warnings systems, participatory videos, set up a micro – credit program geared to adapting houses, etc.) as entry points to develop a multi-stakeholder process to address flood risk in the context of climate change and draft local adaptation guidelines.

## Hidalgo, Cecilia

### Innovative institutional structures and partnerships: the provision of climate services in Southeast South America

This presentation shares preliminary results of an ongoing research on the recently launched RCC-SSA carried by the Project Towards usable climate science - Informing sustainable decisions and provision of climate services to the agriculture and water sectors of southeastern South America (Inter-American Institute for Global Change Research -CRN-3035). Collaborative production of knowledge between scientists (social and natural) and stakeholders (governmental and nongovernmental) around the provision of climate services in SESA is being monitored and analyzed.  As innovative institutional structures and partnerships are emerging, the novelty of the process urges documentation and reflection on the dynamics of cooperation. Two main senses of co-production have been distinguished and elicited in current claims for knowledge able to support adaptation decisions, provide straightforward estimates of uncertainty, and meet the needs of climate-sensitive sectors. One points to interdisciplinarity and social participation, to the articulation of the talents, perspectives and values needed to

produce relevant and usable knowledge. The other highlights the intertwined transformations of identities, institutions, languages and discourses that characterize the workings of science and technology within society.  Taking these conceptual distinctions into account, we characterize the evolution of the network and specific limitations or barriers for the development, implementation, and provision of climate services in SESA, from both the supply and demand sides.

## Hoell, Andrew

### The Famine Early Warning Systems Network Monthly Forecast Review for Food Security Analyses

FEWS NET, the Famine Early Warning Systems Network, is a leading provider of early warning and analysis on acute food insecurity.  Created in 1985 by the US Agency for International Development (USAID) after devastating famines in East and West Africa, FEWS NET provides objective, evidenced-based analysis to help government decision-makers and relief agencies plan for and respond to humanitarian crises. Detailed analyses of future food insecurity depend upon reliable climate forecasts and require close collaborations between food security personnel and climate scientists.  The Monthly Forecast Review is a tool used by FEWS NET to provide a forum in which climate scientists of all backgrounds meet to address the informational needs of food security personnel throughout Africa, Central Asia and Central America and the Caribbean.

## Letson, David

### Agroclimate.org

AgroClimate.org is a web-resource of tools and data on climate and crops that can be used to assist with decisions about the management of agricultural systems in the Southeastern U.S. (See video at https://www.youtube.com/watch?v=r50mZZ9hcy8) AgroClimate is an interactive website with climate, agriculture, and forestry information that allows users to assess resource management options with respect to their probable outcomes under forecast climate conditions. AgroClimate uses crop simulation models along with historic and forecast climate data to allow decision makers to compare changes in probable outcomes under different climate conditions. AgroClimate is a product that is still under development. At present it includes: 1) background climate information and a climate tool that allows decision makers to compare climate variability under different ENSO conditions; 2) crop information and tools for peanut, tomato, and potato; 3) forest management and wildfire risk assessment; and 4) links to other sources of related information of value to decision makers. Planned additions coming soon to AgroClimate include: 1) tools for assessing management options for additional crops, pastures, and livestock that are important to the agricultural economy

of the southeastern USA; 2) a tool to help decision makers to assess the value of irrigation water; 3) a tool to help decision makers assess the value of crop insurance; and 4) a county-level database that links historic agricultural production data with climate so that decision makers can assess the effects of past climate variability of agricultural commodities.

# Loboguerrero, Ana Maria

## Hacking for climate services

Significant opportunities exist around the use of information and communication technologies (ICTs) for Climate information services related to Climate-Smart Agriculture in Latin America and the Caribbean. As CCAFS promotes open data, and makes a number of different informational resources available online for free, there are good prospects for promoting use of these resources through novel competitions and incentive mechanisms. A Hackathon was proposed as part of the COP events in Lima, which provided a cash prize to a group of information technologists who create the best climate-smart app during a fixed amount of time. The app had to include CCAFS (and other) data sources which are also open data, and convert data into services for a specific audience of relevance to CCAFS Latin America mission. A panel of judges evaluated the results and scored according to the criteria set out in the guidelines. There was a prize for the best apps.  The result of this competition will be presented in this session. Participants will be invited to explore options for engaging hackathons for climate services.

# Martin, Andrea

## Customizing the Climate Impacts - Decision Support Tool (CIMPACT-DST) for Vietnam: A Platform for Integrating Climate Science Information into Urban Planning Decisions

Transferred to local ownership and disseminated to users in 2014, the Vietnam Climate Impacts Decision Support Tool (CIMPACT-DST) allows Vietnamese urban planners to identify and evaluate climate change impacts and preferred adaptation solutions. Informed by an in-depth needs assessment process, the Excel-based tool, fully customized by Cascadia Consulting Group, is in use by approximately 65 urban planners and managers from the North, Central, and Southern regions of the country. CIMPACT-DST efficiently filters through the latest localized climate change information, existing vulnerability assessments, spatial data, and government-approved best-practice adaptation strategies, and shows planners the most relevant risks and recommended actions for their project and decision-making timeframe. The tool's impact summaries and adaptation recommendations can be specific to siting and design in sectors such as energy supply and transmission, information and communications, public health, transportation, and water resources. Currently in the evaluation phase, the pilot

CIMPACT-DST has thus far influenced the development of new climate-resilient urban master plans in the flood-prone coastal communes of Vinh Thanh, Vinh Hien, Dien Loc, and Phong An. Importantly, the Provincial People's Committee of Thua Thien-Hue province recently granted the technology official approval, which provides political and financial support for continued improvement and application of the tool by the local Hue Planning Institute (HPI).

## Mason, Simon

### Climate services for conflict states

The World Meteorological Organization has defined four categories of national climate service capabilities ranging from basic to advanced; at the basic level the national climate service is able to offer little more than securing, archiving, and providing access to a country's climate record and minimal interaction with users. There are over 60 countries worldwide in this category, but 6 countries do not even achieve this minimal level. The purpose of this presentation is to provide some guidance on the access and quality of climate data and information for such countries, and specifically for fragile data-poor states that lack the infrastructural and / or human capacity to operate an effective climate service at or beyond the basic level. In many cases the national climate services have not always been in a poor state, and so it may be possible to access reasonable historical datasets that can give some idea of the climatology of the country, including averages, and estimates of the risk of extremes. Such data may be available from some of the regional and global datasets; some guidance on the use of such data will be discussed. Other options include remotely sensed and model datasets, which can provide more up-to-date information. The pros and cons of some of these datasets will also be discussed.

## Matin, Mir

### Fighting fires from space: Using satellite data to detect fires and strengthen local-level response in Nepal and Bhutan

SERVIR-Himalaya's Forest Fire Monitoring and Alert System (FFMAS) was developed in support of the Government of Nepal's forest fire management strategy to improve the capacity of national level decision-makers and local communities to cope with forest fire disaster. The System utilizes remotely sensed data to generate and disseminate three products: Short Message System (SMS) alerts, email notification, and a web application for visualizing near real time and historical fire data, and providing managers with useful planning information for the shifting patterns of fires over time. The System's subscribers include District Forest Officers (DFOs) in 72 of Nepal's 74 districts and focal persons of Federation of Community Forestry Users (FECOFUN) in all of Nepal's districts. Under the SERVIR Program, an informal assessment was conducted to better understand the extent to which the information generated by the FFMAS was being

used and elucidate the factors which contribute to an effective decision support system (DSS).  While not a climate service per se, the addition of precipitation data, NDVI, soil moisture, and other climatic datasets could provide complimentary information that would allow for fire risk and predictive models – something that may be considered by SERVIR, or other users of the product. While the FFMAS was developed in close collaboration with an identified user group – the Department of Forests in Nepal – the SERVIR study found that targeted communications and outreach to users to explain the System's capabilities was a crticial factor in the use of the System as a decision support tool.  In fact, the gap between expected and actual use was due largely to lack of awareness of the FFMAS, rather than limitations with the System itself.   The FFMAS offers a compelling example of how remotely sensed information can support decisions at the local level.  The real challenge, however, to make the System relevant was to communicate and orient the decision makers who could benefit from the information being generated.  As will be discussed in this session, sensitization of users to the system is a critical factor to enable uptake and use of a DSS.

## McDonald, Anselmo

### Use of climatic information for surveillance of Aedes aegypti infestation in two cities of Panama and Association between Sea Surface Temperature

This study identifies the pattern of infestation by Aedes aegypti based on climatic conditions during 2013 in two cities of Panama. A multivariate Autoregressive Moving Average - Generalized Autoregressive Conditional heteroskedasticity model (ARMA - GARCH) was conducted to estimate Aedes aegypti Infestation levels (Ae-HI) based on the climatic conditions (climatic indices and Multivariate ENSO Index) in 30 townships of the districts of Panama and San Miguelito. Georeferenced data (Longitude (x), latitude (y)) of Ae-HI was used. The results of the model were represented with a Geographic Information System (GIS). According to the Ministry of Health of Panama, Ae-HI between 0.0 - 1.0 were classified as low risk, values between 1.0 - 2.0 as medium risk and values of Ae-HI > 2 were considered as high risk. Overall, the highest levels of infestation were recorded during the months of the rainy season (May to November), with the exception of the month of September.

## Mejía, Raul

### Research Priorities for the Development of Climate Services in Latin America

Based on the experiences of the Latin American Observatory (OLE2) and Ecuador's National Weather Service (INAMHI), research priorities are proposed in terms of (1) improved national-to-regional observations, monitoring and early warning systems, taking into account a characterization of the recent past in order to understand better the present and future climate; (2) the exploration of additional predictors and methodologies to increase the predictability at seasonal scale and the addition of sub-

seasonal prediction products so a more integrated multi-scale (weather-to-seasonal) approach be considered on a operational basis; (3) a more in-depth involvement with the users of the climate information, better communication of the products and uncertainty management; and (4) the focus on Decision Support Systems that dynamically consider both hazards and vulnerability, for example in terms of probabilities of *risks* associated with a particular event (in contrast with only providing rainfall or temperature maps which only address potential hazards).

## Muñoz, Ángel G.

### A Preliminary Evaluation of the Latin American Observatory's Climate Services

The Latin American Observatory, or OLE2 (Muñoz et al., 2010), is an informal regional partnership started in 2008 with the aim of enhancing the collaboration between national weather services (NWS) and research and development institutes in Latin America. OLE2 provides scientific support, training, and additional (weather and) climate services to partner organizations in order to increase the local and regional efficiencies of environmental decision-making, especially in terms of risk management strategies and the establishment of early warning systems (García-Solera, 2012; Muñoz et al., 2012). Although regarded as a successful partnership, until now no formal evaluation has been performed on the Latin American Observatory as a network to enhance the provision of climate services (García-Solera, 2012). In this work the evaluation elements suggested by Vaughan & Dessai (2014) are used to diagnose the use of OLE2 products by its partners, the network structure and governance, communication methods, and the efficacy of its technology and knowledge transference. This study uses 28 online semi-structured surveys (a total of 14 countries participate in the partnership) and a case-by-case analysis of OLE2's climate services reported in the literature. In the following pages the conclusions of this study are summarized.

## Nair, Shadananan

### An assessment of the efficiency of climate services in a tropical state of India

The tropical state of Kerala is one of the regions highly vulnerable to the impact of climate change in the Indian subcontinent. Changing climate has large impact on the water resources and thus in the production of food and energy and on the public health. The state with 3000 mm annual rainfall and rich cultivable land faces serious seasonal water shortage and food and energy crises as a result of the vagaries in monsoons and extremes in rainfall. Increasing rainfall intensity creates floods and erosion and sedimentation in rivers and reservoirs. Increasing rainfall seasonality leads to seasonal water shortage and even drought. The state that largely depending on hydropower faces shortage of power that has affected the industrial sector. For 75% of the food requirement, Kerala depends on neighbouring states. Spread of air-borne and water-borne diseases seriously affects public health. These issues lead to several socio-

economic issues such as conflict over sharing of water, hiking price of food and reliable water, and suicide of farmers. In spite of all these, measures for adaptation and impact mitigation are inefficient and climate services in these sectors are poor. Contributions of government agencies, research institutions and universities are not satisfactory. There is a lack of cooperation and coordination of activities. Information from the meteorological agency is not fully dependable, especially in the agricultural sector. Currently there is no mechanism available for the prediction of climate related health hazards. Though the NGOs can contribute much in providing awareness and research, difficulty in procuring necessary data and information that are monopolised by the government departments is a major obstacle. This study assesses the impact of climate change on water, energy, food and public health in the state and critically reviews the current climate services, policies and adaptation strategies. Guidelines for an appropriate climate information system and for the dissemination and implementation of the knowledge and research outputs have been provided.

## Ndunhu, Lillian

### Leveraging Local and Scientific Knowledge to Drive Better Decision Making in Land Productivity and Resilience

As the threat of food shortages and hunger loom over families in many areas in Africa, there is need to increase the productivity of Africa's agricultural systems to alleviate over-reliance on food aid. Lack of updated and timely information affects production levels and the success of restoration efforts.  The Land Potential knowledge system (LandPKS) uses local and scientific knowledge of land productivity and resilience to provide an understanding of land potential which can be used to determine where land is not meeting its productive potential, where unrealistic expectations are driving unsustainable development investments and where proposed intensification is likely to lead to irreversible degradation. This will be achieved by the development of a mobile application and knowledge engine that will allow users to dynamically and explicitly determine land potential and degradation risk by analyzing a combination of satellite derived and locally collected data.  LandPKS Knowledge engine is powered by geospatial datasets (Weather data (SLATE), DEM(90m SRTM) and DEM derivatives, Soil maps (HWSD) and soil derivative , Land Use/ Land Cover (Glob cover), among others) and the EPIC/APEX crop simulation model to predict productivity and soil erosion potential. The LandPKS Android application offers a simple user interface, graphical displays, and a logical work progression to allow individual users with no formal soil science training to assess soil characteristics at the point level while embedded tutorials guide the user through soil texture evaluations, land cover assessments, and photographing plot features. User inputs are then uploaded to the cloud, integrated with global climate and soils databases, and run through predictive models to provide relative estimates of potential productivity and degradation risk. In the future, the system will provide users with management options and connect land managers with similar land potential. It will also leverage the widespread use of mobile phones to crowd source information,

including follow-up monitoring data, in data poor regions for improving model predictions. The system is being piloted in 2014 in Kenya and Namibia. In Kenya, the project is being hosted at the Regional Centre for Mapping of Resources for Development(RCMRD) under the SERVIR-East and Southern Africa Program.

## Osgood, Daniel

### Participatory and human-centered design of DSS for disaster preparedness

For nearly a decade, Dan Osgood of the IRI has been involved in designing and implementing climate risk measures, primarily agricultural index insurance, around the world. These experiences have informed a process of human centered design that carries from index insurance work into the realm of disaster preparedness. Through the participatory methods, Dan is interested in determining thresholds for action and designing tools that can incorporate climate information to be useful for decision makers. Currently Dan works with these topics and methodologies in the Caribbean through the IRAP project, a NOAA and USAID funded collaboration with the University of Arizona to use climate information to improve adaptation to climate change.

## Osgood, Daniel

### Index insurance as a climate service for development purposes

Weather index insurance is a promising tool for climate change adaptation and risk management; it can help enhance livelihoods and improve resiliency by enabling access to financial markets and has been proven to be a valuable climate service for farmers when incorporated into a wider climate risk management toolkit. While index insurance has been used for development for nearly a decade, we are beginning to see second-generation projects reaching sustainable scales. This session will discuss the use of index insurance as a climate service for development and the extent to which human-centered processes are successful in developing end-user driven products. The session will feature projects in Latin America and discuss how human-centered processes have or can help improve product design leading to end-user demand. The session will culminate in a run through and discussion of a human-centered process.

## Pasten, Max

### Adaptation to Climate Change in the Health Sector of Paraguay

In order to evaluate climate change (CC) impacts, researchers utilize the global climate change scenarios taking into consideration recommendations of IPCC (Intergovernmental Panel on Climate Change). In Paraguay the CC problem is of real importance due to possible impacts that could occur in different productive sectors of the country and especially in the health sector. In this study were used future climate scenarios for Paraguay, which will be use as scientific basis for the characterization of

regional vulnerabilities, this results will be important information to be used in the decision making process and in future plans of the health sector. In this study climate scenarios A2 and B2 based on the fourth IPCC Scientific Report were used at the district level, in order to calculate the Climate Scenarios Index (IEC). The baseline (1961-1990) and climate projections (2020-2030) for both scenarios, based on regionalized climate model HADRM3P, were used to calculate the anomalies of temperature and precipitation. The District Vulnerability Index (IVD) contains different indicators aggregated in health, environment and social dimensions, that provide the context of each specific region, and it allows a more accurate analysis of their conditions during the decision making process. Our results show that there are high vulnerability indexes in the environmental field and in all our ecoregions, that occurred by the deforestation and destruction of virgin forests. The social index, which was impacted by indicators as health access, education levels, housing conditions, and level of family poverty, also affect the wellbeing and health of the population, and its capacity of reacts against the adverse events. The health index permitted the characterization of large areas of the country in relation of two endemic vector-borne diseases (dengue fever and tegumentary leishmaniasis), that are associated to social determinants which impact on the health of urban and rural populations. Projections to 2020-2030 show a significant number of districts with higher IVD (above 0.50) in the B2 scenario, fact observed by the intense variability of climatic variables in Paraguay during this decade.

## Piperno, Adriana

### Incorporating risk management into land management: building the road between the possible and the desired

Uruguay is on a path to incorporate risk management into public policies. This work showcases the progress of DINAGUA, in joint work with departmental governments and the National Land Planning Directorate in incorporating risk management tools in land planning, with focus on flood risk maps in urban areas. Understanding that risk is a social construct, and does not depend only hazard levels but also the vulnerability of the exposed areas and its resilience and resistance, the risk map is presented both as an understanding and action instrument. Promotes the construction of the desired city, guiding future developments to safer areas, helping to mitigate the risks and supporting the transformation of high-risk in opportunity areas, revaluing the river ecosystem services.

## Rankine, Dale

### The resurgence of crop modeling in the Caribbean: the case of sweet potato

Sweet potato (Ipomoea batatas) has been identified as central to the region's pursuit of food and nutrition security, particularly in a changing climate. The crop has high nutritional value, innate drought tolerant properties, and can be grown with relatively

low inputs. The routine use of crop models for yield optimisation is largely absent in the Caribbean. In this study, the FAO AquaCrop model was parameterized for sweet potato for the first time. Parameters were developed using data from three sweet potato varieties grown in two agro-ecological zones in Jamaica under rain-fed and irrigated conditions. Digital photography was combined with an automated canopy estimator to track canopy development. The overall simulation of biomass was good with deviations of less than 28% for four out of six simulations and season-long performance of the model was commendable. Yield simulation though challenging were also good. Simulations were also done under two future climates, even in the absence of long-term records of weather parameters to facilitate downscaling of climate projections. Warmer and drier conditions resulted in earlier maturity, declines in biomass and yield while cooler and wetter conditions favoured production, but suggested longer maturity period. Yield and biomass declines were reduced and subsequently reversed under the future climates (in both treatments) when the effect of elevated $CO_2$ was factored in. The ground work has been laid for a resurgence of crop simulation modelling in the Caribbean. Besides optimising production, it also has the potential to improve early warning systems and decision making in this climate sensitive sector.

## Rohozynsky, Oleksandr

### Ensuring the evaluability of climate services

Project evaluation is one of the standard management tools for international development projects, used by most donors and international organizations such as USAID, World Bank, etc. However, it is rarely used for management of global projects in the area of climate change because (1) it is usually expensive to conduct data collection on a global scale needed for such evaluation; and (2) there is significant delay between any project intervention and its impact on climate change or the policies. At the same time, global climate change projects often have multiple components/activities (trainings, tools, applications, etc.) that are rolled out gradually starting with a few countries in the world. This presents an opportunity to use evaluation of these activities as an internal project management mechanism. However, since evaluation policies of most donor organizations require evaluation of projects or higher-level initiatives, evaluation of specific project activities presents challenges because the activities are not set up in a way that allows for easy evaluation. The workshop facilitator will present the approach to evaluating selected project activities (tool) of the SERVIR Program. SERVIR is a joint initiative of USAID and NASA to improve environmental management and resilience to climate change by building the capacity of developing countries to integrate Earth observation information and geospatial technologies into decision-making and practice. The session will also include observations from conducting evaluability assessments of two other SERVIR applications.

## Rucks, Jorge

### The National Climate Change and Variability Response System of Uruguay

The National Climate Change and Variability Response System of Uruguay, is an interinstitutional arrangement created in 2009 with the objective of coordination and planning of public and private actions needed for the prevention of climate risks, and the mitigation and adaptation to climate change. The NCCRS has two bodies: first the Coordination Group at political level including all related ministries, the office of planning and budget, the national emergency system and the congress of mayors; secondly the advising commission which also includes major technical institutes, the Univerisity of the Republic and other institutions that advise the NCCRS on policy making and planning"

## Saravia, Celmira

### Towards the validation of crucial information for establishing an early warning system of hypercritical heat waves in the Uruguayan northern dairy area

During summer, pasture based dairy areas in northern Uruguay suffer periods of hypercritical heat waves determining production decrease  for dairy cows. These periods were determined by the Temperature Humidity Index (THI).  In turn, four types of weather associated with the occurrence of these life-threatening situations were determined for the 2005-2006 summer. Due to costs, measures as strong  ventilation in barnes cannot be maintained over time, so it is desirable to establish an early warning system. Therefore, the mentioned weather patterns are under review, in order to validation. Once validated, customary Weather Services information can generate crucial information with more than one day in advance, which is essential for the establishment of early warning systems. Finally, a situation is discussed: the one amongst the production of the needed knowledge -where they are involved biometeorological aspects of production techniques, organization and management of the product concentration and some meteorological skills in one side, and the skills needed in the operation of these warning systems in the other hand, -where are involved another and special wide range of expertises, from operative synoptic meteorology to customs an social psychology of the producers.

## Shaban, Mawanda

### Forecast-based financing for risk reduction through: Early Warning and Early Action

The Uganda Red Cross Society is working with the German Red Cross and Red Cross/Red Crescent Climate Centre to develop a Memorandum of Understanding with the National Meteorological Authority, a funding mechanism, and a set of Standard Operating Procedures (SOPs) that allow certain forecast thresholds to trigger pre-determined

disaster preparedness actions. This talk will discuss these disaster-preparedness actions and the threshold-based system that triggers them.

## Shumake Guillemot, Joy

### Communicating health decision and climate information needs

This interactive session will explore how to identify and communicate climate information needs. It will present and refine a decision support tool that can help health partners move from planning stages to taking action by identifying specific climate-related decision needs and the associated climate information and services required to respond. This tool can be used to improve communication with metrological partners to inform the sourcing and tailoring of health specific climate and weather information products and climate services.

## Shumake Guillemot, Joy

### Global Perspectives of Building Health Resilience to Climate: WHO National Adaptation Planning and the Global Framework for Climate Services.

This talk will give a global overview of the policy and operational approaches being used by WHO and Ministries of Health worldwide to respond to climate change. The presentation will focus on describing the interplay and decision-support needs of two key components of WHOs global strategy: the Operational Framework for Climate Resilient Health Systems, and the implementation of the Global Framework for Climate Services. These two initiatives reinforce each other, as GFCS health initiatives aim to strengthen health partner access to and use of climate information, in order to make sound decisions and implement national climate and health action plans.

## Silveira, Luis

### Early warning systems for flood forecasting in Durazno City in Uruguay

A hydrologic-hydrodynamic model of the Yi river basins in Uruguay has been developed as a support tool to the Emergency Coordination Centre of Durazno City. The purpose was to improve the existing Decision Support System (DSS) and the emergency planning by providing information on gauge height and its permanence in time and the risk of flooded areas. Four past flood events of high return period were used for calibration and validation with accurate results. The input data to the operational model in real time is hourly observed rainfall and gauge height as well as rainfall forecasts by several international sources. The use of predictions from numerical weather forecasts allows to generate pre-alert scenarios with larger lead time. These scenarios can warn the emergency coordinators and thus are of great value to pre-manage a probable emergency.

## Sitati, Asha

### Early warning systems for climate change: Identifying & understanding user needs for information and the design of DSS

Early warning systems for climate related hazards offer a decision making tool for both communities and policy makers. Although great strides have been made in developing early warning systems most deal with one hazard, only provide short-term warnings, and do not reach the most vulnerable. This presentation will review research results of the United Nations Environment Programme's CLIM-WARN project. The project seeks to identify how governments can better communicate risks by designing multi-hazard early warning systems that deliver actionable warnings across timescales. Household surveys and focus group discussions were conducted in 36 communities in Kenya, Ghana and Burkina Faso in order to identify relevant climate hazards, user information needs and response strategies. Preliminary results show significant variability in user needs within and between countries. For instance, in Kenya, floods are more frequent in the west while droughts are frequent in the north. Populations in urban areas face a range of hazards - floods, droughts, disease outbreaks. Populations have varying access to media and telecommunications technology. While 55% of rural populace never watches television, 64% of urban respondents watch television on a daily basis. Communities also have different concepts of how information should be delivered and warning systems designed. It will be a challenge for national governments to create systems that accommodate such diversity yet provide standard quality of service to all. There is a need for flexible and forward-looking early warning systems that deliver broader information about risks. Information disseminated through the system could not only include details of hazards, but also long-term adaptation options, general education, and health information, thus increasingly both capabilities and response options.

## Spence, Jacqueline

### Climate services, food security, and drought: Becoming more proactive

The Meteorological Service is a scientific division of the Minister of Water, Land Environment and Climate Change in Jamaica. The Service through its Applied Meteorology Section, resident in the Climate Branch, and in partnership with the Caribbean Institute for Meteorology and Hydrology (CIMH) and USAID/IRI developed and tested a number of innovative tools for offering improved climate services to the Jamaican Agriculture Sector. The collaboration has been enhanced through direct involvement of the Ministry of Agriculture and Fisheries (MoAF) to provide new services that support decision making at the farm level and within larger production areas, served by extension officers.We present some of the key lessons learnt and good practices from this important nexus, which include- but are not limited to processes-tools used, methods of dissemination,  (and receipt of feedback) and training in the utilization of the products. The local work is buttressed by, and nested within broader regional initiatives such as the Caribbean Climate Outlook Forum (CariCOF) led by the

CIMH.  The challenges experienced in this intriguing journey, such as the incorporation of the new approaches into routine operations of the sector as well as their mainstreaming into policy will also be highlighted.


## Stewart Ibarra, Anna

### Lessons from the field: Local research and surveillance of climate-sensitive diseases in coastal Ecuador

Climate and water-sensitive infectious diseases, such as dengue fever and cholera, present a major public health threat for vulnerable coastal urban populations. To identify effective public health sector responses requires, first, local research to generate the evidence base for the effects of climate on disease risk, and second, the translation of research findings into operational decision-support tools for the public health sector. To address this need in Ecuador, the Ministry of Health, the National Institute of Meteorology and Hydrology, and universities are partnering to create an integrated infectious disease-climate surveillance platform in Machala, Ecuador. I will present research findings and local lessons learned from this US-Ecuador translational research consortium.


## Steynor, Anna

### A place-based co-exploration approach to climate decision-making in developing countries

The Climate System Analysis Group (University of Cape Town) and the Global Change System for Analysis Research and Training (START) have been piloting a proof of concept "co-exploration" approach in an attempt to better understand the context of climate information within a multi-stressor decision-making framework.  The decision-making space is often dominated by a supply-chain approach to climate services. Stepping away from the supply-chain mentality and into a 'co-exploration' paradigm that integrates the full complement of user groups (from climate modelers to policy makers), allows for the development of a more holistic understanding of the place-based context of vulnerability, and of emerging risks that result from interlocking climate and non-climate stressors. There are distinct elements that charaterise the "co-exploration" approach. These elements include the co-exploratory interaction between user and producer, the place-based as opposed to sector-based focus and the initiation of the process around a multi-stressor, socio-economic framework rather than framing the decision-making process through the lens of climate change.   Alone, each of these elements are widely tested methodologies.  However, to date, the predominant approaches have focused around the co-production concept whereby the users are encouraged to shape the scientific research agenda with little push-back from the producer community.  The co-exploration approach, on the other hand, focuses on a debate of equals between the users and producers.  Both sides are challenged on their traditional thinking and

encouraged to consider reframing their thinking into innovative ways of using the information. The presentation here will outline the methodology of the co-exploration approach, in so much as it has been tested so far. Lessons learnt will be explored as well as the questions it raises together with its potentially applicability within the climate services field.


# Suarez, Pablo

## Red Cross/Red Crescent Climate Center approaches to DSS

The humanitarian sector confronts substantial challenges in linking science-based forecasts with concrete actions to reduce avoidable losses. The Red Cross Red Crescent Climate Centre has been working with partners to develop innovative approaches for decision support systems, including (a) forecast-based financing for disaster preparedness, and (b) games for learning and dialogue. ICCS participants will get a flavor of both innovations, through an intensely participatory activity.


# Suarez, Pablo

## Paying for predictions: An interactive experience of climate service challenges

Join us for an intensely participatory, seriously fun session where you experience the complexity of risk management for the people and organizations that ICCS is trying to serve. "Paying for predictions" is a playable system dynamics model that represents how a few simple rules create emerging complexity for our stakeholders. You will begin with limited budget and access to information. Your team will have the opportunity to invest in climate services. Your individual decisions will have collective consequences. There will be winners and losers, and prizes. Importantly, there will be a new way to explore how climate services can help, but also how they can be misunderstood and misused… and what we can do about it.


# Tiscornia, Guadalupe

## Sistema de Información Geográfica Web "SIGRAS"

El sistema de información geográfica Web "SIGRAS" es un producto desarrollado por la Unidad de Agroclima y Sistemas de Información (GRAS) del Instituto Nacional de Investigación Agropecuaria (INIA) El objetivo principal del desarrollo del SIGRAS fue poner a disposición "on line", información georreferenciada de diverso tipo, propia (del INIA) o proveniente de distintas fuentes (públicas y privadas), permitiendo la realización de búsquedas y consultas simples y cruzadas, dentro y entre las distintas bases de datos disponibles, con cobertura de todo el país. En el SIGRAS se incluyen actualmente capas de información geográfica de clima, evapotranspiración, suelos, agua en el suelo, agua no retenida en el suelo, estado de la vegetación (índice de vegetación normalizado,

NDVI), cartografía básica (caminería, localidades, límites administrativos, etc.) y Google Maps, y se continua trabajando para incorporar otras.


## Trotman, Adrian

### What if? (Re-)Building DSS in SIDS and LDCs

SIDS and LDCs lack the financial, institutional and human-resource capacity of larger countries with stronger, diversified economies. In this setting, practitioners in the Caribbean climate services community are challenged to produce reliable, salient and sharp climate products and services. These then form part of cost effective DSS, and are to be delivered sustainably. Strategies to overcome constraints of restricted capacity involve innovative approaches to product development and delivery that are resource-efficient. This session begins with a summary of the Caribbean context, followed by an overview of climate risk DSS. Participants will then be invited to take part in the practical application of lessons learnt using a scaled replica of a SIDS and the context provided in brief lead up presentations. During this interactive portion of the session, participants will design their own DSS to inform disaster risk reduction and climate-resilient planning practices. Additionally, they will develop a plan and build a climate-resilient pilot community; this community contains a state of the art climate center. Finally, participants will identify the key stakeholders and their respective responsibilities in the governance of climate-risk.


## Van Meerbeeck, Cedric

### What if? (Re-)Building DSS in SIDS and LDCs

SIDS and LDCs lack the financial, institutional and human-resource capacity of larger countries with stronger, diversified economies. In this setting, practitioners in the Caribbean climate services community are challenged to produce reliable, salient and sharp climate products and services. These then form part of cost effective DSS, and are to be delivered sustainably. Strategies to overcome constraints of restricted capacity involve innovative approaches to product development and delivery that are resource-efficient. This session begins with a summary of the Caribbean context, followed by an overview of climate risk DSS. Participants will then be invited to take part in the practical application of lessons learnt using a scaled replica of a SIDS and the context provided in brief lead up presentations. During this interactive portion of the session, participants will design their own DSS to inform disaster risk reduction and climate-resilient planning practices. Additionally, they will develop a plan and build a climate-resilient pilot community; this community contains a state of the art climate center. Finally, participants will identify the key stakeholders and their respective responsibilities in the governance of climate-risk.

# Veizaga, Alfred

## Ancient weather prediction in decision making for agriculture

One of the most important economic activities in the Bolivian altiplano is the agriculture, mostly based on the production of quinoa, barley and a great variety of potatoes. Because of variability and climate change, such as hail, drought, frost and floods impact on their production. This presentation has the purpose to show the usage of ancient weather prediction in decisions making for agriculture. The methodology used was based on 21 interviews with key informants and three community workshops in the municipalities of El Choro, Sica Sica and Jesús de Machaca. There has been found at least sixty bio indicators to plan crops sowing specially between June and September every year. Some examples of these bio indicators are: the use of thola (Parastrephia lepidophylla) that indicates during the flowering and by the seed if it will be a good year with good precipitation level or a bad year with droughts, for example a bad seed indicates a bad year. A second bio indicator is the Andean fox (Pseudalopex culpaeus) it has been observed when it howls and stumbles, which mean that, will be a bad year with droughts. Finally the third bio indicator is the constellation (locally named as Qoto) if the stars are bright it means that will be a good year, this bio indicator is related to the ENSO occurrence (Orlove et. al., 2002). Bio indicators were been used for centuries to predict the weather and so far these ancient technology are working. With these ancient practices farmers are able to make the decision about the types of crops they are going to sow and on which period should they start the sowing. Nevertheless it was found that young people are losing this ancient weather prediction, as well as many of ancient techniques, due to migration of young people, and lack of communication between the youth and the elderly. Therefore, to recover these practices it is recommended revitalize this knowledge.