



Workshop Report

**Workshop on reviewing available
methods and climate data for use in
climate projections for the Philippines**

PAGASA, Quezon City, Manila, Philippines

February 22 – 24, 2016

Report prepared by:

Joseph Daron*, Richard Jones, Claire Scannell, David Corbelli and Thelma Cinco

*joseph.daron@metoffice.gov.uk

Table of Contents

Executive Summary	3
DFID Project.....	4
Workshop Scope and Aims	4
Day 1: Contrasting Different Methods to Produce Future Climate Projections for the Philippines	5
Day 2: Exploring the Similarities and Contradictions between Projections and Project Findings	8
Day 3: Communicating Consistent Climate Change Messages to Inform Decision Makers	12
Conclusions and Recommendations	16
Annexes	18
Annex I – Workshop Agenda	18
Annex II – List of Participants.....	21

Executive Summary

With an increasing demand for reliable and relevant climate information the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) is using a range of different climate modelling approaches to generate future climate projections for the Philippines. The information is being designed to meet the needs of different audiences to help reduce the risks of climate variability and climate change. However, there are significant theoretical and practical challenges in comparing, combining and communicating different sources of future climate information.

A workshop organised by PAGASA and the Met Office, as part of a project funded by the United Kingdom Department for International Development (DFID), confronted the challenges of generating and communicating future climate projections from different methods and models. The workshop brought together climate scientists from PAGASA with scientists at institutions across the Philippines and elsewhere. Users of climate information, including representatives from national and local government, also participated in the workshop. The first two days focused on scientific and modelling issues and the final day focused on approaches to communication and informing decision makers.

Through a series of invited talks and interactive group activities, participants discussed a range of topics, including the strengths and limitations of different climate model downscaling approaches, and ideas for improving the reach and relevance of climate projections for different audiences. Scientists from PAGASA presented the modelling methods being used to provide data for the next set of national climate projections. Participants external to PAGASA offered insight on addressing key challenges and developing practical solutions, such as the development of online portals enabling users to compare different model projections and plan for a range of future climate scenarios. This report highlights some of the key discussion points and messages from the diverse range of talks.

The workshop has provided a first step towards continued engagement between producers and users of long-term climate information that will help improve understanding of the strengths and limitations of different climate modelling methods as well as the capacities of decision makers to use future climate projections. A number of follow-on activities are planned, including writing a collaborative publication discussing the challenges and opportunities for providing robust and relevant information on future climate risks to decision makers in the Philippines. Ultimately the workshop has helped to equip scientists at PAGASA to distil the range of future climate projections and provide coherent climate change messages to users and decision makers.



DFID Project

Typhoon Haiyan (locally named Yolanda) struck the Philippines in November 2013, causing significant damage and loss of life. In response, the UK Department for International Development (DFID) pledged support for the recovery and reconstruction effort. DFID is funding the Met Office, in partnership with PAGASA, to help strengthen PAGASA's technical capabilities as well as provide state-of-the-art information to guide decisions and build resilience to future climate-related risks. More information is available on the [project website](#).

Workshop Scope and Aim

The Philippines is highly vulnerable to a range of climate hazards. To help plan for present and future climate risks there is pressing need for relevant and robust scientific information to guide policy-makers and support adaptations decisions. There is a range of climate information providers in the Philippines but PAGASA are the mandated agency to provide climate projections to inform national and local government decision making.

As part of the DFID project the Met Office is generating downscaled Regional Climate Model (RCM) simulations for the Philippines using HadGEM3-RA at 12km horizontal resolution. The simulations are being driven by Global Climate Model (GCM) experiments from the fifth phase of the Coupled Model Intercomparison Project (CMIP5). At the same time PAGASA are downscaling CMIP5 simulations using a range of RCMs, including PRECIS, CCAM and RegCM4, as well as statistical downscaling methods, to provide future climate projections for the Philippines. Other modelling groups providing future climate projections for the region include the SEACLID/CORDEX Southeast Asia project being led by the University of Malaysia with input from Manila Observatory. All of the current modelling efforts build on an existing body of evidence about climate variability and change in the region, including, most recently, information from projections reported in the fifth assessment report (AR5) of the Intergovernmental Panel on Climate Change (IPCC).

Whilst the objectives and experimental designs vary, each project identified above is producing simulations using state-of-the-art methods in order to provide future climate projections for the region. Moreover, all projects share the aim of improving our understanding of climate variability and change as well as informing decision makers about future climate risks in the Philippines. The large volume of available information provides an excellent opportunity for the Philippines, and PAGASA in particular, to explore the uncertainties associated with climate projections in the region. The challenge is to combine the information and derive consistent messages that are relevant to climate information users and decision makers across government and different sectors of society.

Aim of the workshop:

To bring together climate scientists working at institutions across the Philippines and elsewhere to make sense of the available modelling methods and future climate projections, with a view to providing consistent climate change messages to users and decision makers.

The three day workshop was jointly coordinated and facilitated by PAGASA and the Met Office. Each day centred on a specific theme; the first two days focused on different aspects of scientific and modelling issues and a final day focused on communication and policy implications (see workshop agenda in Annex I). The event brought together relevant experts from the Met Office and PAGASA with partner organisations, including CSIRO, NCAR, Manila Observatory and the University of the Philippines. Additional stakeholders and users of climate information attended the third day of the workshop. A complete list of participants is provided in Annex II. This report outlines the key discussion points and insights gained during the workshop. Each day is reported in turn, followed by conclusions and recommendations for future work.

Day 1

Theme: Contrasting Different Methods to Produce Future Climate Projections for the Philippines



The day began with a formal opening of the workshop and welcome addresses from Dr Falviana Hilario (left), Deputy Administrator for PAGASA, and Dr Richard Jones (centre), Science Fellow at the Met Office. During their comments they reminded participants of the importance of their work in advancing the science of climate change and in helping to prepare the Philippines for future climate risks. Dr Joseph Daron (right) from the Met Office then introduced the motivation for the workshop emphasising the challenge of distilling and communicating output from multiple climate projections, each produced using different models and downscaling methodologies.

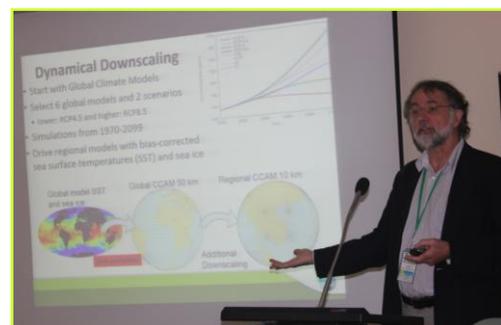


The first session, led by Dr Claire Scannell from the Met Office, involved interaction between participants to introduce themselves and discuss their expectations for the workshop. Participants read their expectations to the group and they were grouped into three common emerging themes: model understanding, meeting user needs, and communication. Within the model understanding theme, expectations included learning about the strengths, limitations and assumptions of different downscaling techniques, assessing the reliability of model information, and identifying areas of agreement and disagreement amongst model outputs. In relation to meeting user needs, participants expected to learn about how to select different scenarios for use in impact studies, and how to identify what model information is relevant for different sectors. Finally,

on the theme of communication, a number of people expected to discuss how to derive clear messages from climate data as well as how to communicate projections and their uncertainties to the local level - e.g. how to express a 1°C change in mean temperature so that the implications are understood. It was noted that some of these expectations were being addressed explicitly during the the workshop while others, though critically important, lay beyond the scope of the three day meeting.

A number of talks were given on day one to outline different projects and modelling approaches used at PAGASA. Dr Thelma Cinco, head of the Climate Impact Assessment and Applications section at PAGASA and a key partner on the DFID project, summarised the different climate modelling activities highlighting the step-change between the first national set of projections using PRECIS with CMIP3 towards a range of different downscaling approaches using CMIP5. Dr Roberto Sandoval from the FAO described statistical downscaling work that is being done as part of the FAO-AMICAF project in collaboration with Anthony Lucero's group at PAGASA. The work has produced downscaled climate projections for the next 30 years with a focus on providing information at the provincial and the river basin scale. Dr Macelino Villafuerte presented the methods and results for PAGASA's work on dynamical downscaling of CMIP5 models using PRECIS, CCAM and RegCM4. The work is still in progress but it is clear that there are aspects where the model simulations show broad agreement and others where there is more divergence in the results. Finally, Ms Rosalina De Guzman spoke about a WorldClim project producing fine scale (1km resolution) statistically downscaled projections. The results described, particularly for future rainfall change, show that across seven GCMs there are considerable differences in the magnitude and spatial patterns of changes, further highlighting the challenge of combining information and communicating clear messages to the user community.

In addition to talks from staff at PAGASA, there were talks from external scientists on day one. Dr Jack Katzfey from CSIRO in Australia (right) described the stretch-grid dynamical downscaling approach used in the model CCAM. Simulations from CCAM use a horizontal resolution of 50km globally and graduate to a 10km horizontal resolution over the area of interest. The simulations use bias-corrected sea surface temperature (SST) fields from the six



best performing CMIP5 GCMs. Dr Gemma Narisma from Manila Observatory spoke about the development of the SEACLID project and its subsequent linking to the CORDEX programme that emerged from coordination between a group of climate modellers in the Southeast Asia region. The SEACLID/CORDEX project is downscaling CMIP5 simulations for the Southeast Asia region through a task-sharing basis among the institutions and six countries involved. The final talk of the day was from Dr Gay Jane Perez from IESM at the University of the Philippines. She presented on agricultural drought forecasting using dynamical (RegCM) and statistical downscaling of the GFS model. Focused on seasonal forecast timescales, Dr Perez spoke about the existing merging of dynamical and statistical downscaling outputs and how there might be learning on how people interpret this output for use on longer timescales.

The afternoon included an interactive “carousel” activity to explore the strengths and limitations associated with four different climate modelling approaches: coupled atmosphere-ocean GCMs, dynamical downscaling using RCMs, stretch-grid models driven by GCM SSTs, and statistical downscaling. Participants moved between four stations, one for each modelling approach, located in the four corners of the room. At each station participants shared their perspectives on the strengths and limitations of the particular approach. A facilitator was permanently at each station to take notes on flipchart paper. Participants spent 20 minutes at the first station, and then 10 minutes at each of the remaining three stations.

One of the key outcomes of the carousel session was the recognition that no method was perfect and there are trade-offs to be made in adopting a particular approach. For example, GCMs provide globally coherent simulations and are required for any form of downscaling but they are coarse resolution and very expensive to run. RCM approaches allow for higher resolutions to simulate smaller scale processes and provide more granularity but they suffer from boundary condition and domain issues. They are also computationally expensive and generate large amounts of data. Stretch-grid global models do not suffer from lateral boundary issues and small scale processes can interact with larger global scale processes but they cannot be tuned for a specific region. Also, the stretched grid global models only incorporate changes in SSTs simulated in the driving GCMs so cannot respond to the large-scale atmospheric changes in the GCMs and thus, in general, will not generate the diversity of responses seen in the RCM downscaling. Finally, statistical downscaled simulations are much less computationally expensive, allowing for very high resolution and point scale information, but the method relies on having reliable long-term observations and the multiple output variables may not necessarily be physically consistent. Overall the session revealed a variety of challenges associated with climate modelling methods but also demonstrated that in combining information from multiple methods, a richer understanding of uncertainties in future climate variability and change could be achieved.



The day ended with a reflection on what participants found most interesting and provided an opportunity for participants to feedback suggestions to the facilitators for the remainder of the workshop. An interesting observation was that given the proliferation of new modelling projects and the range of approaches being adopted by PAGASA and in the Philippines, it is vitally important that there is sufficient time and resource to analyse the available data and make sense of the contradictions between different model outputs. Yet in doing so it may be possible to “harmonise” the information and provide clear messages to users.

Day 2

Theme: Exploring the Similarities and Contradictions between Projections and Project Findings

The theme of the second day was to explore differences and commonalities in the projections and outputs of modelling projects, to build on the comparison of methods on day one.

Day two began with a presentation from Dr David Yates at NCAR in Colorado. Thanks to technical support from Rex Abon Jr at PAGASA the presentation was done remotely from the USA. Dr Yates outlined some of the key issues in using climate models and RCMs to generate reliable climate projections that span the range of uncertainty, with an emphasis on the role of GCM biases. Noting the particularly significant role of SST biases in GCMs for producing downscaled experiments to explore tropical cyclone changes, he described the bias correction approach that has been applied to the model CESM at NCAR. Following this talk, Dr Joseph Daron presented the modelling approach and preliminary results from the DFID project. The project is downscaling a sub-set of CMIP5 models to 12km resolution using HadGEM3-RA to simulate changes to tropical cyclone activity in the region. The domain covers the main development region of tropical cyclones and the same domain is being used for PRECIS simulations at PAGASA at 25km resolution in continuous runs from 1950 to 2100. Preliminary analysis of the HadGEM3-RA simulated changes, in the environmental conditions conducive to tropical cyclones, suggests that there could be an increase in some aspects of tropical cyclone activity by the mid-21st century. However further analysis of the modelled tropical cyclones is required to provide more precise information.

Dr Thelma Cinco presented some of the findings of simulations using PRECIS to downscale HadGEM2-ES. Drawing on the day's theme, Dr Cinco stated that the new PRECIS simulation showed some differences to the previous PRECIS simulation driven by HadCM3. In particular she noted that PRECIS v2 driven by HadGEM2-ES simulates increasing rainfall in the northeast monsoon season (December to February) whilst PRECIS v1 driven by HadGEM2-ES simulates decreasing rainfall over the same season. Dr Cinco noted that explaining the difference in results to the users is a significant challenge.

To provide a way forward for comparing, contrasting and communicating multiple sources of climate information, Dr Richard Jones presented some recent work and thinking from the Met Office. He described the need for careful and thoughtful experimental design, placing emphasis on determining which GCMs provide plausible large scale conditions to justify being downscaled. When analysing model output, the key is to establish the spatial and temporal scales for which information



is robust, paying particular attention to the statistical significance of results. He explained that in producing clear and usable messages it is important to communicate the confidence of projected outcomes. Finally, to inform adaptation decisions, scientists must have some

understanding of the decision-making context. Using an iterative risk management framework allows the identification of climate information entry points, with the potential for updates when new climate information becomes available.

The morning ended with an interactive session on climate risks and processes relevant to the Philippines. Participants split into groups of three to four people and spent 10 minutes identifying some key climate risks for the Philippines, now and in the future, and a further 10 minutes identifying the important climate processes that need to be represented in models in order to provide information relevant to these risks. The aim was to invoke discussion on how to use the available modelling approaches to target the most important questions for the Philippines regarding present and future climate risks. A range of climate risks were identified, from tropical cyclones and extreme rainfall, to sea level rise and shifts in rainfall seasonality. It became apparent that in addition to the challenges of modelling the relevant processes (e.g. seasonal monsoon circulation) it was important to have adequate observed data to characterise these processes and any trends in the real world.



After lunch Ms Edna Juanillo presented PAGASA's plans for a new set of national climate projections. She outlined the previous information available and stated that the new projections would combine information from dynamically downscaled simulations from HadGEM3-RA, PRECIS, RegCM4 and CCAM in addition to statistically downscaled simulations. The outputs are planned to be ready for the end of October 2016 with a set of national conferences and workshops planned for November 2016, which coincides with the month of national climate consciousness. A new national report on climate change projections is planned for release in December 2016. The talk was followed with discussion on the different platforms by which people will be able to access the information. In particular it was noted that the National Mapping and Resource Information Authority (NAMRIA) has the mandate for providing and maintaining web-based hazard and risk maps for use in national and local planning. However there is also potential to host information on the PAGASA website and through collaboration with the Oscar M. Lopez (OML) Centre. Finally, it was discussed that a critical use of the next national projections would be in the comprehensive land use and development plans of the National Economic and Development Authority (NEDA).

An interactive activity was conducted to further explore the process of extracting similarities and differences between model outputs. In groups of three to four people, participants were asked to compare spatial maps of rainfall and temperature change from a range of climate model projection sources, including PRECIS, HadGEM3-RA and results from the IPCC AR5.

First the groups were tasked with writing concise summaries of the different information. Then they were asked to identify three similarities and three differences between the sources of information. At the end, participants explained their answers to the group, including a reflection on their thought processes and implications for how to combine information in practice.



One of the key challenges noted by the participants was the difference in the precise attributes of the data being displayed. For example, three month seasonal mean changes were shown for PRECIS and HadGEM3-RA but six month means are provided in the AR5 figures. Also, participants said that some colour schemes made it difficult to accurately interpret the information. Another issue was the variety of baselines, time scales and scenarios used in the different projections, making a like-for-like comparison impossible. However, despite these challenges, participants did identify some similarities and differences, some of which were common between groups (e.g. general agreement in projected increases for temperatures across the country, and a drying in the March to May season) and others which differed between groups (e.g. some groups noted different projected rainfall changes in particular seasons whilst others focused on issues in the methods used to create the information). It was generally concluded that if climate scientists involved in regional downscaling often disagree about what the information shows and which parts are important, then it will be extremely challenging for non-climate experts to interpret the information, increasing the need for improved cooperation and communication.



Another activity followed, with participants remaining in groups of three to four people. The groups were asked to consider key remaining scientific gaps and challenges relevant to future climate model projections for the Philippines. Participants were then asked to identify opportunities for addressing these gaps and challenges, with a view to collaborating with colleagues in different institutions in the Philippines and elsewhere. The outcomes of the discussions are summarised in Table 1.

Table 1: Key scientific gaps, challenges and opportunities

Gaps and Challenges	Opportunities
<ul style="list-style-type: none"> • Methods to apply model output to address specific risks and sectors, such as flood mitigation and crop production • Availability of reliable high spatial and temporal resolution model projections for analysing and projecting extremes • “Laymanising” scientific information for end-users • Increasing demand for localised climate information and services • Limited number of observing stations in the Philippines 	<ul style="list-style-type: none"> • Openness from climate scientists, modeller and end-users to collaborate and strengthen linkages • Potential to develop a pool of experts in the application of climate science • Drawing on range of information to better span uncertainties and avoid providing information leading to maladaptation • Expansion of partnerships with local communities • PAGASA has a mandate and authority to support information uptake and use by stakeholders

After the interactive sessions, Dr Joseph Daron introduced the concept for a potential collaboration with interested participants at the workshop to build on the issues discussed and work towards a publication with the provisional title, “Challenges and opportunities for providing robust and relevant information on future climate risks to decision makers: a case study from the Philippines”. Participants were asked to state whether or not they were willing to be involved and, if so, identify specific topics that would be of interest in covering in the paper. Approximately ten people stated that they would like to be involved, representing different institutions. Sub-themes that were identified as being of interest included:

- Downscaling approaches (constraints and strengths)
- Applications for impacts analysis (with foci including drought and agriculture)
- Issues in the communication and use of information, and emerging opportunities

There was also a suggestion for another paper on, “Assessing the use of multiple climate projections for the Philippines”, and a call for a policy brief to be one of the output formats. Given the positive response, the plan for a collaborative publication will be pursued, led by Dr Daron and colleagues at the Met Office and PAGASA.



The focus of the workshop shifted towards issues in the communication of climate information for the final part of the day, and this theme would continue to be the central focus of day three. Dr Laura David (left) from the Marine Science Institute at the University of the Philippines presented on innovative approaches to communicating issues on integrated resilience, with a focus on coastal ecosystems. She presented a range of approaches, including a postcard from a coral reef to communicate the pressures facing reef

systems, a video aimed at communicating issues in the retreat of mangroves, an illustrated book aimed at policymakers titled “AHON, A Primer on Climate Resilience”, and a game called “Survive and Thrive” that focused on building resilience through recognising the value of biodiversity. It was mentioned that radio is still the most effective and widespread media for disseminating climate information in the Philippines.

A final reflection session was held before closing on day two. Participants were asked what they might consider doing differently following the learning from the first two days of the workshop. A number of people mentioned that in the future they will spend more time comparing different contrasting climate projections and that collaboration across projects and institutions would be critical in enabling these comparison activities.

Day 3

Theme: Communicating Consistent Climate Change Messages to Inform Decision Makers



The final day of the workshop focused on how to communicate coherent messages from the range of available climate information to inform policy and decision making. Additional participants from the Climate Change Commission and government departments including the Department of Environment and Natural Resources (DENR), the Department of the Interior and Local Governments (DILG), the Bureau of Soils and Water Management and the Energy Policy and Planning Bureau, as well as other non-government agencies, joined the workshop. This allowed engagement between producers and users of climate information, providing an opportunity for the scientists to share insights from the first two days as well as learn more about the issues in how climate information is received and used in practice.

After a formal welcome to the new participants, Dr Richard Jones led the first session of the day that required “scientists” and “users” to split up and form small groups, acknowledging that some participants may consider themselves involved in both the production and use of climate information. The groups were then asked the following questions:

- Scientists: What do you (think you) know and how is this useful?
- Users: What messages have you received and how do you use this information?



The session provoked thoughtful discussion. In the report back, scientist groups presented a number of answers that included: general agreement in future trends of rising temperatures across the Philippines with mixed signals in future rainfall change; some evidence of a shift towards a decreasing frequency but increasing intensity of tropical cyclones; and understanding that El Niño events typically lead to drier conditions in the dry season and more extremes in the wet season. The scientists stated that such information is of variable value to users but in general there is some useful information to guide planning decisions. User groups reported that they regularly receive seasonal forecast information that can be informative for implementing interventions, particularly if there is a strong drought risk. They also stated that whilst the available longer term climate information is useful in mitigation and adaptation policy at the national level, there is a gap in useful information for guiding decisions at the local scale.

Ms Venus Valdemoro presented PAGASA's approaches to communication. She highlighted the many services that PAGASA provides and how they attempt to engage with stakeholders and users of the different information services, emphasising the importance of relationship building. Some of the communication methods highlighted include the warning dissemination protocol and the PAGASA website. Ms Valdemoro spoke about the Information, Education and Communications (IEC) campaign that encompasses a range of different mechanisms for engaging with different communities. Notably, 60,000 students visit PAGASA each year and PAGASA have a very effective social media presence with 1.5 million Facebook page likes and over 3.5 million Twitter followers. She stated that there is scope to leverage existing communication approaches, which mainly focus on shorter timescales, to improve the communication of long-term climate information.

The second activity of the day involved a carousel to identify issues and ideas related to the communication of climate information. Participants moved between stations with the following themes: 1) formats and modes, 2) local level communication, 3) barriers and opportunities to engaging with different audiences, and 4) an "ideas" board for suggested ideas on how to improve communications. Discussion on the first theme revealed a wide range of traditional and contemporary formats and modes of communication. Traditional methods, such as sirens, bells, radio, newspapers and bandillos (village criers) have an important role in communicating weather and climate information for many communities, particularly for early warning of tropical cyclones. Traditional and faith-based leaders and champions also have a key role at the barangay scale. However, increasingly there is a demand for more modern communication formats, particularly SMS, satellite phones, websites, mobile apps and social media.



Effective local level communication has been identified in the DFID project as a key challenge for PAGASA. A number of needs and issues were further discussed in this session. It was noted that there is a lack of technical capacity at local levels for understanding and interpreting climate information. Information must therefore be “laymanised” whilst still maintaining sufficient detail to allow local level impact assessments. State colleges were identified as possible institutions to support the development of scientific literacy and technical capacity of people at the local level. Also, it was stated that whilst locally relevant climate information is minimal, a lack of guidance on how to use the information that is available is a critical barrier to uptake.

There was a very rich discussion on barriers and opportunities to reaching different audiences. Audiences identified as requiring climate information included private sector businesses, farmers and fisherfolk, academics, government, faith-based organisations and NGOs. It was also noted that vulnerable communities, such as children and the elderly, have specific needs regarding information about climate risks. Accessibility to information was identified as a key barrier across all audiences and it was discussed that establishing a sustained dialogue with different communities is essential to increasing the accessibility and visibility of relevant information.

The final carousel station asked participants to think more widely about ideas to improve communication. Ideas included drawing on the UKCP09 approach, in the use of different ways to visualise climate projections, and the CSIRO analogues approach. There was discussion on how to leverage popular culture, particularly telenovelas and social media, to improve communication noting the value of reaching younger audiences. Other ideas included developing demand-based information methods, scaling up youth camps, providing recognition awards for uptake of climate information, providing incentives at the local level to use information, translating information into different local languages, and finally providing a forum for sharing and evaluating climate information across projects and institutions.

The interactive session was followed by a number of talks. Firstly, Dr Jack Katzfey spoke about the Regional Climate Projections Consortium and Data Facility in Asia and the Pacific (RCCDF). The project is developing a web-based portal providing links to observed and future climate information as well as other advice and knowledge products. It was noted that this “one stop shop” for regional climate information could provide a useful mechanism for communicating PAGASA’s new national projections. Ms Jane Delfino then introduced

approaches being developed at the OML centre, and specifically the Climate Knowledge Portal for the Philippines. She identified the limited use and uptake of climate information from the portal at present but explained that the portal is being further developed so that its utility can be realised. Ms Delfino identified specific needs, including a seamless suite of localized climate information as well as the integration of climate information with other types of hazard and locally relevant risk information.



Three further talks were given in the afternoon. Ms Bebet Gozun discussed a USAID funded project on Water Security for Resilient Economic Growth and Stability (Be Secure). She described the project has provided downscaled projections, supplied in collaboration with NCAR, using RegCM4 for four GCMs. In addition the project is using local technical working groups to communicate the climate projections and integrate them into their local disaster risk reduction and climate change action plans. Ms Gina Aljecera (left) then presented on using climate information in government decision making, specifically in NEDA. She explained that they are used in national planning activities and vulnerability assessments. However it was stated that probabilistic information would be useful for understanding the climate risks in more detail. The final talk of the day, from David Corbelli at the Met Office, focused on the DFID project pilot activities in Manila and Salcedo. He described the workshops planned with representatives from the municipalities in the different cities, which were taking place the week after this workshop. The overall aim of the pilots is to find ways to improve the integration of climate information into local level decision making.

During the afternoon participants took part in an activity where small groups, including both scientists and users, compared different climate model projections to derive summary messages. The task involved extracting key information from spatial maps and time series and writing a summary to communicate the information to different audiences: academics, local level government, and fisherfolk. The messages varied from group to group, with emphasis on different aspects of the information and with some messages being far more detailed than others. The task revealed that it is extremely challenging to extract clear messages from a limited set of information produced using different methods and visualised in different formats. It was also evident that the different perspectives were valuable in creating messages that spoke to different user groups. The session suggests that co-production of climate information is a useful approach to preserve scientific integrity and ensure that any information is salient for decision making.

The final session of the day was an open plenary discussion. Comments were particularly encouraged from those who had not had the opportunity to present during the workshop. Key points of discussion included the need to identify “worst case scenarios” from the spread of projections and integrate these with an understanding of impacts. There was a comment that the latest information is assumed to be the “best available” but it may not necessarily be fit for purpose. Roselyn Arayat from the UK Embassy in Manila commented that with so many projects ongoing there is a risk of duplication, so coordination amongst donors, universities and government agencies is critical. Representatives from GIZ commented on

the need to review the state of the climate information reports in the Philippines from different user perspectives and feed this back into PAGASA. Participants from DILG spoke about the training of local government units (LGUs) in using climate information in their climate change action plans and that so far 100 of 700 LGUs have been trained. Finally, Ms Bebet Gozun said that whilst she was only invited to the final day she decided to attend the full three days as she believed this type of forum was critical for linking scientists with government officials and other practitioners in the climate change adaptation space. She proposed that this event may lay the groundwork for developing a more regular forum to discuss these issues.



Conclusions and Recommendations

After three intense days of discussion, sharing of experiences and knowledge, and engagement between scientists, practitioners and decision makers from different institutions, there emerged a growing recognition of the need to confront the challenges associated with comparing, combining and communicating multiple sources of future climate information. The workshop demonstrated the value of working together to address these challenges. Yet it also showed that there are still contested ideas about how to provide reliable climate model projections for the Philippines, as well as a lack of formal methods for combining information produced using multiple methods. Whatever method is used, it was recognised that communicating the confidence of projected outcomes is of utmost importance.

The workshop reinforced the notion that there is a high demand for climate information at the local level. However, whilst there is a perceived need for “downscaled” climate information it is critical to ensure that any information provided is scientifically defensible. High resolution downscaled climate model output may seem more appealing than coarse scale information for integration into local decision making. However if this information does not sample the multiple sources of uncertainty, including the uncertainties evident from comparing multiple methods and models (the primary focus of the workshop), then there is a risk of overconfidence and maladaptation. For information to be useful at the local level it must be *locally relevant*, not necessarily high resolution. In producing clear and usable messages to inform adaptation decisions, scientists must also have some understanding of the decision-making context to support the production of locally relevant information.

The climate modelling community in the Philippines faces an ongoing challenge to generate useful and usable information whilst ensuring it is produced using credible science. This workshop has provided an important platform to enable PAGASA, and other climate science institutions in the Philippines, to interrogate the range of climate modelling methods and projections being used. Furthermore, it provides a first step for continued engagement between producers and users of climate information that will help improve understanding of the strengths and limitations of climate information as well as the capacities of decision makers to use future climate projections. It is now important to sustain this engagement to ensure that PAGASA is providing scientifically robust and decision-relevant information to

guide actions that strengthen the resilience of the Philippines to present and future climate change risks.

Based on the learning from the workshop, there are a number of recommendations for future work and engagement:

- Development of a joint approach across PAGASA to coordinate work on the production of future climate projections including different dynamical and statistical downscaling methods. The approach could include coordination of experimental designs, common methods to analyse model output, and communication of future climate projections through a central channel. The latter points could be addressed in the proposed PhilCCAP2 Climate Futures Project.
- Preparation of a proposal for a research project to develop innovative methods for combining different dynamical and statistical downscaling output with the results of global climate modelling experiments.
- Establishment of an annual national forum to discuss advances in climate science and modelling as well as the application of climate projections across different sectors and levels of society, potentially coordinated jointly by PAGASA and the Climate Commission of the Philippines.
- Discussion on whether there is value in establishing a Philippines Climate Adaptation Network, similar to those being developed in other countries (e.g. [South Africa](#)) to bring together academics, scientists, government decision makers and private sector representatives to engage on issues in climate change adaptation.
- Collaboration on a number of peer-reviewed publications building on the science and partnerships established in the workshop and wider engagement in the DFID project. Provisional working titles for collaborative publications include:
 - Comparison of projected tropical cyclone changes in the Philippines from multiple regional climate models
 - Comparing, combining and communicating multi-model, multi-method climate projections: insights from the Philippines
 - Integrating climate information into local level decision making in the Philippines

Annexes

Annex I – Workshop Agenda

Day 1

Time	Description	Session Leader
08:30 – 09:00	<i>Arrival and coffee</i>	
09:00 – 09:05	Welcome address PAGASA	Dr. Flaviana D. Hilario
	Welcome address, Met Office	Dr. Richard Jones
09:05 – 09:15	Introduction to workshop	Ms. Thelma Cinco and Dr. Joseph Daron
09:15 – 09:45	Activity: Eliciting workshop expectations	Dr. Claire Scannell
09:45 – 10:00	Talk: Overview of PAGASA Climate Modeling Activities	Ms. Thelma Cinco
10:00 – 10:15	Talk: Statistical downscaling for FAO AMICAF project	Mr. Anthony Lucero and Dr. Roberto Sandoval
10:15 – 10:30	Talk: Statistical downscaling from Worldclim	Ms. Rosalina De Guzman
10:30 – 10:40	Discussion	Dr. Joseph Daron
10:40 – 11:00	<i>Break</i>	
11:00 – 11:20	Talk: Downscaling with CCAM for the Philippines	Dr. Jack Katzfey
11:20 – 11:40	Talk: Agricultural Drought Forecasting Using RegCM-downscaled CFS	Dr. Gay Jane Perez
11:40 – 12:00	Talk: Downscaling with HadGEM3RA for the Philippines	Dr. Joseph Daron
12:00 – 12:30	Discussion	Dr. Richard Jones
12:30 – 13:30	<i>Lunch</i>	
13:30 – 13:40	Refresher activity	Dr. Joseph Daron
13:40 – 14:10	Talk: Downscaling activities in SEACLID/CORDEX	Dr. Gemma Narisma
14:10 – 14:40	Talk: Intercomparison of PRECIS, CCAM and RegCM4 simulations over the Philippines	Dr. Marcelino Villafuerte
14:40 – 15:00	Activity: Comparing different climate modelling methods	PAGASA / Met Office
15:00 – 15:20	<i>Break</i>	
15:20 – 16:00	Activity: continuation of activity	PAGASA / Met Office
16:00 – 16:20	Report back and discussion	Dr. Richard Jones
16:20 – 16:50	Activity: Identifying key risks and processes	Dr. Joseph Daron
16:50 – 17:00	Wrap up and close day	Dr. Joseph Daron

Day 2

Time	Description	Session Leader
09:00 – 09:20	Report back on end of day one activity and feedback from day one	Dr. Joseph Daron
09:20 – 09:50	Talk: WRF downscaling of tropical cyclones	Dr. David Yates
09:50 – 10:10	Talk: HadGEM3RA results from DFID project	Dr. Joseph Daron
10:10 – 10:30	Discussion	Dr. Claire Scannell
10:30 – 10:50	<i>Break</i>	
10:50 – 11:15	Talk: PAGASA plans for 2016 Philippines projections	Ms. Edna L. Juanillo
11:15 – 11:45	Talk: PRECIS downscaling at PAGASA	Ms. Thelma Cinco
11:45 – 12:15	Talk: Comparing model output to derive coherent messages	Dr. Richard Jones
12:15 – 12:30	Discussion	Dr. Joseph Daron
12:30 – 13:30	<i>Lunch</i>	
13:30 – 15:00	Activity and Discussion: Extracting similarities and contradictions from data	PAGASA / Met Office
15:00 – 15:20	<i>Break</i>	
15:20 – 16:05	Activity: Determining gaps / priorities for future collaboration	PAGASA / Met Office
16:05 – 16:20	Activity: Identify author team and scope for working paper	Dr. Joseph Daron
16:20 – 16:50	Talk: Communicating integrated resilience	Dr. Laura David
16:50 – 17:00	Wrap up and close day	Dr. Richard Jones

Day 3

Time	Description	Session Leader
08:30 – 09:00	<i>Arrival and coffee</i>	
9:00 – 09:15	Welcome message and introduction	Dr. Flaviana D. Hilario and Dr. Joseph Daron
09:15 – 09:45	Activity: Identifying messages to communicate - Integrating the thoughts and experiences of users and providers	Dr. Richard Jones
09:45 – 10:10	Talk: PAGASA's approaches to communication	Ms. Venus Valdemoro
10:10 – 10:20	Discussion	Dr. Joseph Daron
10:20 – 10:40	<i>Break</i>	
10:40 – 11:15	Activity: Investigating different communication approaches	PAGASA / Met Office
11:15 – 11:40	Talk: ADB Regional Climate Projections Consortium and Data Facility Project	Dr. Jack Katzfey
11:40 – 12:00	Talk: Be-secure project	Ms Bebet Gozun
12:00 – 12:20	Talk: Climate Knowledge Portal for the Philippines: Bringing useful climate information to decision-makers	Ms. Rafaela Jane Delfino
12:20 – 12:30	Discussion	Dr. Richard Jones
12:30 – 13:30	<i>Lunch</i>	
13:30 – 14:00	Report back on activity and discussion	Dr. Claire Scannell
14:00 – 14:20	Talk: Government uses of Climate Information	Ms. Gina Aljecera
14:20 – 14:40	Talk: DFID Project Pilot on Tropical Cyclone Risks and Communicating Information at the Local Scale	Dr. David Corbelli
14:40 – 15:00	Discussion	Dr. Joseph Daron
15:00 – 15:20	<i>Break</i>	
15:20 – 15:50	Plenary: Opportunity for participants to share perspectives	PAGASA / Met Office
15:50 – 16:30	Activity: Co-producing consistent messages from multiple sources of climate data	PAGASA / Met Office
16:30 – 16:45	Report back and discussion	Dr. Richard Jones
16:45 – 16:55	Wrap up and summary of day	Ms. Thelma Cinco and Dr. Joseph Daron
16:55 – 17:00	Closing address	Ms. Edna L. Juanillo

Annex II – List of Participants

Facilitator	Institution
Joseph Daron	Met Office
Claire Scannell	Met Office
Richard Jones	Met Office
Thelma Cinco	PAGASA
Participant	Institution
David Corbelli	Met Office
Francis Colledge	Met Office
Flaviana Hilario	PAGASA
Edna Juanillo	PAGASA
Rosaline De Guzman	PAGASA
Cecilia Monteverde	PAGASA
Anthony Joseph Lucero	PAGASA
Ana Liza Solis	PAGASA
Emma Ares	PAGASA
Marcelino Villafuerte II	PAGASA
Rusy Abastillas	PAGASA
Meliton Pio Guzman	PAGASA
Joseph Baconcillo	PAGASA
Rex Abdon Jr.	PAGASA
Rhonalyn Macalalad	PAGASA
Jack Katzfey	CSIRO
David Yates	NCAR
Gerry Bagtaza	University of the Philippines
Mylene Cayetano	University of the Philippines
Gay Jane Perez	University of the Philippines
Leoncio Amadore	University of the Philippines
Laura David	Marine Science Institute, UPD
Gemma Teresa Narisma	Manila Observatory, Ateneo de Manila University Campus
Rafaela Jane Delfino	Oscar M Lopez Center
Azyleah Avino	Laguna Lake Department Authority - LLDA
Bebot Gozun	Be Secure project, USAID
Roselyn Arayat	UK Embassy, Manila
Edwin G. Domingo	Department of Environment and Natural Resources (DENR)
Conrad A. Bravante	Department of Environment and Natural Resources (DENR)
Wilbur Dee	Department of Environment and Natural Resources (DENR)
Kelvin Joseph Mendoza	Department of the Interior and Local Governments (DILG)
Amelle Bianca Camba	CODICC
Susan Rachel Jose	Climate Change Commission
Eduardo Alberto	Bureau of Soils and Water Management
Grace Sheila Jalani	Bureau of Soils and Water Management
Vicky Capito	Energy Policy & Planning Bureau
Marieta Quejada	Energy Policy & Planning Bureau
Cathlyn Ann Capiroso	National Economic and Development Authority (NEDA)
Hazel Ann Alforja	National Economic and Development Authority (NEDA)
Ruel Cabile	Aksyon Klima Pilipinas
Agnes Balota	Gesellschaft für Internationale Zusammenarbeit (GIZ)
Franklin Diza	Disease Prevention and Control Bureau
Lourdes Margarita Aves Caballero	Pacific Rim Innovations and Management Exponents, Inc. (PRIMEX)



Met Office
FitzRoy Road, Exeter
Devon EX1 3PB
United Kingdom

Tel (UK): 0370 900 0100 (Int): +44 1392 885680
Fax (UK): 0370 900 5050 (Int): +44 1392 885681
enquiries@metoffice.gov.uk
www.metoffice.gov.uk