2019

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Strengthening Links Between Science and Governments for the Development of Public Policies in Latin America

ENG

POLICY BRIEF

GENERATION AND AVAILABILITY OF DATA CONCERNING CLIMATE CHANGE IMPACTS

Inaiê Takaes Santos

KEY MESSAGE

- Knowledge about the impacts of climate change in Latin American countries is key not only for prioritizing and monitoring the effectiveness of adaptation measures, but also for advancing in our discussions about losses and damages, as well as issues related to climate justice.
- Climate change analyses need to consider the determinants of vulnerability not only from regional and territorial perspectives, but also from a transdisciplinary point of view in order to include knowledge, expectations, and the needs of decision makers in information production.
- Climate models require setting out a systematic collection system for high quality data as well as technical capacity for interpreting and translating the information for specific regions and sectors.
- To address uncertainty, robust public policies can be formulated based on the identification of current vulnerabilities, which will bring benefits regardless of the climate scenarios.
- The integration of knowledge requires long-term commitments and continuous resource availability that can be reinforced by institutionalization of networks and associations.

Executive summary

Considerable progress has been made in recent years in generating information on current and future climate change impacts in Latin American countries, but there are still deficiencies in both the production of information and the ability to interpret and translate the information generated into specific productive, social and environmental systems. As a result, public policies fail to incorporate key climate information into medium- and long-term objectives. The public sector has a fundamental role in the production and management of this information and for this it needs to strengthen national research institutions, with measures that range from human resources and computational infrastructure to the fostering of transdisciplinary approaches in scientific research programs. Projections and scenarios are fundamental but not sufficient: climate change impacts have multiple dimensions, as they also manifest themselves through second order (or higher) effects, such as epidemics and migration crises. In addition, climate information needs to be translated into specific regional and sectoral contexts, which requires mobilization of actors and resources in the sectors where information must be applied. The recommendations presented here are based on diagnostic reports, desk research of specific literature, and interviews with professionals experienced in public policy processes and the development of adaptation strategies.

Resumen ejecutivo

Se ha logrado un progreso considerable, en los últimos años, en la generación de información sobre los impactos actuales y futuros del cambio climático en los países de América Latina; no obstante, todavía hay deficiencias tanto en la producción de información como en la capacidad de interpretar y traducir la información generada para sistemas productivos, sociales y ambientales específicos. Como resultado, las políticas públicas no incorporan información climática clave en objetivos a mediano y largo plazo. El sector público tiene un papel fundamental en la producción y gestión de esta información, y para ello necesita fortalecer las instituciones nacionales de investigación, con medidas que van desde los recursos humanos y la infraestructura computacional hasta el fomento de enfoques transdisciplinarios en los programas de investigación científica. Las proyecciones y los escenarios son fundamentales, pero no suficientes: los impactos del cambio climático tienen múltiples dimensiones, ya que también se manifiestan a través de efectos de segundo orden (o superiores), tales como epidemias y crisis migratorias. Además, la información climática debe traducirse en contextos regionales y sectoriales específicos, lo que requiere la movilización de actores y recursos en los sectores donde la información necesita ser aplicada. Las recomendaciones presentadas aquí se basan en los informes de diagnóstico, investigación documental de literatura específica y entrevistas con profesionales con experiencia en procesos de políticas públicas y desarrollo de estrategias de adaptación.

Introduction. What is the Problem?

Latin America has unique ecosystems and it contains the world´s greatest biodiversity. Its emerging economies rely on natural resources to a large degree and, at the same time accelerate urbanization.

A wide range of climate change impacts are predicted for the region by the end of the century: anomalies in rainfall patterns, strong increases in the frequency and intensity of extreme weather events (e.g. cyclones, storms), and increased risk of drought and aridity.

Even with the lowest level of global warming, the region will suffer, not only due to the direct impacts (e.g. the reduction or extinction of species), but also due to the potential combination and simultaneous occurrence of impacts such as the reduction of agricultural production and damage to infrastructure resulting from the disruption of transport (1) that could cause a crisis in urban food supply.

Even though progress has been made in the design of the policy agenda, knowledge gaps are slowing down the progress of adaptation plans and policies. Climate scenarios are an important aspect of scientific research on the impacts of climate change. Nevertheless, their contribution can be limited if they are lacking progress and integration with the knowledge about the systems exposed to climate dangers. Like the understanding of the determinants and regional variability of vulnerability, exposure and adaptation capacity is still low hence uncertainties related to these elements are poorly characterized and quantified (2).

In order to produce useful information such as maps, long term risk and vulnerability analysis, projections, and climate scenarios, researchers need good quality data on temperature, precipitation, wind, soil humidity, and ocean conditions. Long term climate and hydrological data in the region shows discontinuity and lack of homogeneity, which affects the quality of the data, and therefore the levels of confidence in historical changes and the identification of tendencies (2).

Information generated on the impacts of climate change must take into account multiple dimensions since the impacts can be observed in damages in the infrastructure, the interruption of essential services, and production activities, as well as have second order effects (or higher) in diverse areas such as public health and migration.

Project LatinoAdapta's first phase revealed that the difficulty in using the information available has to do with its fragmentation, the lack of articulation between the different research programs, the lack of training for interpreting the information, as well as the complexity of the analysis and uncertainty inherent to the scenarios and projections.

Likewise, decision makers at the sub national level have a hard time accessing the information and/or when available it doesn´t apply to the scale or the sector of interest. There is also a lack of investments available for scientific work, and only a small part of research budgets is allocated to communicating the results obtained.

Why do we need to address these knowledge gaps?

There are at least three reasons why most Latin American countries meet the conditions to make climate change adaptation more essential than ever.

- High percentage of population in the vulnerable groups.
- High economic importance of extractive and agricultural activities that are more sensitive to climate variations than others such as manufacturing and services.
- Large gaps of infrastructure that require long-term planning and hence the importance of considering climate information so the structures are resilient to expected impacts.

Climate change is a global phenomenon, however its causes and impacts are distributed unequally. Latin America and the Caribbean represent less than 10% of global greenhouse gas emissions but they are extremely vulnerable to the impacts of climate change that threaten the right to life, health, food, water and sanitation, among other human rights (3).

Within the framework of environmental justice, the adequate monitoring of impacts and adaptive actions will provide more reliable data that the region can use to discuss losses and damages in the international arena.

Even though there are technical and political difficulties in evaluating adaptation limits, the challenges to reduce and manage loss and damage are not very different from those of adaptation (4). The different priorities and actions to approach loss and damage detailed in the United Nations Framework Convention on Climate Change (UNFCCC) can be summarized in three important objectives, two of which are already part of the climate change adaptation and disaster risk reduction agendas (Figure 1).

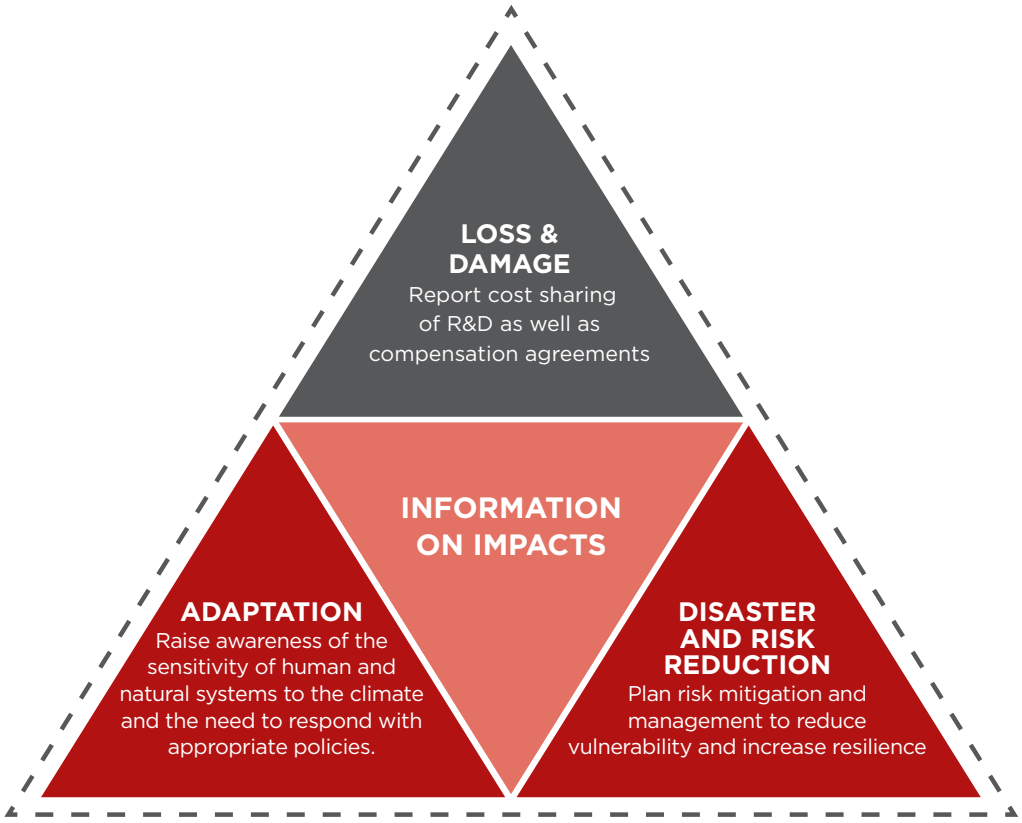

Figure 1 – Common objectives in the agenda of Climate Change Adaptation, Disaster Risk Reduction, and Loss and Damage. Source: Based on (4).

Capacity building and institutional strengthening to generate and make available information on the impacts of climate change contributes to the system´s adaptive capacity and resilience. They also support advances to the loss and damage agenda included in the Warsaw International Mechanism established in the United Nations Framework Convention on Climate Change (UNFCC) in 2013 (5).

The more advanced stages of adaptation strategies such as the prioritization of measures based on cost-benefit indicators require robust information about the current and future projected impacts, since the benefits of these measure depends largely on the impacts that will be avoided with its implementation. Information referring to the impacts of adaptation to climate change contributes also to the generation and systematization of data for measuring, reporting, and verifying adaptation measures detailed in the National Determined Contributions (NDC).

Proposals to resolve problems

Capacity Building

Ecological and socioeconomic conditions differ from country to country and therefore so do impacts. The Global Framework for Climate Services (GFCS) is a World Meteorological Organization initiative that stresses the importance of governments empowering institutions such as the national meteorological, hydrological and oceanographic services that have experience in forecasting phenomena (e.g. droughts and floods), so that climate information can be interpreted within the national framework. Capacity building includes specifically the following: a) human resources b) infrastructures c) procedures d) institutions. Its aim is to improve the interactions between climate service suppliers and users, the policies and practices of climate data management, and lastly the quality and amount of climate observations, among others (6).

Even though deficiencies in the observation of biological, environmental and socioeconomic variables exist, it is important that this information be included with the climate data, and that users are consulted before specific measures are adopted (7). Combined with the appropriate socioeconomic, biological and environmental data, observations of climate variables can provide information for application models and indices that associate climate conditions with significant measures for users, such as the incidence of diseases, crop yields, and energy demand (7). In view of the fact that there is no single methodology that can be applied to all sectors, the UNFCCC prepared a compendium of tools and methods to evaluate climate change impacts in different sectors including hydraulic resources, agriculture, public health, among others (8).

The public sector plays a key role in raising awareness of communities and organizations about climate change risks. It is also key in coordinating inter-sector planning initiatives.Although governments do not provide all the information that is used directly in a sector or region, government plans or strategies have the power to mobilize private actors in order to produce relevant and context specific information. The private sector can support the public sector in the development of adaptation strategies such as establishing and managing early alert systems or systems for observing climate. Likewise, they can provide alternative lower cost models to improve efficiency, innovation, and technological services (9). These actions are consistent with responsible corporate adaptation, in which the benefits that stem from adaptations measures are not limited to the company´s operations. Instead they take into consideration the best way to mitigate and approach climate risk in the communities where they are being implemented (9).

Mechanisms for promoting scientific research

Combining scientific knowledge with public participation is becoming increasingly more important to improve the capacity of different sectors and governments to respond to the challenges of climate variability and extreme weather conditions. More research programs are needed that include not only climatologists and meteorologists but also scientists in the fields where the programs are implemented, such as agriculture, energy, and hydraulic resources.

Many development agencies view the adoption of social impact requirements as the engine of scientific research, either with the sole purpose of communicating results or to involve stakeholders in the research process. Interdisciplinary and transdisciplinary approaches to scientific research contribute to improve production and the use of climate information, consistent with the concept behind climate services (Table 1).

These approaches stress the role that intermediary actors play in integrating disciplines and transmitting knowledge to specific actors. They go beyond the unidirectional linear relationship that treats science as a knowledge provider and decision makers merely as users of information. They foster collaboration between scientists, governmental and non-governmental actors from different climate-sensitive sectors, and give them the status they deserve in research projects (10).

Table 1. Concepts and practices associated with climate services

Climate services refer to the production and dissemination of climate data, information, and knowledge useful and relevant to support decision-making and policy formulation in sectors sensitive to climate variability and change. By definition, they must respond to a climate need, and therefore, require user participation. Those interested in learning more about the concept and practices related to climate services can refer to the following websites:

- Global Framework for Climate Services — https://gfcs.wmo.int/
- Climate Services for South of South America — http://serviciosclimaticos.blogspot.com/
- Climate Service Center Germany — https://www.climate-service-center.de/index.php.en
- Climate Services (Scientific newspaper) — https://www.journals.elsevier.com/climate-services

The concept of climate services brings to the table a new interdisciplinary perspective with regards to social and environmental systems. It seeks to work through the needs and expectations of different actors and sectors, although the idea of services is tied to meteorology and hydrology (10).

However, integrating disciplines is a great challenge in itself. Including actors that are outside of the scientific arena in the information generating process requires additional effort, since they may reason differently, and the integration between scientists and stakeholders does not always occur spontaneously. The need to create and maintain spaces that foster interaction over time, and lead to collaboration between the different actors, requires additional public funding so that the promises of integration are not limited to vague intentions listed in the terms of reference, edicts, and training programs. Table 2 describes a case that was successful and counted on the collaboration of scientists and non-scientists.

Table 2. Adaptation in the municipality of Santos, Brazil

- The Metropole Project assessed how municipal governments could make decisions concerning adaptation to sea level rise by applying a participatory approach. The process included a wide variety of participants, including public servants, real estate agents, and street vendors among others, working together on adaptation solutions. The team of scientists presented representations of the projected impacts of climate change detailed in regional maps, as well as the cumulative costs of extreme weather events (11). However, adaptation awareness was facilitated by the fact that the stakeholders were already observing the impact for some time.
- Some of the factors that facilitated the interaction of these actors with scientists were the public administration´s commitment, the existence of municipality databases with non-climate data, and the credibility (also on the part of stakeholders) that the project responded to the municipality´s long-term resilience instead of the administration´s political interests (12).
- The collaboration between scientists and public sector management was institutionalized later on with the creation of the Academic Advisory Commission to support the Municipal Commission for Climate Change Adaptation. Currently, the municipal adaptation plan is in the process of being implemented with the support of the Ministry of the Environment and the German Agency for International Cooperation (GIZ), through the ProAdapta project.

Flexibility for new organizational models, including funding

The transdisciplinary approach in itself, implies new organizational models due to the greater diversity of actors involved. The funding of institutional capacity building actions for the production of climate services must depend not only on national and international mechanisms, but also on private initiative. In some cases for example, it is possible to develop agreements such as the hiring of consultants by private companies, preferably in consortia dedicated to interpreting and producing information in different formats that are appropriate for use in specific sectors and regions.

However, we must be aware of the potential risk of overlapping efforts and resources, which is also a problem. Hence the importance of institutionalizing networks, including the private sector, such as the national networks of the United Nations Global Compact. Ideally, the products - or at least part of them - resulting from these partnerships can be shared with other organizations or generate a public good, for example, according to the concept of responsible corporate adaptation already mentioned.

Institutionalization of networks and partnerships

In recent years, there has been considerable progress in the production of information for the countries of South America through downscaling techniques. However, the weakness lies in the ability to interpret and manipulate such information. To overcome the limitations of computing infrastructure, a possible solution is establishing international partnerships, such as the GFCS (Table 3). The institutionalization of these collaboration agreements contributes to ongoing communication channels and sharing information over time.

Table 3. Regional Climate Center for South of South America (CRC-SAS)

- CRC-SAS is a network built according to the principles defined by WMO, whose objective is to provide climate services to support the National Meteorological Services (NMS) and other users in southern South America: Argentina, Brazil, Paraguay, Uruguay, Bolivia and Chile. Its capacity development and training activities are aimed not only at NMS staff, but also at the user community in general. Therefore, the initiative seeks to promote the articulation of scientific information and experience, as well as a regular basis of communication between scientists, institutions and stakeholders.
- A good example of an institutional partnership that can take advantage of provision of climate services in South America is the one established by the Convention on the Rights of the Child with the project “Towards usable climate science: Informing decisions and provision of climate services to the agriculture and water sectors of southeastern South America” funded by the Institute for Global Change Research (IGCR). The project has a team of researchers trained in physics, biology and social sciences, as well as representatives of government agencies and NGOs from Argentina, Brazil, Paraguay and the United States (10).
- For more information: http://www.crc-sas.org/pt/institucional.php

Recognizing the limitations of downscaling

Regarding the scale of interest, since the Fourth Assessment Report (AR4) of the United Nations Intergovernmental Panel on Climate Change (IPCC), substantial progress has been made in impact analysis using combined[1] global and regional models, and this has allowed a better description of future climate change and extreme events in Latin America (13); this improvement continues to be observed in the AR6 models. A few years ago, the required IT infrastructure was limited in Latin American countries, but today several research groups produce information at regional level. These already provide sufficient resolution to develop adaptation strategies by sub national governments and / or sector associations, especially if the region or sector already has experience with some of the key impacts, such as sea level rise or the water supply crises (12).

Some examples are Cordex[2], ProjETA[3] and Climate Change, Agriculture and Food Security (CCAFS)[4]. The Earth System Grid Federation (ESGF)[5] initiative has a global system of federated data centers that provide access to the largest archive of climate data worldwide. However, the information available is not always in a format that can be used directly by decision makers. Less detailed country scenarios are available in fact sheets prepared by the Center for Climate Services in Germany (GERICS)[6] or on the World Bank's[7] knowledge portal.

While they are relevant for sub national policy-making, scale reduction practices also have limitations, especially when the meteorological data used for the calibration of the model is of poor quality, the relationship between the global climate and the regional climate is poorly understood and represented, and there is no technical capacity for data interpretation and management (14). There is also a risk that high resolution scale reduction will be misinterpreted as precise scale reduction, that is, the ability to reduce the scale does not imply greater confidence in the resulting scenarios (14).

Therefore, it is essential that governments strengthen the means for the systematic collection of observations at local and national levels, and thus contribute to data quality, such as precipitation, temperature and surface temperature measurements. It is also necessary to provide team training, mainly at sub national level, to manage the information generated in simulations and projections. In the short term, a practical approach to circumvent the limitations of computing infrastructure and technical capacity is to partner with research institutions in other countries.

Recognizing uncertainty in robust decision making

Given the great uncertainties about future vulnerability and exposure, absorbing the wide breadth of results of possible socio-economic trajectories is a big challenge due to the amount of social, economic and cultural factors that interact with each other. These factors include the level of wealth and its distribution in society, demography, migration patterns, access to technology and information, employment patterns, the quality of adaptive solutions, social values, government structures and institutions focused on resolving conflicts (13).

Also, top-down approaches and bottom-up methods suggest that the adaptation strategy be based initially on current vulnerabilities, and consider adaptation actions that make sense to the current challenges and that are probably beneficial beyond the future scenario (14), since the uncertainty of present and past observations is much less than that inherent in future projections. In any case, decade-long climate projections have some limits with which sensitivity tests and solid planning can be performed instead of identifying optimal options (15).

Given the high degree of uncertainty that characterizes climate scenarios, the robustness of public policies, including adaptation actions, becomes the fundamental criterion for prioritization. In this context, decision makers must pay special attention to the so-called "co-benefits"; that is, benefits not related to climate change, and measures without regret, which generate benefits (climate and non-climate) that exceed their cost of implementation under current climate conditions (16).

However, a reliable assessment of biophysical impacts is a prerequisite for any analysis of social or sector impacts, and the scientific community has warned that even the most modern models underestimate extreme impacts (17,18). It is therefore essential to pay more attention to tail events, which can far exceed those described in the IPCC reports (19).

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Recommendations

In summary and based on the above, given the knowledge gaps on the impacts of climate change, following are recommendations for policy and decision makers:

- Develop national and sub-national institutional capacities, especially - but not restrictively - of meteorological, hydrological and oceanographic services, to strengthen infrastructure, to create, archive, control quality, communicate, transfer, receive and use climate data and information in useful formats for decision making.

- Develop professional capacities by providing training to public servants, mainly in the sectors most affected by climate change (agriculture, health, infrastructure, urban planning, etc.) and at the lowest levels of governance. These should be able to perceive interactions between biophysical and socioeconomic variables related to their area of specialization, as well as to interpret and manage data from climate models, in order to produce information relevant to the sector and the region of interest.

- Promote inter and transdisciplinary approaches in the mechanisms to promote scientific research and the production of climate services.

- Explore new organizational arrangements, including private sector funding, to translate impacts to specific sectors, and at the same time try to reduce possible overlapping of efforts.

- Make sure not to create high expectations of fitted models for smaller geographical scales. In the absence of fitted models, it is also possible to advance adaptation strategies by identifying key determinants of vulnerability to current climate conditions, and exploring the spectrum of plausible scenarios to consider actions that will be beneficial in any case.

- In order to overcome budget constraints and/or technical capacity, even for the development of fitted models, it is possible to seek partnerships with research institutions in other countries. It is therefore important to institutionalize networks and partnerships to maintain collaborative efforts over time.

Acknowledgements

The author acknowledges the following experts who were consulted for the preparation of this policy report: Lincoln Muniz Alves (National Institute of Space Research - INPE, Brazil), Adrián Martínez Blanco (The Climate Route), Tania Guillén Bolaños (GERICS), Eduardo Kimoto Hosokawa (Santos City Hall, Brazil) and Danielle Almeida de Carvalho (GIZ Consultant).

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This document is part of the LatinoAdapta Project: Strengthening Links Between Science and Governments for the Development of Public Policies in Latin America, executed by the Regional Network for Climate Change and Decision Making - UNESCO UNITWIN Program, led by Fundación AVINA and funded by the International Development Research Center (IDRC) of Canada. The project was implemented in six countries in Latin America including Argentina, Brazil, Chile, Costa Rica, Paraguay, and Uruguay.

AUTHOR
Inaiê Takaes Santos
MSc. in Economics, Policy and environmental governance specialist.
inaiets@gmail.com

REVIEWER
Mariela Morales

GENERAL EDITOR
Paula Bianchi

PROOFREADER
Felipe Fossati

TRANSLATOR
Patricia Wild

GRAPHIC DESIGN

Hola

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