Further views related to adaptation communications

Provided in conjunction with the joint submission by Argentina, Brazil and Uruguay on the matter

1. National Adaptation Policies and Plans

ARGENTINA

As part of the active policies on adaptation to climate change, various steps have been taken since the signing of the Paris Agreement, which mean a qualitative leap in the approach to the subject. Indeed, the creation of a Climate Change Cabinet (by Decree No. 891/2016), coordinated by the Chief of the Cabinet of Ministers, has put climate change on top of the agenda regarding decision-making at national level.

This issue is no longer just a matter of the Environmental area. Today it has given place to proactive actions of other ministerial bodies. Thus, Ministries such as Transport, Energy and Agribusiness, among others, have become active participants in the development of policies related to climate change.

In the same vein, coordination mechanisms with subnational governments through the "Bureau of Climate Change" of the Federal Environment Council (COFEMA) allow an active interaction between the National Government and the Provinces which also allows a common vision of the problem, creating scenarios of cooperation.

Various governing bodies have made joint efforts with numerous sectors of the civil society, comprising non-governmental organizations, chambers of commerce, Academia, and labor organizations, among others, that became enabled to make different contributions to the subject through an open process that allows participation of all stakeholders.

As part of this National Cabinet, in order to ensure the achievement of the desired objectives, various sector-based bureau or "working groups" are being implemented. Within the Bureau on Adaptation, the process to develop the National Adaptation Plan has already begun. Recent work in this field has made a significant progress in identifying priority lines of action that respond to emerging needs based on studies conducted within the framework of the Third National Communication that Argentina presented during the COP 21.

Argentina considers that it is necessary to have a National Adaptation Plan that includes, inter alia, disaster risk reduction, as well as different visions and geographical and social heterogeneity. Indeed, emphasizing the complexity and diversity of our country, a systemic approach to the discussion or action concerning the environment is required.

Furthermore, and on the basis of this systemic perspective, several tools that will be useful for various levels of government are currently under development. An example

of this is the preparation of an interactive platform that will allow us to see the development of adaptation measures at provincial and national adaptation to climate change scenarios and extreme weather events through the identification and analysis of vulnerabilities in the territory.

An example of this is the preparation of an interactive visualization platform that will develop measures of local, provincial and national adaptation to climate change scenarios and extreme weather events through the identification and analysis of vulnerabilities in the territory of Argentina.

Another aspect of great importance for state policies that will have an effective territorial impact, is to strengthen capacities at the municipal level. To do this, a methodological guide to support local governments in the design and implementation of adaptation plans is being developed. This will enable local authorities to know their vulnerabilities, their resources and capabilities concerning to the impacts of climate change.

In order to strengthen the activities related to different focal areas through synergic mechanisms between different sources of funding areas, but with financial and administrative hub in the Adaptation Fund, two projects related to this fund are being developed:

- Adaptation and resilience of family farming in northeastern Argentina to the impact and variability of climate change. This project's main objectives are to increase the adaptive capacity and resilience of small family farmers, strengthen monitoring systems and build institutional capacity for decision-making.

- Increasing Climate Resilience and Enhancing Sustainable Land Management in the Southwest of the Province of Buenos Aires. The general objective is to reduce vulnerability to desertification processes induced by ecosystems' climate change in system areas, agricultural and livestock in the southwest of the Province of Buenos Aires and, likewise, create a strengthened and enabling institutional framework to meet the negative impacts of climate change.

Moreover, in the context of the actions taken by the Ministry of Environment and Sustainable Development, and in close collaboration between the areas of Climate and Land Degradation Change, it has institutionalized the National Observatory of Land Degradation and Desertification, based on a network of scientific-technological and political organizations that provide information and knowledge and at the same time are users of information. For viewing, interactive maps, publications and an online repository of geospatial data are developed.

The central objective of the Observatory is to provide information on the status, trends and risk of land degradation and desertification to develop proposals and promote prevention, control and reduction of risk in the context of climate change that has

imposed additional pressure to processes of loss of productivity and profitability of land.

In line with the work being done in terms of strengthening the processes of adaptation, the Federal Emergency System is in the process of revitalizing, which gathers the civil protection services of nation and provinces with the aim of generating mechanisms of disaster risk reduction in the territory, with a clear direction towards prevention.

BRAZIL

Since 2013, Brazil has been making efforts to develop it´s national adaptation agenda. Brazil´s National Adaptation Plan[1] (NAP) launched in May 2016 is one of the main results of this effort. The Plan was developed by the Federal Government in close collaboration with civil society, the private sector and state governments. The Plan identifies current and future climate change impacts in Brazil and vulnerability associated with those impacts. It establishes actions and policies to promote adaptation in 11 different sectors of the economy, society and infrastructure.

The objective of the Plan is to address and promote the reduction of climatic risk in the country, avoiding economic and social losses, and benefiting from opportunities. It encompasses measures and tools to promote the adaptation of environmental, human, productive and infrastructure systems.

The plan observes the following principles: 1) Intergovernmental coordination (federal, states, municipalities); 2) Intergovernmental coordination; 3) Sectoral, thematic and territorial approach; 4) Social, cultural, economic and regional approaches; 5) Co-benefits between adaptation and mitigation; 6) Governmental planning encompassing adaptation to climate change; 7) Scientific, technical and traditional knowledge-based adaptation actions; 8) Promotion of ecosystem-based adaptation (AbE) and its incorporation into public policies; and the 8) Promotion of regional cooperation.

Along with the elaboration of Brazil´s NAP, the government is developing a set of studies, methodologies, and tools, in collaboration with different scientific institutions, for the comprehension and diagnosis of exposition and vulnerability to climate change in Brazil. Different territorial scales (biomes, states and local scale) are being evaluated through different methodologies, contributing to a better understanding of impacts and vulnerability, and to the definition of measures and politics that can guide, in the future, the increment of adaptation capacity and vulnerability reduction in the country.

URUGUAY

Uruguay's 2009 National Climate Change Response Plan states that adaptation is a strategic priority for the country. This is essential to be able to effectively respond to

[1] Available in Portuguese at http://www.mma.gov.br/clima/adaptacao/plano-nacional-de-adaptacao.

climate change and increased climate variability, especially, to reduce risks and losses and damages from increasingly intense climate adverse effects.

Uruguay is highly sensitive to droughts, it has low-lying coastal areas, as well as areas which are prone to climate related disasters, such as floods. Adaptation becomes particularly important when it comes to food production, which is a core activity for the domestic economy and to ensure global food security and is highly sensitive to climate.

Within this context, Uruguay has, through the implementation of public policies, been addressing adaptation to climate change and variability and climate risk management for different sectors, both at national and subnational levels of government by with domestic and external means of implementation. In sectors such as cattle farming, agriculture and energy there has been important progress in the implementation of specific adaptation measures.

This makes it possible to begin the design of sector/territorial-specific National Adaptation Plans (NAPs), such as agricultural, coastal and urban, to identify adaptation needs in the medium and long term, and allowing for the development and implementation of strategies and programs, within the planning and development frameworks of these sectors.

The main adaptation actions undertaken were:

- Energy mix diversification to reduce vulnerability and cost overruns of the power system in case of hydropower generation deficits.
- Development of climate index insurances and other financial instruments for risk reduction in the power sector.
- Design and implementation of adaptation measures in cattle production, including water sources, feed and rangeland management measures.
- Development of soil use and management plans to reduce erosion and preservation of organic matter in croplands.
- Resettlement of population living in urban areas vulnerable to floods, and land-use planning measures to reduce the risk of floods.
- Monitoring program and eradication campaigns for the Aedes Aegypti mosquito, strengthening of the National Immunization Program against diseases caused by climate sensitive vectors and other health communication and awareness raising activities.
- Development and strengthening of the National Protected Areas System, which contributes to the protection of climate change and variability vulnerable biodiversity and ecosystems.
- Restoration and maintenance of coastal ecosystems services that provide protection against extreme events and of ecosystems services that protect drinking water sources.
- Overhaul and maintenance of road infrastructure, especially in coastal/ flood sensitive areas, taking into account climate change and variability.

- Development of research and data collection programs and networks on the impacts and adaptation to climate change and variability.
- Development of information systems, climate services and monitoring programs, particularly for the environmental, agriculture and emergency sectors, and development of early warning systems, to support decision-making.
- Development, strengthening and decentralization of the National Emergency System.
- Strengthening of weather, climate and water services.
- Design and implementation of the National Climate Change Response Plan; the Metropolitan Climate Plan; Climate Change Adaptation and Development Project for the agriculture sector; Integrated Water Resources Management National Plan within the climate change and variability framework, Land-use Planning programs for vulnerable regions and Stormwater Management Plans; Emergency and Sudden-impact Disasters Response Protocol; identification of adaptation measures in the tourism sector and development of a National Adaptation Plan for the coastal sector.

Building on the experience and results of these undertakings, and incorporating new elements, by 2030 Uruguay expects to have accomplished the following adaptation actions, with the support of external means of implementation:

- Development and implementation of national, regional and sector-specific participatory climate change and variability adaptation plans, and incorporation of monitoring and reporting systems on adaptation and loss and damage.
- Development of new early warning systems and new hydrometeorological insurances, within the disaster risk reduction framework for the agricultural, coastal and health sectors, and for flood sensitive urban areas, infrastructure and other vulnerable regions.
- Strengthen climate risk management against floods, through the enhancement of vulnerable population resettlement processes and the implementation of new land-use planning measures. Moreover, with regard to drought management, identification of new water sources, promote the construction of associative works, such as large reservoirs to serve various users, and improve efficiency in water use.
- Improve the protection of surface and underground water sources, such as aquifer recharge areas, through the promotion of good drilling practices, point source and non-point sources pollution control and the implementation of conservation and restoration measures for gallery forests.
- Promote ecosystem-based adaptation, strengthening ecosystem and biodiversity conservation strategies.
- Design, adapt and maintain a resilient infrastructure, considering the impact of climate change and variability.
- Articulate and develop new integrated climate services and information systems, for continuous monitoring, risk mapping and loss and damage evaluation, by strengthening academic, monitoring and observation institutions, such as the Uruguayan Institute of Meteorology and the National Water Management Service.
- Build research, development and innovation capacities to enhance domestic response to climate change and variability.

- Enhance visibility of climate change adaptation measures within the allocations of the national budget, including the development of a national system of environmental indicators.
- Implement education, training and awareness programs that address climate change response needs.

2. Current and projected impacts related to climate change in Southeastern South America and Brazil

According to the Fifth Assessment Report (AR5) of the IPCC (Part B, Chapter 27 "Central and South America") the Southeastern region of South America (SESA), including Argentina, Brazil and Uruguay, present the following climate and hydrological trends and projections:

-Significant trends in precipitation and temperature have been observed in South America (SA). In addition, changes in climate variability and in extreme events have severely affected the region. There are increasing trends in annual rainfall in SESA.

-Climate projections suggest increases in temperature, and increases or decreases in precipitation, while in SA rainfall varies geographically, most notably showing a reduction of –22% in northeast Brazil, and an increase of +25% in SESA. By 2100 projections show an increase in dry spells in tropical SA east of the Andes, and in warm days and nights in most of SA.

- Changes in streamflow and water availability have been observed and projected to continue in the future in SA, affecting already vulnerable regions. The Andean cryosphere is retreating, affecting the seasonal distribution of streamflows. Increasing runoffs in the La Plata River basin and decreasing ones in the Central Andes. Risk of water supply shortages will increase owing to precipitation reductions and evapotranspiration increases in semi-arid regions, thus affecting water supply for cities, hydropower generation and agriculture.

Also the IPCC signals that South and Central American region *"has multiple stressors on natural and human systems derived in part from significant land use changes and exacerbated by climate variability/climate change. Climate variability at various time scales has been affecting social and natural systems, and extremes in particular have affected large regions. In Central and South America, 613 climatological and hydro-meteorological extreme events occurred in the period 2000–2013, resulting in 13,883 fatalities, 53.8 million people affected, and economic losses of US$52.3 billion*[2]*. Land is facing increasing pressure from competing uses such as cattle ranching, food production, and bioenergy. Two other important contrasting features characterize the region: having the biggest tropical forest of the planet on the one side, and possessing the largest potential for agricultural expansion and development during the next decades on the other. This is the case because the large countries of SA, especially, would have a major role in food and bioenergy production in the future, as long as policies toward adaptation to global climate change will be strategically designed. The*

[2] *(www.emdat.be)*

region is already one of the top producers and user of bioenergy and this experience will serve as an example to other developing regions as well as developed regions."

AR5 also describes "observed and projected impacts and vulnerabilities" in major sectors in relation to climate change. Below is a summary of IPCC findings by key sectors in our region:

Freshwater resources

-Changes in hydrological related conditions, being the most robust trend for major rivers found in the subbasins of La Plata River basin, showing a positive trend in streamflow in the second half of the 20th century at different sites[3] Increasing trends in streamflows have also been found in the Patos Lagoon in southern Brazil[4] and Laguna Mar Chiquita and in the Santa Fe Province, both in Argentina, with ecological and erosive consequences[5].

-Extratropical Andes face significant reductions[6] with effects compounded by changes in snowpack extent[7]. Semiarid regions in SESA and NEB with highly populated basins, and with extensive agriculture irrigation and hydropower demands are expected to increase their current vulnerability[8]

-Projected changes in the cryosphere conditions of the Andes could affect the occurrence of extreme events as well as scenarios of water quality pollution by exposure to contaminants as a result of glaciers' retreat[9].

Terrestrial and Inland Water Systems

-Vertebrate fauna is projected to suffer species losses until 2100 of at least 10%[10]. In Brazil, projections for Atlantic forest birds, endemic bird species, and plant species[11] of the Cerrado biome indicate that distribution will dislocate toward the south and southeast, precisely where fragmentation and habitat loss are worse.

-In addition to climate change impacts at the individual species level, biotic interactions will be affected. Modifications in phenology, structure of ecological

[3] *(Pasquini and Depetris, 2007; Krepper et al., 2008; Saurral et al., 2008; Amsler and Drago, 2009; Conway and Mahé, 2009; Dai et al., 2009; Krepper and Zucarelli, 2010; Dai, 2011; Doyle and Barros, 2011)*
[4] *(Marques, 2012)*
[5] *(Pasquini et al., 2006; Rodrigues Capítulo et al., 2010; Troin et al., 2010; Venencio and García, 2011; Bucher and Curto, 2012)*
[6] *(see review in Masiokas et al. (2009)*
[7] *(Pizarro et al., 2013; Vicuña et al., 2013)*
[8] *(high confidence; ECLAC, 2009a; Souvignet et al., 2010; Fiebig-Wittmaack et al., 2012; Vicuña et al., 2012)*
[9] *(Fortner et al., 2011)*
[10] *(Lawler et al., 2009)*
[11] *(Anciães and Peterson, 2006); (Marini et al., 2009); (by 2055, scenarios HHGSDX50 and HHGGAX50; Siqueira and Peterson, 2003)*

networks, predator-prey interactions, and non-trophic interactions among organisms have been forecasted[12].

-Although in the region biodiversity conservation is largely confined to protected areas, with the magnitude of climatic changes projected for the century, it is expected that many species and vegetational types will lose representativeness inside such protected areas[13].

Coastal Systems and Low-lying Areas

-Coastal states of Latin America and the Caribbean have a human population of more than 610 million, three-fourths of whom live within 200 km of the coast[14]. Fish stocks, places for recreation and tourism, and controls of pests and pathogens are all under pressure[15]. The distribution of population is a crucial factor for inundation impact, with coastal areas being non-homogeneously impacted. A scenario of 1 m SLR would affect some coastal populations in Brazil and the Caribbean islands[16].

-The greatest flooding levels (hurricanes not considered) in the region are found in Rio de La Plata area, which combine a 5 mm yr–1 change in storm surge with SLR changes in extreme flooding levels[17]. Extreme flooding events may become more frequent because return periods are decreasing, and urban coastal areas in the eastern coast will be particularly affected, while at the same time beach erosion is expected to increase in southern Brazil[18].

-In addition, the southwestern Atlantic coast, eastern Brazilian reefs might suffer a massive coral cover decline in the next 50 years[19].

Food Production Systems and Food Security

-By the end of the 21st century SA could lose between 1 and 21% of its arable land due to climate change and population growth[20]. Even if rainfall projections estimate increases of about 25% in SESA for 2100, agricultural systems could be threatened if climate reverts to a drier situation due to inter-decadal variability. This could put at risk the viability of continuous agriculture in marginal regions of Argentina's Pampas[21].

-In Chile and western Argentina, yields could be reduced by water limitation. In northern Patagonia (Argentina) fruit and vegetable growing could be negatively affected caused by a reduction in rainfall and in average flows in the Neuquén River

[12] (*Brooker et al., 2008; Walther, 2010)*
[13] (Heller and Zavaleta, 2009)
[14] *(Guarderas et al., 2008).*
[15] *(Guarderas et al., 2008; Mora, 2008)*
[16] *ECLAC, 2011a).*
[17] *(ECLAC, 2011a; Losada et al., 2013).*
[18] *(ECLAC, 2011a).*
[19] *(Francini-Filho et al., 2008).*
[20] *(Zhang and Cai, 2011).*
[21] *(Podestá et al., 2009)*

basin. In the north of the Mendoza basin (Argentina) increases in water demand, due to population growth, may compromise the availability of subterranean water for irrigation, pushing up irrigation costs and forcing many producers out of farming toward 2030. Also, water quality could be reduced by the worsening of existing salinization processes[22].

-For NEB, declining crop yields in subsistence crops such as beans, corn, and cassava are projected[23]. In addition, increases in temperature could reduce the areas currently favorable to cowpea bean[24]. The highest warming foreseen for 2100 could make the coffee crop unfeasible in Minas Gerais and São Paulo (southeast Brazil).

-Climate change may also alter the current scenario of plant diseases and their management, having effects on productivity[25]. In Argentina, years with severe infection of late cycle diseases in soybean could increase; severe outbreaks of the Mal de Rio Cuarto virus in maize could be more frequent; and wheat head fusariosis will increase slightly in the south of the Pampas region by the end of the century[26]. In Brazil favorable areas for soybean and coffee rusts will move toward the south, particularly for the hottest scenario of 2080[27].

-The choice of livestock species could change in the future. For example, by 2060, under a hot and dry scenario, beef and dairy cattle, pig, and chicken production choice could decrease between 0.9 and 3.2%. Thus, future climate could strongly affect milk production and feed intake in dairy cattle in Brazil, where substantial modifications in areas suitable for livestock, mainly in the Pernambuco region, are expected[28].

Human Settlements, Industry and Infrastructure

-Urban human settlements suffer from many of the vulnerabilities and impacts already presented taking into account that the provision of critical resources and services, including water, health, and energy, as well as adequate infrastructure and housing remain determinants of urban vulnerability that are enhanced by climate change[29].

-Water resource management is a major concern for many cities that need to provide both drinking water and sanitation[30]. More than 20% of the population in the region are concentrated in the largest city in each country[31], hence water availability for human consumption in the region's megacities of great concern. Flooding is also a preoccupation in several cities.

[22] *(ECLAC, 2010a)*
[23] *(Lobell et al., 2008; Margulis et al., 2010)*
[24] *(Silva et al., 2010)*
[25] *(Ghini et al., 2011)*
[26] *(ECLAC, 2010a)*
[27] *(Alves et al., 2011)*
[28] *(da Silva et al., 2009)*
[29] *(Smolka and Larangeira, 2008; Winchester, 2008; Roberts, 2009; Romero-Lankao et al., 2012c, 2013b)*
[30] *(Henríquez Ruiz, 2009)*
[31] *(World Bank, 2012)*

-The increase in precipitation is one of the expected risks affecting the city of São Paulo. Increases in flood events during 1980–2000 have been observed also in the Buenos Aires province and Metropolitan Area[32]. There are also the combined effects of climate change impacts, human settlements' features, and other stresses, such as more intense pollution events[33] and more intense hydrological cycles from urban heat island effects. In terms of these combined effects, peri-urban areas and irregular settlements pose particular challenges to urban governance and risk management given their scale, lack of infrastructure, and socioeconomic fragility[34].

Renewable Energy

-Hydro, wind energy, and biofuel production might be sensitive to climate change in SA. With the vital role that renewable energy plays in mitigating the effects of climate change.

-Biodiesel production has the lowest costs in LA[35] owing to the high production of soybean in Brazil and Argentina. Also, the cost of ethanol, mainly derived from sugarcane, is the lowest in CA, SA, and LA[36]. As the effects previously reported on crops growing in SESA might prevail (…), that is, that an increase in productivity may happen due to increasing precipitation, future uncertainty will have to be dealt with by preparing adapted varieties of soybean in order to maintain food and biodiesel production, mainly in Argentina, as it is one of the main producers of biodiesel from soybean in the world[37].

-Other renewable energy sources -such as wind power generation- may also be vulnerable, raising the need for further research.

Human Health

-Changes in weather extremes and climatic patterns are affecting human health, by increasing morbidity, mortality, and disabilities, and through the emergence of diseases in previously non-endemic regions[38]. Heat waves and cold spells have increased urban mortality rates[39].

-Although the incidence of malaria has decreased in Argentina, its vector density has increased in the northwest along with climate variables[40]. Unlike malaria, dengue fever and its hemorrhagic variant are mostly urban diseases whose vector is affected

[32] *(Andrade and Scarpati, 2007; Barros et al., 2008; Hegglin and Huggel, 2008; Nabel et al., 2008)*
[33] *(Moreno, 2006; Nobre, 2011; Nobre et al., 2011; Romero-Lankao et al., 2013b)*
[34] *(Romero-Lankao et al., 2012a)*
[35] *(Chum et al., 2011)*
[36] *(Chum et al., 2011)*
[37] *(Chum et al., 2011)*
[38] *Winchester and Szalachman, 2009; Rodríguez- Morales, 2011*
[39] *(McMichael et al., 2006; Bell et al., 2008; Hardoy and Pandiella, 2009; Muggeo and Hajat, 2009; Hajat et al., 2010)*
[40] *(Dantur Juri et al., 2010, 2011)*

by climate conditions. Their incidence have risen in tropical America in the last 25 years, causing annual economic losses of US$2.1+ (1 to 4) billion[41]. Weather and climate variability are also associated with dengue fever in southern SA[42], involving also demographic and geographic factors in Argentina[43]. In Rio de Janeiro a 1°C increase in monthly minimum temperature led to a 45% increase of dengue fever in the next month, and 10 mm increase in rainfall to a 6% increase[44]. Despite large vaccination campaigns, the risk of yellow fever outbreaks has increased mostly in tropical America's densely populated poor urban settings[45], alongside climate conditions[46].

-Hantaviruses have been recently reported throughout the region[47], and El Niño and climate change augment their prevalence[48]. Variation in hantavirus reservoirs in Patagonia is strongly dependent on climate and environmental conditions[49]. The incidence of visceral leishmaniasis has increased in Brazil (highest in LA) in association with El Niño and deforestation[50], as in Argentina, Paraguay, and Uruguay[51].

-The worsening of air quality and higher temperatures in urban settings are increasing chronic respiratory and cardiovascular diseases, and morbidity from asthma and rhinitis[52], but also atherosclerosis, pregnancy-related outcomes, cancer, cognitive deficit, otitis, and diabetes[53]. Dehydration from heat waves increases hospitalizations for chronic kidney diseases[54], affecting construction, sugarcane, and cotton workers in CA[55].

[41] *(Torres and Castro, 2007; Tapia-Conyer et al., 2009; Shepard et al., 2011)*
[42] *(Honório et al., 2009; Costa et al., 2010; de Carvalho-Leandro et al., 2010; Degallier et al., 2010; Lowe et al., 2011)*
[43] *(Carbajo et al., 2012)*
[44] *(Gomes et al., 2012)*
[45] *(Gardner and Ryman, 2010)*
[46] *(Jentes et al., 2011)*
[47] *(Jonsson et al., 2010; MacNeil et al., 2011)*
[48] *(Dearing and Dizney, 2010)*
[49] *(Andreo et al., 2012; Carbajo et al., 2009)*
[50] *(Ready, 2008; Cascio et al., 2011; Sortino-Rachou et al., 2011)*
[51] *(Bern et al., 2008; Dupnik et al., 2011; Salomón et al., 2011; Fernández et al., 2012)*
[52] *(Grass and Cane, 2008; Martins and Andrade, 2008; Gurjar et al., 2010; Jasinski et al., 2011; Rodriguez et al., 2011)*
[53] *(Olmo et al., 2011)*
[54] *(Kjellstrom et al., 2010)*
[55] *(Crowe et al., 2009, 2010; Kjellstrom and Crowe, 2011; Peraza et al., 2012)*