Latin America and the Caribbean Initiative

BIODIVERSITY, GENDER AND CLIMATE CHANGE

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LATIN AMERICA AND THE CARIBBEAN INITIATIVE: BIODIVERSITY, GENDER AND KNOWLEDGE

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PRESENTATION

Latin America and the Caribbean are a global power of natural and cultural diversity, and at the same time, lead the rates of unequal development, with impacts in poverty and degradation of nature. Considering the marginal contribution of greenhouse gases, the climate crisis disproportionately affects the region, mostly impacting the more vulnerable population and its ways of life. Women “stand out” within this group.

On the other hand, even though conservation of nature is a very efficient and effective tool for climate change adaptation and mitigation, it’s still an opportunity waiting for its turn in Latin America and the Caribbean. In the same way, even though women’s contribution to the economy and culture are crucial to the region’s social well-being, their full integration into decision-making and management of climate change mitigation and adaptation processes still presents significant gaps.
Consequently, our region can make use of the strategic advantages of its great natural and cultural heritage and turn around the disproportionate use of nature, which is threatening its capacity for resilience and the provision of well-being to its population. A key tool in this process is the design and stewardship of instances for cooperation, including pertinent and timely actions to address the climate crisis—aggravated by the loss of biodiversity—, and social and gender inequity that underline economic, cultural and political practices in all of Latin America and the Caribbean.

Proposals for change must be addressed in a coherent and integrated manner, and therefore, these instances for cooperation, conceived with the people that live in the territories, can be a way to improve policies that regulate soil use, the management of fisheries and water resources, and agriculture, to reduce the use of polluting substances or promote planning of urban and rural areas, among others.

Promoting these changes through actions that gather experience and several forms of knowledge are an ethical and practical imperative, providing space to those who are most acutely impacted by the social crisis, responding to the urgency of the global mandates of the Sustainable Development Goals, the Convention on Climate Change, or the Convention on Biological Diversity.

In this series of policy briefs, we present the regional integrative work regarding three key pillars related to the environmental crisis we face: climate change, biodiversity and knowledge with a gender approach; “The Latin America and Caribbean Initiative: Biodiversity, gender and knowledge”, which is comprised of more than 20 academic institutions, research centers and interdisciplinary organizations, collected the experience and knowledge existing in the region to propose, design and connect efforts to advance and above all, accelerate the development of strategic and concrete actions for the benefit of our societies.

This document prioritizes fields of action based on knowledge, scientific research and the experience of said institutions, communities and local or central governments, considering visions and desires, revealing best practices and the benefits of local governance in climate change adaptation and mitigation.

This text gathers these visions and experiences in documents by theme synthesis: knowledge and sciences in Latin America and the Caribbean; marine conservation and women hand in hand; the conservation of terrestrial ecosystems and the importance of women in the sustainable use of resources; the importance of aquatic ecosystems and water, the growth of cities in the region and their planning; and a territorial, social and feminine outlook to properly face natural disasters.

Each of these proposals in particular, and all of them together represent new forms of relating with the region’s socioecological systems, in which the contribution of nature, women and knowledge is made clear in proposals for concrete actions in specific territories.

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KNOWLEDGE AND SCIENCE

MAIN IDEA

Climate change is closely related to biodiversity loss and ecosystem degradation, which is why it is essential to increase strategic knowledge that helps reduce human vulnerability, considering gender perspective, and thus contributing to maintain the biological and cultural heritage of Latin America and the Caribbean.

CONCEPTUAL FOUNDATION

The increasing acknowledgement of the role that climate change plays in worsening the biodiversity crisis and its impacts on human wellbeing represents a large-scale challenge for all of the planet's inhabitants, but it also provides an opportunity to align actions at the local, regional and global level, and to join efforts toward reaching the goals of a more sustainable development.

There is sound evidence regarding the impacts of climate change on human well-being, such as sea level rise and the effects of extreme hydrometeorological phenomena; while the loss of biodiversity –which threatens our own existence and well-being, and is caused directly by human activities–, has not had the necessary attention, and its significance for the future of humanity has yet to be recognized with sufficient intensity (CórdobaMuñoz, 2019).

Climate change will be one of the major threats to biodiversity within the next 50 years (Thuiller, 2007; Dawson et al, 2011; Bellard et al, 2012). Even though it is hard to dissect its effects from those of other threats and their synergies, there is sound scientific evidence of changes in patterns and responses of biodiversity attributable to historical changes in climate conditions (Thuiller, 2007; Pacifici et al, 2017).

Severe climate change effects have been documented on different levels and aspects of biodiversity, such as changes in the seasonality of natural events, phenological and physiological responses in organisms, as well as modifications in species' migration patterns and distribution ranges, in the composition of biotic communities, and the structure and functioning of ecosystems (Walther et al, 2002; Brooker et al, 2007).

In marine ecosystems, changes have been documented in reproduction, recruitment, migration and spatial diversity patterns of fish, as well as in plankton species composition, which affect trophic networks and marine productivity (Walther et al, 2002; Thuiller, 2007). Ocean acidification, combined with rising sea temperatures, have a negative impact on ecosystems such as coral

reefs, which are important for coastal protection, fishery production and tourism (IPCC, 2019).

CLIMATE CHANGE AND ECOSYSTEMS

Most of the research on climate change and its impacts on biodiversity has been conducted in countries with large economies, mostly in the Northern Hemisphere and nations such as Australia or South Africa, but there is little or no information for extensive areas in Latin America and the Caribbean, Africa and Asia (Walther et al, 2002; Thuiller, 2007; Pacifici et al, 2017). This type of bias leads to recommendations on the vulnerability of biodiversity to climate change that ignore functional processes in ecosystems different from those studied. For example, tropical species evolved in environments with relatively stable climates, which is why they have a low acclimation capacity (Janzen, 1967).

Biodiversity loss and its impact on human well-being represents an enormous challenge, thus, there is an urgent need to implement measures to reduce and revert this loss. It is also essential to suggest and adopt better adaptation and mitigation measures to face climate change. These measures must consider systemic actions that include the conservation of natural vegetation remnants, biological, riparian (or riverside) corridors and of hedges in agricultural fields, as well as promoting ecological restoration, sustainable use of forest resources, and productive reconversion to agroecological and silvopastoral practices to reduce negative impacts on biodiversity and maintain environmental services (Heller & Zavaleta, 2009; Halffter et al, 2018). Additionally, changes in energy generation and use –to reduce greenhouse gas emissions— need to be carried out alongside actions that maintain biodiversity processes (Andersen, 2019). If these measures are not implemented, it's possible that towards the end of this century there will be severe losses in biodiversity and ecosystem services (Warren et al, 2013).

In Latin America and the Caribbean, as in the rest of the world, measures should be based on scientific knowledge and the region's traditional knowledge. They must also include gender perspective analyses so that the initiatives are appropriate, in the complex context of communities faced with global change, with regard to biological, economic, social and political aspects (Simms & Rendel, 2006; Castañeda & Gammage, 2011; Gumucio & Tafur Rueda, 2015).

GENDER AND CLIMATE CHANGE

Climate change has a greater impact on population sectors that directly depend on natural resources for their sustenance and on those with less capacity to respond to hydrometeorological risks, making them more vulnerable. Women frequently face greater risks and greater workloads from the effects of climate change, particularly the female population in poverty situations. This is due to gender roles and responsibilities, social and cultural norms, lack of access to decision-making processes, resources and markets, and an increased exposure to violence toward them (Djoudi & Brockhaus, 2011; Goh, 2012; Castañeda & Gammage, 2011; UNFCC, 2019).

However, it's important to consider that different social identities (for example, ethnicity, physical ability, age) interact with gender aspects, which is why the intersectionality of gender with other forms of inequity must be recognized and translated into sound public policy proposals (Vázquez-García et al, 2011). Many studies on climate change with gender perspectives point to differentiated effects, but empirical evidence in aspects related to agricultural production, food safety, health, access to water and energy resources, migration and conflict, natural disasters, and others, is still limited, fragmented and dependent upon the socioecological context. Important gaps and challenges in gender and climate change studies remain (Goh, 2012), even more so considering that the subject of biodiversity is intricately related. The links between gender, climate change and biodiversity are not usually addressed in a comprehensive manner,

which is why it is crucial to promote multidisciplinary studies that focus on the local sphere to propose actions and public policies that include a gender and equity perspective, in order to increase the resilience of biotic and human communities to a changing climate.

The challenges for biodiversity conservation in the face of climate change provide the opportunity to improve social well-being in Latin America and the Caribbean, particularly for more vulnerable sectors. In this intersection, it is possible to recognize the potential and differing role that women have in adopting adaptation strategies to climate change and reducing their own vulnerability and that of their families.

Some of the mitigation and adaptation strategies related to biodiversity in terrestrial environments are: increasing landscape connectivity, increasing the number, representativity and connectivity of protected areas, promoting multifunctional landscapes and production practices that have less impact on ecosystems, and restoring degraded ecosystems (Heller & Zavaleta, 2009; Mawdsley et al, 2009).

It is also important to increase native vegetation cover, related to carbon capture and storage, considering that several studies point to the importance of "naturalness"; meaning, that when carbon reservoirs maintain their biodiversity, which regulates ecosystem processes, they sustain environmental services that are key for human well-being, particularly in rural sectors where people directly depend on biodiversity (Dirzo et al., 2014; Chuarucci and Piovesan, 2019).

From a gender perspective, adaptation strategies to reduce human vulnerability are not neutral and are closely related to land use and biological resources management decisions, and therefore, strongly linked to biodiversity conservation (Djoudi & Brockhaus, 2011; Dah-gbeto & Villamor, 2016; Casas Varez, 2017). Social contexts and resulting landscape mosaics have been characterized; however, few studies describe the mechanisms and gender-specific decisions that influence the multifunctionality of landscape and the provision of ecosystem services, even though it is recognized that better management decisions are made with greater gender equity (Villamor et al, 2014). Because of the above, greater cultural and gender equity is required in order to generate the knowledge that will guide actions and policies on these subjects (Medin et al, 2014; Montana & Borie, 2016).

RECOMMENDATIONS

■ Generate transdisciplinary research on gender, climate change and its impacts on biodiversity, to suggest pertinent adaptation measures based on the particular characteristics of regions.

■ Generate better knowledge in the region regarding:

o The impacts of climate change on ecosystem processes and functions (i.e. migrations, phenology), as well as the provision and regulation of ecosystem services such as pollination, and the control of disease vectors and pests (Walther et al, 2002).

o Identify changes in biodiversity related to climate change, using long term research, to promote specific ecosystem-based adaptation actions or to reverse and mitigate the impacts.

■ Implement adaptation strategies in farming systems, water management and within communities that include gender perspective in decisions regarding the use of land and biological resources, biodiversity conservation (Casas Varez, 2017) and food safety in rural communities in order to reduce human vulnerability (Forero et al, 2014).

■ Extensively promote ecological restoration actions.

■ Steer actions and policies with multidisciplinary approaches and greater gender equity to reduce the vulnerability of people and their land (Medin et al, 2014; Montana & Borie, 2016).

■ Improve policies and programs regarding the functions that women and children perform in their daily lives (Lambrou & Laub, 2004), considering the knowledge and experience of women and men in biodiversity conservation.

■ Reduce the inequality and poverty that currently affects a large part of the population in Latin America and the Caribbean, and promote interventions for adaptation to climate change related to sustainable rural and urban development (López Feldan & Hernández Cortés, 2016).

■ Increase the participation of women with higher education and postgraduate degrees in science. Increase demand for gender equality and ethnic diversity in organizations. Networks are required to help change gender imbalance (Allagnat et al, 2017).

■ Strengthen or create bridging institutions between science and decision-making, that play a central role in inter-institutional coordination and public policy design.

■ Disseminate relevant data and information in a clear manner and offer easy access tools to decision makers and society, so they can adopt an active role and increase their informed participation in the process of developing and implementing public policies.

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GLOSSARY

Biodiversity (or biological diversity)

Variety of life that encompasses the variety of all organisms such as plants, animals and microorganisms; the variety within one same species, between species and different populations and, even the variety of ecosystems and landscapes (MA, 2005). We normally interact with two broad types of ecosystems, natural ones – tropical, temperate and mangrove forests, reefs, etc.— and ecosystems that have been modified by humans (agricultural fields, forest plantations, aquaculture systems and in a sense, urban landscapes too). These ecosystems, in addition to the species that constitute them and their genetic variation, are what we call biodiversity (Sarukhán et al, 2009).

Biological corridors

Corridors are landscape elements, generally narrow strips that allow species to survive and move between habitats; a corridor does not necessarily comply with all requirements for the survival of a species (Rosenberg et al, 1995). Corridors can also be considered geographical areas where ecosystem management actions converge, which are implemented to connect areas of interest for biodiversity conservation (protected areas, for example).

Riparian or riverside corridors

Riparian vegetation corridors are located on riverbanks and present specific conditions, characterized by species that tolerate the humidity of rivers, and can maintain the riverbed (Calles & López, 2012).

Biodiversity crisis

Rapid loss of genetic, species and ecosystem diversity due to anthropogenic changes such as land use variations, habitat degradation, introduction of invasive alien species, overexploitation of resources and pollution at a magnitude and rate that is unprecedented in the planet's history (Dirzo, 1990).

Phenology

Involves the study of periodic phenomena of plants and the relationship between these events and edaphic (belonging or related to soil) and climate factors (De Fina & Ravelo, 1979; Martí et al. 2004).

Trophic networks

An ecosystem's group of food chains, which are interconnected with each other through feeding interactions.

Ecosystem services

The conditions and benefits that human societies obtain from biodiversity and the ecosystem processes it sustains. These are categorized in regulating (water filtration, agricultural pest control, air quality), provision (materials, medicinal compounds, fuels) or cultural (recreation, spiritual, religious) services (MA, 2005). IPBES currently refers to them as "nature's contributions to people" (Pascual et al, 2017).

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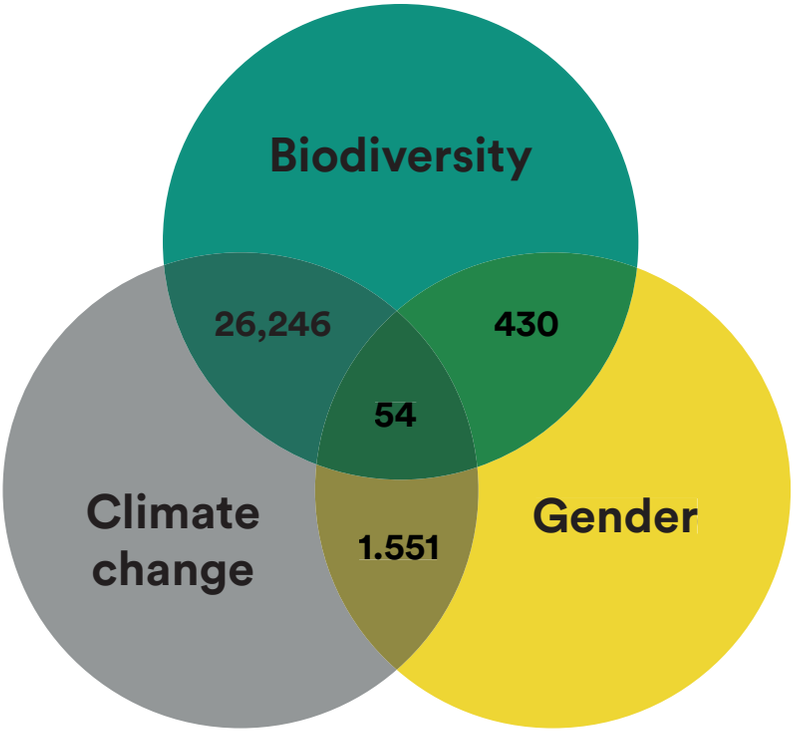

Figur 1. Number of studies that contain the following combination of words in their title, summary or key words: "Climate change & Biodiversity", "Climate change & Gender", "Biodiversity & Gender" and "Climate Change, Biodiversity & Gender"; the search for scientific literature was conducted by consulting Web of Science and all its databases; date of consultation: November 7, 2019.

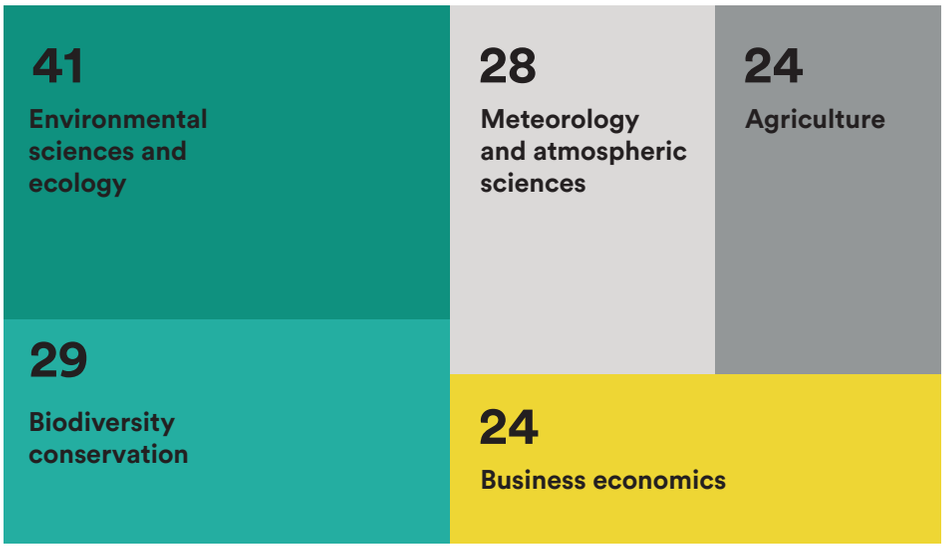

Figure 2. Scientific disciplines of 54 studies containing the following combination of words in their title, summary or key words: "Climate Change, Biodiversity & Gender" (studies can consider more than one discipline). The search for scientific literature was conducted by consulting Web of Science and all its databases; date of consultation: November 7, 2019.

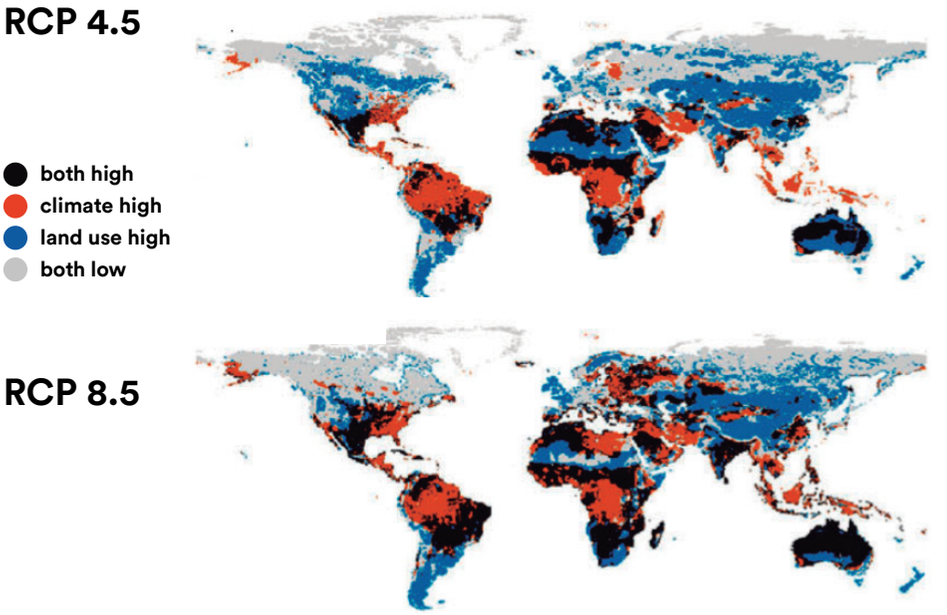

Figure 3. Spatial patterns of biodiversity loss due to climate change and land-use change by 2070. Areas with more than 10% net loss of species due to climate change are shown in brown; areas with a net loss of more than 10% of species due to changes in land use are shown in blue; areas where more than 10% losses for each pressure overlap are shown in black; and areas with less than a 10% loss for both pressures are shown in grey. Projections are shown for two socio-economic and greenhouse-gas-emission: RCP 4.5 y RCP 8.5.

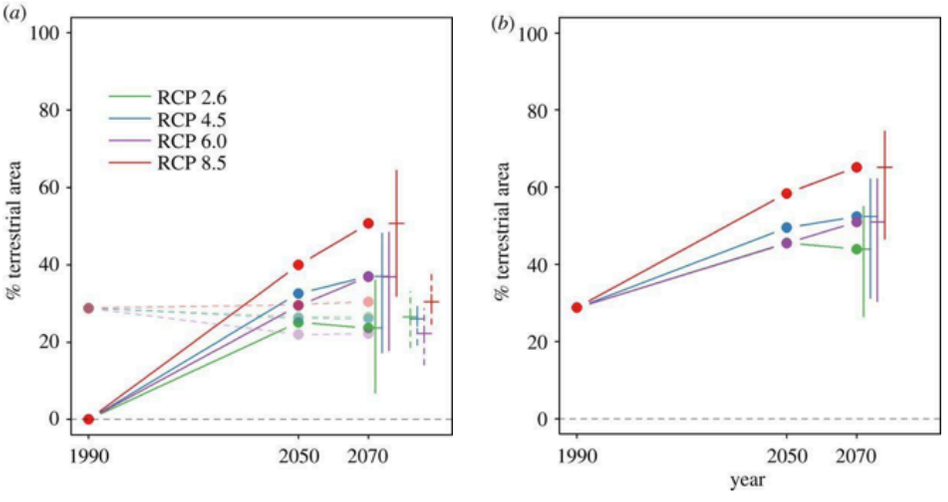

Figure 4. Predicted percentage of the Earth's terrestrial surface exceeding 20% species loss under future climate and land-use change. All values are expressed relative to a pre-human impact baseline. Separate effects of climate (solid, opaque lines) and land use (dashed, translucent lines) are shown in (a), while combined effects of both pressures (assuming no interactions) are shown in (b). Error bars show estimated uncertainty in the projections for the year 2070: 95% confidence intervals for land-use impact models, and range of estimates across the distribution model ensemble for the climate impact models. Results for both land-use and climate impacts are based on the final projections at a spatial resolution of 0.5°.

DECEMBER 2019

WOMEN AND COASTAL MARINE VEGETATION OF LATIN AMERICA

MAIN IDEA

Coastal marine vegetation plays a fundamental role in climate change because it acts as a buffer for the impacts that affect coastal systems, and also the interactions that they provide in the ocean and its ecosystems. In addition, it is responsible for the capture and storage of blue carbon –carbon dioxide that has been accumulated and sequestered by mangroves, tidal marshes and sea grass and its respective substrates, living biomass (leaves, branches, stalks) and dead biomass (detritus) (IUCN, 2014). However, when it comes to developing climate change mitigation and adaptation strategies, marine coastal plants remain largely unseen to decision-makers.

On the other hand, it is also necessary to promote women's participation in the care, management and development of marine coastal vegetation of Latin America, as a powerful tool to mitigate and adapt to the negative impacts of climate change. We understand that the reference to women, as a universal and uniform category to understand their contribution to overcoming marine coastal environmental degradation, is still not enough. This document raises the importance of women in these matters.

Today, the design and implementation of efficient measures to recover, protect and manage the resources of systems dominated by marine-coastal vegetation, do not include an integrated vision in terms of gender equity, hindering the identification of women's unique roles in these activities, as well as the recognition of their true contribution to the management of extracted resources and their specific needs and interests.

Including the gender perspective in the analysis and design of conservation interventions would improve governance agreements, allowing for better management of coastal resources, which will finally determine the state of coastal marine ecosystems and their resilience to climate change.

CONCEPTUAL FOUNDATION

The well-being of all of humanity depends, directly or indirectly, on the ocean (IPCC, 2019), since it contains several habitats and species that interconnect life on Earth and provide essential services, such as the production of 50% of the oxygen that is available (Paulmier, 2017), the capture and sequestration of CO2 in the atmosphere (over 30%) and the redistribution of heat (IPCC, 2019). Therefore, the ocean's health is key for the global well-being -current and future-, of our planet and its society.

Coastal areas connect the human population with marine biodiversity and at the same time, sequester almost half of the carbon dioxide in the atmosphere in its sediments (Pendleton et al., 2012), which are even more effective than vegetation on land (Himes-Cornell et al., 2018). Even though coastal areas only cover about 2% of total land surface, they concentrate 13% of the world's urban population (World Cities Report, 2016) and contribute almost 20% of the protein consumed at a global level, and 70% in coastal countries (FAO, 2016). Latin American and Caribbean coasts are rich and diverse, with a high population density as is the case in countries such as Mexico, Peru or Chile, whose coastlines are home to about 40% to 50% of the total population, which strongly depends on the services and benefits that coastal systems offer: food (fishing) and aquaculture, tourism and the maintenance and regulation of other ecosystem services.

The extraordinary coastal biodiversity and productivity position Latin America and the Caribbean in second place among the most important sectors at the global level in terms of fisheries and aquaculture, contributing 3.8% of total production and providing about 2.5 million jobs (FAO, 2018). This happens because one of the four most important coastal currents in the world, in terms of productivity, is found in Latin America: the Humboldt Current (Cury et al, 2000), which sustains one of the most fruitful marine ecosystems in the western coast of South America. (FAO, 2016). The region's coasts are highly biodiverse, and many are dominated by marine coastal plants (Figure 1).

The region's tropical coasts contain 26% of the world's mangroves (Himes Cornell et al., 2018), while at greater latitudes there are mass extensions of microalgae forests (Wernberg et al., 2019; Filbee-Dexter & Wernberg, 2018). This coastal marine vegetation, that also includes seagrass meadows and tidal marshes, removes mass amounts of carbon from the atmosphere, which they capture in their structures and store in sea beds, thus contributing to the mitigation of the effects of climate change and, therefore, to climate regulation.

"BLUE FORESTS"

Like forests on land, these "blue forests" act as regulators of the provision service of fisheries by providing habitats, refuges and sites that are important for breeding and larvae retention of several species of fish, crustaceans and shellfish. A lot of these resources have high commercial and economic value for communities at a local, regional and national level, in countries in Latin America and the Caribbean, as well as for the international market. In addition, coastal marine vegetation provides protection services in the coasts, protecting them from erosion, the rising sea level, reducing impacts from typhoons, surges and cyclones, phenomena that will become more frequent in climate change scenarios (IPCC, 2019).

Coastal systems dominated by vegetation have been indiscriminately destroyed or have been significantly altered by several human activities that threaten to reduce their abundance and the distribution range of many of the species that live there. The lack of sustainable regulation for use of the shoreline (ex. Coastal real-estate development, pollution from hydrocarbons), has caused a significant change in habitats, while the overexploitation of resources has decimated the populations of coastal marine vegetation (ex. Overfishing, macroalgae removal) .

The introduction of invasive species –facilitated by the discharge of ballast water in port areas and the aquaculture of exotic species— places coastal systems at risk, in addition to the pollution from basins that drain into coasts (ex. arrival of farming chemicals or plastic through the discharge of rivers). The destruction of habitats by sedimentation and the alteration of hydrological regimes

(IPCC, 2019; Himes-Cornell et al., 2018), also compromises these systems and their services and benefits, as well as the human population that depend on them.

If this trend of coastal marine vegetation destruction were to continue for the next 100 years, practically all unprotected mangroves could disappear (Pendelton et al., 2012). Among ecosystem services bearing the greatest impact, in addition to the reduction in the sequestration and storage of carbon (blue carbon), there would be a drop in the number of viable fisheries, as well as proper areas for aquaculture, the reduction of breeding areas for marine biota and filtering and purification services associated to the quality of water (Himes-Cornell et al., 2018). This will have direct consequences on the lifestyle of Latin American coastal communities and all the activities that are developed there.

Therefore, fishing communities on the coast face the impact and immediate and direct challenge that derives from disasters and transformations that will be produced by climate change, while at the same time bearing the burden of protecting their means of livelihood that are being threatened today by unregulated practices and inefficient policies that destroy coastal systems and their resources. Because they are key agents for the resilience of coastal fishing communities, women have a role to play in climate change adaptation and mitigation, as well as in the management of associated risks (FAO, 2017).

Proper management of coastal vegetation will allow not only to ensure the provision of food and fishery resources (Siles et al., 2019), but will also contribute to climate change adaptation and mitigation. However, the lack of a concrete gender approach in the regulations that steer the use of coastal marine resources, currently prevents the identification of women's unique roles in the value chain, and a recognition of their real contribution in the management of resources being extracted and their specific needs and interests. This is particularly troubling, since evidence increasingly shows that by including a gender perspective in the analysis and design of conservation interventions, this not only prioritizes one of the key measures to advance in the protection of human rights and sustainable development (World Economic Forum, 2015), but also improves the governance agreements that allow for better management of the coast's fishery resources. Last, this determines the state of marine ecosystems and their resilience to climate change (FAO, 2013).

GENDER INEQUALITY

Women in Latin America perform an important role in the fishing industry, because they represent almost half of the workforce in the sector (The World Bank, 2012). Their presence has historically remained invisible in a widely male and patriarchal system, in spite of their active presence across the value chain of most of the resources extracted, from harvesting, processing, marketing, sale, as well as in the management and protection of resources (Godoy et al., 2016). At present, the persistence of gender inequality prevents women from fully and actively participating in economic opportunities and decision-making processes, which limits their potential access to incorporate knowledge and experience to the entire sector (FAO, 2014). In other words, initiatives that continue to dismiss gender structures and the cost of these inequities, will not have an impact on the social, environmental and development benefits, especially at the local level. In addition, there is a significant difference between reality and the data available on the roles of women and men in fisheries. The workforce of women in particular is not reflected in the value chain of the extraction of coastal marine vegetation resources in Latin America and the Caribbean, nor is

the extent and characteristics of their participation.

This gap must be addressed from the start, by collecting and processing information by gender, assessing the entire value chain of coastal marine production, including other tasks such as domestic and care-providing work that tends to cover the leadership and productive role of women (Godoy et al., 2016).

This step is essential in breaking the vicious cycle derived from ignoring women (Figure 2), which will allow a reduction of the gap and the design and implementation of public policies that are more inclusive, promoting equal access to goods and services, as well as building on the design of economic and environmental incentives for such purposes. This is essential in order to fully understand the link between gender and the environment, with which barriers of inequity could be demonstrated and torn down allowing the design of transformative actions towards a more sustainable and inclusive development (UNEP & IUCN, 2018).

The protection of coastal marine vegetation has been recognized as an instrument to attain Sustainable Development Goal #14 (United Nations, 2017), to which 193 nations have adhered, including all the countries of Latin America and the Caribbean. The protection of coastal systems is a cost-effective tool to deal with the socioecological effects of climate change (IPCC, 2019), and is part of what is called "Nature-based Solutions" (IUCN, 2016).

The creation of Protected Marine Areas (AMP in Spanish) has been widely used as a tool to protect marine ecosystems from anthropogenic pressure and to ensure the goods, services and benefits provided by oceans (Dixon, 1993; Angulo-Valdés & Hatcher, 2010), contributing to their resilience (Walker & Salt, 2012). The deficit of Protected Marine Areas is especially critical in coastal zones, which can clearly be seen in Chile, a country that leads the effort of marine protection in Latin America (42% of its exclusive economic zone), but whose coastal protection encompasses 0,04% (WCS, 2018).

Leading countries in marine protection in Latin America and the Caribbean, such as Brazil, have almost 25% of their ocean protected, followed by Mexico with 23% of its ocean protected. Last, the effectiveness of marine protected areas depends on proper governance and local management (IPCC, 2019; Watson et al., 2014; Adams et al., 2019), which is strongly determined by the equal and inclusive participation of the different relevant actors, specially women, as is the case in fisheries management. Therefore, the ways in which we think about gender and environmental crisis affect the possibilities we have to transform, care for and maintain these systems.

Last, the design, establishment and integrated management of protected areas, as well as the collaboration and integration of jurisdictions at different local and regional scales, can foster the monitoring of effective public policies regarding the ocean's transformation in a climate change scenario (IPCC, 2019).

Regional collaboration, in particular, should be based on climate action, and within it, multi-scale engagement between local and indigenous communities that can foster the processes of change. In addition, coordination and complementarity between countries, and a long-term perspective should be secured, and above all, building capacities in climate matters, biodiversity and gender.

RECOMMENDATIONS

- Promote a gender approach in the collection of primary information related to management, use and protection of coastal plant systems in Latin America and the Caribbean, that promotes the visibility of women and other relevant actors (indigenous people) in the value chains associated with coastal use, coastal protected areas, management plans and others. In addition, apply a gender approach in the design of policies and pertinent and effective coastal marine vegetation management plans.

- Generate, train and sustain a network of women leaders for the conservation and sustainable use of the region's coastal marine vegetation, to support reciprocal learning, and channel learning, good practices while at the same time amplifying and gathering the region's voice on sustainable coastal management.

- Advance in the identification and georeferencing register of coastal plant ecosystems in Latin America and the Caribbean, considering the conservation status of each, as well as their threats and local, national and global relevant actors.

- Define and test methodologies to conduct a carbon inventory of the region's coastal plant systems that can be replicated in different countries and territories. Doing so requires establishing capacities in the regional network.

- Manage the creation (and implementation of the respective management plans) of protected coastal marine areas that include coastal plant systems and are representative of them depending on the region in which they are established (including mangroves, sea grass meadows, brown macroalgae and tidal marshes).

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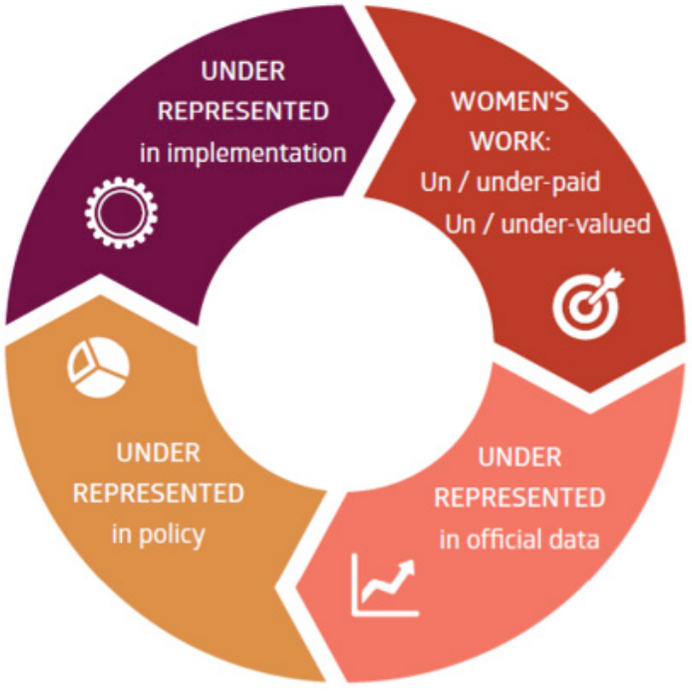
Figure 1. Global distribution of marine coastal vegetation.

Taken from https://sciencenordic.com/climatechange-climate-solutions-denmark/marineforests---natures-own-carbon-capture-andstorage/1458305

Figure 2. Vicious cycle and its consequences, caused by the lack of a gender approach and the disregard of women in policies.

Taken from FAO (2017) Towards gender-equitable small-scale fisheries governance and development–A handbook. In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication, by Nilanjana Biswas. Rome, Italy.



CHALLENGES AND OPPORTUNITIES FOR A SUSTAINABLE, FAIR AND RESILIENT URBAN DEVELOPMENT

MAIN IDEA

Cities of Latin America and the Caribbean have great needs, as well as opportunities to increase their resilience in facing climate change and several of the associated risks . To do so, the full and equal participation of their residents is required, integrating women in planning urban systems, reducing gaps, designing sustainable infrastructure, and including Nature-based Solutions (NbS).

AN URBANIZED AND UNEQUAL REGION TOWARDS SUSTAINABILITY

Environmental problems in the urban systems of Latin America and the Caribbean worsen as biodiversity, pollution, and unsustainable infrastructure deteriorate. Many informal settlements have located on the outskirts of cities, in flooding zones and areas that are vulnerable to urban planning risks, lacking a socio-ecological approach. Furthermore, they do not integrate the community. Gap reduction requires residents to have a comprehensive development, meaning, in social, economic, and environmental dimensions.

Access to housing and the infrastructure of social housing continue to be fragile and unfair in the cities of Latin America and the Caribbean. In environmental terms, they do not adjust to existing technological opportunities. Many Latin Americans experience energy poverty in their homes (Calvo, 2019) or infrastructure problems associated to access to water, transportation, and education, among others. The differences in access and services affect the most vulnerable people, primarily women and infants.

Latin America and the Caribbean is the world's region with the most extensive urban population. In 2019, the population reached 648 million people, comprised of 50.8% women and 48,2% men (CELADE-ECLAC, 2019; UN-DESA, 2019). It is estimated that the region will reach its maximum population by 2058, with a total of 767.5 million people. In this context, in addition to gender and access to water inequities, and inequality in income distribution, the scenario for the sustainable and resilient development of Latin American cities is complex. The transition toward sustainability, resilience, and climate change adaptation requires the regulation of increasing urbanization and the implementation of comprehensive strategies to reduce multiple impacts, supporting local governments to be effective, with measures based on knowledge and with urgency due to the climate crisis.

Today, 81% of the population in Latin America and the Caribbean live in urban zones and will increase, even in countries where the rural community prevails, such as Bolivia and Ecuador. Therefore, the next ten years are essential to promote an urbanization process that is consistent with the United Nations Sustainable Development Goals (SDG). Costa Rica is the leading country in this matter.

SUSTAINABILITY GOALS

Urban transformations have to align with the 17 global sustainability goals and the principles of urban resilience. This means applying sustainable urban development criteria from small cities to intermediate and more complex ones, such as the metropolitan areas and global cities that already have over 10 million residents, like Buenos, Aires, Río de Janeiro, and São Paulo. This, in addition to climate change scenarios and social crises – like those recently occurred in Ecuador, Bolivia, Chile, and Colombia—impose several challenges on the future of our cities, which include their sustainability inseparably from the conservation of nature's biodiversity and resilience.

Migrations are an effect of the social and climate crises, and countries of Latin America and the Caribbean are not prepared to manage the increasing demands of migrations due to socio-natural disasters or "environmental refugees", and socio-political conflicts, as is the case of Venezuela. These particularities have implications and consequences for the growth of cities, political stability, and economies, mainly for developing countries in the region (OIM, 2008).

The region's cities are drivers for change and innovation that should move toward sustainability; however, they are places or areas where socio-spatial inequities and inequalities are expressed. Unfortunately, despite the reduction of extreme poverty, informal settlements persist, as well as differences and injustices in access to transport, drinking water, green areas, education, and health, to mention a few. These trends are even worse when there is indigenous population, with gaps that are still very noticeable in terms of inequity and discrimination.

The guide and goals of the 17 SDGs trace a path, in which goal 11 should be highlighted: "Sustainable Cities and Communities." In this regard, according to the last progress report, in Latin American cities in general, moderate progress is observed in aspects like pollution reduction, increase in access to drinking water, and satisfaction with public transport. For example, in Chile and Argentina, access to water in cities is an objective that has been attained. However, Argentinian cities do not present high levels of satisfaction with public transportation, and neither do Chilean cities with pollution, expressed in the concentration of particulate matter PM 2.5. Of the ten most polluted cities in South America, nine are in Chile (IQAir AirVisual, 2018).

Meanwhile, Bolivia and Colombia show progress in pollution reduction and satisfaction with public transportation, but have non-compliances to improve the population's access to drinking water. In Central American cities, instead, there is a lack of information, and where there are reports, these show a decrease in well-being and progress in urban sustainability. Costa Rica is the exception, which once again, has an outstanding performance with significant achievements, leading the way for sustainable cities in Latin America and the Caribbean (Sachs et al., 2019).

CLIMATE CHANGE AND RESILIENCE

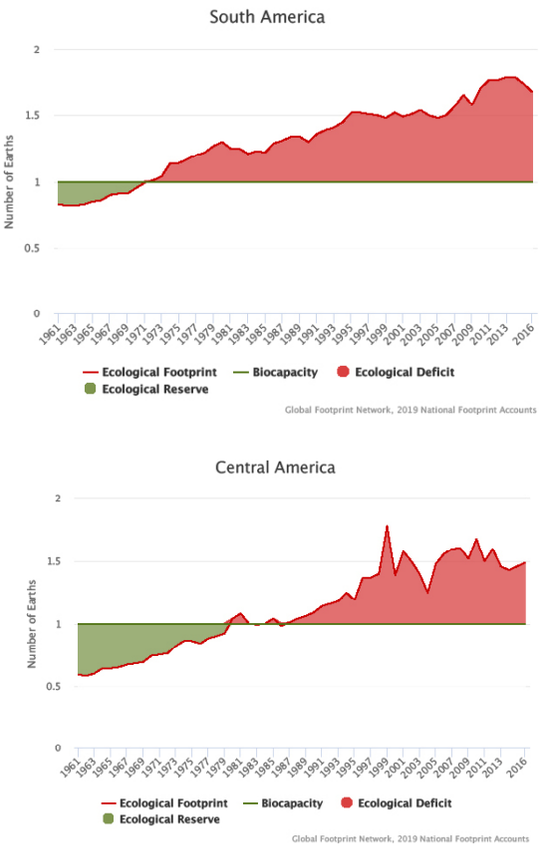
Changes in consumption patterns demonstrate that already there are countries that exceed their biocapacity; Chile is the first to use up its resources and has the region's highest ecological footprint or ecological assets that require a certain population to produce the natural resources it consumes, followed by Argentina (Global Footprint Network, 2019). The contradiction between the ecological footprint and human development is demonstrated because these are the same countries that are ranked in the first 50 positions of the last global Human Development Index (PNUD, 2018).

The trend toward the increase of CO2 is constant; only four countries show a drop: Belice, Guatemala,

Jamaica, and Dominican Republic (ECLAC, 2015), so the ecological footprint is expected to increase in the next four decades. Up until 2016, South America required 1,68 planets, and Central America needed 1.49 to subsist, according to the ecological deficit, meaning they exceed the area's biocapacity or the capacity of nature to meet this demand in both regions (Figs. 1 and 2). In comparison, it is very similar to the global average, which requires 1.69 planets and is significantly lower than regions with higher consumption patterns such as North America, which currently requires 4.95 planets.

We need cities to resist climate change and, at the same time, to be low in carbon. Adaptation and mitigation will depend on the ability to reduce the ecological footprint and on concrete public policies in countries of Latin America and the Caribbean. Climate change additionally imposes challenges on the resilience to socio-natural risks due to the increase in the frequency and intensity of extreme weather events such as heat waves, coastal flooding, urban flooding, and droughts (The Royal Society, 2014).

The recent Sustainable Development Report (Sachs et al., 2019) indicates that most of the region is highly insufficient in generating government strategies and policies to face climate change. Therefore, the capacity for adaptation and to strengthen resilience to weather phenomena continues to have socio-economic and socio-cultural gaps as limitations. We already see this with the drought in Bolivia, Peru and Ecuador, northern Chile and Argentina, and central Mexico. Phenomena are worsening even more so with migration, creating nuclei of poverty, vulnerability, and socio-environmental impacts and conflicts.



Figures 1 and 2. Number of planets needed by South America and Central America, according to the human demand on nature (ecological footprint) and the capacity of nature to meet this demand (Global Footprint Network, 2019).

On the other hand, extreme hydrometeorological events such as precipitations associated to alluviums, overflowing rivers, floods, hurricanes (as in Puerto Rico and the Bahamas), and the increase in the intensity and frequency of ocean surges will continue to claim lives and create economic damages, as well as significant impacts in infrastructure and associated commercial activities (UN Habitat, 2012, IPCC, 2014). However, there are a few examples to follow, with solutions that include natural defenses or a limitation to the alteration of coasts, as in Lima (Peru), which established the intangibility of the cliffs that are part of the "green coast" riverside corridor to reduce risks during natural events.

The New Urban Agenda (NUA) launched in Habitat III, precisely in the Latin American capital Quito, is the operational instrument or action guide to achieving more inclusive, compact, and connected cities through design, governance, legislation and urban economy. This agenda combines urbanization and development with new modes of sustainable consumption and production, and its primary element is vulnerability to climate change. Another example is Asunción (Paraguay), which will implement actions for resilience by applying the UN-Habitat tool, which aims to improve urban resilience (UN-Habitat, 2017).

GENDER INEQUITIES

Gender inequities reduce the ability of women –who are responsible for their homes and caring for children and the elderly—to face disturbances and disasters. In this context, it is essential to include crosscutting gender-sensitive approaches in the formulation of policies and programs on adaptation and mitigation, with Nature-based Solutions (NbS) and strategies for urban systems. Both the Convention on Climate Change and on Biological Diversity have included the gender perspective through action plans. Nevertheless, we must reduce the gaps by amplifying concrete actions, identifying inequities, and providing appropriate solutions, especially in matters related to infrastructure, which should not only be sustainable, but also consider the different needs of women and men (OECD, 2019).

GREEN INFRASTRUCTURE

Cities in Latin America and the Caribbean have experienced scattered growth that has affected the ecological balance and connectivity, fragmenting the landscape in several cases (Larrazábal et al., 2014; Inostroza et al., 2013; Rojas et al., 2013) and degrading the ecosystems that provide ecosystem services such as water provision and quality.

This trend can be addressed by incorporating green infrastructure as a NbS in the region's urban systems, allowing ecosystems to respond effectively. Thus, they will be able to control storm waters; conserve energy; increase or maintain urban

Figure 3. Nature-based Solutions: an umbrella concept for ecosystem-based approaches (Cohen Shacham et al., 2016).

biodiversity; allow air purification; reduce emissions, temperature, and noise; increase the number of recreational areas, accessibility, and strengthen social cohesion.

The concept of Nature-based Solutions (NbS) includes actions to protect, sustainably manage, and restore natural or modified ecosystems. These are a cost-effective way to address climate change, the risk of disasters, food and water security, human health and socio-economic development.
They simultaneously contribute to human well-being and generate benefits for biodiversity (Cohen-Shacham et al., 2016). This approach allows the sustainable design of urban systems in Latin America and the Caribbean, and answers to several challenges of the region, which will continue to grow in the next four decades.

Currently, several initiatives promote Nature-based Solutions in urban areas in Europe, which are a knowledge base to be adapted and applied in Latin America and the Caribbean, considering cultural and ecosystem differences. One of them is the Urban Nature Alliance, which aims to standardize how cities measure their natural capital and to generate awareness on the benefits of preserving urban ecosystems. Other initiatives are Oppla, a repository of NbS for the European Union; and OpenNESS, which translates the concepts of ecosystem services and natural capital into operational frameworks, among others.

NATURE-BASED SOLUTIONS

The green infrastructure or network of natural and semi-natural areas, and also of other environmental elements, which is strategically planned, designed, and managed for the provision of ecosystem services, is already being recommended (European Commission, 2014). The municipality of Hermosillo in Mexico, for example, develops a handbook for Mexican towns (IMPLAN, Hermosillo, 2019). These measures will help to better deal with climate threats such as flooding or to reduce the heat island effect, among other incidents.

Ecological corridors, the protection of ravines, foothills, native vegetation as well as bodies of water and waterways and their flooding and riparian zones, can contribute to counteract adverse effects on the population. A few examples are the transformation initiatives and projects led by Curitiba (Brazil) and the green belt of the city of Cuenca in Ecuador. Urban green spaces, such as parks, which are in general equally accessible, can become areas for post-disaster refuge, recovery, and gathering, in addition to promoting recreation, psychological well-being, motivate physical activity and inclusion; as is the case of Parque de la Amistad in Montevideo (Uruguay).

In Colombia, there are examples of how the role of nature in cities has been incorporated and valued, clearly recognizing the need to plan cities and their nature in a different manner. The country has 400 municipalities exposed to landslide incidents located in river flooding zones because the forest cover was extensively cutdown to provide space for human occupation, as occurred in Utica in 2011 (Cundinamarca), Salgar in 2015 (Antioquia) and Mocoa in 2017 (Putumayo). These incidents left behind human and material loss in the Colombian country (OECD, 2019).

Other outstanding initiatives include the Territorial Management Plan of Medellín, which involves a sound combination of land use to respond to the demands caused by climate change. In the same city of Medellín, an attempt is being made to reduce the effects of residential segregation caused by the fragmentation of a highway, removing it from the surface to recover and integrate space next to the river. This originates the Medellín River Park, which also controls urban growth with the Green Ring or Garden of Medellín. In addition to Hermosillo, the administration of the Municipality of Mérida (Mexico) set the goal of planting 100,000 trees in three years, which is why they developed a “Tree planting guide”.

These examples of Nature-based Solutions in cities of Latin America and the Caribbean demonstrate

that projects and initiatives for the conservation and integration of biodiversity in the city can be implemented. Investments that include these solutions in urban zones, buildings, and public areas are needed, integrating them as instruments of territorial planning and local policies, thus facing challenges such as climate change.

In this sense, wetlands are also a perfect opportunity to develop NbS. However, these have been one of the ecosystems most affected by the expansion of cities. Our region leads the loss of wetlands at a global level in the last three decades, with 59% (Darrah, 2019). The planning of Latin American cities has entirely omitted the role of wetlands in climate change and resilience. Nonetheless, their benefits have been widely demonstrated (Rojas et al., 2019; Villagra et al., 2014), a matter that is discussed in depth in the brief on ecosystems of continental waters. An original bill of law was recently developed in Chile, called "Protection of urban wetlands," whose purpose is to stop the extensive expansion of real estate development on these natural areas. It was approved by parliament in November 2019 (Boletín 11.256).

PUBLIC POLICIES

In order to face the challenges of climate change with sustainable, comprehensive, and effective public policies, we must consider gender equity among the technical criteria and strengthen the role of Nature-based Solutions in cities of Latin America and the Caribbean. To do so, awareness and amplifying actions -such as those exposed in this brief- are required, with the participation of civil society and scientific engagement.

There are successful experiences in the region, such as Porto Alegre (Brazil) or in Costa Rica, where a National Policy for Urban Development (PNDU 2018-2030) was launched, which holistically articulates different principal axes for sustainability integrating nature. For example, stormwater management, bioclimatic architecture, and urban woodland, among others. In 2016, Chile initiated ecological planning in several of the country's regions, identifying natural areas in which to conserve or restore the provision of ecosystem services, through an interconnected network of areas of ecological significance ("Red de infraestructura ecológica", PUCV, 2017).

Therefore, the region's sectoral policies must recognize the need to integrate natural areas in urban planning. Also, in order to consider the landscape scale, understanding the interconnection of urban and rural systems is essential, taking into account urban systems' demands for goods and services and the contribution of natural or semi-natural ecosystems.

Lastly, public policies have to consider a cascading planning system, with an integrating approach and different scales; design, or restructure urban systems in terms of vulnerability to climate change and foster women's participation in planning. We must move from vulnerability to resilience and sustainability, reducing gender gaps in order to make opportunities equal among men and women (Wilson Centre, 2018), understanding they fulfill different roles in society and that their preferences differ. Therefore, the development of cities and associated infrastructure must consider gender and sustainability perspectives, and women's sensibility is a contribution to decision-making (OECD, 2019). Also, ensure binding participatory mechanisms with complete information to make decisions regarding territorial development, and strengthen governance while protecting biodiversity and environmental and social equity.

RECOMMENDATIONS

- Reduce the vulnerability of our cities with active risk and climate change management strategies, aligned to the commitments of international agendas (i.e., SDG, Paris Agreement, Sendai Framework, Biological Diversity Convention).
- Consider the regulation of urbanization and the vulnerability of settlements to several climate change scenarios, following sustainability goals (SDGs), such as access to water supply, and reduction of the ecological footprint, promoting low carbon emission buildings and public transport systems.
- Restore and conserve urban biodiversity by integrating and gradually incorporating Nature-based Solutions in planning instruments and local policies.
- Use the advantages of NbS to reduce inequalities in sanitary infrastructure and access to goods and services such as parks and public areas.
- Meet the challenges imposed by climate change and disaster risks with comprehensive urban public policies that consider NbS.
- Good governance at multiple urban scales is needed to improve citizen participation and promote gender equity.
- Reduce reconstruction and habitat restoration expenses with efficient ecosystem services and respond to several of society's challenges through actions that ensure healthy (eco) systems.

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RIVERS AND WETLANDS, LOCAL GOVERNANCE AND KNOWLEDGE IN NEW CLIMATE SCENARIOS

MAIN IDEA

Aquatic ecosystems in Latin America and the Caribbean play a fundamental role in climate change resilience. Deforestation, overconsumption of water in a context of shortage and pollution loads from the use of fertilizers, are problems that reduce resilience and are determining factors in biodiversity loss, deepening social and gender gaps. Sustainable management, Nature-based Solutions and conservation with a gender perspective should be the priority axes of climate change adaptation programs.

TYPES AND IMPORTANCE OF AQUATIC ECOSYSTEMS

The region has a great variety of unique aquatic ecosystems and harbors species that have adapted to singular conditions –which human life depend upon—taking on greater value in the climate crisis (Kumar, 2017). For example, those found on the Northern and Southern Andes mountain range in Latin America, allowing the expression of complex water systems such as the Páramo, Jalca and Puna. The páramos capture and store carbon gas from the atmosphere, regulate the water cycle, contribute to regulate the regional climate and are sacred sites for a majority of ancestral cultures, among many other benefits (Rivera, D. y Rodríguez, C. 2011).

In addition, there are outstanding biogeochemical processes in the Southern Andean salt flats and lagoons (Farías M.E., 2012, Farías M. & Contreras L.M., 2013) that are important in climate change: the meadows (bogs) and bofedales are groundwater reserves that allow the presence of ecosystems and community settlements. A minimal change in groundwater levels drastically affects these ecosystems. Women and men, in addition, participate in the care of animals, herding and farming tasks, which are threatened by the intense extraction of groundwater, changes in weather patterns and habitat loss. The Andes contain 10% of the world's continental waters (IUCN, 2008) and the ecological and social importance of these Andean systems is well documented (EHAA, 2008).

Coastal systems are another form of aquatic systems in the region. These are transition ecosystems between the ocean continental waters such as estuaries, mangroves, coastal lagoons and tidal marshes, which receive nutrients from the continent's fresh water, benefiting highly productive areas for fishing and other human activities that are relevant for the local economies of Latin America and the Caribbean. This is the case for mangroves, which play a vital role in carbon sequestration, they protect the shores from rising sea levels, provide food to coastal communities and are habitats for unique species; the loss of mangroves, however, is alarming. In Costa Rica, it

is estimated (Hernández-Blanco et al., 2018) that the total average value of the ecosystem services provided by mangroves is $1.5 billion per year (mean: $160 million/year). Mangroves account for only 7% of the natural forests of Central America; Mexico, Brazil, Australia and Nigeria possess 48% of the world's total mangrove surface.

In addition, there are strategic ecosystems in Latin America and the Caribbean, such as peatlands. These are little known wetlands that act as regulators of the global carbon cycle and are efficient water regulators. Research on peatland is relatively recent in the region, of a total of 6,181 articles published between 2003 and 2007, 52% account for Europe and only 2% for South America, however, the origin of peat goes back to 11,000 years on average, and as long as 17,000 years in some cases (Markgraft & Huber, 2010).

The Southern Hemisphere boasts 5% of the global peatland surface (Lappalainen, 1996), though these aquatic ecosystems exist in cold and subtropical climates and within an altitudinal range of 0 to 4,000 meters, known as Caribbean coastal peatlands, they are a buffer between mangroves and continental wetlands. Other types of peatland are tropical peatlands, which are floodplains of rivers Pastaza-Marañón (Draper et al. 2014)–, and peatlands of the Andean páramo, located above 3,000 meters, in areas with poor drainage, similar to the high Andean systems of the puna. Last, the Patagonian peatlands in Chile and Argentina, the Southern Hemisphere's primary terrestrial extra-tropical system for the capture and storage of carbon (Joosten & Clarke, 2002; Blanco & De la Balse, 2004).

GENERAL DIAGNOSIS REGARDING ACCESS TO WATER IN THE REGION

The Latin American and Caribbean region is characterized by an annual average precipitation of 1,600 millimeters and an average

Paraná-Paraguay System

Patagonian peatlands

Andean lagoons and salt flats

Páramos
(Cocuy, Pan de Azúcar Cocuy, AUTOR: ANGELICA BATISTA-MORALES)

Mangroves

Coastal wetlands throughout the entire coast of the Caribbean and part of South America. Source: Global distribution of blue carbon, Joosten & Clarke, 2002

runoff of 400,000 cubic meters per second and is known as a region with abundant water resources (BID-CEPAL, 2018). It contains 34% of global renewable water resources (UNEPWCMC, 2016), but there is inequality in water availability and access to it.

In Chile, expenses from the use of water trucks increased in the last five years to US$ 187 million (i.e. 9 low-complexity hospitals, Amulén 2019), affecting the resilience capacity and climate change adaptation. This has also increased poverty and migrations. Conservation of the region's wetlands, recognizing their spatial and temporal dynamics, within the framework of a socioecological context, is a cost effective and complementary solution for the development of infrastructure to provide access to water (e.g. Colombia, Jaramillo, 2016).

Groundwater sustains numerous ecosystems. Its evolution is much slower than surface water and thus constitutes a reserve that has the capacity to lessen the effects of draughts (Custodio et al., 2017). The increasingly intensive exploitation of groundwater, as surface water sources are exhausted puts their sustainability at risk, as their extraction has not been accompanied by adequate knowledge and legislation (Lictevout & Faysse, 2018). This has led to the overexploitation of aquifers and the exclusion of small users who access water. The signature case is Petorca (Valparaíso region, Chile) where drought and overconsumption have left the community without access to water.

In recent years the regions of southeastern and central Brazil have experienced periods of water shortage. In the northeastern semiarid of Brazil, historically affected by a lack of water, over 52% of the population lives in rural areas, of which 60% are women. Rainwater collection is performed in order to guarantee water security for schools and small properties in communities (ASA Brazil, 2019; MDA, 2019). In Colombia, some of the populated areas of the Caribbean are more susceptible to drinking water shortages (IDEAM, 2018), even indigenous Wayuu communities in La Guajira (Colombia), which has a hydric offer of 26mm per year of surface water, perform ancestral practices that not only welcome the rainy season at the end of a period of drought (Daza, 2018), but also request help because their right to water is being violated.

According to a recent study, in Chile's case (Fundación Amulén, 2019), it is estimated that almost one million people are affected by water shortage. Meanwhile, 47.2% of the rural population doesn't have access to the drinking water network. Girls and women perform water collection tasks.

In the Caribbean as well as countries in Central America and northern South America, extreme events such as droughts and flooding are frequent, presenting changing cycles. In all cases they affect the more vulnerable populations, generating physical and ecological changes in the basins and at a landscape level. Reports describe economic loss and people affected during the winter wave of 2010-2011 in Colombia, for example, where 3,219,239 people were reported as being affected (CEPAL, 2012), and the loss of about USD$ 7.8 billion (Hoyos et al, 2013).

The rainfall deficit has been persistent in some regions of Latin America, such as the central area of Chile, which up until 2019 registers a 72% deficit (FCFM, 2019). Extreme drought phenomena increase due to the resource's bad distribution, lack of proper infrastructure (ex. aqueducts, treatment plants, water reuse), in addition to other anthropogenic drivers as we'll see later on. All of this triggers adverse effects on the more vulnerable human populations, meaning more social burdens on women and minors.

ADAPTATION AND RESILIENCE TO ANTHROPOGENIC THREATS

Pressures on aquatic ecosystems have multiple drivers such as changes in land use, deforestation, fires, development of non-sustainable infrastructure and the persistent polluting discharges into rivers, lakes and wetlands. The degradation of these systems has direct effects on water availability (UNESCO, 2015). An example is the Atuel river in Mendoza, Argentina, where "pampeanos" (people of the lowlands) have lost access to water (Rojas and Wagner, 2016). This situation is replicated in different areas of the region, as a result of the way the territory is occupied and the use of natural resources. According to the United Nations global report on the development of water resources (WWAP, 2017), only 20% of wastewater is treated in Latin America, making the region vulnerable to public health events.

On the other hand, changes due to real estate development or public works infrastructure (grey infrastructure) break up the flows of surface and groundwater, and the unplanned urban expansion is decreasing the life of natural systems and people's quality of life. There are many examples in the coastal systems of Latin America and the Caribbean, such as the increasing loss of mangroves even though they fulfill vital roles. In Mexico, the total mangrove surface was 856,405 hectares in 1981, this figure dropped to 775,555 in 2017 (CONABIO). In areas such as Quintana Roo (Mexico), there were 137,910 hectares of mangroves between 1970 and 1980, but urbanization and the development of tourism reduced this area to 125,049 in 2014.

Many of the region's wetlands have become "urban wetlands" because they have been absorbed by cities. For example, between 1975 and 2000, 55% of the urbanization of the metropolitan area of Concepción (Chile) was conducted at the expense of the loss of 23% of existing wetlands (Pauchard et al., 2006). This type of change has generated a dramatic increase in the content of nitrogen and phosphorus in water, causing eutrophication and the increase of toxic algae (Wurtsbaugh et al., 2019). Urban lagoons represent a reservoir of freshwater and well-being that is vital to the population.

In this same sense, scientific literature demonstrates impacts on aquatic ecosystems caused by these civil works, such as variations in surface water flows, loss of ecosystems and species due to migrations in transfer channels, changes in the quality of water of receiving basins and water salinization (Habit E. and Parra O., 2001; Wen Zhuang, 2016; Shumilova et al., 2018). Loss of connectivity or fragmentation alters the ecosystem function of rivers and their productivity, which makes them less resilient to other stress factors such as climate change (Habit et al., 2018). The immediate effect is biodiversity loss, especially fish species (Poff, 2019, Díaz et al., 2019). This trend is expected to increase significantly toward 2050, mainly because of the incentive to build reservoirs (Benjumea et al., 2014) and power stations <20 MW (Diáz et al., 2019).

In addition, the forestry and agricultural expansion in basins has consequences on the quantity and quality of rivers, lakes and wetlands (Ramsar, 2018; CR2, 2019; Curado, 2004; Galdino, 2006). Pollution from diffuse sources at the level of water basins is a silent and high impact problem in the region, as stated in the report The State of Biodiversity in Latin America and the Caribbean (UNEP, 2016). The excessive increase in the use of fertilizers has negative effects on the quality of water, the health of ecosystems and people, and the acidification of soils or biodiversity loss (OECD, 2019). Reported causes are agricultural runoff, pisciculture and wastewater discharges with no tertiary treatment (ECLAC-OECD, 2016).

At the global level, the natural fixation of nitrogen is 203 million tons/year, while the anthropogenic fixation is 210 million tons/year,

and only fertilizers are contributing 96 million tons/year (OECD, 2019). Eutrophication and hyper eutrophication incidents in coastal lagoons or inland systems are frequent in several countries of South America (Parra et al., 2003; Chalarca et al., 2007; Almaza et al., 2016; Figueroa A. & Bruna S., 2019), such as the Paraná-Paraguay system, specially the plateau area. The pressure can be observed here, as well as the increase in farming and livestock production, mining, infrastructure works, deforestation, forest fires and controlled burns, and the loss of biodiversity and local economies that depend on the marshland. This situation seems to be a trend in aquatic ecosystems (Andrade et al., 2018) of Latin America and the Caribbean, which is troubling.

Forest fires deserve special attention regarding the effects associated with climate and precipitation. During droughts, forest ecosystems throughout the region are highly vulnerable to fires, a recent example is the Amazon rainforest environmental disaster during the 2019 dry season (Fonseca et al, 2019), with a 515% increase in the border zone of Brazil, Bolivia and Paraguay –the marshland— and over 480% increase of controlled burns compared to the previous year (INPE, 2019). Forest fires in the Amazon are a threat to hydroclimatology: about 40% of the rain in the tropics is recycled as an effect of evapotranspiration (Eltahir, 1994), a decrease in the vegetation coverage would account for an environmental catastrophe.

Pertinent territorial actions are a basic principle that we must consolidate with determination. The development of 'water highways', dams or the use of water trucks to provide supply during water shortages or droughts are inadequate. Therefore, consistent solutions to the climate crisis, collective and systemic measures based on nature, are urgent.

ECOSYSTEM CONSERVATION FOR ADAPTATION AND RESILIENCE

We can positively use aquatic ecosystems to reduce the risk of disasters and improve water availability. A few concrete formulas in Latin America and the Caribbean demonstrate that sustainably using water and aquatic ecosystems is possible. However, there are dramatic cases of continued neglect in poorer areas, which are indeed more polluted and deprived of effective and timely public policies.

Aquatic ecosystems tend to be resilient during floods and droughts, especially when they are well conserved, like a few areas of the Amazon rainforest subject to seasonal flooding, such as the extensive grasslands and wetlands of the riverside plains of the Paraná river or the coastal system of Roncuant-Andalién in the Biobío Region (Chile), which was able to absorb the impact of the 2010 tsunami, unlike the landslide flooding in 2018 in Calama and San Pedro de Atacama (Chile), the world's driest desert, where adaptation and prevention for human settlements is increasingly more complex in the face of unpredictable events such as these.

Sustainable management of biodiversity and water in territories is essential to maintain socioecological systems (IPBES, 2019); this is directly related to the United Nations targets of the 2030 Sustainable Development Goals and the Aichi Targets, to which we propose the greatest efforts be directed in order to broaden sustainable actions and revert bad practices, thus reducing gaps and inequities.

We can't continue to solve complex problems without including the risk factors of climate change. Several projects in countries in Latin America and the Caribbean demonstrate that networks that integrate communities, developing pertinent actions based on local and scientific knowledge, provide effective and positive results. Colombia, for example, has created the Adaptation

Fund to guarantee resilience in territories in the face of climate change risks or the Blue Corridor conservation program throughout the Paraná-Paraguay Wetlands System, where communities feed, move and develop local economies (PCA, 2019).

Other successful cases are Chiloé in Chile, with the design of a Rural Drinking Water Participatory Network (RPA in Spanish), recovering micro-watersheds through adaptive ecosystem management and the comparative experience of conservation and peatland exploitation in Southern Patagonia in Chile and Argentina (Iturraspe R. y Urciuolo A., 2014; Iturraspe, 2016; Figueroa A. y Saavedra B., 2018). In addition to these cases, the 2030 Women's Program was developed, which involves over 50 countries; Chile, Bolivia, Paraguay, Brazil, Colombia and Mexico represent Latin America, in addition to three states of the Gulf of Mexico that have experience in coastal wetlands. Action has been developed to reduce the vulnerability of communities settled in this area.

Regional initiatives related to the Ramsar Convention are a good example of collective efforts between the State and organizations; however, an evaluation needs to be conducted regarding their progress, the service provided by governments and their continuity, as well as the funds assigned by international agencies that allow for the effectiveness of national and international commitments. A few outstanding initiatives are the Regional Initiative for the Fluvial Wetlands of the Plata Basin, the Regional Initiative for the High Andean Wetlands and the Regional Initiative for the Management and Sustainable Use of Mangroves.

WATER AND GOVERNANCE

As the population of Latin America and the Caribbean increases, so does the pressure on water. It is urgent to improve and increase the efforts in the region's countries to reduce gender gaps and inequities regarding access to water and the health of aquatic ecosystems. The importance of water resources in local and global economies demands that we amplify efforts and accelerate the work in facing the climate crisis and extreme climate incidents, including collective actions, proper economic instruments and funds for actions, such as those implemented by a few of the region's countries. However, the change in production practices is one of the greatest challenges for aquatic ecosystems to continue to provide ecosystem services that are vital for the planet.

Water management in the region is sectorial, with not enough participation or dialogue between other actors, meaning, there is water for human consumption, for irrigation, to generate hydropower, and for mining, among others. This form of management creates greater discoordination and fragmentation in water use, which as a result produces not only the overexploitation of this resource, but a considerable reduction of the water volume available to all uses (including the ecosystem).

Identifying and strengthening local and community governance is fundamental for sustainable territories. In addition, installing competencies and capacities in social capital is required. Therefore, pertinent and binding participatory processes must be promoted to define local priorities. In addition, the development of public policies from and for the territories must be encouraged.

RECOMMENDATIONS

■ Improve access and efficiency in the use of water and biodiversity, at all levels, prioritizing women in vulnerable groups, providing capacities to reduce inequalities, thus achieving a harmonious development between men and women, in accordance to the social and cultural context.

■ As suggested in the Brisbane Declaration and the Global Action Agenda on Environmental Flows in 2018, a new understanding on the relationship between people and rivers is urgent, in order to renew the concept of environmental flows (Anderson, E. P., et al 2019). The development of 'water highways', reservoirs or the use of water trucks to supply the water shortage or drought are inadequate (Figueroa A. y Bruna S., 2019).

■ Include wetland ecosystems, such as mangroves or peatlands, in the national contributions (Nationally Determined Contributions, NDC) of countries, within the UNFCCC. More science, funding and collaborative work between local and regional research centers is needed.

■ Improve city planning to reduce the pressure on water resources, considering the load capacity of the basins and water available.

■ Promote studies, monitoring networks, and the use of remote sensors to broaden knowledge, which have been successfully used in some countries in Latin America and the Caribbean, but whose development is limited. Development of collaborative projects among the region's countries to strengthen human capacities, local and scientific knowledge, and to improve comprehensive policies, in support of the 2030 Agenda for Sustainable Development (2030 SDG) and CBD targets, among others specific to each country.

■ Regulate, prevent and reduce sources and routes for pollution from nitrogen on surface water and aquifer ecosystems and simultaneously reduce air pollution and prevent untreated liquid industrial waste in coastal areas (OECD, 2019).

■ Amplify Nature-based Solutions (NbS) for the sustainable development of territories in all possible spaces, in order to reduce risks and recover the sense of social belonging within the territories, considering the gender perspective. For example, in the recovery of riverbanks and the conservation of flooding areas, which improves the behavior of aquatic ecosystems in natural disasters (Russi et al., 2013); conserve and restore wetlands to reduce the risk of disasters and take advantage of the capacity for resilience of these ecosystems and the resilience of communities.

■ Protecting fluvial systems at the water basin level to safeguard the quality of water, preventing erosion and maintaining connections between terrestrial and aquatic ecosystems is vital (Reid et al., 2019).

■ Use rivers as connectivity networks of the social network, restoring degraded areas, specially in vulnerable localities, providing social value in empty land, promoting the occupation of areas with projects that incorporate and use local workforce (family vegetable gardens, botanical gardens, areas for recreation, care and learning of children and young people), promoting social inclusion to reduce poverty and inequality, provide surroundings related to nature.

■ Reduce the irreversible impacts of infrastructure on the structure and operation of aquatic ecosystems and hydrological systems.

■ Promote environmental education programmes that include different levels of academic training (preschool, schools and universities), in addition to activities with riverside and urban communities, promoting the protection and conscious use of water, waste management and respect for nature.

■ Maintain monitoring and evaluation observatories for the state of water resources, such as investigation lines that act locally as well as regionally, with information available to different actors and for decision-making at different levels.

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IMPORTANCE OF TERRESTRIAL ECOSYSTEMS IN LATIN AMERICA AND THE CARIBBEAN

MAIN IDEA

Production activities such as cattle breeding, forestry and agriculture under schemes of intense and extensive use, are factors that have not only determined poverty and the loss of biodiversity but also maintain inequalities between men and women hidden, which is aggravated in adverse climate change scenarios.

CONCEPTUAL FOUNDATION AND DIAGNOSIS

Proposals for mitigation and adaptation to climate change in terrestrial ecosystems, together with poverty assessments exclusively based on a market approach, diminish and distort the contribution of biodiversity to the direct consumption in homes and the contribution of the women's workforce in production activities, which for the most part are not paid. This bias frequently leads to the assumption that biodiversity conservation is causing poverty in populations that live in areas rich in biodiversity or near them.

With a little over two billion hectares of terrestrial surface, Latin America and the Caribbean account for no more than 15% of the Earth's surface; however, they possess the world's greatest diversity of species and ecoregions (ECLAC, 2002; ECLAC, 2018). The terrestrial ecosystems of the region have been recognized among the planet's most valuable for their capacity to contribute to the quality of life of their residents. Nature's contribution to its residents has been estimated in at least 24.3 trillion dollars a year, which is equivalent to the total gross product of the countries of this region.

In addition, it is recognized that biodiversity and the current condition of ecosystems is declining, which decreases the quality of life (IPBES, 2018). In a more recent assessment of the status of terrestrial ecosystems in Latin America and the Caribbean, which was developed within the International Union for Conservation of Nature (IUCN) red list of ecosystems evaluation framework, 85% of America's forest areas are potentially threatened (Ferrer et al. 2018) which is related to changes in land use of natural ecosystems in different time scales (see figure 1).

Even though today there are different methodologies to value and evaluate the actual status of the region's ecosystems, there exist certain types of ecosystems associated to local conditions of the territory that are not explicitly incorporated in the regional assessments and receive direct impacts from production systems. On the other hand, only

recently has the debate moved toward Nature-based Solutions (NbS) which are fundamental to mitigate and adapt to components of global change, particularly climate change.

In this sense, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and IPCC- Land and Climate Change (2019) coincide in highlighting the role that communities play in effective conservation. Nevertheless, it is necessary to consider the specific interests of women in the definition of priorities in territorial management plans, as well as in the definition of areas of use in territorial planning processes.

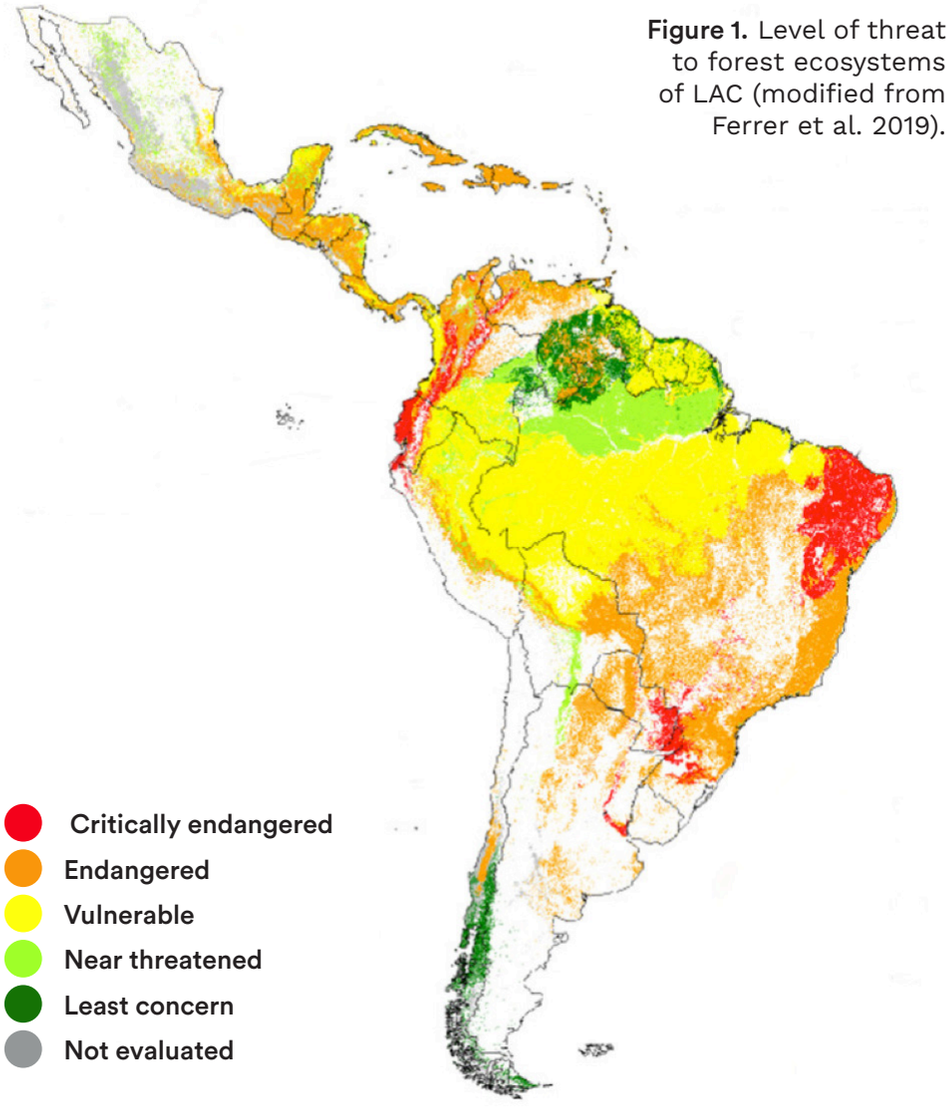

Figure 1. Level of threat to forest ecosystems of LAC (modified from Ferrer et al. 2019).

In the management of specific natural resources, the analyses of value chains with gender perspective shed light on the contributions of women and men, as well as their specific needs for training and technical assistance. In territorial control and surveillance systems, women's participation is feasible when the organization of these systems considers the participation of homes as a group, not only men (ex. Riverside communities of the Tamshiyacu – Tahuayo Regional Communal Conservation Area).

The assumption that poverty is related to the areas where biodiversity concentrates should be reviewed in terms of Goal 15 of the Sustainable Development Goals (SDG), regarding Life and Terrestrial Ecosystems. This indicates that by 2020 there is a need to integrate biological diversity and ecosystem values in national and local planning, development processes, poverty reduction strategies and accounting. This coincides with Target 2 of the Aichi Biological Diversity Convention.

THE VALUE OF WOMEN

Advancements in this goal must also consider the comprehensive contribution of women to the economy of households. According to Goal 5 of the SDGs, "recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies, and the

promotion of shared responsibility within the household and the family, as nationally appropriate" (United Nations, 2019). In this case, especially for populations that depend more directly on biodiversity and healthy ecosystems.

Evaluations related to goals indicated in Latin America and the Caribbean show that, even though progress has been made, it would not be enough to reach the goals by 2030, let alone 2020. Advances refer to laws being passed in some countries including biodiversity values in environmental impact assessments (UNEP, 2016), as well as in a few programs for paid environmental services. In 1996, Costa Rica led the first program of this kind to recognize four ecosystem services: the capture and storage of atmospheric carbon, the protection of water sources, biodiversity conservation and scenic beauty conservation.

In addition, there are several initiatives underway within the deforestation and forest degradation emissions reduction framework (REDD+) that aim to create financial value for carbon stored in forests through conservation processes and sustainable management, allowing conservation of the functions of storage and sequestration of carbon in forests (UNEP, 2016, page 21).

In spite of the above, the idea that biodiversity and its conservation generate poverty in households located nearest the areas of greater biodiversity concentration, persists. In the State of the World's Forests report of 2018, FAO tried to quantify the contribution of forests to Target 1.1 of the Sustainable Development Goals: "By 2030, eradicate extreme poverty for all people everywhere (currently measured as people living on less than $1.25 a day)".

Two outcomes were highlighted in this report:

1. "In countries where reliable data on poverty and population are available, an association between high forest cover and high poverty rates has been confirmed". This affirmation used the indicator $1.25 a day, since the indicator has been established to be globally applied.

2. "For these extremely poor populations, forests contribute between 20% to 28% of their income". This affirmation considers monetary and subsistence income instead, from a study that, according to FAO, is the most complete on rural environmental income produced by the Poverty and Environment network, with a sample size of about 7,000 homes in Asia, Africa and South America (FAO, 2018; Angelsen, et al., 2014). The fundamental reason behind the establishment of a "direct association between high forest cover and high rates of poverty are transaction costs, given the distance between settlements and urban centers and markets" (FAO, 2018). What must remain very clear in this appreciation is that the estimated income of USD$1.25 a day includes only monetary income, meaning, that which is produced in market transactions, excluding the value of products and resources that are designated for direct use and self-consumption in households, which largely sustain their food security.

RURAL ECONOMY

In terms of rural economy, the debate surrounding "subsistence economy" and "market economy" is not new. In the 1970's, a new economic anthropology raised criticism against classic economy, warning about its limitations to understand indigenous and rural economies due to the assumption of market integration as a universal measure for poverty or wealth.

Under this assumption, indigenous and traditional farming economies are characterized by their inefficiency and condemned to live in the margins of economy. In contrast, economic anthropology proposes that it is more adequate to consider indigenous economies as economic systems constituted by two "spheres": one, based on reciprocity and the other on market transactions (Firth, 1974; Frankenberg, 1974). Thus, it is possible to have a more holistic understanding of household economies whose livelihoods largely depend on biodiversity and ecosystems, since they assign a significant part of their resources to direct use and self-consumption in their homes.

Using the above as a framework, another study with a smaller scope, conducted in 153 households of the Tacana indigenous people, whose territory is adjacent to the Madidi National Park and Natural Area for Integrated Management in Bolivia, showed that households have up to 12 sources of income, classified into three types: a) activities that do not drastically change land use (wood, fishing, hunting, collection of non-timber products, wild honey, etc.) and that contribute 44% of gross income, b) activities that don't depend directly on ecosystems (businesses, bonuses, remittance, working for others) and that contribute 33% and, c) activities that require change in land use, such as agriculture and livestock production, which contribute only 23%.

While gross income is 60% monetary and 40% non-monetary, costs are 67% non-monetary and 33% monetary. Here, non-monetary costs are conformed by unpaid family and communal labour (minkas), of which 83% are women who are at the base of functioning economic systems. Activities that depend on well conserved ecosystems usually generate non-monetary income (consumption, trade, gifts).

The measurement of population in extreme poverty turns around, depending on whether or not non-monetary income is considered; in fact, by considering only gross monetary income, 60% of the population falls into the category of the extremely poor (according to standards officially established for Bolivia). However, when monetary as well as non-monetary income is considered, barely 17.6% of the population falls in the extreme poverty category (Lehm, Lara, & amp; Solares, 2017).

RECOMMENDATIONS

"Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries", according to Goal 13 of the Sustainable Development Goals in relation to taking "urgent action to combat climate change and its impacts".

This requires recognizing aspects such as:

- Developing countries, particularly in Latin America and the Caribbean, are home to the greatest diversity of ecosystems and species. This richness is an important foundation for climate change adaptation and mitigation.

- Proper valuation of biodiversity implies recognizing its contribution to the well-being and income of populations, especially those that live near areas of biodiversity concentration.

- Income that is generated based on biodiversity and well conserved ecosystems, is monetary as well as non-monetary, and therefore, the approach to poverty measurement needs to change by incorporating non-monetary income. By doing so, the unfair stigma that nature conservation necessarily brings poverty will be overcome.

- The contribution of women who participate in the conservation and sustainable use of resources contributed by nature must be recognized, quantified and included in economic estimates. Similar to what happens with the contribution of biodiversity, by being mostly unpaid, the contribution of these women remains hidden in economic estimates.

- Recognize that the market is not a universal measure to establish the income and costs of households. This necessarily implies recognizing that women are affected differently by natural disasters and climate change. They are more exposed to risks, more vulnerable and the impacts translate into an even greater overburden of work in the provision of care.

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DISASTERS AND RESILIENCE FROM A GENDER PERSPECTIVE

MAIN IDEA

The consequence of climate change and the loss of biodiversity is the multiplication of socio-natural disasters in the region. Human alteration of biophysical balances, including the intervention in hydrological cycles, coastal and wetland erosion, soil degradation and the loss of biodiversity, are creating –and intensifying — territorial risk situations at multiple levels. This new scenario brings along several challenges for the gender agenda. More broadly, it is an invitation to introduce a feminist sensibility in resilience and Disaster Risk Reduction (DRR) programs.

In fact, the relationship between climate change and biodiversity on one hand, and climate change and gender on the other, places us within double tension. It makes us think about the gender gap regarding the effects of socio-natural disasters. The risks are unequally distributed, and it is women who tend to be more affected because of sociocultural, institutional and economic structures.

The gender-DRR nexus, however, is not reduced to the differential impacts of socio-natural disasters. It also materializes in the way DRR programs are designed and, more broadly, in how ecosystem interventions prioritize segmented, vertical, universalist, rational and functional logics in the relationship between people, nature and knowledge. Feminist theory and practice have taught us that these logics underplay the modes of thinking and doing driven by women in their territories.

We also suggest that the gender-disaster-resilience nexus, seen from a Latin American, territorial and feminist perspective, necessarily invites us to adopt an intersectional perspective: gender inequity in disasters intersects with the consequences of racism, poverty, marginality and heteronormativity (Ryder, 2017). Discrimination of women in inter-relation with other forms of discrimination (by race, ethnicity, class, caste, nationality, religion, functional diversity, age and gender identity), increases their social vulnerability in the face of climate change (Echegoyemberry, 2018). This, in addition to the exclusion from decision-making processes and the limited mobility that some women present (Arana Zegarra, 2017).

DEVELOPMENT AND DIAGNOSIS

The gender gap in the effect of disasters

The literature indicates that women die to a larger extent in socio-natural disasters, mostly due to the effect of social norms, differentiated roles and socioeconomic status. For example, research suggests that boys receive preferential treatment during rescue efforts and, therefore, have a greater chance at survival than women and girls (Neumayer & Plümper, 2007). In addition, research conducted in Nicaragua shows that women, in order to fulfill their social role, wait for the authorization of their husband or head of household to leave their home when threatened by disaster (Bradshaw & Arenas 2004).

On the other hand, socio-natural disasters affect women's mental health with disproportionate intensity due to the multiple responsibilities associated with their roles within the community (ECLAC, 2005; IPCC, 2014). In fact, it has been demonstrated that because of climate variability and its social consequences, family and gender violence increases, and women's social networks weaken.

These gender norms also affect the male population. There is evidence that boys and men increase their exposure in situations of disaster. This, due to the expectations of heroic behavior that confirm their social obligation of masculinity during the emergency (Skinner, E., 2011; IUCN, s/f; Bradshaw & Arenas, 2004; Brody, Demetriades & Esplen, 2008).

In a 2012 report, the United Nations Population Fund established that displacement due to socio-natural disasters, which includes separation of the family group and all the associated economic effects, strongly contributes to gender violence. The situations of instability, chaos and public insecurity that often characterize the first stages of a disaster, may contribute to disorder and impunity, and to feelings of fear and insecurity, creating a breeding ground for violence against women and girls.

Feminist perspectives in disaster risk management

In the region's Disaster Risk Reduction programs, vulnerability and resilience have risen as key concepts. While the former points to factors that increase risks in disasters, the latter emphasizes the characteristics that allow a community to resist a disaster and recover from it. In practice, and paradoxically, women are seen at once as vulnerated individuals and as key performers for community resilience (Enarson & Chakrabarti, 2009).

From a gender perspective, it's fundamental to underscore that resilience as well as vulnerability are relational, that is, products of the position of groups and individuals within their social, institutional and territorial contexts (Dow, 1992). Therefore, it makes no sense to consider women as "vulnerable" or "resilient", since it's the relationships between gender identities and their interactions with ethnic, age and class positions that contribute to strengthen or weaken a community.

It is essential to recognize that gender inequalities with regards to disaster vulnerability and resilience are intimately linked to the way in which disaster risk management —understood as "the group of measures, strategies and actions that are carried out with the objective of avoiding, reducing or diminishing the risk of disasters and their effects (Government of Chile, 2019)— is designed, implemented and assessed.

The notion itself of Disaster Risk Management (DRM) is strongly anchored in a paradigm of 'control and command' (Tironi and Manríquez, 2018), which downplays the key role that women play in on site emergency management (Rocheleau 1996).

DRM does not recognize the multiple actions and interventions that are carried out by women in an anonymous, informal manner, with no economic or institutional recognition, and that have proven to be fundamental during disasters. It is precisely women who lead the organization of shelters, the delivery of aid, manage volunteers and provide emotional support, among other roles (Fordham 2014).

In addition, DRM is still being defined as a predominantly top-down, institutional exercise, that prioritizes scientific voices. This model does not recognize the primary importance of what has been called "the logic of care" (Mol 2008, Tironi and Rodríguez-Giralt 2017). Actions such as providing emotional support, caring for young and elderly people, and the delivery of information are mainly carried out by women. These actions have proven to be as or more relevant than the "technical" interventions prioritized by DRM in Latin America and the Caribbean (Magaña et al. 2010), while, paradoxically, they are completely marginalized in local, regional or national DRM programs.

Paraguay & Guatemala

A country in Latin America that is actively including gender aspects in DRM policy is Paraguay. The National Emergency Secretariat of Paraguay (SEN in Spanish), with the support of the Gender Practice Area of the UNDP Regional Center, has initiated a ground-breaking process to operationalize and implement the "Transversal axes of the national policy on Disaster Risk Management", among them, gender.

Guatemala has also taken some significant steps towards a gender-oriented approach to DRM. The National Coordinator for Disaster Reduction (CONRED in Spanish) has driven gender equality mainstreaming in two extensive areas: strengthening the institutionalization of comprehensive risk management with a gender perspective, and the promotion and coordination of participatory and community-based training processes.

Iquique 2014, Chile

In order to facilitate emergency management after the Iquique earthquake in March 2014, the Regional Government (Intendencia in Spanish) created Territorial Information Facilities (CIT in Spanish). CITs were located in the areas most affected by the earthquake, which coincided with the poorest sectors of the Iquique metropolitan area. The CITs objective was to provide victims the necessary information to apply for reconstruction subsidies. In practice, employees at these facilities were exclusively women who had strong social and political ties with the territory, and therefore the CITs functioned essentially as spaces where people were listened to and given emotional support and guidance (Tironi and Manríquez, 2018).

This work was fundamental to manage the anxiety and uncertainty felt by the community, especially by undocumented migrants, single mothers, people in situations of poverty or other vulnerability cases. Even though this labor of care became crucial, it was not officialized in CIT protocols, and the work done by women at CITs was never recognized by the institutional apparatus.

RECOMMENDATIONS

Conceptual recommendations

- Gender inequality in disaster risk management must always be thought of in terms of intersectionality, that is, linked to disparities regarding class, race, age, ethnicity, religion and nationality, among others.

- The connection between gender, resilience and disasters must reconsider the definitions used by DRR programs for the entire disaster cycle — preparation, emergency, reconstruction and mitigation. The concepts of disaster and vulnerability should be defined and applied in a way that reveals and opposes heteronormativity, patriarchy and sexism.

Political recommendations

- Include gender considerations in all stages of the disaster cycle, particularly including gender-inclusive guidelines in the design of emergency housing and relocation processes, and integrating nature as an element for the comprehensive reconstruction of ecosystemic well-being.

- Recognize and include interventions and objectives for emotional support, care and repair in disaster risk reduction policies and programs.

- Ensure gender parity in institutional areas for Disaster Risk Reduction at the municipal, regional and national level, to ensure gender-sensitive

- Create risk and exposure maps at the local level that are able to identify gender gaps and intersectional differences in the access to ecosystem services provided by biodiversity, to reduce inequities and environmental injustice.

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CASE STUDIES ON AQUATIC ECOSYSTEMS

1.

WATER MANAGEMENT AND CLIMATE CHANGE ADAPTATION IN THE MOJANA REGION

La Mojana is a territory located in the Caribbean zone of Colombia which is comprised of 11 municipalities that face seasons of floods and extended drought; therefore, the aim is to create resilience and reduce the vulnerability of communities that face climate impacts. The region is inhabited by about 405,625 people, of which 83.8% are poor and have livelihoods that are strongly vulnerable to changes in the area's climate and hydric dynamics. A change of paradigm in regional risk planning will be provided by a comprehensive and adaptative approach to climate change for informed disaster risk management in the territorial field, with the participation of women.

Experiences regarding water management and climate change adaptation in Colombia are looking stronger after the harsh winter of 2010-2011, which led the national government to create the Adaptation Fund. The objective was to guarantee the territory's resilience in the face of climate change risks, as the main pillar for sustainable development. With the support of UNDP, this fund allowed the development of a global approach that promotes sustainable development based on climate risk information of floods and droughts and reduces the vulnerability of communities and property.

Between 2012 and 2019, the Ministry of Environment, using resources from the Kyoto Protocol Adaptation Fund, UNPD, Adaptation Fund, universities, and the Humboldt Institute, among others, developed an adaptation project which was designed in a joint effort with community organizations through onsite consultations.

The project included the development of strategies to ensure resilience at the domestic level, promoting an adaptable infrastructure and the creation of family vegetable gardens. The initiative innovated in pilot agricultural techniques for the efficient use of water in rice fields, in the improvement of a regional early warning system for floods and promoted community associations to keep the population and local leaders informed on the impact they will face in the region with climate change.

As a result, the project obtained, among others, the restoration of 700 hectares of wetland through participatory processes, with joint work from researchers, farmers, and fishermen, who through their relationship with the ecosystem provided the tools for a better understanding of their function.

For the second phase of this macro-project (UNDP 2019), which has an eight-year horizon starting in 2019, planned measures include greater management of systematized knowledge and the dissemination of the impacts of climate change on water management for planning. The project promotes infrastructure associated to water resources that could be resilient to climate, the restoration of the ecosystem by vulnerable homes and communities, in addition to an early warning system for climate resilience. At the same time, the project considers improvements to livelihoods through agroecosystems that are resilient to climate change. Considering that 49% of the project's 201,707 indirect beneficiaries are women, a gender transversality plan was prepared, specifically designed to improve access to, and management of the region's water resources. Women's leadership is particularly recognized in activities associated to ecosystem restoration and monitoring, and the management of family vegetable gardens as a fundamental means to ensure food safety in the face of climate change risks.

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2.

DRINKING WATER SUPPLY AT CHILOÉ ISLAND, CHILE

At Isla Grande de Chiloé (Chiloé Island) – located in southern Chile—specifically in the rural area of Catruman, the drinking water supply is at risk. The ecosystem functions of forests and wetlands, mainly water storage and regulation, have been altered by multiple social and ecological synergic factors. Summer precipitations have diminished by 25% in the last decade and the change in land use of the Chiloé Archipelago resulted in a loss of more than 10,000 hectares of native forest between 1995 and 2010, which became pastures, eucalyptus plantations and shrubs. In addition, the advanced degradation of forest and wetland ecosystems, which are

foto: Cristian Frêne

overexploited by local residents; 64% of Catruman residents receive water in cistern trucks during the summer, in volumes of less than 50L/person/day. The estimated water demand for human use in Catruman is 25,000 L/day (600 L/family/day), considering human consumption and subsistence farming activities.

Publicly funded work conducted by the Institute for Ecology and Biodiversity (IEB in Spanish) and the local community, addressed the issue of water scarcity. Water-supplying micro basins were identified, and participatory work was established based on the principles of adaptative ecosystem management. This enabled the design of a "Participatory Network of Rural Drinking Water" (RPA in Spanish), which included a micro basin management plan, hydrological monitoring and a storage and distribution network for drinking water for 15 families and the Catruman civic center.

Other actions of the project included gathering local information on land use and long-term records on precipitation and changes in land use, developing a socio-ecological diagnosis of the rural area of Catruman and an estimation of the local water balance. The creation of an artificial wetland to treat sewage water was also considered. This initiative is a systemic solution to water scarcity in summer for a rural community, with a long-term horizon, providing quality water, reducing the population's health risks and recovering degraded ecosystems to provide key ecosystem services for rural communities.

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CONSERVATION PROGRAMS FOR WETLANDS IN PARANÁ DELTA, IBERÁ ESTUARIES IN ARGENTINA AND PANTANAL IN BRAZIL

The Paraná-Paraguay system of wetlands is one of the most important of the world and is being threatened. The connectivity between the river and the lagoons of the islands is at risk, due to the construction of embankments; at the same time, the system is losing its flood pulse and reducing wetland areas. In addition, water pollution from urban, industrial farming and livestock development as well as the traffic of polluting vessels have negative

foto: Pedro Critofori

effects on the riverbank and fishing. These factors negatively impact this great wetland of global and local significance, which affects the sustainability of fisheries.

The Corredor Azul program (2017-2027) led by Wetlands International is being developed in order to turn these threats around and drive strategies for conservation and sustainable use. The program is being executed in Brazil by a women's organization called MUPAN. It is aimed at preserving the health and connectivity of the Paraná-Paraguay wetland system and involves actions in three focal wetlands: the Paraná Delta, Iberá Estuaries in Argentina and Pantanal in Brazil, a border region with Bolivia and Paraguay. Work is being done with base communities to improve their well-being by increasing their income from the use of wetlands and/or through better climate change adaptation.

In addition, MUPAN actively participates in other wetland conservation projects to complete the "gender sensitive SDGs agenda in wetlands". This initiative is led by the Women 2030 Program, coordinated by a consortium of partners (GFC, GWA, WEP, APWLP y WECF) with the support of the European Commission's International Cooperation department. Over 50 countries are involved, including Bolivia, Brazil, Chile, Colombia, Paraguay and Mexico from Latin America.

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4. CONSERVATION AND REGULATORY FRAMEWORK FOR PEATLAND IN SOUTHERN PATAGONIA, ARGENTINA AND CHILE

Similar to Argentina (Ushuaia, Tierra del Fuego), the extraction of peat in Chile is regulated by the Mining Law; however, there are differences in management. In Ushuaia's case, progress has been made. This does not happen in Chile. In Argentina, the exploitation of peatlands is concentrated in Tierra del Fuego, whereas in Chile, this happens in Magallanes, Chiloé Island and more recently, in the Aysén Region. The exploitation demonstrates a lack of knowledge regarding the ecological and environmental contribution made by peatlands, and is conducted in precarious and improvised conditions, and ignorance of good practices.

In Tierra del Fuego, Argentina, after several joint actions by the General Directorate for Water Resources of the Province (DGRH in Spanish), and the International Mires Conservation Group (IMCG) Secretariat, an agreement was reached regarding the rational use of peatlands. The Ushuaia Statement recognizes the global importance of peatlands in Tierra del Fuego and recommends a Strategic Action Plan for its rational use. A strategy and action plan were developed by the Tierra del Fuego Secretariat for Sustainable Development and the Environment, Wetlands International and FARN.

foto: Silva-Quintanas

Thus, unregulated exploitation of peatlands changed, and decisive actions were agreed on. Among the most relevant are the declaration of a moratorium in the adjudication of peat mining concessions and the approval of an environmental management plan for their use and conservation.

In addition, the "Vinciguerra Glaciar and Associated Peatland" was declared a RAMSAR site (2009) and a commission was created to manage peatlands (Res. SDSyA 326/2010). Work was done on guidelines for peatland management, based on ecosystem, hydrologic, social and economic criteria, as well as preexisting plans.

Land-use zoning was also performed (Res. SDSyA 401/2011), defining peatland protection zones, protection zones set aside for 30 years with potential for future extractive use and sacrifice or exploitation zones assigned for regulated extractive use (Iturraspe & Urciuolo, 2014). In addition, the hydrologic restoration of peatland at the Valdés river Reserve, which was a pilot experience (Iturraspe & Urciuolo, 2017). Last, the Mining Code must be harmoniously applied with other national and local regulations, whose provisions govern and promote the rational use of peatland.

Unlike Argentina, in Chile, in addition to the exploitation of peat, Sphagnum magellanicum moss is also exploited, an activity that has experienced sustained growth with an expansion in volume and export price. This scenario has led to an increase in its extraction, which is mistakenly called "harvest". The largest extension of peatland in Chile is found in the Magallanes Region, but there are also significant areas.

In Chiloé, Palena and Aysén. A large part of the peatland in Magallanes is in protected areas and national parks, but there are many units that have been intervened outside these areas in Chiloé, which is a large, very populated island, there is a strong intervention on peatland and moss Sphagnum sp. (pomponales), since there is a precarious and unregulated artisanal

collection of fiber performed by women and children (Zegers et al. 2006). The export of Sphagnum magellanicum moss has experienced sustained and ongoing growth, with an expansion of this activity in volume as well as export price, increasing its extraction.

Cutting degrades the wetland and its regeneration is feasible only under appropriate extraction practices that are difficult to control. In Chiloé, the Sphagnum moss takes about 12 years to regenerate, and in Magallanes, about 85 years (Decree published in the Official Journal on February 2, 2018). The Chilean Ministry of Agriculture established measures for the "protection of Sphagnum magellanicum moss", which regulate its cutting, collection and sale of fiber, meaning, its use, having no measurable results to date.

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5. "MÁS AGUA" PROJECT IN THE NORTHERN CHILE ALTIPLANO

The increasing extraction of groundwater, in addition to years of drought in the Andean zone of the Atacama region, have placed the ancestral activities of Andean communities at risk. The "Más Agua" (More Water) project, implemented by the Norte Grande Corporation and financed by Coca Cola Chile through Avina Foundation, has recovered about 250 hectares of high Andean wetlands, termed vegas and bofedales, between 2013 and 2018, in the Altiplano area of the Tarapacá Region in northern Chile. The project, implemented with the Aymara communities, aims to recover these ecosystems using ancestral water management techniques.

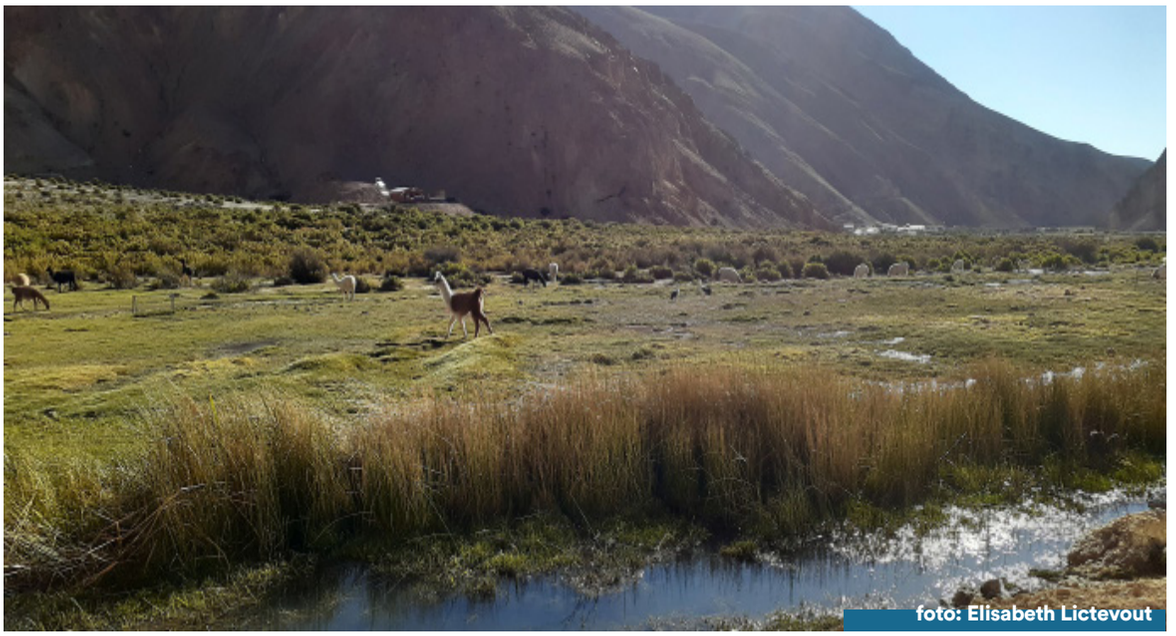

foto: Elisabeth Lictevout

The results for ecosystem services are encouraging: groundwater recharge, regulation of water flow and floods in water basins, maintenance of water quality and availability, greater plant production - and consequently, carbon capture, improvement of llama and alpaca breeding, and the concentration of resources and habitats for wildlife.

Bofedales produce organic soil and act as sponges that are able to retain and store water, which mitigates the impacts of climate fluctuations between dry and humid periods. These ecosystem services are highly valued by the populations since they have a key role in the development of the cultures of native Andean people.

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6.

POLLUTION OF THE MATANZA-RIACHUELO ESTUARY, ARGENTINA

Decades of pollution of the Matanza estuary in Argentina have affected many vulnerable families that live in precarious sanitary conditions, mainly impacting pregnant women and children. The main river course of this watershed, which is 2,300 km2 and 70 km long, is the Matanza stream, an affluent of the La Plata river that has five million residents, most of them vulnerable. The watershed includes part of the city of Buenos Aires and 15 other municipalities.

This area has a high industrial concentration, including the main petrochemical center and 16,700 industries, many of which discharge untreated or poorly treated effluents. The river basin shows very high environmental degradation, since land use has been altered by urbanization, the presence of industries, pig or chicken farms, open landfills and intensive farming activities that contribute fertilizers and pesticides. The lower river course was channeled and is a deposit for voluminous metal waste. This is Argentina's most polluted river and one of the most affected in the world. "Villa inflammable" (flammable villa), located near the estuary's mouth and the petrochemical center, is one of the most critical areas, whose population presents severe health problems due to the environment's toxicity.

Studies of the basin indicate genotoxic risks for the water ecosystem (Biruk et al. 2016) and in the La Plata river, toxics were found in concentrations that impact water organisms (ACUMAR, 2008). Satellite images show the pollution plume is more than 30 kilometers long. In the 1990's, national authorities rated the situation as Argentina's greatest environmental problem; however, a remediation plan was conducted with no results. In 2004, "Villa inflammable" residents and NGO's sued the National State, the Province of Buenos Aires, the city of Buenos Aires and 44 industries. The Supreme Court of Justice (CSJN in Spanish) issued an historic ruling in 2008 establishing responsibility in the matters of prevention and remediation of environmental damage (farn.org. ar/archives/10819).

The Supreme Court of Justice was the primary driver for the substantial advances in building institutionality at the basin level, in an open and participatory process (Ferro, 2016). A synergy was generated between citizen participation and the institutions that mobilized the process for environmental institutionalization. Despite the improvements that were achieved, there is still much to be done to reestablish the complete ecosystem.

The leadership of women from diverse areas of involvement has been relevant; mothers and teachers have witnessed the environmental deterioration. This legal case is known as the "Mendoza case", because it was Beatriz Mendoza, with other "Villa Inflamable" neighbors who initiated the judicial claim that would later lead to Argentina's most transcendental environmental ruling. Women of the River: https://www.youtube.com/watch?v=6IlwE5ZocIw&t=653s (INFOBAE, 27/8/2019).

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7.

IMPLEMENTATION OF ADAPTATION MEASURES IN COASTAL WETLANDS OF TABASCO IN THE GULF OF MEXICO

The "Carmen-Pajonal-Machona Lagoon system" area in Tabasco, Mexico, receives frequent flooding from extreme hydrometeorological events, which leads to regular heavy precipitations in the region, in addition to evidence of the rising sea level. Climate change scenarios indicate that there will be significant variation in the area's rain patterns, which could intensify the current vulnerability of communities.

foto: Adis-Bacab Tenosique, A.C.

The project termed "Adaptation in coastal wetlands in the Gulf of Mexico in view of climate change impacts", implemented pilot measures to reduce the vulnerability of communities settled in the coastal wetlands of three states in the Gulf of Mexico: Veracruz, Tabasco and Quintana Roo. This initiative was carried out in collaboration with the National Commission for Water (CONAGUA in Spanish) and the National Commission for Protected Natural Areas (CONANP) and its main focus was "Ecosystem-based Adaptation" with strong social participation and gender perspective.

Adaptation measures were implemented in three communities of the state of Tabasco: El

Mingo, Las Coloradas, and El Golpe, located in the Carmen-Pajonal-Machona Lagoon System, through an integrated approach which allowed these communities to be better informed and prepared to deal with the adverse effects of climate change.

The measures were designed based on differentiated characterizations of the vulnerability of men and women, and the identification and recognition of communities regarding the fact that men and women relate to natural resources in different ways. The activities centered on the communal reforestation of mangroves and riparian vegetation, using native species of the region, as well as on the rehabilitation of water flow within mangroves. The involvement of women during each step of the process contributed to the rise of new leadership roles within the communities. This turned them into change agents of change, gaining legitimacy and credibility in their new roles due to their commitment, presence and contributions to the activities. In addition, the women of the communities acquired new skills and abilities and are now active promoters of the environmental health of the ecosystem, interested in training other communities.

This project operated with resources from a donation made by the Global Environment Fund, through the World Bank and was technically coordinated by the National Institute of Ecology and Climate Change (INECC in Spanish) and the Mexican Institute of Water Technology (MTE in Spanish), from 2011 to 2016. (https://www.youtube.com/ watch?v=1bxCfOXSmX0&feature=youtu.be)

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ABBREVIATIONS:

Women 2030 Program: GFC – Global Forest Coalition, GWA – Gender and Water Alliance, WEP – Women's Empowerment Principles, APWLD – Asia Pacific Forum on Women, Law and Development and WECF – Women Engage for a Common Future.