

# LATIN AMERICA AND THE CARIBBEAN:

One of the last frontiers for  
life

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This document is the result of the work of a group of Latin American and Caribbean personalities who have theorized and deepened the relationship between development and the environment for several decades. This group, called "Foundational Thinkers of Sustainable Development" is made up of Nicolo Gligo (coordinator), David Barkin, Julio Carrizosa, Hernán Durán, Patricio Fernández Seyler, Gilberto Gallopín, José Leal, Margarita Marino de Botero, César Morales, Fernando Ortiz Monasterio, Daniel Panario, Walter Pengue, Manuel Rodríguez Becerra, Alejandro Rofman, René Saa, Osvaldo Sunkel and José Villamil.

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Deceased members of the group and co-authors of the book  
"The environmental tragedy of Latin America and the Caribbean"

## PRESENTATION

The increase in major environmental problems threatens the destabilization of the planet. Within the global panorama, the region of Latin America and the Caribbean shows its own unique characteristics that motivate a deep reflection, on the one hand, on the threats that loom over it, and, on the other hand, on the possibilities that its territories have, given its enormous stock of natural goods.

The University of Chile, through its Center for Public Policy Analysis of the Faculty of Government, has wanted to stimulate the Latin American and Caribbean debate by supporting the publication "Latin America and the Caribbean: One of the Last Frontiers for Life" prepared by personalities from several countries in the region, called "Foundational Thinkers of Sustainable Development". In 2020, this same group published in the Economic Commission for Latin America and the Caribbean (ECLAC) a much consulted and thoughtful book called "The Environmental Tragedy of Latin America and the Caribbean", a prelude to this publication. I should point out that, of the members of this group, six are, or have been, professors at the University of Chile in the faculties of Government, Agronomic Sciences and Economics and Business.

We believe that this new reflection, with a vision that rescues the natural heritage of the region, will be able to expose both the difficult regional situation and the analysis of the feasibility of the possible ways to reach effective political and instrumental solutions.

**Professor Sergio Galilea O.**

Director of the Center for Public Policy Analysis  
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## SUMMARY



In 2020, the Economic Commission for Latin America and the Caribbean (ECLAC) published the book "The Environmental Tragedy of Latin America and the Caribbean", (<https://www.cepal.org/es/publicaciones/46101-la-tragedia-ambiental-Latin-America-Caribbean>) written by 21 experts from various countries in the region, who shared their experience of five decades of continuous environmental struggle. These authors have been recognized by that institution as "Foundational thinkers of sustainable development".

Aware that the environment continues its tendency to deterioration outlined in this book, and that there are new and complex factors that exacerbate the situation day by day, these authors propose a new updated analysis of the environment and a set of reflections that contribute to finding solutions to get out of the crossroads faced by both the region and the earth as a whole.

This study analyzes the environmental reality of Latin America and the Caribbean in the face of extreme future uncertainty. The first chapter, "The state of the environment in the region", begins by exposing the environmental state of terrestrial space, maritime space and human settlements. In the terrestrial regional space, the analyses of shared macroecosystems such as the Amazon, the La Plata Basin, the Altiplano, Patagonia, the Orinoquia and others stand out, emphasizing that they contain the greatest wealth of biodiversity in the world and a remarkable availability of water resources.

The processes of deterioration of natural resources and natural goods are discussed, especially deforestation, reduction of biodiversity, pollution of fresh water, and loss of soil. In the maritime regional space, the overexploitation and pollution of the oceans and their profound impacts on the health of these subsystems of the planet, including coastal areas, are detailed.

The processes of deterioration of its resources, modification of the behavior of its ecosystems and alterations due to the effects of climate change are made explicit, describing the impact on living resources by fishing, and the effects of eutrophication and chemical pollution. In regional human settlements, they are especially characterized by segregated structures with clear differences between poor and rich, urban marginalization, and shortages that generate environmentally negative spaces.

The second chapter is called "Causes and determinants of the regional environmental crisis" proposing, in the first place, the global framework and its influence. It states that the global environmental crisis is expressed in the fact that a substantial part of the ecological limits of the Earth system have been transgressed, which places humanity at high risk.

Latin America has contributed to this situation, but it is stressed that the greatest responsibility lies with the developed countries. In the perspective of the so-called triad of environmental crisis composed of climate change, biodiversity decline, and chemical pollution, Latin America and the Caribbean has a substantial responsibility for the decline



of biodiversity, as typified by the deforestation of the Amazon rainforest and the deterioration and destruction of other large ecosystems of special ecological value.

The climate crisis, the loss of biodiversity and environmental pollution derived from the use of natural resources beyond the limit of their renewal, which are intensifying, present unpredictable threats, many scientists maintaining that we have entered a new era marked by human action at the planetary level: the Anthropocene. Trends point to the Earth moving towards an increase in environmental impacts and a decrease in human well-being, leading to a deepening of the imbalance between society and nature.

This is the framework that influences the environmental situation of the region. However, various endogenous factors are conditioning the environmental crisis. One of the basic and fundamental concerns is the maintenance of a system of economic growth with modes of production and consumption that are harmful to the environment. A second issue refers to the contradiction in the region between economic growth, which is basically based on the exploitation of its natural resources, and the environment, since, in order to grow economically and reduce poverty, the countries of the region, more or less, overexploit their natural resources with the consequent environmental cost.

Additionally, the text discusses the intensification of major factors, such as war, drug trafficking, efforts to corrupt governments, and problems arising from inadequate international and national financing. All this within the effects and repercussions of climate change, the persistence of poverty, both global and extreme, and the increases in citizen insecurity.

The diagnosis is completed by moving from global to regional, analyzing the social reality of the region, poverty and development indices.

The third chapter is entitled “Latin America and the Caribbean: Exploring Solutions” where it starts by asking the question about the environmental future: whether it can worsen by deepening the crisis, or alternatively, move towards a more positive future based on the particular characteristics of the region, which are based on its natural wealth, its absence of wars between countries, its strategic geographical location, and the cultural level of its population.

The following is an analysis of the United Nations Sustainable Development Goals, as a contribution to the construction of a socially and environmentally fairer world. In the search for ways to make effective environmental management viable, policies and instruments are identified that, within the prevailing development modality, have yielded positive results in environmental management. In particular, emphasis is placed on the priority of ecosystem restoration and adaptation to extreme climate events, given the high vulnerability of these in the countries of the region. It analyzes the need to turn the environment into a political subject par excellence, reduce poverty and the inadequate distribution of income and quality of life, especially total health.

In addition, the need to incorporate effective management is discussed, starting with giving this dimension hierarchy, since in the region there is no vision, with its consequent strategies, that places the environment at the center of decisions, which makes this issue a politically marginal dimension. Another of the main avenues that should be intensified refers

to policies that reinforce environmental management by prioritizing explicit environmental policies and, in particular, implicit ones, derived from the development

In addition, it is important to prioritize science and technology and to modify the models of technological generation, adaptation and diffusion. Another avenue refers to the revaluation of education and ancestral cultures, and finally, the need to insist on regional integration among countries in the region, particularly in macro ecosystems shared by more than two countries.

plans and programs of productive sectors. There is an urgent need to promote reforms and improve the instruments of the financial system.

Finally, the Epilogue highlights the main aspects dealt with in the previous sections and proposes two main possibilities for the future. One, which describes it on the basis of the continuity of the observed and current trends; and the other, which designs a desirable future image if the transformations aimed at its sustainability were to be made. And, in this way, to enhance the contribution of Latin America and the Caribbean to life and well-being at the planetary level.



## FOREWORD

The history of Latin America and the Caribbean is not as long as that of other countries in Europe, Africa, Asia or Oceania, and is very different from that of the United States, although our prehistory is similar to that of this giant. Humans began to arrive on this continent more than seventy thousand years after we left Africa. Our history is also different if you look at it from a political and economic point of view. Today we are a group of 33 republics; some very small, others very large, certainly a very diverse republican group: 33 constitutions, 33 different histories and political institutions. We can point out that we have had no significant wars in the last 100 years. Only limited conflicts reduced to border skirmishes have been solved by diplomatic means. But we cannot fail to mention that many countries in the region have suffered coups d'état, some of them influenced by foreign interventions, which have caused deaths and disappearances and have installed regimes that have violated democracy and human rights.

Our history is different, on the one hand, and similar on the other. When we were colonized by the Europeans, the intelligence of the pre-Columbian agrarian empires was either destroyed or could be rescued by amalgamating it with that which came from Europe. We were made through this history and also through the imprint of the multiple waves of immigrants, especially when we became independent nations. We are the same in the overexploitation and plundering to which we were subjected in colonial times. We are similar in the importation of land systems that shaped the way we organized our territory and land use. We are also similar in the configuration of human settlements, our cities, towns and

villages. Many of our territories are part of shared ecosystems, of common basins, of rivers of international use, of bordering but indivisible mountain ranges. All of this leads us to conclude that our links are intensifying as the threats of change threaten us.

Therefore, it is urgent to reflect on the basis of knowledge, not only from scientific research but also from our common and specific experiences. This analysis has to start from the recognition of the complexity of reality, that is, not only from politics, economics, fiction or magic, but from totality.

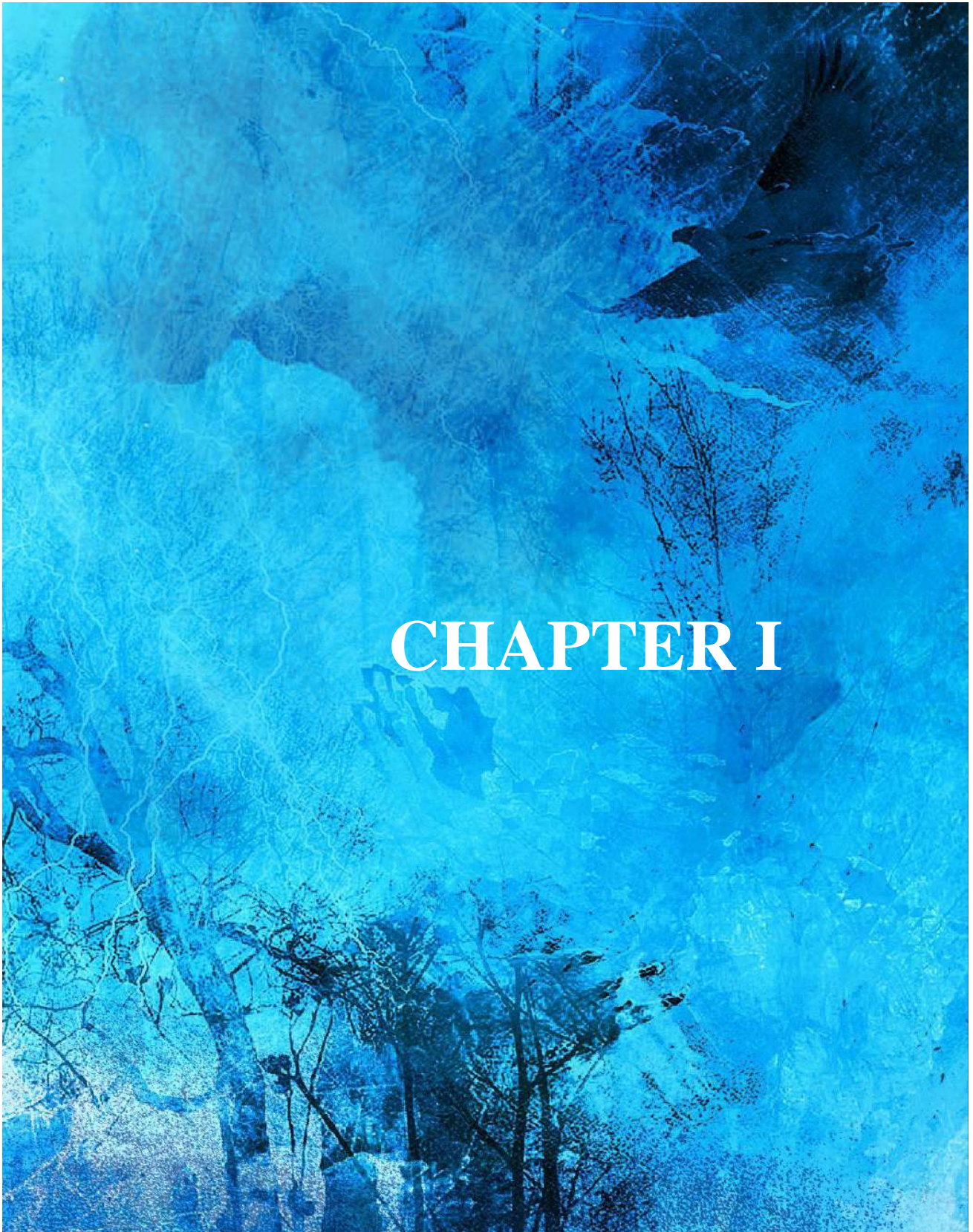
It is difficult to understand these characteristics and interrelationships without considering the magnitude and variability of the growth of the human population in our continent, especially the total increase in the number of people who are considered poor. Today, about 30% of the population is poor, that is, more than 180 million Latin Americans and Caribbeans are desperate and many of them resort to corruption and violence to escape from poverty. The environmental gravity of this situation can be understood when we consider that the physical structures that have to sustain these poor people not only do not change but shrink.

Development theory has told us not to worry, because technology will solve the situation, but this has not happened in the region, not even in the richest countries on the planet. On the contrary, this technology has modified the biotic aspects of this space, and these modifications have had an impact on increasing the production of goods, but this has been at the cost of the loss of species and forests, of water, soil and atmospheric pollution and has led to climate

change. All of this has had an impact on our ecosystems.

The dramatic environmental situation that the region is experiencing, and the common determinants and conditionalities are somehow interrelated, leading us to a deep understanding of

our complex situation. We firmly believe that we must try to change course in order to modify this situation and improve our environment so that it can have an impact on better living conditions.



# CHAPTER I

## CHAPTER I. STATE OF THE ENVIRONMENT IN THE REGION

The environmental tragedy has not changed in the last five years. All the aggregate statistics for the region show that the environmental deterioration resulting from the loss of natural resources continues to worsen. Deforestation continues to grow, despite the slowdown in the rate of destruction that has recently occurred in some countries, such as Brazil, and biodiversity continues to decline.

Soil erosion and soil depletion are constant in the region.

Desertification is advancing. Water availability and glaciers have decreased. Soil, water and air pollution is increasing. Seas are increasingly polluted, and their living resources are affected.

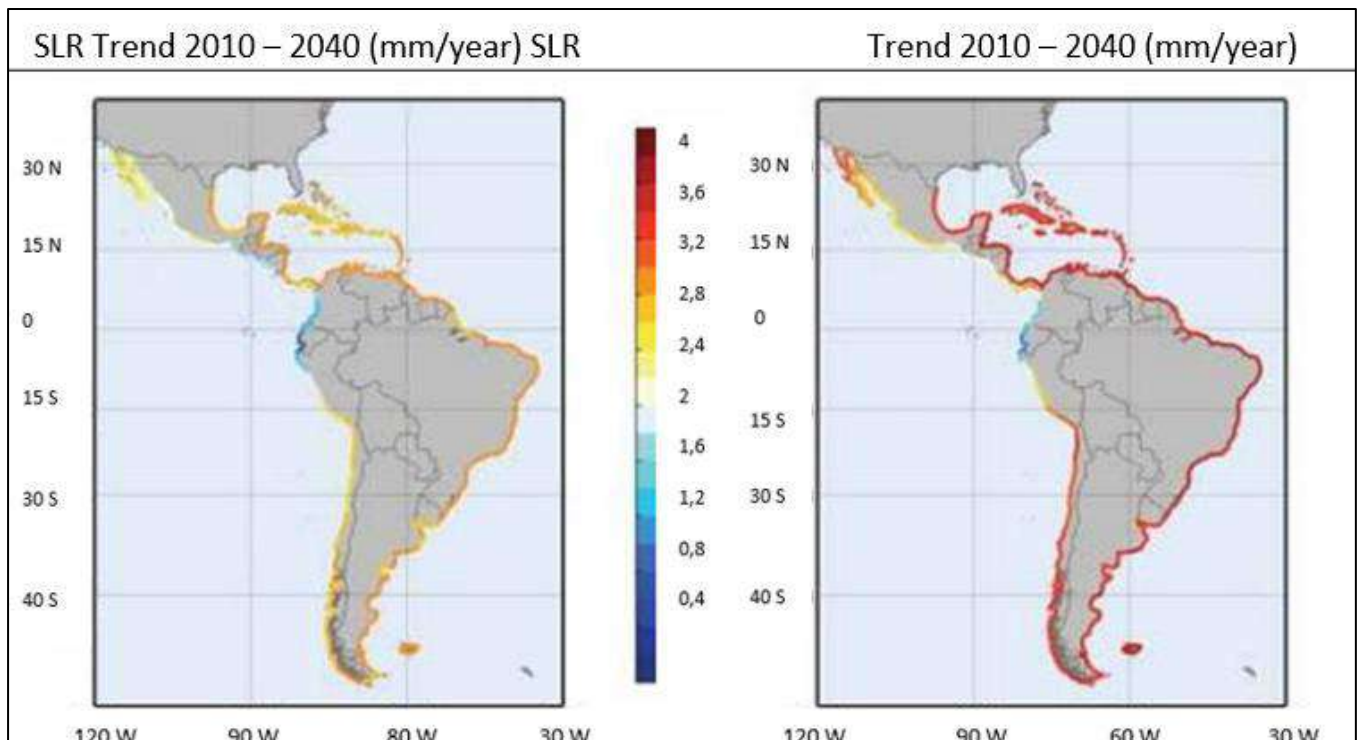
### *A. Terrestrial space*

Latin America and the Caribbean have a particularly rich nature. It has remarkable biodiversity in terms of ecosystems, species and genetics. It has 24% of the world's terrestrial ecoregions and 18% of its marine ecoregions and possesses 1/3 of the world's freshwater resources. It comprises a multitude of ecosystems with climatic conditions ranging from tropical to cold, from humid to arid and semi-arid. Two hemispheres and three oceans. It is also the region from which come important ecosystem services that not only sustain the region, but also provide

substantive support to planetary stability. The world uses them but does not recognize them. The new global environmental agenda, beyond climate change, should recognize this relevance and begin to value the invisible and intangible environmental services that are essential for life.

All the major macro-systems, most of them bi- or multinational, have suffered deterioration that affects their potential. Among them, the Caribbean Sea, seriously threatened by rising sea levels and the intensification, in frequency and intensity, of negative natural climatic events, stand out (see Figure 1).

Figure 1 Average trend of sea level in the periods 2010-40 and 2040-70 (Millimeters per year)



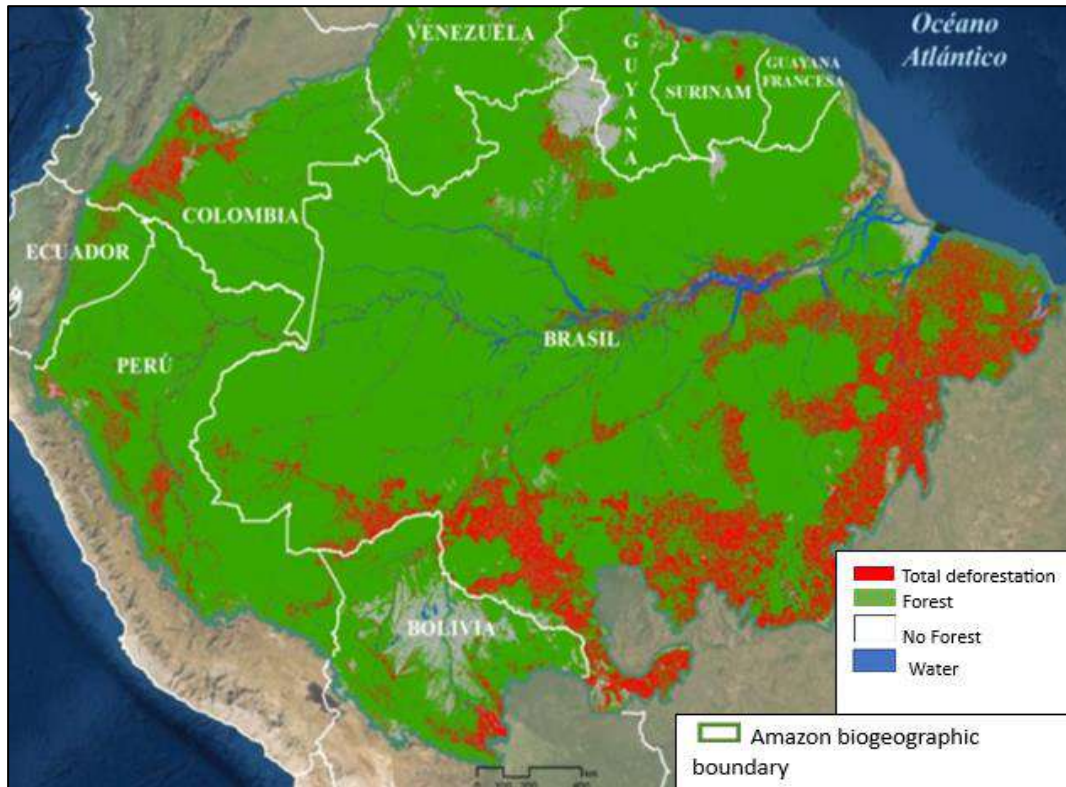
Source: *Effects of Climate Change on the Coast of Latin America and the Caribbean. Dynamics, Trends and Climate Variability. ECLAC 2015, Page 98*

The Amazon, with an extension of 7.05 million km<sup>2</sup>, with its basin extending over 9 countries (including French Guyana), has an average flow of 209,000 m<sup>3</sup>/s (reaching 300,000 m<sup>3</sup>/s during the peak period), which is equivalent to one fifth of the flow of all the rivers in the world. The Napo, Marañón, Putumayo, Japurá, Negro, Ucayali, Tocantins and other rivers belong to this basin. The Amazon has been subjected to constant deforestation and degradation (see Figure 2), the main cause of which is based on the expansion of the agricultural frontier (see graphs 1 and 2). Deforestation amounts to 18% of the total area and 17% of the remaining forest is degraded. But, in addition to these processes, due to climate change, its territories have suffered fires of unprecedented magnitude.

It is important to highlight the contribution of the large Amazonian macro ecosystem to global climate regulation. The Amazon rainforest is one of the planet's climatic turning points, with enormous potential to alter the global climate. Its contribution to both its own and exogenous climatic cycles is remarkable. Convective rainfall, a product of the climatic complexities that occur in the basin, is part of the natural water feedback cycle, and its influence on the pluviometry and water volumes of the Tibetan plateau cycles has recently been investigated. The deterioration of its vegetation cover, the rupture of its water cycles, and the effect of air rivers on its atmosphere, have worsened in recent years, significantly affecting the global climate balance and, directly, the temperate zone of the southern cone, one of the granaries of the world, which, if

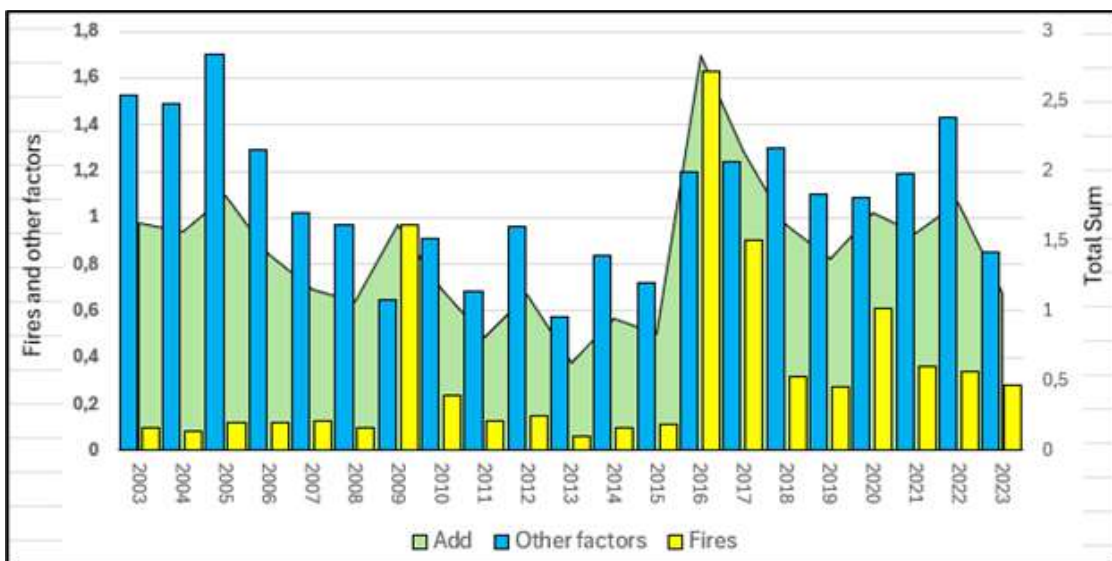
the current trend continues, will become semi-arid territories, diminishing their food production capacity.

Figure 2 Deforestation in the Amazon 2003-2023)



Source: <https://www.maaproject.org/2023/amazonia-2022/>

Graph 1 Deforestation in the Amazon region according to factors



Source: <https://www.stockholmresilience.org/research/planetary-boundaries.html>

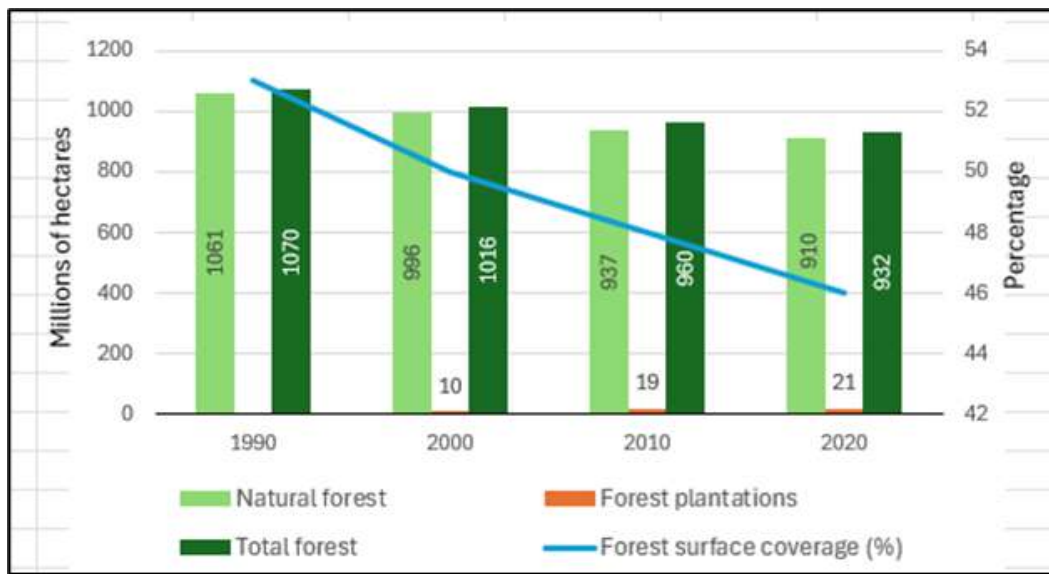
The great basin of the Río de la Plata covers an extensive and varied territory with subsystems



of notable particularities, all of which are subject to deterioration processes. The Paraná, Uruguay, Tigre, Paraguay, Salado, Iguazú, Pilcomayo, Bermejo and other rivers converge in the Río de la Plata. Important urban centers are located in this basin: São Paulo, Brasilia, Campo Grande, Asunción, Corrientes, Rosario. In this basin, the following stand out: The Gran Chaco Gualamba (Argentine Bolivian - Paraguayan), which faces an unprecedented pampeanization process, pushing its agricultural frontier in a totally unsustainable way. In the northern part of the Rio de la Plata basin is the Pantanal, the largest tropical wetland in the world, which extends mainly through the Brazilian state of Mato Grosso do

Sul and surrounding areas; to a lesser extent, through the state of Mato Grosso; through the department of Santa Cruz in Bolivia; and through the department of Alto Paraguay in Paraguay. The Pantanal has been subject to various threats, one of the most serious being the wildfires that destroyed, in the Brazilian part alone, 4.2 million hectares in 2020 and 2 million hectares in 2021. The Humid Pampas, that vast Argentine – Uruguayan - Brazilian territory, which seemed untouched, has been affected by unsustainable processes of industrial intensification of agriculture, livestock and forestry in the Rio de la Plata basin.

*Graph 2 Latin America and the Caribbean: Forest decline (Million hectares)*



Source: Authors' elaboration with data from the loss of forests in Latin America and the Caribbean 1990–2020: statistical evidence.

The Peruvian - Bolivian – Chilean - Argentinean Puna has worsened its soil erosion processes. The Darien Gap is undergoing deforestation, as are the tropical forests of Central America and southern Mexico. The Peruvian-Chilean desert, like the Mexican deserts, and the Polígono das Secas in Brazil, similar to the semi-desert areas of central and western Argentina and the Brazilian Cerrado (hyperthermic savannah), have continued to

suffer deterioration due to their fragility and inappropriate uses. The transverse temperate valleys of the southern cone have been affected by inappropriate artificialization processes.

The Chilean-Argentinean Patagonia, with an area of 1.9 million km<sup>2</sup>, on the eastern side has suffered serious erosion processes due to overgrazing, depletion of its grasslands,

deforestation and desertification processes. On the western side, it has been affected by deforestation and a decrease in the size of glaciers.

The Orinoco Basin has an area of 991,587 km<sup>2</sup>. The plains are the dominant landscape, with forest ecosystems in transition with the Amazon rainforest and in the mountain range where the Orinoco River and most of its tributaries originate, the Orinoco being one of the most important rivers in the world in terms of length and flow (2,140 km and slightly more than 30,000 m<sup>3</sup>/s). In addition to the impacts produced by grazing and agricultural crops on soils and biodiversity, the process of draining its wetlands to open up land for agricultural activities has had negative effects on the water cycle in this region, which is particularly rich in water resources.

The weight of deforestation in the Amazon, mentioned above, has been crucial to the fact that

the region's forests have decreased by 138 million hectares in the last 30 years (source Graph 2). The rate of destruction is being maintained, although it is important to note the decrease in recent years in Brazil. The loss of tropical primary forest in 2022 was 4.1 million hectares, 8% more than in 2021 (*Global Forest Watch*, 2024). It should be noted that the Latin American and Caribbean Forest has twice the biomass of the world average (178 ton/ha).

It is important to reiterate the richness of the region, both in number of species and populations, but to emphasize that it continues to decline. The region between 1970 and 2016 presented the greatest decrease in the world, 94%, in the index of abundance of bird, mammal, reptile, amphibian and fish populations (see Table 1). The high genetic biodiversity of the region would be in decline, similar to the biodiversity of species, but the knowledge available on this subject is very limited.

*Table 1 Latin America & the Caribbean: Number of threatened species by main taxonomic group.*

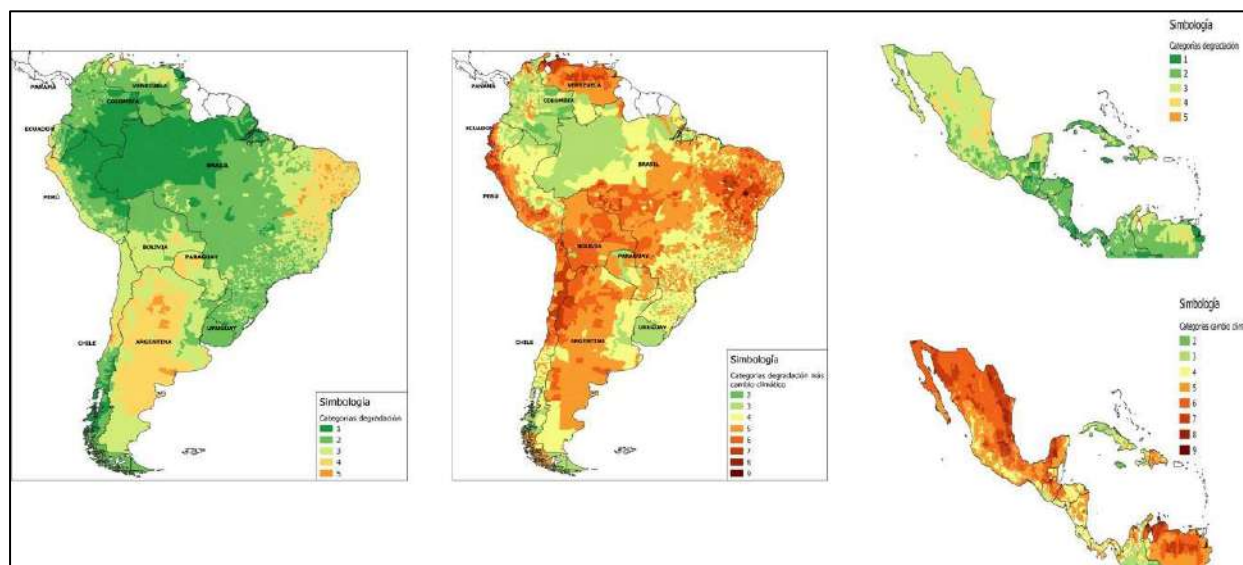
Taxonomic group	South America	Mesoamerica	Caribbean	Total
<b>Mammals</b>	429	178	81	688
<b>Birds</b>	633	177	144	954
<b>Reptiles</b>	402	266	400	1,068
<b>Amphibians</b>	1,194	553	182	1,929
<b>Fish</b>	1,542	974	1,396	3,912
<b>Molluscs</b>	83	20	9	112
<b>Other invertebrates</b>	302	392	779	1,473
<b>Vegetable</b>	6,821	3,416	1,256	11,493
<b>Fungi</b>	137	19	2	158
<b>Eukaryotes</b>	6	0	0	6
<b>Total</b>	11,549	5,995	4,249	21,793

Source :Own calculation base on <https://www.iucnredlist.org/es/statistics>

Latin American and Caribbean soils, by extension and variety, constitute a fundamental, but threatened, reservoir for world food production. It should be noted that the proportion of degraded land in relation to the global surface was 22.9% in 2019. A recent study on Hotspots of desertification and land degradation, carried out

at the level of approximately 18,000 municipalities in Latin America and the Caribbean (*Morales C., Cherlet, M. 2023*), shows that 16.6% (about 3,383,181 km<sup>2</sup>, of the region's total surface), is seriously degraded and a little more than 101 million people live in them (about 15% of the total population). Considering the effects of climate change and projections of precipitation and temperatures to the year 2050, the situation would worsen even more (see Figure 3).

Figure 3 Latin America and the Caribbean: Desertification and land degradation. 2023 and projections to 2050



Source: *The Hotspots of desertification and land degradation in Latin America and the Caribbean* Morales C. Cherlet M. (2023).

Agricultural areas, in addition to the pollution received from urban centers and sometimes from mining, agricultural activity, especially due to the indiscriminate use of pesticides and fertilizers, has evident repercussions on soil, air and water pollution. Eutrophication processes affect water courses and bodies of water.

Agricultural growth has had high environmental costs, the main causes being the change in land use and the use of soil beyond their capacity. The expansion of the agricultural frontier has had high costs, particularly when it is done to the detriment of the tropical forest. Agricultural intensification has often resulted in the overuse of technological inputs, with the consequent environmental impacts. Monocultures have been detrimental to soil conservation. In addition, recently, production processes based on transgenic crops with a high load of agrochemicals (such as glyphosate) threaten to increase contamination levels.

The transformation of pristine ecosystems into agricultural areas has an undisputed environmental cost. This is what has happened in the previously mentioned expansion of the agricultural frontier, especially in tropical and subtropical areas. Expansion for livestock use, slash and burn systems, have had an extraordinarily high environmental impact with clear consequences on climate change.

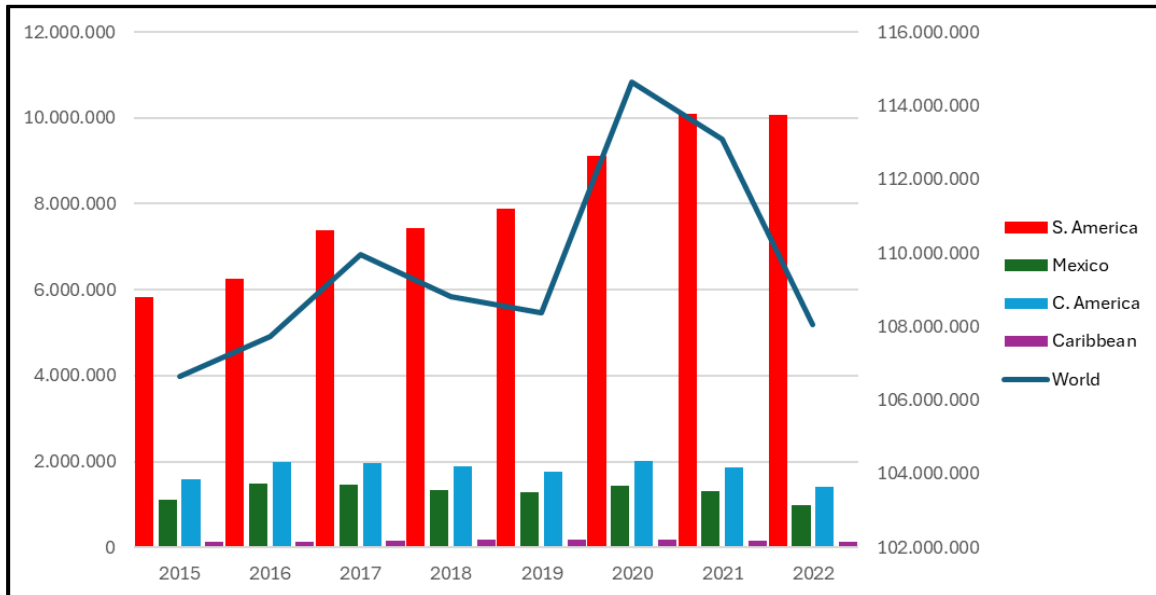
In the mountainous areas of the region, especially in North and Central America and in the Andes, soil is overused, generating erosion and nutrient depletion. Very few areas of pre-Columbian terraces remain, with their irrigation systems, which, based on the change of soil types, made soil conservation possible. The destruction of the terraces has been intensified by the introduction of domestic livestock, especially cattle.

On the other hand, agricultural intensification in traditional areas involves the use of high-productivity technological packages based on energy, fertilizers, pesticides, hormones, and

phyto-regulators, and improved genetic material (see graph 3). The abuse of pesticides is a frequent cultural practice in the region that produces

notorious contamination affecting biodiversity conservation.

**Graph 3 Latin America and the Caribbean: Use of nitrogen fertilizers. Average 2016 - 2020. (Kg/ha cultivated)**



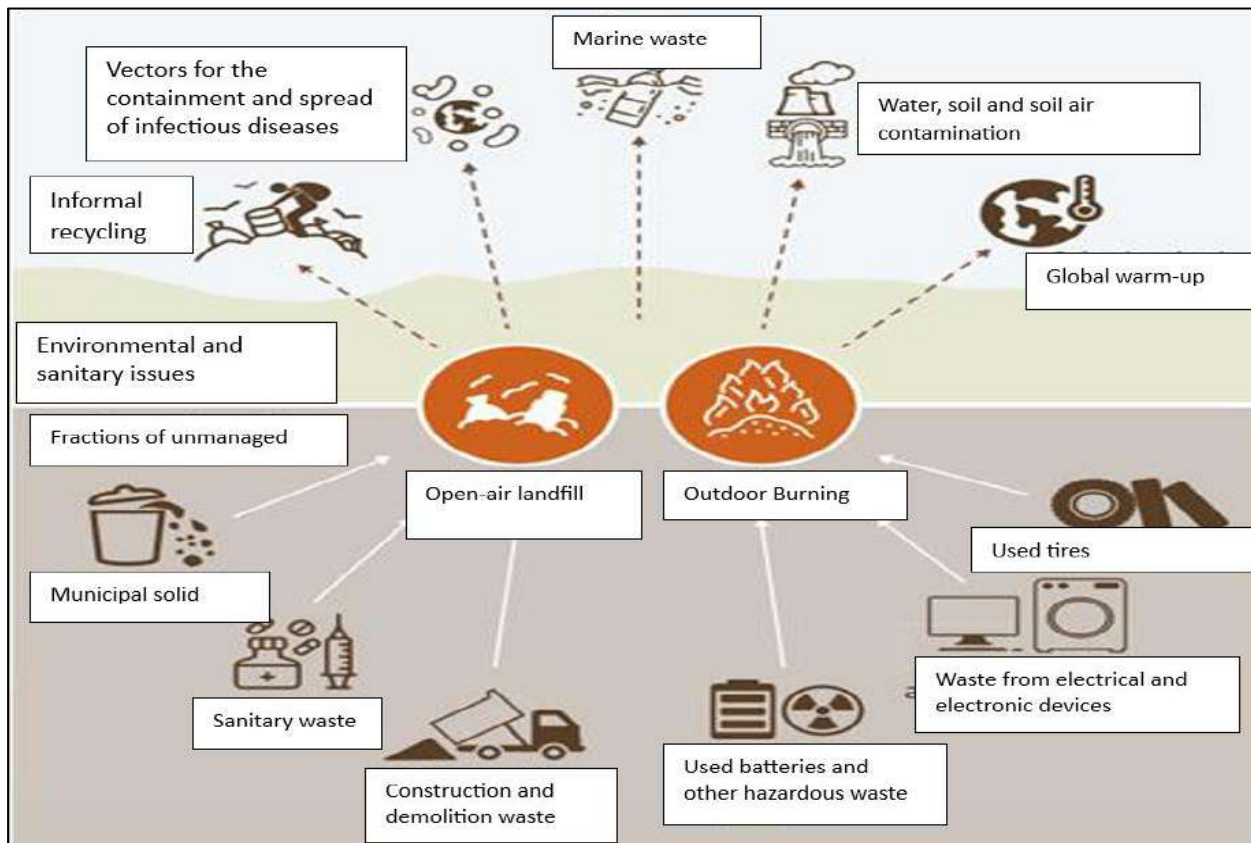
Source: Authors' elaboration with data from FAO. [www.Faostat.org](http://www.Faostat.org)

The occupation of new areas for human settlements takes on special relevance due to the current and growing effects of climate change impacts, especially in coastal and inland cities. The Caribbean faces unprecedented problems and serious risks of marine flooding of its islands and cities.

In 2016, the region generated 231 million tons of municipal solid waste, of which only 55% was properly managed and 4.5% was recycled. Three quarters of wastewater returns to rivers and other water sources, some of which is subsequently used for irrigation. Wastewater can contain a wide

range of contaminants such as pathogenic microorganisms and organic pollutants and elements such as chromium, copper, mercury, and zinc, which can affect public health and the environment. In many countries of the region, sewage collection and distribution systems have been poorly maintained and have begun to leak, causing soil and groundwater contamination (see Figure 4). In addition, the mixing of domestic waste and hazardous industrial waste was a common practice in the region. Hazardous industrial waste was discharged into open dumps without leachate management or containment, and without prior treatment, putting the environment and human health at risk.

Figure 4 Sources of solid waste and their impact on the environment



Source. *Global assessment of soil pollution. FAO and UNEP, 2022*

### B. The maritime space

The present and future of Latin America's seas must be understood in a global context. The overexploitation and pollution of the oceans, a product of human activity, have had profound impacts on the health of these subsystems of the planet, including coastal zones, which in turn have been modified by the urbanization of large areas. Overexploitation and pollution accelerated after World War II, to which have been added the impacts of climate change on the oceans. The impact of the fishing industry on the environment has historically been very significant.

Mesoamerica, the Caribbean and South America are the 3 maritime sub-regions of Latin America

and the Caribbean, which have a marine area of 16 million square kilometers and more than 70,000 km of coastline, for 22 countries in the region, the ocean represents 60% or more of their sovereign territories (*World Bank, 2015; UNEP, 2016; ECLAC, 2019a*). Latin America and the Caribbean are home to 47 of the 258 marine ecoregions of the world proposed by Spalding et al. [*Spalding, M. D. et al. (2007), "Marine ecoregions of the world: a bioregionalization of coastal and shelf areas", BioScience, vol. 57, No. 7*] Of the countries in the region, 23 have 75% more marine territory than terrestrial. Twenty-seven percent of the region's population lives in coastal areas. Economically, it is important for its

contribution to the subsistence of the population's diet and for tourism, especially in the Caribbean countries.

The region's sea is subject to processes of deterioration of its living resources, alteration of the behavior of its ecosystems and alterations due to the effects of climate change. The region's fishery resources are very high, but are affected by the alterations of ecosystems, and the breakdown of the trophic webs derived from overfishing and in some cases, the introduction of invasive exotic species.

According to *ECLAC in 2017*, less than 50% of the stocks assessed in the Southwest Atlantic and Southeast Pacific were within sustainable levels, while in the Western Central Atlantic and Eastern Central Pacific region it was around 80%. On the other hand, the fish catch, which in 1994 was 24,689,820.7 tons in the region (without whales, seals and other aquatic mammals) fell to 18,098,481.7 tons in 2021, which could be due basically to the decrease in biomass due to overfishing. (See Graph 4).

Both chemical pollution and eutrophication generate hypoxia processes that kill fish and alter ecosystems. In Latin America and the Caribbean there are 19 hypoxic zones and 31 eutrophication zones (*World Resources Institute, 2013*), with the Gulf of Mexico being the area where the largest zones are located, not only in the region but in the world. In 2020 it covered 20,121 km<sup>2</sup> (*Turner and Rabalais, 2020*). (See Figure 5)

Acidification, which is the decrease in seawater pH in the region, as in the rest of the world, is caused by the absorption of excess CO<sub>2</sub> by the oceans causing its absorption by the sea, which alters the chemistry of carbonates in the oceans as

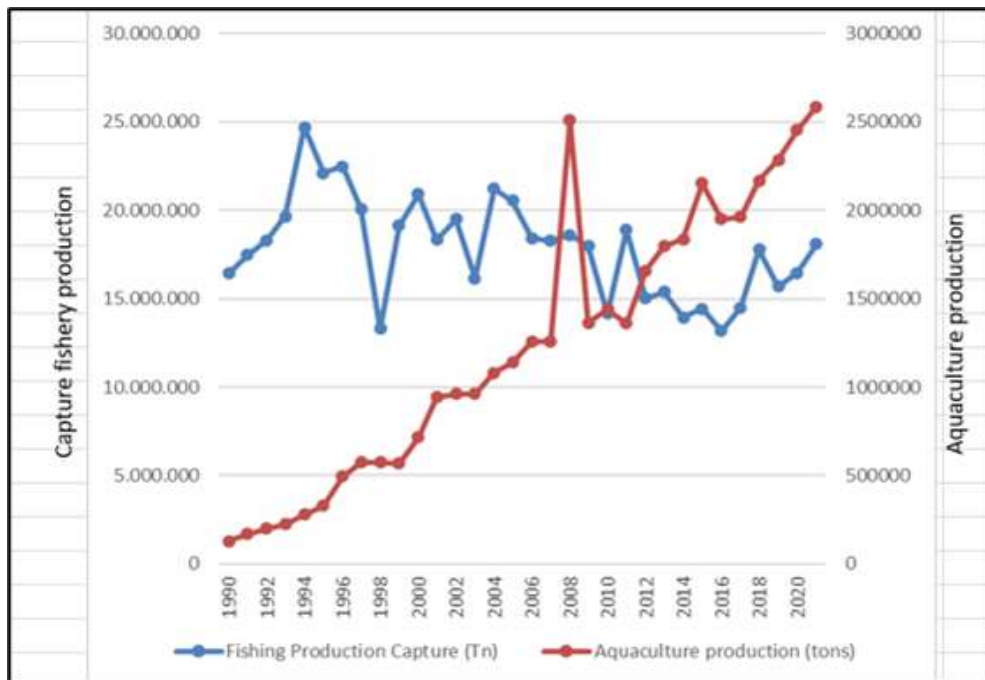
a consequence. Several estimates indicate that the region is reaching the minimum limit of aragonite, a critical mineral for coral reef formation.

The Mesoamerican coral reef is the second largest in the world; 37% of it is deteriorated due to pollution, harmful fishing and tourism practices and, since the end of the last century, as a result of the impacts of climate changes that include branching as a result of abnormal temperature increases in the Caribbean Sea (1998, 2010, 2015/16, 2023/24), which in some proportion leads to its death. Moreover, the addition intensifies the strength of the hurricanes and, therefore, their erosion (*Perry et al., 2013; McField, 2017*).

The lowest surface pH values in the world are recorded in the Eastern Tropical Pacific, which encompasses the coasts of Mexico in the Pacific Ocean and Central America up to the coastal areas of Equator (*Fiedler and Lavín, 2017*).

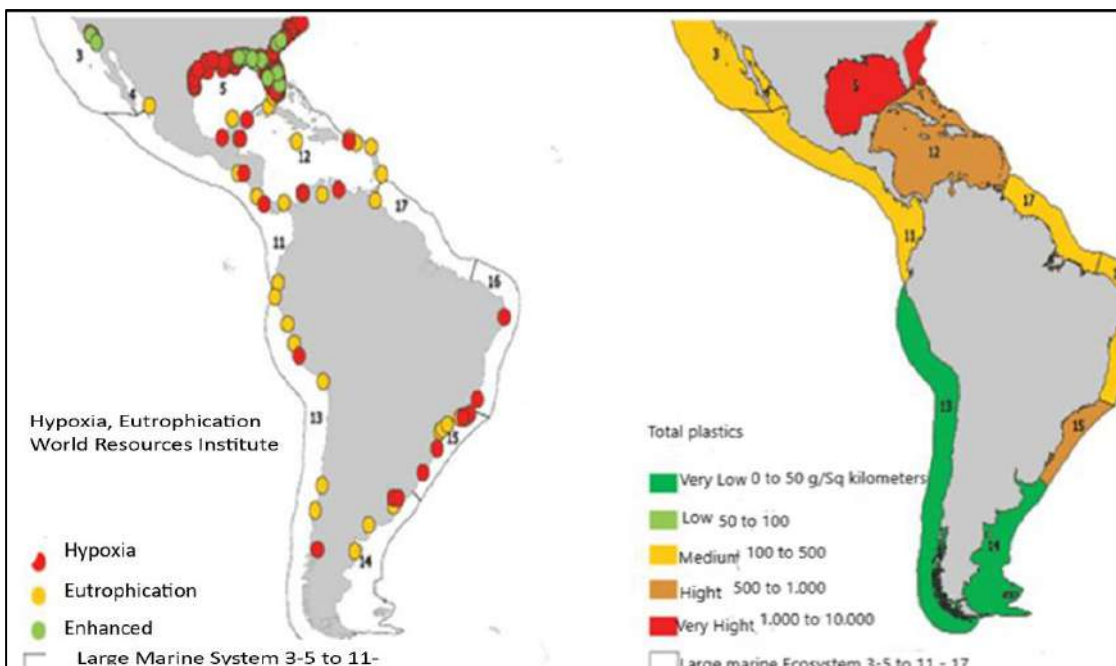
The Caribbean islands are naturally vulnerable to hurricanes. According to the International Disaster Database between 1950 and 2014 hurricanes caused 238 natural disasters in the Caribbean. Of those storms, the database only has recorded damage caused by 148 hurricanes, which amounted to around USD 52 billion (in constant 2010 USD). This equates to an average damage of 1.6% of GDP per year on each island. It is obvious that climate change is increasing the intensity of hurricanes. For example, the damage caused by Hurricane Fiona on the island of Puerto Rico on September 18, 2022, is estimated at around US\$5 billion.

Graph 4 Latin America and Caribbean: Evolution of fish catch and aquaculture production.



Source: Own calculation based on <https://www.fao.org/fishery/en>

Figure 5 Latin America and the Caribbean: marine pollution, hypoxia and eutrophication zones, 2020, and plastics, 2016



Source: M. Tambutti and J.J. Gómez (Coordinators). "Panorama of the oceans, seas and marine resources in Latin America and the Caribbean: conservation, sustainable development and mitigation of climate change". Project Documents (LC/TS2020/167/Rev.1) Santiago. Economic Commission for Latin America and the Caribbean.

*Note:* The numbers on the map correspond to large marine ecosystems: 3 – California Current, 4 – Gulf of California, 5 – Gulf of Mexico, 11 – Central American Pacific Coastal Shelf, 12 – Caribbean Sea, 13 – California Humboldt Current, 14 – Patagonia Shelf, 15 – Brazil Southern Shelf, 16 – Brazil East Shelf, 17 – Brazil North Shelf



### C. Human settlements

The growth of cities in Latin America and the Caribbean made human settlements the fundamental center of each country's development.

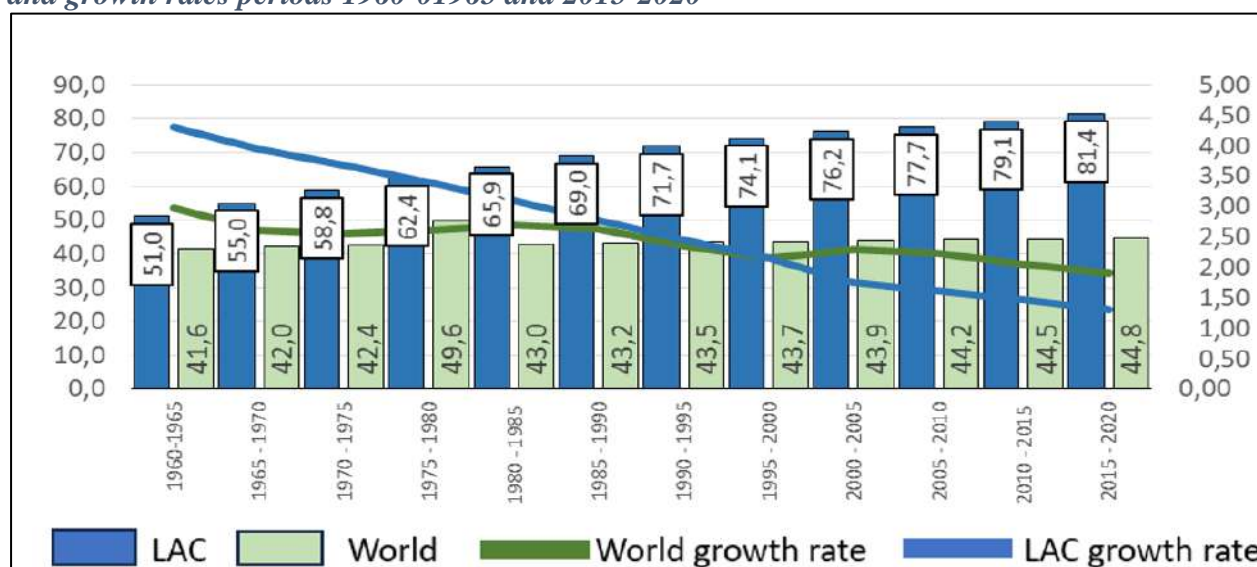
Conquest and colonization generated a new picture, different from that of Asia and Europe. The “development” became in the hands of the colonizers generating a functional urbanism to the new needs of the continent: to be exporters of valuable materials, mining and agriculture. The important cities were built for this purpose, and it is significant that they had imposing temples to support through religions the exporting action and the organs of power of the monarchies that dominated from Europe.

Over the last few decades, the patterns and dynamics of urban growth in Latin America and the Caribbean have changed substantially. According to projections by the *Latin American*

*Demographic Center, CELADE, ECLAC, by 2024, the region's urban population will reach 82.4% of the total population, although urban population growth rates have been declining since 1985 onwards, after having experienced strong growth in previous periods. It is from 1995 onwards that the region's urban population growth rate is lower than that recorded worldwide (See Graph 5).*

These phenomena were initially the result of strong rural-urban migration, which gave rise to precarious human settlements occupying land of lesser value, generally on steep slopes, riverbanks, near landfills. In short, on land of little or no habitability. More recently, in addition to rural-urban migration, there has been a growing migratory flow between countries in the region.

**Graph 5 World and Latin America and the Caribbean: Percentage of urban population and growth rates periods 1960-01965 and 2015-2020**



Source: Authors' elaboration with data from the United Nations (UNFPA and ECLAC) and the World Bank

As a result of the above, cities were built in a segregated manner with sectors, the least, with notable endowments of high-quality goods and services similar to the lifestyles of developed countries, creating “archipelagos of modernization” made up of “islands” in an ocean of underdevelopment. In front of these archipelagos, lower income areas have been built, many of them slums, and others clearly marginalized.

In Latin America and the Caribbean, communities, civil society organizations and private urban enterprises, as well as local governments, have been responsible for the construction of our cities, which are characterized by, on average: inadequate disposal of solid and liquid waste of all types (from domestic to industrial); contamination of air, soil and surface water; haphazard urbanization including sprawl and low-density urbanization and settlement in risky areas; urbanization patterns that involve long commutes to work from distant suburbs; fossil fuel-based, overcrowded transportation systems; contaminated soil and groundwater; and unwarranted destruction of valuable nature, landscapes and soils.

Urban growth often leads to infrastructure expansion and increased demand for natural resources. Urban areas tend to be warmer than rural areas due to the concentration of buildings, roads and other infrastructure that absorb and retain heat. This is known as the heat island effect, which can negatively affect the local climate and the health of residents. Urban sprawl can fragment natural habitats, making it difficult for many species of flora and fauna to move and survive.

From the environmental point of view, cities constitute living urban systems whose physiology is expressed with greater or lesser

force in all the countries of the region, in poor pathological areas, where the convergence of energy, information and materials does not respond to efficiently organized patterns, and where the forms of evacuation of materials and energy are typical of an environment with high disorder and entropy.

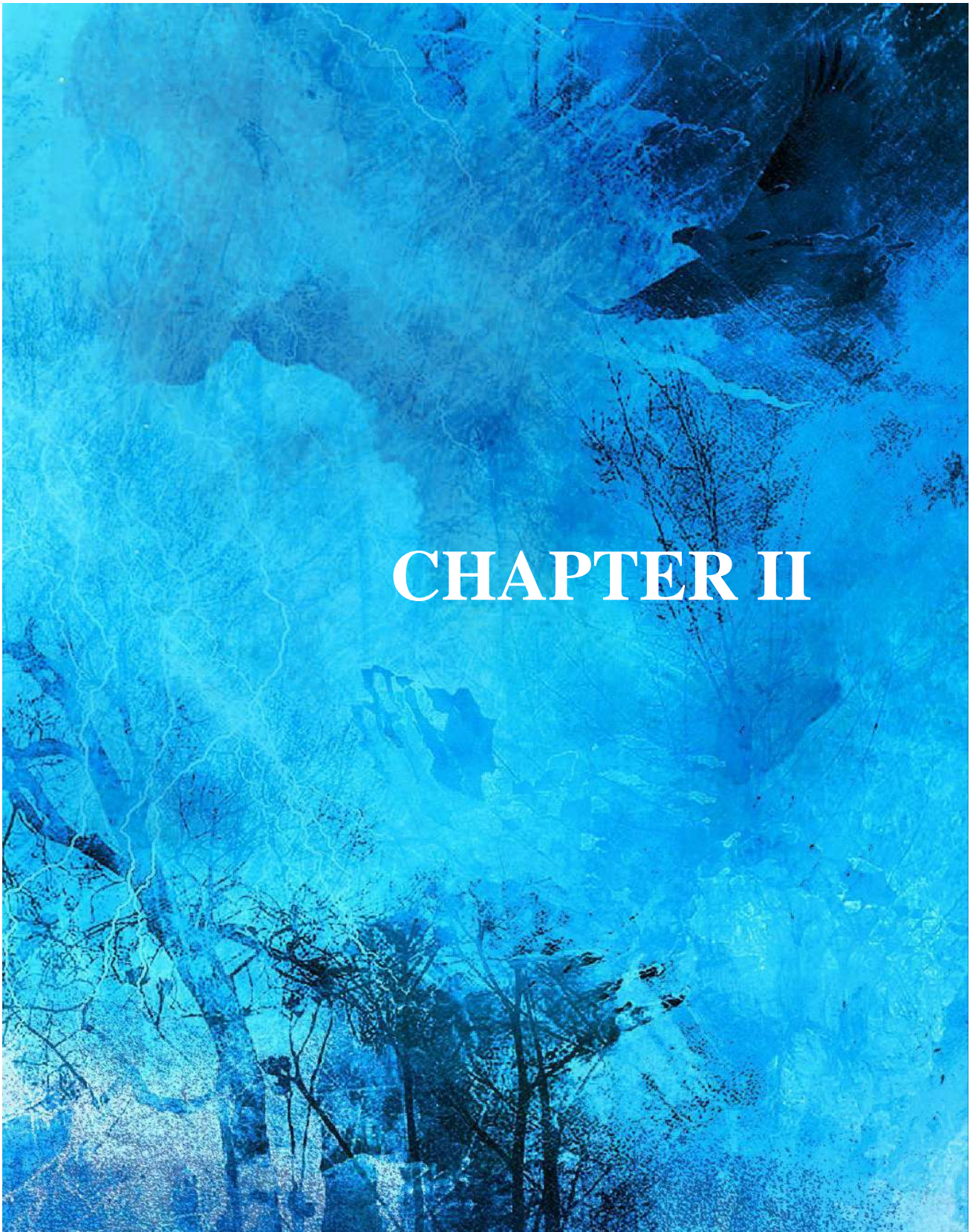
The region's cities have generally been built and expanded into very fertile agricultural areas or in coastal areas with natural harbor conditions. The natural ecological supply, especially in the former, has been high, but generally poorly utilized by privileges for quick profits over historical and environmental considerations. An example of the latter is the destruction, for the benefit of urban expansion, of wetlands, very important ecosystems for the preservation of biodiversity and for carbon capture and retention. Moreover, many pre-Columbian settlements were razed and replaced by cities, without considering how these peoples were incorporated into nature, taking advantage of its attributes.

The main problems of the urban environment have basically been generated by inadequate territorial and urban environmental management. The environmental situation is basic to define the quality of life of poor and marginalized populations. The growing industrial development, especially in the metropolises, is also fundamental in the configuration of cities.

A major environmental problem is generated by urban sprawl, which in most of the region's cities is mainly influenced by land speculation. New forms of gentrification are driven by the variation in land rents and the process of creating gated suburban neighborhoods for those who abandon the varied neighborhoods of the affluent class in their historical locations. Thus, land outside the agglomeration of

agricultural use is transformed into land devoted to gated or semi-gated neighborhoods of high rental value in the new use. This is especially important in Latin America and the Caribbean, as the concentration of land and

wealth puts pressure on the design of certain public policies not to curb land speculation, which is the main driver of inorganic urban sprawl.



## CHAPTER II. CAUSES AND DETERMINANTS OF THE REGIONAL ENVIRONMENTAL CRISIS

### *A. The global framework and its influence*

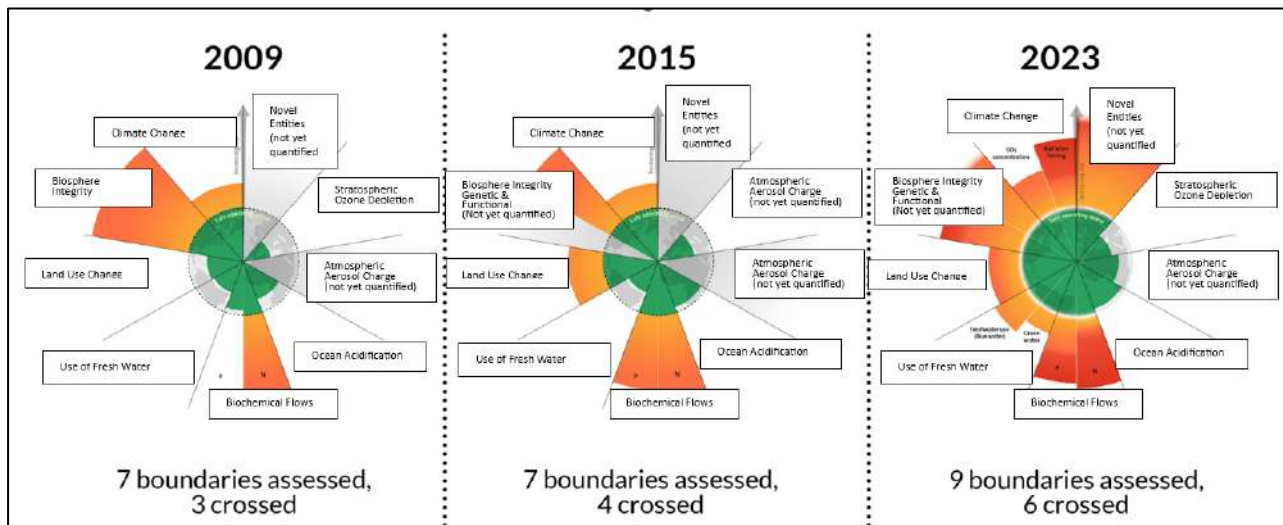
The global environmental crisis is fundamentally expressed in the fact that a substantial part of the ecological limits of the Earth system have been transgressed, which places humanity, and in general the fabric of life, at high risk. Latin America has contributed to this situation, but it is emphasized that the major responsibility lies with the developed countries. In the perspective of the so-called triad of the environmental crisis composed of climate change, the decline of biodiversity and chemical pollution -three phenomena that have the highest hierarchy among global environmental problems- Latin America has a substantial responsibility in the decline of biodiversity, as typified by the deforestation of the Amazon rainforest and the deterioration and destruction of other large ecosystems of special ecological value referred to in previous paragraphs.

In 1972, the Club of Rome, in its report *The Limits to Growth*, prepared by a group of researchers from the Massachusetts Institute of Technology (MIT) who used a systemic approach with a mathematical model that made explicit several of the multiple links between human's activities and environmental elements such as land suitable for cultivation, non-renewable natural resources, and pollution, concluded that,

if the trends of the time (similar to those of today) continued, a global catastrophe would be inevitable by the middle of the eleventh century. In 1975, the Bariloche Foundation published the book "Catastrophe or New Society" where, also based on a mathematical model of world simulation, it determined that, if the natural, economic and human resources existing in each major region (Latin America, Asia, Africa, and Developed Countries) were used to meet basic human needs, and provided that inequalities within each region were drastically reduced, all could meet the needs of their populations within a reasonable timeframe, while preserving environmental quality.

In 2009, nearly forty years after the *Limits to Growth* report was published, Johan Rockström and his collaborators at the Stockholm Resilience Center elaborated the concept of planetary boundaries: "The concept presents a set of nine planetary boundaries within which humanity can continue to develop and prosper for generations to come. At present, six of the nine boundaries have been transgressed and only three are operating in a safe zone (see Figure 6). This vision, widely accepted by the scientific community, characterizes today the global environmental crisis affecting each and every country in the world.

Figure 6 Evolution of Planetary Boundaries



Source: The 2023 update to the Planetary boundaries. Licensed under CC BY-NC-ND 3.0. Credit: "Azote for Stockholm Resilience Centre, based on analysis in Richardson et al. <https://www.stockholmresilience.org/4.1fe8f33123572b59ab80007039.html>

According to this study, the nine planetary boundaries are: climate change, biosphere integrity, ocean acidification, stratospheric ozone depletion, nitrogen and phosphorus fluxes, freshwater change, soil system change, atmospheric aerosol loading, and new entities (chemicals). It is noted that transgressing one or more of the planetary boundaries can be deleterious or even catastrophic because of the risk of crossing thresholds that will trigger abrupt and nonlinear environmental changes on a scale between continental and planetary systems. The

proposed planetary boundary is not placed at the position of the biophysical threshold but rather upstream of it, i.e., well before reaching the threshold. This intermediate area between the boundary and the threshold is not only important to consider the uncertainty about the exact position of the threshold with respect to the control variable, but also gives society sufficient time to react to early warning signs that it may be approaching a threshold and a consequent abrupt or risky change.

Of the nine identified thresholds, three are operating in the safe zone: ocean acidification, stratospheric ozone depletion, and atmospheric aerosol loading. Three of the thresholds have been exceeded and are operating in a zone of increasing risk: climate change, freshwater change, and land use. And in three cases the threshold has been exceeded, implying that we are still operating in a high-risk zone: the integrity of the biosphere, nitrogen and phosphorus fluxes,

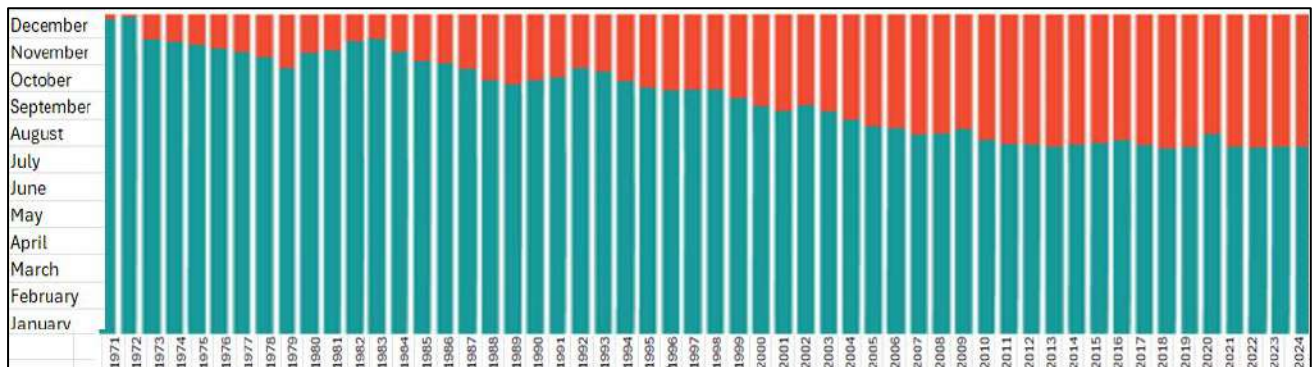
and new entities (chemicals). For Latin America and the Caribbean, three processes appear as relevant examples: the aforementioned deforestation in the region, especially the massive deforestation in the Amazon, which generates a substantial emission of greenhouse gases, thus contributing to global warming, which in turn is one of the threats to the extinction of a diversity of flora and wildlife species.

The colossal death of coral reefs, especially in the Caribbean Sea, as a result of the increase of more than 2°C in the temperature of the sea where they live, is another illustration of the profound interrelationships between climate change and the integrity of the biosphere. In turn, the acidification of the sea occurs due to an excess of CO<sub>2</sub> in the atmosphere in relation to that which can capture through photosynthesis, which results in its dissolution in marine waters. This phenomenon generates a continuous decline in the pH of these waters.

In addition to these limits, the deterioration of the planet's ecological footprint, whose indicator

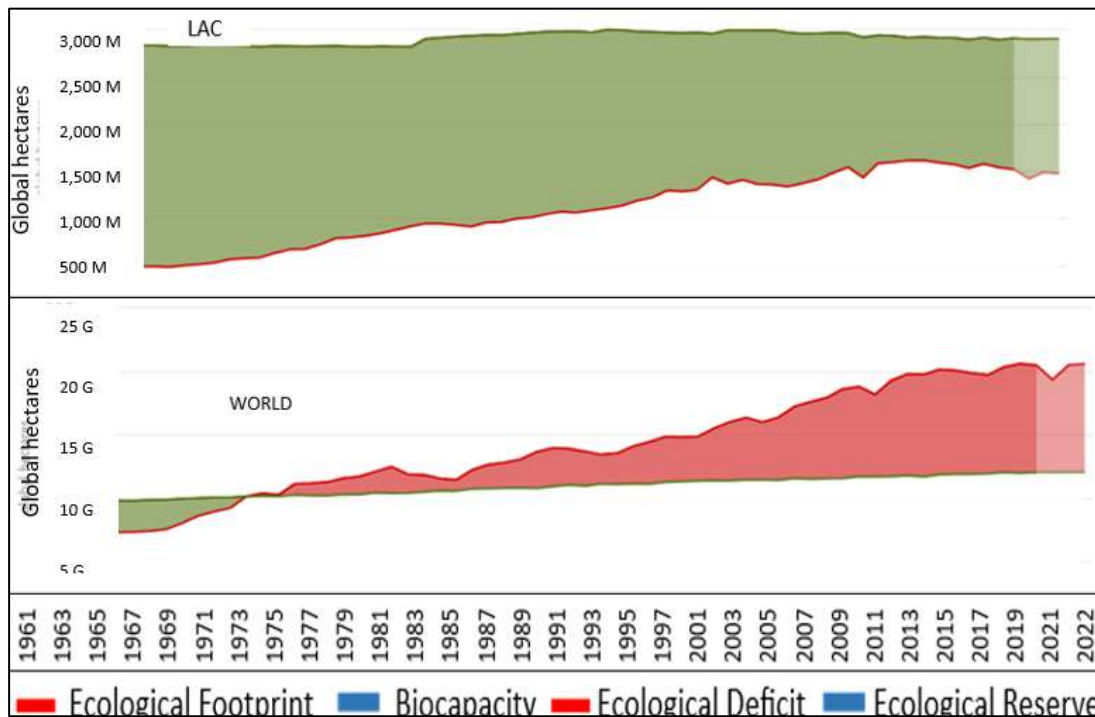
gives the sustainability measured in the capacity of reproduction over the deterioration and consumption of nature's goods, especially natural resources, is fully confirmed. There is a marked differentiation between the Latin American and Caribbean region with respect to the world situation (see Graph 6 and 7). Although the ecological footprint is increasing in the region, there is still an ecological reserve, a situation that does not occur at the world level, given that since 1972 there has been no capacity for recovery. However, it should be noted that the situation in the region is highly variable, as there are countries that have exceeded their recovery capacity for several years.

**Graph 6 World: Days in which the ecological capacity of the land has been exceeded. 1970- 2024 (in red)**



Source: [https://overshoot.footprintnetwork.org/?\\_ga=2.109937029.1884524750.1724691869-1722468895.1724691869](https://overshoot.footprintnetwork.org/?_ga=2.109937029.1884524750.1724691869-1722468895.1724691869)

Graph 7 World and Latin America and the Caribbean. Ecological Footprint, Biocapacity, Ecological Deficit and Ecological Reserve



Source: Prepared by the authors with information from:

<https://data.footprintnetwork.org/#/compareCountries?type=BCtot&cn=2003,5001,2004,2000,2001,2002,1002,2001,138,231&yr=2022>

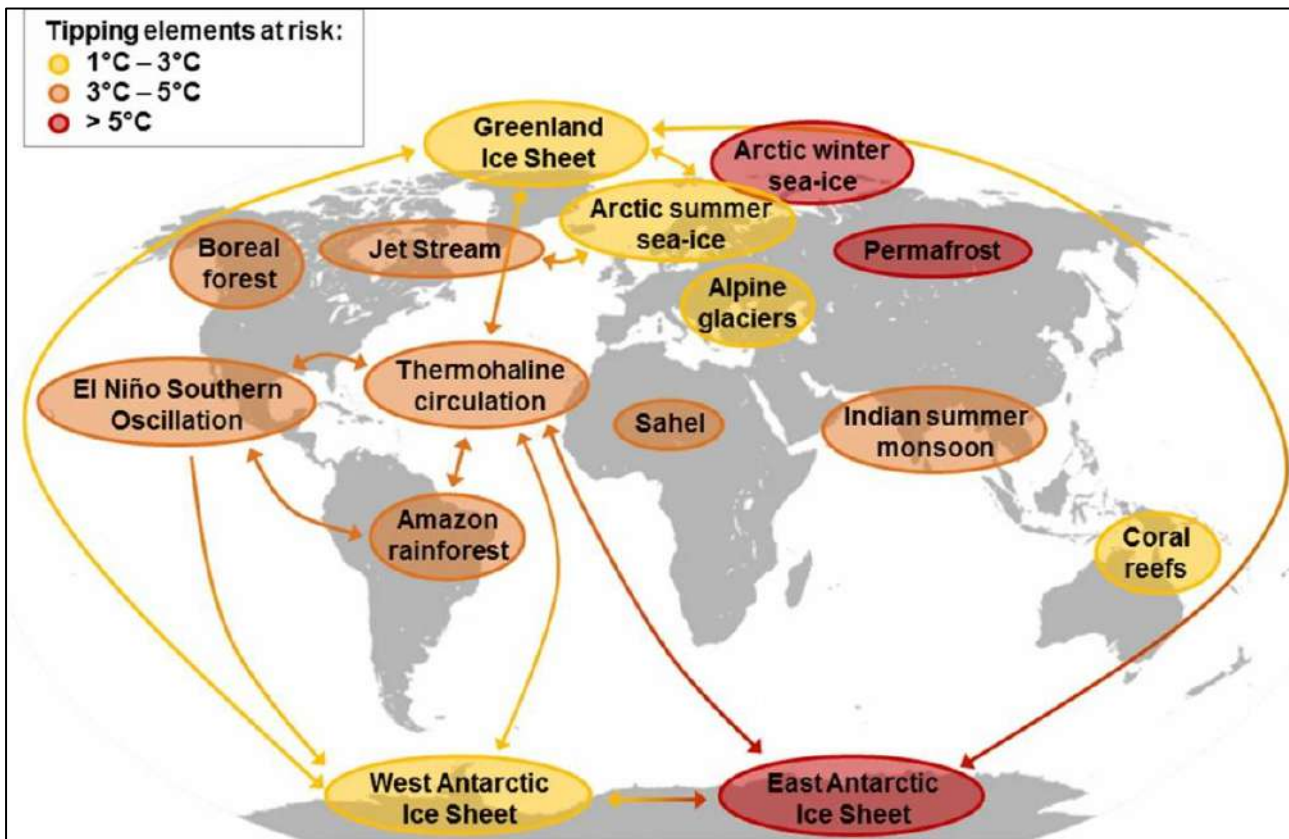
The complexity of cause/effect networks in the global environmental system is further highlighted when taking into consideration the phenomenon of tipping points revealed by *Tim Lenton and others*.

characterized by threshold behavior. These systems appear to remain stable with increasing global temperature, but from a global temperature threshold (tipping point), very small additional perturbations can 'flip' them towards a qualitatively new state. (See Figure 7)

Climate tipping elements are critical, large-scale components of the Earth system,



Figure 7 Tipping points in the climate system 2024



Source: Steffen, Will & Rockström, Johan & Richardson, Katherine & Lenton, Timothy & Folke, Carl & Liverman, Diana & Summerhayes, C. & Barnosky, Anthony & Cornell, Sarah & Crucifix, Michel & Donges, Jonathan & Fetzer, Ingo & Lade, Steven & Scheffer, Marten & Winkelmann, Ricarda & Schellnhuber, Hans. (2018). Trajectories of the Earth System in the Anthropocene. *Proceedings of the National Academy of Sciences*. 115. 201810141. 10.1073/pnas.1810141115.

One of these elements is the great Amazonian ecosystem; if deforestation continues, it is estimated that the Amazon will reach its tipping point when between 20 and 25% of its total area has been deforested, at which point (due to changes in its endogenous rainfall system) the forest would become savannah, with very important regional and global impacts. More than half of these values have already been deforested, which makes the situation more dangerous.

The climate crisis, biodiversity loss and

environmental pollution resulting from the use of natural resources beyond the limit of their renewability are intensifying and present unpredictable threats. Humanity is pushing the boundaries of the safety of the Earth system and its secure environment. Many scientists believe that we have entered a new era marked by human action at a planetary level: the Anthropocene. Trends point to the Earth moving towards an increase in environmental impacts and a decrease in human well-being, leading to a deepening of the imbalance between society and nature.

The political landscape in the region's governments is becoming increasingly complex at all levels. Three global factors are increasingly relevant compared to the time when the earlier referenced book was written (2020): Climate change, which is already making itself felt in intensity and frequency of extreme phenomena, drug trafficking and wars. Each of them brings new adverse facets about how we can face the future of humanity, protecting the environment and, therefore, the survival of the planet. Indeed, the last two are part of the cause, and climate change is part of the consequence.

Drug trafficking has created centers of power that play important roles in politics and warfare, as well as in financial systems. It manifests itself with greater or lesser intensity depending on the territories in which it operates to produce and distribute its drugs. In addition, they expand their illicit businesses into other traditional illegal businesses, such as timber smuggling, semi-artisanal gold mining, human trafficking, prostitution, extortion schemes, etc.

Although these centers of power are not states, they play important roles of control and action in many territories of the world and on our continent.

We must highlight the impact produced on the soil by the change of plantations towards drug precursor species and by the chemical contamination of water courses, as a result of drug processing. The action of drug trafficking is a matter of power and economic resources to take control of the territory where it operates, on a national and international scale. The war on drugs, created to control the opioid trade, is very difficult and its solution will require bolder proposals.

With the end of the Cold War, and associated with the reconfiguration of world geopolitics, a new

scenario was generated with struggles in international politics that encompass a more complex level of interests, making it difficult to establish a typology of behaviors in different global scenarios. Competition between the U.S. and China has been gaining strength as a relevant factor. The countries of Latin America and the Caribbean are not currently attractive markets in the arms battle of the leading powers in the field, which could be good for the definition of their own policies that benefit the population and their environment.

At present, the war between Russia and Ukraine, the war between Israel and the Hamas group, the tension in the Middle East, have influenced the increase in energy and food prices, endangering world security.

Migration, both internal and external, has become a high-impact problem. The region, which reached 1.6 million migrants in 2021, would increase to 17 million in 2050, a *situation that would be amplified if poverty, land use change, and land degradation persist* (World Bank, *Groundswell Report*, 2022). The main causes of migration are political problems and extreme natural events derived from the impact of climate change. Between 2015 and 2022, the impact of climate change has directly affected 47,759,237 people (CEPALSTAT, *Statistical Database and Publications, Impacts*, 2024).

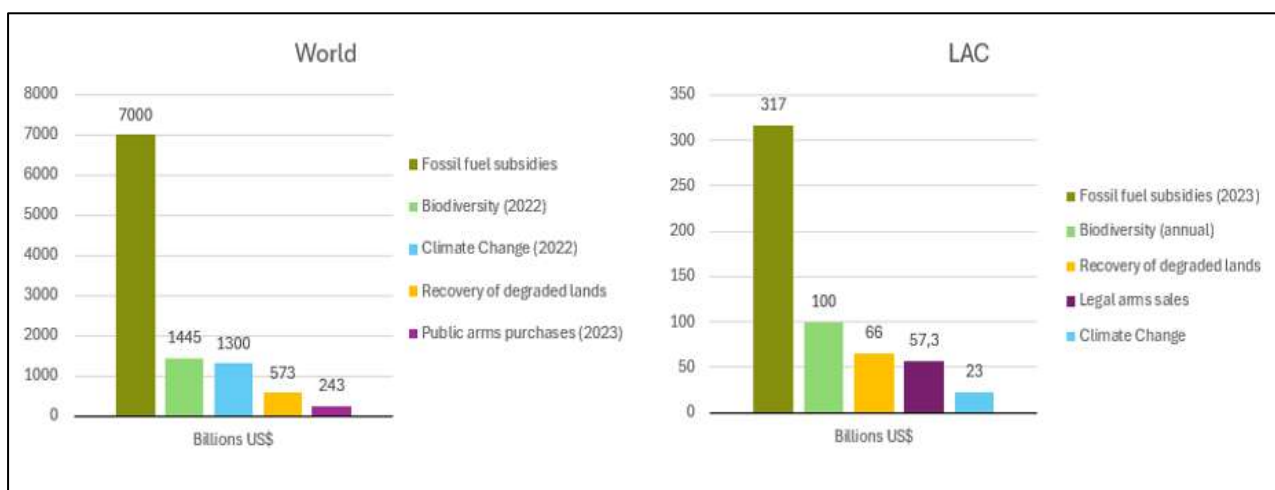
The problem of financing to combat climate change within the framework of the UN climate negotiations in 2009, developed countries committed to transfer to developing countries \$100 billion per year until 2020 (target extended to 2025 in the Paris Agreement). But this amount has not been achieved. For example, in 2016 only \$58.5 billion was achieved and although the amount increased significantly by 2019, only \$79.6 billion was achieved (IPCC). To meet the goal of net-zero emissions by 2050, the Climate

Policy Initiative estimates that global financing is needed in the amount of USD 4.5 trillion (million billion) by 2030, when in 2020 it was only USD 632 billion.

This implies that at least a 590% increase in annual climate finance is required in order to meet the internationally agreed 2030 targets and avoid

the most dangerous impacts of climate change. A remarkable fact is that even though climate finance is very high, it is only a fraction of public spending on arms between 2021 and 2022 and an even smaller fraction of spending on implicit fossil fuel subsidies, as can be seen in graph 8 below

**Graph 8. World. Financing for climate, biodiversity and degraded land reclamation compared to total fossil fuel subsidies. Figures in billions of US\$**



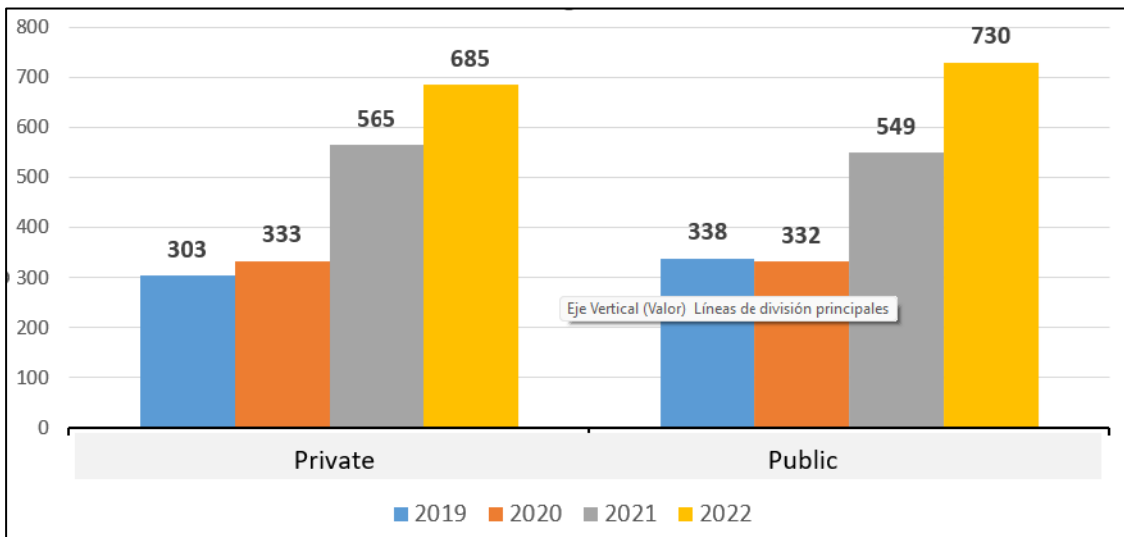
Source: Authors' elaboration based on: Stockholm International Peace Research Institute, *The Global Landscape of Climate Finance 2023*, International Monetary Fund, *subsidy database*, ECLAC, *Economics of Climate Change 2023* and the Convention to Combat Desertification (UNCCD)

The composition of financing according to the most recent information available indicates that resources directed to mitigation of the effects of climate change represented 91% of the total, adaptation, only 5%, and mixed impact, the remaining 4%. Regardless of the above, funding for adaptation continues to lag behind. The increase in funding is neither sufficient nor consistent across sectors and regions. Indeed, the growth is largely due to significant increases in clean energy investment in a few regions and countries. China, the United States, Europe, Brazil, Japan and India received 90% of the increase in funding. While this marks progress,

large gaps remain. Agriculture and industry, the most important sources of emissions after energy and transport, receive a disproportionately small amount (less than 4% of total funding for mitigation and mixed impacts). These two activities have a combined mitigation potential of 20 GT CO<sub>2</sub> by 2030, higher than the energy and transport sectors, according to the IPCC.

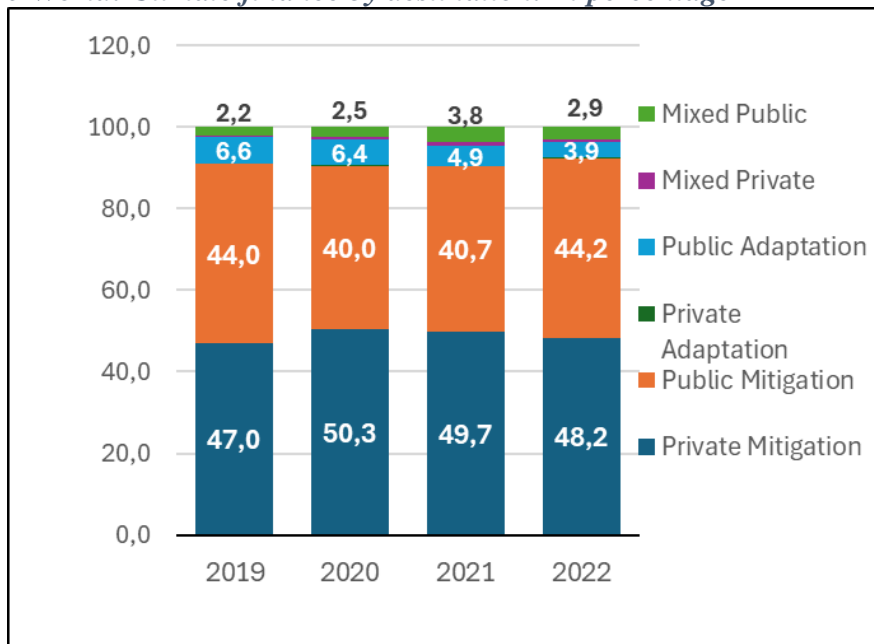
On the other hand, it is important to identify the origin and destination of financial resources for climate in the period 2019 to 2022. (See graph 9 and 10).

**Graph 9 World: Climate finance by origin. In billions of USD**



Source: Authors' elaboration based on Global Landscape of Climate Finance 2023. Climate Police Initiative

**Graph 10 World: Climate finance by destination. In percentage**

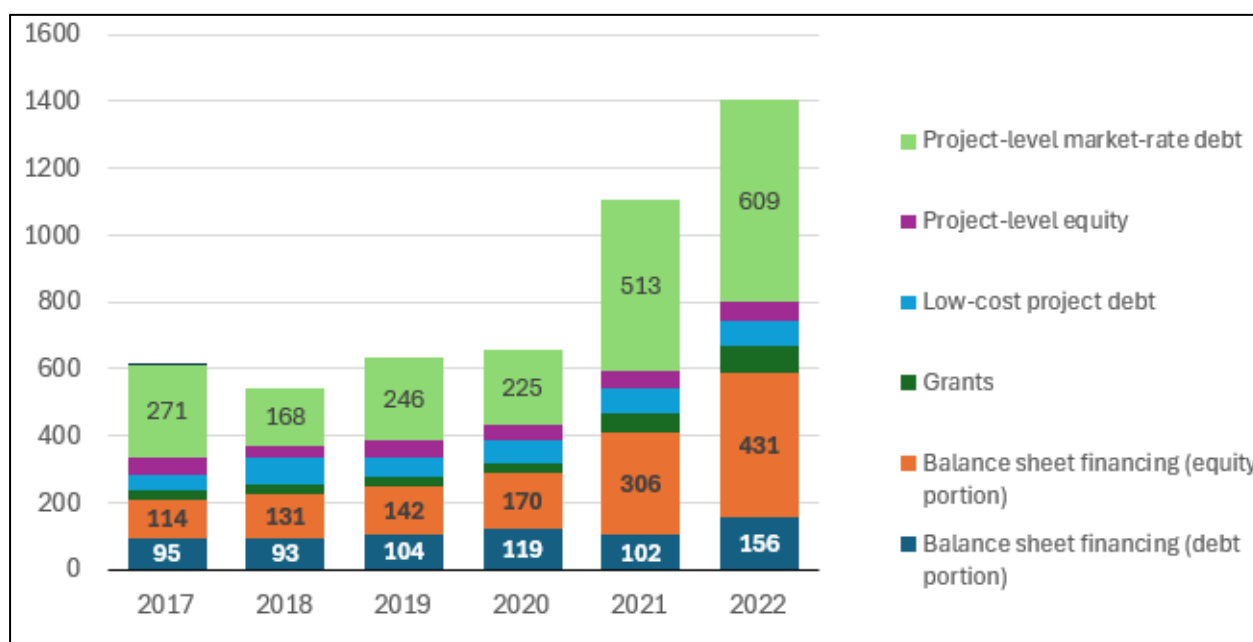


Source: Authors' elaboration based on Global Landscape of Climate Finance 2023. Climate Police Initiative

Very important for our analysis is to examine the instruments used to provide the resources to apply the funds. As you can see, the main one is

loans at market rates, followed by debt balance financing. (see graph 11)

Graph 11 Breakdown of global climate finance by instrument (USD billion)



Source: Authors' elaboration based on *Global Landscape of Climate Finance 2023*. Climate Police Initiative

Climate finance is grossly inadequate to meet the challenges of implementing the measures needed to achieve zero neutrality by 2050 and even to avoid reaching global average temperature increases of no more than 1.5 °C.

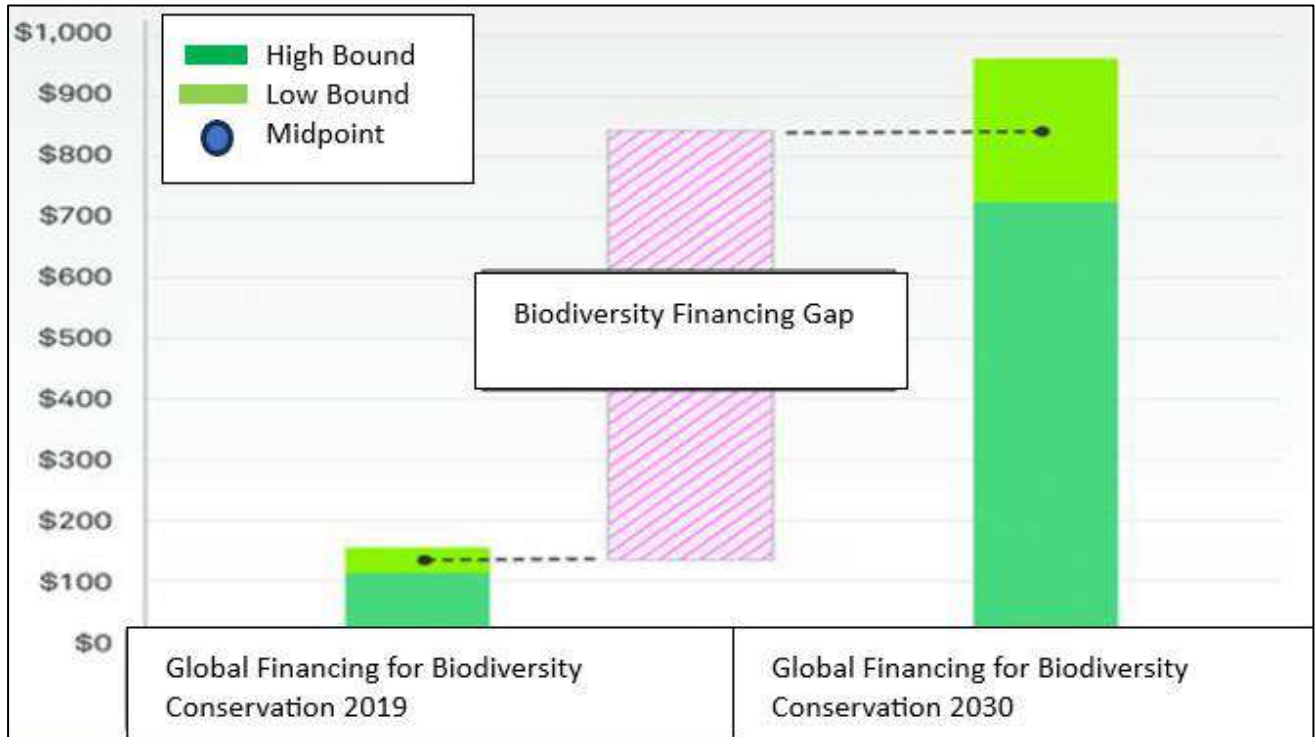
Total climate finance is a fraction of public spending on weapons and substantially less than what is spent on fossil fuel subsidies when considering the amount up to 2050, the year in which zero carbon neutrality would be achieved. Most climate finance is concentrated in East Asia and Pacific countries (including China, Japan, Australia, Australia, New Zealand, South Korea, Malaysia, Vietnam). South Korea, Malaysia, Vietnam). In this region, most of the financing is of public origin. It is followed by the United States, Canada and Europe. Latin America and the Caribbean is one of the regions that are and will be affected by climate change and that generates environmental services of value for all humanity.

Funding for Biodiversity Conservation: Globally, more than \$820 billion is needed each year to restore and protect ecosystems on a scale that can avert a planetary crisis that scientists describe as the sixth mass extinction, with more than one million species of plants and animals at risk of extinction due to the impacts of human activity (UNDP, 2024).

Comparing estimates of global biodiversity funding needs (USD 722 to 967 billion per year) with existing flows (USD 124 to 143 billion), the global shortfall is on the order of USD 598 to 824 billion per year. Accordingly, current funding levels cover only 16% to 19% of the total need for resources to halt biodiversity loss.

The graph below shows the annual funding gap using the higher estimates for today with future needs. The average gap is US\$ 711 billion per year (see graph 13).

Graph 12 Funding gap for biodiversity restoration

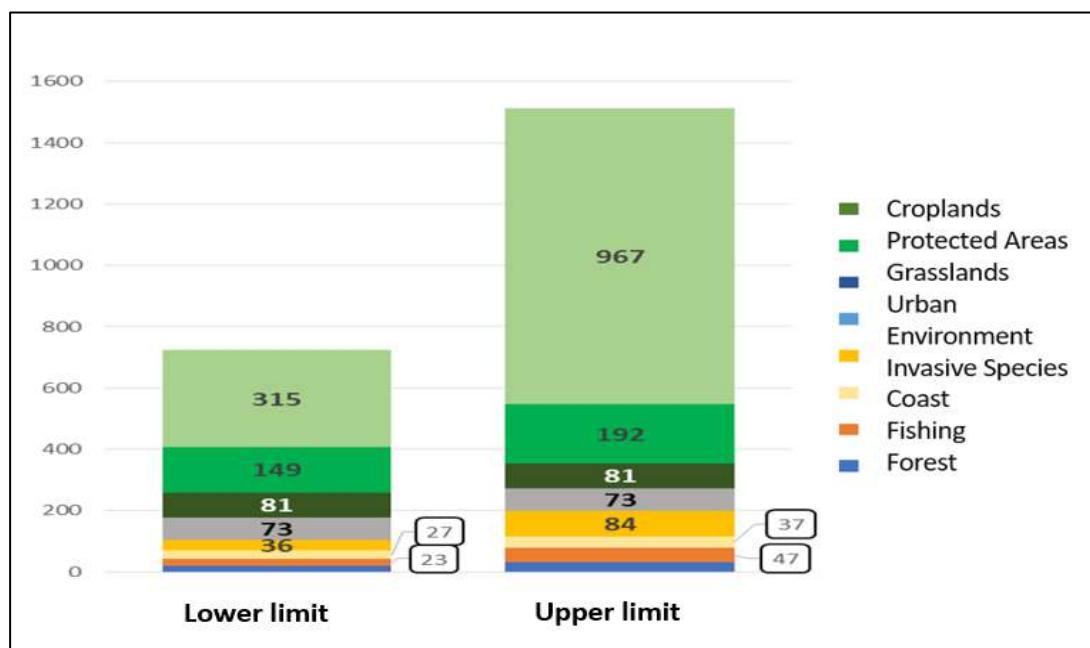


Source: Deutz, Andrew, Heal, Geoffrey ; Niu, Rose ; Swanson, Eric; Townshend, Terr ; Li, Zhu; Delmar, Alejandro. Meghji, Alqayam; Sethi, Suresh ; Puente, John.

Regarding the destinations of the financing, it goes mostly to farmland, followed by protected areas and pastures. Further back is the urban

environment, invasive species, the coastline, fishing and forests. (See graph 14)

*Graph 13 Overall funding needs for conservation*



Source <https://www.paulsoninstitute.org/conservation/financing-nature-report/>

For decades, the world has been plunged into an escalation of ecological crises, including an unprecedented decline in the abundance and diversity of life on Earth. Nevertheless, international plans and initiatives to halt the rapid erosion of biodiversity have consistently failed; none of the 196 signatory governments of the Convention on Biological Diversity (CBD) Latin America and the Caribbean achieved the 20 targets to which they committed in 2010.

The Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES), which is the intergovernmental body charged with strengthening the connection between science and biodiversity policy, concluded that significant action on biodiversity loss is required which implies transformational change, defined as “a fundamental reorganization of the entire system across technological, economic and social factors, including paradigms, goals and values.”

*B. Endogenous regional factors conditioning the environmental crisis*

The region has been and continues to be an increasingly exploited reservoir of its natural resources. The most industrialized countries, which account for 26% of the population, consume 78% of the world's production of goods and services, demand more than 75% of natural

resources and 80% of energy, 70% of synthetic fertilizers and 87% of the world's armaments.

Latin America and the Caribbean continue to base their economic growth on primary products. The share of these products in exports in 2021 reached 66.2%. (See Table 2)

*Table 2 Latin America and the Caribbean: Share of exports of primary products*

<b>Primary products according to natural resources</b>	<b>%</b>
<b>Non-renewable</b>	<b>25,5</b>
<b>Renewable</b>	<b>30,7</b>
<b>Total</b>	<b>66,2</b>

Source: ECLAC, *Overview of Natural Resources in Latin America and the Caribbean*, 2023

There are clear differentiations in industrial production between large and small countries in the region. However, the industrial production of large countries is based on a significant percentage of transformations of their own natural resources, to which they are generally incorporated with low added value. The prevailing mode of development has expanded as a function of an unleashed modernity in which a minority part of the population receives the benefits of high consumption and technological change while the rest, indoctrinated by consumerism, pressures for more possibilities of accessing greater income and consumption. This has resulted in significant environmental pressures.

Techno-economic growth has been used as a tool to impose this style of growth to consolidate itself in the region, co-opted the environmental policy of countries through scientific and

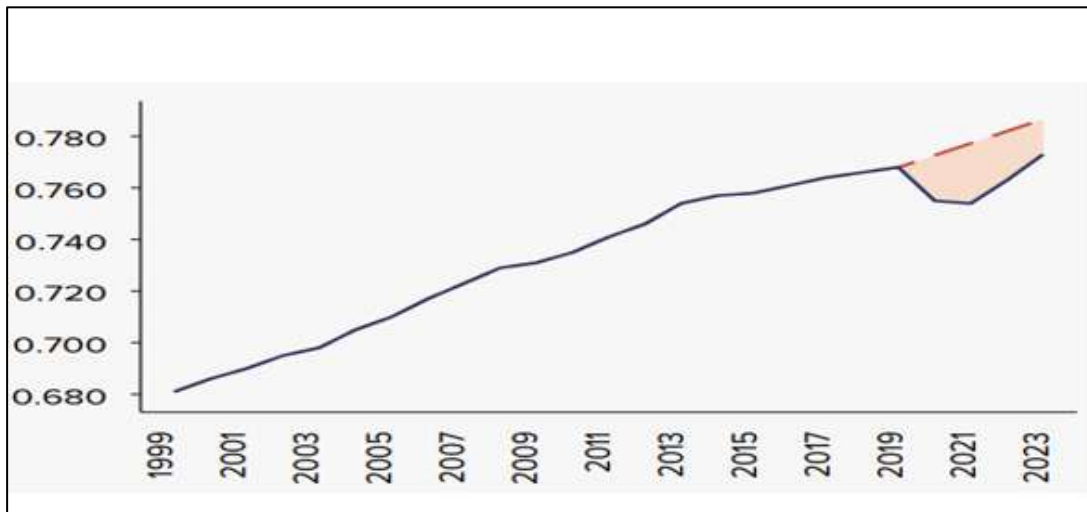
technological submission, applying the economic logic of a maximized and short-term productive rationality.

The windows of opportunity for a civilizing process in a region of growing uncertainty are closing fast. The trends point to an increase in environmental impacts and a threat to future human well-being, leading to a deepening imbalance between society and nature and a growing and accelerating loss of intra- and intergenerational equity.

With respect to human well-being, life expectancy (a reasonable indicator of quality of life) is increasing. LAC's human development index improved post-pandemic more than in other regions, although it is rising, it has not managed to recover pre-pandemic levels. (See Graph 14)



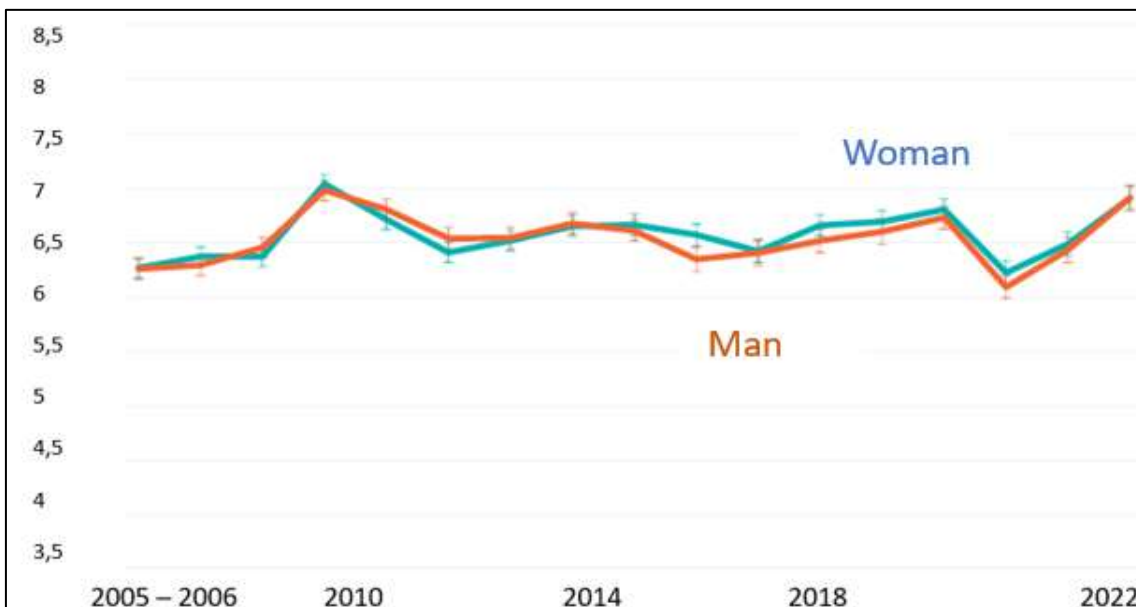
*Graph 14 Global Human Development Index for Latin America and the Caribbean. 1990 – 2023*



Source: Human Development Report Office. HUMAN DEVELOPMENT REPORT 2023/2024

The "Happiness Index" (life satisfaction) has remained relatively constant since 2005-6, contrary to regions such as North America and Europe, where it has been declining (see Figure 15)

*Graph 15 Latin America and the Caribbean: Happiness Index*



Source: World Happiness Report 2024. <https://happiness-report.s3amazonaws.com/2024/WHR+24.pdf>

A newborn growing up today in Latin America and the Caribbean will suffer significantly, in a very tangible way, compared to previous generations who were merely warned by scientists.

All this occurs in an international context that is becoming increasingly complex where economic competitiveness, internal wars, between countries and cultures, have proven to be more important than the survival of the human species.

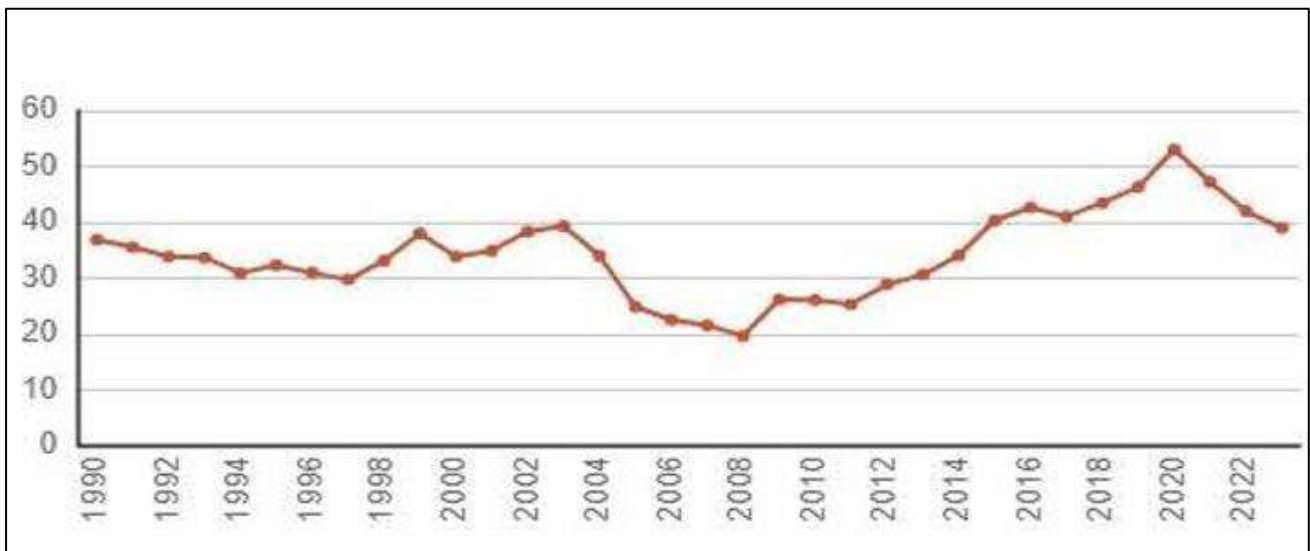
The international financial system – and the countries that support it – have conditioned the environmental situation. Banks are saved and countries are destroyed. It is necessary to recognize the ecological, colonial and social debts that developed countries owe to Latin America to at least partially detail the enormous social and environmental degradation caused by the prevailing mode of development. (See graph

Financial rates have not recognized the differential growth of nature. Renewable rates and replacement rates have not been considered

when natural resources are involved in the profit and loss accounts of companies, countries and national and international financiers.

The international financial system today works to the detriment of natural heritage and biodiversity, both Latin American and worldwide. Economic and financial systems have not undergone the modifications required to catalyze broader transitions towards fair and sustainable outcomes, seeking to achieve the globally agreed goals that have been deferred decade after decade. Clearly, there has been a mismatch between the scale of global economic activity, its impacts on nature, and the volume of investments needed to counteract these impacts, to achieve better environmental performance that improves the lives of people and the planet.

**Graph 16 Latin America and the Caribbean: External debt as a percentage of GDP. 1990 - 2023**



Source: CEPALSTAT, Latin America and the Caribbean: Regional Economic Profile, 2023

It is obvious that the main causes of the environmental situation in the region derive from the maintenance of environmentally

negative modes of production and consumption, marked by economic and often economic factors. In the countries of the region, there is

no vision, nor consequent strategies, that puts the environment at the center of decisions. This dimension, beyond the usual discourses, continues to be marginal in the strategies of many governments. Almost no country puts the strategic planning of spaces and processes before short-term economic interests.

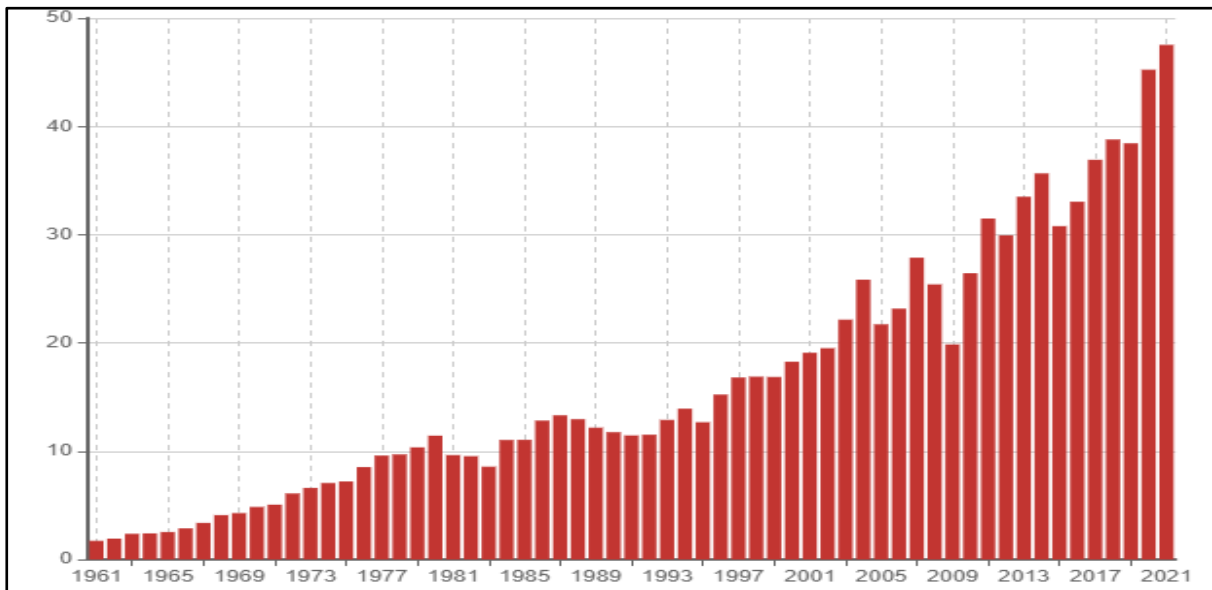
For many of these countries, the environment is not an opportunity to build harmonies that are oriented towards Good Living, this concept being defined as the satisfaction of human needs to achieve a dignified life in harmony and peace with nature, establishing development on a human scale. This concept arises from the reflection of indigenous and non-indigenous thinkers, who propose the need for the common good of humanity, based on a realizable utopia. Emerging from social and political organizations, it has been incorporated into some constitutions of countries in the region.

This is contrary to considering the environment only as a source of natural resources to be exploited, or an obstacle that slows down and hinders economic growth. If countries have governance practices of significant magnitude, it is only because the environmental dimension has become partly a political subject that is generated by population pressure. However, there is an attempt to avoid it or alternatively

diminish its relevance.

The most important sector for the regional environment is agriculture. Agriculture has continued its course of technological increase on the basis of technological packages derived from the green revolution created after the Second World War. This often leads to environmental problems that arise due to inadequate management. The main ones are produced, in general terms, using a generated technological package suitable for temperate zones, applied to the subtropics and tropics, generating significant ecological costs. In addition, agro systems, to increase yields, are subjected to artificialization that overuse technological inputs such as pesticides, fertilizer, hormones and Phyto regulators, whose residues are difficult to manage. Fertilizers, especially nitrogen and phosphorus fertilizers, have led to the eutrophication of marine and continental water bodies (particularly lakes), with the disappearance of different forms of life. Today there are approximately 450 dead zones in the sea, as an expression of the transgression of the threshold of nitrogen and phosphorus fluxes (one of the nine limits of the planet). (See Graph 17) Added to this are the practices of monocultures that produce serious problems both in health and in the physics of the soil.

*Graph 17 Latin America and the Caribbean: Fertilizer Use Intensity*

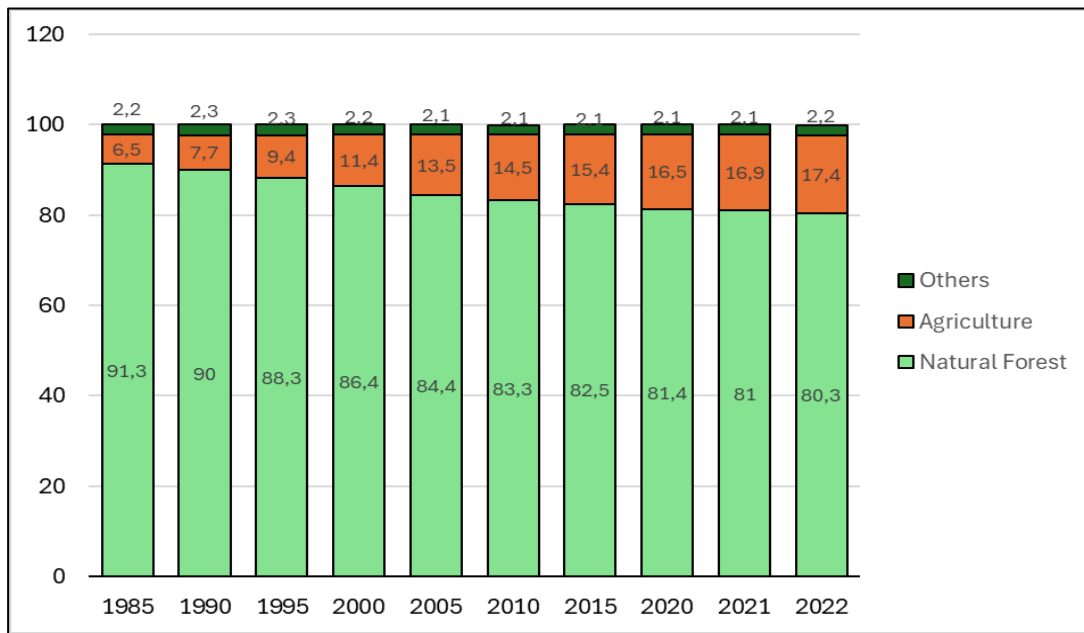


Source: ECLAC, ECLAC, Economic Commission for Latin America and the Caribbean, United Nations

These problems have special repercussions on the predominant forms of expansion of the agricultural frontier, especially in the humid forest, and in Andean areas with steeply sloping soils. And this has been the main cause of the

loss of the humid tropical forest, especially in the Amazon. In 2022, as a result of the constant increase over the last 60 years, the figure of 17.4% of land use change from forest to agriculture has been reached. (See Graph 18)

*Graph 18 Latin America and the Caribbean: Land-Use Change (in %)*

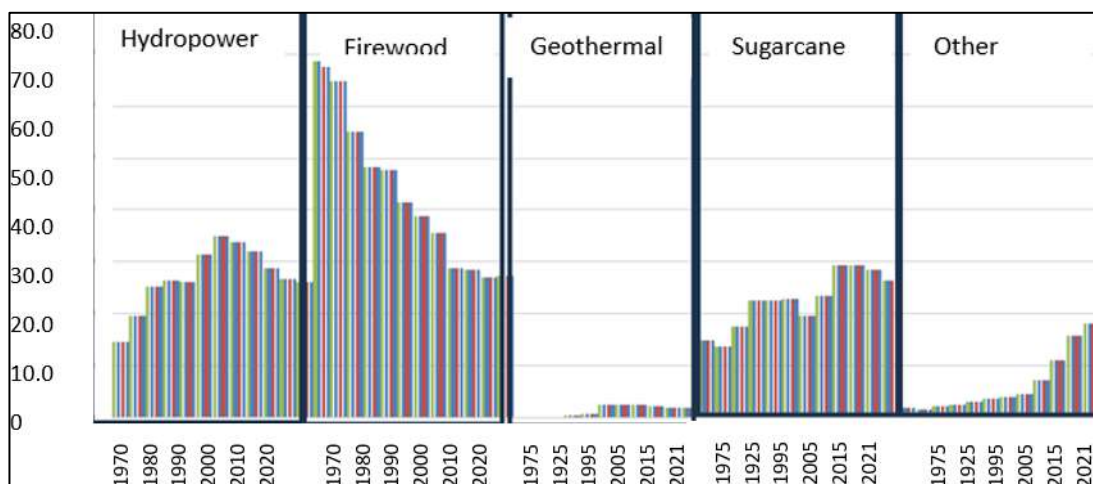


Source: <https://www.maaproject.org/2022/amazonia-tipping/Y>  
<https://plataforma.amazonia.mapbiomas.org/>

Another sector that impacts on the environment is energy. Since energy production and consumption are directly related to environmental sustainability, economic growth and improvement of the quality of life. It should be noted that there has been notable progress in the efficiency of both energy production and

consumption, especially in the transport and industrial sectors. It is worrying that the share of renewable primary energy supply (wind, hydro, geothermal, tidal and biomass) has been declining since 2014. Their lower proportion diminishes the importance of natural regeneration. (See graph 19)

*Graph 19 Latin America and the Caribbean: Share of Renewable Primary Energy Supply Chart, Histogram Automatically Generated Description (Rectangle)*



Source: CEPALSTAT, Environment, Databases and Publications, 2024

Electricity consumption has increased significantly in the region and the importance of renewable sources is high in the energy matrix thanks to the relative weight of hydroelectric power. In recent years, hydroelectric production has been decreasing, generally due to environmental problems derived from the impacts on the intervened ecosystems.

Policies to promote the use of production derived from non-conventional sources have been appealed. However, they have not yet reached the proportions of the early seventies, so the region is still in debt. One issue that has obviously had an impact on the environmental situation is that of environmental strategy priorities.

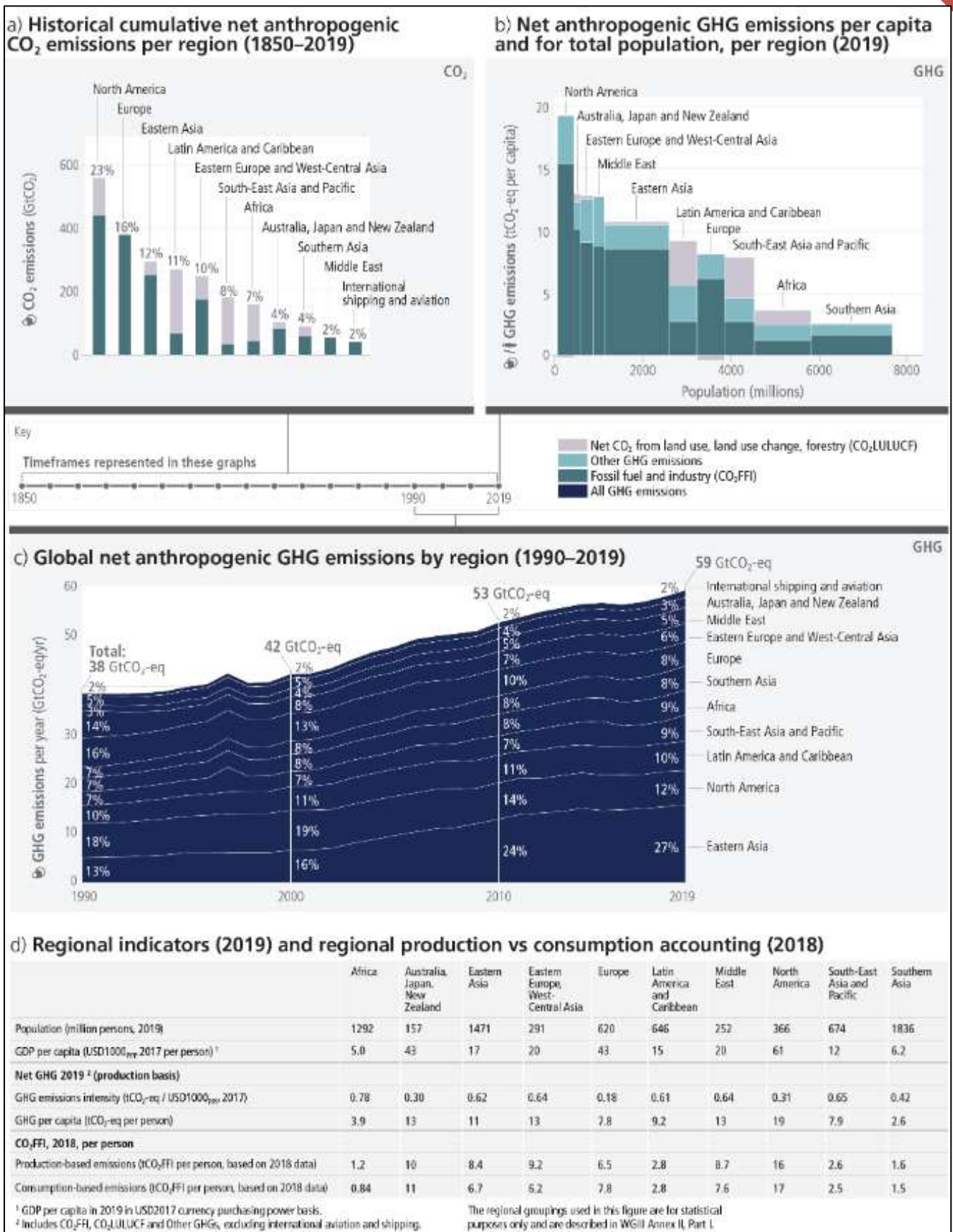
How much more, how much less, the countries of the region assume the priorities of the developed countries, prioritizing the fight against climate change, referring to greenhouse gas emissions, especially carbon neutral goals, over natural resource conservation strategies?

These approaches have not been modified in recent years.

Moreover, it could be said that, given the impact of climate change, this concern has become more acute in the region as well as for the issue of ecosystem and resource conservation and restoration has diminished. No progress will be made on the environmental issue if efforts are not made to prioritize the proper use of resources, to place them at their full value, to negotiate on an equal footing, and to reduce their impact. However, it should be reiterated that the region is responsible for only 11% (see Figure 8 below).

The increase in emissions by region is unevenly distributed, both globally and internationally. It is important to note that the main source of net CO<sub>2</sub> in the region is derived from land use, land use change and forestry over industry and fossil fuels. In the region, more than 50% of total emissions come from land use change, mainly from deforestation, agriculture and forestry.

Figure 8 World and regions: Emissions growth by region and its distribution



Source: IPCC VI Report

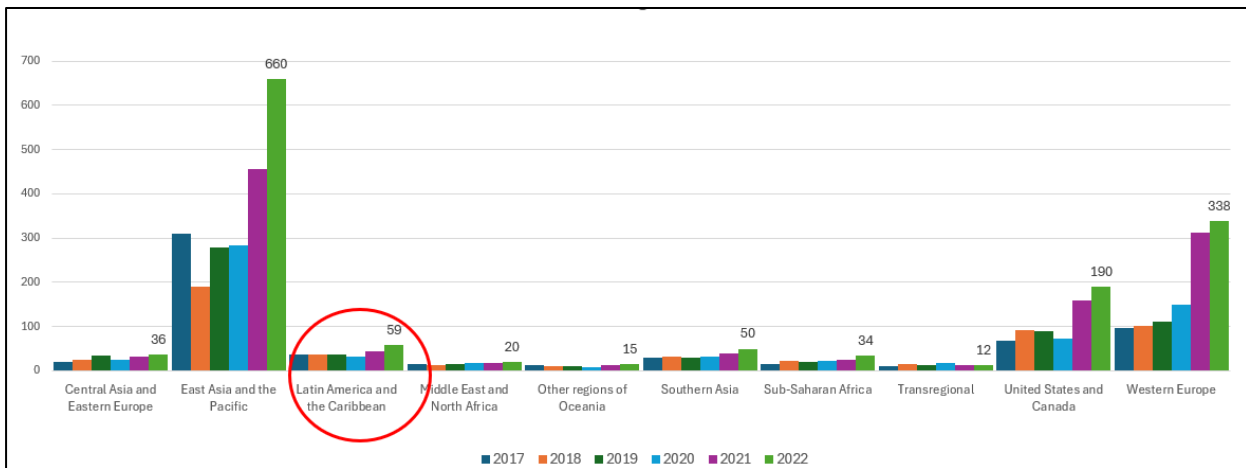
Chapter II ENDOGENOUS REGIONAL FACTORS CONDITIONING THE ENVIRONMENTAL CRISIS. Endogenous regional factors conditioning the environmental crisis

In relation to the region's financing and how much financial resources reach Latin America and the Caribbean, (See graph 20) it is shown that the region captures only 5.9% of the resources for climate change. The resources that Latin America and the Caribbean receive for the protection and conservation of nature is a smaller fraction compared to the resources allocated to carbon-intensive activities. The

same is true of the resources allocated in national budgets.

In the case of national budgets, what we observe is that countries also spend significantly more on carbon-intensive activities, for example, up to 323 times more than on those activities labeled for biodiversity conservation

*Graph 20 Regions of the world: Resources for climate change (%)*



Source: Authors' elaboration with information from the *Global Landscape of Climate Finance 2023*

Most of the climate finance directed to Latin America and the Caribbean corresponds to loans at market rates. Projects of this nature generate very important social and economic benefits in addition to positive externalities for the environment in which they are implemented and have long implementation and life periods. For this reason, many agencies recommend approving their implementation at below market rates.

In the region, this problem has worsened considerably after the successive global economic crises. Although it is not recommended to use loans to finance sustainability projects if they lead to deepening the country debt, under certain conditions the acquisition of debt at preferential

rates could be a viable option for the scaling up of Nature-Based Solutions (NBS).

Several countries tend to show progress in environmental policies: environmental impact assessment systems, land use planning, both at the urban level with regulatory plans and in rural areas, particularly in protected areas systems and laws. Some policies have had an impact on the reduction of pollutants, both industrial and domestic, especially in urban areas, both in soil, water and air. But we must be very clear: In some specific cases it has been possible to slow down the deterioration and destruction, but all these efforts have clearly been insufficient to change the sign of the trends.



Beyond this criticism, if we analyze the number of different measures that have been taken in recent years in relation to the environment and natural resources, especially those linked to environmental institutional strengthening of the public services, we should conclude that there has been progress in incorporating the environmental dimension into the work of the countries.

To the notorious changes in the public structure described above, we must add new legislation and regulations, introduction of greater controls and standards, environmental restoration plans, expansion of protected areas and strengthening of their management, programs to mitigate the impact of large projects, training and environmental education programs, international environmental commitments, and more.

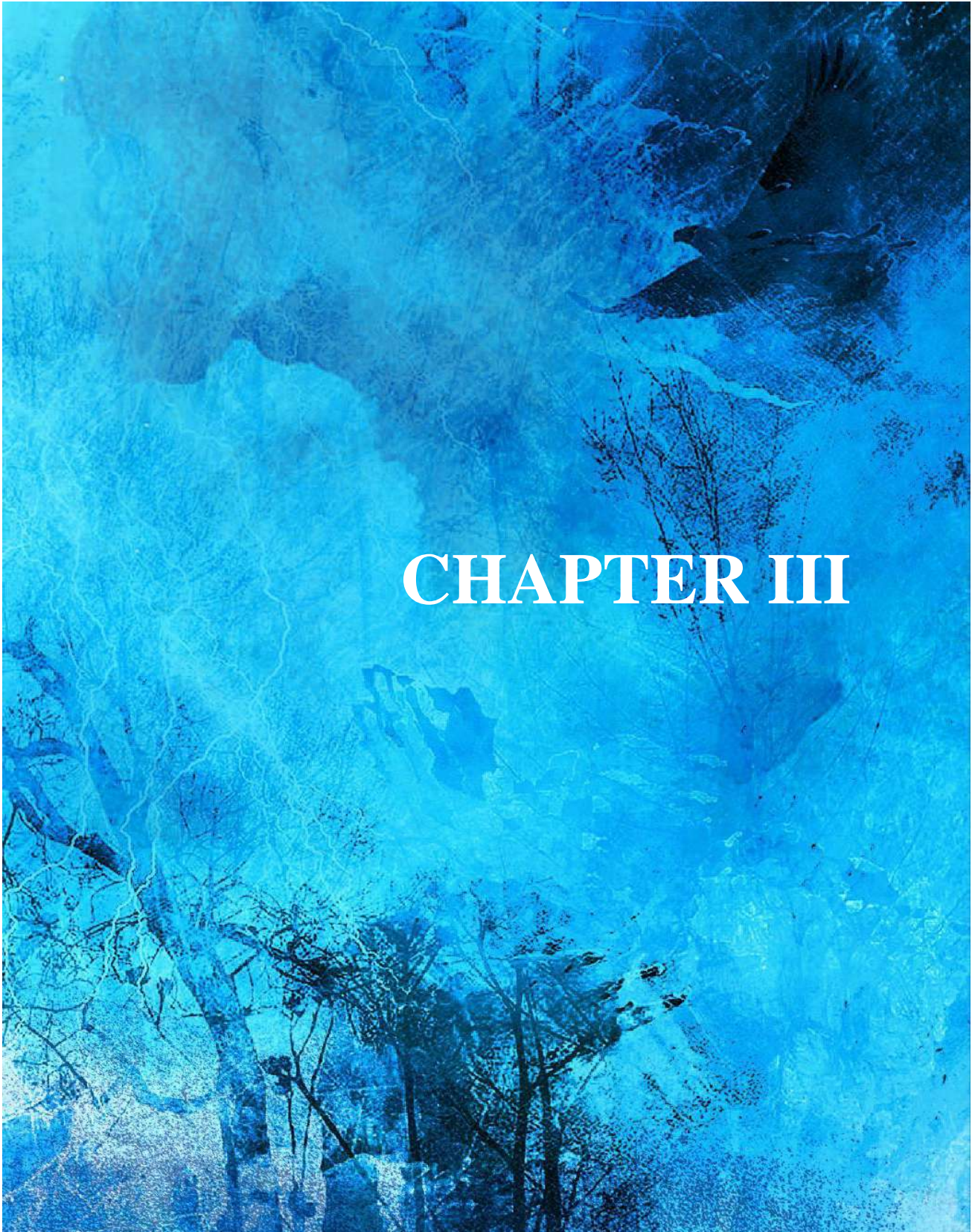
It is important to point out that in many of the countries of the region (even those with the best laws and regulations) there are major shortcomings in the implementation and enforcement of these laws and regulations. All statistics show that the deterioration has continued. Experience shows that the efforts made in the region to reverse negative trends have only served to attenuate the negative slopes of certain deterioration processes without modifying their signs.

Most of the explanations for this situation are oriented towards the inefficiency of the public bureaucratic apparatus, the lack of commitment on the part of the business sectors and, more

generally, the insufficient environmental awareness of the population. However, it is necessary to warn that the explanations are much more complex: interaction of diverse factors such as the environmental contradictions of the economic model, in particular planning horizons, conflicts of interests, and conflicts between social and private goods; the compartmentalization of policies, different rationalities, some of them contradictory, of the social actors, especially productive ones, coexistence of different degrees and types of consciences of the population, from diffuse to critical, and late political maturity of the traditional strata of the legislative and judicial powers.

Notwithstanding the negative environmental condition, the region ranks third among eight regions of the world in terms of environmental performance, according to the last two reports (2020 and 2022) of the Environmental Performance Index (delivered by Yale and Columbia Universities every two years for the last twenty years). This index synthesizes 45 indicators on the progress being made by each country and each region in each of the environmental dimensions considered.

Nevertheless, all the efforts that have given the region this acceptable relative position with respect to other regions of the world have been absolutely insufficient to halt the deterioration of regional ecosystems and the loss of natural resources.



# CHAPTER III

## CHAPTER III. LATIN AMERICA AND THE CARIBBEAN: EXPLORING SOLUTIONS

### *A. A difficult future or a positive future in a complex reality?*

The background of the advance of ecosystem deterioration and the loss of natural resources and natural assets described above, as long as the causes are not modified, do not bode well for the future of the region. The worsening of the environmental situation is the result of increasing global conditioning factors such as drug trafficking, the effect of wars, climate change and its effects on the intensification of natural disasters, deficits in general and environmental governance, financing limitations, the low qualification of the labor force, low investment in science and technology, and the harmful impacts of emigration in poor conditions. All this is in addition to the traditional conditions derived from a traditional mode of production and consumption.

Economic growth in Latin America and the Caribbean is significantly based on the exploitation of natural resources to which very little value is generally added. This clearly differentiates the region from developed countries, which historically have already consumed a large part of their own natural resources. To grow in the region, under current conditions, is to put pressure on the environment. Although these aspects, which could make us see a more difficult future, Latin America and the Caribbean, due to its particular characteristics based on its natural wealth, its lack of wars, its strategic geographical location, and the cultural level of its population, could become a region with high growth, which in turn is environmentally sustainable, and with a less inequitable and unjust social development.

The region has great potential to increase its food production for itself and for the world. The region has fertile land, freshwater availability, ecosystems with great potential for high agricultural productivity crops, primary and secondary forests, and varied climates that would respond to the diversification of crops.

Nickel, copper, lithium, silicon, rare earths, iron, gold, silver, the number of few, constitute a natural heritage of high strategic value. In addition, the region has the possibility, at competitive costs, of producing green hydrogen (H<sub>2</sub>V). The region is already under pressure from sectors related to these resources, and others that need to decarbonize in accordance with international trade rules.

Latin America and the Caribbean, faced with pressure to accelerate decarbonization processes, could offer the development of energy sources associated with the availability of green energy. Moreover, the region has the cleanest electricity grid in the world, which would help energy-intensive investments. Going forward, with this set of attributes, the region could produce industrial goods with much lower emissions than advanced countries and with an unparalleled time to market and cost structure. Agriculture, in turn, could significantly expand production on the condition that it is required to advance sustainable and regenerative technologies, reclamation of degraded lands and other environmental techniques.

The region, based on the above, could be strengthened in relation to other regions by providing solutions to major issues of interest to the World. This could lay the foundations for growth that is not only more environmentally sustainable, but also more socially and economically sustained. However, in order for the region to realize its full potential, it will be necessary to focus primarily on the conservation of its natural heritage, on efforts to add value with environmental criteria, on trying to ensure that international markets function correctly, and on addressing unilateral protectionist foreign measures, such as subsidies, the imposition of rules, standards, certifications and other non-tariff barriers that neutralize comparative and competitive environmental advantages.

The Treaty of Tlatelolco for the Prohibition of nuclear weapons in Latin America and the

Caribbean, signed in 1967, has been successful in meeting its objectives. This is another of the advantages offered by the region, which, by not permitting nuclear development or testing, contributes to peace, to the conservation of the natural heritage and to preventing the introduction of a factor that is highly destructive of the environment.

It is obvious that, up to now, the negative factors have outweighed the positive ones. It is therefore necessary to reverse this balance, and, with this aim, the environmental dimension should become a factor that is not marginal but, on the contrary, basic and strategic to achieve these goals. It is therefore necessary to insist on new policies and instruments that have an impact on a full and efficient incorporation of the environmental dimension in development strategies and policies, which are described below.

## *B. Using the UN Sustainable Development Goals, the Paris Agreement and the Kuming-Montreal Framework*

The World Commission on Environment and Development defined Sustainable Development in its 1987 report “Our Common Future” as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Subsequently, the Rio Summit (or Earth Summit), held from 3rd to 14, June 1992, with the participation of 172 countries (with 108 heads of state) and 2,400 representatives of non-governmental organizations, produced the following documents: Agenda 21, the Statement of Forest Principles, the Convention for a United Nations Framework on Climate Change, the United Nations Convention on Biological Diversity and the Rio Declaration. It reaffirms the Declaration of the United Nations Conference on the Human Environment, adopted in Stockholm on 16th June 1972, and seeks to build on it. It is important to highlight the principle: “In order to achieve sustainable development, environmental protection shall be an integral part of the development process and shall not be considered in isolation. And also, the principle: “Peace, development and environmental protection are interdependent and inseparable.”

Subsequently, in 2015, the countries of the UN system signed an agreement to promote the concept of sustainable development through the international policy known as Sustainable Development Goals (SDGs), which replaced the Millennium Development Goals, agreed in 2000. All countries in Latin America and the Caribbean have accepted and committed to the Sustainable Development Goals, implicitly

accepting development as that of the countries of the Global North.

Clearly, the concept, as defined, is open to different interpretations, due in part to the plurality of meanings historically used to give meaning to “development”. Development has often been confused with economic growth, but it is important to clearly differentiate between the two.

Development, in the abstract, is a qualitative process of unfolding potentialities that may or may not involve economic growth (quantitative increase in wealth), although a period of economic growth is essential for developing countries, until the fundamental needs of their inhabitants are met. It is also important to separate economic growth from material or energy growth: economic growth is not necessarily synonymous with material economic growth.

The commonly used concept of “development” contains the value judgment that development is good, and therefore desirable and desired. In this context, the term development means a necessary and abstract process, which would translate into a definition of development, not as a concrete historical process, but as a theoretical process, without a spatial-temporal dimension.

It is important to point out that the way in which “this development” is constructed clearly differentiates Latin American countries from the so-called developed countries. Economic growth, industrialization, increase in the standard of living, what is commonly

understood as “development” in the region is significantly based, as the figures dictate, on the overexploitation and loss of natural resources and goods. This contradiction has not been overcome, since it would mean questioning the prevailing system, rejecting the bonds of dependence, without, in turn, a clear definition of alternatives and transitions.

The definition, approval and specification of the Millennium Development Goals in 2000 by the 193 countries that make up the UN, improved and replaced in 2015 by the 17 Sustainable Development Goals (SDGs), with their 169 targets and 232 indicators have served to partly reduce the potential ambiguity of the concept of Sustainable Development and as a framework for organizing actions. Fortunately, the Sustainable Development Goals Center for Latin America, an initiative of the Universidad de Los Andes and the Sustainable Development Solutions Network, both Colombian institutions, publishes a comprehensive annual report on the status of compliance in the countries of the region. It states that the concept of Sustainable Development would be useful for Latin America and the Caribbean as it would make it possible to visualize the factors we have already mentioned, such as the natural wealth it possesses, the existence of poverty in the countries of the region, the high environmental vulnerability, the prospects for economic growth and the need to increase social welfare.

In addition, the Sustainable Development Goals would be useful in constituting a universal call to action to end poverty, protect the planet and improve the lives and prospects of people around the world. However, it should be noted that they are the product of political bargaining among UN member countries and

therefore do not show the complex cause-effect interrelationships and dependencies among them. Furthermore, and very importantly, it should be made explicit that endorsement of the Sustainable Development Goals is not binding for any country, and the countries themselves report on how their plans and strategies are progressing, thus consolidating information at the global level. Nevertheless, the Sustainable Development Goals to date, in many of the region's countries, have served only as a kind of reflection and an imagination exercise, and in others they have served as a compass to point toward the quasi-utopia of a more just and sustainable world. For the region, it is ultimately vital to replace the traditional “development” model (an attempt to copy the trajectory followed by the countries of the global North) with another model that is ecologically sustainable, socially desirable and economically efficient. The SDGs can support such a shift.

The Paris Agreement (2015) of the Climate Change Convention set the goal of “keeping the increase in global average temperature well below 2°C above pre-industrial levels” and pursuing efforts to limit that temperature increase to 1.5°C above pre-industrial levels. Each country is to achieve the targets, referred to as NDCs<sup>1</sup>. Every five years, countries are expected to review their NDCs, aiming to align them with a view to align them with the desired trajectory, determined at the national level. All countries in the region have established their NDCs, but for the countries in the region it is expected to be extremely difficult to achieve carbon neutrality by 2050. This is because emission reductions are very costly in relation to the revenues of most LAC countries and because they face significant risks. As a result of the transition, in the form of loss of tax and

<sup>1</sup> National determined contributions

export revenues. On the other hand, it is considered that the region's main economic efforts should preferably be oriented towards Adaptation to the effects of climate change.

The Global Biodiversity Framework (GBF), also known as the Kunming-Montreal Framework, is a comprehensive international plan designed to guide global efforts to protect and restore biodiversity over the next decade. It was agreed on 19th December 2022, at the Biodiversity COP organized by the CBD. It aims to catalyze, facilitate and galvanize urgent and transformative action by governments and subnational and local authorities, with the participation of all of society, to halt and reverse biodiversity loss. It defines 23 global targets that require urgent action during the decade to 2030. It is further expected to enable the achievement of the outcome-oriented targets by 2050.

The Kunming-Montreal targets have some reference to the political-economic drivers of

biodiversity loss. For example, Target 14 calls for integrating the true value of biodiversity into all aspects of governance. Targets 18 and 19 of the latter group refer to specific amounts and targets of resources to be eliminated (subsidies harmful to biodiversity) and other resources to be allocated to fund biodiversity strategies and plans, to increase Official Development Assistance from developed to developing countries.

However, it is likely that many States will have difficulties in meeting the targets under current global political-economic rules, due to the presence of strong drivers for increased extractives activities and pressures to expand the agricultural frontier. Already the difficulties and failures to meet the targets point to the need to close the gap between financing needs and available resources, but also to introduce profound changes in the financial structure, not only for biodiversity but also for nature and the environment.

### *C. Making the environment a political subject*

The region will not be able to make progress in significant environmental solutions if this dimension remains marginalized. Therefore, it is essential to make the environmental dimension a political subject. This is essential that the environment becomes a priority concern for citizens and a priority for the legislative, executive and judicial powers, as well as for the private sector.

The challenge of turning the environment into a political subject requires an informed and empowered society, which needs its own channels of citizen expression to enable this

pressure to be translated into laws, regulations and public policies. To turn the environment into a political subject, it is necessary to be aware that this dimension is an issue directly related to survival and the improvement of the quality of life. If this is not achieved, urgencies will always postpone environmental decisions.

The Escazú Agreement is precisely oriented in this direction and places people and the environment at the center of political priorities by establishing the objective of guaranteeing the full and effective implementation in Latin America and the Caribbean of the rights to

access to environmental information, public participation in environmental decision-making processes, and access to environmental justice.

It is the first regional environmental treaty in the world to contain specific provisions for the promotion and protection of environmental human rights defenders. It came into effect 2021 and the fact that 10 countries have not ratified it is evidence that there are differences between countries in the context of the low priority given to the environmental dimension in the region. In addition, some countries that have ratified it show no differences with their previous situations.

This political change must go hand in hand with science, technology and innovation, but within a framework that breaks the dependence that is currently shown. Science must rescue the knowledge of nature, but it is also important to know how society makes use of it by transforming nature.

From this derives the importance of knowing the rationality used in the use of resources, their ownership, constitutional norms, laws and regulations, control systems, social conflicts, traditions, the values of the population and its different ethnic groups, etc.

It is interesting to note the progress in Latin America of middle-income social groups that have expressed themselves in direct democratic actions, often winning, with notable majorities, conflicts such as those related to the defense of water or protected areas, among others.

We recommend, similar to what France has done, to propose in each country of the region, the creation of a high-level and binding socioeconomic - environmental council at the



the country level, to guide integral development strategies, where the environment has the great importance, it deserves.

In an effort to make the environment a political subject, it is necessary to forge a critical conscience that allows us to know in depth the

relationship of society with its environment, with its conflicts and environmental harmony.

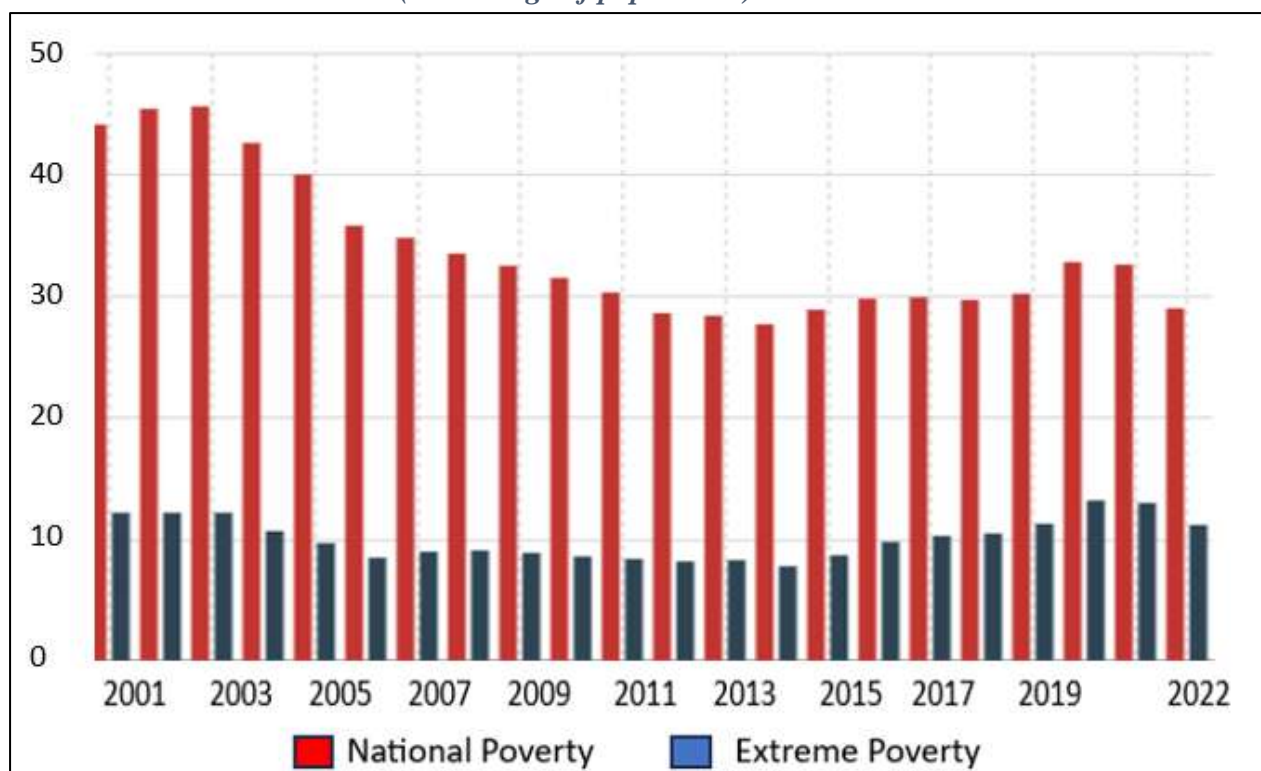
Adequacy in the management of environmental public policy requires the formation of technical cadres at the highest levels of decision making with a solid and updated training in the face of the enormous global challenges.

### D. Poverty reduction

The clear downward trend of the last two decades, both in Poverty and Extreme Poverty in Latin America and the Caribbean, had a turning point in 2014, when both figures were reversed, to show in subsequent

years a moderate increase in these variables, which could give way to stagnation. In 2022, almost 30 million inhabitants of the region remained in poverty and 11 million in extreme poverty. (See Graph 21)

*Graph 21. Latin America and the Caribbean: Population in Poverty 2001 – 2022. (Percentage of population)*



Source: CEPALSTAT, Environment, Databases and publications, 2024

In addition, income in each country of the region presents marked national imbalances, which is expressed through their Gini Concentration Indexes (0.464 for the entire

region) with large national variations that fluctuate between 0.400 and 0.570, in addition

to a Nominal GDP calculated by Purchasing Power Parity (PPP) that is extremely unequal between countries, fluctuating between 45,400 and 3,240 dollars. The Human Development Index (HDI) also varies widely, ranging from 0.860 to 0.552 (*CEPALSTAT, 2022*).

It is not possible to aspire to have values and attitudes favorable to the environment when people need to eat and meet their basic needs. It is entirely understandable that people suffering from hunger and deprivation consider only the short term.

Reducing poverty levels is a requirement that we must address in parallel with the conversion of the environment as a political subject. The ongoing nature of this problem or its

aggravation slows down attempts to improve environmental management and thus the dignified life of the people. However, we must point out that, in general terms, when poverty has decreased in the region, it has done so at the cost of the deterioration and reduction of its natural resources. This contradiction is a very important factor to consider in the elaboration of environmental strategies and policies.

It should be noted that poverty reduction does not refer only to income poverty, measured in monetary terms, but also to multidimensional poverty, which measures the main aspects related to quality of life through factors such as housing, access to health, level of education, recreation, access to sports and other forms of community social relations.

### *E.. Implementing environmental and governance agendas*

The current predominant development modality in the region must necessarily be modified, aiming at an essential social and economic transformation that lays the foundations for a new paradigm where the environment, the right of future generations and that of other species, is considered at its core, far beyond the short-term policies to which governments are accustomed. Without the environment, there is no growth, let alone development. Therefore, in an effort to build a new paradigm, there is an urgent need to modify growth strategies and policies.

It is reiterated that Latin America and the Caribbean is one of the main centers of global biodiversity. It is also the region that provides important ecosystem services that not only sustain the region, but also provide substantive support to planetary stability. The world uses them but does not recognize them. The new

global environmental agenda, beyond climate change, must recognize this relevance and begin to value the invisible and intangible environmental services that are essential for life.

To adopt a regional environmental agenda and national environmental agendas that are different from the current ones, it is necessary to strongly emphasize the issue of “environmental governance”, generating renewed approaches and to further bring to the issue out of the marginality in which it is submerged. Environmental governance must be translated into a global structural approach that encompasses all the public and private factors that affect economic growth and the quality of life of the population. It means a comprehensive commitment that goes beyond sectoral approaches that treat the environment as a sector of the economy. To further bring

translated into the penetration of the environmental dimension in all sectors of the economy and in all territorial disaggregation, assuming the binding nature of the issue with development decisions.

For this purpose of taking the environmental issue out of marginality, relevant environmental approaches are needed in all departments. In addition, it is necessary to empower new and modern Ministries of

Environment, as responsible for the management of natural resources, the environment and ecosystem services, essential elements for life and without which, there is neither economy nor society. We need to emphasize the training and education of government decision-makers, collaborating with the Universities so that they collaborate in expanding knowledge of the environment at all levels of education.

### *F. Prioritize environmental policies*

There is a key issue that should somehow integrate and prioritize factors that result in better management than the current one to provoke a real change of sign in the environmental deterioration processes. This refers to the way in which public environmental policies derived from the application of current legislation in the countries and government programs are generated.

When reference is made to environmental policy in the countries of the region, it is generally assumed that it is the explicit environmental policy and that it originates in the central environmental agencies of the public administration. Explicit policies are generated by ministries of the environment and environmental commissions or councils. But of utmost importance, implicit environmental policies also originate in other ministries or in the central power, almost all of them related to economic growth that in most cases have an environmental transcendence that has not been adequately weighed. Economic growth and social policies are the ones that rule in the countries and most of the time they favor the short term over the medium and long term, influencing the implicit environmental policies that they generate to be negative.

Environmental policies implicit in development policies should not be confused with their environmental impacts. When speaking of implicit environmental policies, it is said that these are only moderately known and that they require a previous political or technical environmental decision derived from development policies. How many areas of environmental sacrifice exist in our Latin American and Caribbean countries!

Explicit environmental policies are generally reactive policies. They try to diminish the negative effects generated in the production and consumption processes caused by the prevailing development modality. Almost all public environmental agencies in the countries of the region are reactive in their environmental policies. They respond to the urgencies that derive mainly from pollution caused by urban and industrial expansion, deforestation, soil erosion, deterioration of marine resources and pollution from mining activities.

The most novel initiative of environmental policies in the region is the fact that some countries have incorporated Nature as a subject of rights, as is evident in some of the region's rivers (the Amazon). It is a policy that is part of

transforming the environment as a political subject, but whose implementation could surely take several decades. Nevertheless, the urgency of the required actions demands that we proceed with diligence.

Likewise, the declaration of national parks, indigenous reserves and collective properties of black communities is perhaps the greatest milestone in land-use planning policy, as attested to by various evaluations of its effectiveness. In many cases, these land-use planning modalities have been incorporated into the constitutions of the countries as a state policy and have a strong legal shield.

Novel initiatives of explicit environmental policies are those related to the environmental impact assessment systems (SEIA) that almost all countries have put into operation. Although environmental impact assessment might appear to be non-reactive, its application clearly is. Assessments are not normally made of policies and programs but preferably of projects, previously decided in some sector of the economy that is not considered as environmental. EIAs only try to reduce impacts, although only occasionally do they succeed in substantially modifying a project and rarely in rejecting it.

A strong regional effort has been made to intensify the certification of companies. In 1999 there were 372 certifications, which increased to 11,871 in 2020 (*CEPALSTAT, Statistical database and publications, Impacts, 2024*).

Other explicit environmental policies are related to the conservation of renewable natural resources. These are clearly reactive. A classic example is deforestation reduction policies, which have not been successful in the countries of the region. Almost all countries have

legislation and institutions for forest protection, which define explicit environmental policies. However, the factors that influence deforestation are beyond their control. On the other hand, energy pricing policies have an impact on a variable pressure to produce firewood from native forests.

Latin America and the Caribbean are not the regions that contribute most to global greenhouse gas emissions. The region's contribution is low and lower than that of East Asia and North America (excluding Mexico). The region has decreased the emission of greenhouse gases, in 2014 it was 343,089 MT CO<sub>2</sub>, a figure that decreases in 2020 to 306,454. The consumption of total Ozone Depleting Substances (ODS) decreases from 74,451 tons in 1089 to 1,188 (*CEPALSTAT, Environment, Waste, Air Emissions, 2024*).

Without being the main cause of climate change, the region is and will be greatly affected by it. It is obvious that climate change affects it, and that this issue should be on its agenda, but environmental policies on mitigation should not be an objective in itself, but only a consequence of better management of its natural heritage. Therefore, the Latin American and Caribbean region, with regard to climate change, should focus strongly on adaptation to the effects of climate change and those projected for the future. It is emphasized that international funding flows for adaptation to developing countries are 5 to 10 times lower than estimated needs and the gap is widening. Estimated annual adaptation needs are \$170 to \$340 billion per year by 2030 and \$315 to \$575 billion by 2050 (*UNEP, 2021*).

The main adaptation policies should be aimed at halting and reversing environmental deterioration and destruction in the region. But more than an adaptation policy, this is an

ethical imperative for the region with a view to being in solidarity with nature and ensuring the well-being of its population, protecting the extraordinary natural heritage it possesses. Adaptation policies often converge with mitigation policies.

Halting deforestation and conserving and restoring forests are themselves climate change mitigation measures. The same is true for wetlands. A priority policy for adaptation and for climate change mitigation is the transformation of agriculture so that it emits fewer greenhouse gases, consumes less freshwater, is more productive, and has the resilience to face the onslaught of extreme climatic events (droughts, torrential rains, major floods). It is a purpose that implies a substantial investment in science and technology and innovation. Another priority policy is to take the measures required to ensure the population's access to drinking water during periods of drought, as well as the security of water supply for the productive sectors.

Environmental policies for the expansion and development of agriculture in Latin America and the Caribbean are essential because of the importance of agriculture to the region's economy and because forestry and agriculture are the activities that are widespread in most of the territories of the countries of the region.

Agricultural policies should seek to minimize the environmental cost of transforming pristine ecosystems into agricultural areas. It is necessary that public governance in the areas of agricultural frontier expansion try to redirect and introduce environmentally appropriate technologies to avoid spontaneous growth by ejected farmers and the occupation generated by the interests of livestock capital. The expansion for livestock uses, and its slash and burn systems have had an extraordinarily high

environmental impact with clear consequences on climate change. It is therefore urgent to innovate with agricultural expansion policies that minimize the ecological cost, such as agroforestry technologies, such as undergrowth cultivation or the design of agricultural islands with wildlife corridors.

Another environmentally sound agricultural policy should focus on avoiding the major environmental problem of the region's mountainous areas, especially in northern and Central America and in the Andes, where soils are overused, causing erosion and nutrient depletion.

On the other hand, agricultural intensification in traditional areas involves the use of high productivity technological packages based on fertilizers, pesticides, hormones, and phyto-regulators, and genetic material obtained in breeding processes. Only a minority of the region has intensified land use while minimizing the environmental cost. The extraordinary impact of scientific development and the consequent technologies have not been applied in most of the territories of the region. They are far away from precision agriculture, the use of drones, the automation of tasks, innovation in irrigation, remote sensing methods, detailed fertilization, etc.

However, it is necessary to emphasize that there are no advances or technologies without exhaustive knowledge of ecosystems and their attributes. The intensification, from the general to the farm level, of ecosystem research policies is needed to be able to decide adequately (and not based on commercial propaganda) on the techniques to be used. The variability of the countries' ecosystems is a challenge that requires adequate strategies and policies.

In recent decades, innovations in agriculture have been based on transgenic, cisgenic, gene editing, CRISPR, and other technologies. Genetic engineering has made possible a major scientific leap forward. However, it should be noted that the dependence of producers on the large transnationals that generate and commercialize these technological innovations is increasing and influences monocultures that damage the soil and the environment. In addition, this dependence is intensified because certain transgenic seeds respond only to the fertilizer created by the same company.

The case of soybean with its millions of hectares in several countries of the region is demonstrative of this dependence and of the serious environmental problems generated: soil compaction due to plowing, genetic contamination and even human intoxication derived from the use of fertilizers and pesticides. Transgenics and other similar techniques require very strict agricultural environmental policies that regulate their use, allow cultural rotations and minimize environmental impact. The more the ecosystem is artificialized, the more regulation is required.

Agricultural artificialization requires public policies that standardize and control the use of technological inputs, especially pesticides. The residual effect on products can be somehow controlled by export standards, but, in food products for domestic consumption, effective environmental and health policies are required to avoid affecting human health.

There is a great challenge in the design of environmental policies for urban development. The cities of Central and South America will grow from 6.5 billion tons of domestic waste to more than 11 billion tons by 2050, almost doubling the domestic consumption of materials for the growth of their cities.

It is essential to reorder the territory of the basin or ecosystem in which the city is located, superimposing the dynamics of the populations on the natural conditions and their evolution. Evidence shows that people, especially those with fewer resources, tend to occupy areas that are vulnerable because of their low value due to their uninhabitable conditions.

Urban development and environmental policies should focus on the following processes: (1) decontamination of air; (2) decontamination of domestic and industrial wastewater; use of the best existing technologies for greater energy and material efficiency; (3) redesign of products and materials to reduce consumption, reuse, recycle, compost, recover materials from products that cannot be recycled; (4) establishment of efficient public transportation, with increasing mobility and decent conditions; (5) design of cities with higher population density, where self-sufficient neighborhoods are built with educational, medical and sports services and with the different commercial services they require; (6) orient the construction of housing towards designs that are more efficient in the use of energy and different materials; (7) creation of the infrastructure required to face extreme climatic events such as extreme rainfall, extreme droughts, and abnormal oceanic events, such as the intensification of extreme storm surges; (8) relocation of inhabitants living in environmentally vulnerable areas; (9) protection of peri-urban ecosystems that contribute to climate, drainage, water availability, and soil conservation, such as forests, wetlands, and moorlands; (10) consideration in urban environmental development of the contribution to decarbonization, especially with regard to urban transportation and intra-city energy sources. Also, it is necessary to implement technologies and urban designs that improve

energy efficiency, such as green buildings, efficient public transportation, and the use of renewable energies; (11) incorporation of green infrastructure, such as parks, vertical gardens, and green roofs, which help mitigate the heat island effect in order to improve air quality and provide habitats for biodiversity; (12) promotion of the use of public transportation, bicycles, and walking, reducing dependence on private vehicles and reducing greenhouse gas emissions.

It is necessary to establish a tax policy that allows access to urban land to all those who use it for residential, recreational and productive uses and guarantees the appropriation of land rent for the transformation with participatory planning of its current occupational design into environmentally sustainable spaces through land use planning strategies with social equity.

City land-use planning policies need to be reoriented towards forms that include and adequately value environmental conditions. This implies discarding the classic regulatory plans that are concerned with regularizing what has already been done either by spontaneous occupation or land speculation. It is necessary to replace them with plans that consider the environmental offer where the cities are located, studying in depth the background of geology, geomorphology, climate, (pluviometric regime, intensity of them, frequency of frost, snow, etc.) conditions and characteristics of the basins and sub-basins, quality of the soils, (especially drainage), quality of air, (thermal investments, predominant winds), volcanic risks (lava roads), etc. It is proposed to intensify city greening policies, tending towards a productive urban green, which on the one hand improves the ecological services provided by it in relation to carbon absorption and nutrient recycling, and improves the circulation of water resources

within the urban system. This also contributes to food security by promoting urban and peri-urban agriculture and the growth of parks, squares and linear groves for food and services.

In addition, it is essential to design public policies for managing the development of urban industrial areas, given their importance in the structuring of cities. This should be translated into the application of strict industrial waste management policies, both in terms of design and control.

Regarding air pollution, pollution studies should be carried out based on representative stations determining MP2.5, MP10, SO<sub>2</sub>, O<sub>3</sub>, NO<sub>2</sub>, PB, and others. The primary standards should be determined, and limits should be set for each one according to annual, monthly and daily periods and latency limits. Emission sources should be determined as accurately as possible.

Policies are needed to intensify the supply of drinking water for the maximum population and to increase wastewater treatment, Acknowledging the backward state of the region's cities in these areas.

In addition, policies to increase efficiency in the use of water resources are becoming increasingly important to save water due to the increasing droughts caused by climate change.

The Caribbean islands should be considered the first priority, and their total or partial abandonment should be programmed when there is no other solution, in order to direct the population and be welcomed by sister peoples, with particular care to maintain their social ties and culture. We must claim for them the payment of the ecological debt of the countries that caused this ecological catastrophe by establishing a binding UN resolution.

According to local traditions, the only way to preserve ecosystems and values is to leave the defense of their resources to the communities themselves, empowering them with the technical and even coercive means to defend them. Otherwise, they will be victimized by powerful economic actors, or by paramilitary organizations or other organized crime

structures. There are many successful, though not sufficiently legalized, examples to date, but it has been clearly demonstrated that only those who inhabit a territory, even without official support, or even with official opposition, have managed to preserve environment and community.

### *G. Promote reforms and improve financial system instruments*

Countries need to advance in the orientation and regulation of their financial systems, taking on board the experiences arising from movements to obtain environmental benefits. But it is also necessary for countries to insist on the need for an urgent and profound reform of the international financial system. In the face of the current negative situation, we must recognize the exceptions. For example, the IFC has exemplary environmental and social safeguards for projects requesting financing (as credit or *equity*) that have been pioneers in the multilateral banking system.

External debt continues to oppress the growth opportunities of the vast majority of countries in the region. Pressure for natural resource exploitation and structural adjustment programs continue to burden Latin American economies. Finances have not been adjusted to possible payment patterns to reduce the debt burden and the reduction of interest rates.

Debt swaps represent an opportunity to implement Nature-Based Solutions (NBS) on a large scale, which can bring additional benefits in terms of the sustainability of the debt itself if addressed as part of a programmatic approach at the country level with favorable conditions.

Sovereign green bonds, on the other hand, also have the potential to induce transformations at a scale. An ECLAC study (*Rodriguez A., et al.*) points out that the implementation of risk guarantees could help reduce the costs associated with taking on new debt or refinancing existing debt as outlined by the Green Climate Fund (*GCF, 2022*).

Climate and nature debt swaps were widely used in the region during the 1980s and 1990s, in a period marked by deep debt crises in countries (*Sheikh, 2018*). There are two types of swaps: commercial and public swaps. In commercial swaps, public debt is restructured and traded in the markets, where third parties such as an NGO, another government, or individuals buy such debt.

On the other hand, in public swaps, the exchange is carried out directly between debtor government and debt-buying government or development bank without the use of the market (*GCF, 2021*). Most debt swaps took place in Latin American countries, including El Salvador, Colombia, Jamaica, Peru, Chile and Costa Rica. Mexico, in particular, signed 12 debt-for-nature swap agreements with the United States.



By the end of 2003, a total of 66 bilateral debt-for-nature swap agreements had been concluded; 27% of them involved Germany and 28% involved the United States. The latter country has been the largest single creditor of public debt-for-nature swaps worldwide (*GCF, 2021*). This mechanism has been proposed as a tool to finance climate change adaptation and mitigation projects. In fact, the Green Climate Fund (GCF) considers purchasing debt at a negotiated discount and redeeming it in exchange for local currency payments to an independent trust fund to support climate action and nature conservation (*GCF, 2022*).

Although there are not many studies that support the effectiveness of this mechanism, some developing countries have implemented transactions of this type, with significant funds allocated for conservation, with the result that deforestation rates tend to be lower compared to those that do not. The possibility of using this model to conserve other ecosystems, such as coral reefs and grasslands, is also being explored.

According to the Green Climate Fund (*GCF, 2022*), these green bonds are issued by public entities or private companies in the capital markets, and their issuance is certified under voluntary standards that guarantee that the funds raised are used for projects with a positive environmental impact. There is a variant called blue bonds that allude to ocean conservation.

Green bonds have experienced significant growth in Latin America and the Caribbean, particularly in renewable energy, water management and infrastructure, but their development has been more limited in the agricultural sector. Globally, agriculture, forestry and land use account for less than 3.8% of total green bond issuance, with forestry

having the largest share. In the however, bonds for the same category have a relatively higher cumulative share (12.1%) than compared to the global average (*CBI, 2021; CBI, 2019*).

Green bonds constitute a mechanism with great potential to finance agricultural practices in Latin America and the Caribbean. Sovereign green bonds offer an opportunity for governments to access loans at preferential rates, backed by environmental commitments. In this way, public funds generated through debt can be used to support specific initiatives to boost BDS in the agricultural sector.

The Global Environment Facility (GEF) has funded BNS-related projects, including the creation of protected areas, restoration of degraded lands, water resource management, ecosystem-based adaptation, as well as forest and farmland protection and management (*GEF, 2023*).

Carbon certificates or carbon credits represent the reduction or capture of one ton of carbon equivalent (1 ton CO<sub>2</sub> eq.) from the atmosphere and can be traded in the market for individuals or organizations to offset their greenhouse gas (GHG) emissions. There are two types of carbon markets: regulated and voluntary.

In Latin America and the Caribbean most carbon certificates come from BNS and renewable energy projects. The demand for these certificates in the voluntary carbon market has increased significantly in recent years. By 2020, Latin America and the Caribbean will reach a record 95 MtCO<sub>2</sub> eq. The region is the second largest supplier of voluntary carbon credits, with 20% of the global supply. Forest sector credits (REDD+), certified by Verra7 (the leading certifier of carbon credits in Latin America and the Caribbean) account for more than 70% of all

removals in the region. It should be noted, however, that the carbon market has been the subject of controversy due to price volatility and the risk of being used for greenwashing. Offsets are perceived as less transparent and divert attention away from the need to directly reduce GHG emissions, which is indispensable for transformational change (CBI, 2020).

Payment for environmental services (PES) schemes involve payment to landowners for the adoption of management practices that preserve ecosystems or provide environmental benefits, usually through fees based on the ecosystem services provided (GCF, 2022). These schemes have been widely applied for natural resource conservation, especially in areas where ecosystem services are valuable, such as forests, water, and biodiversity. Some PES programs also aim to improve socioeconomic outcomes and reduce poverty. The public sector plays an important role in removing barriers and reducing investment

risk, so that PES can channel private funds to high-priority ecosystems (GCF, 2022). PES are most widely used for water resource and watershed management, which contributes to improved water quality, agricultural productivity, climate resilience, and overall economic development (GCF, 2022; Dominique et al., 2021).

Drucker and Ramírez (2020) argue for the need to create a payment for environmental services (PES) scheme specifically for agrobiodiversity conservation (called PACS), based on experiences of this type developed in Latin American and Caribbean countries, between 2010 and 2018, which covered 130 threatened varieties of important food crops. Although the area cultivated with these varieties increased in the short term, PACS failed to bring the varieties to the risk-free threshold, due to the scale of the interventions and the availability of seeds of the threatened varieties.

## *H. Rescuing experiences of policies and instruments that have had positive impacts*

There have been a few of strategies and policies applied in the region that have been overtly positive, despite the fact that they have been implemented within a political system in which environmentally damaging modes of production and consumption predominate. These approaches help to design strategies based on realistic policies that use effective instruments that have already served to attenuate the environmental crisis, while considering that they should be aimed at paradigmatic changes.

One of these has been the environmental impact assessment instrument. As stated above, they have been put into operation in all countries, to a greater or lesser extent. These in many cases have contributed to modifying projects and even, in some cases, to rejecting them. It is obvious that the systems still leave much to be desired and need to be improved, but, in the future, it is expected that they will continue to be improved.

In an effort to contribute to their improvement, the independent consultants who carry out the environmental impact assessments cannot be

chosen by the interested parties but must be the product of methods that provide greater impartiality, for example, being drawn from a list of specialists, otherwise expert companies are created to justify the unjustifiable.

Another instrument that has been used positively and has influenced better environmental management is ISO 14001 certification and similar. However, in most of the countries where they are applied, they are voluntary in nature, therefore, they are not auditable by the environmental authority; they only contribute to show a disposition and a greater environmental appearance on the part of the companies. Although certification systems in nearly all countries require significant revision and improvement, they have helped medium and large companies place greater emphasis on the environmental impact of their operations

It is necessary to mention the importance of the Environment, Society and Governance (ESG) certifications, which have become increasingly important, among which the B companies are the most relevant. Many companies in the region belong to this last modality, with high requirements and third-party certification. However, in many cases it is nothing more than propaganda with a high advertising content that demonstrates the growing importance that the market assigns to the environment.

Another positive impact has been the development of specific urban, industrial and mining decontamination plans. Many of these plans have been linked to empowered citizen movements that have turned their issues into political subjects.

A very useful instrument is the use of continental and maritime land use planning.

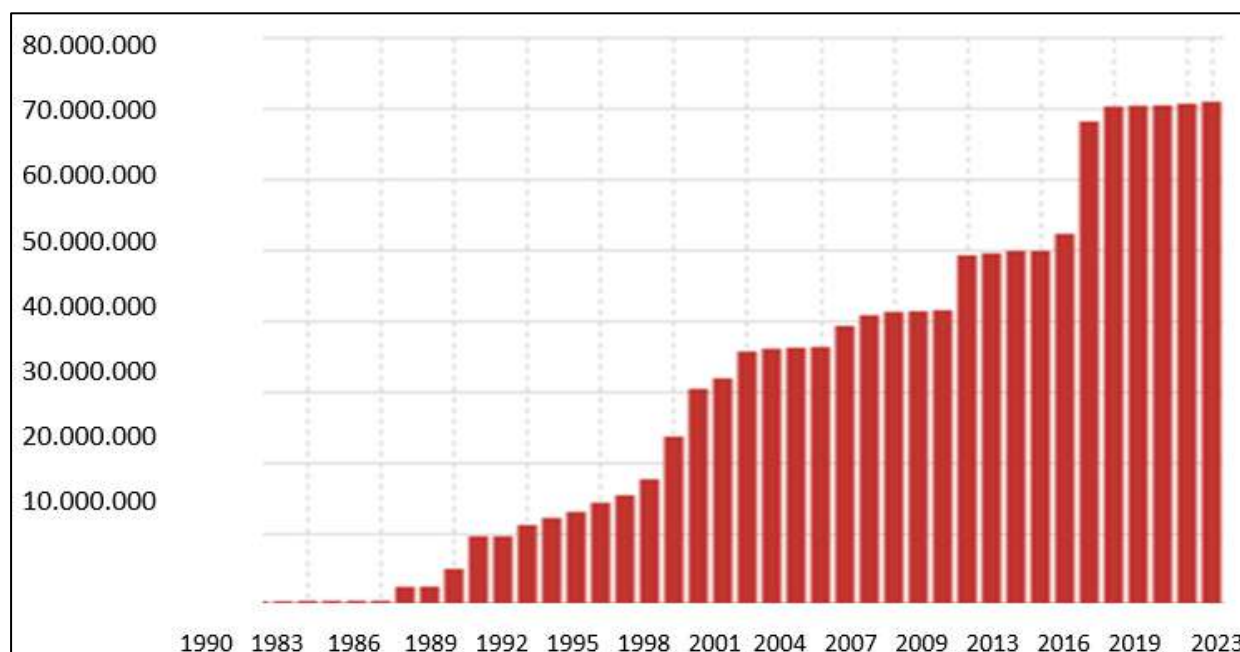
Regional and national territories were occupied more intensively following the designs of the market and, preferably, land speculation. Since land use change is one of the most intensive and harmful factors in the region, land use planning proposals should prioritize this instrument.

The region has 9,154 areas under some legal condition of protection systems, which represent 22% of its land surface. There is still much to be protected: of 2,300 key biodiversity areas in Latin America and the Caribbean, 43.8% are not protected (*UBEP\_WCMC and IUCN, 2020*). Land use planning has been useful in the determination of protected areas that follow the IUCN classification and are under the category of national parks. category of national parks. It should be recognized that many of them appear only on paper. It is also necessary to consider that a significant percentage of parks, although clearly defined and legalized, do not have the human and financial resources for adequate management.

On the other hand, these instruments have often aimed to address situations faced by many low-income communities who, in search of housing, have settled in hillside areas, low-lying flood-prone zones, and other high-risk sectors where land value is negligible due to a lack of basic habitability conditions. And this form of occupation has taken its toll in human lives, in the deterioration of the quality of life and in the loss of natural resources.

It should be noted that measures have been taken in the region to protect wetland areas under the Ramsar Convention. In 1980 there were only 2010 hectares under protection, which increased to 9,596,136.1 in 1993, and to 70,920,739.0 in 2023. (see graph 22)

*Graph 22 Latin America and the Caribbean: Evolution of wetland areas under the Ramsar Convention*



Source: ECLAC, ECLAC, Economic Commission for Latin America and the Caribbean. United Nations

According to the Protected Planet database (WCMC/IUCN, 2020), the total marine surface of the Latin American and Caribbean region is 18,723,205 square kilometers, of which 3.8 million square kilometers, 20% of the marine surface of the region, correspond to marine protected areas (including those located beyond the exclusive economic zone).

It is important to consider that these land-use planning instruments should not be elaborated in the traditional way in which physical studies predominate, but that we should consider in a relevant way, social approaches and anthropological conditions, demographic trends, migrations and other population dynamics.

This instrument has been used for the preparation of urban growth and management plans. Its use should be intensified to avoid the occupation of areas of low or no habitability and the loss of highly productive agricultural areas. Unfortunately, it is common for the

positive effect to be nullified, on many occasions, by distortions derived from economic powers that speculate with land use.

The analysis of all these planning experiences leads to the conclusion that it is necessary to integrate at the highest level a real and dynamic territorial planning, supra-ministerial and decidedly binding, that analyzes how the population acts with its environment, what are the dynamics of its activities and projections and how the communities and their activities are inserted in territories with geo-climatic risks. The time has come to decide 7, 8 or 14 categories with defined vocations, with limitations of use, and with rights and obligations of the owners and occupants. This will be an important step forward in the management of the territories and in the drastic reduction of possible environmental conflicts derived from future productive undertakings.

An interesting experience carried out in some European countries and states of the United

States, plus some initiatives that are beginning in the Region, link sustainable public food purchases with school feeding programs and other similar programs, with the incorporation

of environmental standards related to clean production and healthy eating, a concept that refers to the reduction and even elimination of the use of agrochemicals.

## *I. Revaluing ancestral culture and education*

This generation and future generations have felt the brutal impact of bad economic development. It is necessary an essential social and economic transformation that lays the foundations of a new paradigm where the environment, the right of future generations and that of other species, are priority issues in the management of development, far beyond the short-term policies that governments are accustomed to use. Without the environment, there is no growth, let alone development. The recognition that future generations are also bearers of rights, with advocates representing their interests, has already been a topic of public discussion; it is now time to put this into action.

In pre-Columbian times, the region knew how to implement strategies to ensure the welfare of their communities and the conservation of their territories. Entire civilizations grew and developed thanks to their natural resources, and they also learned from their mistakes. Even today there is ancestral knowledge in the communities and native peoples, which must be listened to and recognized in the framework of facilitating - and not canceling - their own good living and evolution. It is necessary to learn their good practices.

We must emphasize that in the territories of several native peoples, deforestation is two to three times lower than in the protected areas of each country in which they live.

The new generations in Latin America have a fundamental role to play. They must take advantage of the mistakes of the past and transform their future. To this end, environmental education, an education for life, should be transversal at all educational levels, formal and informal. This environmental education is not just a mere green adjustment to reduce one or another consumption or recycle one or another material, which is useful, but totally insufficient. Education for life must contain an integration and dialogue of knowledge between the ancient and the modern, the ecological and the social and economic, to propose a radical transformation of the social system and money

## *J. Intensifying the contribution of science and technology*

The world is witnessing an unprecedented development of science and technology. The advances are spectacular, especially in communication, artificial intelligence and robotization. In medicine, scientific advances have prolonged human life by 15 to 20 years, and it is estimated that this process will continue in the future. We observe with amazement the spectacular innovations that are usually generated in developed countries. Many of them are known and admired, but they hardly reach Latin America and the Caribbean. Many remarkable technological innovations have been generated, but despite this the environment continues to deteriorate at an ever-increasing rate. Innovations do not arrive or only serve to partially alleviate the deterioration.

The model of technological generation, adoption and diffusion that predominates in most of the countries of the region corresponds to a structure of scientific-technological dependence that is currently complexified by global advances and the growing costs implementing science and technology. In some countries of Latin America and the Caribbean, it is believed that sending a contingent of professionals and researchers to more developed countries for postgraduate studies each year is enough to join the international circuit and receive all its benefits. Furthermore, we should fight for the freer use of scientific knowledge over and above corporate interests.

The marked regional technological dependence is increasing day by day. It is essential to scrutinize the effects of this dependence; to

know what the appropriation of surpluses through technological generation and adoption is; to investigate the effects of certain technologies on irreversible ecosystemic transformations and how the new ecosystemic and productive structures condition more demand for foreign technologies. Technological policies must be modified to prevent certain technologies from inducing the use of renewable resources beyond their regeneration rates. It is necessary to deepen how foreign models are influencing the use and restructuring of national spaces in the conservation and appropriation of biodiversity.

It is normal to hear discussions about the need to establish endogenous technology development policies and in some technical policy meetings there is a tendency to reflect about the negativity of foreign technologies, even though these are the ones that are used in a vast majority. This is not the problem. The dichotomy between endogenous and exogenous, the dichotomy between internal or external generation is false and misleading. For it does not matter where the technology comes from or who generates it; what should concern us is that the decision on its use is really our own, i.e., that it is endogenous.

To achieve genuinely endogenous technological decisions, it is essential to prioritize science—abundant science—along with the establishment of training programs focused on patenting and implementing scientific and technological advancements for the benefit of the countries in the region. And in this respect, there is a deficit in almost all

Latin America and the Caribbean. Technological adoption and adaptation require a significant scientific background. This is the only way to avoid growing dependence and is possibly the only way to close the gap that currently exists with the countries of the center. A network of research institutions with

complementary capabilities throughout the region is urgently needed. This seems to be the only viable endogenous way, while claiming that access to laboratories in the central countries should be regulated by UNESCO or UNDP.

### *K. Promoting Regional Integration*

In order to move towards, it is essential to significantly reduce economic, cultural and political dependence. This cannot be achieved by each country acting separately; rather, decisive steps must be taken to integrate Latin America and the Caribbean. This integration will not be easy because it will have to row against the current to break the ties of bilateral dependence.

The integration of Latin America was proposed more than five decades ago, precisely at the time when the European Community of Nations, the basis for the creation of the European Union, was being born. Progress was made in subregional integration, such as the Andean Community of Nations (1969), Mercosur (1991) and the Central American Integration System (1991), but although all these treaties achieved relative development, today they seem to be in decline.

Many facets must be considered for this integration, ranging from fostering a sense of regional belonging to addressing concrete issues, whether they encompass the entire region or are confined to specific areas or shared challenges, such as scientific and cultural development. The shared ecosystems, seas and basins, already mentioned above, show territories where there are wide margins for integration actions. The Amazon basin,

although almost 70% of its territory belongs to Brazil, also belongs to Peru, Colombia, Bolivia, Ecuador, Guyana, Suriname and Venezuela. The La Plata basin includes territories of Argentina, Brazil, Paraguay, Bolivia and Uruguay. The other major basin is the Orinoco basin shared by Colombia, Venezuela and Guyana. The Central American countries share several smaller, but very relevant basins for sub-regional integration. These include the Tampa, Montagua, Belize, Paz, Coca and San Juan basins. The Altiplano of Bolivia, Peru, Chile and Argentina is a very specific territory due to its high altitude. These last two countries also share Patagonia, a territory of great specificity due to its special climatic conditions.

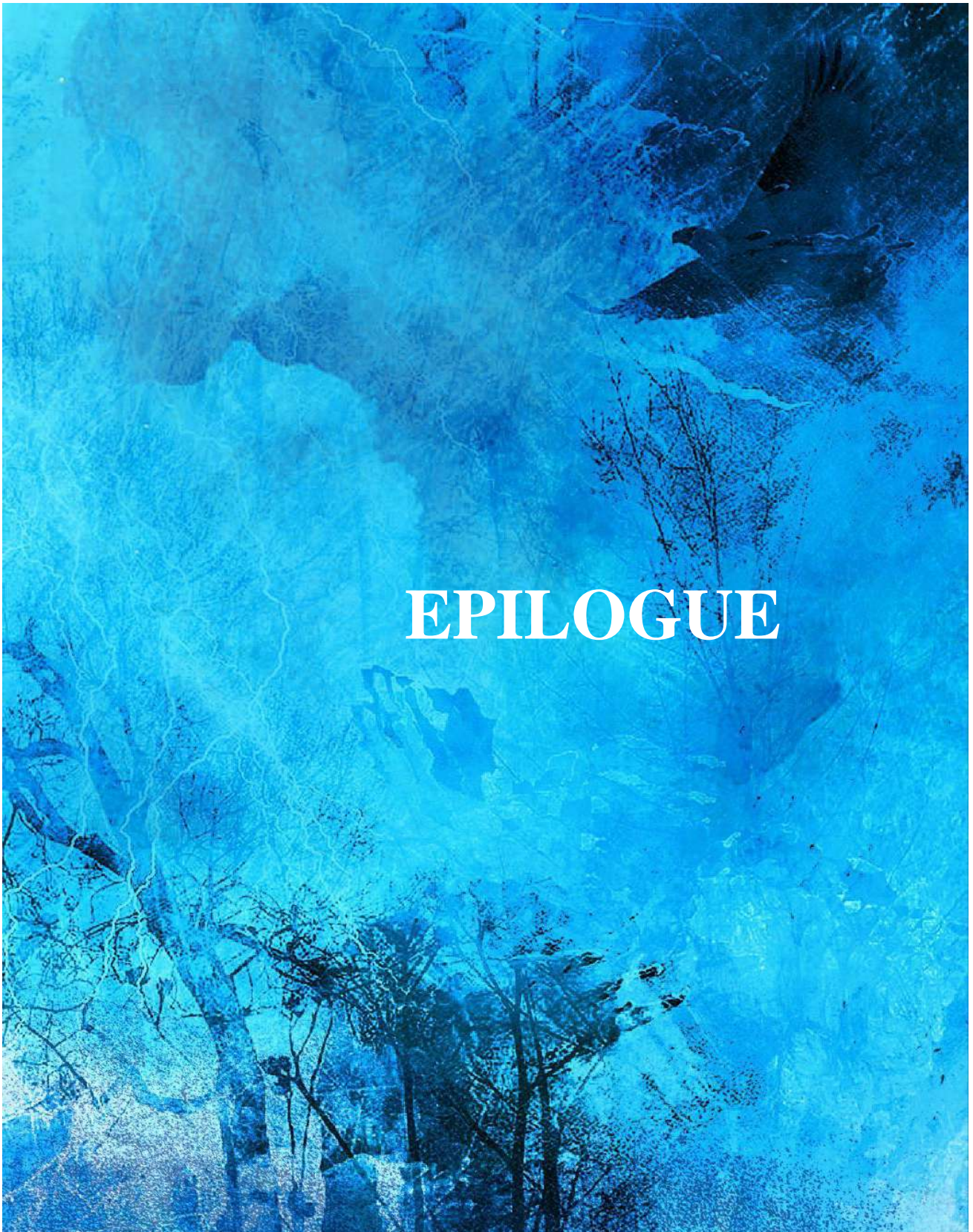
There are many other territories that correspond to shared ecosystems and ecosystems of great similarity and importance, such as the páramos, on whose water harvesting millions of people depend.

The OAS has ignored the environmental issue and ECLAC, which has addressed it, has not been able to convince governments beyond the important achievement of Escazú at the national level. It is essential to strengthen and/or create subregional mechanisms to protect shared ecosystems.

Consequently, from the environmental point of view, Latin American and Caribbean countries have a wide margin to jointly carry out projects of territorial and scientific research, natural

resource use, border decontamination, energy enhancement, etc. that incorporate high levels of environmental sustainability. The water crises and climate change put pressure to incorporate greater efforts for this integration.





## EPILOGUE

To pretend to remain in an extractive economy, based on economic growth sustained by the exploitation of nature, by unsustainable modes of production and by exacerbated consumerism that eats away at our environment and our people, is unfeasible and will have to change drastically.

The intensification, recurrence and acceleration of global conflicts such as the weight of war, the incidence of drug trafficking, illegal wildlife trafficking and the corruption that corrodes governments and institutions, leave a very worrying question mark over the future. To this we add the combination and complexity of scenarios where climate change, pollution, land use change and land appropriation are interrelated with the emergence of global and extreme poverty, together with significant increases in citizen, food and energy insecurity.

Today's financial structures threaten both nature and the most vulnerable societies. And the predatory interests that weigh on the countries of the Latin American and Caribbean region threaten the social stability and governance of their own communities. The international financial system will have to change and be linked, in addition to the externalities produced by productive transformations, with the rates of nature and with a society that is not only measured through money. It is necessary to emphasize that there are important initiatives and norms of international organizations to make investments more environmentally sustainable, as well as other initiatives for private banks to follow this path.

The growing external debt must be linked to and included in the growing ecological debt. It is necessary to generate new processes of environmental governance that become more effective in knowledge, processes and action, to promote effective environmental policies.

Process technologies are in addition to input technologies and must be adapted to the regional and cultural context of Latin America and the Caribbean, rich in an ancestral heritage, strongly linked to environmental and natural knowledge. The total economic value of nature and the ecosystem services it provides must be recognized and placed at its true value by global societies. Latin America and the Caribbean is a very important region as a provider of these services, sustainable energy and materials. In addition to its contribution to regional and global climate regulation, it is a great frontier that, productively and sustainably, can contribute first and foremost to improving the quality of life of millions of Latin Americans and Caribbeans, as well as helping with the provision of diverse, nutritious and environmentally friendly food.

Although more research and development of new technologies is needed, with what we already know and have, it is possible to halt environmental degradation in the region to a large extent; the lack of technologies and knowledge cannot be used as an excuse for environmental inaction.

The search for solutions, in addition to recognizing the main causes mentioned above and assessing the deterioration and its trends, involves, first and foremost, identifying policies and instruments that go beyond the

prevailing development and that have yielded positive results in environmental management.

In addition to the global agendas previously mentioned the Latin American and Caribbean region has its own with a clear environmental perspective: “Our Own Agenda” (document of the Commission on Development and Environment of Latin America and the Caribbean) focused on the coming decades, which is based on the effort to turn the environment into a political subject par excellence, as well as to strongly reduce poverty and hunger. On the other hand, it is based on the promotion of scientific dialogue and knowledge that promote the recognition of nature and biodiversity as an essential factor, proposing the necessary and indispensable equality of conditions for quality education, living conditions and a better distribution of income.

The first environmental ministries emerged from this region, today vilified or mistreated by both internal and external political actors. This

must change by reviving and strengthening capacities that will lead us to prioritize the environmental dimension in national, regional and global decision-making. In addition, we must seek solutions that go beyond national boundaries, when necessary, to enhance the rich macro-ecosystems shared by two or more countries.

The region is one of the richest in nature, culture and diversity. Moreover, it is free of some of the great evils that afflict the planet. Despite the negative reality of the state of our environment and its aforementioned trends, the environmental characteristics allow us to glimpse real scenarios of hope and opportunities. Society and scientists and researchers identify these issues. Many of the authors of this book have been raising them for many decades. We also showed the failures and learned from them. We currently hold out hope for a region that clearly has a defined future, a growing social demand for a healthy environment, and a struggle that has never faltered to take the future into our own hands.

### *The alternative facing the region*

*Persistence of the current situation:* Environmental degradation continues, adding to the growing impacts of climate change and the loss of ecosystems and biodiversity. This has repercussions on the economies of the region's countries, which, in order to alleviate the situation, encourage the overexploitation of natural resources. Environmental degradation, coupled with economic deterioration, results in a loss of the countries' capacity to adapt to the consequences of climate change. In the medium

term, the region exhibits high poverty rates, weakened economies, degraded environments, and institutional and political instability.

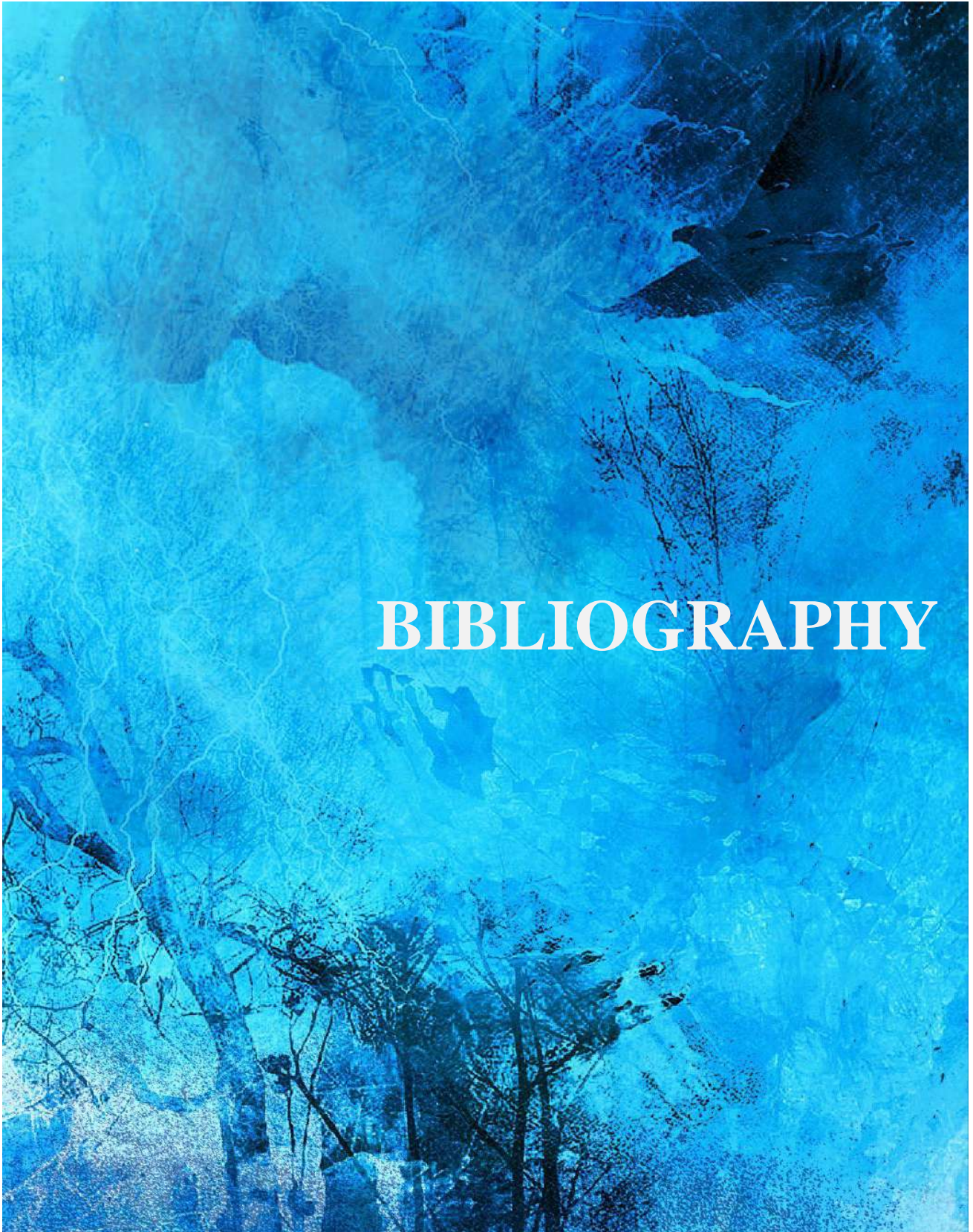
*Transformations towards desirable sustainability:* Most of the countries in the region have decided to seriously concentrate their efforts on changing the current development model towards a more socially cohesive development, based on a sound economy, and drastically reducing

environmental costs. The governments of Latin America and the Caribbean (driven by their people, alarmed by the situation and anxious about the future of their children and the aspirations of their youth) are implementing governance systems focused on satisfying human needs, respecting the dynamics of the systems themselves, and promoting a more socially responsible development model.

Consumerism, regarded in its own right, is gradually replaced by principles of austerity, sustainability and harmony, distinguishing the quality of life from the accumulation of material goods. The principles of solidarity, equity and sustainability are universally established. This leads to a change in consumption patterns, relative dematerialization of economies, and decoupling of economic growth from environmental deterioration. There is widespread recognition of the value of ecosystem services and their role in human well-being and ecosystem health. In the medium term, the region exhibits a sharp decrease in poverty, renewed economies, recovered environments, and institutional stability.

Latin America has some comparative advantages to changing course: in practice, it has likely experienced more instances of living with uncertainty than many countries around the world.

It has also generated original thinking in many aspects, not only from an environmental point of view, but also culturally, socially, economically, and technologically. It has a critical mass and shared cultural roots that, if mobilized in an articulated way, could have a great effect (something that would be more difficult in other more culturally fragmented regions). The change in trend is necessary and urgent. But not automatic. Only human determination will make it possible.



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Duisburg Society and Friedrich Ebert Foundation) and Mexico (World Bank/El Colegio de Mexico). Since 2016 he teaches graduate level courses on Environmental Management and Environment in Public Policy and is Coordinator of Diploma in Environmental Management of Waste Outputs and Circular Economy at the School of Government and Public Management of the University of Chile. Between 1978 and 1981 he worked at the United Nations Environment Programme (UNEP), at the headquarters in Nairobi, on clean technology and environmental economics. Between 1981 and 2010 he was a project expert and coordinator of courses on development and environment at the Latin American and Caribbean Institute for Economic and Social Planning (ILPES) and the Economic Commission for Latin America and the Caribbean (ECLAC). He was a consultant to the Brundtland Commission for the book "Our Common Future". He was head of the Environmental Economics Unit of the National Environmental Commission (CONAMA, 1996-2000) and deputy head of the Administrative Department of Environmental Protection at the United Nations Interim Administration Mission in Kosovo (2000-2001). He also served as advisor to the Ministry of Environment of Haiti (2008-2010). He was director of the Master in Environment and Sustainable Development at the Universidad Mayor (2006-2015) and director of the Diploma in Energy Efficiency at the same university. He is the author of several books, manuals on environmental impact assessment, articles, newspaper columns and documents on topics of his specialty. He is the author of the following books, among others: *"Desarrollo Sustentable en la Empresa. Estrategias público-privadas a nivel local"* (2008, chapter of the book *"De la economía global al desarrollo local"*, Universitat de València). *"SMEs in the environmental goods and services*

*market: identification of opportunities, policies and instruments. Case studies: Argentina, Chile, Colombia and Mexico"* (2006, Document ECLAC/GTZ, LC/W.42, editor). *"Economic instruments in local environmental management. Some proposals to stimulate recycling"* (2005, chapter in 'Environmental Management at the Local Level', Konrad Adenauer Foundation/Corporación Ambiental del Sur). *"Guías para la evaluación del impacto ambiental de proyectos de desarrollo local"* (1997, ILPES, United Nations, Santiago, with several reeditions. 1997 in Manizales, Universidad de Caldas, Colombia; 1998 in Cusco, Colegio Universitario Andino, Peru; and in 1998, corrected and enlarged edition: ILPES, United Nations, Santiago).

**MARGARITA MARINO DE BOTERO** - Born in Barranquilla (Colombia), she studied Anthropology, Philosophy and Arts, and Communication Sciences. Consultant for Latin America and the Caribbean for the INFOTERRA program, UNEP (1974-1976). Director General of the National Institute of Natural Resources and Environment (INDERENA, 1983-1986); member of the Board of Directors of *INTERPRESS Service*, Rome, Italy, (1986-1990); member of the World Commission on Environment and Development "Brundtland Commission" (1983-1987); member of the group "Rethinking International Governance", Minnesota University (1985); member of the Latin American and Caribbean Commission on Environment and Development UNDP, UNEP, IDB (1991); special advisor to the WCED conference, RIO'92; member of the editorial board of TIERRAMERICA and the *Green Globe Yearbook*, Oslo (1993); member of the board of *Globe 92*, Vancouver; Earth Day (1991, 1992, 1993); ECOED, Toronto; of ENDA Third World; of the IICA sustainable agriculture group, San José C. R. (1993);

special advisor to the DELORS Commission on Education for the 21st Century (UNESCO) (1993); member of the Board of Governors of the International Foundation for Development in Third World Countries (FIT) of Canada; coordinator of the Global Dialogues of STI Departments (Colciencias, Colombia, 1993); member of the Board of Governors of the International Foundation for Development in Third World Countries (FIT) of Canada; coordinator of the Global Dialogues of STI Departments (Colciencias, Colombia, 1993). (Colciencias, 1997-1999); vice-chair of the International Board of Expo 2000 (Hannover, Germany, 1999-2000); vice-chair of the International Board of the Center for Development Research (ZEF), University of Bonn, Germany (1999-2004); executive director of the Congress of Environmental Sciences and Technologies, chaired by the Colombian Academy of Exact Sciences, Physics, Physics and Technology (Academia Colombiana de Ciencias Exactas, Física y Física, Colombia, 1999-2004). In Colombia, she founded and directs the Center for Studies and Documentation “El Colegio Verde” since 1987. She has received several recognitions from Colombian Universities. In 2024 she was honored by PNN with a newly discovered orchid and a Colombian stamp in her name. She is also a member of the Grupo de Pensamiento y Acción Ambiental Latinoamericano (GRUPALA). Outstanding contributions: *"Ecodesarrollo. El pensamiento del decenio"* (1983, INDERENA/UNEP, editor). *"El libro de los conejos verdes"* (1986, INDERENA FESCOL). *Our Common Future*, (1987, CMMD, Alianza Editorial 1992) (Consultant). *Our Common Future* (1987 CMMD, Alianza Editorial (Consulting).

**CESAR MORALES ESTUPIÑÁN** - Born in Esmeraldas (Ecuador), he is an agronomist engineer from the University of Chile, with a

major in Agricultural Economics. He studied at the Faculty of Economic Sciences of the University of Guayaquil (Ecuador), has a diploma in Development Planning and Public Policies, by the Latin American and Caribbean Institute for Economic and Social Planning (ILPES) of the Economic Commission for Latin America and the Caribbean (ECLAC), United Nations, and a doctorate in the Study of Latin American Societies, with mention in Environmental Economics, joint program of the *Sorbonne Université*, France and the University of Art and Social Sciences (ARCIS), Chile. ARCIS University (Chile France). Visiting Professor at *Davis University*, California, USA; Universidad Internacional de Andalucía, Universidad de Barcelona and Universidad Autónoma de Barcelona, Spain; Universidad de Costa Rica (UCR) and Universidad Nacional de Costa Rica (UNA), Professor at Universidad de Chile, School of Government, Climate Change and Public Policies and Economics of Desertification. Director of the Development Division of the Ecuadorian Center for Development Studies (CENDES), Director of Studies of the Agroindustrial Committee, Corporación de Fomento de la Producción, Chile. ECLAC Officer, Agricultural, Productive Development and Sustainable Development Divisions. Head of the ECLAC/GIZ/UNCCD Project on “Inaction Costs of Desertification and Land Degradation for Latin America and the Caribbean”. Member of the scientific committee of the UNCCD, Member of the *Economics of Land Degradation* initiative (GIZ - UNCCD). Advisories: to agro-industrial companies in Chile and Ecuador; to the Minister of Planning of Costa Rica; to the Undersecretary of the Ministry of Social Development, Chile and to the Presidential Delegate for Water Resources, Chile, and to UNCCD Representatives for Latin America and the Caribbean. Consultancies in ECLAC,

FAO, UNDP, World Bank, IDB and GIZ on economic and social impacts of natural disasters, financing for the Environment; and Evaluation of Nature-Based Adaptation Measures (Peru and Tajikistan). Relevant related publications: “*Land Degradation Hotspots in Latin America and the Caribbean*” (Joint Research Center of the European Union, in publication, co-author); “*Global Land Outlook*” (2019, UNCCD author of Thematic Report for the UNCCD COP [https://catalogue.unccd.int/1221\\_GLO\\_LAC\\_S.pdf](https://catalogue.unccd.int/1221_GLO_LAC_S.pdf)); “*Two convergent methods to Estimate the Costs of Desertification*” (2015), *Studies of inaction costs of land degradation in Chile, Peru, Ecuador, Paraguay, Costa Rica, Panama, Guatemala, Dominican Rep., Nicaragua* (author, available in ECLAC repositories). “*Poverty, desertification and natural resource degradation*” (2005, co-author ECLAC) [https://www.cepal.org/sites/default/files/publication/files/2448/S0500967\\_es.pdf](https://www.cepal.org/sites/default/files/publication/files/2448/S0500967_es.pdf)).

**FERNANDO ORTIZ MONASTERIO** - Born in Mexico City, his political and professional center of operation. He is an electromechanical engineer graduated from the Universidad Iberoamericana and did postgraduate studies at the Development Planning Unit of the *University College* of London. He taught at the School of Industrial Design at the Universidad Autónoma Metropolitana and was a researcher for the Development and Environment Program at El Colegio de México. He was a member of the Mexican Academy of Human Rights and of Amnesty International

where in the 1970's he was responsible for the Campaign for the Abolition of Torture in Latin America, which contributed to Amnesty International receiving the Nobel Peace Prize in

1977. Between 1970 and 2024 he has carried out more than 1,000 environmental engineering projects, with emphasis on environmental restoration, hazardous industrial waste management and the planning and management of protected natural areas. In addition, he was founder of the National Association of Solar Energy (ANES) and the Mexican Conservation Federation (FECOMEX), and as a member of Monarca A.C. he operated the Monarch Butterfly Reserve from civil society. Between 2000 and 2003 he was Executive Secretary of the Inter-Secretarial Commission for Biosafety of Genetically Modified Organisms (CIBIOGEM). From 2014 to 2017 he directed the University Network for Disaster Prevention and Response (UNIREP). He currently militates in the pacifist global organizations of social disobedience: *Scientific Rebellion* and the *Union for Climate Justice*. She is part of the group *Con-ciencia* and cultivates relationships with and teachings of native peoples of Mexico. His publications include: “*Introducción al Estudio a la Contaminación en la Nave Espacial Tierra*” (1973); *Tierra Profanada. La Historia Ambiental de México*, (1985, National Institute of Anthropology and History, Mexico DF). “*Manejo de los Desechos Industriales Peligrosos en México*” (1987, Fundación Universo Veintiuno). “*Cosmos in a Microscope. The Life of Alfonso L. Herrera (1869-1942)*”. *Vanguard in Biology and Conservation* (2019, Biblioteca Pública del Estado de Jalisco Juan José Arreola, Mexico, author).

**DANIEL PANARIO** - Born in Montevideo, he is an agricultural engineer graduated from the University of the Republic, Uruguay. He holds a Diploma of Advanced Studies in Conservation and Management of the Natural Environment and a PhD in Environmental Technology and Water Management, both from the International University of Andalusia



(Spain). He is a full professor at the Institute of Ecology and Environmental Sciences (IECA), Faculty of Sciences, Udelar. At that institution he is Coordinator of the graduate program in Environmental Sciences (specialist, master and doctorate) and was Director of the IECA until May 2024. He is categorized as Level II of the National System of Researchers (SNI) and grade 4 of PEDECIBA (Basic Sciences Development Program) in the Geosciences Area. He has been a visiting professor at graduate and postgraduate levels, and lecturer at numerous universities in Europe and America. He was Head of Land Investigations of the Ministry of Livestock and Agriculture, Directorate of Soils (1968-1991), being co-author of the Soil Map of Uruguay and the detailed cartography at parcel scale. He was a consultant for IDRC/CIID, United Nations (UNDP and UNEP) and OAS (IIN). He was Associate Researcher at GEOLITTOMER-Nantes (UMR 6554, CNRS), France. He has been visiting researcher of the project "Environmental Governance in Latin America and the Caribbean: developing frameworks for the sustainable and equitable use of natural resources (ENGOV)" at the Gino Germani Research Institute (IIGG), Argentina. He has integrated the Working Groups "Climate justice and environmental governance" (2016-2019) and "Global environmental change/local social metabolism" (2019-2022) and currently the WG "Social metabolism, environmental justice" (2022-2025) of the Latin American Council of Social Sciences (CLACSO). The Latin American Development Center (CELADE) has awarded him the National Award for Citizen Excellence and Golden Citizen (2012) for his work in teaching and environmental knowledge. He is the author or co-author of 130 publications (refereed articles, books and book chapters), as well as numerous scientific reports (see: [https://n9.cl/cvuy-sni-anii-daniel\\_panario](https://n9.cl/cvuy-sni-anii-daniel_panario)). The following books or

chapters stand out: "*Classification of ecoregions and determination of site and condition*" (1993, REPAAN, Chile). "*Towards another development: an environmental perspective*" (1998, together with Héctor Sejenovich). "*Poverty and sustainable development in environmental governance in Latin America* (2015, CLACSO); *Landscape declassification system for Uruguay. Tool for planning and conservation*" (2016, UNIA). "*Challenges and Opportunities for Food and Nutrition Security in the Americas. The Point of View of the Academies of Sciences*" (2017, co-author chapter).

**WALTER PENGUE** - Born in San Martín, province of Buenos Aires (Argentina), he is an agronomist engineer, with a specialization in Plant Breeding (Plant Breeding) and a master's degree in environmental and Territorial Policies, graduated from the University of Buenos Aires. He has a PhD in Agroecology from the University of Cordoba (Spain) and completed a postdoctoral fellowship on Biosafety at the Integrated Biosafety Research Centre (INBI) in New Zealand. He was founder of the Argentine-Uruguayan Association of Ecological Economics (ASAUEE) and president and member of the World Council of the International Society for Ecological Economics (ISEE), as well as founding member of the Latin American Scientific Society of Agroecology (SOCLA). He is a member of the International Resource Panel and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Since 2016 he was a member of the Executive Committee of The Economics of Ecosystems and Biodiversity (TEEB) for Agriculture and Food initiative. He is director of the Landscape Ecology and Environment Group (GEPAMA) at the University of Buenos Aires and full professor of Ecological Economics, Instituto del Conurbano (ICO) of

the National University of General Sarmiento (Argentina). Visiting professor at different universities in America, Europe, Asia and Oceania. He is a member of the Argentine Academy of Environmental Sciences. He has been lead author of the IPCC (Round 6) (2020 to 2023). He is Coordinator of authors of the IPBES global document (2020/2024) entitled *NEXUS, Thematic Assessment on Interactions between Biodiversity, Water, Food Systems, Health and Climate Change*. The following publications stand out: *“Transgenic crops: where are we going?”* (2000). *“Industrial agriculture and transnationalization in Latin America: the transgenesis of a continent?”* (2005). *“Environmental thought from the South: complexity, resources and Latin American political ecology”* (compiler and author, 2017). *“Agroecology, environment and health: productive green shields and sustainable villages”* (co-editor and author, 2018). Numerous articles and books on ecological economics, agroecology, agriculture and agri-food systems. His latest book is *“Ecological Economics, Natural Resources and Food Systems Who Eats Whom?”* (His work can be downloaded from Researchgate: <https://www.researchgate.net/profile/Walter-Pengue>).

**MANUEL RODRÍGUEZ BECERRA** - Born in Bogotá, he is an industrial engineer from the Universidad de los Andes and holds a *Bachelor of Philosophy* in Management from *Oxford University*, England. He has received the following distinctions: Best Leader of Colombia, awarded by the Leadership and Democracy Foundation, 2013; Grand National Medal for Education “Agustín Nieto Caballero”; Grand Cross of the Order of Merit in Engineering, Julio Garavito; National Distinction for the Environment, and Professor Emeritus of the Universidad de los Andes. He was Colombia's first Minister of the

Environment and general manager of the National Institute of Renewable Natural Resources and the Environment (INDERENA), where he coordinated the drafting of the law that created the Ministry of the Environment and the National Environmental System (1990-1994). He was a member of the World Commission on Forests and Sustainable Development and chaired the United Nations Forum on Forests on two occasions (1996-1999 and 2003-2005). Since 1971 he has been linked to the Universidad de los Andes, where he served (1976-1990) as Dean of the Faculty of Arts and Sciences, Dean of the Faculty of Administration and Academic Vice-Rector. Since 2001 he has been teaching and researching in the School of Management in the fields of environmental policy, sustainable development and international environmental relations. He is co-founder of the National Environmental Forum (1998), which he chairs, of the National Parks How We Go Alliance (2017), of the Center for Sustainable Development Goals

for Latin America and the Caribbean (2018) and the Alliance for the Defense of the Bogotá Savannah (2019). He is the author and editor of 30 books (see at <https://manuelrodriguezbecerra.com/libros/>) and numerous articles, and a columnist for the newspaper *El Tiempo*. His most recent books are *“Governance and Management of Sustainable Development”* (2018, co-editor). *“Our Planet, Our Future”* (2019, Penguin-Random House). *“Present and future of the environment in Colombia”* (2023, Penguin-Random House).

**ALEJANDRO ROFMAN** - Born in Rosario (Argentina), he holds a PhD in Economics from the National University of Córdoba and a BA in Economics from the University of

Pennsylvania (USA, 1965). He completed postgraduate studies in Urban and Regional Planning at the Universidad Nacional del Litoral (Argentina, 1962-1963). He is Doctor Honoris Causa, the highest distinction at the National Universities of Entre Ríos, Salta and Rosario (Argentina). Since 1965 he has been a senior researcher at the Centro de Estudios Urbanos y Regionales (CEUR) in Argentina. He is currently a senior researcher at the National Council for Scientific and Technical Research (CONICET) at that center. He was Director of Studies of the Secretariat of Regional Development (1984-1985), in Argentina, and Undersecretary of Regional Development of the City of Buenos Aires. He has held undergraduate and graduate teaching positions at universities in Argentina, the Pontifical Catholic University of Chile, the Federal University of Rio Grande do Sul (Brazil), the Hebrew University of Jerusalem (Israel) and the University of the Republic (Uruguay). He is a professor of Economics in the Bachelor's Degree in Economics at the Faculty of Economics of the University of Buenos Aires and director of the PhD program in Economics at the Universidad Nacional de Buenos Aires. He has published numerous articles and books on regional development, urban and regional environment, regional economies and urban economies. His most significant book is *“Las economías regionales: luces y sombras de un ciclo de grandes transformaciones” 1995-2007* (2012).

**RENÉ SAA VIDAL** - Born in Chuquicamata (Chile), since graduating from the University of Chile he has lived, for work reasons, in addition to Santiago, in Colombia, Ecuador, the United States, Guatemala, Mexico and the Dominican Republic. After graduating as a geographer from the University of Chile, he pursued graduate studies at the University of Colorado (USA), with a master's degree in Geography,

and is a doctoral candidate at the same university. He also studied remote sensing at the University of Michigan (USA). Between 1960 and 1973, he participated in Chile in the creation of the Instituto de Investigación de Recursos Naturales (IREN), where he became deputy executive director. After the return of democracy, he was an advisor to the Natural Resources Information Center (CIREN), executive director of the Forestry Institute (INFOR) and an official of the National Institute of Statistics (INE). For 22 years he worked as an international expert in various regional and agricultural planning projects, both in Latin America and Africa, in United Nations agencies and financial organizations such as the World Bank and the Inter-American Development Bank (IDB). Professor (TA) at the University of Colorado at Boulder and at the Metropolitan State College of Denver (USA). Currently, Adjunct Professor in Undergraduate and Postgraduate and researcher at the Center for Public Policy Analysis at the School of Government of the University of Chile. The following publications stand out: *“Estado del Medio Ambiente y del Patrimonio Natural en Chile”* (2022, Universidad de Chile, co-author of chapter, <https://uchile.cl/publicaciones/206797/informe-pais-estado-del-medio-ambiente-y-del-patrimonio-natural-2022>); and *“Estado del Medio Ambiente en Chile 2018”* (2019, <https://uchile.cl/publicaciones/159662/informe-pais-estado-del-medio-ambiente-en-chile-2018>).

**OSVALDO SUNKEL WEIL** - Born in Puerto Montt (Chile), he studied Economics and Administration at the University of Chile, and took postgraduate courses at the Economic Commission for Latin America and the Caribbean (ECLAC) and the

the Caribbean (ECLAC) and the London School of Economics and Political Science. In 1994, he received the Kalman Silvert Award, the highest distinction of the Latin American Studies Association (LASA). During his career he has been linked to different institutions: ECLAC and the University of Chile since 1952; the *Institute of Development Studies* (IDS) (UK), between 1975 and 1986, and the Corporación de Investigaciones para el Desarrollo (CINDE) since 1987. He has worked for ECLAC in many Latin American countries, especially Brazil, Chile, Mexico, Panama and Central America. Since its creation in 1962, he joined ECLAC's Latin American and Caribbean Institute for Economic and Social Planning (ILPES). He directed the ECLAC/UNEP Joint Unit on Development and Environment of ECLAC and was director of the publication *Pensamiento Iberoamericano*. He is a full professor at the University of Chile; he was co-founder and professor-researcher of the Institute of International Studies (IEI), coordinator of the Sustainable Development Program, director of the Center for Public Policy Analysis (CAPP) and director of the Institute of Public Affairs (INAP), all at the University of Chile. He was also *Professorial Fellow* at the *Institute of Development Studies*, visiting professor at the Latin American Faculty of Social Sciences (FLACSO) and the Pontificia Universidad Católica de Chile, El Colegio de México, the University of Paris, the Max Planck Society and the University of Texas at Austin, Duke University, the University of California (Los Angeles) and the University of Florida (Bacardi Chair for Eminent Scholars). He has published numerous books and chapters, of which the following stand out: “*El Subdesarrollo Latinoamericano y la Teoría del Desarrollo*” ( Siglo XXI Editores, 1970 + 16 editions). “*Estilos de desarrollo y medio ambiente en la América Latina*” (selection with N. Gligo) Introduction:

‘*La interacción entre los estilos de desarrollo y el medio ambiente en la América Latina*’ (*The interaction between development styles and the environment in Latin America*) Mexico: Fondo de Cultura Económica. 1980. 2v. *The Debt and Development Crises in Latin America: The End of an Illusion*” (co-authored by Sthefany Griffith-Jones) (1987, Buenos Aires: GEL) ” *Development from Within. Un enfoque neoestructuralista para la América Latina*” (1991, Fondo de Cultura Económica).

**JOSÉ JOAQUÍN VILLAMIL** - Born in San Juan (Puerto Rico), where he currently resides, he studied Economics and Regional Science at the University of Pennsylvania (United States). He has received several distinctions, among them the *John Simon Guggenheim Memorial Foundation* Fellowship for his work on small economies. He received an Honorary Doctorate from the Universidad Metropolitana in San Juan (Puerto Rico). Fondos Unidos de Puerto Rico awarded him twice with the Antonio R. Barceló Award for his contributions to the community-based organizations sector. The Puerto Rico Chamber of Commerce honored him for his contributions to economic development. He was the author of Puerto Rico's Science and Technology Policy in 1996 and of several initiatives for regional technological development and economic development on the island, including the strategic plan for foreign trade. He was founding director of the Puerto Rico Community Foundation and the *Aspen Institute*'s Nonprofit Sector Research Support Fund in the United States. He is a professor at the Graduate School of Planning of the University of Puerto Rico, visiting professor at Harvard University, visiting professor at the *Institute of Development Studies* (IDS) (UK) and guest lecturer at various universities in Europe, the United States and Latin America. He has published extensively on development,

globalization and small economies. His work includes: “*Decision-making under conditions of extreme resource scarcity*” ( 1973, PLERUS, Puerto Rico). “*Transnational Capitalism and National Development*” (1981, compiler, Fondo de Cultura Económica). Chapters of the previous book “*Puerto Rico 1948-1976: the limits of dependent development*”. “*Planning for Autonomous*

*Growth: Concept of Development Styles*”, in: *In Sunkel Osvaldo and Nicolo Gligo (selection) “Estilos de desarrollo y medio ambiente en la América Latina”* Mexico: Fondo de Cultura Económica. 1980. 2v. El Trimestre Económico Lecturas 36. “*Reconstructing a Destructured Society* (2020, *article in Perspectivas*, Puerto Rico).