v. 5, n. 4, 2025

Scientific Journal of Applied Social and Clinical Science

MITIGATING AND ADAPTING TO CLIMATE CHANGE

Cristiano Queiroz Lima

Acceptance date: 26/02/2025

Abstract: Climate change is currently a recurring theme in the mass media. The fact is that most of the population is unaware of the problem, but is suffering the consequences of climate change. So, what can we do to involve everyone in government and society to initiate a change that we know will have long-term results, but we need to start. In this context, this article seeks to present the discussions about climate change, as well as analyzing the involvement of society and government in climate change today. Finally, this article aims to show what we can all do - governments, society and the private sector - to mitigate the impacts of climate change, given that it is not a simple task, as it involves a series of measures that are difficult to implement, have a high cost and require time in the medium to long term. But we have to start and try to take action for the future of the planet.
Keywords: Climate change; Global warming; Climate adaptation.

INTRODUCTION

In the middle of the 21st century, we are seeing climate change everywhere - high temperatures everywhere on all continents, unexpected storms and floods, rising sea levels, people and animals dying from heatwaves, extreme droughts - in short, signs that indicate there is an imbalance on the planet.

What is causing this? It's certainly not a recent occurrence. Over the years, planet Earth has been punished with pollution of all kinds in land, water and air, followed by rampant deforestation in the name of development. In other words, the planet has been damaged for many years and every day the consequences of these disordered actions are being concretely demonstrated through the unbalanced phenomena we are experiencing around the world.

For example, glaciers and Antarctica are no longer the same, they are melting and shrinking every day. Another concrete example is the city of Venice in Italy, where the sea level rises every year and causes flooding in the streets. In short, there are countless examples we can cite in Brazil and around the world that more than demonstrate that the planet needs healing.

But how can we make or at least begin to make a change in order to get back on the road to balance so that new generations can reap the rewards of these changes and live in a better, more balanced world?

This article aims to show what we can all do - governments, society and the private sector - to mitigate the impacts of climate change. This is not a simple task, as it involves a series of measures that are difficult to implement, have a high cost and take time in the medium to long term. But we have to start and try to take action for the future of the planet.

THEORETICAL BACKGROUND

Art. 1 º This Law institutes the National Policy on Climate Change - PNMC and establishes its principles, objectives, guidelines and instruments.

Art 2 º For the purposes of this Law, the following definitions shall apply:

> I - adaptation: initiatives and measures to reduce the vulnerability of natural and human systems to the current and expected effects of climate change;
>
> II - adverse effects of climate change: changes in the physical environment or biota resulting from climate change that have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems, on the functioning of socio-economic systems or on human health and well-being;

III - emissions: release of greenhouse gases or their precursors into the atmosphere in a specific area and over a given period;

IV - source: process or activity that releases greenhouse gas, aerosol or greenhouse gas precursor into the atmosphere;

V - greenhouse gases: gaseous constituents, natural or man-made, which absorb and re-emit infrared radiation in the atmosphere;

VI - impact: the effects of climate change on human and natural systems;

VII - mitigation: technological changes and substitutions that reduce the use of resources and emissions per unit of production, as well as the implementation of measures that reduce greenhouse gas emissions and increase sinks;

VIII - climate change: a change in climate that can be directly or indirectly attributed to human activity that alters the composition of the world's atmosphere and that is added to that caused by natural climate variability observed over comparable periods;

IX - sink: process, activity or mechanism that removes greenhouse gas, aerosol or greenhouse gas precursor from the atmosphere; and

X - vulnerability: the degree of susceptibility and incapacity of a system, depending on its sensitivity, adaptive capacity, and the character, magnitude and rate of change and variation of the climate to which it is exposed, to deal with the adverse effects of climate change, including climate variability and extreme events.

Art. 3 º The PNMC and the actions arising from it, carried out under the responsibility of political entities and public administration bodies, will observe the principles of precaution, prevention, citizen participation, sustainable development and common but differentiated responsibilities, the latter at the international level, and the following will be taken into account with regard to the measures to be adopted in its implementation:

I - everyone has the duty to act, for the benefit of present and future generations, to reduce the impacts of anthropogenic interference on the climate system;

II - measures will be taken to predict, avoid or minimize the identified causes of climate change of anthropogenic origin in the national territory, on which there is reasonable consensus by the scientific and technical circles involved in the study of the phenomena involved;

III - the measures taken must take into account the different socio-economic contexts in which they are applied, distribute the resulting burdens and charges between the economic sectors and the populations and communities concerned in an equitable and balanced manner, and weigh up individual responsibilities regarding the origin of the emitting sources and the effects caused on the climate;

IV - sustainable development is the condition to face climate change and reconcile meeting the common and particular needs of populations and communities living in the national territory;

V - actions at national level to tackle current, present and future climate change must take into account and integrate actions promoted at state and municipal level by public and private entities;

VI - (VETOED)

Art. 4 º The National Policy on Climate Change - PNMC will aim to:

I - the compatibility of economic and social development with the protection of the climate system;

II - the reduction of anthropogenic greenhouse gas emissions in relation to their different sources;

III - (VETOED);

IV - strengthening anthropogenic removals by greenhouse gas sinks in the national territory;

V - the implementation of measures to promote adaptation to climate change by the 3 (three) spheres of the Federation, with the participation and collaboration of the economic and social agents concerned or beneficiaries, in particular those especially vulnerable to its adverse effects;

VI - the preservation, conservation and recovery of environmental resources, with particular attention to the major natural biomes considered to be National Heritage;

VII - consolidating and expanding legally protected areas and encouraging reforestation and the restoration of vegetation cover in degraded areas;

VIII - encouraging the development of the Brazilian Emissions Reduction Market (MBRE).

Sole paragraph. The objectives of the National Policy on Climate Change must be in line with sustainable development in order to seek economic growth, the eradication of poverty and the reduction of social inequalities.

Art. 5 (O) The guidelines of the National Policy on Climate Change are:

I - the commitments assumed by Brazil in the United Nations Framework Convention on Climate Change, the Kyoto Protocol and other documents on climate change to which it becomes a signatory;

II - climate change mitigation actions in line with sustainable development, which are, whenever possible, measurable so that they can be properly quantified and verified a posteriori;

III - adaptation measures to reduce the adverse effects of climate change and the vulnerability of environmental, social and economic systems;

IV - integrated climate change mitigation and adaptation strategies at local, regional and national level;

V - encouraging and supporting the participation of federal, state, district and municipal governments, as well as the productive sector, academia and organized civil society, in the development and implementation of policies, plans, programs and actions related to climate change;

VI - the promotion and development of scientific and technological research, and the dissemination of technologies, processes and practices aimed at:

a) mitigate climate change by reducing anthropogenic emissions by sources and strengthening anthropogenic removals by sinks of greenhouse gases;

b) reduce uncertainties in future national and regional projections of climate change;

c) identify vulnerabilities and adopt appropriate adaptation measures;

VII - the use of financial and economic instruments to promote actions to mitigate and adapt to climate change, subject to the provisions of Article 6º;

VIII - the identification, and its articulation with the Policy provided for in this Law, of already established instruments of government action capable of contributing to protecting the climate system;

IX - supporting and encouraging activities that effectively reduce emissions or promote removals by greenhouse gas sinks;

X - the promotion of international cooperation at bilateral, regional and multilateral level for the financing, training, development, transfer and dissemination of technologies and processes for the implementation of mitigation and adaptation actions, including scientific research, systematic observation and the exchange of information;

XI - improving the systematic and precise observation of the climate and its manifestations in the national territory and contiguous ocean areas;

XII - promoting the dissemination of information, education, training and public awareness on climate change;

XIII - encouragement and support for maintenance and promotion:

a) low greenhouse gas emission practices, activities and technologies;

b) sustainable production and consumption patterns.

Art. 6 (O) The instruments of the National Policy on Climate Change are:(Regulation)

I - the National Plan on Climate Change;

II - the National Climate Change Fund;

III - the Action Plans for the Prevention and Control of Deforestation in the biomes; (See Decree No. 10.142, of 2019)

IV - Brazil's National Communication to the United Nations Framework Convention on Climate Change, in accordance with the criteria established by this Convention and its Conferences of the Parties;

V - the resolutions of the Interministerial Commission on Global Climate Change;

VI - fiscal and tax measures designed to stimulate the reduction of emissions and removal of greenhouse gases, including differentiated rates, exemptions, compensation and incentives, to be established idos in a specific law;

VII - specific lines of credit and financing from public and private financial agents;

VIII - the development of research lines by development agencies;

IX - specific appropriations for climate change actions in the federal budget;

X - the financial and economic mechanisms for mitigating climate change and adapting to the effects of climate change that exist under the United Nations Framework Convention on Climate Change and the Kyoto Protocol;

XI - financial and economic mechanisms, at national level, relating to climate change mitigation and adaptation;

XII - existing measures, or those to be created, to stimulate the development of processes and technologies that contribute to the reduction of greenhouse gas emissions and removals, as well as to adaptation, including the establishment of preference criteria in public tenders and competitions, including public-private partnerships and the authorization, permission, grant and concession for the exploitation of public services and natural resources, for proposals that provide greater savings in energy, water and other natural resources and a reduction in greenhouse gas emissions and waste;

XIII - records, inventories, estimates, evaluations and any other studies of greenhouse gas emissions and their sources, drawn up on the basis of information and data provided by public and private entities.

XIV - dissemination, education and awareness-raising measures;

XV - national climate monitoring;

XVI - sustainability indicators;

XVII - the establishment of quantifiable and verifiable environmental standards and targets for the reduction of anthropogenic emissions by sources and anthropogenic removals by sinks of greenhouse gases;

XVIII - assessing environmental impacts on the microclimate and macroclimate.

Art. 7 º The institutional instruments for implementing the National Climate Change Policy include:

I - the Interministerial Committee on Climate Change;

II - the Interministerial Commission on Global Climate Change;

III - the Brazilian Climate Change Forum;

IV - the Brazilian Research Network on Global Climate Change - Rede Clima;

V - the Commission for the Coordination of Meteorology, Climatology and Hydrology Activities.

Art. 8 º Official financial institutions will make specific credit and financing lines available to develop actions and activities that meet the objectives of this Law and are aimed at inducing the conduct of private agents to comply with and implement the PNMC, within the scope of their social actions and responsibilities.

Art. 9 º The Brazilian Emissions Reduction Market (MBRE) will be operated on commodities and futures exchanges, stock exchanges and organized over-the-counter entities authorized by the Brazilian Securities Commission (CVM), where securities representing certified avoided greenhouse gas emissions will be traded.

Art. 10. (VETOED)

Art. 11. The principles, objectives, guidelines and instruments of public policies and government programs must be compatible with the principles, objectives, guidelines and instruments of this National Policy on Climate Change.(Regulation)

Sole Paragraph. Decrees of the Executive Branch will establish, in line with the National Policy on Climate Change, sectoral plans for mitigating and adapting to climate change, with a view to consolidating and a low-carbon economy, in the generation and distribution of electricity, in urban public transport and in interstate freight and passenger transport systems, in the manufacturing industry and in consumer durables, the fine and basic chemical industries, the pulp and paper industry, mining, the construction industry, health services and agriculture, with a view to meeting gradual targets for reducing quantifiable and verifiable anthropogenic emissions, taking into account the specificities of each sector, including through the Clean Development Mechanism (CDM) and Nationally Appropriate Mitigation Actions (NAMAs).

Art. 12: In order to achieve the objectives of the PNMC, the country shall adopt, as a voluntary national commitment, actions to mitigate greenhouse gas emissions, with a view to reducing its projected emissions by between 36.1% (thirty-six and one-tenth percent) and 38.9% (thirty-eight and nine-tenths percent) by 2020. etadas.(Regulation)

The projection of emissions for 2020 as well as the details of the actions to achieve the objective expressed in the caput will be established by decree, based on the second Brazilian Inventory of Anthropogenic Emissions and Removals of Greenhouse Gases not Controlled by the Montreal Protocol, to be concluded in 2010.

According to the Federal Official Gazette - Section 1 - Extra Edition - A - 19/5/2022, Page 1 the publication DECREE No. 11.003, OF MARCH 21, 2022 establishing the Federal Strategy to Encourage the Sustainable Use of Biogas and Biomethane

Art. 1 The Federal Strategy to Encourage the Sustainable Use of Biogas and Biomethane is hereby established, with the following objectives:

I - encourage programs and actions to reduce methane emissions;

II - encourage the use of biogas and biomethane as renewable sources of energy and fuel; and

III - to contribute to the fulfillment of the commitments undertaken by the country within the scope of:

a) the United Nations Framework Convention on Climate Change, promulgated by Decree No. 2,652 of 1, July1998;

b) the Glasgow Climate Pact; and

c) the Global Methane Commitment.

Art. 2 The bodies and entities of the direct federal public administration, autarchic and foundations will consider, where appropriate, the Federal Strategy for Encouraging the Sustainable Use of Biogas and Biomethane in their strategic planning, programs and institutional actions.

Art. 3 For the purposes of this Decree, the following are considered:

I - biogas - raw gas whose composition contains methane obtained from renewable raw materials or organic waste;

II - biomethane - gaseous biofuel consisting essentially of methane, derived from the purification of biogas, in compliance with the specifications established by the National Petroleum, Natural Gas and Biofuels Agency (ANP);

III - methane credit - a financial, environmental, transferable asset representing the reduction or removal of one ton d and methane, which has been recognized and issued as a credit in the voluntary or regulated market; and (Editing by Decree No. 11.075, of 2022)

IV - vehicular natural gas - denomination of gaseous fuel, typically from natural gas, biomethane or a mixture of both, intended for vehicular use, whose main component is methane, in compliance with the specifications established by the ANP.

Art. 4 The guidelines of the Federal Strategy to Encourage the Sustainable Use of Biogas and Biomethane are:

I - encourage the carbon market, especially in terms of methane credit;

II - encourage the drawing up of plans and the signing of sectoral agreements;

III - promote the implementation of biodigesters, biogas purification systems and biomethane production and compression systems;

IV - promote initiatives to supply light and heavy vehicles, such as buses, trucks and agricultural tractors, and vessels powered by biomethane or biomethane hybrids, such as green points and corridors;

V - promote the implementation of technologies that enable the use of biogas and biomethane as sources of energy and renewable fuel;

VI - promote the development of scientific-technological research and innovation, and the dissemination of technologies, processes and practices aimed at mitigating emissions from methane sources;

VII - promote measures and mechanisms to encourage the reduction of methane emissions; and

VIII - promote national and international cooperation for the financing, training, development, transfer and dissemination of technologies and processes for the implementation of actions to reduce methane emissions.

Art. 5 The instruments of the Federal Strategy to Encourage the Sustainable Use of Biogas and Biomethane are:

I - National Green Growth Program;

II - National Climate Change Fund;

III - scientific research, especially that carried out through funding agencies; and

IV - National Biofuels Policy - RenovaBio.

Art. 6 Governance, integration and coordination of the actions necessary to implement the Federal Strategy to Encourage the Sustainable Use of Biogas and Biomethane will be carried out within the scope of the Interministerial Committee on Climate Change and Green Growth, referred to in Decree No. 10.845, of October 25, 2021.

Art. 7 The main sources of biogas and biomethane considered within the scope of the Federal Strategy to Encourage the Sustainable Use of Biogas and Biomethane are urban and rural waste, including, among others:

I - waste disposed of in landfills;

II - waste generated in sewage treatment plants;

III - waste from the sugar-energy chain; and

IV - waste from pig farming, poultry farming and others.

Sole paragraph. Other sources of biogas and biomethane are allowed, as long as they comply with the criteria and procedures established by the competent bodies.

Art. 8 The sale of biomethane for use in vehicles and residential, industrial and commercial installations must comply with the specifications established by the ANP.

Art. 9 The Ministers of State for the Environment and Mines and Energy may issue supplementary rules necessary to implement the provisions of this Decree, within the scope of their powers.

According to DECREE No. 9.073, OF JUNE 5, 2017 enacting the Paris Agreement under the United Nations Framework Convention on Climate Change, concluded in Paris on December 12, 2015 and signed in New York on April 22, 2016.

Considering that the Federative Republic of Brazil concluded the Paris Agreement under the United Nations Framework Convention on Climate Change in Paris on December 12, 2015, and signed it in New York on April 22, 2016;

Considering that the National Congress approved the Agreement through Legislative Decree No. 140 of August 16, 2016; and

Considering that the Brazilian Government deposited the instrument of ratification of the Agreement with the Secretary-General of the United Nations on September 21, 2016, and that the Agreement entered into force for the Federative Republic of Brazil, in the external legal sphere, on November 4, 2016;

DECREE

Art. 1 The Paris Agreement under the United Nations Framework Convention on Climate Change, concluded in Paris on December 12, 2015, and signed in New York on April 22, 2016, annexed to this Decree, is hereby promulgated.

Art. 2 Acts that may result in a revision of the Agreement and complementary adjustments that entail burdensome charges or commitments to the national patrimony, under the terms of item I of the caput of art. 49 of the Constitution, are subject to the approval of the National Congress.

Art. 3 This Decree enters into force on the date of its publication

DECREE NO. 11.075, OF MAY 19, 2022

Establishes the procedures for drawing up Sectoral Climate Change Mitigation Plans, institutes the National System for Reducing Greenhouse Gas Emissions and amends Decree No. 11.003 of March 21, 2022.

THE PRESIDENT OF THE REPUBLIC, in the use of the powers conferred upon him by Article 84, *caput*, items IV and VI, paragraph "a", of the Constitution, and in view of the provisions of Law No. 12.187, of December 29, 2009,

DECREE

CHAPTER I
PRELIMINARY PROVISIONS

Art. 1 This Decree establishes the procedures for drawing up the Sectoral Climate Change Mitigation Plans referred to in the sole paragraph of art. 11 of Law no. 12.187, of December 29, 2009, and establishes the National System for Reducing Greenhouse Gas Emissions - Sinare.

Art. 2 For the purposes of this Decree, the following are considered:

I - carbon credit - a financial, environmental, transferable asset representing the reduction or removal of one tonne of carbon dioxide equivalent, which has been recognized and issued as a credit on the voluntary or regulated market;

II - methane credit - a financial, environmental, transferable asset representing the reduction or removal of one ton of methane, which has been recognized and issued as a credit on the voluntary or regulated market;

III - certified emission reduction credit-carbon credit that has been registered with Sinare;

IV - offsetting greenhouse gas emissions - a mechanism by which a natural or legal person, under public or private law, offsets greenhouse gas emissions generated as a result of its activities, by means of its own removals accounted for in its greenhouse gas inventory or through the acquisition and effective retirement of a certified emission reduction credit;

V - Nationally Determined Contributions - **NDC** - commitment made internationally by a signatory of the Paris Agreement to collaborate with the objective of limiting the increase in global temperature, to be achieved by the public sector, in the various spheres, and by the private sector;

VI - sector agents - members of the sectors referred to in the sole paragraph of art. 11 of Law no. 12.187, of 2009;

VII - measurement, reporting and verification - guidelines and procedures for monitoring, quantifying, accounting for and disclosing, in a standardized, accurate and verified manner, the greenhouse gas emissions of an activity or the reduction and removal of greenhouse gas emissions from an activity or project subject to certification;

VIII - greenhouse gas emission target - greenhouse gas emission target established in Sectoral Climate Change Mitigation Plans;

IX - mitigation - technological changes and substitutions or measures that reduce the use of resources and greenhouse gas emissions per unit of production and that promote the increase of sinks;

X - Sinare certification standard - set of rules with minimum criteria for monitoring, reporting and verifying greenhouse gas emissions or reductions accepted for registration with Sinare;

XI - carbon stock unit - a financial, environmental, transferable asset representing the maintenance or storage of one ton of carbon dioxide equivalent, including all means of depositing carbon, except for greenhouse gases, in the atmosphere; and

XII - Sectoral Climate Change Mitigation Plans - sectoral government planning instruments for meeting climate targets.

CHAPTER II

SECTORAL CLIMATE CHANGE MITIGATION PLANS

Art. 3It is the responsibility of the Ministry of the Environment, the Ministry of the Economy and related sectoral ministries, if any, to propose Sectoral Climate Change Mitigation Plans.

The Sectoral Climate Change Mitigation Plans will be approved by the Interministerial Committee on Climate Change and Green Growth, established as provided for in Decree No. 10,845, of October 25, 2021.

Art. 4The Sectoral Climate Change Mitigation Plans shall establish gradual targets for the reduction of anthropogenic emissions and removals by greenhouse gas sinks, which shall be measurable and verifiable, taking into account the specificities of the sectoral agents.

The targets referred to in the *caput* will comply with the long-term goal of climate neutrality set out in the NDC and will be monitored through the presentation of periodic greenhouse gas inventories by sectoral agents, to be defined in the respective Plans.

Art. 5 Sectoral Climate Change Mitigation Plans may define differentiated treatment for sectoral agents, taking into account, among other criteria:

I - specific category of companies and rural properties;

II - turnover;

III - emission levels;

IV - characteristics of the economic sector; and

V - region of location.

Sole Paragraph: The Plans referred to in the *heading* may establish different timetables for the sectoral agents that are members of Sinare to join.

Art. 6 The deadlines and rules for updating the Sectoral Climate Change Mitigation Plans will be defined when they are drawn up by the competent bodies and will observe the commitments made by the country in the United Nations Framework Convention on Climate Change through the NDC**.**

Art. 7 The Brazilian Emissions Reduction Market is an environmental management mechanism and will be an instrument for operationalizing Sectoral Climate Change Mitigation Plans, with a view to acting as a tool for implementing emission reduction commitments through the use and transaction of certified emission reduction credits.

CHAPTER III

THE NATIONAL GREENHOUSE GAS EMISSIONS REDUCTION SYSTEM

Art. 8 - The National Greenhouse Gas Emissions Reduction System - SINARE - is hereby established, the purpose of which is to serve as a single central registry for greenhouse gas emissions, removals, reductions and offsets and for acts of trade, transfers, transactions and retirement of certified emission reduction credits.

§ Paragraph 1 - A joint act by the Ministers of State for the Environment and the Economy will establish the rules on:

I - registration;

II - the Sinare certification standard;

III - accreditation of certifiers and custody centers;

IV - the implementation, operation and management of Sinare;

V - the public and accessible register, in a digital environment, of projects, initiatives and programs for generating certified credit for reducing emissions and offsetting greenhouse gas emissions; and

VI - the criteria for making other assets representing the reduction or removal of greenhouse gases compatible with the carbon credits recognized by Sinare, when technically and economically feasible, at the proposal of the body or entity responsible for said assets.

§ Paragraph 2 Certified emission reduction credits may be used to comply with greenhouse gas emission limits or may be traded with due registration with Sinare, in accordance with the rules established in the manner provided for in Paragraph 1.

§ Paragraph 3 - The Ministry of the Environment shall be responsible for making Sinare operational.

§ Paragraph 4 Sinare will be made available as a digital tool.

§ Paragraph 5 - A joint act of the Ministers of State for the Environment, the Economy and Science, Technology and Innovation may establish mechanisms for compatibility with the National Emissions Registration System, established by Decree No. 9.172, of October 17, 2017.

Art. 9 Sinare instruments are:

I - the integrated registry of greenhouse gas emissions, reductions and removals and of acts of trade, transfers, transactions and retirement of certified emission reduction credits;

II - integration mechanisms with the international regulated market, which must be established in accordance with the rules set out in §1 of Article 8; and

III - the recording of the inventory of greenhouse gas emissions and removals.

Art. 10 - Emission reductions and removals registered in Sinare that are additional to the targets set for sector agents will be recognized as certified emission reduction credits, if they meet the System's certification standard.

Art. 11 Sinare will also make it possible, without the need to generate a certified emissions reduction credit and in line with the rules established in the manner provided for in §1 of Art. 8, to register:

I - carbon footprints of products, processes and activities;

II - carbon in native vegetation;

III - soil carbon;

IV - blue carbon; and

V - carbon stock unit.

CHAPTER IV

FINAL PROVISIONS

Art. 12 - The sectors referred to in the sole paragraph of art. 11 of Law no. 12.187, of 2009, may present, within one hundred and eighty days from the date of publication of this Decree, extendable for the same period, their proposals for the establishment of greenhouse gas emission reduction curves, considering the long-term objective of climate neutrality informed in the NDC.

Art. 13 - Decree No. 11.003, of March 21, 2022, shall come into force with the following changes:

III - methane credit - a financial, environmental, transferable asset representing the reduction or removal of one tonne of methane, which has been recognized and issued as a credit on the voluntary or regulated market; and

Art. 14: Item III of the *caput of* art. 17 of Decree no. 9578, of November 22, 2018, is hereby revoked.

THE PARIS AGREEMENT

With 16 paragraphs and 29 articles, the Paris Agreement establishes a series of actions to be taken by the signatory countries to reduce greenhouse gas emissions. The treaty replaced the Kyoto Protocol, the first international agreement to control greenhouse gas emissions, signed in 1997 in Japan.

The Paris Agreement was signed on December 12, 2015 and came into force on November 4, 2016. Countries responsible for around 55% of the planet's emissions had to ratify this global commitment for the document to be valid.

Each country accumulates different targets, according to its conditions. These domestic targets form the Nationally Determined Contribution (NDC) in each signatory country.

The European Union and 193 other countries, including Brazil, accounting for more than 90% of human emissions, have joined the treaty. The only countries that have refused to join are in the Middle East, such as Iran, a record emitter in the region.

Some important points established by the agreement:

- Keeping the global temperature increase below 2°C compared to the pre-industrial average in the coming years. However, the aim is to limit the temperature increase to 1.5°C;
- Transfer of technology and funding of around US$100 billion a year between developed and underdeveloped countries to maintain actions against climate change;
- Review of the agreement every five years;
- Although there is effectively no obligation for countries to strictly follow the articles of the treaty, it is mandatory for experts to monitor the efforts made by each signatory;
- Every two years, nations must submit reports on their progress.

BRAZIL'S PARTICIPATION IN THE AGREEMENT

Brazil signed the Paris Agreement in 2015, with the goal of reducing its greenhouse gas emissions by up to 37% compared to 2005 emission levels by 2025. This target increases to a 43% reduction in emissions by 2030.

However, Brazil's NDC is considered weak by environmentalists. According to the Climate Observatory, in order to meet the climate objectives of the Paris Agreement, Brazil should promote a net emissions reduction of more than 80% compared to 2005. To do this, the country would need, for example, to install more clean and renewable energy sources, extinguish deforestation throughout the country and restore around 14 million hectares of reserve areas.

According to the UN, the latest advances made by the treaty's signatory countries are "a long way off" curbing global warming and only 1% of emissions will be contained by 2030 with the results achieved so far.

SDGS

1. poverty eradication - End poverty in all its forms, everywhere.

2. Zero hunger and sustainable agriculture - End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

3. Health and well-being - Ensuring a healthy life and promoting well-being for all, at all ages.

4. Quality education - Ensure inclusive, equitable and quality education and promote lifelong learning opportunities for all.

5. Gender equality - Achieving gender equality and empowering all women and girls.

6. Clean water and sanitation - Ensure availability and sustainable management of water and sanitation for all.

7. Clean and affordable energy - Ensure access to affordable, reliable, sustainable and renewable energy for all.

8. Decent work and economic growth - Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all.

9. Infrastructure innovation - Building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation.

10. Reducing inequalities - Reducing inequalities within and between countries.

11. Sustainable cities and communities - Making cities and human settlements inclusive, safe, resilient and sustainable.

12. Responsible consumption and production - Ensure sustainable production and consumption patterns.

13. Action against global climate change - Take urgent action to combat climate change and its impacts.

14. Life in the water - Conservation and sustainable use of the oceans, seas and marine resources for sustainable development.

15. Terrestrial life - Protecting, restoring and promoting the sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, halting and reversing land degradation and halting biodiversity loss.

16. Peace, justice and effective institutions - Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

17. Partnerships and means of implementation - Strengthen the means of implementation and revitalize the global partnership for sustainable development.

The Intergovernmental Panel on Climate Change (IPCC), a body linked to the United Nations, has recently released a report pointing out a devastating scenario about the main impacts of global warming on the environment and the economy, if concrete measures to reduce the rise in the planet's temperature are not adopted. In Brazil, there are significant impacts in various places such as the Amazon, the semi-arid northeast and coastal regions.

In this report, the IPCC clearly demonstrates that the impacts of climate change are knocking on our door right now and will only get worse. Ocean levels are already rising and, as a result, 100 million people living less than a meter above sea level are at risk of losing their homes. The populations of India and China could go hungry because of the decline in food production as a result of global warming.

Freshwater springs, which supply millions of people around the world, are at risk, the study points out. In the Amazon region, for example, people could be affected by even higher summer temperatures in some regions, an increase in the frequency of severe droughts like the one in 2005 and the transformation of the forest into a much more open, savannah-like vegetation, especially in the eastern region. In northeastern Brazil, temperatures will rise even more, turning the region from semi-arid to arid and compromising the recharge of groundwater. In the southeast, rainfall will increase with a direct impact on agriculture and on floods and landslides.

Even with all these warnings, this study is just the tip of the iceberg. The impacts of climate change are altering the chemistry of the planet, causing the extinction and migration of species and compromising the environmental services provided by nature. In addition, rising temperatures and changing rainfall patterns are particularly damaging to the economic and social development of developing nations.

"The negotiators are tired of discussing every single word of the report in order to reach an agreement. This is because heads of state are anxiously awaiting the important conclusions of this scientific conference," observes Hans Verlome, director of WWF's Global Climate Change Program. "The urgency of this report, prepared by a select group of the planet's scientists, must be taken into account by governments and they must react just as quickly."

"There is no escaping these facts: global warming will bring famine, floods and droughts. The poorest countries, which are least responsible for the emissions of the gases that cause climate change, will suffer the most. And they have the least money to invest in infrastructure to adapt to the impacts of global warming. But the rich countries are also running enormous risks," says Carlos Alberto de Mattos Scaramuzza, Conservation Superintendent at WWF-Brazil. "We no longer have the option of ignoring global warming, otherwise the consequences will be disastrous. The IPCC scientists have clearly stated that some of the impacts of climate change are inevitable, but there is still time to protect humanity from some of the most disastrous consequences. "Defending what's left of nature on this planet, such as the Amazon rainforest, mangroves and corals, will become an economic and ethical priority, our societies are dependent on nature but we are only now realizing this," says Lara Hansen, chief scientist of the WWF Global Climate Change Programme.

Brazil is the world's fourth largest emitter of greenhouse gases, with more than two thirds of emissions coming from deforestation. "The time has come to demonstrate how we are going to contribute to reducing global warming," says Karen Suassuna, WWF-Brazil's Climate Change technician. "It was clear that Brazil is already being impacted by climate change and could be even more so. That's why we need to set clear targets for drastically reducing deforestation and invest in non-conventional renewable energies and energy efficiency"

In September 2006, WWF-Brazil presented Brazilian society with the study "Agenda Eléctrica Sustentável 2020", an alternative for the country's electricity growth without the need for more pollution. The report outlines a scenario for the Brazilian electricity sector using non-conventional clean energies, energy efficiency techniques, generating more jobs and more savings for Brazil.

IPCC

The IPCC is linked to the United Nations and was created in 1988 with the aim of assessing the scientific, technical and socio-economic information relevant to understanding climate change, its impacts and the options for mitigation and adaptation. Every five years, the IPCC releases a report based on a review of research by more than 2,500 scientists from around the world.

Scientific Journal of Applied Social and Clinical Science ISSN 2764-2216 DOI https://doi.org/10.22533/at.ed.216542520025

The Panel has three working groups:

- Working group I assesses the scientific aspects of the climate system and climate change.

- Working Group II assesses the vulnerability of socio-economic and natural systems to the consequences of climate change and the options for adaptation.

- Working Group III evaluates options for limiting greenhouse gas emissions and other ways to stop climate change.

The first report was released in 1990, the second in 1995 and the third in 2001. The fourth will be completed in 2007 and released according to the following schedule:

Local strategies for mitigating and adapting to climate change can be presented in accordance with DECREE No. 32.102 of January 15, 2020, the Municipality of Salvador creates the Working Group for the preparation of the Plan for Mitigation and Adaptation to Climate Change and the Municipal Policy on Climate Change by means of the Organic Law of the Municipality, in view of the provisions of Federal Law No. 12.187 of December 29, 2009, which establishes the National Policy on Climate Change - PNMC, and Municipal Law 8.915 of September 26, 2015, which provides for the Municipal Policy on the Environment and Sustainable Development.

Considering the need to promote adaptation and climate risk reduction in the face of the adverse effects of climate change, which are already affecting the city, in order to avoid losses and damage and boost efforts and investments to adapt to climate change;

Considering that one of the objectives of the Municipal Environmental Policy, in the form of article 4, IX, of Municipal Law No. 8.915/2015, is to "establish a strategy for reducing anthropogenic greenhouse gas emissions in the municipality as well as a policy for adapting to the effects of climate change";

Considering the Resilience Strategy as an instrument for defining the city's sustainable development actions, with one of its initiatives being the construction of the Climate Change Mitigation and Adaptation Plan (PMAMC);

Considering the ratification in 2016 of the Paris Agreement, in which nations pledge to keep the increase in global average greenhouse gas emissions to no more than 2°C above pre-industrial levels, while pursuing efforts to limit this increase to no more than 1.5°C;

Considering that the municipality of Salvador is one of the cities that make up the C40 Network of Major Cities for Climate Leadership (C40), made up of 94 cities, representing more than 700 million inhabitants and a quarter of the global economy, with the aim of promoting climate action in line with the ambitions of the Paris Agreement;

Considering that the City of Salvador made a commitment in 2017 to C40 to develop strategies by the end of 2020 to neutralize greenhouse gas emissions and be more resilient to the effects of climate change by 2050;

DECREE:

Art. 1 The Climate Change Working Group is hereby created to support the preparation of the Climate Change Mitigation and Adaptation Plan - PMAMC - and the Municipal Climate Change Policy in Salvador.

Art. 2 The Working Group is responsible for:

I - Identify, evaluate and provide updated data in a clear and rapid manner on policies, plans and actions related to greenhouse gas (GHG) emissions and adaptation to climate change in Salvador;

II - Contribute to the development of the proposals, guidelines and strategies of the Climate Change Mitigation and Adaptation Plan - PMAMC - which establish short, medium and long-term initiatives regarding the cause and impact of climate change;

III - Validate priority actions for climate mitigation and adaptation in municipal projects in the urban space until 2050;

IV - Draw up recommendations aimed at reducing GHG;

V - Support the formulation of a bill as a final result of the PMAMC;

VI - Maintain continuous monitoring of the implementation of the PMAMC.

Local strategies for mitigating and adapting to climate change in the municipality of Feira de Santana, State of Bahia, can be seen in LAW NO. 3169/2011.

CHAPTER II

PRINCIPLES, OBJECTIVES AND GUIDELINES

Art. 2 - The Climate Change Policy of the Municipality of Feira de Santana is governed by the following principles,

I - Economic growth, social development and environmental protection as interdependent and mutually reinforcing pillars,

II - The protection of the climate system for present and future generations, based on sustainable development,

III - The prevention of dangerous anthropogenic interference in the climate system,

IV - Precaution, consisting of the adoption of measures which, even in the absence of formal scientific certainty about the existence of a risk of serious or irreversible damage, make it possible to prevent such damage, as a guarantee of the safety and well-being of the population and conservation of the environment,

V - The common but differentiated responsibilities and respective capacities of countries, as enshrined in the United Nations Framework Convention on Climate Change, taking into account the historical contribution of countries to global warming,

VI - The recognition of the physical, biotic, demographic, economic, social and cultural diversity of the territories of identity of the State of Bahia in the identification of vulnerabilities to climate change and in the implementation of mitigation and adaptation actions,

VII - The importance of environmental education for the progressive broadening of understanding of phenomena related to climate change.

Art. 3 The Municipality of Feira de Santana's Climate Change Policy has the following objectives:

I - Avoid the negative impacts of anthropogenic interference in the climate system by encouraging, in its territory, a reduction in the growth rate of greenhouse gas emissions and the capture and storage of these gases.

II - Define and implement measures to promote adaptation to climate change in all Identity Territories, economic and social sectors, especially those most vulnerable to its adverse effects.

Sole Paragraph - The objectives of the Policy of the Municipality of Feira de Santana should make economic growth compatible with the protection of the climate system in line with sustainable development, seeking to eradicate poverty and reduce social inequalities .

Art. 4 The guidelines of the Feira de Santana Municipal Climate Change Policy are:

I - Brazil's commitments to the United Nations Framework Convention on Climate Change and the Kyoto Protocol,

II - The establishment of local, regional, national and international cooperation aimed at reducing greenhouse gas emissions under the Convention.

III - The inclusion of the Municipality of Feira de Santana, in the State of Bahia, in the national effort to reduce greenhouse gas (GHG) emissions and sustainable development in the fight against climate change through the implementation of relevant sectoral or intersectoral plans, programs and policies in a coordinated, complementary and harmonious manner.

IV - The development of programs for understanding and mobilizing society with regard to climate change in order to promote public participation in decision--making processes.

V - Promoting research, production and dissemination of knowledge about climate change, the state's vulnerabilities to the phenomenon, adaptation measures and mitigation of its impacts.

VI - The adoption of climate change mitigation actions in line with sustainable development, which are, whenever possible, measurable, informable and verifiable.

VII - The adoption of adaptation measures to reduce the adverse effects of climate change on environmental, social and economic systems, prioritizing the most vulnerable.

VIII - The adoption of integrated climate change mitigation and adaptation strategies.

IX - Promoting research, development and dissemination of technologies, processes and practices aimed at:

a) Mitigating climate change by reducing anthropogenic emissions by sources and strengthening anthropogenic removals by sinks of greenhouse gases.

b) Identify vulnerabilities and, based on this identification, implement appropriate adaptation measures.

X - Use financial and economic instruments to promote actions to mitigate and adapt to climate change, in compliance with current legislation.

XI - Identify and align the government action instruments already established to achieve the objectives of this Policy.

XII - Improve and guarantee systematic observation and precise monitoring of the climate and its manifestations in the state territory.

XIII - Promote and facilitate, in accordance with existing laws and regulations, education, training and understanding of climate change, adopting a pluralism of ideas and pedagogical concepts from the perspectives of inter-, multi- and transdisciplinarity.

XIV - To support and encourage changes in production and consumption patterns in order to contribute to the objectives of this Policy.

XV - Promote and establish actions aimed at reducing emissions from deforestation and net greenhouse gas emissions.

TITLE II

INSTRUMENTS OF THE CLIMATE CHANGE POLICY OF THE MUNICIPALITY OF FEIRA DE SANTANA, STATE OF BAHIA

Art. 5 The following are instruments of the Municipality of Feira de Santana's Policy on Climate Change .

I - Reports from the Intergovernmental Panel on Climate Change (IPCC),

II - Brazil's National Communication to the United Nations Framework Convention on Climate Change, in accordance with the criteria established by this Convention and its Conferences of the Parties,

III - the National Plan on Climate Change,

IV - the National Climate Change Fund,

V - the Resolutions of the Interministerial Commission on Global Climate Change,

VI - the Resolutions of the Interministerial Committee on Climate Change,

VII - the State Plan on Climate Change,

VIII - the State Plan to Combat Desertification,

IX - the State Water Resources Plan,

X - the State Water Resources Fund,

XI - the State Environmental Education Plan,

XII - the State Health Plan,

XIII - the State Environmental Plan,

XIV - the State Environmental Resources Fund,

XV - the State Plan for preventing and fighting forest fires,

XVI - the Ecological Economic Zoning of the State of Bahia,

XVII - the State Inventory of Greenhouse Gases - GHG,

XVIII - the State Climate Change Vulnerability Map,

XIX - Resources from mechanisms to reduce emissions and stabilize greenhouse gases - GHG,

XX - specific lines of credit and financing from public and private financial agents,

XXI - existing or to be created measures to stimulate the development of technological processes and clean technologies for energy generation and consumption, which contribute to the reduction of greenhouse gas emissions and removals,

XXII - fiscal and tax measures designed to stimulate the reduction of emissions and removal of greenhouse gases, to be established in a specific law,

XXIII - financial and economic mechanisms relating to climate change mitigation and adaptation that exist at national and international level,

XXIV - specific donations for climate change actions in FUNDEMA's budget,

XXV - national, state and municipal climate monitoring data,

XXVI - the development of lines of study and research,

XXVII - measures to publicize, educate and mobilize the various sectors of society.

CHAPTER I

FEIRA DE SANTANA MUNICIPAL PLAN ON CLIMATE CHANGE

Art. 6 The Feira de Santana Municipality Climate Change Plan aims to underpin and guide the implementation of Environmental Policy through actions and measures aimed at mitigating climate change and adapting to its effects.

Art. 7 The Feira de Santana Municipal Plan on Climate Change will be drawn up by the Municipal Department for the Environment and Natural Resources under the coordination of CONDEMA - the Feira de Santana Municipal Council for the Defense of the Environment.

Art. 8 The strategy for drawing up the Feira de Santana Municipality Plan on Climate Change shall include public consultations through the Municipal Forum on Global Climate Change and Biodiversity for the expression of social movements, the scientific sector, the business sector and all others interested in the subject, with the aim of promoting transparency in the process and social participation in social preparation and implementation.

Sole Paragraph - The public consultation process will include the results of the National, State and Municipal Environmental Conferences, as well as any relevant comments from society.

Art. 9 The Municipality of Feira de Santana's Climate Change Plan is in line with the State and Federal Environmental Education Policy, and should promote the development and implementation of environmental education campaigns, programs and actions, in accessible language and compatible with the different audiences, with the aim of making the population aware of the causes and impacts of climate change and the individual and collective alternatives for mitigating and strengthening greenhouse gas sinks, with the participation of organized civil society and educational institutions.

TITLE III

MANAGEMENT OF THE CLIMATE CHANGE POLICY OF THE MUNICIPALITY OF FEIRA DE SANTANA, STATE OF BAHIA

Art. 10 - The instruments of the Municipality of Feira de Santana's Climate Change Policy, in their institutional dimension, are articulated with the following forums, collegiate bodies and public or institutional spaces.

I - the Brazilian Climate Change Forum - FBMC,

II - the Bahia Forum on Global Climate Change and Biodiversity,

III - the State Coordination of Civil Defense - CORDEC, linked to the Secretariat for Social Development and Combating Poverty,

IV - the Bahia State Meteorology Center - CEMBA, of the Water and Climate Management Institute - INGA,

V - the State and Municipal Health Council,

VI - the Inter-institutional Commission for Environmental Education in the State of Bahia - CIEA - BA,

VII - the State Environment Council - CEPRAM,

VIII - the State Water Resources Council - CONERH,

IX - the Municipal Council for the Defense of the Environment - CONDEMA.

X - the State Technical Commission for the Coastal Management Program - GERCO.

Art. 11 - The Institute for Water and Climate Management - INGA and the executing body of the State Climate Change Policy, in accordance with Law 11.050/2008.

TITLE IV
DEFINITIONS AND FINAL PROVISIONS

CHAPTER I DEFINITIONS

Art. 12 - For the purposes of this law, the following definitions shall apply.

I - Anthropic action - human action on the environment,

II - Adaptation - initiatives and measures to reduce the vulnerability of natural and human systems to the current and expected effects of climate change,

III - Desertification - land degradation in the arid, semi-arid and dry sub-humid zones, resulting from various factors, including climatic variations and human activities,

IV - Sustainable development - development capable of meeting the needs of the present generation without compromising the ability to meet the needs of future generations, with the implication of the compatibility of economic development, social justice and environmental protection, as interdependent and mutually reinforcing dimensions,

V - Adverse effects of climate change - changes in the physical environment or biota resulting from climate change that have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems, on the functioning of socio-economic systems or on human health and well-being,

VI - Emissions - release of greenhouse gases or their precursors into the atmosphere in a specific area and over a given period,

VII - Source - process or activity that releases a greenhouse gas, aerosol or greenhouse gas precursor into the atmosphere,

VIII - Greenhouse gases - gaseous constituents of the atmosphere, both natural and man-made, which absorb and return infrared radiation,

IX - Impact - the effects of climate change on human and natural systems,

X - Mitigation - technological changes and substitutions that reduce the use of resources and emissions per unit of production, as well as the implementation of measures that reduce greenhouse gas emissions and increase sinks,

XI - Climate change - a change in climate that can be directly or indirectly attributed to human activity that alters the composition of the world's atmosphere and which is added to that caused by natural climate variability observed over comparable periods,

XII - Sink - process, activity or mechanism that removes a greenhouse gas, aerosol or precursor of a greenhouse gas from the atmosphere,

XIII - Territory of identity - a planning unit adopted by the Government of Bahia since 2007 which represents a physical space, geographically defined, not necessarily continuous, characterized by multidimensional criteria, such as the environment, economy, society, culture, politics and institutions, and a population, as relatively distinct social groups, which relate internally and externally through specific processes, where one or more elements can be distinguished that indicate identity and social, cultural and territorial cohesion, (MDA),

XIV - Vulnerability - the degree of susceptibility and incapacity of a system, depending on its sensitivity, its capacity to adapt and the character, magnitude and rate of climate change and variation to which it is exposed, to deal with the adverse effects of climate change, including climate variability and extreme events.

METHODOLOGY

This article is also part of a constructive paradigm for adapting to and mitigating climate change. It is the result of a bibliographical research within the discipline of sustainable cities in the postgraduate program in territorial planning at the State University of Feira de Santana/Ba. The information that forms the basis of this work comes from the most recent scientific articles, theses, reports and books on the climate scenario.

DISCUSSIONS AND RESULTS

CLIMATE CHANGE MITIGATION AND ADAPTATION MEASURES

*Winning the battle against climate change is difficult, but with everyone's effort and the right mitigation measures, we can minimize the damage:

*Improve energy efficiency and focus on renewable energies as opposed to fossil fuels.

*Promote public transport and sustainable mobility with more urban journeys by bicycle, fewer flights by plane and more journeys by train and car sharing.

food, responsible consumption and the 3R rule (reduce, reuse and recycle).

*Tax the use of fossil fuels and CO2 emissions markets.

*Alongside mitigation measures to contain global warming, we must promote measures to adapt to climate change.

*Build safe and sustainable buildings and infrastructure.

*Reforest forests and restore damaged ecosystems.

The consequences of global warming - what we know and what we don't ?

Scientists still have a lot to learn about how and why the climate is changing. We don't know for sure how much the temperature will rise, how fast or all the consequences. While we know that yes, it is a man-made effect, and we also know that "there will be more hot days" and "sea levels will rise", we cannot, however, blame climate change for this or that particular storm or hurricane.

There will be stronger storms, which means more hurricanes, floods, loss of life and the destruction of buildings, roads and power lines that took years to build and could take years to rebuild.

In other regions, there will be more frequent and severe droughts. This is because warmer air can retain more moisture, and as it warms up it becomes drier, sucking more water out of the ground. A warmer climate means more frequent and destructive forest fires.

Another effect of the increased heat is that sea levels will rise. This is partly because of melting polar ice and because the water expands as it warms up. This will pose a problem for coastal regions in general. Bangladesh will be particularly affected, as most of the country's territory lies in low-lying, flood-prone river deltas.

As for our food, there is a positive side: wheat and many other plants grow faster and need less water when there is a lot of carbon in the air and, in some northern regions, production could increase. However, in most places it will decrease, and in some percentage points by up to 50%. In poor communities, food prices could rise by 20% or more.

The stronger heat will not be good for the animals that feed us: they will become less productive and more likely to die early, which in turn will make meat, eggs and dairy products more expensive. We will also have less seafood, as the oceans are getting warmer. Fish are moving to different waters, or simply dying. If the temperature rises by 2°C, coral reefs could disappear completely, destroying the main source of food for more than 1 billion people.

Other animals will also be affected. According to IPCC research, an increase of 2ºC would reduce the geographical territory of vertebrates by 8%, plants by 16% and insects by 18%. As the climate gets warmer, mosquitoes will start living in new places and we will see cases of malaria and other insect-borne diseases in places where they have never appeared before.

Heatstroke will be another major problem. In the regions most at risk - the Persian Gulf, South Asia and parts of China - there will be times of the year when hundreds of millions of lives will be at risk.

Finally, these things have knock-on social effects: civil wars, illegal immigration and refugees. During the worst drought ever recorded in Syria - which lasted from 2007 to 2010 - around 1.5 million people left the countryside for the cities, helping to set the stage for the armed conflict that began in 2011. The result is that by 2018, around 13 million Syrians

had become refugees.Drawing a parallel with the current pandemic, according to scholars by the middle of the century, climate change could be as deadly as covid-19 and, by 2100, five times more lethal. The economic damage caused by climate change is likely to be as serious as the occurrence of a pandemic like this every ten years. And by the end of the 21st century, it will be much worse if the world doesn't change its cur so.

All countries need to consolidate the goal of reaching zero - by 2050 for rich countries and, after that, as soon as possible for middle-income countries. Secondly, governments must develop specific plans to meet these targets. To reach zero by 2050, we will need public policies and market structures in place by 2030. And thirdly, any country in a position to fund research needs to make sure it is on track to produce cheap clean energy - by reducing Green Premiums - to the point where middle--income countries can zero their emissions.

None of this will be easy. Fossil fuels are so ubiquitous that it may be difficult to capture all the ways in which they affect our lives.

Fossil fuels (as well as other products that generate greenhouse gases) are omnipresent. We will need to make a huge transition to other energy sources and, worse, in a short space of time. However, a rapid transition is almost unprecedented in human history.

Bill then proposes 7 goals that governments around the world (not just national, but also state and city governments, where appropriate) should strive for:

> 1) Avoiding investment lapses: in general, the government's role is to invest in research and development when the private sector doesn't because it doesn't see how it can make a profit. When it becomes clear that companies can make money, the private sector takes over. When an idea is at an embryonic stage - when we're not sure if it will work, and success may take longer than banks or venture capital firms are willing to wait - public initiatives and funds, when well applied, can ensure that it is exploited until it reaches or exhausts its potential. It may be an extraordinary innovation, but it could also be a hole in the water, so we need to tolerate some unquestionable failures.
>
> 2. Balancing the game: Here we come to the problem of externalities. We could raise the cost of fossil fuels by incorporating the damage they cause into prices. There are several ways, including a carbon tax or an emissions trading program, to ensure that at least some of these external costs are borne by those responsible for them. In order for companies to be able to buy and sell the right to emit, pricing emissions is one of the most important things we can do to eliminate Green Premiums. Bill also notes that the concept of carbon pricing is widely accepted among economists from different schools of thought and across the political spectrum.

It is also possible to go down the road of adopting clean electricity standards. Twenty-nine American states and the European Union currently adopt a performance model called the renewable portfolio standard. The idea is to require utility companies to obtain a certain percentage of their electricity from renewable sources. These are flexible, market-based mechanisms; for example, utilities with more access to renewable sources can sell credits to others.

However, there is a problem with the way this initiative is currently put into practice. It allows utilities to use only certain low-carbon technologies (wind, solar, geothermal, sometimes hydroelectric) and excludes options such as nuclear power and carbon capture. This in practice raises the overall cost of reducing emissions.

3. Overcoming non-market barriers: there are some situations where green alternatives actually have a negative premium, i.e. we would save money if we adopted them. Yet they are not being adopted as they should be. Why don't landlords modernize their properties with more efficient equipment? Because they pass on the energy bill to the tenants, who usually aren't allowed to do this kind of renovation and, in any case, probably won't live in the house long enough to reap the long-term rewards. These barriers have little to do with cost. They exist mainly because of a lack of information, trained staff or incentives - areas where the right public policies can make a big difference.

4. Keep up to date: Here we get into a situation where the state gets in the way with its outdated regulations. "If you want to use concrete in a building, the building regulations specify in minute detail the expected performance of the material - its strength, how much weight it can bear and so on. They can even define the exact chemical composition of the concrete to be used. These standards usually exclude the low-emission cement you want to use, even if it meets all the performance standards." We must ensure that the standards reflect the latest advances in technology, as well as the urgency of getting to zero.

5. Planning a just transition: Politically, this should be the hottest point. How do we deal with those who will be harmed in this transition? Cities and states dependent on fossil fuel extraction. It's understandable that people are worried about the even greater difficulties the transition could bring to their livelihoods. We will have more support for the energy transition if we seek to understand the concerns of families and communities whose livelihoods will be hit hard, and take them seriously.

There are certainly communities where well-paid jobs in the fossil fuel sector will naturally give way to, say, jobs in the solar energy industry. But many others will have to undergo a difficult transition to something other than fossil fuel extraction. As the solutions will vary from place to place, adjustments led by local government bodies will be necessary. But the federal government can help - as part of a comprehensive plan to get to zero - by providing funds and technical advice and by connecting communities experiencing similar problems across the country so that they can share solutions.

6. doing the hard part too: There is a natural tendency to prioritize the easy part of the energy transition, where the technologies are already more mature and cheaper. But we can't limit ourselves to the obvious measures. We must also turn to the complicated issues: energy storage, fuels, cement, steel, clean fertilizers, etc. And this will require a different approach in terms of public policy-making. We will need to invest more in research and development in these more difficult areas and make them available on the market.

7. Working simultaneously on technology, policies and markets: markets, public policies and technology need to be complementary. They are like three levers that need to be activated at the same time for everything to work.

Simply implementing some policy - say, zero emission standards for cars - won't make much difference if we don't have the technology to eliminate emissions or if there isn't a company willing to manufacture and sell cars within the standards. On the other hand, a low-emission technology - say, a device that captures carbon from the exhausts of a coal--fired power station - won't help much if we don't create financial incentives for energy companies to install it. And few companies

will bet on inventing zero-emissions technology if the competition gets the better of them by selling fossil fuel-based products.

Governments could help by pricing carbon and implementing taxes. It could also adopt standards for clean fuel - and for other products too. Performance standards could also help accelerate the use of cement, steel, plastics and other products that generate a lot of emissions. Governments would start the process by establishing standards programs for their purchases and creating labeling programs that provide the buyer with information on how "clean" each of the different suppliers is. From there, we can expand them to standards that cover all carbon-intensive products on the market, not just those purchased by a government.

Imported products would also have to meet them, in order to calm national concerns that its manufacturing sector will make more expensive products and leave the country at a competitive disadvantage.

As well as producing new technology as quickly as possible, governments will need to retire all inefficient fossil fuel-powered equipment - from power plants to cars - even faster. Power plants are expensive, and the energy they produce is only cheap if we can spread the construction costs over their lifetime. That's why companies and public agencies are reluctant to decommission a perfectly functional plant that may still have decades of use ahead of it. Incentives in both tax legislation and regulation could speed up the process of getting rid of these "oldies".

WHAT CAN EACH OF US DO?

When we ask ourselves what we can do to limit climate change, it's natural to think of things like buying an electric car or eating less meat. This kind of personal action is important because it signals to the market, but the bulk of our emissions depend on the wider systems in which our daily lives take place.

But the installation of this new energy system requires concerted political action. That's why engaging in the political process is the most important step that people from all walks of life can take to avoid a climate disaster.

Our representatives will adopt specific climate change plans if they are demanded by their constituents. Thanks to activists around the world, we don't need to generate demand: millions of people are already involved in a call to action. What we must do, however, is turn these demands into pressure that encourages politicians to make the tough decisions and pacts needed to fulfill promises to reduce emissions.

Senators and deputies receive frequent reports on what their offices hear from voters. But don't just say "do something about climate change". Find out where they stand on the issue, ask questions, make it clear that this is an issue that will help determine their vote. Demand more funding for clean energy research and development, the development of a clean energy standard, a price on carbon.

Think in both local and national terms. Many relevant decisions are made at the state and local level by governors, mayors and state and municipal legislatures - instances where citizens can have an even greater impact than at the federal level. Get to know your representatives, commissions and councils and keep in touch with them.

Some steps are easier to take than others. The simplest things are also important - planting trees to offset emissions, for example, is a good measure to take for political and environmental reasons. It shows that you care about climate change. But just doing the easy things won't solve the problem. The private sector will also have to worry about the more difficult steps. For a start, this means taking more risks - for example, investing in projects that might even fail, but which represent a good clean energy breakthrough.

Here are some practical steps the private sector can take:

1. establish an internal carbon tax. Some companies have imposed a carbon tax on each of their departments. This doesn't mean making a false commitment to reducing emissions. What they want to do is help get products out of the lab and onto the market, because the revenue from internal fees can go directly to actions that reduce Green Premiums and help create a market for the clean energy products these companies will need. Employees, investors and customers should be spokespeople for this approach, supporting the executives responsible for its implementation.

2. Prioritize innovation in low-carbon solutions. Investing in new ideas used to be a matter of honor for most industries, but the glory years of corporate research and development are in the past. Today, companies in the aerospace, materials and energy industries spend an average of less than 5% of their revenue on research and development (software companies, more than 15%). Companies should review their research and development priorities, with particular attention to low-carbon innovations, many of which will require long-term efforts. Larger companies can form partnerships with government researchers to bring practical commercial experience to research.

3. get involved in the process of creating public policies. The business world can't be afraid to work with the government, just as the public authorities can't be afraid to work with the private sector

FINAL CONSIDERATIONS

In this scenario, various initiatives are under discussion, such as establishing a global carbon market, pricing carbon, encouraging renewable energy sources, reducing dependence on oil, ending deforestation, among others.

Brazil can take the lead in the new cycle of actions to combat climate change. In the country, renewable sources (solar, wind, hydroelectric and biomass, for example) are expanding, and several initiatives mention the importance of the "standing forest", i.e. producing without deforesting, combining technology and good practices. So-called "nature-based solutions" also find fertile ground here - they just need to be put into practice by more players and have an ever wider reach. All of this was highlighted during COP 28.

As we study the subject of climate change and how to solve the world's environmental problems, we are increasingly faced with questions that have no answers in the short term. What we realize is that we need an effort by governments, civil society, individuals, communities and the private sector to formulate actions to mitigate climate change on the planet, which will take time and joint effort so that new generations can live in a more harmonious world.

REFERENCES

TRIGUEIRO, André. Mundo sustentável 2: novos rumos para um planeta em crise . São Paulo. Globo, 2012.

GATES, Bill. Como evitar um desastre climático, as soluções que temos e as inovações necessárias. 1º ed. São Paulo : Conpanhia das Letras ,2021.

TRIGUEIRO, André. Cidades e Soluções : como construir uma sociedade sustentável . Rio de Janeiro. LeYa, 2017.

TOMMAS , Luiz Roberto. Estudo de Impacto Ambiental . São Paulo: CETESB ,1993.

CARVALHO , Benjamin de Araújo . Ecologia e poluição . Rio de Janeiro . Freitas Bastos ,1975.

BARBIERI, José Carlos . Desenvolvimento sustentável :das origens à Agenda 2030 . Petrópolis: Vozes, 2020.

Prefeitura municipal de Salvador. http://www.salvador.ba.gov.br/Acesso em 03 de fev 2024.

Prefeitura Municipal de Feira de Santana/Ba .https://leismunicipais.com.br/.Acesso em 03 fev de 2024.

Presidência da Republica Casa Civil.https://www.gov.br/casacivil/pt-br/ Acesso em 03 fev 2024.

DiarioOficialdaUniãoCâmara dos Deputados.https://imagem.camara.leg.br/diarios.asp/Acesso em 03 fev 2024.

Pacto Global Nações Unidas.https://www.pactoglobal.org.br/Acesso em 03 de fev de 2024.