

# PLANETARY PROTOCOL FOR CLIMATE CHANGE RESILIENCE



THE PONTIFICAL  
ACADEMY  
OF SCIENCES



THE PONTIFICAL  
ACADEMY OF SOCIAL  
SCIENCES

A new way  
to navigate  
through the  
climate crisis.

EXTENDED VERSION OF THE PROTOCOL | MAY 6, 2024

**CO<sub>2</sub> has created an invisible, human-made blanket that traps heat and heats the planet.**



Photo Source:  
United Nations Climate Action  
Data Source:  
IPCC-AR6-2021

**The blanket currently weighs 1200 billion tons and by 2030 -2035 planetary heating can reach the critical threshold of 1.5°C.**

We are a diverse international group of researchers, faith leaders, policymakers, and heads of cities, towns, governorates, and provinces, assembled under the auspices of the Vatican's Pontifical Academy of Sciences and Pontifical Academy of Social Sciences. Pope Francis presided over a summit in May of 2024 which led to this protocol.

### **The Rationale for the Protocol**

We recognize that 2023 was the hottest year on record, resulting in severe global impacts due to extreme weather events. By February 2024, ocean temperatures soared to levels never seen (21°C), continuing a pattern that persisted throughout the preceding year. Climate experts now forecast that the Earth is very likely to exceed the critical global heating threshold of 1.5°C by 2030 to 2035. We have a limited time frame to proactively prepare for and respond to the crisis, rather than simply reacting to it.

*Qua* climate change, we see the world population as incredibly diverse, yet, when considering climate change and its impacts, it arrays into three distinct groups: the Top One billion who are contributing more than 50% of heat-trapping pollutants; the Middle Four billion; and the Bottom Three billion. The adjectives Top, Middle, and Bottom denote the position of each group in the energy and wealth pyramid and are not used as pejorative terms. The Top One billion and the Middle Four billion together contribute about 90% of the pollution. On the other hand, the Bottom Three billion contributed less than 10% yet suffered 75% of the losses. The 46 Least Developed Countries (LDCs), most of them in Africa, with 15% of the population of the world, contribute only 1% of the world's CO<sub>2</sub> emissions. The G20 group of countries are responsible for 80% of the world's CO<sub>2</sub> emissions.

Women and children are more vulnerable than men to the impacts of climate change since 70% of the people living in poverty (about 1.3 billion) are women. Women have less access than men to resources that would help them to adapt to climate change. Women are dominant in the world's food production (50-80 percent) but own less than 10 % of the land. Home and childcare responsibilities prevent women from migrating when a disaster hits. Women are not only victims of climate change, but they can also be powerful agents of resilience building.

Nearly a billion children live in countries at "extremely high risk" of climate devastation. They are most vulnerable to the physical and psychological impacts of climate change as their bodies and minds are still developing. The impacts of climate change upon them have deep implications for their current well-being and their potential to flourish. Further, eco-anxiety adds to mental health vulnerabilities across the globe and impeding our youth's sense of future possibilities.



**The poorest 3 billion people have contributed less than 10% of the CO<sub>2</sub> emissions but suffered 75% of the losses.**

Human inaction in the face of rapid climate change is immoral. Human inaction is also a violation of human rights, as ruled by the European Court of Human Rights (ECHR) on April 9, 2024. However, the global population is now increasingly sensitised to meaningful actions to solve the climate crisis. The accelerated progress we need is being hindered by increased misinformation and disinformation.

The data demonstrate that climate change poses a grave danger to every aspect of public health and safety, including mental health: global heating, high-intensity cyclones, monsoons, floods, hurricanes, droughts, heatwaves, forest fires, [increased risks](#) of zoonoses and food-, water- and vector-borne diseases, and non-communicable diseases (dementia, cardiovascular and respiratory conditions), maternal and child health and mental health issues. Furthermore, climate change is undermining many of the social determinants for good health, such as livelihoods, equity, access to healthcare and social support, and access to adequate food and nutritional security. Air pollution from fossil fuels alone leads to over [five million](#) premature deaths in children and adults every year.

We are particularly concerned that over 3.6 billion people live in areas highly susceptible to the effects of climate change. For them, extreme weather patterns are the new drivers of forced migrations. An average of 21.5 million people have been forcibly displaced by weather-related sudden onset hazards each year since 2008. The World Bank's Groundswell report estimates that climate change could force an additional 216 million people across six world regions to move within their countries or across borders by 2050. Over [a billion people](#) could be displaced globally by 2050. Therefore, protections for climate migrants are urgently needed.

Data available reveals that the climate crisis has resulted in a material loss of \$4.3 trillion over the last 50 years. From 2010 to 2020, human mortality from extreme weather in vulnerable regions that did not contribute significantly to emissions was [15 times higher than in other regions](#). With unchecked emissions, the loss to be incurred during the next 50 years could be a staggering \$178 trillion, and these losses are likely to be underestimated because most modeling approaches exclude or undervalue irreversible risks, such as crossing tipping points in natural and human systems.

Although strong mitigation actions, if applied globally as planned during COP-28, may slow down warming to under 2°C by 2060, this scenario is increasingly uncertain. With today's climate policy commitments worldwide, we expect to approach 2.7°C warming by 2100. This would render about [one-third of the currently habitable space on Earth uninhabitable](#) – affecting more than 2 billion people.

Starting from 2023, with [implemented policies](#), we face at least 25 years where global warming will inevitably surpass targets, [reaching](#) 1.5°C (2.7°F) to 2.0°C (3.7°F). This escalation heightens the risk of severe disruptions and crossing critical thresholds in both natural and social systems.

# Air pollution from fossil fuels leads to over 5 million premature deaths in children and adults every year.



Current mitigation efforts are not enough to ensure the safety of people and ecosystems. Therefore, we must accelerate endeavors to bend down the warming curve by phasing out fossil fuels and rapidly reducing greenhouse gas emissions to enable sustainable living. At the same time, we must focus our efforts on strengthening the resilience of people and ecosystems. Following IPCC-AR6 (2023)

*We define resilience as the capacity of social, economic, and environmental systems to cope with a hazardous event, trend, or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure while also maintaining the capacity for adaptation, learning, and transformation.*

## The Protocol

We call for the creation of a Planetary Protocol for Climate Change Resilience, endorsed by experts in both the sciences and social sciences and, crucially, by those in direct service to the communities of the world, including mayors and governors. As evidenced by our signatures at the end of this document, we are committed to, and advocate for, the immediate implementation of these critical measures:

- 1) A One-Earth approach is needed to guide urgent action and speed up policy change and implementation. Amidst the climate emergency, it is imperative to acknowledge the fundamental right of every individual to climate change resilience.
- 2) We are dealing with separate but interconnected systemic challenges: climate change, large-scale biodiversity loss, environmental pollution, global inequity, and food insecurity. These issues, if not addressed collectively with great urgency, pose existential threats to humans and other living beings, as well as the ecosystems they depend upon. Poor people will be the most adversely affected.
- 3) We recognize that the climate crisis will get **worse** in the near-term, even if the most optimistic mitigation actions to bend the emissions curve are put into place now. Emissions already present in our atmosphere, will cause suffering that socio-political inertia will extend. We need both a short-term plan (a sprint over the next 25 years) and a long-term plan (a marathon over 25 to 100 years).
- 4) Bend the warming curve down rapidly, and, rebound to sustainable living to survive and thrive in ways that are just and lasting. While current approaches to the climate crisis, especially climate finances, revolve mainly around mitigation, we need to do more, and faster. Global cooperation is essential, since emissions anywhere is global heating everywhere.

**An average of 21.5 million people have been forcibly displaced by weather-related hazards each year since 2008.**

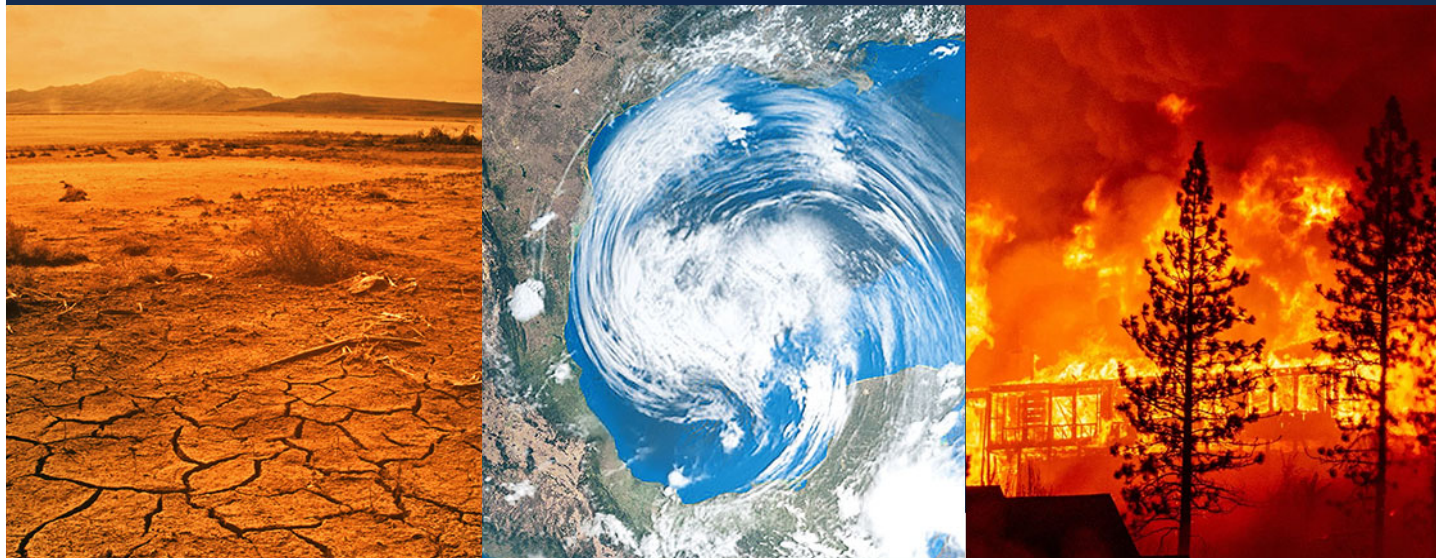


**Over a billion people could be displaced globally by 2050.**

- 5) We advocate for a swift, multifaceted approach to climate resilience: rapidly reducing emissions, adapting to current climate shifts, and implementing innovative financing mechanisms. This effort demands global cooperation to address, for example, anticipated large-scale migrations, immediate behavioral shifts to cool the planet, transformative education, sustainable food and water practices and ocean and land restoration.
- 6) Wealthy nations and the global affluent must empower the poorest three billion, who contribute least to climate change, with access to clean energy, water, food, and air. They should also facilitate technology and resource transfers to developing countries, aiding them in the global effort to curb warming and tackle short-lived climate pollutants effectively. Both political and investment priority should be given to actions that achieve both fast mitigation, and rapid adaptation. We should strive for mandatory commitments and effective results. These actions will contribute to climate justice and peace, locally and globally.
- 7) We recognize that healthy natural systems underpin our physical, social, and economic resilience, and advocate for urgent action to scale implementation of nature-based climate solutions.
- 8) We acknowledge that the architecture of the P2C2R must be built on the three-pillar MAST principle, as described in our book, [Resilience of People and Ecosystems under Climate Stress](#), and in the COP-28 statement of [PAS and PASS](#).
- I) Doing everything in our power to rapidly reduce global greenhouse gas emissions and bend the warming curve by 2050 to limit temporary overshoot to below 2°C and to limit the warming to 1.5°C as soon as possible, is the first pillar of MAST... and also prioritizing nature-based solutions in the proactive removal of CO<sub>2</sub> from the atmosphere.
  - We must drastically reduce four short-lived climate pollutants (methane, black carbon soot, tropospheric ozone, and HFCs) to reduce the rate of warming by half in the short term (<25 years). We need massive acceleration of the global decarbonization process by transitioning away from fossil fuels during the same time.
  - We must remove about 300 billion tons of CO<sub>2</sub> from the atmosphere during the next 40 years (an ultra-marathon), ideally in nature-based ways as much as possible. The current weight of the CO<sub>2</sub> blanket that humans have contributed to is over 1,200 billion tons. Safe means of greenhouse gas capture and storage must be researched and developed, but is not an alternative to cutting emissions from fossil fuels.
  - The design approach of climate solutions must broaden the current focus and include

# THE COST OF DOING NOTHING

Unchecked climate change could cost the global economy \$178 trillion in net present value terms from 2021- 2070.



By 2050, it is estimated that an additional \$33 trillion on top of existing spending plans (\$98 trillion) is needed to achieved 1.5°C goal.

nature-based climate solutions that bring in oceans, mangroves, farmlands and forests, which will contribute to addressing the biodiversity loss and inequity crises, along with technological and institutional innovations.

- Construction and housing: transforming the built environment is a crucial factor in the climate equation. Buildings and infrastructure are directly responsible for up to 40% of the emissions. Transform settlements into carbon banks by prioritizing organic building materials in support of sustainable bioeconomy including such homes that transform today's depressed areas. Nature-based, clean affordable energy solutions should also be the basis for the transformation of the built environment.
  - Agroforestry for resilient and productive landscapes: with its multifunctional properties, agroforestry should be scaled up in rural and urban settings to provide a sound framework for optimizing synergies to reduce climate risks –and, at the same time, enhance biodiversity at the interface of agriculture and forestry.
- II) Adaptation to unavoidable climate change is the second pillar of MAST. Adaptation has three objectives: reducing sensitivity to climate change, reducing exposure to climate threats, and enhancing adaptive capacity. However, there are limits to human and ecosystem adaptations, and to stay within these limits, adaptation must be tightly integrated with mitigation. Crucially, adaptation must be prioritized equally with mitigation and requires action, across all sectors and levels of society. Adaptation efforts should include a focus on public health, including mental health and well-being, along with the flourishing of other living beings and ecosystems - a critical priority in the design of adaptation, solutions under P2C2R. Adapting to heat stress is essential to avoid large numbers of deaths in the coming decades.
- Reducing inequity: The milestones of adaptation for this group include access to affordable clean energy, clean water, sustainable farming, healthcare, early warning systems of weather extremes, and, above all, education.
  - Women should be decision-makers at national and local levels for resource allocation for climate change actions. Girls' and women's literacy promotes health and is a most powerful tool against poverty.
  - Stability for ecosystems: the Amazon is one of the most important biomes on Earth in delivering ecosystem services that are essential to increase the resilience of global systems to climate change. But the Amazon is also suffering from a pronounced loss of resilience. A particular case for just land and natural resource management can be

# MAST: A Strategy to Survive and Thrive the Climate Crisis.



## Mitigation Adaptation Societal Transformation

made for the Congo basin and the African drylands. Nearly a third of global drylands occur in Africa. These two-thirds of Africa's land area are home to the most vulnerable communities, ecosystems, and livelihoods.

- Ensuring food and water security and meeting WHO air quality standards should be a high priority. The plan should also include maintaining acceptable air quality in poor neighborhoods through air quality monitoring and indoor filtration systems.
- Nature-based solutions should be integral to both adaptation and mitigation of emissions. These include sustainable land and soil management, forest protection, agroforestry, water-use efficiency in farming, reduced inputs such as fertilizer to help farmers economically, and enhancing soil capacity for carbon sequestration. There is an opportunity to scale up people-centered approaches to reduce deforestation, protect biodiversity, and reduce inequity in the Amazon, Africa, and Asia. Given the threats or a tipping point in the Amazon ecosystem, new and bold finance mechanisms are needed.
- There is a need to increase the magnitude, efficiency, and speed of climate finance deployment including the need for adaptation/resilience-specific financing in addition to climate finance. Multilateral organizations should be challenged to reduce bureaucracy and increase on-the-ground impact through innovative governance and management arrangements. Donors from both the public and private sectors should be challenged to multiply the scale of funding. Investments in communities and cities must be prioritised.
- Regional climate hotspots, such as Amazonia, Small Island Nations, Drylands of Great Horn of Africa, West Africa, Southern Africa, South Asia, the Middle East, NE China, and Southwest USA, should receive special attention. Taking Africa as a major example of adaptation urgency, an integrated intervention in Africa's drylands should include the following actions and governance structure: establish new business models for inclusive economies, particularly in growing urban centers, to drive sustainable value chains. Create Green Enterprises (social enterprises) that become employers. Establish a high-level political commitment to land restoration and tenure security for local benefits.
- Building capacities of citizens and institutions in climate change adaptation at all levels through education, training, public awareness activities, and exchange of knowledge and best practices, including applications of climate resilience technologies and traditional knowledge.

The need for a profound societal transformation across the global population is immediate and critical. Our aim is to enlighten and galvanize societies worldwide into prompt, unified action against climate change and for climate resilience. Our strategy is comprehensive, spanning policy shifts, education, and behavioral changes under the banner of MAST. This is a pivotal moment that calls for unwavering commitment and immediate action. We must capture this moment and transition to a benevolent era with no one left behind.

III) Societal Transformation is the third pillar of MAST, which is essential for thriving in a sustainable future after surviving the crisis. Societal Transformation involves fundamental shifts in behavior, including consumption, and in socio-economic systems and governance. In Pope Francis' words, "This transformation is akin to an ecological conversion." The climate crisis presents us with an unparalleled opportunity to build a stronger, healthier, and more just world that reflects the fact that our thriving depends on the well-being of the natural world and other living beings.

- This transformation requires climate literacy for all, from children to adults; access to affordable energy, clean air and water, and education for the poorest three billion people on the planet so they can adapt to climate disasters and thrive in a post-global warming world; public-private partnerships to finance both mitigation and adaptation; provision of skills and training, to allow all access to the jobs needed to deliver these changes, and partnerships with faith-based institutions to garner strong public support for climate actions.
- Planning and policy initiatives must adopt and include child-centered approaches to fostering resilience.
- Comprehensive environmental and sustainability education should be integrated into school curricula worldwide, ensuring that all children develop a deep understanding of ecological issues, sustainable practices, and their roles in fostering a sustainable future from an early age. This should include the promotion of attitudes that encourage responsible stewardship of the planet, critical thinking about environmental challenges as well as preparation for future careers in sustainable industries.
- We must urgently transition from fossil fuel energy to clean energy.
- Harmful subsidies for fossil fuels must be shifted to support actions that can rapidly bend the warming curve, such as universal health coverage, public transportation, healthy food choices, reducing air and water pollution, and promoting equity.
- A firm commitment must be made to sustainable agriculture so as to rapidly bend the warming curve, promote equity and offer healthy food choices.
- Behavioral change in people, communities, and the private sector must be rooted through a new global initiative to educate everyone from childhood to old age.



- Researchers and policymakers working on solutions should adopt evidence-based trans-disciplinary collaborations that involve mayors, governors, and local NGOs to manage the resources available at various levels of government.
- Climate change is global, impacts locally, and requires local action. Therefore, we call upon heads of nations to facilitate stronger voices of mayors and governors in global climate policy.

## Authors

V. Ramanathan (PAS; Co-Chair of the Protocol Document, India, USA), Marcelo Suarez-Orozco (PASS; Co-Chair of the Protocol Document, Argentina, USA), Joachim von Braun (President of PAS; Germany), Sr. Helen Alford OP (President PASS; UK), Cardinal Turkson (Chancellor of PAS and PASS; Ghana), Orjan Gustafsson (PAS; Sweden), Mohamed Hassan (PAS; Sudan/Italy), John Schellnhuber (PAS; Germany), Virgilio Viana (PAS; Brazil), Hoesung Lee (IPCC Chair until 2023; S Korea), Gina McCarthy (Former EPA Chief and Climate advisor to Biden administration; USA), Sunita Narain (Dir General, CSE; India), Gabrielle Dreyfus (Chief Scientist, IGSD; DC), Jeremy Farrar (WHO Chief Scientist; UK); Joyce Kimutai (Univ of Cape Town and Oxford U; IPCC Lead author on desertification; South Africa), Melissa Hoffer (Climate Chief, Massachusetts; USA), Carola Suarez-Orozco (Harvard University, USA), Soumya Swaminathan (Former chief scientist, WHO; President, Swaminathan Foundation, India), Romina Picolotti (Former Environment Minister, Argentina/USA and IGSD; DC; USA, Argentina); Kongjian Yu (China/USA).

Acknowledgement: Publication of this document was funded by Sara McCune Foundation.

The protocol can be cited as:

Ramanathan, V; Suarez-Orozco, M; von Braun, J; Sr. Helen Alford; Turkson, P; Gustafsson, O; Hassan, M; Schellnhuber, J; Viana, V; Lee, Hoesung; McCarthy, G; Narain, S; Dreyfus, G; Farrar, J; Kimutai, J; Hoffer, M; Suarez-Orozco, C; Swaminathan, S; Picolotti, R; Yu, K; 2024: Planetary Protocol for Climate Change Resilience. Published by the Pontifical Academy of Sciences and the Pontifical Academy of Social Sciences.