

Mobilizing Science for a Global Green Renaissance Progress Report 1st edition

In this report, we share highlights from the first edition of the Frontiers Planet Prize and the accompanying progress it has made since its launch, on Earth Day, April 22nd, 2022.

We present an overview of all the institutions that have participated in the prize, the national academies that advocate the research excellence of their country, our esteemed partners and board members that empower the research community at large, and of course, the scientists that were nominated for their groundbreaking work on the planetary boundaries.

Introducing the Frontiers Planet Prize

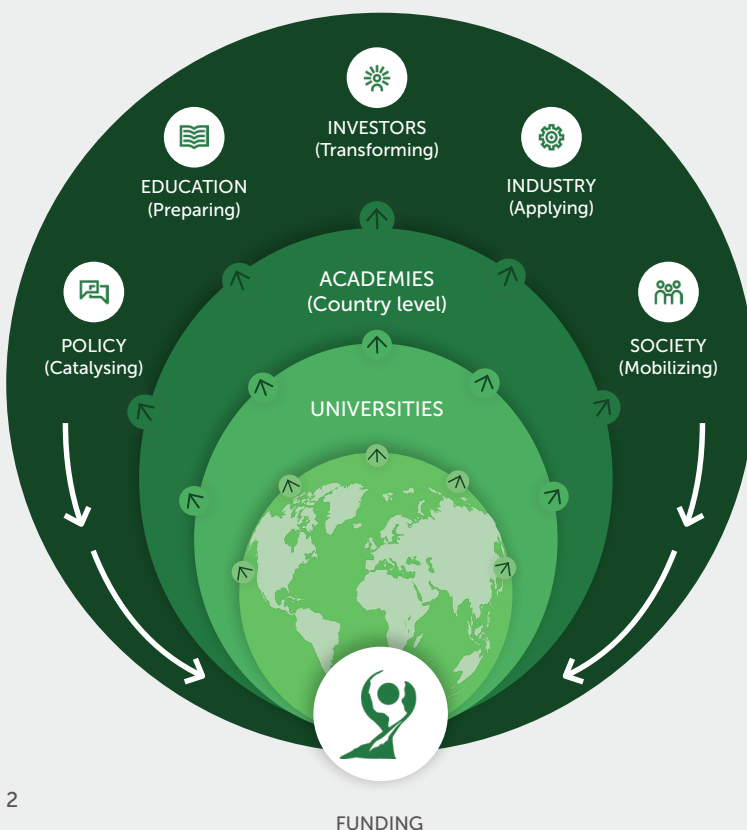
The Frontiers Planet Prize is a global science competition that recognizes and rewards scientists whose research contributes to accelerating the solutions that allow humanity to continue to thrive within the **nine planetary boundaries**. The planetary boundaries framework provides the basis for the criteria of the prize and describe the limits of nine biophysical systems and processes, or “tipping points” that regulate the functioning of life support systems on earth and ultimately the stability and resilience of the earth system.

Launched by the Frontiers Research Foundation, on Earth Day 2022, the prize’s mission is to directly respond to the current sustainability challenges our planet faces.

The award intends to honor a National Champion per country, and three International Champions, each

of whom is awarded one million Swiss francs. These titles are awarded to the lead scientists of the winning published article whose findings are judged to have the greatest potential to keep our planet remain within at least one of these planetary boundaries. The decision to grant the title of National and International Champions is done exclusively by an international, independent Jury of 100 world leading sustainability experts.

In addition to receiving the recognition as National or International Champion, and to promote the dissemination and amplification of the impact of the winning research, the Foundation facilitates opportunities for these scientists to present their work at national and international conferences and embed them in initiatives that effectively bridges science and society. The ultimate ambition of the Prize is to use science excellence to secure more research funding dedicated to advancing planetary boundary science, through engaging with policy makers, venture capitalists, high schools, and young leaders – crucial stakeholders in society.



The cohort of National Champions for the first edition were announced on Earth Day, 2023 (April 22nd), and the International Champions at the Frontiers Planet Prize Award Ceremony, which took place in Montreux, Switzerland as part of **Frontiers Forum Live**, on April 27th 2023.

FIGURE 1
The butterfly effect: the impact of the prize beyond academia

The Prize mechanics and criteria

The unique mechanism of the Frontiers Planet Prize allows for a rigorous evaluation at both an institutional and national level to crowd source the most impactful research. National Nominating Bodies (NNBs) are a global cohort of leading research institutions and universities that source applications from researchers affiliated to their institution. National Representative Bodies (NRBs) consist of national academies and research councils within each country where participation in the prize takes place. Each NNB receives applications from active researchers within their institution, evaluate them and submit the top three nominations to their NRBs, who in turn, evaluate and shortlist three nominations that represent science excellence from their country to the Jury of 100. At all stages, participating bodies ensure an equitable opportunity was given to all scientists, eligible for the prize.

The final body in the evaluation process is the Jury of 100: an international and independently functioning panel of leading sustainability and planetary health experts. Collectively, their multidisciplinary expertise covers the full spectrum of planetary boundary science, and planetary health. Chaired by Johan Rockstrom, director of the Potsdam Institute for Climate Research Institute, and pioneer of the planetary boundaries framework, the Jury of 100 is the ultimate arbiter who decide on the National and International Champions.

The criteria of the prize, set by the Jury of 100, focuses on scientific novelty, excellence, the applicability of the research results, scalability of the findings, the number of planetary boundaries involved, and the overall contribution to our understanding of planetary boundaries. All applications considered for the first edition of the prize are based on one peer reviewed research article, accepted for publication within the two years prior to the submission deadline.



FIGURE 2
The mechanics of the Frontiers Planet Prize

Participation

During the first edition of the prize, institutions in countries that contribute to 90% of all the world's output on planetary boundary science were invited to participate. Invitations were issued by both the

Frontiers Planet Prize team, and 13 participating academies as NRBs, who worked in disseminating the call for participation within their countries and inviting institutions to register. A total of 233 NNBS registered to participate. For all countries without a participating national academy, the International Science Council acted as a global National Representative Body.

Institutions registered per country

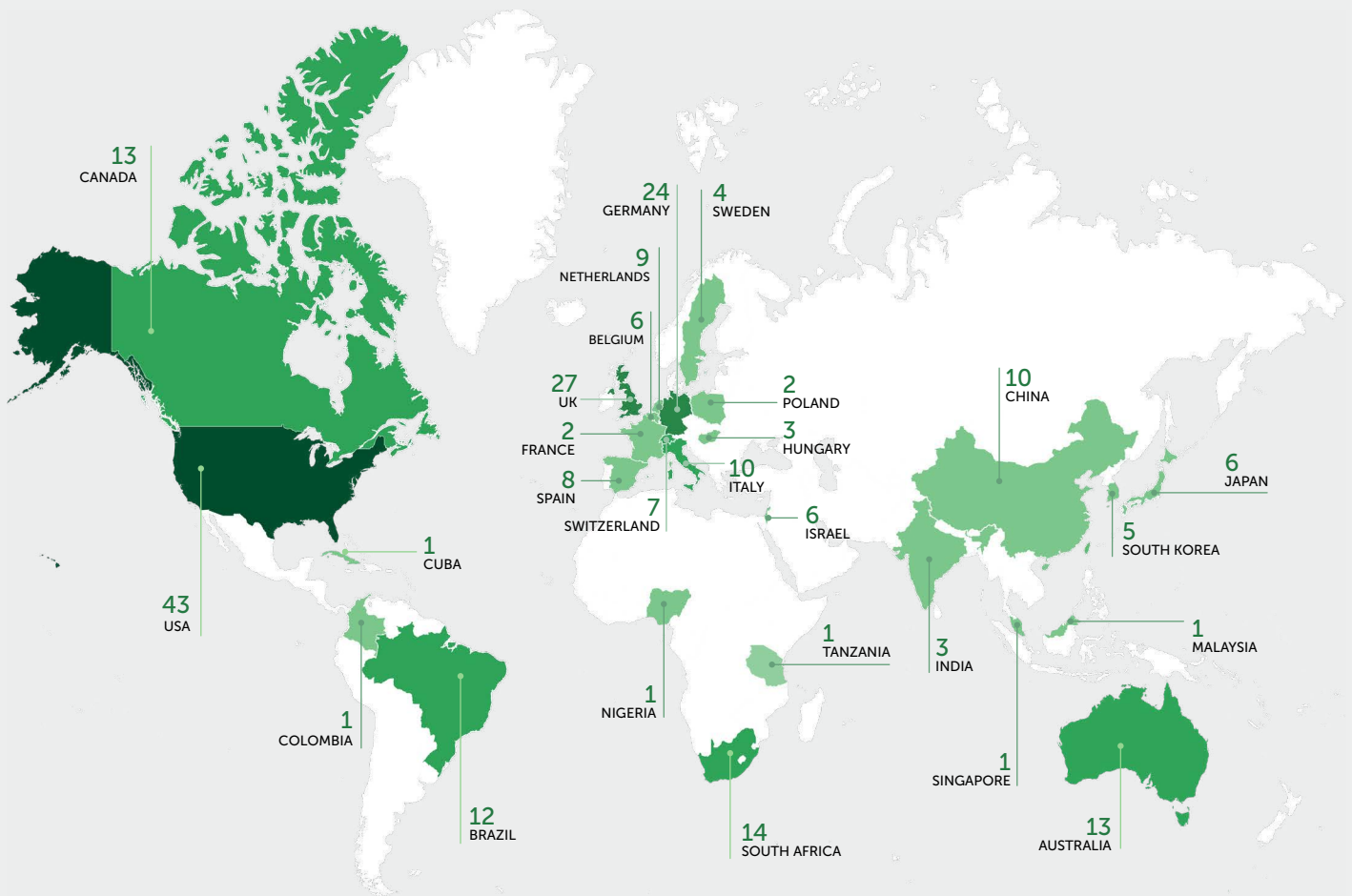


FIGURE 3
Global map of number of institutions registered per country

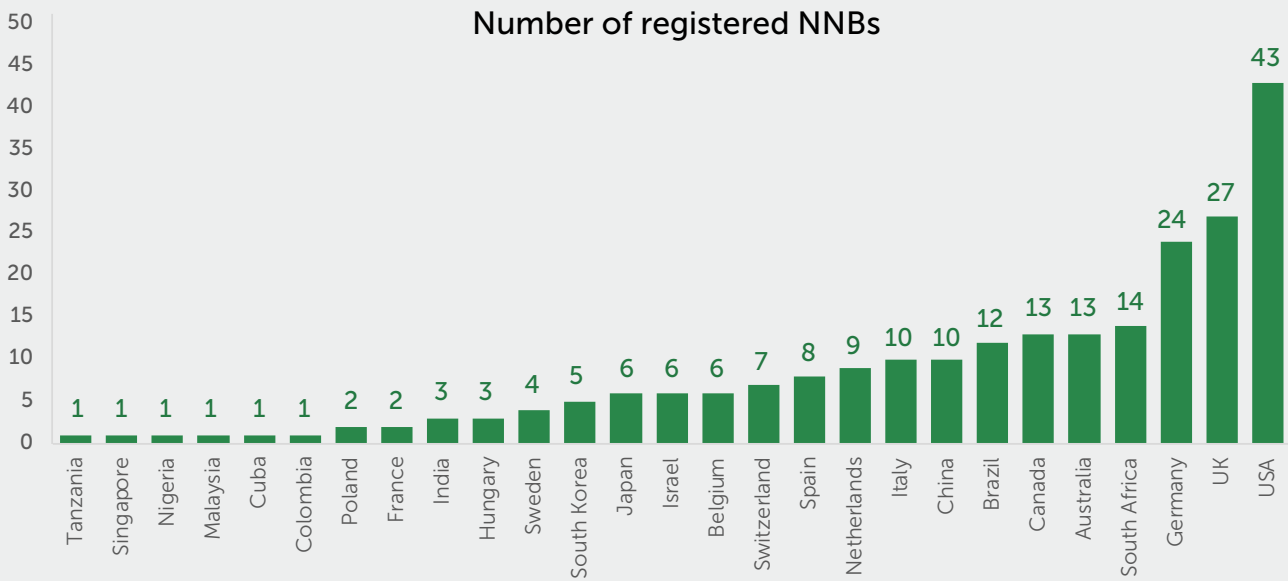


FIGURE 4
Distribution of National Nominating Bodies per country

The initial cohort of NRBS was composed of the following participating academies and research councils in the first edition.

- Network of African Science Academies (representing the entire African continent)
- Australian Academy of Sciences (Australia)
- Royal Academy of Science, Letters and Fine Arts of Belgium (French speaking Belgium)
- Brazilian Academy of Science (Brazil)
- National Research Council Canada / Government of Canada (Canada)
- China Association for Science and Technology (China)
- Royal Flemish Academy of Belgium for Science and the Arts (Flemish speaking Belgium)
- Hungarian Academy of Sciences (Hungary)
- Israel Academy of Sciences and Humanities (Israel)
- Polish Academy of Arts and Sciences (Poland)
- Academy of Science of South Africa (South Africa)
- Spanish Royal Academy of Sciences - The Royal Academy of Exact, Physical and Natural Sciences of Spain (Spain)
- National Academy of Sciences (United States of America)

All National Academies are each entrusted with a threefold mandate: to propagate and promote participation from their institutional network, to gather and assess nominations received from their National Nominating Bodies, and to amplify the impact of the research excellence from their respective countries through prominent conference and scientific symposia.

The 1st edition National Champions

A total of 20 National Champions, from 6 continents were selected by the Jury of 100 and were officially announced on Earth Day 2023. The Champions, research articles and journal of publication were as follows:



 Australia

Prof Peter Macreadie
Deakin University

Blue carbon as a natural climate solution

(Nature Reviews Earth & Environment, 2021).



 Belgium

Prof Pierre Coheur
Université libre de Bruxelles

Global, regional and national trends of atmospheric ammonia derived from a decadal (2008-2018) satellite record

(Environmental Research Letters, 2021).



 Brazil

Prof Ricardo Rodrigues
University of São Paulo

Balancing natural forest regrowth and tree planting to ensure social fairness and compliance with environmental policies

(Journal of Applied Ecology, 2021).



 Canada

Prof Marie-Josée Fortin
University of Toronto

Limited spatial rescue potential for coral reefs lost to future climate warming

(Global Ecology and Biogeography, 2022).



 China

Prof Baojing Gu
Zhejiang University

Abating ammonia is more cost-effective than nitrogen oxides for mitigating PM2.5 air pollution

Science, 2021



 Germany

Prof Klement Tockner

Senckenberg Society for Nature Research & Goethe Uni. Frankfurt

Global prevalence of non-perennial rivers and streams

Nature, 2021



 Hungary

Dr Gábor Szatmári

Centre for Agricultural Research

Estimating soil organic carbon stock change at multiple scales using machine learning and multivariate geostatistics

Geoderma, 2021



 Israel

Prof Jonathan Belmaker

Tel Aviv University

A meta-analysis reveals edge effects within marine protected areas

Nature Ecology and Evolution, 2021




 Italy

Prof Andrea Castelletti
Politecnico di Milano

Unintended consequences of climate change mitigation for African river basins

Nature Climate Change, 2021



 Japan

Prof Jian Feng Ma

Okayama University

Duplication of a manganese/cadmium transporter gene reduces cadmium accumulation in rice grain

Nature Food, 2022



 Netherlands


Dr Paul Behrens

Leiden University

Dietary change in high-income nations alone can lead to substantial double climate dividend

Nature Food, 2022



 Poland

Prof Bartosz Grzybowski

Polish Academy of Sciences, Korea's Institute for Basic Science & Allchemy, Inc

Computer-designed repurposing of chemical wastes into drugs

Nature, 2022



 South Africa

Prof Mark New
University of Cape Town

Nature-based solutions in mountain catchments reduce impact of anthropogenic climate change on drought streamflow

Communications Earth & Environment, 2022



 Singapore

Prof Lian Pin Koh

National University of Singapore

Co-benefits of forest carbon projects in Southeast Asia

Nature, 2022



 South Korea

Prof Soon-Il An

Yonsei University

Widespread irreversible changes in surface temperature & precipitation in response to CO₂ forcing

Nature Climate Change, 2022



 Spain

Prof Luis Guanter

Universitat Politècnica de València

Satellite-based survey of extreme methane emissions in the Permian Basin

Science Advances, 2021



 Sweden

Prof Maria Nilsson
Umeå University

Tracking progress on health and climate change in Europe

Lancet Public Health, 2021



 Switzerland

Prof Bernhard Schmid

University of Zurich

Multispecies forest plantations outyield monocultures across a broad range of conditions

Science, 2022



 UK

Prof Carlos Peres

University of East Anglia

Sustainable-use protected areas catalyze enhanced livelihoods in rural Amazonia

Proceedings of the National Academy of Sciences, 2021



 USA

Prof Edward Kolodziej

University of Washington

A ubiquitous tire rubber-derived chemical induces acute mortality in coho salmon

Science, 2020

The 1st edition International Champions

April 27th, 2023, marked the announcement of the International Champions, which took place at the **Frontiers Forum live** event at Montreux, Switzerland.

During a second round of voting, out of the 20 National Champions, the Jury selected four International Champions following a tied vote. The four champions

from the United Kingdom, South Africa, China, and the Netherlands, all shared the total prize of three million Swiss francs to continue the research activities of each winning article. Professor Carlos Peres, from East Anglia University, UK and Prof Mark New, from Cape Town University, South Africa both received one million Swiss francs each, while Prof Baojing Gu, from Zhejiang University, China, and Dr Paul Behrens, from Leiden University, the Netherlands each received 500,000 Swiss francs.



International Champion 1



Prof Carlos Peres

University of East Anglia, UK

Prof Carlos Peres from Belém, in the eastern Brazilian Amazon, leads the Amazon Ecology & Conservation Research Group at the University of East Anglia. His research with the non-profit conservation organization Instituto Juruá has focused on how best to protect tropical floodplain and forest ecosystems in marginalized tropical regions with poor governance, while rewarding the local communities who proverbially 'hold the fort'. The aim of this 'win-win' conservation-development program is to demonstrate that it is possible to implement bottom-up initiatives that both protect virtually intact natural ecosystems in the Amazon and improve multiple dimensions of local livelihoods, including education, healthcare and access to markets, sustainable income, and information technology.

Prof Peres's winning research article explores the planetary boundaries climate change, freshwater use, and land system change.



Winning article

Sustainable-use protected areas catalyze enhanced livelihoods in rural Amazonia

Proceedings of the National Academy of Sciences, 2021


 International Champion 2



Prof Mark New
University of Cape Town, South Africa

Based in Cape Town, South Africa, Mark New represents the AXA Research Chair in African Climate Risk group based at the African Climate and Development Initiative at the University of Cape Town. The research aims to attribute the impacts of climate on society and, more importantly, how different adaptation responses can offset these impacts. This quantification of socio-economic impacts and the effectiveness of adaptation will provide evidence on which forms of adaptation are most effective in different contexts, where investments in adaptation will yield the best returns, and the extent of damage that can be avoided through adaptation. The work aims to provide better information for decision-makers and investors in adaptation, to provide more robust information on losses and damages from climate change, to raise public awareness of climate risk and its impact on human security, and ultimately to make natural and human systems more resilient to the climate risks that cannot be avoided through mitigation.

Prof New’s winning research article explores the planetary boundaries biosphere integrity, climate change, freshwater use, and land system change.

 Winning article

Nature-based solutions in mountain catchments reduce impact of anthropogenic climate change on drought streamflow

Communications
Earth and
Environment, 2022

 International Champion 3



Prof Prof Baojing Gu
Zhejiang University, China

Baojing Gu is from Hangzhou, China and represents the international nitrogen management research group based at Zhejiang University. His team's research is based on how to mitigate global fine particulate matter pollution by reducing nitrogen emissions through interdisciplinary analysis of nitrogen budget, atmospheric chemistry, human health, cost-benefit, and policy implications. The goals of this initiative are (1) to reduce both atmospheric aerosol loading and nitrogen pollution to the safe planetary boundary, (2) to save economic resources from pollution control and fertilizer use for food production, (3) to increase the efficiency of global PM2.5 pollution control, and (4) to highlight the importance of ammonia abatement for the synergy of food security and environmental protection.

Prof Gu's winning research article explores the planetary boundaries biogeochemical flows and atmospheric aerosol loading.

 Winning article

Abating ammonia is more cost-effective than nitrogen oxides for mitigating PM2.5 air pollution

Science, 2021

 International Champion 4



Dr Paul Behrens

Leiden University, The Netherlands

Paul Behrens is from the UK and is based at Leiden University in the Netherlands. At the Institute of Environmental Sciences, his group’s research focuses on reducing environmental impacts through changes in behavior and production. His winning research looks at how land freed up by the shift to a plant-based diet could be used in high-income countries, significantly reducing carbon dioxide and methane emissions. There is significant potential for a double dividend if the land saved is returned to natural vegetation, yielding improvements in biodiversity, water quality, and air quality. Dr Behrens works in industrial ecology on climate, energy, and food systems. He has written a popular science book, *The Best of Times, The Worst of Times: Futures from the Frontiers of Climate Science*, which describes humanity’s current trajectory and possible futures in paired chapters of pessimism and hope.

Dr Behrens’s winning research article explores the planetary boundaries climate change, and land system change.

 Winning article

Dietary change in high-income nations alone can lead to substantial double climate dividend

Nature Food, 2022

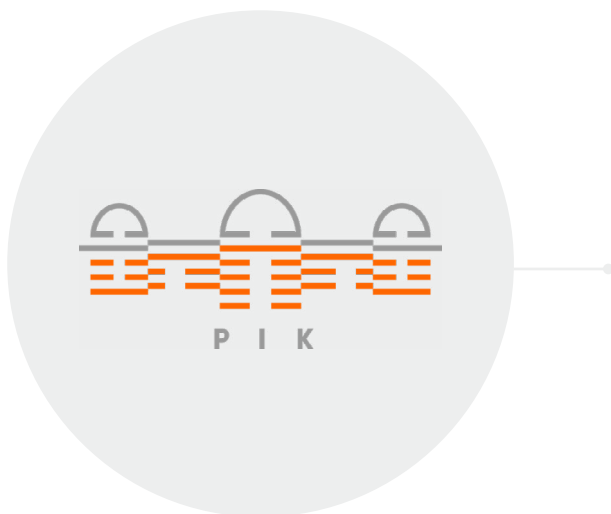
Inspiring action and awareness through our partnership network

In our collective journey towards a sustainable future, the Frontiers Planet Prize forged strong collaborations with key strategic partners aligned with our collective mission. Each partner brings unique expertise, valuable perspectives, and an unwavering commitment to inspiring action and promoting awareness. Together, we stimulate and encourage meaningful discussions, connect diverse communities, and unlock opportunities for the academic community embedded in the prize.



International Science Council

The International Science Council (ISC) is a non-governmental organization with a unique global membership that brings together more than 200 international scientific unions and associations, as well as national and regional scientific organizations, including academies and research councils.



Potsdam Institute for Climate Impact Research

The Potsdam Institute for Climate Impact Research (PIK) is a world leader on interdisciplinary climate impact research for global sustainability and contributing knowledge and solutions for a safe and just climate. The mission of the Potsdam Institute for Climate Impact Research is to integrate the latest understanding of the Earth system with the assessment of climate risks, and with the exploration of policies and pathways towards a manageable climate future.



Future Earth

Future Earth is a global initiative focused on advancing sustainability science. It convenes researchers and scholars from all parts of the world, across different societal and academic sectors, and across the natural, social, and human sciences. Future Earth initiates and supports international collaboration between these researchers and stakeholders to identify and generate the integrated knowledge needed for successful transformations towards societies that provide good and fair lives for all within a stable and resilient Earth system. To achieve this, Future Earth uses rigorous transdisciplinary research and systems thinking approach.



The Villars Institute

The Villars Institute was established in 2022 as a non-profit foundation to accelerate the transition to a net zero economy and to restore the health of the planet for all its inhabitants. Located in the Swiss Alps, the Villars Institute is a platform for systemic change and a place for intergenerational collaboration. It is also a curator of artistic, cultural, and sports activities that promote biodiversity, planetary health, and sustainable development.



Falling Walls

Falling Walls is a unique global hub connecting science, business, and society. It shapes the future of humanity through impact-oriented ideas and discoveries, driven by its shared dedication to creating breakthroughs across borders and disciplines.

Amplifying transformational science through our strategic initiatives

In addition to recognizing and rewarding impactful research, the prize also acts as a platform to integrate their findings into broader discussions beyond academia. These initiatives are facilitated by strategic partnerships that provide opportunities for the prize winners to participate in various national and international forums.

Initiatives include the participation of our recipients in scientific panels, conferences, and focused roundtables. These initiatives serve to disseminate their insights to a wider audience, with the aim of informing policy and encouraging the implementation of their discoveries.

Following the inaugural Frontiers Planet Prize Award Ceremony held in April 2023, both the Prize and its recipients have been actively involved in numerous

global events, cementing their roles in the discussions around planetary health and wellbeing, including:

- Accelerating climate solutions at scale in key biomes: The 2023 [Nature Restoration Roundtable](#), hosted by the Villars Institute
- Securing a powerful global voice for science, featuring Prof Baojing Gu, International Champion, China [Global Knowledge Dialogues](#), hosted by the International Science Council
- Advancing science to save the planet: [Falling Walls Science Summit 2023](#)
- Futures from the Frontiers of Climate Science: a keynote from Dr Paul Behrens [Frontiers Forum Virtual Series](#)
- Unlocking Solutions through Transformational Science: a panel discussion at [COP28](#)

The contribution of the scientific community to these conversations is ongoing and imperative for future policy and decision-making processes.

Closing words

“As Director of the Frontiers Planet Prize, I see our mission as the spark that ignites a vital green renaissance in our modern, 21st-century world. Science allowed us to rethink and reorganise our Middle Ages into premodern and more enlightened societies. Science again is needed to transform our fossil fuel based, biodiversity degrading, hyper industrialised societies into a healthy planet. This transformation is the unavoidable [green renaissance](#) challenge we face this century and there is no way we can make it without a global and massive mobilization of what made the homo sapiens truly sapiens: our brains and knowledge. The global scientific community can do this but is in dire need of more significant resources to make this vision a reality. It is here that the Frontiers Planet Prize’s fundamental ambition emerges - to stimulate a worldwide race for solutions and acquire these vital resources as part of the challenge and in doing so mobilizing more funding to step up the production of knowledge we need. We simply cannot afford to wait until business as usual will produce the science we need.

While it is true that science alone may not settle all our planet’s concerns, without it, it certainly will not happen.”



Prof Jean-Claude Burgelman

Director of the Frontiers Planet Prize

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