



The Degrees Initiative

First Floor
10 Queen St Pl
London, EC4R 1BE

United Nations Environment Programme

Civil Society Unit
Nairobi, Kenya

21 February 2025

The Degrees Initiative inputs to the UNEA-7 draft Ministerial Declaration

The Degrees Initiative is grateful for and welcomes the opportunity to contribute information to be considered for inclusion in the draft Ministerial Declaration of the seventh session of the United Nations Environment Assembly (UNEA-7) under the theme 'Advancing Sustainable Solutions for a Resilient Planet'.

The Degrees Initiative is a nongovernmental organisation which for thirteen years has built the capacity of developing countries and emerging economies to evaluate solar radiation modification (SRM), supporting research in 22 countries across the Global South.

Degrees empowers researchers in climate-vulnerable regions to conduct their own research and ensure their voices are heard in international negotiations and discussions on SRM research and governance.

The Degrees Initiative requests the Ministers for the Environment to consider the following:

- If the world is to make informed decisions on SRM, it needs Southern research and expertise.
- There are leading SRM research projects across the Global South, listed in Annex 1. The Southern researchers supported by Degrees are becoming leading SRM experts. To date, research teams from Africa, Asia, and South America have [published](#) 33 peer-reviewed papers on SRM in internationally renowned journals. Over 20 of the researchers are also Intergovernmental Panel on Climate Change (IPCC) authors, including two IPCC Vice-Chairs.
- Degrees is available to connect the Ministers for the Environment with the projects in the Annex, so that they can be informed by experts from their own countries/regions.
- Strengthening the Global South science-policy interface on SRM can generate regional-specific policy-relevant research, grounding important decision-making on

The Degrees Initiative is a Company Limited by Guarantee without share capital registered in England and Wales (company number: 13290405) and a charity registered in England and Wales (charity number: 1196532). Registered address: The Degrees Initiative, c/o Bates Wells, 10 Queen Street Place, London, EC4R 1BE, United Kingdom. Email: info@degrees.ngo. Website: www.degrees.ngo

this controversial and complex topic on authoritative and validated interdisciplinary expert research.

The Degrees Initiative is neutral on whether SRM should ever be used and will neither promote nor oppose it. It emphasises that SRM cannot be an alternative to cutting greenhouse gas emissions. However, given the increase in global temperatures, the world needs more scientific evidence to reach informed decisions on SRM. These, in turn, require a broader conversation and participation, especially in and by the Global South, to ensure the adoption of equitable decisions that 'Advance Sustainable Solutions for a Resilient Planet'.

Annex 1:

Degrees-Funded African Research Projects

Benin 1

Prof. Ezinvi Baloïtcha at the *University of Abomey-Calavi* and his team research how SRM may affect the impacts of climate change on West Africa's regional climate, in particular precipitation regimes and river discharge in the coastal countries located along the northern Gulf of Guinea where the climate is strongly modulated by oceanic conditions.

[*Effects of SRM on climate change in the northern Gulf of Guinea \(2018\)*](#)

Benin 2

Dr Frédéric Kpèdonou Bonou, researcher at *Institut de Recherches Halieutiques et Océanologiques du Bénin* and his team explore how SRM might reduce (or not) the impacts of climate change on chlorophyll, plankton, and nutrient cycles along the coastal countries in the Gulf of Guinea (GG), as well as on the regional sea level, to help decision-makers anticipate and adapt to climate impacts.

[*Marine biogeochemistry and sea level in the Gulf of Guinea \(2023\)*](#)

Cameroon

Dr Thierry C. Fotso-Nguemo, researcher at the Climate Change Research Laboratory based at the *National Institute of Cartography (NIC)* in Yaoundé, Cameroon, leads a team to evaluate how SRM might alter the effects of climate change on the hydro-climatology of major Central African river basins, including how that might affect irrigation and the filling of dams.

[*Assessing the risks of water deficit in Central Africa \(2023\)*](#)

Ghana 1

Prof. Nana Ama Browne Klutse, Vice-Chair of IPCC WGI and Senior Lecturer at the Department of Physics, *University of Ghana* and team examine how the use of SRM could affect regional temperature, humidity and rainfall in a warming climate.

[*Exploring changes to the Harmattan windy season and precipitation in southern West Africa \(2023\)*](#)

Ghana 2

Dr Portia Adade Williams, Research Scientist with the *Science and Technology Policy Research Institute of the Council for Scientific and Industrial Research* and her team aim to develop social practice recommendations for the potential adoption and implementation of SRM across Africa.

[*Assessing knowledge, governance and social implications of SRM across Africa \(2024\)*](#)

The Degrees Initiative is a Company Limited by Guarantee without share capital registered in England and Wales (company number: 13290405) and a charity registered in England and Wales (charity number: 1196532). Registered address: The Degrees Initiative, c/o Bates Wells, 10 Queen Street Place, London, EC4R 1BE, United Kingdom. Email: info@degrees.ngo.

Website: www.degrees.ngo

Kenya

The team led by Dr Franklin J. Opijah, dynamical meteorology scientist, *University of Nairobi* aims to find out what SRM could mean for climate extremes and urban floods in East Africa, with a focus on the urban areas of Dar es Salaam, Kampala, Nairobi and Addis Ababa.

[*Impacts of SRM on extreme rainfall and urban floods in East Africa \(2021\)*](#)

Mali

Dr Amadou Coulibaly, scientific coordinator, *Institut Polytechnique Rural de Formation et de Recherche Appliquée* and his team model the impact of SRM on droughts from meteorological, agricultural, and hydrological perspectives, providing regional policymakers and stakeholders with valuable information to support their participation in future international scientific and policy debates.

[*Exploring whether SRM could offset droughts in West Africa \(2023\)*](#)

Nigeria

Dr Vincent Olanrewaju Ajayi, associate professor in climate science with a specialisation in climate modelling, *Federal University of Technology* and his team will explore how different crop types – such as cereals, legumes, horticulture, and roots and tubers – will react to different temperature scenarios, both with and without the use of SRM.

[*Assessing the effects of SRM on crops in West Africa \(2023\)*](#)

South Africa 1

Drs Chris Lennard and Romaric Odoulami, climate scientists at the Climate System Analysis Group (CSAG) and African Climate Development Institute (ACDI), *University of Cape Town* and their team are researching the potential impact of SRM on agricultural production in Southern Africa through an analysis of the large-scale prognostic drivers of extreme weather events.

[*Agricultural production under SRM in Southern Africa \(2018\)*](#)

South Africa 2

Dr Andreas Schwarz Meyer, post-doctoral research fellow at the African Climate & Development Initiative (ACDI), *University of Cape Town*, South Africa and his team plan to conduct the first detailed overview – globally and for developing countries – of the temporal and spatial dynamics of biodiversity risks under future climate scenarios with and without SRM.

[*Exploring whether SRM can reduce risks to biodiversity and human health \(2023\)*](#)

South Africa 3

Prof. Babatunde Abiodun, Lecturer and Coordinator of the Atmospheric Science Programme, Department of Environmental and Geographical Science at the *University of Cape Town* and his team are examining how SRM might affect the future of rangeland and livestock production on the continent, to help African policymakers more effectively engage in the debate around whether SRM could be an option to reduce the risks posed by global warming to food security.

[*Assessing the future of livestock production in Africa \(2023\)*](#)

Degrees-funded Asia research projects

Bangladesh 1

Dr Abu Syed, Managing Director of C4RE Services Ltd., senior fellow of the Bangladesh Centre for Advanced Studies (BCAS) and Director of the Nansen-Bangladesh International Centre for Coastal, Ocean and Climate Studies (NABIC) and his team seek to understand how SRM could affect the country's hydrology, with a focus on the Padma-Brahmaputra-Meghna basin.

[*Assessing the impacts of SRM on hydrology in Bangladesh \(2021\)*](#)

Bangladesh 2

Dr Sadique Rahman, Professor at the Department of Agricultural Finance and Management, *Sher-e-Bangla Agricultural University* and his team seek to identify factors affecting the public perception towards SRM in Bangladesh. By analysing six specific climatic hotspots in Bangladesh, they will investigate the differences in perception and preferences towards different SRM techniques across various climatic conditions.

[*Public perceptions of SRM in a climate-vulnerable South Asian country \(2024\)*](#)

Indonesia 1

Dr Heri Kuswanto, Associate Professor at the Department of Statistics of the *Institut Teknologi Sepuluh Nopember* (ITS) and his team are researching the potential impacts of SRM on the climate in Southeast Asia. The project builds on the pioneering SRM research conducted by the team since 2018 on extreme temperature and precipitation over Indonesia.

[*Hydro-climatic extremes in Southeast Asia under SRM \(2018\)*](#)

Indonesia 2

Prof. Rahmat Gernowo, Department of Physics, Faculty of Science and Mathematics, *Diponegoro University*, is leading a team to investigate the shifting impact of tropical cyclones on affected areas due to climate change and how the deployment of SRM might affect their behaviour.

[Studying tropical cyclone-related extreme rainfall in Indonesia \(2023\)](#)

India 1

Prof. Govindasamy Bala, Centre for Atmospheric and Oceanic Sciences, *Indian Institute of Science* (IISc) leads a team that creating and using multiple climate model simulations to evaluate the effect of SRM on the monsoon, compared to a warming world without SRM, bringing crucial new information to global discussions about its future potential.

[Investigating the Indian summer monsoon rainfall under SRM \(2023\)](#)

India 2

Dr Manish Shrivastava, Senior Fellow and Associate Director at *The Energy and Resources Institute* (TERI) is leading a project to build an ecosystem for research on SRM in South Asia, by initiating dialogue among researchers and policy stakeholders on the subject. The team will explore knowledge and perceptions of SRM among policy-influencing stakeholders while examining key drivers of these perceptions.

[Exploring Asian perspectives on the governance of SRM \(2024\)](#)

Malaysia

Prof. Mou Leong Tan, Associate Professor with the Geoinformatics Unit at the *Universiti Sains Malaysia* (USM), leads a team that is evaluating the potential impact of SRM in the Muda River Basin, which supplies vital freshwater to the northern states in Peninsular Malaysia.

[Impact of SRM on Hydro-climatic Extremes in Malaysia \(2023\)](#)

Pakistan 1

Prof. Athar Hussain, Head of Centre for Climate Research and Development (CCRD) at *COMSATS University* is leading the first team exploring how the use of SRM could affect the impacts of climate change on malaria in South Asia, including Iran, Afghanistan, India, Nepal, Bangladesh and Bhutan.

[The impact of climate change and SRM on malaria in South Asia \(2023\)](#)

Pakistan 2

Prof. Athar Hussain, Head of Centre for Climate Research and Development (CCRD) at *COMSATS University* leads a project on climate change, SRM and vector-borne diseases. Using malaria as a pilot study, they will pinpoint knowledge gaps where the impacts of SRM for health policymakers start playing a role in policy development, and survey key stakeholders in Pakistan to better understand existing perceptions regarding climate change and SRM prevailing in the national health community.

[Socio-political dimensions of climate change and SRM in the Pakistani health sector \(2024\)](#)

Philippines 1

Dr Patricia Ann Jaranilla-Sanchez, Professor at the *University of the Philippines Los Baños* (UPLB) with the School of Environmental Science and Management (SESAM) leads a team that researches the potential impacts of SRM on the country's agriculture, focusing on rice and corn in the Laguna and Lanao Lake areas.

[*Impacts of SRM on agriculture: the Southeast Asian case \(2021\)*](#)

Philippines 2

Dr Lorena L. Sabino, Assistant Professor, Department of Social Forestry and Forest Governance, at the *University of the Philippines Los Baños* (UPLB) leads the project 'Exploring Cultural, Legal, and Intergenerational Perspectives on SRM Ethics (ECLIPSE)'. Her team will draw from a case study in vulnerable ridge-to-reef communities facing the impacts of climate change. Additionally, the project will explore collaborative frameworks and capacity-building initiatives between Ghana and the Philippines, focusing on sharing experiences, knowledge, instruments, and strategies for any potential future SRM deployment, management, and governance.

[*Exploring Cultural, Legal, and Intergenerational Perspectives on SRM Ethics \(ECLIPSE\) \(2024\)*](#)

Thailand

Dr Pornampai (Ping-Ping) Narenpitak, an atmospheric scientist at the *Thailand National Science and Technology Development Agency*, leads a team to assess whether stratospheric aerosol injection (SAI) could reduce the irreversible impacts of climate change, such as temperature rise, precipitation changes, saltwater intrusion, and coastal erosion in the country.

[*Modelling temperature and precipitation changes in lowland Thailand \(2023\)*](#)

Degrees-funded Latin-America and the Caribbean research projects

Argentina 1

Prof. Inés Camilloni is Vice-Chair of IPCC's Working Group I for the seventh assessment cycle, a full Professor at the Department of Atmospheric and Oceanic Sciences of the *University of Buenos Aires* (UBA) and an Independent Researcher of the Argentina National Research Council (CONICET). She leads a team researching the regional and local effects that solar radiation modification (SRM) could have on the hydroclimate of the La Plata basin.

[*Impacts of SRM on the La Plata Basin's hydroclimate in South America \(2018\)*](#)

Argentina 2

Dr Florencia Luna is the director of the Program of Bioethics of FLACSO Argentina (*Latin American University of Social Sciences*) and a Superior Researcher at Argentina's National Research Council (CONICET). The project she leads aims to investigate the ethical implications of solar radiation modification (SRM), particularly Stratospheric Aerosol Injection (SAI), focusing on its consequences for health justice in the Global South.

[*Exploring the ethical implications of SRM for health justice in the Global South \(2024\)*](#)

Brazil 1

Prof. Michelle Simões Reboita, a Professor and Researcher at the *Federal University of Itajubá* and coordinator of GPEPSA-UNIFEI, a study group in environmental practices, leads a team exploring the impact of climate change on cyclones in the southern hemisphere, how SRM might affect that, and the implications for southern African and South American coastlines.

[*Studying the response of cyclones to SRM in the Southern Hemisphere \(2003\)*](#)

Brazil 2

Prof. Mauricio Uriona Maldonado is an Associate Professor of Engineering at *UFSC* and an Extraordinary Associate Professor at the University of Stellenbosch. He leads a project to understand stakeholder perspectives on SRM in Brazil, India, and South Africa. The project uses System Dynamics (SD) models to simulate the complex interactions between climate, economic and social factors.

[*Developing an integrated climate-economy stakeholder-based model for SRM impacts \(2024\)*](#)

Brazil 3

Prof. Julia S. Guivant, Senior Professor at the Graduate Program in Political Sociology and in the Interdisciplinary Doctoral Program in Human Sciences of the *Federal University of Santa Catarina*, leads a project to systematise lessons from recent experiences of international public debate. These lessons will be applied to scientific and public debates about the risks and benefits of SRM. It will then examine perceptions about the social, political, ethical, economic, and environmental impacts of SRM across a range of key stakeholders in Brazil, including experts, productive sector representatives, government agents, and other sectors of the public.

[*Understanding Brazilian stakeholder knowledge and perspectives on SRM \(2024\)*](#)

Chile

Dr Alfonso Fernandez, a broadly trained physical geographer at the *Universidad de Concepción* in Chile, is leading a team to evaluate how SRM might affect the retreat of glaciers in the Andes. This project will provide important information for negotiators and policymakers in South America as they engage in discussions about the potential future deployment or rejection of SRM as an option to tackle climate change.

The Degrees Initiative is a Company Limited by Guarantee without share capital registered in England and Wales (company number: 13290405) and a charity registered in England and Wales (charity number: 1196532). Registered address: The Degrees Initiative, c/o Bates Wells, 10 Queen Street Place, London, EC4R 1BE, United Kingdom. Email: info@degrees.ngo.

Website: www.degrees.ngo

[*Tackling the effects of climate change on the Andean glaciers \(2023\)*](#)

Jamaica

Dr Leonardo Clarke, Lecturer in the Department of Physics and Researcher with the Climate Studies Group Mona (CSGM), *University of the West Indies* is researching how SRM might affect the Caribbean's future climate and its agriculture, an important component of the region's economy.

[*Caribbean agriculture under SRM: a case study in Jamaica \(2018\)*](#)

Mexico 1

Dr Graciela Binimelis de Raga, Senior Scientist, Institute for Atmospheric Sciences and Climate Change at *Universidad Nacional Autónoma de México* (UNAM), leads a project to model the potential impact of climate change on heat waves in Mexico and explore the effectiveness of SRM as a potential mitigation strategy. This will provide insights for key stakeholders should SRM be considered as a response to climate change.

[*Modelling the impact of heatwaves on urban centers in Mexico \(2024\)*](#)

Mexico 2

Dr Julián Velasco is a full researcher at the Institute for Atmospheric Sciences and Climate Change, *Universidad Nacional Autónoma de México* (UNAM). He leads a project modelling the effects of climate change and SRM on biodiversity, focusing on Mexico and the Americas.

[*Modelling the impacts of climate change and SRM on biodiversity in the Americas \(2024\)*](#)

Mexico 3

Dr Francisco Estrada Porrua, Senior Researcher, Institute for Atmospheric Sciences and Climate Change (ICAYCC) at *Universidad Nacional Autónoma de México* (UNAM). He and his team will assess the economic impacts and risks of SRM using a state-of-the-art integrated assessment model called CLIMRISK. This model allows for producing spatially explicit estimates of economic impacts and climate-economy risk indices. CLIMRISK will provide a variety of economic metrics (e.g., present value of damages, social cost of carbon) for regional, country, and grid cell levels.

[*Assessing the economic risks and benefits of SRM for Latin America \(2024\)*](#)