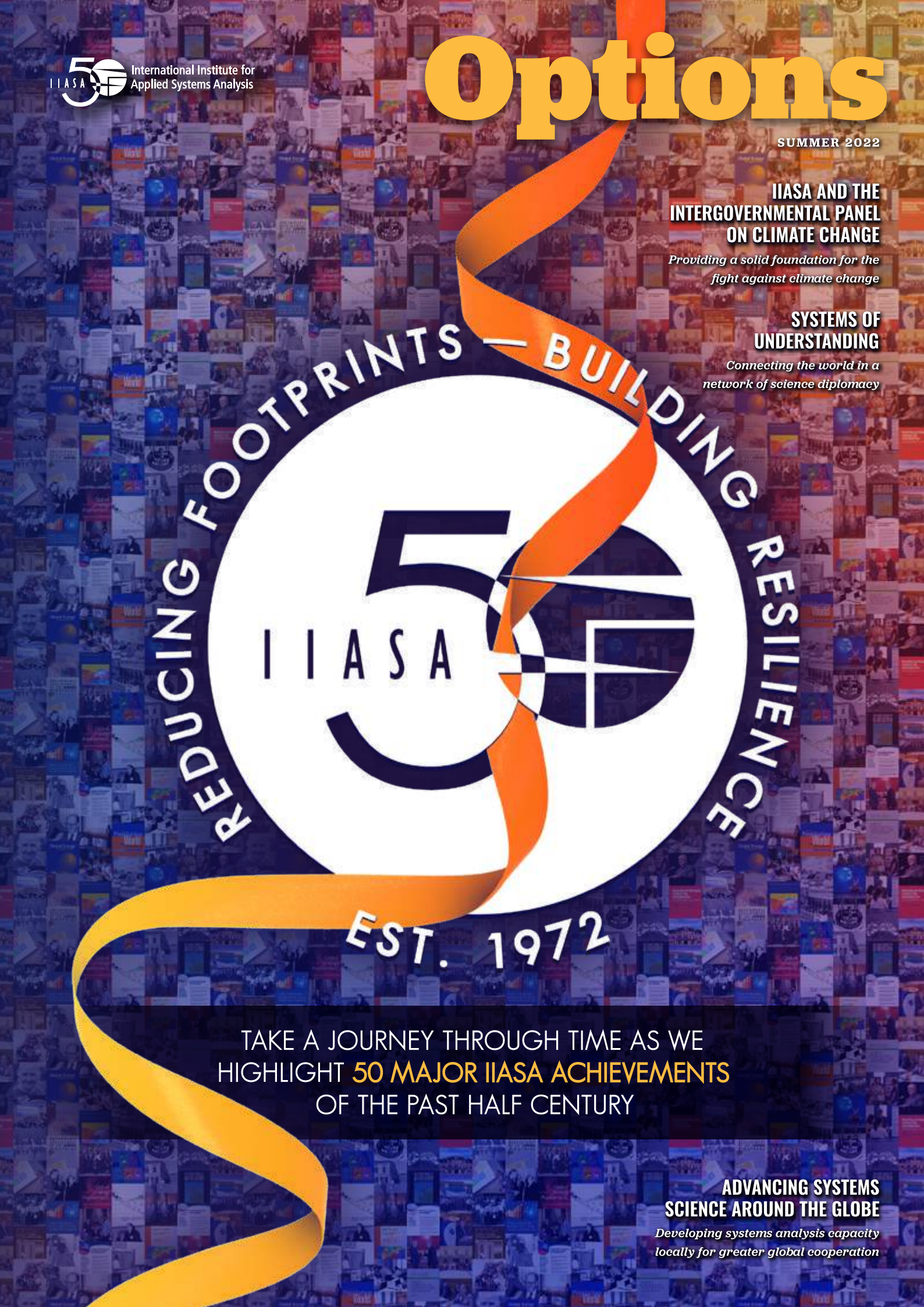

International Institute for Applied Systems Analysis
Options
SUMMER 2022
IIASA AND THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE
Providing a solid foundation for the fight against climate change
SYSTEMS OF UNDERSTANDING
Connecting the world in a network of science diplomacy
REDUCING FOOTPRINTS — BUILDING RESILIENCE
IIASA
EST. 1972
TAKE A JOURNEY THROUGH TIME AS WE HIGHLIGHT 50 MAJOR IIASA ACHIEVEMENTS OF THE PAST HALF CENTURY
ADVANCING SYSTEMS SCIENCE AROUND THE GLOBE
Developing systems analysis capacity locally for greater global cooperation

OPTIONS IS ALSO AVAILABLE ONLINE:
WWW.IIASA.AC.AT/OPTIONS

FROM THE EDITORS

This year marks half a century since IIASA was first founded to promote East-West scientific cooperation during the Cold War. We invite you to join us on a journey through time to celebrate the institute's exceptional achievements over the past 50 years in this special anniversary edition of *Options*.

Our cover feature highlights 50 great achievements in a timeline starting with the signing of the IIASA charter in 1972 and progressing through global policy impacts and contributions to Nobel winning research over the years (pages 14-19). We also take a closer look at the institute's role in the Intergovernmental Panel on Climate Change (IPCC), showing how participation and input by IIASA not only contributes to, but supports the scientific foundation of reports by the highly influential non-governmental body (pages 7-9). As it forges the links of systems science, IIASA can help to connect the world in a network of science diplomacy. In this issue, we delve into the concept of science diplomacy and show how it can bring decision makers with clashing views into the same room to tackle common problems (pages 20-21).

If you would like to share your thoughts on articles in this edition or if you have ideas for topics that you would like to see featured in future issues, please feel free to get in touch with us via email.

Ansa Heyl *and* **Rachel Potter**
heyl@iiasa.ac.at | potter@iiasa.ac.at

ABOUT OPTIONS

Writers: Stephen Battersby, Monika Bauer, JoAnne Linnerooth-Bayer, Ansa Heyl, Rachel Potter, Jeremy Summers, Fanni Daniella Szakal, Neema Tavakolian
Expert reviewers: Dilek Fraisl, Steffen Fritz, Elie Gaget, Adriana Gómez-Sanabria, Sepo Hachigonta, Petr Havlik, Stefan Hochrainer-Stigler, Julian Hunt, Leiwen Jiang, Pavel Kiparisov, Zbigniew Klimont, Nadejda Komendantova, Volker Krey, Junguo Liu, Wolfgang Lutz, Ian McCallum, Reinhard Mechler, Shonali Pachauri, Armon Rezai, Jennifer Richmond, Thomas Schinko, Linda See, Sergey Sizov, Iain Stewart, Michael Thompson, Albert van Jaarsveld, Fabian Wagner, Daniela Weber, Barbara Willaarts, Piotr Żebrowski
Graphic design: Adam Islaam
Cover: © Adam Islaam | IIASA

COPYRIGHT

Please collect used paper for recycling
EU Ecolabel: AT/028/036
Climate neutral Print product ClimatePartner.com/13996-2111-1041
printed according to the Austrian Ecolabel criteria for printed matter (UZ 24), Print Alliance HAV Produktions GmbH, UW-Nr. 715

News in brief

A call for more diplomacy and science diplomacy efforts in Ukraine

A message from the UN Sustainable Development Solutions Network (SDSN) published in April this year and endorsed by members of the SDSN Leadership Council and community, including IIASA Director General Albert van Jaarsveld and dozens of other leaders in the scientific community, called on all nations "to put diplomacy to the service of humanity by ending the war in Ukraine through negotiations before the war ends all of us".

Beyond speaking out against the invasion, IIASA and other international scientific institutions have a particular role to play through science diplomacy. This unofficial channel is under threat, however, as many western institutions suspended all scientific collaboration with Russia.

A second letter, authored by van Jaarsveld and the presidents of the International Science Council, the SDSN, and the International Network for Government Science Advice published in *Nature*, argued that this was a mistake as science has proven to be an effective form of diplomacy that promotes peace and understanding while addressing urgent global problems.

The value of science diplomacy was demonstrated during the cold war, when, despite clashing ideologies and military confrontation, scientific cooperation helped pave the way for advances in international relations such as the Helsinki Accords.

"IIASA and other science diplomacy bodies were created for times like this," explains van Jaarsveld. "They should be strengthened amid this crisis to ensure they can fulfil their mandates when traditional diplomacy avenues may falter."

The authors also suggested establishing a global fund to assist science communities in distress around the globe, and highlighted the need to help refugee scientists and students from Ukraine. IIASA is part of an initiative set up by the Austrian Academy of Sciences to support displaced Ukrainian researchers with short-term research stays at universities and research institutes in Austria.

By **Ansa Heyl**

Further info: www.iiasa.ac.at/news/22-ukrainediplomacy

Albert van Jaarsveld: jaarsveld@iiasa.ac.at

© Andrii Yalanskyi | Dreamstime

DO CLIMATE EXTREMES ENCOURAGE SUPPORT FOR GREEN PARTIES?

IIASA researchers analyzed the effect of people's increased experiences with climate extremes on environmental concern and explored to what extent this translates into political support for climate action in the form of Green voting. Their results show that living through temperature anomalies, heat episodes, and dry spells have a significant effect on both people's environmental concern and tendency to vote Green, but only under favorable economic conditions. The findings are relevant for current debates on how to best promote and effectively implement further mitigation measures in line with the Paris Agreement and the European Green Deal.

www.iiasa.ac.at/news/22-greenvoting

SUPPORTING NET-ZERO TARGETS IN AUSTRIA

Forward-looking visions for a low-carbon, climate resilient future that receive broad societal buy-in are crucial to reach the Paris Agreement's 1.5°C goal. To support the Styrian government, one of Austria's nine federal provinces, in reaching its goals in this regard, IIASA researchers are collaborating with several Austrian partners on the transdisciplinary Climate Modernity Project, which aims to involve a diverse group of citizens in co-generating inclusive ideas to shape the future of Styria under climate and global change. Visions and ideas generated during a two-day workshop in March are set to be incorporated into Styria's new climate and energy strategy.

www.iiasa.ac.at/news/22-climatemodernity

A systems approach to cyber security

Cyberattacks on critical infrastructure are becoming ever more complex and disruptive, causing systems to shut down, or enabling attackers to remotely control affected systems. The impacts of such attacks are however not only limited to losses incurred by the operators of the compromised system, but could also mean economic losses for parties relying on their services.

Existing assessment frameworks and cyber security models have a strong focus on the cost of security measures versus potential losses in the case of a successful cyber attack from the perspective of the system operator. Yet, a simple cost-benefit analysis is not satisfactory in the context of security of critical infrastructure, where the potential impacts are multidimensional and may affect multiple stakeholders.

To overcome this shortcoming, IIASA researchers have developed a framework featuring a holistic picture of the cyber security landscape composed of multiple attack scenarios (considered separately in standard practice); along with a model that explicitly represents multiple dimensions of the potential impacts of successful cyber attacks.

The method offers the possibility to explicitly represent and mitigate the exposure of different stakeholders other than system operators to the consequences of successful cyber attacks, allowing relevant stakeholders to meaningfully participate in shaping the cyber security of critical infrastructure.

"A systemic perspective on cyber security is crucial to establishing an accurate landscape of cyber threats to critical infrastructure and in the efficient and inclusive management of important systems," concludes lead author Piotr Żebrowski, a researcher in the IIASA Advancing Systems Analysis Program.

By **Ansa Heyl**

Further info: www.iiasa.ac.at/news/22-cybersecurity

Piotr Żebrowski: zebrowsk@iiasa.ac.at

Health fears can increase pandemic isolation habits in older Europeans

The COVID-19 pandemic has been raging on for over two years now, requiring people to continuously adapt to changing social distancing regulations. But how much do people actually adhere to these rules and what are the factors influencing their decisions? This is what a study by the Wittgenstein Centre for Demography and Global Human Capital, a collaboration between IIASA, the Austrian Academy of Sciences (OeAW), and the University of Vienna, wanted to understand.

Researchers asked over 24,000 Europeans aged 50 and over to report on their perceived health and compared the results with physical performance tests from the most recent Survey of Health, Aging, and Retirement in Europe (SHARE). They found that those who underestimated their own health, followed social distancing rules more diligently than those with a more accurate health perception.

"There can, however, also be a downside: while those with a heightened perception of susceptibility to the disease help prevent transmission through fewer shopping trips and staying home instead, they also face increased isolation and loneliness," notes study coauthor and IIASA researcher Daniela Weber.

The researchers hope that their study will help to inform policymakers on how to better connect with the public in future pandemic communication. They also point out that future health literacy campaigns should consider differences in health perception among people and how these differences affect health behavior.

By **Fanni Daniella Szakal** **Further info:** www.iiasa.ac.at/news/22-healthfears

Daniela Weber: weberd@iiasa.ac.at

© Dezzor | Dreamstime

© camaliot

Use your cellphone to improve weather forecasts

An unexpected rain shower ruining a carefully planned day out is a familiar nuisance for many of us. We organize our lives around the weather forecast, but more often than not, it lets us down. Is it possible to improve the reliability of weather predictions? Through the CAMALIOT project from the European Space Agency, ETH Zurich, and IIASA, it might be, and it is open for everyone's contribution.

The CAMALIOT project involves the application of machine learning technology to raw data from the Global Navigation Satellite System (GNSS) to improve the prediction of extreme weather events. It aims to build an infrastructure needed for gathering large volumes of observations from satellites orbiting the Earth using the GPS function of smartphones with dual frequency receivers.

Through an Android app designed by IIASA, researchers and citizens alike can collect data (ideally while keeping the phone static and with a good view of the sky) and upload it to the CAMALIOT server. As well as logging weather-relevant data on Earth, the app also collects data for forecasting weather in space, which has an impact on the integrity of our communication systems.

The citizen science campaign started on 17 March 2022 and will run until the end of July. To increase engagement, participants have the chance to win prizes at the end of the campaign.

"We've had great participation so far, with more than 15 billion measurements collected by over 10,000 citizen scientists," says Linda See, a senior researcher at IIASA who led the development of the Android app. "By participating, people will not only help to improve weather forecasting, but will also contribute to new scientific opportunities that could benefit society in the future."

By **Fanni Daniella Szakal**

Linda See: see@iiasa.ac.at

Further info: www.iiasa.ac.at/news/22-cellphoneweather

UNDERSTANDING INFECTIOUS DISEASES

Pandemics can take an enormous human and economic toll. To better understand their impacts on society, in an international collaboration, a team of researchers conducted a survey of recent theoretical and empirical insights into the economic and policy implications of modern infectious diseases. The researchers concluded that early and targeted health and policy interventions can be effective in minimizing trade-offs between lost lives and livelihoods. As this unfortunate choice is often inevitable to some extent, the study emphasizes that the eventual decisions on trade-offs should be based on evidence-based, transparent, inclusive social debate rather than on science alone.

www.iiasa.ac.at/news/22-infectiousdiseases

ELECTRIC TRUCK HYDROPOWER TECHNOLOGY

Mountain regions have a large potential for hydropower that cannot be harnessed effectively by conventional technologies. IIASA researcher Julian Hunt and an international team of researchers developed an innovative hydropower technology based on electric trucks transporting water down mountains and generating electricity using regenerative brakes. The proposed technology is competitive with solar, wind, and conventional hydropower in terms of costs and it minimizes negative impacts on the environment. Electric Truck Hydropower is an option that could provide a flexible and clean solution for electricity generation in mountainous regions.

www.iiasa.ac.at/news/22-hydropower

How circular waste management can benefit the environment

In 2015, humans produced about 1.9 Gigatonnes of trash globally, equaling the weight of about 40,000 RMS Titanic ships. By 2050, this figure is expected to almost double. Despite growing efforts to reduce, reuse and recycle waste, currently only about 13% is recycled and a mere 5.5% is composted. The growing waste crisis poses a threat to the environment and human health through the emission of toxic pollutants and greenhouse gases.

In a recent study led by IIASA, researchers examined the global potential of waste management as an important catalyzer towards the Paris Agreement and the UN Sustainable Development Goals. The team translated the Shared Socioeconomic Pathways — a set of scenarios describing alternative socioeconomic developments up to 2100 – into waste narratives and evaluated their potential to reduce greenhouse gas and air pollutant emissions. The researchers also investigated how different world developments hinder or accelerate the adoption of circular waste management systems — sustainable systems with minimal waste generation, comprehensive waste collection, reuse, and recycling. They found that the adoption of such a system virtually eliminated air pollution from open burning of waste in 2030 and reduced methane emissions.

"Our detailed representation of the municipal solid waste sector, the associated emissions, and mitigation potentials can be used as input to Integrated Assessments Models and applied to develop emission scenarios for the Intergovernmental Panel on Climate Change (IPCC)," explains lead author Adriana Gómez-Sanabria.

By **Fanni Daniella Szakal**

Further info: www.iiasa.ac.at/news/22-wastemanagement

Adriana Gómez-Sanabria: gomezsa@iiasa.ac.at

© Madrugada | Dreamstime

© Aliaksandr Kisel | Dreamstime

Tracking wellbeing and sustainable development from space

Researchers have been using satellite images of Earth at night to study human activity for almost 30 years. Traditionally, the focus was on using the data gathered from lit areas to help map issues like economic growth and development trends, especially in places where data are lacking, with data from unlit areas typically being disregarded.

In a recent study, IIASA researchers and colleagues from several other institutions, however, found that it also works the other way around — in other words, identifying unlit areas makes it possible to target interventions for poverty alleviation and places to focus on to improve energy access.

Rural electrification holds great promise for increasing wellbeing and can also have significant positive impacts in terms of household income, expenditure, health, and education. In sub-Saharan Africa in particular, projections indicate that over 300 million people will still be living in extreme poverty by 2030. The impacts of the COVID-19 pandemic are likely to push an additional 88 to 115 million people into extreme poverty in 2030, setting back the UN's goals to reduce poverty by around three years.

If applied over time, this method could provide opportunities to track wellbeing and progress toward the Sustainable Development Goals (SDGs). It can help better inform energy policy around the globe and can also be helpful in shaping aid policy by ensuring that interventions can be targeted to reach remote rural areas that are likely energy poor.

By **Ansa Heyl** **Further info:** www.iiasa.ac.at/news/22-globalpoverty

Ian McCallum: mccallum@iiasa.ac.at **Steffen Fritz:** fritz@iiasa.ac.at

Shonali Pachauri: pachauri@iiasa.ac.at

By **Ansa Heyl**

IIASA AND THE IPCC: PROVIDING A SOLID FOUNDATION FOR THE FIGHT AGAINST CLIMATE CHANGE

Pioneering IIASA research into climate change in the 1970s and 1980s played a key role in establishing the Intergovernmental Panel on Climate Change (IPCC) in 1988. Since then, IIASA scientists have been authors and reviewers of all IPCC assessment reports with their participation and input not only contributing to, but also supporting the scientific foundation of these reports.

As a multidisciplinary, international research institute conducting policy-oriented research into issues that are too large or complex to be solved by a single country or academic discipline, IIASA is fertile ground for producing IPCC authors. However, the institute's contributions to climate science stretch back even further.

BREAKING NEW GROUND IN CLIMATE SCIENCE

A key conference held by IIASA under the theme, "Carbon Dioxide, Climate, and Society" in 1978 culminated in one of the earliest international assessments of the climate problem, with 40 authors from 11 countries contributing technical papers.

Many of the issues raised at that seminal 1978 conference have been included in IPCC assessment reports over the years and are still discussed today. This includes, among others, the use of alternative, renewable energy sources such as biomass; carbon capture and storage; how to reduce the world's energy demand—and even uncertainty, which dominated and still dominates every aspect of climate change from emission rates, through environmental consequences to the socioeconomic impacts themselves.

Apart from contributions to these and other critical climate related topics, IIASA continues to set itself apart as more than just a participant in IPCC assessments through innovative research in the climate change arena. Among these is a flagship publication by IIASA researchers in *Nature Climate Change* in 2021, summarizing the community effort on attainability and costs of climate targets. This work critically informed the IPCC Sixth Assessment Report and includes about 40% of all scenarios of the community scenarios that were assessed. IIASA also organized an IPCC scenario expert workshop in preparation of the Sixth Assessment Report with more than 100 experts, and hosts the Scenario Explorer and databases underlying the Fifth and Sixth Assessment Reports, as well as the Special Report on 1.5°C as part of a memorandum of understanding with the IPCC and the Integrated Assessment Modeling Consortium.

"One of the main challenges in climate modeling and scenarios is bridging from science to policy from the long-term global to the short-term local,

and back. IIASA's impact stands robustly on scalable modeling approaches simultaneously serving scientific assessments as well as national policymakers and regulatory processes, which continuously inform each other," says Integrated Biosphere Futures Research Group Leader Petr Havlík, a lead author on the Sixth Assessment Report.

SETTING THE TONE AT A CROSSROADS FOR HUMANITY

Humanity currently finds itself at a crossroads. While we have the tools and know-how required to limit warming and climate action is being taken in many countries, policies, regulations, and market instruments need to be scaled up and applied more widely and equitably to ensure that they effectively support deep emissions reductions and stimulate innovation.

The IPCC Sixth Assessment Report features an unprecedented 32 IIASA researchers spread across all three working groups in various capacities including coordinating lead authors, lead authors, and contributing authors.

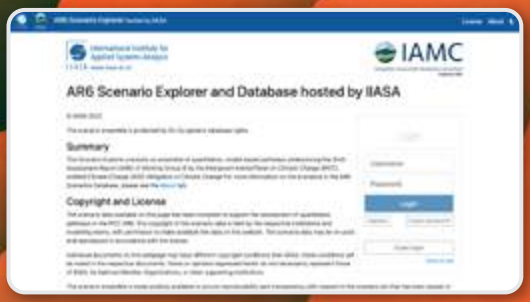
"In addition to contributing to the assessment of the literature, IIASA researchers have been helping to improve the quantitative basis for the scenario assessment in the Working Group III Report. Building on previous experience in the Fifth Assessment Report and the Special Report on Global Warming of 1.5°C, IIASA is hosting a dataset with more than 3,000 scenarios with quantitative information on socioeconomic development, greenhouse gas emissions, and sectoral transformations across energy, land use, transportation, and industry," explains Integrated Assessment and Climate Change Research Group Leader, Volker Krey.

The Working Group I contribution to the Sixth Assessment Report released towards the end of 2021 addressed the most up-to-date physical understanding of the climate system and climate change, pulling together the findings from more than 14,000 peer-reviewed studies. One of the key developments since the fifth assessment cycle is the strengthening of the links between human-caused warming and increasingly severe extreme weather. The report relied on the output from the latest generation of global climate models, produced as part of the sixth Coupled Model Intercomparison Project (CMIP6), to which IIASA also contributes.

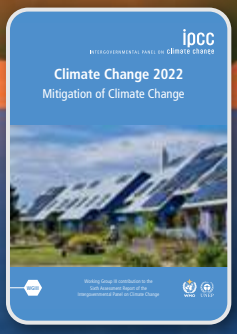
"Climate change is already affecting every region on Earth and in multiple ways, with human influence contributing to many observed changes in weather and climate extremes. Changes we experience will increase with further warming and they will intensify with every added ton of CO_2. While there is no going back from some changes in the climate system, some can still be slowed or stopped by limiting warming – it is in our hands. We will never get tired of stressing that to achieve that, strong, rapid, and sustained reductions in CO_2, methane, and other greenhouse gasses are necessary. This would not only reduce the consequences of climate

IIASA IS HOSTING A DATASET WITH MORE THAN 3,000 SCENARIOS WITH QUANTITATIVE INFORMATION ON SOCIOECONOMIC DEVELOPMENT, GREENHOUSE GAS EMISSIONS, AND SECTORAL TRANSFORMATIONS...

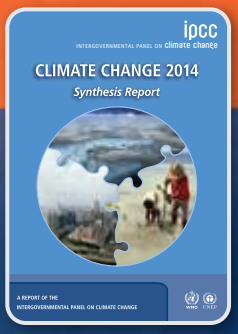
VOLKER KREY



IIASA Scenario Explorer

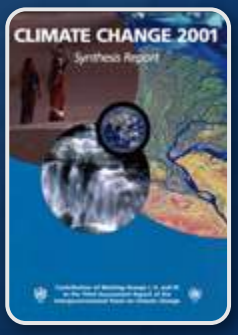


Sixth Assessment Report (AR6)

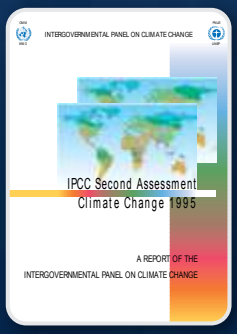


Fifth Assessment Report (AR5)

Fourth Assessment Report (AR4)



Third Assessment Report (AR3)



Second Assessment Report (AR2)

First Assessment Report (AR1)

All reports © IPCC

THE 1.5°C GLOBAL AMBITION ON CLIMATE MITIGATION IS REAL: BEYOND THIS WARMING LEVEL, IMPACTS AND RISKS WILL BECOME INCREASINGLY EXISTENTIAL AND IRREVERSIBLE

REINHARD MECHLER

change but also improve air quality and reduce ecosystem impacts," says IIASA Pollution Management Research Group Leader Zbigniew Klimont, lead author on the Working Group I chapter on short-lived climate forcers.

The Working Group II report examined the impacts of climate change on nature and people around the globe, exploring future impacts at different levels of warming and the resulting risks, and offering options to strengthen nature and society's resilience to ongoing climate change. The report introduced several new components: a strong focus on opportunities for adaptation and risk management as well as their limits; a special section on climate change impacts, risks and options to act for cities and settlements by the sea, tropical forests, mountains, biodiversity hotspots, dryland and deserts, the Mediterranean, as well as the Polar Regions; and an atlas that will present data and findings on observed and projected climate change impacts and risks from global to regional scales, offering even more insights for decision makers.

"The cumulative scientific evidence of this report is indisputable: climate change is a threat to human wellbeing and the health of the planet. While action on adaptation (and mitigation) is being taken across the world, there are growing gaps with regard to avoiding and reducing risks, as well as dealing with unavoided and unavoidable impacts and risks. Adaptation limits will soon be reached in both natural and human systems without urgent action on adaptation and Loss and Damage. The 1.5°C global ambition on climate mitigation is real: beyond this warming level, impacts and risks will become increasingly existential and irreversible," says IIASA Systemic Risk and Resilience Research Group Leader Reinhard Mechler, a lead author on the chapter on decision-making options for managing risk.

The bulk of IIASA contributors to the Sixth Assessment Report worked on the Working Group III report released in April this year, where IIASA researchers' considerable expertise in climate change mitigation was put to good use to provide an updated global assessment of climate change mitigation progress and pledges, and to examine the sources of global emissions. A major new component of the Working Group III report is a new chapter on the social aspects of mitigation, which explores the factors that drive consumption and greenhouse gas emissions. The report also provides a richer coverage of differences in regional and household level emissions patterns.

"The report shows that the least developed countries have not contributed significantly to past global greenhouse gas emissions, nor are they doing so now. Providing universal access to modern energy services in regions that still lack access to decent living standards is possible without significant implications for global emissions growth," notes chapter lead author Shonali Pachauri, who leads the Transformative Institutional and Social Solutions Research Group at IIASA.

Since the release of the Working Group III report, IIASA authors have been actively engaging with various actors across the climate change community to present and clarify the findings of the report and to emphasize the importance and urgency of climate action to ensure a livable future for all of humanity.

"IIASA can be proud of the diverse contributions of its researchers shaping many of the key conclusions and insights of the IPCC reports. In addition to hosting the underlying scenario data of the IPCC Working Group III, IIASA researchers have helped to bring new elements into the assessment, such as the new chapter on demand-side solutions or the systematic feasibility assessment of the assessed mitigation pathways. The IPCC reports are very clear about the urgent need for deep and sustained emissions reductions and how to achieve them in all sectors of the world. The ball is now in the court of the decision makers. I hope they understood the messages and will initiate the required actions," concludes IIASA Energy, Climate, and Environment Program Director, Keywan Riahi.

Further info:
www.iiasa.ac.at/IPCC | www.iiasa.ac.at/news/22-climateaction
www.iiasa.ac.at/news/22-ipccreport | data.ece.iiasa.ac.at/ar6

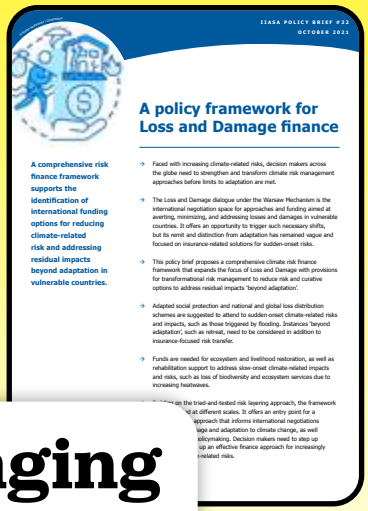
Petr Havlik
havlikpt@iiasa.ac.at

Volker Krey
krey@iiasa.ac.at

Shonali Pachauri
pachauri@iiasa.ac.at

Zbigniew Klimont
klimont@iiasa.ac.at

Reinhard Mechler
mechler@iiasa.ac.at



An equitable road to managing climate and systemic risk

In a world of increasing systemic and climate-related risks, developing an effective and equitable approach to risk management is more important than ever. Through enhanced research and engagement, IIASA has been working to influence policy change and support community implementation.

The last years saw massive and increasingly existential climate-related events around the world, from wildfires, to flooding, to heatwaves. Local adaptation limits are drawing near, particularly in the Global South, and some of the changes will be irreversible. We need to upgrade and transform the way climate-related risk is governed and managed, especially in vulnerable countries across the globe.

In 2013, the United Nations Framework Convention on Climate Change (UNFCCC) established the Warsaw International Mechanism (WIM) to avert, minimize, and address losses and damages associated with the impacts of climate change. While there has been a lot of dialogue and refinement of the concepts of Loss and Damage (L&D), concrete actions have been lacking and the question of who is to finance the costs remains contested.

Reinhard Mechler and Teresa Deubelli from the IIASA Systemic Risk and Resilience (SYRR) Research Group have brought together ideas from various disciplines to suggest a comprehensive framework for L&D finance, which has been set out in publications, an IIASA policy brief, and presented at the Glasgow climate summit (COP26) towards the end of 2021. The L&D policy framework, also building on work with Stefan Hochrainer-Stigler and Thomas Schinko of the IIASA Equity and Justice (EQU) Research Group, builds on risk analysis to distinguish between avoided, unavoided, and unavoidable risks to be managed as part of a portfolio approach where the various layers of risk create a risk hierarchy, including action on risk reduction, risk finance, and risk retention. Additional global support should enhance locally-led action in hotspot communities, where the increasingly existential risks are being experienced.

The impacts from climate change will affect some countries more than others, and the available resources for climate mitigation also differ across the globe. Researchers from EQU, have identified the main types of justice and ethical challenges concerning climate-related L&D, and developed concepts for bridging the remaining divides between Global North and Global South countries by aligning comprehensive climate risk analytics with distributive and compensatory justice considerations.

A recent briefing note on systemic risk developed by SYRR in collaboration with the International Science Council (ISC), the United Nations Office for Disaster Risk Reduction, and the Risk Knowledge Action Network, shows that in addition to the climate crisis, there is a wider ranging systemic risk landscape around the world with increasing attention in research, policy, and practice spent on conflicts, environmental destruction, and the COVID-19 pandemic. As part of a COVID-19 recovery initiative jointly developed with the ISC, a group led by SYRR engaged with leading experts globally to suggest that in efforts for enhancing governance for sustainability, we need to put systemic resilience at the center of global and national governance arrangements, so that systemic risk across sectors and decision-making realms is effectively owned and addressed.

By **Fanni Daniella Szakal**

Further info: www.iiasa.ac.at/pb32 | www.iiasa.ac.at/news/22-briefingnote
pure.iiasa.ac.at/16819

Reinhard Mechler: mechler@iiasa.ac.at
Thomas Schinko: schinko@iiasa.ac.at
Stefan Hochrainer-Stigler: hochrain@iiasa.ac.at

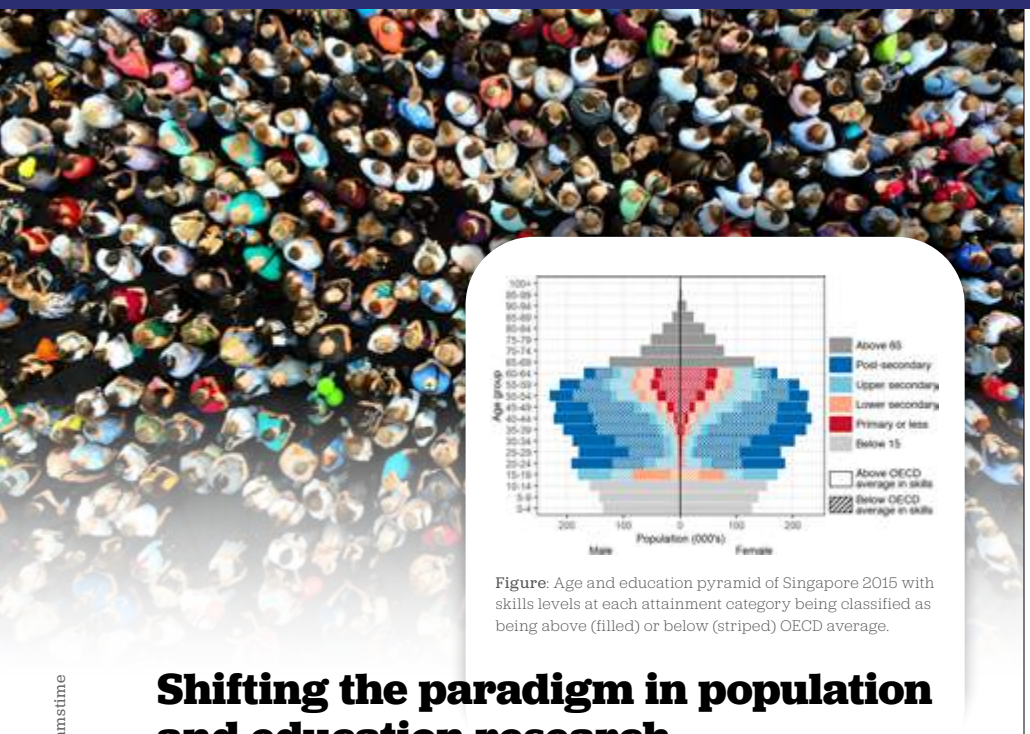


Figure: Age and education pyramid of Singapore 2015 with skills levels at each attainment category being classified as being above (filled) or below (striped) OECD average.

Shifting the paradigm in population and education research

IIASA has conducted research into both the determinants and consequences of population trends since its early days. In the 1970s, the methods of multi-state demography for modeling heterogeneous populations were developed at and around IIASA.

Since the mid-2000s, IIASA and the Vienna Institute of Demography (VID) of the Austrian Academy of Sciences further developed these methods for applications to the modeling of populations stratified by age, sex, and level of educational attainment. This included back projections to 1950 as well as forward projections to the end of the century based on alternative scenarios (following the Shared Socioeconomic Pathways). This allowed scientists to study how different education levels influence mortality, fertility, and the effects of age-specific human capital growth on economic growth, as well as the adaptive capacity to climate change.

Since then, IIASA and VID demographers regularly issue European and Asian Population Data Sheets to provide fresh data and new approaches to measure population dynamics, thereby contributing to regional and national development policy.

"IIASA research in this field really has changed the paradigm in the way of seeing human capital formation as part of population change and how this relates to sustainable development," notes Wolfgang Lutz, Senior Advisor in the IIASA Population and Just Societies Program.

IIASA demographers have significantly contributed to regional and global-level policy dialogue on sustainable development by assessing progress and, among others, helping to change the education goal from the 2000 Millennium Development Goals, which only aimed at universal primary education, to the Sustainable Development Goals (SDGs), which extended it to include universal primary and secondary education. By looking at the question of the quality of education, they have also exposed the disparities in the process of the diffusion of education.

Today, the IIASA Population and Just Societies Program continues to advance its methods, approaches, and data to deliver results that can be incorporated into system analytical models, inclusive policy processes, and ultimately, into equitable and effective policy pathways and transformations.

By **Ansa Heyl**

Further info: www.iiasa.ac.at/model/popprojections
pure.iiasa.ac.at/8619 | pure.iiasa.ac.at/9586 | pure.iiasa.ac.at/17034

Wolfgang Lutz: lutz@iiasa.ac.at

INTEGRATED SOLUTIONS FOR BIODIVERSITY

A new IIASA policy brief highlights key action on biodiversity loss and its potential increased effectiveness if other global challenges are embraced. The brief contains policy recommendations to inform discussions during the Convention on Biological Diversity (CBD) meeting in Kunming, China, in autumn 2022 and aid the implementation of the new Global Biodiversity Framework. The featured research can also support international efforts on climate mitigation and securing food supplies by helping policymakers to integrate goals and interventions as well as conservation and food production beyond protected areas, and to prioritize the conservation of key sites for climate and biodiversity.

www.iiasa.ac.at/pb33

FUTURE-PROOFING GLOBAL FOOD PRODUCTION SYSTEMS

A collaboration between IIASA, The Nature Conservancy, and SYSTEMIQ – a systems change company that partners with business, finance, policymakers, and civil society to make economic systems sustainable – has mapped the many and varied agricultural subsystems that support food production into the concept of 'foodscapes' and estimated possible interventions that could enable a food systems transformation towards environmental sustainability. The work will help inform the vital transformations needed to ensure worldwide food system sustainability into the future by bringing local context to global outlooks and supplying important realities such as environmental constraints and economic necessities of food-producing communities.

www.iiasa.ac.at/news/21-globalfood

ADVANCING SYSTEMS SCIENCE ACROSS THE GLOBE

By **Fanni Daniela Szakal**

ADRI

NAASAC

SASAC

In the last decade, IIASA has helped to establish several systems analysis research centres worldwide, partnering with local researchers from East to West and North to South to advance the discipline.

50 years ago, IIASA was founded with the aim of supporting collaboration between the East and the West. Today, international collaboration is still at the heart of IIASA. Researchers from all over the world gather between the historic walls of Schloss Laxenburg in Austria and work together across borders on pressing global issues. However, to increase the footprint of what IIASA can achieve, in the last decades there have been greater efforts to develop systems analysis capacity locally, right where it is needed.

"A core part of our mission is to advance systems analysis around the world," says Iain Stewart, former head of Communications and External Relations at IIASA. "For us, it is equally important to develop capacity here at IIASA and in our member countries."

ASIAN DEMOGRAPHIC RESEARCH INSTITUTE (ADRI)

The first stop on the systems analysis journey around the world is the economic and cultural hub of the East, Shanghai. Responding to a need for comparative analysis of demographic and socioeconomic changes across Asia in the past decades, the Asian Demographic Research Institute (ADRI) was jointly established by IIASA and Shanghai University in 2015.

"Most institutes in Asia focus on purely country-oriented issues. There is no institute working on comparative analysis of important issues that the

entire Asian continent has to deal with," says ADRI Director Leiwen Jiang, who is also a former IIASA researcher. "As IIASA has a very strong position in the research areas we wanted to focus on, we decided to work together closely to take advantage of the methodology."

Today the collaboration between IIASA and ADRI remains strong, with IIASA researcher Wolfgang Lutz chairing the advisory board and several other researchers joining ADRI as full-time professors.

Since its founding, the institute has achieved overwhelming success with a publication record that stands out among all other population institutes in Asia. The institute also hosts a postgraduate program to train the next generation of systems thinkers and organizes workshops, conferences, and other training opportunities for researchers across Asia and beyond.

SOUTHERN AFRICAN SYSTEMS ANALYSIS CENTRE (SASAC)

Our next stop is in South Africa, which is home to a vibrant systems analysis community. This is in part thanks to initiatives such as the Southern African Young Scientists Summer Program (SA-YSSP) that was launched a decade ago as a replica of the original Young Scientists Summer Program (YSSP) hosted at IIASA since 1977. Over the course of the SA-YSSP's three-year run, experts from South Africa and IIASA mentored and trained more than 80 doctoral students from 30 countries during their summer projects.

Building on the success of the SA-YSSP while addressing its shortcomings, in 2015 the National Research Foundation (NRF) and the Department of Science & Technology in South Africa launched the Southern African Systems Analysis Centre (SASAC) in close collaboration with IIASA. SASAC offers three-year PhD scholarships as well as shorter training opportunities for researchers.

"There has been a tremendous change since the establishment of SASAC. The majority of the students we train don't just end up within the university system, but go on to become excellent experts, looking at broader pictures of ways to address challenges associated with the Sustainable Development Goals," explains Sepo Hachigonta, director in the Strategy, Planning, and Partnerships division at the NRF.

Like Hachigonta, who is himself a 2007 IIASA YSSP alumnus, a lot of students transition from academia to working for government and funding agencies where they can affect policy in tangible ways in South Africa and the surrounding region.

NORTH AFRICA APPLIED SYSTEMS ANALYSIS CENTRE (NAASAC)

We now move northward to arrive at the newest addition to the systems analysis community, the North Africa Applied Systems Analysis Centre (NAASAC) in Egypt. Encouraged by the overwhelming success in South Africa, the Academy of Scientific Research and Technology in Egypt launched NAASAC in December 2021 in partnership with IIASA.

NAASAC's focus is on training government policymakers through a diploma course to support evidence-based decision-making and introduce systems thinking into policy in Egypt and the surrounding region. IIASA is set to offer supervision and training modules for the course.

"I am very enthusiastic about the potential," says IIASA Dean of Capacity Development and Training, Fabian Wagner, who serves on the NAASAC Advisory Board. "This is a great way for a member country to engage with us and make the most of our partnership. We can concretely help them to establish a syllabus, help them in teaching, and we can even bring people to IIASA for training."

MESSAGE MODEL

On the other side of the pond, the seeds of systems analysis have begun to take root and flourish through a more informal partnership in Brazil. The collaboration started when the IIASA Model for Energy Supply Strategy Alternatives and their General Environmental Impact (MESSAGE) was introduced to the Energy Planning program in COPPE, the Federal University of Rio de Janeiro, back in 2000.

"Initially, it started off very small, and it slowly built up over time. A Brazilian version of the model was developed, and now the model is self-sufficient with a group of 30 researchers working on it," says Roberto Schaeffer of the Federal University of Rio de Janeiro. "Science is a long-term investment game; you can't expect results from one year to another. You have to think about this on a 20 to 30-year time horizon to really benefit from it."

Today, the benefits of this partnership are obvious. The Brazilian research group have greatly enhanced the Brazilian MESSAGE model, increasing its spatial resolution and the technologies it covers, in addition to developing the first full global integrated assessment model for climate mitigation outside of Europe, Japan, and the US. MESSAGE was also used by the Ministry of Mines and Energy and the Ministry of Science in Brazil, giving policy decisions a solid scientific base.

Further info:
www.iiasa.ac.at/news/21-NAASAC
www.previous.iiasa.ac.at/news/18-SouthAfrica
adri.shu.edu.cn

Sepo Hachigonta: sp.hachigonta@nrf.ac.za
Leiwen Jiang: ljiang@shu.edu.cn
Fabian Wagner: wagnerf@iiasa.ac.at
Iain Stewart: iain.stewart@iucn.org

Celebrating 50 years of systems science

Scientific collaboration across geo-political divides is needed now more than ever. Originally founded to build bridges between nations, IIASA research continues to use the power of systems analysis to bring together scientists from around the globe to find holistic solutions to issues of global concern.

The institute's 50th anniversary provides a perfect moment to take stock of its achievements as we look to the future. Join us on a journey through time as we highlight 50 major IIASA achievements of the past half century.

By **Rachel Potter**

REDUCING FOOTPRINTS

IIASA

50

EST.

1970

1972

IIASA is founded by 12 nations from the East and West at the height of the Cold War.

1974

George Dantzig, winner of the US National Medal of Science, and Nobel Prize laureates Koopmans (USA) and Kantorovich (USSR) expand on an IIASA study of advanced systems science.

1975

Nobel Prize winner William Nordhaus' career is given a jump start at IIASA when he publishes the first economic model of global warming. pure.iiasa.ac.at/id/eprint/365

1977

The first Young Scientists Summer Program takes place at IIASA.

1978

IIASA scientists warn the world about the dangers of climate change and suggest pioneering solutions such as capturing and storing carbon. pure.iiasa.ac.at/id/eprint/821

1978

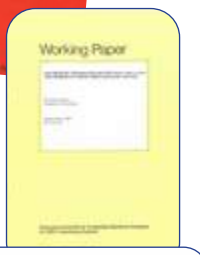
A new research field, Adaptive Ecosystem Policy and Management, is founded at IIASA and has implications for forest management policy throughout North America and Scandinavia. pure.iiasa.ac.at/id/eprint/823

1980

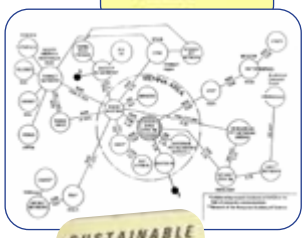
1980
Researchers at IIASA develop reliable projections of population aging in developed countries.

1981
The first comprehensive, truly global assessment of energy issues is published at IIASA, resulting in the internationally acclaimed report, Energy in a Finite World. pure.iiasa.ac.at/id/eprint/1539

1982
IIASA conducts a study on the eutrophication of Lake Balaton, influencing water policy worldwide.



1983
Groundbreaking IIASA research pioneers the modern approach to increasing returns showing how powerful firms can exploit the nature of high-tech markets to the disadvantage of opponents who offer better products.
pure.iiasa.ac.at/id/eprint/2222



1983
Researchers at IIASA establish a computer network reaching beyond the Iron Curtain - 10 years before the Internet.

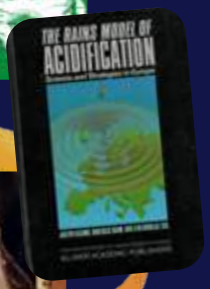
1986
A book published by IIASA scholars is quickly accepted by the science community as the core scientific text on sustainable development. pure.iiasa.ac.at/id/eprint/2751

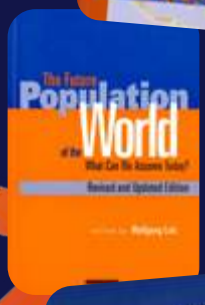
1988
In response to mounting tensions around global food issues, IIASA creates a computer model: Basic Linked System, that becomes a practical tool for determining the effectiveness of policies to eliminate hunger and the impacts of agricultural trade liberalization. pure.iiasa.ac.at/id/eprint/3061 | pure.iiasa.ac.at/id/eprint/3060

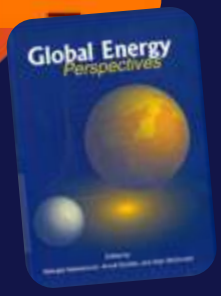
1989
An IIASA model analyzing Europe's acid rain problem is adopted by all 28 countries of the Geneva Convention on Transboundary Air Pollution.

1990

1991
Leading economists from Eastern and Western Europe, Japan, the USA, and the USSR are brought together by IIASA to identify reforms to help the Soviet Union overcome its economic crisis and transition to a market economy. pure.iiasa.ac.at/id/eprint/3465







1992

The first continent-wide assessment of forest resources in Europe and the European regions of the former USSR conducted at IIASA reveals the alarming consequences of air pollution for European forests. pure.iiasa.ac.at/id/eprint/3589 | pure.iiasa.ac.at/id/eprint/3586

1995

The IIASA Regional Acidification Information and Simulation (RAINS) scientific model underpins the agreement of 33 European governments to reduce damaging emissions of sulfur dioxide. pure.iiasa.ac.at/id/eprint/3352

1995

Five IIASA scholars are chosen to be lead authors of the Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). More than 40 IIASA scholars have since played leading roles in IPCC assessment reports.

1995

The IIASA RAINS model is extended to analyse sulfur dioxide emissions in Asia and is presented to energy planners and government officials in 18 Southeast Asian nations.

1996

A second edition of the IIASA book, The Future Population of the World: What Can We Assume Today? is published, predicting that the world population will probably never double again. pure.iiasa.ac.at/id/eprint/4762

1998

The World Energy Council partners with IIASA in a unique study on Global Energy Perspectives, which analyzes how current and near-term energy decisions will have implications throughout the twenty-first century. pure.iiasa.ac.at/id/eprint/5445

REDUCING FOOTPRINTS

IIASA

EST.

2000

2000

IIASA scientists and models play a leading role in preparing the most comprehensive scenarios yet of greenhouse gas emissions for the twenty-first century. pure.iiasa.ac.at/id/eprint/6101

2001

Demographers at IIASA are the first to forecast that the world's population will peak in the twenty-first century and then begin to decline. pure.iiasa.ac.at/id/eprint/6361

2002

IIASA scientists complete the most comprehensive study of Russian forests and land resources ever undertaken.

2002

The United Nations commissions IIASA scientists to analyze the likely impacts of climate change on agriculture to 2080. core.ac.uk/display/33898140?source=2

2004

IIASA scientists reveal that undesirable genetic changes are taking place in fish stocks due to commercial exploitation. pure.iiasa.ac.at/id/eprint/7262

2005

Innovative approaches to free vulnerable countries from dependence on unpredictable post-disaster aid are identified by IIASA Risk, Modeling, and Society Program scholars.

pure.iiasa.ac.at/id/eprint/7521

2007

IIASA scientists share the Nobel Peace Prize with authors of the IPCC reports and Al Gore for "their efforts to build up and disseminate greater knowledge about man-made climate change".

2008

In one of the most cited papers on global aging, IIASA demographers show that the global speed of ageing is likely to peak between 2020 and 2030, and then decelerate. pure.iiasa.ac.at/id/eprint/8622

2008

IIASA analyses guide the EU on reducing greenhouse gas emissions for the EU Climate and Energy Package.

2008

Research from IIASA and partners warns that the production of some commonly used biofuels can contribute significantly to global warming through nitrous oxide emissions. pure.iiasa.ac.at/id/eprint/8534

2010

2011

The Representative Concentration Pathways database is co-developed and hosted by IIASA, equipping the climate change research community with common greenhouse gas emissions data. pure.iiasa.ac.at/id/eprint/9576

2012

IIASA and partners identify 14 measures to reduce short-lived climate forcers such as methane and ozone, providing scientific evidence for the Climate and Clean Air Coalition and its 72 states. pure.iiasa.ac.at/id/eprint/10016

2012
The Global Energy Assessment is published by IIASA and goes on to provide the scientific basis and objectives for UN Sustainable Development Goal (SDG) 7 on ensuring access to sustainable energy for all. pure.iiasa.ac.at/id/eprint/10099

2013
A revamped Geo-Wiki is launched by IIASA and partners to harness the power of citizen science to collect and verify land cover data, thereby dramatically improving the quality of the data.

2014
The European Commission agrees a proposal for new climate and energy targets for 2030 informed by IIASA modeling results.

2014
IIASA publishes the first population projections that include level of educational attainment for all countries of the world. pure.iiasa.ac.at/id/eprint/11143

2014
High-level officials and experts from across Europe, the Eurasian Economic Union, and Asia are brought together by IIASA to explore the challenges and opportunities of establishing closer economic relations and the creation of a common economic space, so enhancing mutual understanding.

2015
The UN SDGs are formally adopted with IIASA science underpinning goals on tackling climate change and ensuring access to sustainable energy for all.

2015
IIASA science contributes to talks leading up to the Paris Agreement, providing the only study to show that it is technologically viable to limit global warming to 1.5°C above pre-industrial levels.

2016
Research by IIASA and partners provides inputs to the revisions of the EU Renewable Energy Directive, including the introduction of sustainability criteria for all biofuels produced or consumed in the EU.

2017
Informed by a decade of IIASA demographic research, the German Federal Ministry for Development allocates 25% of its funding for education.

2018
The Zambezi River Basin Commission develops a strategic plan for water, energy, and food management based on findings from an IIASA-led study.

REDUCING FOOTPRINTS

IIASA

EST.

2018

The IPCC publishes its Special Report on Global Warming of 1.5°C. The report involved 224 contributing authors from 40 countries of which 12 were from IIASA.

2018

The Zurich Flood Resilience Alliance renews its partnership with IIASA to apply systemic risk research to help two million people around the globe become more resilient against flooding.

2019

IIASA demographers introduce a completely new way of measuring aging defined not only by chronological age but also, among other factors, life expectancy, cognitive, and physical health.

2019

The Chinese Government officially adopts the IIASA Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model to strengthen air quality in the country.

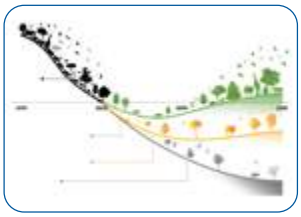
2019

IIASA contributes to a groundbreaking report by the Indonesian Ministry of National Development Planning showing how the country could gain huge economic benefits by transitioning to a low-carbon economy.

2020

2021

IIASA partners with the International Science Council to bring together hundreds of experts to use systems thinking to identify how to rebuild a world that is more resilient, sustainable, and just.



2021

The post-2020 Biodiversity Framework of the Convention on Biological Diversity is informed by IIASA research.

Visit our interactive digital 50th anniversary timeline: www.iiasa.ac.at/50/timeline

By **Stephen Battersby**

SYSTEMS OF UNDERSTANDING

As it forges the links of systems science, IIASA can also help to connect the world in a network of science diplomacy.

WE NEED TO TALK. International diplomacy is vital for a peaceful and sustainable planet – and alongside traditional diplomatic channels, science has a special role to play. Science can bring decision makers with clashing views into the same room to tackle common problems. It can help to reveal the bigger picture beyond narrow national interests. It can bring universal truths and cool calculation into the overheated arena of politics.

IIASA is the child of diplomacy. A deal forged in 1967 between US President Lyndon B. Johnson and Soviet Prime Minister Alexey Kosygin led to the institute's creation in 1972, when 12 member nations came together to found a new scientific institution that bridged the Cold War divide, working on solutions to common problems. This is a perfect example of diplomacy acting in the interest of science, despite the clashing politics of the time.

Today, ambassadors and other diplomats posted to Vienna often visit IIASA. Here they can see how participating in IIASA projects may benefit their countries, for example, by solving problems they have in common with others. IIASA has consultative or observer status in many intergovernmental organizations, such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services and the United Nations Environment Programme, and it contributes scientific findings to many international negotiations. This also helps garner support for science-informed solutions.

A broader aim is to bring countries together to solve shared problems on a multinational or global scale. This kind of science diplomacy is inherent in the majority of work at IIASA – a natural consequence of the "International" and the "Applied".

"It is there in any project that is transnational and helps build trust or resolves tensions," says Sergey Sizov, Science Diplomacy Officer at IIASA.

> ***"It is there in any project that is transnational and helps build trust or resolves tensions."***
>
> **SERGEY SIZOV**

For instance, IIASA research into risk insurance informs the Loss and Damage Mechanism to support developing countries in the face of climate hazards, so it can help reduce the growing climate tensions between rich and poor nations.

Some of the systems analysis methods that IIASA has developed over the past half century turn out to be excellent catalysts for diplomacy. This was evident in the Integrated Solutions for Water, Energy, and Land (ISWEL) Project, which focused on shared water resources in the river basins of the Indus and Zambezi. These rivers face many demands, and national interests are often at odds.

"Say one country puts in a hydroelectric plant, that would affect everyone downstream," explains Barbara Willaarts, a Research Scholar in the Water Security Research Group. "So we need to find sustainable solutions to meet everyone's water, energy, and land demands."

Partnering with the Global Environment Facility and the United Nations Industrial Development Organization, IIASA used a modeling framework to analyze water, energy, and land use for various future climate and development paths, so researchers could anticipate where and when extreme scarcity might occur, and explore possible solutions. The project involved a wide range of stakeholders from each country through workshops and consultations. This made the project an engine for science diplomacy.

"An innovative aspect of the ISWEL project was soft tools: serious games and policy simulations. Learning-by-doing with these tools helped people with different values and priorities to explore problems together," says Willaarts. "We managed to create a very constructive process, where despite the complexity and political sensitivity, stakeholders were very engaged and willing to explore solutions to common problems."

IIASA is neutral ground, a depoliticized venue where people can meet and talk about the problems they face. Its members are not governments, but scientific institutions. When a transboundary issue is funneled through science, rather than political dialogue, there may be more chance of a rational, peaceful outcome. Debate can be less about preconceptions and more about evidence. If normal diplomatic relations break down, science can offer an alternative path.

"Sometimes diplomats are not comfortable having direct meetings with their counterparts, but they are ready to have unofficial contact on the margins of a larger gathering organized by a neutral third party," notes Sizov. "Then scientists can build a bridge through unofficial channels."

For example, by the 1990s diplomats across 33 European governments had forged an international environmental treaty that helped bring an end to Europe's acid rain problem. The agreement was made possible by an IIASA scientific model that enabled scientists, policymakers, and diplomats to explore options to tackle air pollution, all in the neutral setting of an international scientific organization. This also shows applied systems science being diplomatic in the sense of tactful and sensitive; not aiming to dictate policy, but rather to give options, showing the possibilities
if you choose this or that policy pathway.

More can be done, of course. To spur on the institute's science diplomacy activities, the 2021-2030 Strategy sets a formal mandate to "build trust and help divergent views to jointly confront problems of global interest by engaging with decision makers, providing scientific insights for policymaking, developing cooperative strategies and, thereby, strengthening bilateral and multilateral relations for sustainable development."

> *"Shared global challenges will not be resolved unilaterally, and no nation will achieve a sustainable future in isolation."*
>
> **Albert van Jaarsveld**

A new document, the Science Diplomacy Strategy, will lay out how to make this happen.

"One aim will be to scan for new threats to international relations in areas where systems analysis could provide common ground," says Iain Stewart, former co-chair of the IIASA Science Diplomacy Strategy Working Group.

This summer at the IIASA 50th anniversary science diplomacy event: The Need for International Scientific Cooperation and Multilateralism, policymakers, researchers, and high-ranking diplomats will discuss how international scientific cooperation can unlock discoveries, strengthen international relations, and contribute evidence-based solutions to negotiations.

Diplomacy may have its limits, but surely we need this kind of cool-headed collaboration more than ever.

"Shared global challenges will not be resolved unilaterally, and no nation will achieve a sustainable future in isolation," says IIASA Director General Albert van Jaarsveld. "It will require negotiated compromises among multilateral partners to make lasting progress against the universal global change challenges we face.'

Further information:
previous.iiasa.ac.at/web/home/research/iswel/ISWEL
previous.iiasa.ac.at/web/home/research/oecd/OECD-IIASA_Partnership
www.oecd-ilibrary.org/governance/systemic-thinking-for-policy-making_879c4f7a-en

Sergey Sizov: sizov@iiasa.ac.at | **Iain Stewart:** iain.stewart@iucn.org
Albert van Jaarsveld: jaarsveld@iiasa.ac.at | **Barbara Willaarts:** willaart@iiasa.ac.at

Regional impacts

© Nicoleta Raluca Tudor | Dreamstime

Combatting marine litter through better data collection

One of the most significant problems facing mankind is in our oceans. Marine litter, particularly plastics, harms more than just the ocean ecosystem—it can trap or kill sea and land animals and break down into smaller pieces that eventually end up in human food sources.

Yet, the real extent of the problem is currently unknown due to the vastness of the oceans and the extensive circulation of plastic litter, which makes the research on marine litter and its impact on the environment challenging and prohibitively expensive.

A recent project led by IIASA researcher Dilek Fraisl, aims to bridge the gap between volunteer-led local data collection and official monitoring and reporting processes to combat this problem. The project is based on an IIASA-led study on mapping citizen science contributions to the UN Sustainable Development Goals (SDGs).

"In our Citizen Science for the SDGs project we collaborated with the Ghana Statistical Service, Ghana Environmental Protection Agency, the United Nations Environment Programme (UNEP), and other partners. We used citizen science data to address the data gap on marine plastics, which fed into Ghana's official SDG monitoring and reporting efforts on a national scale, and UNEP globally," explains Fraisl. "Thanks to our project, Ghana has become the first country to officially report on SDG indicator 14.1.1b on marine litter using citizen science data. Our results will also inform the formulation of an Integrated Coastal and Marine Management Policy in Ghana."

By **Jeremy Summers**

Further info: pure.iiasa.ac.at/17774 | pure.iiasa.ac.at/16543

Dilek Fraisl: fraisl@iiasa.ac.at

Local politics and global visions of Morocco's renewable energy transition

© Sjankauskas | Dreamstime

As more countries in the Global South begin to transition towards green energy, there has been a noticeable and alarming trend in associated projects. These projects are situated within a spectrum of expectations that range from autocratic mega-projects that hurt local communities on the one hand; and promissory projects that foster sustainability and inclusivity on the other.

Morocco is embarking on an ambitious green energy transition and is planning to construct 20 concentrated solar power plants as part of a national strategy known as the Solar Plan, which aims to not only provide energy security, but also to set the kingdom up for green energy export.

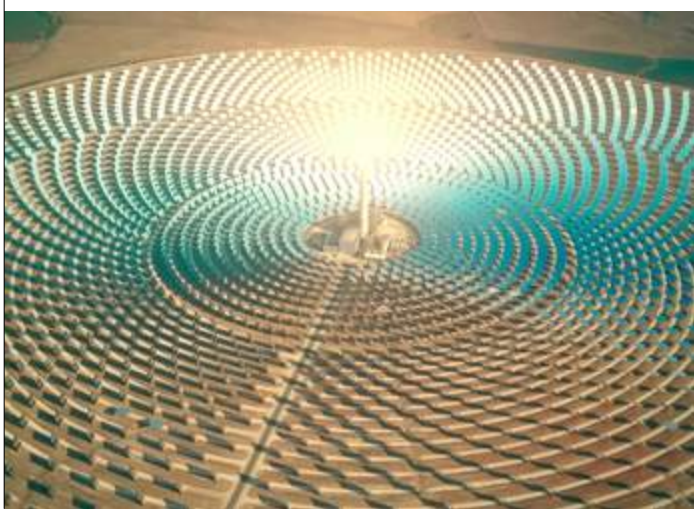
IIASA researchers looked at Morocco's Solar Plan and the dynamics set in motion on affected local communities. Research from Tata, a rural Moroccan community where a concentrated solar power plant is being built, indicates that there is still a top-down approach to these large projects with much of the policy field being dominated by national considerations, the interests of national elites, and international investors, not leaving much space for inclusiveness and the involvement of local communities.

On the other hand, the researchers noted that just the announcement of concentrated solar power projects in an area gave rise to a chain of societal and political dynamics that create opportunities for local stakeholders to enter negotiations regarding the benefits for their local communities.

By **Neema Tavakolian**

Further info: pure.iiasa.ac.at/17737

Nadejda Komendantova: komendan@iiasa.ac.at



© Alexey Novikov | Dreamstime

Solving Brazil's energy and food crisis

Home to the largest river in the world by water volume, Brazil relies heavily on hydropower for electricity generation. In 2021, the main region for hydropower production in the southeast of Brazil was affected by severe drought, plunging the country into a food and energy crisis.

To understand why river flow has reduced in the region and to develop mitigation strategies, IIASA researcher Julian Hunt and Brazilian colleagues analyzed river flow for eight dammed reservoirs during the wet and dry seasons. Surprisingly, they found that having kept the reservoir levels low during the previous drought in 2014 might have exacerbated the current problem. Full reservoirs increase the humidity in the air, which is already very high in Brazil's rainy season. This in turn decreases evaporation rates and increases the chance for rainfall, suggesting that storing more water in reservoirs could actually increase river flow and hydropower generation in the Southeast region of Brazil.

"We should realize that managing water, land, and other resources is not just a way to adapt to a changing climate. It can also affect the climate itself," says Hunt.

The team developed specific recommendations for how high the reservoirs should be filled and at what capacity the hydropower plants should be working. The results of the study will hopefully help Brazil to manage its water resources and maximize energy and food production.

By **Fanni Daniella Szakal**

Further info: pure.iiasa.ac.at/17425

Julian Hunt: hunt@iiasa.ac.at

Building more fire-resistant housing in California

California is known for sunny weather and beautiful landscapes. The dry, windy, and hot conditions that make California desirable, however, also make it vulnerable to wildfires.

In recent decades, wildfires have devastated much of California and led to new ways to battle this threat. One of the most important approaches centers around utilizing fire-resistant housing materials.

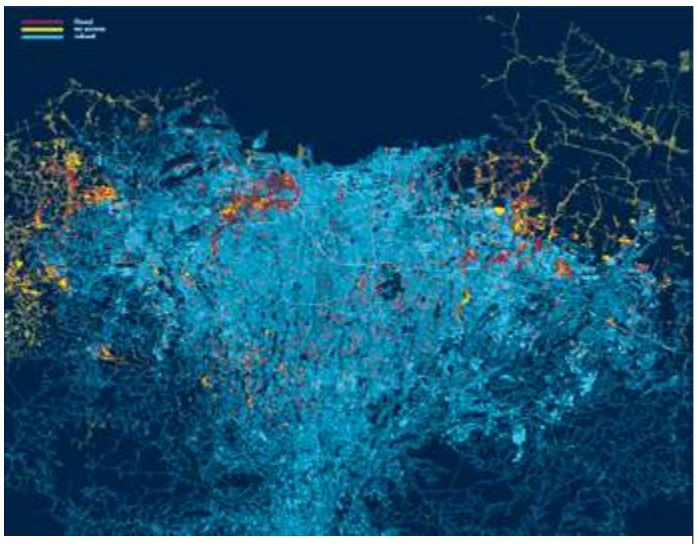
In her 2021 Young Scientists Summer Program (YSSP) project, PhD candidate Jennifer Richmond used multivariate regression analysis to test the hypothesis that Californian building code changes in 1995 and 2008 had a significant impact on the level of fire-resistant building class adoption throughout the state. The results showed that the building code change in 2008 might have had a broader impact in encouraging the adoption of higher-level fire-resistant home construction materials than the building code change for roofing in 1995.

"The risk of wildfires continues to evolve as climate change enables conditions that are hotter, drier, and conducive to more frequent and intense fires," explains Richmond. "The goal of this research is to better understand empirical underpinnings of the relationship between higher classes of fire-resistant building materials used in home construction across different spatial and socioeconomic dynamics as well as building code enforcement and non-enforcement jurisdictions. Building codes meant to harden homes are an important part of wildfire resilience because evidence suggests that codes and standards—although by no means foolproof—can be effective at protecting property while also preventing further spread of fires."

By **Jeremy Summers**

Further info: pure.iiasa.ac.at/17657

Jennifer Richmond jenlouisrichmond@gmail.com



Greater Jakarta vulnerability map based on simulated flood occurence

Using a new framework to help Jakarta protect against flooding

Many coastal cities around the world are at risk of flooding due to rising sea levels. Few cities, however, face challenges like Jakarta.

Situated on the Indonesian island of Java, Jakarta is home to 32 million people and is surrounded by several low-lying rivers that routinely swell during monsoon season. Increased pumping of groundwater in recent decades has also caused many parts of the city to sink.

In his report on his 2021 Young Scientists Summer Program (YSSP) project, Pavel Kiparisov, a PhD candidate in Environmental Sciences and Policy at the Central European University, shows that flood effects can be quantified relying solely on open data sources and tools.

© Akbar Solo | Dreamstime

Using this data, scientists can focus not only on predictions and their localization but also on identification of vulnerabilities of the whole system. This will help cities prepare for extraordinary events that are less predictable or not predictable at all. Additionally, Kiparisov explains, the suggested framework can be implemented by one researcher in a matter of minutes and hours, as opposed to post-disaster ground surveys, which are usually costly and time-consuming.

"With the growing frequency of disasters across the world and the threats they pose, we must have tools for identifying vulnerabilities in urban systems and rapid quantification of infrastructural damage and numbers of affected people," explains Kiparisov. "My research marries network analysis with geographic information systems and proposes a framework that will become a basis of this kind of tool."

By **Jeremy Summers**

Further info: pure.iiasa.ac.at/17660

Pavel Kiparisov: pavel@kiparisov.space

Using social media to gain support for renewable energy in Iran

Iran has high potential for renewable energy use, as its position in the Middle East and the World Sun Belt make it an excellent candidate for both wind and solar technologies. However, despite favorable conditions, the country's share of renewable energies remains minor. There are many reasons for this, including social attitudes towards renewable energies, which can be influenced by various factors.

Among these factors are the availability of information and trust in the source. Considering the growing importance of social media as a mass communication platform, IIASA researchers looked into the impact of social media on social attitudes towards renewable energies.

Using various behavioral economics theories, Nadejda Komendantova, Tahere Zobeidi, and Masoud Yazdanpanah evaluated the impact of trust on information credibility about renewable energy sources and their perceived usefulness among Instagram users in Iran.

"We found that perceived trust is a direct predictor of information adoption and a mediator between perceived usefulness and information adoption. The credibility of the source can influence people's attitudes toward information about renewable energies, while attitudes also affected the perceived usefulness of the information. So, people who think that information on social media is useful and valuable are more likely to accept and use the information," Komendantova explains.

The researchers further highlight that environmental information providers and publishers of environmental information on Instagram need to increase the quality of information and credibility of information resources to increase recognition of the benefits of renewable energy.

By **Neema Tavakolian**

Further info: pure.iiasa.ac.at/17668

Nadejda Komendantova: komendan@iiasa.ac.at

© Vladimir Grigorev | Dreamstime

Forecasting future distributions of European wetland birds

Wetland birds provide many ecosystem services and have important cultural values. Their populations are however threatened by the loss of natural wetlands and climate change. One way that these birds try to adapt to climate warming is by shifting their home ranges.

© Vynikal | Dreamstime

IIASA alumnus Elie Gaget, who is now at the University of Turku in Finland, participated in a study that aimed to predict how climate change will affect the future distributions of 64 wetland birds in Europe. To forecast range shifts over a century (1970s - 2070s), the team used Species Distribution Models with climate and land-use data and validated their predictions against observed species distribution changes.

The models predicted that about three quarters of birds would have smaller ranges in the future, while a quarter of them — species from the South of Europe — will expand their distributions towards the North, following the warming climate.

"As forecasting biodiversity changes is a complex task, validation of the predictions against independent data is important to ensure the reliability of the forecasts," says Gaget. "The study shows that climate and land use changes were very likely the main driver of wetland bird distribution changes in the past and that in the near future, these birds will have less space to breed in Europe."

The results highlight the need for preserving and restoring wetlands to improve wetland birds' resilience to environmental changes in the future.

By **Fanni Daniela Szakal**

Further info: pure.iiasa.ac.at/17777

Elie Gaget: elie.gaget@gmail.com

© Dashark | Dreamstime

© Kamachi209 | Dreamstime

Gaining popular support for green tax reform

In the effort to combat climate change, the notion of green tax reform has become increasingly common. Essentially, green tax reform shifts taxation from activities that are environmentally beneficial to those that are harmful.

However, green tax reform has hitherto been unpopular, largely because the less wealthy bear the brunt of higher-priced, carbon-intensive commodities. It then stands to reason that if these reforms were changed to benefit more people, support for green tax reform would increase dramatically.

In a recent study published in the *European Economic Review*, Armon Rezai and his coauthors used an Exact Affine Stone Index (EASI) demand system based on German household data and a labor supply schedule, using wage data, to investigate how different carbon tax designs affect people across the income distribution.

The researchers found that if revenue is recycled via lower income taxes, there is more efficiency at the expense of equity, benefitting about half of households. By combining a mix of lump-sum payments and lower income taxes, more people can benefit, increasing support for green tax reform.

"Green tax reform has the potential to lower overall costs of climate policy, but richer households often benefit the most," explains Rezai, a researcher in the IIASA Population and Just Societies and Advancing Systems Analysis Programs. "The trick is to find ways for more people to benefit without blunting the tax's ability to reduce emissions. Such a green tax reform will have public support and allow policymakers to enact it."

By **Jeremy Summers**

Further info: pure.iiasa.ac.at/17730

Armon Rezai rezai@iiasa.ac.at

Message from the director

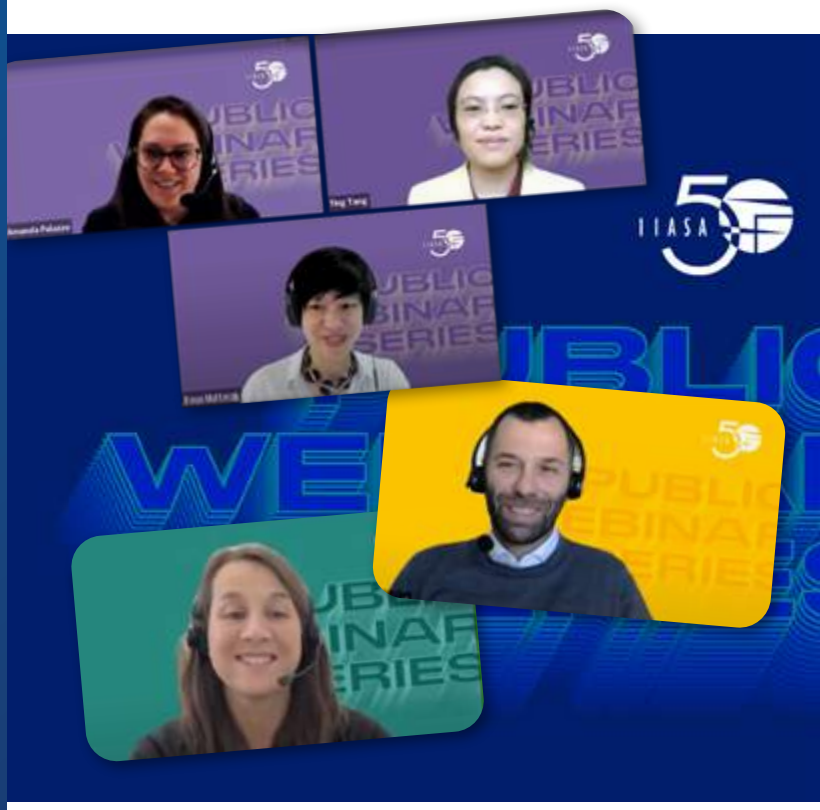
The global pandemic and the war in Ukraine are causing unprecedented humanitarian crises with emerging food and energy shortages. These events are undermining the efforts of the international community to maintain the momentum to address vital and urgent global sustainability matters. Of course, collaboration cannot happen where there is military action, but the urgency of the global sustainability agenda means that vital multilateral linkages must be maintained to support our ability to seek solutions to shared problems such as climate change, food and water security, and public health.

IIASA and similar bodies with a science diplomacy focus were created precisely for times like these. They should be strengthened amid the ongoing crises to ensure they can fulfil their mandates where traditional diplomacy avenues falter. The 50th Anniversary of IIASA provides an opportunity to remind us of the bridges built by IIASA during the Cold War. Throughout this anniversary year, we will be co-hosting 14 events with National Member Organizations in-country, to highlight the value of systems analysis to tackle complex regional problems and strengthen engagement with researchers from member countries.

Science diplomacy is unlikely to resolve the pandemic or the war in Ukraine, but it can maintain vital channels of communication to aid recovery and mend relations where required. Today, interventions like the accommodation of displaced researchers are urgently required to maintain the global research community. In this regard, IIASA actively participates in supporting Ukrainian scientists through initiatives like the academic mobility program of the Austrian Academy of Sciences and the International Science Council Displaced Researcher Initiative.

ALBERT VAN JAARSVELD

By **Rachel Potter**



© Adam Islaam | IIASA

The IIASA Public Webinar Series: In conversation with our researchers

What are the best ways to tackle the climate crisis? How can we protect biodiversity? What are the ways forward towards sustainable, resilient, just, and equitable societies? In a world facing multiple global crises, it is vital for science, society, and individuals to connect and share our knowledge, insights, and experience.

Over the last six months IIASA has run a series of public webinars that provide a platform for the science curious and enthusiasts, as well as science professionals and novices, to discuss the world's most pressing sustainability problems and systems approaches for a better future.

These webinars are open to all and provide a perfect opportunity to engage with IIASA researchers in an interactive and informal setting.

Over 600 people from across the world have attended the open sessions so far to discuss current and pressing issues such as reversing biodiversity loss, using citizen science to achieve the UN Sustainable Development Goals, managing climate-related risk and understanding the challenges facing women in the context of a changing climate, and the empowerment of women researchers.

Plans are underway for exciting upcoming events in this series. Keep an eye on the IIASA website and social media channels to join the conversation, advance understanding, and engage with science to ultimately increase the quality of our lives and the sustainability of our world.

IIASA and Jordan advance systems science

In March 2022, IIASA Director General Albert van Jaarsveld led a delegation to Jordan to consolidate and strengthen collaboration with the country's scientific leaders and research communities.

Jordan is a prospective member of IIASA through the Royal Scientific Society of Jordan (RSS), the institute's main partner in the kingdom. The visit built on a longstanding working partnership with HRH Princess Sumaya bint El Hassan, President of the RSS, who has been influential in positioning and enabling the country as a leading advocate for science and a catalyst for change.

The meeting focused on IIASA and Jordan's common interests: advancing and building capacity in systems analysis, applying systems science to global and local challenges such as water scarcity, sustainable energy transition, air and water pollution, the impact of climate change on agriculture, and using science to build bridges across national boundaries.

In addition to HRH Princess Sumaya bint El Hassan, the delegation met with Jordanian scientific and government leaders and policymakers including HRH Prince El Hassan bin Talal, Founder and Chairman of the RSS and Ayman Al Safadi, the Jordanian Deputy Prime Minister and Minister for Foreign Affairs.

"This partnership will allow Jordanian scientists and researchers to contribute to multi-disciplinary and multi-national policy-oriented research. The sharing of expertise will help us move from monitoring to modeling and assessment so that we may plan for a sustainable future. Together, we can make a difference and steer a course to sanity," said HRH Princess Sumaya bint El Hassan.

Further info: www.iiasa.ac.at/event/22-jordan

HRH Prince El Hassan bin Talal at the Majlis El Hassan meets with an IIASA delegation led by IIASA Director General Albert van Jaarsveld at the Royal Hashemite Court. © IIASA

Scott Spillias
© Scott Spillias

Siddharth Joshi
© Siddharth Joshi

Yingjie Li
© Yingjie Li

Camille Belmin
© Camille Belmin

Awards for outstanding early-career scientists

Four exceptional young scientists from the 2021 Young Scientists Summer Program (YSSP) have been recognized for their papers.

Scott Spillias from the University of Queensland, Australia, has won the Peccei Award for his study The global benefits of large-scale seaweed farming. Siddharth Joshi from the University of Cork, Ireland, has won the Mikhalevich Award for his study on the Role of rooftop solar photovoltaics in global energy transitions.

The Peccei award is named in honor of IIASA alumnus Aurelio Peccei and recognizes policy-related research, while the Mikhalevich Award, named after IIASA alumnus Vladimir S. Mikhalevich, acknowledges mathematically and methodologically oriented research. The winning papers were selected by a committee comprised of one member from each IIASA program based on their outstanding quality, originality, and relevance.

"Taking part in the YSSP has been a great opportunity to work with highly motivated scientists on the cutting edge of global energy systems modeling to find solutions to mitigate climate change. The work ethic and genuine love for research that IIASA scientists have, has inspired my research," says Joshi.

Fellow YSSP participants Yingjie Li from Michigan State University, USA, and Camille Belmin from the Potsdam Institute for Climate Impact Research (PIK), Germany, received honorable mentions from the committee for their work. Belmin analyzed the energy-fertility nexus in population projections, and Li's study focused on the international socio-environmental spillover effects on achieving the Sustainable Development Goals.

Further info: www.iiasa.ac.at/news/22-ysspawards

© Silveri | IIASA

IIASA luminaries honored with lifetime achievement awards

Guenther Fischer and Nebojsa Nakicenovic have been awarded the first IIASA Lifetime Achievement Awards.

This is the pinnacle scientific award given by the institute and recognizes individuals who have been true flagbearers of IIASA and have guided the institute to deliver scientific excellence in pursuit of answers to complex global and universal problems faced by humanity. The awards are made to senior IIASA researchers of exceptional distinction after formal retirement.

Fischer and Nakicenovic are internationally renowned for the outstanding international scientific impact and reach of their work as well as for their scientific leadership through participation in international science and policy advisory structures.

Fischer joined IIASA in 1975. His leadership of projects has led to the development of products that have been applied globally and at national scales around the world. This includes the integrated ecological-economic framework that emphasized the risks of excessive biofuel production on global food security, the Global Agro-Ecological Zones (GAEZ) modeling system, and the World Food System Model, which led to his sharing the Nobel Peace Prize with other Intergovernmental Panel on Climate Change (IPCC) authors in 2007.

Nakicenovic joined IIASA in 1973. He has dedicated his career to establishing the institute as one of the leading science research institutions in the world, paving the way for the institute's continued role within the IPCC. He established and led the Global Energy Assessment - its findings directly shaped Sustainable Development Goal (SDG) 7 - to ensure access to affordable, reliable, sustainable, and modern energy for all. He served as Deputy Director General of IIASA from 2008 to 2018 and as Acting Director General in 2018. Nakicenovic's scientific contributions are recognized the world over and he serves on advisory bodies such as the UN Secretary General Advisory Board, the German Advisory Council on Global Change, and the Group of Chief Scientific Advisors to the European Commission.

Further info: www.iiasa.ac.at/news/21-lifetimeaward

RISING STAR OF CLIMATE SCIENCE WINS ISC AWARD

IIASA researcher Joeri Rogelj received the International Science Council (ISC) Early Career Science Award for Europe for his exceptional contribution to science, international scientific collaboration, and policy engagement.

Rogelj's pioneering research on climate change scenarios changed the global conversation around the feasibility of keeping global warming to 1.5°C in advance of the UN Paris Agreement. He has been an author on highly influential reports of the Intergovernmental Panel on Climate Change (IPCC) and the UN Environment Programme (UNEP), and was the youngest member on the UN Secretary-General's Climate Summit Science Advisory Group in 2019.

www.iiasa.ac.at/news/21-rogeljaward

NEW RESEARCH LEADERSHIP APPOINTMENT

Anne Goujon, an expert in demography and education, has been appointed to lead the IIASA Population and Just Societies (POPJUS) Program.

She was previously at the European Commission Joint Research Centre in Ispra, Italy and led the research group "Human Capital Data Lab" at the Vienna Institute of Demography (VID at the Austrian Academy of Sciences).

www.iiasa.ac.at/news/22-goujonleadership

BOARD OF REGENTS' HIGHEST HONOR AWARDED TO BRIAN FATH

IIASA senior researcher and Young Scientists Summer Program (YSSP) Scientific Coordinator, Brian Fath, has received the 2022 University System of Maryland Board of Regents Faculty's Award for Excellence in research, scholarship, and creativity.

www.iiasa.ac.at/news/22-fathaward

© Junguo Liu

Junguo Liu

By **Monika Bauer**

Currently Chair Professor in the School of Environmental Science and Engineering at the Southern University of Science and Technology (SUSTech) in China, Junguo Liu is also a senior guest researcher at IIASA and an alumnus of the 2005 Young Scientists Summer Program (YSSP). His main research interests include hydrology and water resources, global environmental change, and ecological restoration.

"As a scientist, I am interested in answering critical questions such as how water resources, water quality, and water scarcity are affected by climate change and socioeconomic activities, how they vary among regions and how they may evolve in the future, and what management strategies could effectively mitigate water scarcity," notes Liu.

To answer these questions, he is interested in working on an integrated water scarcity assessment framework or the three-dimensional water scarcity assessment framework that incorporates water quantity, quality, and environmental flow requirements. In this regard, Liu has collaborated on developing several simulation tools for assessing water resources and water scarcity, including the Water and Ecosystem Simulator (WAYS) model, and the GIS-based Environmental Policy Integrated Climate (GEPIC) model.

"A novel aspect of my research is to develop an integrated hydro-economy approach, which enables tracing the water flows among economic sectors and across regions," explains Liu. "A unique aspect of this is the emphasis on translating scientific research results into water policies and solving critical problems of societal relevance."

Liu has been recognized as a 2021 Fellow of the American Association for the Advancement of Science (AAAS) in the section on agriculture, food, and renewable resources. In addition, he is one of the youngest elected members in the history of the Academy of Europe. He sees these as opportunities to collaborate with more people from all over the world to solve practical problems for a better and more sustainable planet.

From Everest to systems analysis

Before joining IIASA in 1980, Michael Thompson was a Himalayan mountaineer. Navigating risk in the mountains has influenced his research on risk theory, and environment and development in Nepal.

A few months prior to the 1970 British expedition to the South Face of Annapurna – one of the highest mountains in the world – Michael Thompson and the legendary mountaineer Don Whillans pitched their tent in "The Sanctuary": an impressive set of peaks that comprise the Annapurna massif. Every day, Whillans would scan the enormous wall of rock and ice before them through his binoculars.

"Mountains may look beautiful, quiet, and still," said Whillans, "but they're not; they are on the move all the time." Every now and then, the roar of an avalanche would pierce the silence, with countless blocks of ice crashing down the side of the mountain they hoped to climb. "People tell you that if you follow the rules, you will be okay," Whillans added, "but they're wrong."

Being able to understand and assess risk is an essential skill for any mountaineer who wishes to survive the altitude, the cold, and the avalanches. Thompson, now a senior researcher in the Equity and Justice Research Group of the IIASA Population and Just Societies Program, learnt this first-hand on that expedition to Annapurna and on the subsequent one to the South-West Face of Everest in 1975. However, he never imagined just how useful those experiences would prove later in his academic work.

Thompson studied social anthropology at University College London and then at Oxford before joining IIASA in 1980. His work at the institute took him back to the mountains: he developed a systems overview of the environmental and developmental problems of the Himalayan region for the United Nations Environment Program (UNEP) and worked with Nepali researchers and entrepreneurs to bring novel technologies to light.

"To my surprise, mountaineering and applied systems analysis came together quite effectively," he notes.

The 1970 Annapurna South Face expedition team pictured in front of the Annapurna massif. Fourth from the right in the first row is Michael Thompson, to his right is Don Whillans, with a cigarette.

He also drew on his experience of navigating risk in the mountains when he joined the lively debate on the different approaches to risk as part of the former IIASA Risk and Resilience Program.

"At that time, risk research was done as if it was chemistry; as if you could calculate the objective risk of everything. But it's not as simple as that," he explains. "People don't just react to risks; they react to what they perceive the risks to be."

Today, thanks in large part to researchers at IIASA, august bodies such as the US National Academy of Sciences and the UK's Royal Society recognize that, as *Nature*'s correspondent put it, "public perceptions should be included in the assessment of risk."

By **Fanni Daniella Szakal** **Michael Thompson:** thompson@iiasa.ac.at

Furhter info: www.iiasa.ac.at/blog/22-secretlives1

REFLECTION

Looking back on 50 years of risk research at IIASA

JoAnne Linnerooth-Bayer, former director of the IIASA Risk and Resilience Program, reflects on a rewarding career.

© M.Silveri | IIASA

Harnessing the atom to provide the world with energy was the utopian vision at the International Atomic Energy Agency where I had lunch in 1972. That lunch – and my economic dissertation – landed me a job as research assistant with a then little-known research institute, IIASA, in a project on nuclear power.

Risk research was thus launched at IIASA with the (rhetorical) question: "Why does the public oppose nuclear power when systems (risk) analysis tells us that the chance of dying from a nuclear power plant accident is less than dying from a gorilla attack in Laxenburg?"

In addressing this question, I garnered interdisciplinary lessons that would last me 50 years in risk research across such controversial issues as the transport of liquefied natural gas, chemical plant accidents, and most recently, climate extremes. I learned from anthropologists that there is no one 'public' but rather competing 'worldview communities' who construct problems and solutions using very different, plural rationalities – now called echo-chambers – and from sociologists that experts themselves are part of these communities so there is no one 'objective' risk or even science. I learned from psychologists that risk is more than the probability of some negative outcome such as death or injury; it matters who imposes the risk and who is at risk, whether it is voluntary, controllable, or catastrophic; and from mathematicians I learned the fallacy of 'expected value' thinking. Since there are no value-free solutions to risk policy issues, I concluded that trust in credible, equitable, and plurally conceived science-based policy processes – governance – is essential.

The risk landscape has changed with the emergence of such global risks as climate change, biodiversity decline, and pandemic outbreaks, but the lessons have not. Who bears the risk, who benefits, and who decides based on what evidence, are equity questions that continue to loom large on the institute's research agenda. I'm especially proud of our contribution to the climate negotiations on equitable risk sharing.

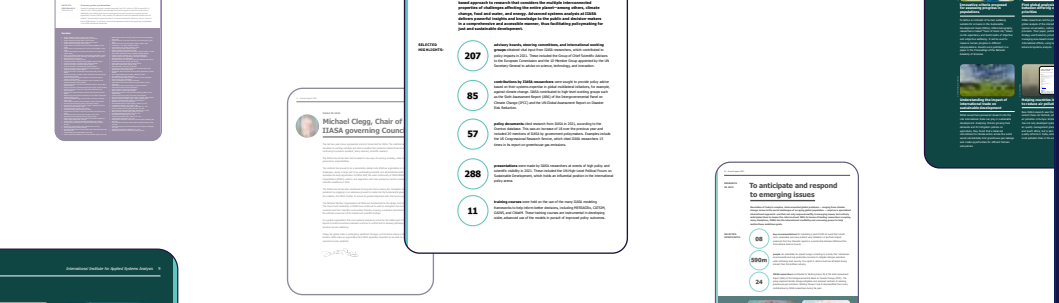
Wealthy countries have contributed excessively to climate risks, and the poorest in the developing world disproportionately bear the burdens. Could novel types of (subsidized) insurance be a backdoor for wealthy countries to avoid liability and still compensate the most vulnerable? Along with colleagues, I have pursued this idea by contributing to the Intergovernmental Panel on Climate Change (IPCC) and co-founding the Munich Climate Insurance Initiative.

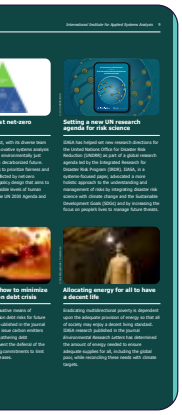
I am also excited about our 'soft systems' approach to co-generating policy options in 'wicked' settings characterized by 'deep uncertainty' and 'deep conflict', as we have demonstrated in expert-based stakeholder processes across the world.

Learning goes on. Our recent work on nature-based solutions as a transformative game changer for the climate-biodiversity-risk nexus, has made me fundamentally question earlier risk thinking. Given the huge and urgent nature-financing gap, can inclusive stakeholder engagement, as a core foundation of democracy, lead to the urgent, radical changes the world needs to address today?

As in the past 50 years, the institute's reputation and risk network are well placed to remain at the forefront of addressing this and other critical, even existential, questions.

JoAnne Linnerooth-Bayer: bayer@iiasa.ac.at





Annual report 2021

Read our annual report for highlights of IIASA research and activities in 2021

www.iiasa.ac.at/ar/21

International Institute for Applied Systems Analysis

The International Institute for Applied Systems Analysis (IIASA) is an independent, international research institute with National Member Organizations in Africa, the Americas, Asia, and Europe. Through its research programs and initiatives, the institute conducts policy-oriented research into issues that are too large or complex to be solved by a single country or academic discipline. This includes pressing concerns that affect the future of all of humanity, such as climate change, energy security, population aging, and sustainable development. The results of IIASA research and the expertise of its researchers are made available to policymakers in countries around the world to help them produce effective, science-based policies that will enable them to face these challenges.

National Member Organizations:

Austria The Austrian Academy of Sciences **Brazil** The Brazilian Federal Agency for Support and Evaluation of Graduate Education (CAPES) **China** The National Natural Science Foundation of China (NSFC) **Egypt** Academy of Scientific Research and Technology (ASRT) **Finland** The Finnish Committee for IIASA **Germany** Association for the Advancement of IIASA **India** The Technology Information, Forecasting and Assessment Council (TIFAC) **Indonesia** (*Observer*) Indonesian National Committee for IIASA **Iran, Islamic Republic of** Iran National Science Foundation (INSF) **Israel** The Israel Committee for IIASA **Japan** The Japan Committee for IIASA **Jordan** (*Prospective*) The Royal Scientific Society (RSS) of Jordan **Korea, Republic of** National Research Foundation of Korea (NRF) **Malaysia** (*Observer*) Academy of Sciences Malaysia (ASM) **Mexico** (*Observer*) Mexican National Committee for IIASA **Norway** The Research Council of Norway (RCN) **Russian Federation** The Russian Academy of Sciences (RAS) **Slovakia** Ministry of Education, Science, Research and Sport **South Africa** The National Research Foundation (NRF) **Sweden** The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (FORMAS) **Ukraine** The National Academy of Sciences of Ukraine (NASU) **UK** UK Research and Innovation (UKRI) **USA** The National Academy of Sciences (NAS) **Vietnam** Vietnam Academy of Science and Technology (VAST)

twitter.com/iiasavienna
facebook.com/iiasa
blog.iiasa.ac.at
linkedin.com/company/iiasa-vienna
youtube.com/iiasalive
flickr.com/iiasa
instagram.com/iiasavienna