Options

WINTER 2020

THE POST-COVID DIGITAL WORKPLACE
What has moving online meant for IIASA and its ability to produce and communicate research?

A ROADMAP FOR THE FUTURE OF SYSTEMS SCIENCE AT IIASA
A look at the bold new research strategy that will guide IIASA research over the next decade.

COVID-19: A SHOCK TO THE GLOBAL SYSTEM
Addressing impacts and harnessing opportunities for a more sustainable post-COVID world
As we continue to grapple with the impacts of the COVID-19 pandemic, we are proud to present you with this special edition of Options magazine, in which our focus has been to highlight the work IIASA researchers have been doing to provide science-based insights to policymakers, despite the strange new normal we are all still getting used to.

In our cover feature, we showcase IIASA researchers’ involvement in addressing emerging issues and supporting policymakers on the road to a more sustainable post-COVID world (pages 10-15). The lockdown measures instituted during the pandemic has caused the international research community to move its activities online almost overnight. In our second feature, we explore what this has meant for IIASA and our ability to produce and communicate research (pages 16-17). In these times of rapid change, IIASA is also on the verge of embarking on a bold new strategy, which will ensure that the institute continues to provide independent, systems science-based insights to global and universal challenges over the next decade. Read more about this on pages 18-19.

If you would like to share your thoughts on an article you read in this issue or have ideas for topics that you would like to see covered in coming issues of Options, please get in touch with us via email.

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ABOUT OPTIONS
Options magazine features recent IIASA research and activities.

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News in brief

Bending the curve of biodiversity loss

Each time a plant or an animal goes extinct, our world unravels. For decades, human activity has pushed the Earth to the brink and shaped a future of steadily declining biodiversity. If we allow the current trend to continue, we will be rendering vibrant and bountiful species homeless, leading future generations to live on a lonely planet. We are the cause – but we could also be the solution.

An IIASA study published in Nature and which forms part of the 2020 World Wide Fund for Nature (WWF) Living Planet Report, suggests that without ambitious and integrated action combining biodiversity conservation and restoration efforts with food system transformation, turning the tide of biodiversity loss by 2050 or earlier will not be possible.

The study uses multiple models to explore future pathways for reaching biodiversity targets.

“We wanted to assess robustly whether it might be feasible to bend the curve of declining terrestrial biodiversity due to current and future land use while avoiding jeopardizing our chances to achieve other Sustainable Development Goals,” explains study lead author and IIASA researcher David Leclère.

The study is optimistic that bending the curve of biodiversity loss from habitat conversion by 2050 is possible without jeopardizing food security. However, to achieve such a goal, researchers emphasize the necessity of a balanced synergy between biodiversity conservation, the restoration of degraded land, and a transformation of how we produce and consume food. Consequently, the study could materialize the 2050 vision of the UN Convention on Biological Diversity – “Living in harmony with nature”.

Now is the time to divert from business as usual and to aspire to ambitious global biodiversity and climate mitigation targets. Never has a “New Deal for Nature and People” that halts and starts to reverse biodiversity loss, been needed more.

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FREE TRADE COULD STAVE OFF HUNGER

Easing trade barriers between countries could potentially prevent 53 million people from experiencing acute hunger, an international team of researchers has found. In the battle against climate change-induced hunger, free trade measures for food crops like wheat, corn, or rice can reduce the potential number of people exposed to undernourishment by 2050. Global food strategies must therefore go hand in hand with improvements to trade infrastructure.

www.iiasa.ac.at/news/Hunger-20

ADVANCING FUTURE PREDICTIONS OF PLANT BEHAVIOR

Plants and vegetation are vital for life on Earth and the global carbon cycle, but their behaviors and impacts under future climate are complex and hard to predict. A new IIASA study shows how complex behaviors of plants and vegetation can be better understood and predicted based on underlying organizing principles: evolution, self-organization, and entropy maximization. This approach leads to more reliable vegetation models and improved tools to manage the biosphere for the future.

www.iiasa.ac.at/news/Vegetationmodels-20

WHAT A COMMUNITY OF OPEN SCIENCE ENTAILS

Open-source scientific software can pave the road for a community of open science. By following best practices of scientific software development, especially findable, accessible, interoperable, and reusable (FAIR) data, researchers can achieve more efficient research with well-structured code, explicit dependencies, continuous integration, tests, and good documentation.

blog.iiasa.ac.at/Huppmann-20
Can the onset of recessions be predicted?

According to the authors of a recent study, there was an 85% probability that after the great economic crisis of 2008, the next recession would happen before the start of 2020, in other words, before the onset of the coronavirus crisis.

A recession, which is a significant decline in economic activity, can cause people to lose their jobs, companies to go bankrupt, and countries’ entire economies to land in financial turmoil. It can also lead to substantial losses in GDP, lower employment rates, and reduced investment spending. Nevertheless, each economic crisis varies in its duration and intensity.

By using a novel statistical model and applying it to historical recessions in US and European markets, the authors were able to investigate economic recession patterns. "Recessions do not feature any regular periodicity, and this statistical study tried to understand how corrective actions like market adjustments, stimulus packages, regulations of the financial sector, and trade reforms affect the arrival times of new recessions," explains IIASA researcher Matthias Wildemeersch.

Future recessions are inevitable, yet newly developed statistical tools such as the model developed as part of the study, can provide insights on the likelihood of the next recession, and help policymakers prepare the corrective measures that make the economy more resilient.

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Global methane spike threatens to disrupt climate mitigation goals

Global emissions of methane have hit a new record high, according to an international team of more than 80 scientists. With the support of the Global Carbon Project, the team has found that in 2017, methane concentrations increased by around 9% (or approximately 50 million tons), above the 2000-2006 average. The main culprit of this increase is human-caused emissions, specifically from the agriculture and waste sector, and the fossil fuel sector, the study shows. This is manifested in emissions from livestock production, rice cultivation, and the extraction of oil, gas, and coal.

Methane, a potent greenhouse gas, is 28 times more powerful per kilogram than CO₂ over 100 years. Its release poses the potential for critical tipping points that can accelerate climate disruptions. The comprehensive report released by the Global Carbon Project employed a dual “bottom-up” and “top-down” approach to estimate a global methane budget.

“Identifying the sources bottom-up and verifying these top-down through atmospheric measurements is an important step towards finding effective methane mitigation strategies,” explains study coauthor Lena Höglund-Isaksson, a researcher in the IIASA Air Quality and Greenhouse Gases Program.

If we want to maintain Earth’s temperature well below 2°C and achieve the objectives of the Paris Agreement, we must limit both global CO₂ and methane emissions, researchers emphasize. Hence, this study paves the road for future monitoring of atmospheric methane concentrations while also pinpointing its sources, thereby allowing for the identification of abatement possibilities.

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**Modeling water: quenching the future’s thirst**

A growing global population and continued economic development will require a substantial increase in water demand, especially in developing regions. Concurrently, climate change is already having global, regional, and local impacts on water availability. Ensuring the fluctuating supply can meet the continuously growing water demand without compromising the sensitive aquatic ecosystems from which it is derived, is a huge challenge that will require strategies and policies informed by science.

To aid the accurate assessment of water supply and the demands of both people and the environment, IIASA researchers have developed a large-scale hydrological and water resources model — the Community Water Model. The model can simulate the movement, distribution, and management of water globally and regionally, evaluating availability both in terms of water demand and environmental needs. It includes an accounting of how future water demand will evolve in response to socioeconomic changes and how water availability will be influenced by climate change. The integrated modeling framework considers water demand from agriculture, domestic needs, energy, industry, and the environment.

Because the modeling framework is general, it can also be adapted to address new interdisciplinary research questions; this means that it opens the door to many potential applications to explore connections between the nexus aspects of energy, land, and water.

“The Community Water Model represents one of the new key elements of the IIASA Water Program to assess water supply, water demand, and environmental needs at the global and regional level. With this framework we can provide vital information to decision and policymakers,” says Peter Burek, the IIASA researcher leading the project.

The Community Water Model continues to be developed, incorporating more features designed to enhance the simulation of water availability in agricultural, urban, and groundwater contexts.

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**How climate change is driving migration**

Climate change affects populations worldwide and can drive migration. According to a recent study, factors such as global temperature changes, increased rainfall variability, and natural hazards play a key role in prompting people to relocate.

Environmental migration is most pronounced in middle-income and agricultural countries and weaker in low-income countries where populations often lack the resources needed for the migration process. The study, led by the Potsdam Institute for Climate Impact Research and to which IIASA and researchers from several other institutions contributed, identified geographical regions that may be particularly prone to population movements in the future.

“Our research suggests that populations in Latin America and the Caribbean, several countries in sub-Saharan Africa, as well as Western, Southern, and Southeast Asia are particularly at risk,” explains coauthor and Deputy IIASA World Population Program Director, Raya Muttarak.

The researchers emphasize there is no proven blueprint for environmental migration – it depends on economic and sociopolitical factors – and that the narrative of climate refugees pushing towards Europe or the US may be too simplistic. There is compelling evidence that environmental changes in vulnerable countries predominantly led to internal migration or migration to other low- and middle-income countries rather than cross-border migration to high-income countries.

Given the rising global average temperatures, the researchers believe a better understanding of how climate change influences migration indirectly through affecting socioeconomic drivers of migration alongside geographical and population heterogeneity is key for evidence-based research.

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**Energy access for all**

The absence of affordable, reliable, and sustainable electric services, or energy poverty, has obstructed close to 800 million people, mainly in sub-Saharan Africa, from maintaining a decent life. Universal access to such energy services is encapsulated in Sustainable Development Goal (SDG) 7.

IIASA researchers have developed a novel measurement framework to track energy poverty and help achieve SDG 7. This alternative framework focuses on evaluating energy services through appliance ownership, and the reliability and affordability of electric services in homes rather than electricity consumption, which poorly reflects these.

“Our main objective in this research was to try to design a better but simple framework for measuring energy poverty, and apply this to data from Ethiopia, India, and Rwanda to test how well it captures energy poverty in comparison to other multidimensional frameworks such as the World Bank’s Multi-Tier Framework (MTF),” explains IIASA researcher Shonali Pachauri.

Despite advances the MTF has made on simple access indicators, it has made assessing energy poverty more complicated. Tracking energy poverty using this novel framework is simpler and better at capturing the diversity in service conditions among the poor.

Accurate tracking of energy poverty is the first step to eradicating it. By applying this metric to other nations, the new framework can be further refined to better track SDG 7. It can also help decision makers identify the most vulnerable and direct policies to energy suppliers and households to improve access for all.

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By harnessing crowd-driven artificial intelligence (AI) to provide reliable, real-time information, the two organizations hope to revolutionize how we follow and manage changes in our environment. SAS is committed to building a global community of innovators who use technology to ignite positive change for people and the planet, while IIASA is known for its expertise in systems analysis and for providing policy solutions to address pressing concerns for humanity.

Today, many Earth systems are experiencing rapid changes – changes that exceed the capabilities of traditional modeling. A prime example is forests. Through the use of AI, SAS and IIASA aim to develop a better understanding of deforestation and, in parallel, to elucidate the interconnectivity of Earth’s ecosystems.

"By combining the power of our environmental science research platforms with SAS’ AI and computer vision technologies, and the sheer intellectual power of concerned citizens, we will develop AI models that will exponentially increase the value of human insights and strive to deliver near real-time assessments of global environmental change,” explains IIASA Director General, Albert van Jaarsveld.

Effective AI models cannot simply be conjured up. They must learn from a basis of human intelligence for development. The more we train them the more powerful they become. For this project, SAS and IIASA jointly launched an online app to gather collective intelligence. They are asking volunteers – an army of citizen scientists from high-school students to data scientists – to support this effort by examining evidence of human impact through analysis and categorization of Amazon rainforest images – principally those depicting deforestation.

“The human eye is remarkably good at observing patterns and visual changes – often better than a computer – and it’s great to be able to put that to work,” says IIASA researcher Ian McCallum.

Harnessing the collective efforts of people worldwide will significantly accelerate development of the model. The greater the public engagement, the more powerful the model will become; thereby expediting vital policy responses to protect our forests. Since its launch, thousands of users from 80 countries have contributed to the app; analyzing and reporting on over 40,000 images. Additionally, the geographical scope of the project is expanding within Brazil and to parts of Bolivia and Peru. Gaining a better understanding of the changes occurring in these areas will build the predictive modeling foundation. The plan is to develop the app further and so allow users to classify and report on drivers of deforestation as seen in the images, thus leading to a more intelligent, effective model.

Combining the power of the crowd and AI, SAS and IIASA are elaborating a robust and versatile platform that empowers citizen scientists to contribute to cutting-edge research. An endeavor that highlights how each of us can play a part in shaping, and ultimately thriving, in the world we share.

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The immediate consequences of the COVID-19 pandemic were frightening – a public health emergency, an economic catastrophe, large-scale unemployment, and food-related insecurities. Yet, some potential bright spots for sustainability have also since emerged, such as greater flexibility for many people with remote work, reduced air pollution, and a slowdown in greenhouse gas emissions.

In the early days of the crisis, as countries around the world instituted lockdowns, IIASA leaders and others in the scientific community recognized the potential opportunities arising from strong government actions, which in a matter of days brought the world to a standstill, exploded innovations in support of new business models, and encouraged accompanying lifestyle changes.

“What we saw with COVID-19 was absolutely unique. We started seeing that there were a lot of things that were very positive, that could be preserved, but also some very negative ones that we needed to either eliminate or mitigate,” explains IIASA emeritus researcher Luis Gomez-Echeverri.

“What COVID-19 did was to hold up a mirror to society at large on the weaknesses resulting from our patterns of development – particularly the extreme inequalities that are often brushed under the carpet,” comments IIASA Deputy Director General for Science Leena Srivastava.

With the International Science Council (ISC), IIASA moved quickly to launch an initiative to consult the best in science and practice, and to pull out actionable information that policymakers could use to cement positive changes while addressing the huge challenges.

“We realized that positive changes could be preserved only if there was a conscious intervention,” says Srivastava. “With recovery packages however already being announced, we had to act rapidly, yet confidently, to identify interventions that would nurture and accelerate the transformative changes being witnessed, while resulting in longer term systemic transformations. We therefore offset the absence of sufficient evidence from our new context by bringing together a pool of experts from different disciplines and domains.”

Through a series of workshops, online consultations, and a side event organized in cooperation with the Permanent Missions of Norway and South Africa to the UN as part of the 75th UN General Assembly, the platform has engaged a diverse pool of nearly 300 decision makers, practice experts, and scientists, from around the world. It has also attracted interest from many entities including the private sector, research organizations, academia, and civil society.

“What’s unique about this initiative is that it is science-based and systemic. Many others look at one particular sector, or one especially urgent item,” explains Gomez-Echeverri.

The outputs of the initiative will include a series of reports with key messages and recommendations for policymakers. It will also create a new global network and community of practice that helps bring systems analysis into decision making in matters related to the response to COVID-19.

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A systems approach to human wellbeing

IIASA scientists have proposed a novel systems analysis approach to represent national wellbeing, by mapping the interlinkages between several commonly measured components of wellbeing. Led by scientists in the institute's innovative Advanced Systems Analysis Program, the new approach was published in two recent research papers.

"Macro-economic indicators such as GDP have been used to evaluate economic effects of various economic policies, but to date there are no tools to support policy planning aimed at enhancing national wellbeing in a systemic way," says IIASA researcher Leena Ilmola-Sheppard, who led the project.

Economic indicators have long been used as a general measure of countries’ development, but there is growing interest in new methods that can capture a fuller picture of human wellbeing. The Organisation for Economic Co-operation and Development (OECD), for instance, collects data on many dimensions of wellbeing, both material and non-material. However, they treat them in isolation.

The researchers started with the OECD measures, which include economic indicators such as income and wealth, jobs and earnings, as well as social and individual indicators like work-life balance, health, education, and subjective wellbeing. They then conducted a literature review to map how these various factors influence each other in both positive and negative ways. For example, education has positive impacts on many other aspects of life, including health, wealth, and even our ability to adapt and survive crises.

By mapping the influence of multiple wellbeing-related factors, the researchers say that the approach could bring new insights to policy, allowing decision makers to identify low-cost actions that can simultaneously improve several components of wellbeing. It could also help avoid unintended consequences that can occur from trying to address one problem in isolation.

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A DIFFERENT WAY TO SPUR CLIMATE ACTION

Although the Paris Agreement led many countries to set ambitious targets to reduce their greenhouse gas emissions, many are failing to comply with these non-binding commitments. A new IIASA-led study suggests that an approach based on commitments to conditional emissions reductions may help incentivize countries to climate action.

www.iiasa.ac.at/news/Commitments-20

ONE-STOP SHOP FOR CLIMATE SCENARIOS

A new online toolkit has made climate scenarios accessible to anyone interested. Developed by an international team including IIASA researchers, scientists, and designers, it allows anyone to access the full range of climate scenarios, allowing decision makers and the public to explore for themselves what is at stake with climate stabilization, and to base decisions on the best information available.

www.iiasa.ac.at/news/Senses-20

LOSS AND DAMAGE, AND LIMITS TO ADAPTATION

Within international climate negotiations, one of the most controversial issues has been how to deal with irreversible losses and damages from climate change that may breach adaptation limits. In a recent IIASA-led commentary, researchers showcased first evidence on such limits in socio-ecological systems and presented the potential, where still possible, for overcoming such limits with transformational change.

pure.iiasa.ac.at/16457
COVID-19: A SHOCK TO THE GLOBAL SYSTEM

Systems science is ideally positioned to address global impacts and harness opportunities brought about by the COVID-19 pandemic. IIASA is actively involved in addressing emerging issues and supporting policymakers on the road to a more sustainable post-COVID world.

OVID-19 has truly proven to be a systemic crisis. Since the corona virus emerged in China at the end of 2019 and spread rapidly across the globe, it has impacted every aspect of our lives. The cascading impacts of the pandemic have however been far from equal, with different impacts experienced by men and women, and vulnerable populations in both developing and developed countries suffering more adverse impacts than their more well off counterparts.

Throughout the crisis, people have looked to science to understand the challenges and opportunities of the COVID-19 pandemic and to identify possible and effective response strategies. IIASA researchers have been hard at work to provide scientific insights, holistic solutions, and actionable advice to policymakers to build back better after the crisis and to ensure that no one is left behind as we work towards a more equitable, resilient, and sustainable post-COVID world.
LIFE IN LOCKDOWN

Almost all countries reacted to the rapid rise in COVID-infections by employing measures to contain or delay the spread of the virus. While scenes of empty city squares and deserted streets became commonplace, concern over the economic consequences of drastic lockdown measures soon became the subject of criticism in both political and public debate. This prompted IIASA researcher Tamás Krisztin and colleagues to look into the effectiveness of lockdown measures and to examine how COVID-19 spreads regionally and between countries.

“Our results show that cross-country transmission processes, specifically via international flight connections, played a particularly important role in the early stages of the virus’ spread. It appears that governments, who took early action to reduce cross-border air passenger traffic, did in fact do the right thing to prevent the spread of infection. The policies introduced seem to have played a particular role in reducing COVID-19 cases, flattening the curve, relieving stress on the healthcare system and, ultimately, saving lives,” Krisztin explains.

Despite the strict measures put in place all over the world, loss of life has been a substantial part of the pandemic. To show the potential cost of human lives lost, IIASA researchers also looked into the potential effects of mortality associated with COVID-19 on life expectancy.

The results indicate that at 10% prevalence, the loss in period life expectancy is likely to be more than one year in high life-expectancy countries, while at 50% it would translate into three to nine years of life lost in such regions. While life expectancy cannot directly be used as an indicator to evaluate governments’ response to the pandemic as mortality from the first wave of infections depends on several other factors beyond government responses alone, the researchers note that it does give an indication of whether prevention measures are worth maintaining or not. While the decline in life expectancy will be short-term and will likely return to previous levels once the pandemic is over, the indicator provides quantifiable information to policymakers regarding the human cost of the COVID-19 pandemic.

“The scenarios we explored can give policy-relevant information on what could potentially happen to period life expectancy under different levels of prevalence, which vary with public health strategies to reduce and prevent the spread of COVID-19. If the virus spreads widely in the population, for instance, in the absence of any lockdowns and physical distancing measures, this could result in a notable short-term decline in period life expectancy in many regions of the world,” explains Deputy World Population Program Director, Raya Muttarak.

IIASA researchers and colleagues also examined the age and gender dimensions of COVID-infections and found that confirmed COVID-19 cases are highly...
gendered. Especially when looking at the age pattern of infection, rates of confirmed cases among younger women were higher than for men in several European countries. Interestingly, in countries where greater gender imbalances exist and women tend to take on more duties around the home, this trend was reversed and confirmed cases were much higher among men. Muttarak points out that this reiterates the impact that gender roles can have, as well as the importance of safety measures to reduce exposure to infection for both men and women.

PATHWAYS TO A MORE SUSTAINABLE POST-COVID WORLD

To address emerging issues and provide science based insights to policymakers, IIASA and the International Science Council (ISC) brought together experts from all over the world through a consultative science platform that draws on the combined strengths and extensive scientific communities of the two organizations. Consultations were structured around four broad themes: Governance for Sustainability, Strengthening Science Systems, Resilient Food Systems, and Sustainable Energy.

ENHANCING RISK GOVERNANCE IN AN INCREASINGLY RISKY WORLD

COVID-19 has shown just how intertwined human and natural systems are and how a local threat can exponentially explode into a global crisis – a situation that is reinforced by unequal and unsustainable developments under current socioeconomic trends. In addition, the crisis has revealed that systemic risk is currently not well governed, if at all.

The IIASA-ISC consultations around Governance for Sustainability highlighted that to realize sustainable development, it is imperative to reduce risk, build resilience, and secure long-term development gains. Participants emphasized that current governance arrangements are inadequate to protect global and local commons, stimulate the transformation of the human systems we need, and address the complex and systemic risks facing a world that will see more and more shocks and stressors – both sequentially and in parallel.

“Global institutions built in the 20th century to prevent armed conflicts and manage the flow of goods and services are not adequate to address 21st century multi-scale socioecological challenges and rising inequalities,” says Anne-Sophie Stevance from the ISC, who co-leads the Governance for Sustainability theme.

According to IIASA researcher and theme co-lead Teresa M. Deubelli, as a next step, it appears key to use the lessons from COVID-19 to inform governance reforms with a view to boosting agility and adaptivity, including through enhanced science-policy interfaces, upscaled innovation and foresight, along with updated crisis provisions and more participatory decision-making.

IIASA researcher and theme co-lead Reinhard Mechler adds that COVID-19 illustrates the need for governments to take a more risk-informed, forward-looking approach to counteract risk creation associated with degradation in global (climate) as well as local commons, such as the destruction of ecosystems that enhance the spread of zoonotic diseases.

STRONGER SCIENCE SYSTEMS

Perceptions around how science has responded to the COVID-crisis may vary, but there is broad consensus that there is room for improvement in science systems to better serve the public interest, especially in times of crises. As part of the series of IIASA-ISC discussions around Strengthening Science
Systems, participating experts suggested five interconnected transformative changes to strengthen the science system so that it is better prepared to deal with future crises and to provide input to policy.

The most critical of these would be to strengthen transdisciplinary research on multiple critical risks and system resilience. Secondly, we would need to radically increase the diffusion of scientific knowledge, both within the science system and between science and society. This implies that researchers should be able to share their findings globally with other scientists and decision makers a lot quicker and more widely than is currently the case, while being watchful of not compromising on the quality of the research. Thirdly, the capability of the science system to reorient itself in an agile way in response to emerging societal needs would need to be improved. In other words, scientists should be able to put projects on hold, in order to refocus their research efforts where they are needed most.

The last two areas that should be targeted for transformative change are enhancing public understanding of and trust in science, and improved efficiency of science-policy interface mechanisms.

“COVID-19 revealed quite strongly that even in developed countries where scientific literacy is quite high, there is a lack of basic understanding of how science works, specifically around the role of scientific debate and scientific disagreement. The media could play an important role in supporting efforts in this regard,” explains Elena Rovenskaya, co-leader of the IIASA-ISC Strengthening Science Systems theme. “In terms of achieving improved efficiency in science-policy interface mechanisms, we discussed options such as getting scientists more directly involved in government decision-making processes or to enhance the transparency of science advice to policy and to require that governments give full consideration to the science advice provided.”

Rovenskaya points out that all five aspects are closely related and intertwined and, difficult as it may be, should all be addressed at the same time.

**GUARDING AGAINST HUNGER**

The food system consists of highly interconnected social, technical, financial, economic, and environmental subsystems. The impact of COVID-19 quickly filtered through the entire system, threatening to double the number of people exposed to acute hunger and highlighting how insufficient safety nets designed to protect the most vulnerable were in many parts of the world.

Experts deliberating on the IIASA-ISC Resilient Food Systems theme point out that to ensure a more resilient and equitable global food system, we need to rethink current agricultural practices and implement multi-objective systems that better link social, economic, technological, and environmental systems to improve overall resilience and adaptability. In addition, continuous support needs to be provided to developing countries to strengthen innovation capacities, enable adoption of technologies, and advance the upscaling of sustainable land management practices that are suited to their respective sociocultural, economic, and environmental contexts. At the same time, we should be conscious of the fact that we cannot just prepare for one risk, we need to be prepared for multiple simultaneous risks in the future. Floods in one area and droughts in another that severely impact multiple food producing areas simultaneously, would for instance pose a massive risk to global food security.

“For the long term, the challenge is not only how we respond to the vulnerabilities that have been revealed by the pandemic. We need to realize that we now live in a world where everything is connected; where we are confronted with dynamic problems that play out in a non-linear fashion, and where rapid action is key. Policymakers have to be more prepared for the
collective challenges and compounding risks we face in these uncertain times,” says co-leader of the Resilient Food Systems theme, Frank Sperling.

IIASA researcher, Franziska Gaupp, who has been studying the challenges of a globally interconnected, complex food system and impacts that might affect several of the world’s food producing areas simultaneously, agrees: “There will likely be more shocks hitting our global food system in the future. We need global collaboration and transdisciplinary approaches to ensure that the food chains function even in moments of crises to prevent price spikes and to provide all people with safe access to food,” she says.

RE-IMAGINING ENERGY CONSUMPTION

The COVID-19 crisis and the associated lockdown measures have drastically impacted energy consumption. While increased household electricity consumption costs combined with lower income made it difficult for some, and especially people in poor and developing countries, to provide for their families; demand for fuel and energy was significantly reduced in the industry and transportation sectors. In many cities, people adopted lifestyle and behavioral changes that would have seemed difficult before, like the increased use of bicycles for transport and virtual platforms for doing business, and attending meetings and conferences. Many countries have also advanced in terms of digitalization and the use of online services in education and governance.

Participants of the IIASA-ISC Sustainable Energy theme discussed bold measures for building more resilient societies and explored strategies for just and sustainable recovery pathways from COVID-19. Three areas were identified for immediate action, namely significantly reducing energy demand through measures like remote working, digitalization, and the reshaping of urban spaces and their use; maximizing sustainable energy independence at local and individual levels through, for instance, decentralized renewable energy solutions and efficiency enhancing measures; and influencing behavior towards responsible consumption such as encouraging new trends in mobility, less material consumption, and sharing vs. ownership models.

Participants highlighted that the pandemic demonstrated the possibility of transformation with positive effects for climate, pollution, and health and that this should form the basis for arguing for a profound transformation of the global energy system that also benefits those impacted more severely. Designing and implementing such measures will however require a careful interplay between science, technology and innovation, governance, policy, and business.

“Some fear that the positive changes we have been observing will only last until the pandemic is over and we return to “business-as-
usual”. During the pandemic we however saw that lifestyle changes such as remote working and the increased use of online services are indeed possible and that this transition can happen in a relatively short time,” says IIASA researcher and IIASA-ISC Sustainable Energy theme co-leader Behnam Zakeri. “We have learned a lot from how people and governments reacted to COVID-19, for instance, relying on science-based advice and taking decisive action to tackle the crisis. This gives me hope that we might be able to trigger similar responses to other global crises like climate change.”

One positive “side effect” of the abrupt shifts in human behavior in response to the pandemic has been an encouraging 10-30% reduction in carbon dioxide (CO₂), nitrogen oxides (NOₓ), and other emissions mainly due to the reduction in global travel.

IIASA researcher Joeri Rogelj contributed to a study in which researchers explored whether the reduction in greenhouse gas emissions could have long-term effects on our ability to address global warming. According to Rogelj, the results are both sobering and hopeful.

“The flash crash in global emissions due to lockdown measures will have no measurable impact on global temperatures by 2030; but the decisions we make this year about how to recover from this crisis can put us on a solid track to meet the Paris Agreement. Out of this tragedy comes an opportunity, but unless it is seized, a more polluting next decade is not excluded,” he concludes.

By Ansa Heyl

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The new normal

A common observation among IIASA researchers is how easily many face-to-face activities have moved online post-lockdown and how quickly virtual working has become the norm.

“The transition from physical to virtual appeared almost seamless, possibly because everyone wanted it that way. Even those of us with silver hair learned to use the multiple modes for interaction offered by online communication platforms and found the ‘raise hand’ function,” observes IIASA Deputy Director General for Science, Leena Srivastava.

Keywan Riahi, coordinating lead author on the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report and Energy Program director was surprised at how effective large-scale virtual meetings can be if they are organized well.

“I was in IPCC plenary meetings with more than 250 people logging on at the same time. These online meetings seem to be more productive: parallel threads and discussions can be opened, and while somebody is giving a plenary presentation, others can start real-time discussions in the chat.”

Increased efficiency?

The sense that virtual working leads to improved efficiency is echoed by Caroline Zimm, a researcher with The World in 2050 (TWI2050) initiative.

“In our third TWI2050 report released earlier this year, we again brought together authors from all over the world. The advantage of moving online was that we were able to meet several times during the writing process, while previously we just had one large in-person meeting. In virtual meetings I experienced people to be more punctual, to stick closer to the agenda, and to give more concise remarks.”

For others, the increased efficiency of going digital is not as clear-cut. Piotr Magnuszewski, a researcher in the Risk and Resilience and Water programs, designs simulations and role-playing games to engage diverse audiences on issues of complexity and sustainability.

“COVID-19 has had a huge impact on stakeholder engagement as stakeholder events have needed to be redesigned for the virtual world. Building relationships is an important part of these meetings and it is hard to replace face-to-face communication,” he explains. “Careful planning is needed to engage participants beyond typical teleconferences so that they can fully contribute to the discussion and co-creation of results. We used the Miro software to allow large groups to contribute to a joint assessment of climate-related hazards, vulnerabilities, and impacts in Spain.”
24/7 online availability has also affected researchers in terms of work-life balance as Joeri Rogelj, a researcher in the Energy Program explains.

“One clear limitation of virtual meetings is that truly international collaborative endeavors like the IPCC reports result in calls being scheduled from 6am until midnight for people living in Europe, and even worse hours for people living elsewhere. This can result in a deterioration of a healthy work-life balance and also create barriers to participation.”

Franziska Gaupp, a researcher with the Ecosystems Services and Management Program, offers a counter balance.

“We save a lot of money and time by not travelling in person. Early-career researchers or students with less travel budget can therefore attend conferences more easily. The European Geoscience Union (EGU) conference was free for everyone to attend online this year, and I think a lot of students took advantage of this.”

Michaela Rossini, manager of the Library and Knowledge Resources Unit, points out that while the post-COVID virtual workplace might increase participation for some, several studies suggest that female scientists may be producing less publications as they carry a larger burden of familial responsibilities than their male counterparts do.

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The first virtual Young Scientists Summer Program

Janet Molina-Maturano participated in the 2020 Young Scientists Summer Program (YSSP), the first to be held online since the program began in 1977.

“My experience has been like a rollercoaster. Initially, I experienced some confusion navigating the IIASA structure, acronyms, and platforms in a virtual setting, but IIASA colleagues were always willing to support me “digitally” on both a professional and personal level. There were some exciting moments due to the inspiring research we got to know during the virtual presentations and discussions, but also times of wishing I could get to know people at IIASA and other YSSPers in person. Overall, it has however been a really worthwhile and interesting experience. I highly recommend it!”

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A smaller carbon footprint - will it last?

Reduced work-related travel has lessened the environmental impact from scientific meetings, but will the benefits of this be carried forward?

Jens Borken-Kleefeld is a researcher with the Air Quality and Greenhouse Gases Program and sees the overnight digitalization as proof that many scientific meetings are possible remotely, while acknowledging that complete virtual working poses significant challenges for certain types of field work. He is concerned that demand for face-to-face meetings might just surge when restrictions are lifted. This will be a lost opportunity for change to more sustainable travel practices.

What is clear is that in the longer term, virtual working is here to stay and we need to invest in both better technologies and group processes to make the best of this new situation.
A roadmap for the future of systems science at IIASA

A bold new research strategy will ensure that IIASA continues to fulfill its mandate of providing independent, systems science-based insights to global and universal challenges over the next decade.

For almost half a century, IIASA has been using a systems approach to help policymakers pursue win-win policies that jointly achieve multiple goals. The institute’s unique setting, along with its extensive global scientific network has become renowned for facilitating truly independent research that is free from national or political agendas. This disposition allows international research teams to combine their global knowledge to produce integrated systems solutions and policy insights to address current, emerging, and novel global and shared challenges.

Building on existing expertise while developing new competencies, the next decade will see IIASA enhancing its capabilities and accountability towards providing policy-relevant, impactful research.

In pursuit of research excellence

The new strategy, which will be implemented in 2021 along with a re-focusing of the institute’s scientific organizational structure, focuses on four key driving forces for development namely: governance and institutions; technology and innovation; economy and society; and population and behavior.

These drivers interact in the domains of production and consumption; biodiversity and ecosystem services; and equitable and resilient societies. A systemic, integrated approach to these driving forces, and how they relate to addressing global challenges, form the cornerstone of the institute’s research priorities and are underpinned by a continued emphasis on methodological advances and innovations in system analysis methods and approaches for sustainability.

“Extreme events like the current coronavirus pandemic add a new level of complexity to identifying integrated solutions to global sustainability. The global challenges we face are interlinked and actions in one area will affect others. As such, systems science provides the scientific and policy community with the skills and tools to engage successfully with these challenges,” explains IIASA Director General, Albert van Jaarsveld.

Several projects that harness the opportunities arising from emerging digital technologies and their applications, as well as advancements in computing and big data capabilities, machine learning, and the use of artificial intelligence, are already laying the groundwork to realize the objectives of the new strategy.

To make climate scenarios and digital technologies more accessible, for instance, IIASA researchers and colleagues from several other institutions have developed a comprehensive interactive online platform to help policymakers and businesses, finance actors, and civil society assess the threat of global warming and ways to limit it. The [SENSES platform](#) is the first of its kind to provide the tools to use scenarios, ranging from climate impacts to mitigation and energy options, to a broader public beyond science. Similarly, the [Community Water Model](#) - a large-scale, open source hydrological and
water resources model developed at IIASA - will support and enable different stakeholder groups and scientific communities in the accurate assessment of water supply and the demands of both people and the environment. IIASA will also continue to position itself as a leader in the field of earth observation and citizen science to conduct research and provide innovative, cost effective, and high quality data, tools, and services.

**Building global research partnerships**

Another dimension of the new strategy involves building on the institute’s record of scientific excellence, collaboration with partners, and policy impact. IIASA will continue to leverage its reputation as a neutral scientific broker and its strong networks with a wide range of stakeholders, member countries, and leading scientific organizations to build bridges across political divides and to confront and negotiate solutions to problems of global interest.

The World in 2050 (TWI2050) initiative established by IIASA, the Sustainable Development Solutions Network, and the Stockholm Resilience Centre to support the successful implementation of the UN’s 2030 Agenda, and the institute’s involvement in the Food, Agriculture, Biodiversity, Land, and Energy (FABLE) Consortium, which seeks to establish a model-aided decision-support environment for sustainable development pathways in the land-use space, are just two examples of the institute’s commitment to collaborative and inclusive research. Likewise, the Consultative science platform that was recently jointly established with the International Science Council (ISC) combines the strengths and expertise of the two organizations with those of other international experts to define and design sustainability pathways in a transdisciplinary manner to enable a more equitable and sustainable post-COVID world.

Further examples of IIASA researchers’ involvement in large-scale initiatives include regular involvement as key contributors to the Intergovernmental Panel on Climate Change (IPCC) assessment reports, and contributions to the advancement of the field of Loss and Damaged in the risk management domain.

**Training the next generation of systems scientists**

Any forward-looking strategy should of course also include a capacity-building component. In this regard, the institute postdoc opportunities and its flagship Young Scientists Summer Program (YSSP) have been instrumental in building capacity in systems thinking and analysis by educating and training a new generation of scientists, professionals, and leaders for almost as long as IIASA has been in existence.

As part of the new strategy, training activities at IIASA are being expanded substantially to go beyond its current constituencies to include key decision makers and influencers. As one of the world-leading one-stop destinations for systems analysis, IIASA is also making it its mission to make its data, models, and analytical tools openly available to the research community in a responsible manner.

“We are confident that the new strategy IIASA will soon embark on will more emphatically address the much needed systems science perspective to systematically and comprehensively reduce human footprints and enhance the resilience of natural and socioeconomic systems in pursuit of a sustainable future for humanity,” commented IIASA Deputy Director General for Science, Leena Srivastava. “IIASA has a clear head start in terms of tools, methods, and models to make it nimble enough to be responsive to the needs of society in times of great uncertainty associated with unforeseen events like the COVID-19 crisis, and also to address compound risk and the multiple dimensions of sustainability. I look forward to being part of the journey to make the objectives of the new strategy a reality.”

By Ansa Heyl  Further info: www.iiasa.ac.at/strategy  Albert van Jaarsveld: jaarsveld@iiasa.ac.at  Leena Srivastava: srivastava@iiasa.ac.at
When disasters strike, affected areas usually spend years recovering. In the case of Sub-Saharan Africa, floods and droughts can be so devastating that recovery is impossible before the next disaster strikes.

The concept of disaster risk reduction (DRR) aims to mitigate the effects of natural hazards by investing in frameworks to help lessen their effects. In a study done in collaboration with the UN’s Office for Disaster Risk Reduction, Junko Mochizuki and her colleagues show that the benefits of investing in DRR in Angola, Tanzania, and Zambia far outweigh the costs. Often, scientists and policymakers group benefits of DRR into three buckets: protecting lives and assets, promoting savings and growth, and promoting social and environmental benefits.

The researchers have developed a new model that integrates these buckets of DRR into a single model, allowing them to quantify longer-term growth effects, thereby providing guidance on how much governments should invest in DRR and other infrastructure to achieve improved societal welfare.

“DRR is often seen as a costly investment, with benefits that materialize only when disasters strike,” explains Mochizuki, a researcher in the IIASA Water Program. “This leads to a misconception that this investment is wasted if disasters do not occur. Our research clearly shows this is not the case. Our newly developed macroeconomic model demonstrates that investment in DRR delivers numerous co-benefits even when disasters do not occur, because this investment makes economies safer for people to save and invest in more productively.”

Proving the benefits of investing in disaster risk reduction

Securing water resources for East Africa through stakeholder engagement

East Africa is one of the most dynamic economies in the world. In fact, the region’s GDP per capita is expected to see a sevenfold increase by 2050 as the population doubles. With this increase will come a fivefold increase in water demand as climate change continues to produce higher extremes with more frequent floods and droughts.

IIASA research is helping to improve water management in the region through innovative water modeling tools and scenario assessments. This research helps policymakers identify the principle needs for effective water management policies.

Led by Robert Burtscher and his collaborators, this research shows that population growth adds pressure to already limited resources. In countries like Kenya, Tanzania, and Uganda, water resources are enough to supply basic needs and economic development. However, many countries lack the infrastructure and capacity to access these resources in a sustainable manner. Understanding current and future water needs, as well as how to create access to safe water, explain the researchers, is the first step to solving the problem.

“Our analysis clearly shows that population dynamics has the strongest impact on East Africa’s future water security,” explains Burtscher, a liaison expert in the IIASA Water Program. “This requires strong engagement with stakeholders across all sectors that depend on water resources such as agriculture, energy, and municipalities in charge of supplying drinking water to their citizens. The benefits water provides to these and all stakeholders require a joint commitment to sustainable management.”

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In 2017, agriculture contributed to 23.5% of Brazil's GDP and 40% of its exports. With so much hinging on agriculture in the country, scientists from IIASA and Brazil's National Institute for Space Research (INPE) set out to measure the impacts of climate change on Brazilian agriculture. Their task was to understand such impacts on staples like soybeans, corn, and sugar cane. In much of Brazil, production of these crops will not be economically sustainable, the team concluded.

According to the Global Biosphere Management Model (GLOBIOM-Brazil) soybean production in the Cerrado decreases at least 20% compared to a scenario without climate change. In one area, considered the next frontier of Brazilian soybean production, it could be as large as 60% in 2050.

These results highlight the importance of considering the impacts of changes in temperature and precipitation when planning for the development of Brazilian agribusiness. It also stresses the necessity of a robust national agricultural policy, including investments in modern technology and management methods to mitigate such changes.

“The future of Brazilian agriculture depends on growing productivity quickly enough to avoid (or to adapt to) the most nefarious impacts of climate change,” says IIASA guest researcher, Aline Soterroni. “Our study also shows that the areas in the Amazon and the Cerrado biomes that are being deforested now are likely to be less suitable for agriculture in the future, pointing to the need for policy enforcement to preserve those ecosystems.”

Policymakers worldwide are realizing the benefits of renewable energy, but many, particularly in the Global South, are finding it difficult to overcome local opposition despite widespread social impact assessments (SIAs).

This opposition is caused by concerns about the social, aesthetic, and environmental impacts of renewable energy projects and can lead to the delay and cancellation of many projects.

While Mexico is becoming a global leader in renewable energy, fierce opposition, especially because of land-use rights, has resulted in the re-discussion of existing SIA procedures in terms of their benefits, costs, and risks for local communities.

Research conducted by Nain Martinez, a doctoral student at the University of California, Berkeley in collaboration with IIASA colleagues, revealed several issues related to the regulatory and institutional design of SIAs and practices. It concluded that low involvement of local communities and civil society negatively affect the comprehensiveness of SIAs and the implementation of social management plants.

“This research was based on extensive dialogue with various stakeholders involved in energy policy development and its implementation in Mexico. The results show there is little agreement on an institutional and regulatory framework for deployment of renewable energy sources such as SIAs,” says IIASA researcher Nadejda Komendantova. “Therefore, participatory governance is needed to develop compromise-oriented policy solutions and to include a variety of views.”

The findings aim to inform governments and activists about required reforms to improve the management of social impacts and the relationship between projects and local communities in Mexico and elsewhere.

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It is no surprise that as populations and industrialization increase, so does water demand. However, over the last century, water use has been increasing at a staggering rate—more than twice the rate of the global population.

Further compounding this problem is the lack of spatially detailed datasets, limiting proper understanding of the situation. However, according to a new study, there is hope that technology and policy intervention can help mitigate increased usage and secure water access in China.

In a recent study, Acting Water Program Director Yoshihide Wada and his coauthors provide a detailed, historical picture of water use in China through socioeconomic development and the impact of technology and policy. The study found that although China’s water use doubled between 1965 and 2013, there was a significant slowdown in growth rates after 1975. The authors attribute this to more efficient irrigation methods and other technological adoptions.

"Modeling water use is very complex and we need much more regional data and coordination to improve our understanding of how people use water," explains Wada. "The modeling community should work together to achieve this, as it is crucial to identifying key drivers and mechanisms behind changing water use patterns. More reliable future projections will improve future policies that address the challenge of decoupling water use from socioeconomic development in China and other water-stressed countries."

Both the frequency and magnitude of floods are expected to increase in coming decades. It is therefore important to understand the full impact floods can have on the global population.

Beyond physical and economic damage, floods have adverse impacts on human health. For example, floods lead to a greater incidence of infectious diseases and reduced agricultural production, both of which can be especially dangerous to children. Studies show that floods directly lead to undernutrition and stunted growth.

A study by Deputy World Population Program Director Raya Muttarak and colleagues found that flood-induced undernutrition is particularly serious for children in India. Generally, boys are more at risk for stunting than girls. The study however shows that the probability for stunting is equal for boys and girls—likely due to the fact that parents in India choose to feed boys more than girls during hard times. The study also found that a mother’s education is key to protecting against childhood undernutrition due to improved health knowledge, increased female empowerment, and higher health care use.

"We found that not only do extreme weather events such as floods lead to childhood undernutrition, but that the risk of becoming stunted is not distributed evenly across population subgroups," explains Muttarak. "The finding that infants and girls from rural households with low levels of maternal education are susceptible to undernutrition suggest the need for policy interventions targeting particularly vulnerable populations."

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Determining the relationship between rainfall and child stunting in India

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Using technology to solve the challenges of increased water demand in China

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"Modeling water use is very complex and we need much more regional data and coordination to improve our understanding of how people use water," explains Wada. "The modeling community should work together to achieve this, as it is crucial to identifying key drivers and mechanisms behind changing water use patterns. More reliable future projections will improve future policies that address the challenge of decoupling water use from socioeconomic development in China and other water-stressed countries."

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Like many other countries, Ukraine had often been governing sectorial developments in an independent way across sectors and regions, resulting in declining living and environmental conditions, as well as decreasing economic performance.

Through a joint National Academy of Science Ukraine (NASU) and IIASA project – Integrated Modeling of Robust Solutions for Food, Energy, and Water Security Management – researchers have however shown how policies that alter one sector could have large impacts on others.

The project focuses on problems of common interest for Ukraine, IIASA, and globally, and addresses challenges associated with the management of interdependent food, energy, water, environment, social, and demographic systems for sustainable development.

The IIASA-NASU project has produced a multi-model framework, which allows models developed for different sectors and at different resolutions to be integrated, showing policymakers exactly where the trade-offs or synergies of the policy options may lie.

“The project has also helped to ensure that policies are robust in the face of an uncertain future by incorporating both long-term, strategic policies that anticipate rare events and short-term, operational policies. “IIASA research has led to real improvements in sustainable management in Ukraine,” says Tatiana Ermolieva, deputy principle investigator of the project.

The recommendations of the project were included in the Ukrainian Common Cross-cutting Strategy of Agriculture Development and in the National Energy Strategy of Ukraine-2035 detailing policies based on the principles of sustainable development.

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Steering a course to sanity

We live in an age of seemingly unprecedented peril. As we face complex and interconnected challenges that affect our entire human family, across borders and beyond cultural identities, it can seem that sanity has fled the building. But all is far from lost. As we strive to monitor and assess, to model and advocate, and to share a conviction that we can create a future based on sensible and compassionate science, we may build a global society that takes responsibility for all our people and for our planet.

We must however work together: scientists acting in unison with society, and all scientific disciplines engaged and in concert. The global COVID-19 pandemic has exposed the vulnerabilities of disparity as never before, while the accelerating impacts of climate change are becoming ever more apparent and, in many instances, are far more alarming than previously anticipated. Impacts as diverse as rising sea levels, bushfires, and the spread of plant and animal diseases are affecting environments and ecosystems all across the planet.

It is abundantly clear that climate change is not simply an environmental issue. It is a deeply embedded development issue with inevitable and enormous economic and social consequences. As scientists and science enablers, we urgently need to understand and communicate the scope and magnitude of these challenges, as well as the full ecological impact. Global warming has already hit the Middle East hard, and projections indicate that our region will suffer increasingly profound problems in coming decades as rainfall grows more unpredictable, rising temperatures accelerate evaporation, and the land grows drier.

The RSS strives to address, in creative and inclusive ways, the shared sustainability challenges and unrealized opportunities of Jordan and the MENA region. We aim to work beyond borders to help to achieve the Sustainable Development Goals so that we may empower the Paris Agreement. We know that human-made challenges must be met with thoughtful human ingenuity.

The RSS was founded in 1970, in a particularly fragile political environment. Today, as we plan for our next half-century, we seek to redefine our mission in an age of acute challenges that urgently require systematic scientific assessment. We are therefore honored to represent Jordan as a prospective member of IIASA. This new 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. We know that, similarly, our contributions will help fellow members to understand shared challenges from new perspectives. We believe that science provides the language that we need to communicate, to relate challenges, and to create solutions. Together, we can make a difference and steer a course to sanity.

www.iiasa.ac.at/news/Jordan-20
Collaborating for a sustainable post-pandemic world

Q&A with Heide Hackmann, CEO of the International Science Council and IIASA Distinguished Visiting Fellow.

Q Why is there a need for a consultative platform like the one established by IIASA and the International Science Council (ISC)?
A COVID-19 has revealed the devastating realities of an increasingly complex and cascading global risk landscape. Those realities call for urgent, transformative responses: for radical shifts in thinking away from business-as-usual approaches and for action towards profound changes in the interconnected social, economic, political, cultural, and technological systems that sustain our unsustainable, unequal lifestyles, and humanity’s continued assault on the planetary system. Understanding what our options for transformative thinking and action are, and what it will take to realize them in practice, requires international, multi-stakeholder engagement in processes that harness knowledge, insights, and expertise for the development of tractable pathways to a post-pandemic world. The IIASA-ISC consultative platform has been established to convene such engagement.

Q Can you outline why the four selected themes were chosen and elaborate on the importance of the interdisciplinary nature of these themes?
A The selected themes for the IIASA-ISC consultations speak to essential cornerstones of the transformations now needed. Robust, interdisciplinary scientific understanding and evidence is essential to their design and delivery. But to effectively inform, catalyze, and help navigate processes of transformation, science itself must change: this is the moment for scientists – from all fields, all disciplines, and all parts of the world – to embrace the open science movement, to recommit to international, interdisciplinary collaboration and meaningful engagement with policy and the wider public.

Q How can systems thinking contribute to ensuring a sustainable post-COVID world?
A COVID-19 is more than a global public health crisis. Systems thinking allows us to understand the causes and consequences of the pandemic, revealing how a biological hazard is one of multiple risks embedded in the complexity of today’s interconnected global ecology, including its social, environmental, and economic dimensions. Systems thinking will ensure that as we rally towards recovery from the pandemic, our attention will not be diverted away from climate and the broader ambitions of the 2030 Agenda and its integrated framework of Sustainable Development Goals. The UN Secretary-General’s call to “build back better” from COVID-19 is a call to recommit to that agenda. Promoting systems thinking is essential to any policy and public action in response to that call.

Q In what ways will the platform encourage policymakers to make choices other than those purely driven by economic recovery?
A The IIASA-ISC platform will serve as a lever of change by heightening awareness and understanding of the systemic nature of the crisis and of the pathways to recovery. It will provide a global resource of systems-based expertise to inspire greener thinking away from business-as-usual approaches of restarting the hydrocarbon based economy.

covid19.iiasa.ac.at/isc
New leadership appointments to support strategic research objectives

Newly appointed program directors will address the institute’s research priorities to ensure that program objectives are aligned with the new IIASA strategy, while research group leaders in each program will manage their respective groups and support the program directors.

ADVANCING SYSTEMS ANALYSIS

Program Director Elena Rovenskaya

The Advancing Systems Analysis Program will focus on a broad range of systems related methods including areas from data sciences, computational sciences, risk, and participatory action research. Rovenskaya comments, “I am delighted to embark on this new position. I envisage that the Advancing Systems Analysis Program will become an innovation lab of IIASA, pushing the frontiers of systems analysis methodology, including the interface with policy.”

- Cooperation and Transformative Governance Research Group Leader: Nadejda Komendantova
- Exploratory Modeling of Human-natural Systems Research Group Leader: Sebastian Poledna (Acting)
- Novel Data Ecosystems for Sustainability Research Group Leader: Ian McCallum
- Systemic Risk and Resilience Research Group Leader: Reinhard Mechler

BIODIVERSITY AND NATURAL RESOURCES

Program Director Yoshihide Wada

The Biodiversity and Natural Resources Program will address ecosystem management and modeling, biodiversity and land use matters, and fresh water and marine issues.

“It is my honor to take up this position. IIASA has an excellent track record of ecosystem and natural resources research. I strive to keep the balance of tradition and innovation, and I have a great passion to support the next generation of systems scientists,” says Wada.

- Agriculture, Forestry, and Ecosystem Services Research Group Leader: Florian Kraxner
- Biodiversity, Ecology, and Conservation Research Group Leader: Piero Visconti
- Integrated Biosphere Futures Research Group Leader: Petr Havlík
- Water Security Research Group Leader: Taher Kahil
ECONOMIC FRONTIERS
PROGRAM DIRECTOR MICHAEL KUHN

The aim of the Economic Frontiers Program will be to improve human wellbeing through sustainable economic and planetary security. The program – of which the structure is currently being developed – will apply systems thinking and integrate economic, societal, and environmental benefits to the entire landscape of economic planning and execution, including global economic governance, macroeconomics, and microeconomics to address issues such as planetary tipping points and looming environmental crises.

“I am delighted about the opportunity to integrate economics into IIASA research as a “new kid on the block”, and to collaborate with colleagues from the systems, environmental, climate, and demographic sciences in arriving at truly multidisciplinary approaches, and thereby, to take economics to its frontiers,” says Kuhn.

ENERGY, CLIMATE, AND ENVIRONMENT
PROGRAM DIRECTOR KEYWAN RIAHI

The aim of the Energy, Climate, and Environment Program is to understand the nature and dynamics of feasible systems transformations that can address environmental impacts in a socially and economically sustainable manner.

“Fundamental changes can only be achieved through a systems perspective that fully accounts for critical interdependencies across sectors and manages trade-offs and synergies between technologies, environmental objectives, and other societal and economic priorities at different scales. These trade-offs and potential synergies will be the central theme of the new program,” says Riahi.

- Integrated Assessment and Climate Change Research Group Leader: Volker Krey
- Pollution Management Research Group Leader: Zbigniew Klimont
- Sustainable Service Systems Research Group Leader: Bas van Ruijven
- Transformative Institutional and Social Solutions Research Group Leader: Shonali Pachauri

POPULATION AND JUST SOCIETIES
PROGRAM DIRECTOR RAYA MUTTARAK

The Population and Just Societies Program will study changing demographics and social structures, as well as their impact on sustainability, resilience, and equitable human wellbeing.

“Building on the institute’s strong basis in demographic modeling, coupled with my expertise in social inequalities, our program endeavors to provide empirical-based research using advanced data and methodological tools to deliver relevant results that can be incorporated into different models used in systems analysis,” says Muttarak.

- Equity and Justice Research Group Leader: Thomas Schinko (Acting)
- Migration and Sustainable Development Research Group Leader: Raya Muttarak (Acting)
- Multidimensional Demographic Modeling Research Group Leader: Samir K.C.
- Social Cohesion, Health, and Wellbeing Research Group Leader: TBC

STRATEGIC INITIATIVES
PROGRAM DIRECTOR STEFFEN FRITZ

Fritz will lead the Strategic Initiatives Program, which aims to improve the prospects of a sustainable future and to deliver policy solutions. The program will draw on expertise distributed across the institute and partner organizations to engage in research projects that deliver policy relevant research in emerging areas not emphasized in other IIASA programs.

“I am excited to take up this new position and will strive to implement new initiatives that respond to the needs of humanity and our planet in a timely manner, while helping to accelerate the particular transformative changes we urgently need to tackle inequality, climate change, and the loss of biodiversity,” comments Fritz.

By Bettina Greenwell
**YOUNG SCIENTISTS SUMMER PROGRAM 2020**
During the summer, IIASA hosted 25 doctoral students from around the world in its Young Scientists Summer Program. The initiative offers early-career researchers an opportunity to advance their research and contribute to the institute’s scientific agenda. This year, the program was held in a virtual format due to the ongoing COVID-19 pandemic.

[www.iiasa.ac.at/yssp](http://www.iiasa.ac.at/yssp)

**LUTZ RECEIVES HONORARY DOCTORAL DEGREE IN LIBERAL ARTS**
The Chulalongkorn University (CHULA) Council, Thailand, awarded IIASA World Population Program Director Wolfgang Lutz an Honorary Doctoral Degree in Liberal Arts (Honoris Causa) as proposed by the College of Population Studies (CPS) at CHULA, for his profound contribution to the progress of human society and academic research. IIASA and the CPS have a long tradition of collaboration, particularly in the research fields of aging and climate change adaptation with a focus on Asia.

[www.iiasa.ac.at/awards/CHULA-20](http://www.iiasa.ac.at/awards/CHULA-20)

**WAGNER APPOINTED EDITOR-IN-CHIEF OF SPRINGER NATURE SCIENTIFIC JOURNAL**
IIASA researcher Fabian Wagner joined *Mitigation and Adaptation Strategies for Global Change*, a Springer Nature journal, as the new Editor-in-Chief. Wagner, who is part of the IIASA Air Quality and Greenhouse Gases Program, is also the IIASA Capacity Development and Academic Training Dean – both roles that he will continue in addition to his new appointment.

[www.iiasa.ac.at/awards/Wagner-20](http://www.iiasa.ac.at/awards/Wagner-20)

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**Jordan joins IIASA as a prospective member**
The Royal Scientific Society of Jordan (RSS) and IIASA are jointly exploring the value of full Jordanian membership of the institute until June 2022. Specifically, they will identify areas of mutual research interest that will benefit Jordan, the wider Middle East region, and IIASA; mechanisms that will facilitate collaborative research activities; and ways to overcome any barriers to such research collaboration.

Situated at the heart of the Middle East, Jordan plays a pivotal role in the geopolitics and international relations of the region. Jordanian researchers have collaborated with colleagues at IIASA for several years, and this new partnership heralds the beginning of a more formal commitment between IIASA and the RSS. A Memorandum of Understanding signed between IIASA and Jordan in 2015 was followed up by a more comprehensive document signed with the RSS at the 8th World Science Forum in November 2017. This second agreement has already led to several successful research projects including:

- A four-year collaborative study into participatory governance of energy transitions in the Middle East and North Africa by researchers from IIASA, Jordan, and Sweden funded by the German Federal Ministry for Economic Cooperation and Development.
- A joint publication in *Nature Sustainability* on the Sustainable Development Goals and sustainability science by researchers from IIASA, the RSS, and other countries.
- A collaboration between IIASA researchers and colleagues in Finland and Jordan on how modeling can accurately estimate a deposited dose of aerosol particles in the respiratory system.

"IIASA provides the convening power to build multinational teams of researchers and apply their expertise to complex challenges that cross international boundaries," said Ambassador Leena Al-Hadid, Jordan’s Permanent Representative to the United Nations and other international organizations in Vienna.

By Bettina Greenwell  Further info: [www.iiasa.ac.at/news/Jordan-20](http://www.iiasa.ac.at/news/Jordan-20)
Arame Tall is one of the world experts on climate services, adaptation, resilience, and community-based responses with over 15 years’ experience at the interface of climate and society. She was a participant of the 2010 Young Scientists Summer Program (YSSP) and joined the World Bank in 2017 as a Senior Adaptation and Resilience Specialist in the Climate Change Group.

“In the few months of the YSSP, I learned the need for a very rigorous scientific design that I have used ever since. My supervisor, Anthony Patt, also taught me to break personal boundaries,” mentions Tall.

Her experiences led her to travel to some of the world’s sites most vulnerable to climate change, and to work with various stakeholders on preventative measures to face head-on the worsening impacts of climate change.

While at CGIAR, she bridged the gap between research and climate information, reaching millions of farmers in Africa, Latin America, and South Asia. Tall says that this gave her a unique perspective as she worked directly with the people bearing the brunt of climate change impacts. While working at the Red Cross, Tall helped local communities anticipate climate related disasters such as cyclones, flooding, and rising sea levels in West and Central Africa, and at the World Meteorological Organization, she advised governments and ministers in Africa on policy insights to better mainstream climate risk management into development planning. When Tall joined the World Bank, she led the first Action Plan on Climate Change Adaptation and Resilience, a comprehensive framework for action to scale up the World Bank Group’s support to countries and on-the-ground impact in adaptation. She is now supporting the implementation of this strategy.

“I’m very proud to have led this team,” says Tall.

The plan was launched in January 2019 by then CEO Kristalina Georgieva, and is now used by the entire organization to incentivize integration of climate risk management across all projects, screening for climate impacts, and preventative measures.

By Monika Bauer
People profiles

Understanding the relationship between climate change and the economy

Researcher Asjad Naqvi uses mathematical models to explore environment-economy interactions.

Naqvi first came to IIASA as a 2012 Young Scientists Summer Program participant, and after completing a postdoc program with the institute in 2017, he joined the Risk and Resilience and the Advanced Systems Analysis programs. The ecological economist works with multi-layer networks, agent-based models, and system dynamic models to look at how climate shocks cascade across economic landscapes via trade, migration, and financial networks.

“Climate shocks such as floods or tsunamis directly impact people’s lives. This immediate impact also spreads to other sectors via labor and goods market disruptions. My area of research looks at how such shocks cascade through an economy.”

Naqvi’s passion for science developed out of a personal experience.

“I am originally from Pakistan and was living in Lahore when the 2005 Kashmir earthquake happened. Despite being several hundred kilometers away, I felt it,” says Naqvi. “I then spent a year in the mountains conducting field work. Looking at the literature I realized that almost no models existed on the cascading impact of climate shocks in economics at that point in time.”

Therefore, during his PhD, Naqvi developed a comprehensive agent-based model on this subject. His current research interests include looking at the environment-economy nexus from various angles such as who pollutes and who is exposed; how one can force an economy to be greener; and how climate policies in the Global North impact the Global South via investment and trade flows.

By Bettina Greenwell  Asjad Naqvi: naqvi@iiasa.ac.at

Spreading the word about science

Science communicator Ansa Heyl bridges the gap between researchers and the general public.

Originally from South Africa, Heyl joined IIASA in 2018 as the institute’s press officer and editor in the Communications and External Relations (CER) department. Heyl, whose background is in industrial psychology and psychometrics, changed her career path when she started writing about science as a freelancer while studying at the University of Pretoria.

“As soon as I discovered science communication, I just fell in love with it – it’s the absolute right fit for me. I enjoy the variety of it,” says Heyl. “I cover topics ranging from air pollution to new model development to climate change. It is never boring, and I get to learn something new every day.”

The CER department aims to inform the general public and stakeholders about IIASA research. In other words, it gets the science out there and ensures that the researchers’ findings are heard, for example, by producing Options magazine. For science to make an impact, it has to reach policymakers who can apply the research to change things for the better. The role of science communication is vital as it explains and promotes scientific topics to a non-expert audience.

“It’s not about dumbing things down, but making them clear. This is the philosophy I try to follow when writing about science,” says Heyl who completed her master’s degree in science and technology studies with a specialization in science communication and public engagement last year.

By Bettina Greenwell  Ansa Heyl: heyl@iiasa.ac.at
In pursuit of more equitable and just societies

Raya Muttarak joined the institute in September 2011 and is currently the IIASA World Population Deputy Program Director. She has been appointed Population and Just Societies Program Director as of 1 January 2021.

Q Your research focuses on population, the environment, and sustainable development. What caused you to pursue research in this area?
A In 2012, I had the opportunity to explore the role of education in reducing vulnerability to environmental change in Thailand. That same year, a powerful undersea earthquake hit Indonesia, and a tsunami warning was issued for the country's southern coastal towns. This led me to start collecting data to look at how populations are affected by natural disasters and how this changes depending on various factors. We found a consistent association between individual, household, and community level education in reducing vulnerability. This fascinated me and motivated me to continue looking into the spillover effect of education and how the impact of environmental change varies across population subgroups.

Q What impact do you hope to have with your research?
A I work on these issues in the hope of making positive changes in affected local communities. My research is aimed at impacting policy in a way that, when implemented, makes an effective contribution. Colleagues and I, for example, conducted research on the impact of floods on childhood undernutrition in India. Our results can help the Indian government to pinpoint which vulnerable subgroups of the population should be targeted for policy interventions.

It is also very important to me to mentor those beginning their careers in research. I hope my work inspires young researchers, introduces them to systems thinking, and through the support that I enthusiastically provide, empowers them on their journey.

Q What aspect of the research in your field do you find most important?
A It is important to factor in the contribution from demography, sociology, and other social sciences in climate and environmental research. For instance, sociological work is useful in highlighting the complex interplay between different drivers of migration and thus enhance our understanding in terms of the way and extent to which environmental change influences migration. Likewise, demography has a methodological tool to forecast population size and structure in the future, thus allowing us to match future climate with the projected demographic and socioeconomic conditions.

Q You have been appointed Population and Just Societies Program Director. What is your vision for this appointment?
A The new IIASA strategy lays a framework for the scientific work at IIASA to embrace equity and justice. This is an opportunity to advance our scientific inputs in transformations towards sustainable and resilient societies that ensures equity and leaves no one behind.

Such endeavors can only be achieved by working together in systems analysis that consider the interlinkages between natural, social, and economic systems. I hope to see the implementation of crosscutting projects that enable us to concretely do so.

By Monika Bauer, Raya Muttarak: muttarak@iiasa.ac.at
Young Scientists Summer Program 2021

ACCESS a global research network of over 3,500 scholars

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Muye Ru, YSSP 2019
“My experience at IIASA helped me to think more broadly about my career choices. And now my work can reach and interact with a broader community both inside and out of academia.”

Yoga Wienda Pratama, YSSP 2019
“I got the complete package at IIASA: networking with brilliant people, learning advanced scientific approaches, and being exposed to a ‘think-bigger-and-deeper’ environment.”

DEADLINE: 14 January 2021
To apply or for more information, visit: www.iiasa.ac.at/yssp