Activities with Member Countries

United States of America

Research collaborations between IIASA and the United States of America (US) have been highly productive ever since the Institute was founded in 1972. The US-IIASA relationship is central to the Institute and consequently IIASA participates in more activities related to the US than any of its other member countries. This Info Sheet focuses on key aspects of this beneficial relationship since 2010. The US National Member Organization is the National Academy of Sciences, which partners with the National Science Foundation to promote cooperation with American scientists, research institutions, and government agencies. Opportunities for cooperation start with young PhD students from the US, who receive grants to participate in IIASA Young Scientists Summer Program, and extend up to institutional cooperation such as the IIASA Director General’s collaboration with Professor Jeffrey D. Sachs, Director of the Center for Sustainable Development at The Earth Institute, Columbia University, on achieving the sustainable development goals. Diverse research partnerships range from technical modeling with the Energy Modeling Forum at Stanford University to policy advice to the US Environmental Protection Agency. Collaboration of US scientists with IIASA—facilitated by over almost 1,000 visits to and from IIASA, and on average 20 US nationals among IIASA staff yearly. Regular scientific exchanges—have brought the Institute’s applied systems analysis and global perspective to issues ranging from US energy policies to projection of US demographic changes. Research impact includes providing the intellectual underpinnings for the Climate and Clean Air Coalition, launched in 2012 by then US Secretary of State Hillary Clinton, and shaping the key objectives for the UN Secretary-General’s Sustainable Energy for All initiative.

Highlights of Interactions Between IIASA and the US (since 2010)

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<td>On average over 20 US nationals have been employed by IIASA each year</td>
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<td>IIASA scientists have visited the US over 600 times; US citizens have visited IIASA over 330 times</td>
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Activities with Member Countries: United States of America

IIASA Info Sheet 2017/01
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IIASA Info Sheets provide succinct summaries of IIASA activities. They do not necessarily reflect the views of IIASA staff, visitors, or National Member Organizations.

This Info Sheet summarizes IIASA interactions with the USA during 2010–2017; the research collaboration section covers 2010–2017. It includes highlights, with links to further information, but is not intended to be a comprehensive report on all interactions.

Feedback and updates are encouraged and should be sent to Kim Montgomery.
IIASA National Member Organization in the United States of America

The National Academy of Sciences (NAS) is the National Member Organization (NMO) representing US membership of IIASA. The NAS was a founding member of IIASA in 1972, along with organizations from 11 others countries from the Eastern and Western blocs. The US annual IIASA membership payment is funded by a grant from the NSF, which works with the NAS to strengthen connections between IIASA and US science and policy communities. The American Academy of Arts & Sciences served as NMO from 1982 until 2003.

Professor Michael Clegg, Professor Emeritus, Ecology & Evolutionary Biology at the University of California, Irvine, represents the US NMO on the IIASA Council, the governing body of the Institute. Professor Clegg currently serves as Chair of the IIASA Council. The NAS appoints a US Committee for IIASA, made up of leaders from the US science and policy communities who have experience in IIASA areas of research and their policy implications, and can facilitate research collaborations and capacity building activities. Previous members of the US Committee include Professor Simon Levin, Princeton University and Dan Arvizu, Former Director, National Renewable Energy Laboratory (see Appendix 5 for full list). The current (September 2017) members of the US Committee for IIASA are:

Professor Michael Clegg, (Chair) University of California, Irvine (Emeritus)
Dr. William Colglazier, American Association for Advancement of Science (AAAS)
Dr. Robert W. Corell, H. John Heinz III Center for Science, Economics and the Environment
Professor Maria Donoso, Florida International University
Professor Lauren Hale, Stony Brook Medicine
Dr. Jerry M. Melillo, Marine Biological Laboratory, Woods Hole
Stephen Robinson, University of Wisconsin-Madison
Kathleen Segerson, University of Connecticut
Dr. Barbara Boyle Torrey, National Institute on Aging, NIH
Professor Detlof von Winterfeldt, University of Southern California

Ex-Officio members are Dr. Norman Neureiter, American Association for the Advancement of Science (AAAS); Dr. Roger Levien, Strategy and Innovation Consulting; and Dr. Maggie Goud-Collins, Friends of IIASA.

The NMO Secretary for the US is Kathie Bailey, Director, Board on International Scientific Organizations, NAS.

Seven of IIASA ten Director Generals have been American citizens: Professor Howard Raiffa (1972–1975); Dr. Roger Levien (1975–1981); Professor Thomas H. Lee (1984–1987); Dr. Robert H. Pry (1987–1990); Dr. Peter E. de Jánosi (1990–1996); Professor Gordon J. MacDonald (1996–2000); and Professor Detlof von Winterfeldt (2009–2012).

Professor Simon Levin, Moffett Professor of Biology at Princeton University, was Chair of IIASA governing Council from 2003 to 2009 and Vice-Chair from 2009 to 2013.

Professor Donald Saari, Distinguished Professor, Mathematics and Economics and Director, Institute for Mathematical Behavioral Sciences, University of California, Irvine, was Chair of IIASA governing Council from 2014 to 2017.

Professor Ralph L. Keeney of the Fuqua School of Business at Duke University, Dr. Barbara Boyle Torrey, Population Reference Bureau, Washington DC, and Professor Fred Roberts, Director, Center for Discrete Mathematics and Theoretical Computer Science at Rutgers University, have all been members of IIASA’s Science Advisory Committee since 2011.

Dr. Joanne Linnerooth-Bayer is Acting Director of IIASA Risk, Policy and Vulnerability Program and Dean of IIASA Young Scientists Summer Program.
Professor W. Brian Arthur, External Professor, Santa Fe Institute, and Visiting Researcher, Intelligent Systems Lab, PARC, is credited with describing and influencing the modern theory of increasing returns, which he developed as a researcher at IIASA during the 1980s.

Professor William C. Clark of Harvard Kennedy School, has played a key role in the development of sustainability science. He is a long-term collaborator with IIASA and also served on IIASA Science Advisory Committee.

Professor Ruth DeFries, Professor of Ecology and Sustainable Development, Columbia University, leads research on how land use changes affect climate, biodiversity, and other ecosystem services. Dr. DeFries is a member of the U.S. National Academy of Sciences and received a MacArthur “genius” award. She is a current member of IIASA Science Advisory Committee.

Professor Sally Benson, directs Stanford’s Precourt Institute for Energy and is the Director of the Global Climate and Energy Project at Stanford University. She is a research collaborator and was a coordinating lead author on the Global Energy Assessment.

Professor Barbara Keyfitz, a mathematician who has made important contributions to applied mathematics. She is a fellow of the American Association for the Advancement of Science and of the Society for Industrial and Applied Mathematics. She is a collaborator with IIASA Advanced Systems Analysis.

Professor Tjalling Charles Koopmans, was a Dutch–American mathematician and economist who jointly won the Nobel Prize in Economics in 1975. He joined IIASA in the 1970s to work with fellow Nobel Prize winner Professor Leonid Kantorovich to expand IIASA study of advanced systems science and methodology.

Dr. Cynthia Rosenzweig is the Senior Research Scientist at the NASA Goddard Institute for Space Studies, where she is the leader of the Climate Impacts Group. She is the Co-Chair of the New York City Panel on Climate Change and was a Coordinating Lead Author of Working Group II for the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). She has collaborated with IIASA since the 1990s and worked in IIASA Land Use Change Program in 1997.

Dr. Marianne Fay is the Chief Economist of the Climate Change Group at the World Bank. She co-directed the World Development Report 2010 on Climate Change and led the World Bank’s report for the Rio+20 UN Conference on Sustainable Development. Dr. Fay is a collaborator with IIASA Energy program.

Dr. Donella Meadows and Professor Dennis L. Meadows, widely known as authors of The Limits to Growth and key figures in the development of sustainability as a field of study, researched at IIASA during the 1970s and 1980s.

Professor William D. Nordhaus, of Yale University, who The Economist has called “the father of climate change economics,” developed his first economic model of global warming as a young researcher at IIASA during the 1970s. He has collaborated with the Institute ever since.

Professor Jeffrey D. Sachs, Director of the Center for Sustainable Development at the Earth Institute at Columbia University, Special Advisor to the UN Secretary-General, and IIASA Distinguished Visiting Fellow, has collaborated with IIASA since the early 1990s, when he participated in IIASA’s Economic Reform and Integration project that brought together leading economists from Eastern and Western Europe, Japan, the US, and the USSR to identify policies to guide the Soviet Union through its economic crisis and make the transition into a market economy.

Professor Thomas C. Schelling, Nobel Laureate in Economics (2005), worked at IIASA in several research areas from 1994 to 1999.

Professor Eric F. Wood of Princeton University, recipient of the 2014 Alfred Wegener Medal for his pioneering contributions to hydrology and its interactions with meteorology and climate change, worked on the IIASA Water Program from 1974 to 1976.
Collaborating, Research, and Funding Partners in the United States of America

IIASA works with research funders, academic institutions, policy makers, and individual researchers in the US. The following list includes the names of organizations and individuals’ affiliated institutions that have recently collaborated with IIASA.

- Abt Associates
- Aleut International Association (AIA)
- American Association for the Advancement of Science (AAAS)
- American University
- Appalachian State University
- Arizona State University
- Arctic Slope Regional Corporation (ASRC)
- Boston University (BU)
- California Academy of Sciences
- California Institute of Technology
- Carnegie Institution for Science
- City University of New York
- Clean Air Task Force (CATF)
- ClimateWorks
- Colorado State University
- Columbia University
- Cornell University
- Dartmouth College

IIASA is continually developing collaborations with the US and has recently been working with 140 US organizations via formal and informal connections.

Some leading personalities from government in the US associated with IIASA

**McGeorge Bundy**, Advisor to Presidents John F. Kennedy and Lyndon B. Johnson, initiated the discussions with the Soviet Union in 1967 that led to the establishment of IIASA.

**Dr. John P. Holdren**, Professor of Environmental Policy and Co-Director of the Program on Science, Technology, and Public Policy in Harvard’s Kennedy School of Government, President Obama’s Science Advisor and former Director of the Office of Science and Technology Policy, was one of the key members of an IIASA research team that compared fusion and fast breeder nuclear reactors as part of the IIASA Energy Program’s systematic analysis of energy supply options.

**Dr. E. William Colglazier**, who served as the fourth Science and Technology Adviser to the US Secretary of State from 2011 to 2014, has followed IIASA contributions for 30 years. He spoke at the IIASA International Dialogue on Integrating Science and Technology Advice into Foreign Ministries in 2016 and at the IIASA 40th Anniversary Conference in 2012.

**Dr. Norman Neureiter**, the first Science and Technology Adviser to the US Secretary of State, currently Director, Center for Science, Technology and Security Policy at the American Association for the Advancement of Science.

**Dr. Vaughan Turekian**, Senior Board Director, National Academies of Sciences, Engineering, and Medicine and the former Science and Technology Adviser to the US Secretary of State from 2015 to 2017.


**Dr. Steven Chu**, US Secretary of Energy from 2009 to 2013 and Nobel Laureate in Physics (1997), recently collaborated with IIASA researchers on a book examining how to shift to a more sustainable transport system.
- Duke University
- Earthwatch Institute
- Electric Power Research Institute (EPRI)
- Emory University
- Energy Modeling Forum (EMF), Stanford University
- Environmental Defense Fund (EDF)
- First Solar
- Forest Trends
- George Mason University
- Georgia Institute of Technology
- Global Environment & Technology Foundation (GETF)
- Harvard Kennedy School (HKS) John F. Kennedy School of Government
- Harvard T.H. Chan School of Public Health
- Harvard University
- Hunter College
- Indiana University
- International Food Policy Research Institute
- International Monetary Fund
- Institute for Social and Environmental Transition—International (ISET-International)
- Iowa State University
- John Hopkins University
- Joint Global Change Research Institute (JGCRI)
- Kansas State University
- Lawrence Livermore National Laboratory
- Madison River Group, LLC (MRG)
- Massachusetts Institute of Technology (MIT)
- Michigan State University
- Montana State University
- National Academy of Sciences (NAS)
- National Aeronautics and Space Administration (NASA)
- National Center for Atmospheric Research (NCAR)
- National Oceanic and Atmospheric Administration (NOAA)
- National Park Service
- National Renewable Energy Laboratory (NREL)
- National Science Foundation (NSF)
- New Mexico State University
- New York University
- North Carolina State University
- Oak Ridge National Laboratory
- Office of Science and Technology Policy (OSTP)
- Ohio State University
- Old Dominion University
- Oregon State University
- Pacific Northwest National Laboratory (PNNL)
- Pennsylvania State University
- Pepperdine University
- Pew Research Center
- Population Council
- Portland State University
- Precourt Institute for Energy (PIE), Stanford University
Many of today’s most pressing challenges extend beyond international borders. IIASA research areas such as climate change, water scarcity, and poverty are affected by multiple factors across the globe. In turn, these global problems have impacts on nations, regions, and continents. Finding long-lasting solutions to these challenges requires scientific expertise that is free from the interests of a single nation. IIASA National Member Organizations recognize this need and their investment in IIASA is a contribution to a global public good. The benefit of this contribution is paid back to global researchers, policy makers, and citizens in multiple ways, as the following examples show:

- **IIASA supports the climate change research community** by hosting the Representative Concentration Pathways (RCP) database. The database provides data on greenhouse gas emissions for four different future scenarios that underpin the analysis of thousands of climate change researchers. IIASA also calculated the data for one of the scenarios, all of which have been developed for the world’s most comprehensive analysis of climate change—the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report.

- **IIASA research provides scientific guidance** to the Convention on Long-range Transboundary Air Pollution of the United Nations Economic Commission for Europe. This international environmental treaty between 33 countries has slashed air pollution in Europe, improving people’s health and countries’ crop production. IIASA’s GAINS model guided negotiators and policy makers as they worked on the treaty to identify the most cost-effective approach to cleaning Europe’s air. The negotiators chose the GAINS model not only because of its accuracy and usability but also because it had been developed by an international team with funding from multiple countries, which assured them that the model was nationally unbiased.
Selected presentations in the US by IIASA researchers

- Christina Kaiser  “A microbial community perspective on the regulation of soil organic matter turnover” at the American Geophysical Union (AGU) Fall Meeting in San Francisco (2014).
- Brian Walsh  “Modeling Coherent Strategies for the Sustainable Development Goals” at the American Geophysical Union (AGU) meeting (2016).
IIASA was established in 1972 to use scientific cooperation to build bridges across the Cold War divide and research growing global problems on a truly international scale. Today the soft power of science diplomacy continues to help IIASA member countries through using scientific cooperation to improve international relations, and through international teams jointly researching controversial issues to find consensus such as through integrative assessments of the future for the Arctic or of the economic integration of Eurasia.

In addition, IIASA also maintains its original bridge-building objective through attracting member countries that represent a range of geo-political interests (see full list of IIASA members, back page). For instance, both Russia and the US are members, as are Brazil, China, India, and South Africa. Several key factors also unite all IIASA member countries: their interest in systems analysis, scientific and academic infrastructure, economic stability, and the geopolitical role in future global transitions. With this in mind, IIASA recently negotiated membership with Iran and is also negotiating membership with Israel.
Recent Research Collaborations

Advancing energy and integrated assessment modeling in the US

The United States is a leading producer and supplier of energy as well as one of the world’s largest energy consumers. The energy sector represents almost 9 percent of the US GDP and the US is the world’s third largest producer of oil and natural gas. US national interests are integrally connected to complex global systems that impinge on the country’s economy, energy systems, and climate, among others. Long-standing collaborations between IIASA and US researchers and institutions have continually improved energy and integrated assessment modeling, resulting in a clearer understanding of how today’s energy and climate policies will impact the US. Recent US-IIASA collaborations in this area include:

- An international research collaboration including researchers from the World Resources Institute and IIASA, among others, evaluated the individual country pledges to reduce greenhouse gas emissions for the Paris Agreement on Climate Change. Using a variety of different models, they estimated that median global temperatures would reach 2.6 to 3.1°C by 2100. Thus, the research shows that current pledges are not consistent with the long-term ambition from the Paris agreement and the pledges would have to be strengthened to limit future climate change to well below the 2°C limit included in the Paris agreement. This study was published in *Nature* in 2016.

IIASA work is underpinned by high-quality science, which is regularly published in high impact publications. A selection of recent publications is presented here; a complete list can be found in Appendix 4.

Activities with Member Countries: United States of America

With the Energy Modeling Forum (EMF) at Stanford University, IIASA participated in (1) a global model comparison of what 18 energy–economy and integrated assessment models revealed about how different technologies can help achieve ambitious climate targets; (2) the first large-scale modeling comparison addressing the implications of delayed action on climate change for achieving different climate targets; and (3) the pros and cons of bioenergy deployment for long-run climate management.

Another global model comparison, this time of 23 energy–economy and integrated assessment models, has helped better articulate Asia’s role in mitigating climate change—crucial, given the growing economic relevance of Asia in the world and its energy and environmental impacts. This Asian modeling study was a collaboration with the Joint Global Change Research Institute at the Pacific Northwest National Laboratory (JGCRI/PNNL) and was partly funded by the US Environmental Protection Agency (EPA).

Other recent research, again with JGCRI/PNNL, examined:

- the co-benefits of climate policy for air pollution, energy security, and economic growth (as part of the EU-funded LIMITS project);
- mitigation pathways and associated costs (as part of the EU-funded AMPERE project);
- costs and impacts of mitigation policies to trigger the development of a new generation of Integrated Assessment Models (as part of the EU-funded ADVANCE project);
- national and global transformation strategies for climate change and their linkages to a range of sustainable development objectives (as part of the EU-funded CD-LINKS project); and
- the impact on climate change of increased use of natural gas from the wide deployment of hydraulic fracturing technologies, particularly in North America.

Joint activities have provided significant input to the work of the Intergovernmental Panel on Climate Change (IPCC):

- The Integrated Assessment Modeling Consortium is an organization of scientific research organizations including IIASA, EMF, JGCRI/PNNL, Electric Power Research Institute (EPRI), and the National Center for Atmospheric Research (NCAR). It facilitates and fosters the development of integrated assessment models. Recent work includes the Representative Concentration Pathways (RCPs) database that provides greenhouse gas emission and other projections for the IPCC Fifth Assessment Report (see IIASA’s global contribution, page 7).
- The Shared Socioeconomic Pathways (SSPs) were developed in collaboration with NCAR for the climate change research community to facilitate the integrated analysis of future climate impacts, vulnerabilities, adaptation, and mitigation.

Recent modeling work has looked at technology, renewable energy, and energy infrastructure:

- In 2008 and 2009 IIASA played a central role in a series of EMF-organized seminars in Snowmass, Colorado, which were sponsored by a consortium that included the US Department of Energy, US National Science Foundation, US National Oceanographic and Atmospheric Administration (NOAA), EPA, and EPRI. One outcome from these meetings was a special issue of Energy Economics on "The Economics of Technologies to Combat Global Warming." It was co-edited by William Nordhaus, Sterling Professor of Economics at Yale University, and Nebojsa Nakicenovic, IIASA Deputy Director General, who have been collaborating since the 1970s.
- A study to improve the representation of renewable energy sources in Integrated Assessment Models with the US National Renewable Energy Laboratory.
- An exploratory project with researchers from the Massachusetts Institute of Technology enables IIASA MESSAGE model to also analyze how different financial constraints limit infrastructure investments in the energy system and so affect the transition toward improved energy access and greenhouse gas emission reduction.
Global Energy Assessment and the US

The Global Energy Assessment (GEA), published in 2012, defines a new global energy policy agenda—one that transforms the way society thinks about, uses, and delivers energy. Coordinated by IIASA and involving over 500 specialists from a range of disciplines, industry groups, and policy areas, GEA research aims to facilitate equitable and sustainable energy services for all, in particular for around three billion people who currently lack access to clean, modern energy.

Americans held approximately 50 positions on the GEA including five Convening Lead Analysts and three GEA Governing Council members. Nearly every writing team included US members from the academic, business, and policy communities. The US Department of Energy provided $1 million to support GEA, which went in part to setting up a US GEA Support Office at the Global Energy and Technology Foundation (GETF) in Washington. GETF sponsored stakeholder workshops in the US and cooperated with IIASA and the US NMO to disseminate the assessment to the US energy community in 2012 and 2013. Events included the launch of the GEA report at the Stanford Precourt Institute for Energy and the University of Maryland.

Outcomes from the GEA include the adoption of GEA’s findings as the three key objectives of the UN Secretary-General’s Sustainable Energy for All (SE4All) initiative on energy access, energy efficiency, and renewable energy, which in turn have informed the targets of the Sustainable Development Goal on energy. Several senior American officials are involved in SE4All, including Charles O. Holliday, former Chairman, Bank of America; Carlos Pascual, former Special Envoy and Coordinator for International Energy Affairs, US State Department, on SE4All’s Executive Committee; and John F. Kerry, former US Secretary of State, on SE4All’s advisory board. IIASA is also one of several institutions responsible for building up a global research and knowledge network for the initiative.

Curbing the release of black carbon and methane

IIASA GAINS model is a scientific tool that helps policy makers select a smart mix of measures to simultaneously cut air pollution and greenhouse gas emissions in the most cost-effective way. It has been applied successfully in international negotiations of the Convention on Long-range Transboundary Air Pollution and the European Union to curb air pollution; and it has been used to analyze mitigation efforts for the climate negotiations under the UN Framework Convention on Climate Change.

Most recently US researchers and policy makers have collaborated with the IIASA GAINS modeling team to identify measures to curb the release of either black carbon or methane (pollutants that harm human or plant health while simultaneously exacerbating climate change):

- An international research collaboration involving researchers from Princeton University, Harvard University, University of California-Berkeley, Peking University, and IIASA examined the impact of impact of switching from coal to synthetic natural gas in three broad areas: electricity production, industry, and residential use. The researchers found that switching to synthetic natural gas in industry and electricity production would have little impact on smog-related deaths and cause a major increase in CO2 emissions. However, switching from coal to synthetic natural gas for residential uses, such as heating and cooking, would substantially reduce deaths due to air pollution and increase emissions of CO2 much less. The researchers concluded that deploying synthetic natural gas in the residential sector would substantially improve air quality and reduce premature deaths associated with outdoor air pollution with the smallest increase in carbon dioxide emissions compared with the power and industrial sectors. The study was published in the Proceedings of the National Academy of Sciences (PNAS) in 2017.
IIASA researchers have worked with the US Clean Air Task Force to prepare a handbook on black carbon and IIASA studies are cited repeatedly in the US Environmental Protection Agency’s (EPA) March 2012 report to Congress on black carbon. EPA also provided funding for IIASA GAINS modeling team to participate in the Arctic Council’s Task Force on Short-lived Climate Forcers in order to identify measures to reduce black carbon and methane emissions to slow Arctic climate change.

A joint study between NASA, IIASA, EPA, and various US universities, among others, pinpointed 14 emission reduction strategies for methane and black carbon. The research, published in *Science*, identified measures that would simultaneously increase human wellbeing through reduced local air pollution, improve local environmental quality, increase security of food and energy supply, and lower water demand. In many cases, these measures would also result in more efficient energy use and thereby also reduce emissions of long-lived greenhouse gases.

This *Science* study provided the intellectual underpinnings for the then US Secretary of State Hillary Clinton to launch the **Climate and Clean Air Coalition to Reduce Short-lived Climate Pollutants** in 2012. It was the first international effort to treat these pollutants as a collective challenge and initially supported by the governments of Bangladesh, Canada, Ghana, Mexico, Sweden and the United States. By January 2016, it has 50 member countries and 59 other partner organizations committed to taking action on short-lived climate pollutants. IIASA Program Director Markus Amann is on the scientific committee.

Together with Stanford University’s Energy Modeling Forum, IIASA is conducting a project to analyze air pollution and short-lived climate forcers.

The IIASA GAINS team also conducted a recent study that showed how the US could save energy and avoid greenhouse gas emissions. The researchers demonstrated how district heating (a system for distributing heat generated in a central location to meet residential and commercial heating needs), which is virtually non-existent in the US, could supply up to 43% of heat in residential and commercial buildings.

**The Arctic and the US**

As an Arctic country, the US has a natural interest in Arctic affairs. The global significance of the region has also risen considerably in recent years as the economic potential of the Arctic’s natural resources and new transport routes emerge.

In 2014 IIASA began planning a new flagship project, known as the **Arctic Futures Initiative**, to conduct a holistic, integrative assessment of plausible futures of the Arctic. The project will use systems analysis to cut across different disciplines and integrate the perspectives of academia, policy, business and media. It will focus on developing future scenarios for the region and providing insights for decision makers that are independent of any particular country’s interest. Numerous US organizations are collaborating and helping to shape the initiative, including: Advanced Science Research Center, The City University of New York; Arctic Slope Regional Corporation; Aleut International Association; US Department of State; American Association for the Advancement of Science; Oak Ridge National Laboratory; University of Alaska Fairbanks; Tufts University; Global Environment and Technology Foundation; Madison River Group, LLC; National Science Foundation; US Arctic Executive Committee; and US Arctic Research Commission.

Other collaborators on the project include researchers and diplomats from Canada, Denmark, Finland, Germany, Greenland, Norway, Russia, and Sweden, and international organizations such as the Arctic Monitoring and Assessment Program (AMAP) of the Arctic Council (of which the US is a member).

Other recent studies about the Arctic, in collaboration with partners in the US, include:

- **An assessment of emissions and mitigation options for black carbon**—a short-lived climate forcer that along with methane and ozone offer unique opportunities to slow Arctic warming in the near term. The research was presented at the Arctic Council Ministerial Meeting in 2011 and conducted by an Arctic Council Task Force that included researchers from the US Environmental Protection Agency and IIASA.
Researchers from IIASA, the Universities of Colorado and of Michigan, and the National Oceanic and Atmospheric Administration, among others, evaluated the ability of eleven different models to capture the seasonal change in concentrations of sulfate, black carbon (BC), and other aerosols associated with Arctic Haze.

**Projecting changing population and human capital in the US and around the world**

IIASA demographers study and project the changing composition of population for all countries of the world. They produce one of the few independent alternatives to the demographic projections of the UN Population Division and US Bureau of the Census, among others. As a testament to the quality of IIASA demography, the IPCC in 2011 adopted IIASA population projections as its source data in all modeling for the Fifth Assessment Report and UNESCO has adopted IIASA demographic methods as part of its literacy forecasting.

The Institute’s interdisciplinary setting has encouraged its demographers to research beyond the traditional boundaries of demography and explore how changes in society, economy, and the natural environment influence the health and mortality, migratory patterns, and reproductive behavior of human society. This pioneering approach to demography was shaped by US demographer Nathan Keyfitz, who led IIASA demographers from 1983 through 1991.

A recent innovative example of this broader approach has been the development of research methods to project population by level of education. This equips researchers with the tools to explore the implications of different education policies on a country’s future fertility, life expectancy, migration, and population level, as well as economic growth and the ability to reduce energy poverty (ENACT model).

Through intense data gathering, computer modeling, and other advanced research methods, IIASA provides a country’s researchers and policymakers with the essential numbers and tools to select the most effective policies. For example:

- Sulfur dioxide (SO2) contributes to particulate air pollution, associated with negative impacts on human health and to acid rain, associated with damage to the ecosystem. SO2 emissions have generally been on the decline since the mid-1970s. A joint study between IIASA and JGCRI/PNNL showed that a worrying upturn in emissions from 2000 to 2005 proved short-lived. By 2006 the upward trend halted, following the implementation of SO2 emission controls in China and large emission reductions in more affluent regions, particularly the US and Europe, as the following table shows:

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<th>Region</th>
<th>Changes in SO2 emissions (Gg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>8203</td>
</tr>
<tr>
<td>Europe</td>
<td>−2792</td>
</tr>
<tr>
<td>US &amp; Canada</td>
<td>−1447</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>−1946</td>
</tr>
</tbody>
</table>


Many of the research projects summarized in this Info Sheet draw on analyses from IIASA models, tools, and data, including:

- Planning a sustainable energy system (MESSAGE model, Global Energy Assessment Scenario Database)
- Improving food security through identifying yield gaps (GAEZ model), assessing competition for land use between agriculture, bioenergy, and forestry (GLOBIOM model), and looking at social, economic, and environmental earth systems (FeliX)
- Financial disaster risk management (CATSIM model)
- Projecting future population (Demographic multistate modeling)
- Reducing energy poverty (ENACT model)
to adapt to climate change. In 2014 IIASA published the first projections of educational attainment by age and sex for 195 countries in the Oxford University Press volume *World Population and Human Capital in the Twenty-First Century*. Findings for the US show how different policies over the next few decades could lead to the country’s current population of 310 million falling to 261 million by 2100 or soaring to 761 million by the end of the century. Additionally, in 2016, *Who Survives? Education decides the future of humanity*, a book summarizing scientific research conducted at IIASA was published detailing the importance of education for societal and economic development. The researchers found that education is often more important than income when looking at health, resilience, and wellbeing.

Current US–IIASA population studies on aging:

- Researchers from IIASA, Stony Brook University, and Department of Economic and Social Affairs at the United National Organization combined new measures of aging with probabilistic population projections from the UN to produce a new set of age structure projections for four countries: China, Germany, Iran, and the USA. For China, Germany, and the USA, the study showed that population aging would peak and begin declining well before the end of the century. Iran, which had an extremely rapid fall in fertility rate in the last 20 years, has an unstable age distribution and the results for the country were highly uncertain. The research was published in *PLOS ONE* in 2017.

- Researchers from IIASA and Stony Brook University measured aging based not on chronological age, but on remaining life expectancy, health, and cognitive function, among other measures. It calculated that Americans who were 73.4 years old in 2007 would be as healthy as 65-year-olds in 1965. In addition, this ongoing collaboration recently quantified the policy trade-offs to support aging populations; analyzed how faster increases in human life expectancy could lead to slower population aging; and produced a suite of measurements that could replace conventional measures of age.

- IIASA research found cognitive function may be a better indicator of the impact of aging on an economy than age-distribution, with chronological age imposing less of a social and economic burden if the population is “functionally” younger. The study, which also included participants from the US, was published in the *PNAS*.

- Another study published in *PNAS*, with NCAR and NOAA and funding from the US Department of Energy, the US Environmental Protection Agency, and the Hewlett Foundation, found that changes in population, including aging and urbanization, could significantly affect global emissions of carbon dioxide over the next 40 years.

Other IIASA–US collaborations research fertility and the factors, such as religion and recession, that affect it:

- An investigation found the recent global economic recession had halted the rising fertility in the US that had begun in 1998. And another study showed how differing fertility rates could play a role in deciding America’s long-term political future.

- With funding from the Pew Research Centre, IIASA conducted a demographic assessment of the religious structure of populations in select countries including the US. An earlier study from 2010 projected that the US Hispanic Catholic population will increase from its current 10% to 18% of the American population by 2043.

Finally, in 2011 IIASA demographers assembled a global panel of experts, including researchers from The State University of New York, NCAR, University of Buffalo, Population Council, and the Harvard School of Public Health. Together, they issued the *Laxenburg Declaration*, which outlined the demographic challenges for sustainable development.
Improving the use of land for food and for combating climate change

There is a long history of collaborations between IIASA and US researchers in areas of forests and agriculture, for example IIASA research from the 1970s and 1980s argued for a new adaptive approach to forest and pest management which has been subsequently widely adopted. Building on such productive collaborations, current US-IIASA collaborations in this area include:

- A recent study with researchers from IIASA, Colorado State University, and Pennsylvania State University, among others, estimated that livestock production could account for up to half of the mitigation potential for the global agricultural, forestry, and land-use sectors, which are the second largest source of emissions globally, after the energy sector. The research was published in *Nature Climate Change* in 2016.

- Worked with researchers from the Universities of California, Berkeley, of Colorado, of Florida, of Maryland, of Virginia, and the US Department of Agriculture, among others, on a range of studies that identify policies to develop climate-smart agriculture. Research output has been published widely, including in *Environmental Research Letters* and *PNAS*.

- Provided cropland mapping expertise to collaborators at the University of Maryland as part of the GEOGLAM (GEO Global Agricultural Monitoring) initiative which was launched by the Group of Twenty (G20) Agriculture Ministers in June 2011, and aims to strengthen global agricultural monitoring by improving the use of remote sensing tools for crop production projections and weather forecasting.

- Taken part in a major project to compare global agro-economic models with collaborators across the globe including MIT, PNNL, and the US Department of Agriculture Economic Research Service. Findings have been recently published in *PNAS*.

- Given expert input to a roundtable discussion on responsible agricultural investment that was hosted by the US Government. IIASA researchers had recently used their Global Agro-ecological Zones (GAEZ) model to assess crop production potentials of land as part of a World Bank project and in response to growing numbers of large-scale land acquisitions.

Business can benefit from science through the analysis and knowledge it provides. In turn, science can benefit from business through its experience on the ground and in implementation. IIASA also recognizes that closer collaboration between business and its researchers can increase the impact of the Institute’s work. Not surprisingly, IIASA is seeing a growing number of contracts with commercial partners, including:

- The global insurer, **Zurich Insurance Group**, began working with IIASA in 2013 to identify and address research gaps on flood resilience and community based disaster risk reduction, demonstrate the benefits of pre-event risk reduction over post-event disaster relief and to improve public dialogue around disaster resilience.

- The German carmaker, **Daimler AG**, has collaborated with IIASA researchers to assess biofuel potential from marginal and degraded lands in India and Brazil.

- The Brazilian energy company, **Petrolero Brasileiro**, was one of nineteen sponsors of IIASA’s Global Energy Assessment.

- The research institute of the Japanese carmaker, **Toyota**, has an ongoing collaboration with IIASA to research measures to reduce ozone emissions in Asia.

- The multinational consumer goods company, **Unilever**, funded IIASA’s agricultural experts from 2008-10 to analyze yields and land suitability of key agricultural crops under a changing climate.

In addition, IIASA is exploring ways that it can work more closely with multinational corporations, including through input to the development of their global sustainable business plans.
- Worked with researchers at Duke University and RTI International to analyze the impact of US biofuel policies on fossil fuel displacement and indirect land use change and subsequently on greenhouse gas and nitrogen emissions. The findings underscored the importance of global feedback effects from local policies as while US biofuel policies may reduce net US emissions of greenhouse gases, they would increase global emissions.

IIASA risk experts are also investigating how adaptive forest governance emerges. The project is funded by the National Science Foundation and includes researchers from the University of Colorado and the University of Connecticut.

US-IIASA collaborations are also improving our understanding of ecosystems and the role they can play in tackling climate change. Activities include:

- A collaboration with researchers from the US Department of Agriculture Forest Service as part of the Global Forest Carbon Working Group is investigating the future of the world’s forests. The group recently published an analysis in *Science* of how much carbon the world’s forests absorb.

- Teaming up with the Northern Eurasia Earth Science Partnership Initiative (NEESPI) to improve our understanding of the interactions between the ecosystem, atmosphere, and human dynamics in northern Eurasia. US partners in NEESPI include NASA, National Oceanic and Atmospheric Administration (NOAA), and University of Maryland.

- A partnership with the Environmental Defense Fund, among others, in a project to contribute to rapidly scaling up demand and supply for credits to reducing emissions from deforestation and forest degradation (REDD).

- Work with researchers at Princeton University, among others, to look at the potential of bioenergy with carbon capture and storage (BECCS) to achieve negative emissions of greenhouse gases.

- A collaboration with researchers at Appalachian State University on dealing with uncertainty in greenhouse gas emission inventories.

**Advising countries with economies in transition**

In early 2012 IIASA role as a neutral setting for examining options dealing with complex and sensitive international issues provided the impetus for a remarkable retrospective. The Institute held a conference on how our understanding of successful reforms in transition economies has changed since the early 1990s and how it can help support economic transformation in the future. Participants included Václav Klaus, former President and Prime Minister of the Czech Republic, Andrey Illarionov, former senior economic advisor to President Vladimir Putin, and fourteen US researchers from organizations ranging from The Brookings Institution to Harvard University.

The conference took place over twenty years after IIASA Economic Reform and Integration project brought together leading economists from Eastern and Western Europe, Japan, the US, and USSR. Findings from this project underpinned many of the economic reforms that helped the Soviet Union overcome its economic crisis and make the transition into a market economy in the 1990s.

Other associated research at IIASA includes: (1) a collaboration with The New School for Social Research in New York on the modeling of economic growth, and (2) a dynamic optimization of investment in capital and labor in the US.
Increasing the resilience of vulnerable communities

Helping to reduce the vulnerability of communities to natural disasters and the impacts of climate change is an ongoing area of research at IIASA. For example, floods affect more people globally than any other type of disaster. In recent years, flood-related disasters have had tremendous social and economic impact around the world—from the United States to Philippines, Thailand, China, the UK, Germany, and numerous other countries. A new partnership with The Wharton School, The University of Pennsylvania, funded by Zurich Insurance Group, is identifying and addressing research gaps on flood resilience and community-based disaster risk reduction, demonstrating the benefits of pre-event risk reduction over post-event disaster relief, identifying innovative interventions that could improve public dialogue around disaster resilience. The aim of the project is to help policymakers, civil society, the private sector, and donors to better devise flood resilience strategies that can be implemented in highly vulnerable communities.

Other US-IIASA collaborations in this area include:

- Recently completed work, funded by the US Institute for Social and Environmental Transition, showed the benefits of proactive disaster risk management in meeting the needs of vulnerable communities in South Asia.
- An IIASA study has warned that thermoelectric power generating capacity in the US is likely to reduce by 4–16% for the period 2013–2060. The research explored the impact of climate change on higher water temperatures and reduced river flows in the US and the impact that this lack of cooling water will have on thermoelectric power plants.
- A collaboration with the University of Georgia is examining how a city’s infrastructure can be re-engineered to restore the natural ecosystem services that existed on the land before the city was built.
- IIASA risk experts are part of the Urban Climate Change Research Network (UCCRN), led by Columbia University, and have identified ways to integrate mitigation and adaptation to find win–win actions for cities.

Analyzing ecological and evolutionary dynamics

Developing new methods and pioneering their applications, IIASA analyzes and forecasts how ecological and evolutionary dynamics shape populations, communities, and ecosystems, and how behavioral dynamics and adaptations determine the fate of groups of interacting agents.

Recent collaborations with US researchers have examined options and challenges for the development of aquatic food resources and include:

- Research with the University of Washington provided a published case study that showed the evolution of age and length at maturation of Alaskan salmon and how this was linked to different commercial fishing practices.
- Studies with Dartmouth College and other institutions have explored the evolution of Korean chum salmon under changing environmental conditions and also warn that current fishing practices favor adaptations that, in the long run, reduce the commercial value of the fish stock.

Other studies have opened up new methodological avenues for the applied systems analysis of biodiversity and include:

- A study published in *Nature* presented the first theoretical model demonstrating that picky females play a critical role in the survival and diversity of species. The research resulted from a collaboration between IIASA and a former participant of IIASA’s Young Scientists Summer Program who is now at the University of California, Berkeley.
- A collaboration with the University of Vermont considered conditions under which new species can form.
- Research with Boston and Harvard universities extended the reach of the canonical equation of adaptive dynamics theory to complex interaction structures.
- The use of evolutionary methods to investigate the dynamics of influenza with researchers at the University of Michigan.
Developing the methods of systems analysis

Systems analysis is one of the few research tools that combines both depth and breadth to truly understand complex global challenges. IIASA plays a leadership role in systems analysis as a research field, developing its tools and methodologies, and advancing its science.

An international research collaboration including researchers from IIASA and the Santa Fe Institute investigated how Balinese rice farmers - who plant their fields at different times - make planting decisions by using two variables for their computations: water availability and pest damage. Because there is not enough water for everybody to plant at the same time, fractal planting patterns emerge, which yield close to maximal harvests. The researchers found that these fractal patterns make the system more resilient then it would otherwise be. Their model shows that adaptation in a couple human-natural system can trigger self-organized criticality. This research was published in the journal *PNAS* in 2017.

Along with research collaborations developing the methods of systems analysis, IIASA, in collaboration with the Institute for Operations Research and the Management Sciences (INFORMS), the Santa Fe Institute, and others, hosted Systems Analysis 2015. The conference highlighted recent advances, current lacunas, and untapped disciplinary potentials in the field of systems analysis.

IIASA methodological experts have also recently collaborated with researchers at George Mason University, Princeton University, Massachusetts Institute of Technology, the Wilson Center, University of California at Irvine, University of Southern California, among others. Together they studied how the increasing interdependencies of contemporary global systems are leading to systemic risks posed by the actions and interactions of individual actors. Although these individual forces are potentially small, they can be the catalysis for significant impacts; this gives rise to the notion of “femtorisks.”

Water resources and governance of transboundary water resources

The United States faces water scarcity challenges, due to water restrictions and droughts, which will likely be exacerbated by global climate change. Further, the United States shares the waters of the Colorado River and Rio Grande with Mexico and is under binational agreements, which is governed by the International Boundary and Water Commission.

IIASA has significant expertise in this area and recently launched, with partners, the Water Futures and Solutions (WFaS) initiative – and interdisciplinary and international scientific project to explore complex water challenges and identify integrated solutions. The initiative uniquely combines scenario-based water analysis, multi-model ensemble analysis, and stakeholder consultation.

Recent US-IIASA collaborations in this area include:

- An international research collaboration involving researchers from Columbia University, NASA Goddard Institute for Space Studies, University of California-Santa Barbara, Michigan State University, and IIASA used an ensemble of five global hydrological models, to investigate how human interventions, such as reservoirs, dams, and irrigation measures, affected river water availability and water scarcity. The researchers found that human interventions during 1971-2010 have drastically reshuffled water scarcity hotspots, with impacts on approximately one-third of the global population. On average, approximately 20% of the global population has experienced a significant increase in water availability due to human interventions, alleviating water scarcity experienced by 8% of the population. At the same time, another 23% have experienced a significant decreased in water availability, for 9% aggravating water scarcity problems. As climate change and population place further pressure on tight water resources, the researchers found that policymakers and water managers need to take a regional and global perspective on local decisions, especially considering transboundary river basins. This research was published in the journal *Nature Communications* in 2017.
A research project including researchers from IIASA, New Mexico State University, Colorado State University, and the University of California, Davis is developing comparative approaches to transboundary water resources environmental governance along the United States and Mexico border, by looking at the Rio Grande/Río Bravo Basin. The 1944 Water Treaty between the USA and Mexico aims to share the water resources of the river equitably between the two countries, but there is no clause relating to sustainable development. Seeking to understand the views of its stakeholders, which are an extremely diverse group from local people to research institutions to non-governmental organizations, IIASA researchers interviewed over 75 stakeholders. The researchers found that the stakeholders were concerned that there was no sustainability provision in the treaty to ensure enough water for river ecosystems; thought that communication should be strengthen among all stakeholders and related water agencies; and that environmental education, shall be provided. This research has direct policy implications, including allowing for reciprocal and temporary water re-distribution; taking better advantage of regional water experts; formulating small-scale strategies to move towards sustainability across the basin; and using the existing processes to adapt the 1944 Water Treaty to improve equitable sustainability. This research was published in the journal Water in 2016.

Capacity Building

Young Scientists Summer Program

The Young Scientists Summer Program (YSSP) develops the research skills and networks of talented PhD students. Program participants conduct independent research within the Institute’s research programs under the guidance of IIASA scientific staff. Funding is provided through IIASA’s National Member Organizations.

Since the first US participant in the program in 1977, over 280 US students have participated, many going on to highly successful careers: Jesse Ausubel, for example, is currently Director of the Program for the Human Environment at The Rockefeller University, New York, and Science Advisor to the Alfred P. Sloan Foundation. Former US NMO Committee member and Nobel Laureate Tom Schelling said of the program, "the YSSP program alone would be worth the cost of US membership."

The US National Science Foundation supports around ten YSSP fellows from US institutions annually; while the majority of these students are US nationals, the US NMO regularly supports non-US students, who show exceptional scientific abilities, to attend the program. The following 86 young researchers from the US, or undertaking a PhD in the US, have taken part in the YSSP since 2010 (Funding is provided by the US NMO unless otherwise stated):

**YSSP'17**

Daniel Cooney (Princeton University) considered a general framework for describing the distribution of extraction levels in a group of fishers and investigated how they adjust their extraction levels in response to the competing incentives of catching fish and avoiding punishment for overfishing.

Andrew Fang (University of Minnesota) Comparing new bottom-up city carbon foot printing plus PM2.5 dispersion model using the GAINS Model to assess carbon, air pollution, and health co-benefits in Chinese cities.

Ryan Hanna (University of California, San Diego) studied the impact of microgrid adoption on greenhouse gas emissions from the electric power sector.

Xiaogang He (Princeton University) investigated drought adaptation options using an integrated hydrological and agent-based model.

Jose Pablo Ortiz Partida (University of California, Davis) used multi-objective optimization techniques for human and environmental water resources management focused on the Big Bend Reach of the Rio Grande/Bravo.

Karl Seltzer (Duke University) evaluated how various climate policies with equivalent emissions of long-lived climate pollutants can yield varying impacts to air quality and near-term climate.
**Kasparas Spokas** (Princeton University) incorporated geological constraints and risk in spatially explicit optimizations of carbon capture and sequestration projects.

**Radost Stanimirova** (Boston University) developed an observation and modeling framework that exploits remote sensing, meteorological datasets, and land cover information to improve our capability to both monitor and manage the long-term sustainability of this globally extensive and societally critical land use.

**Shaohui Tang** (The Ohio State University) assessed the benefits and costs of phosphorus control strategies for farming in the Western Lake Erie Basin.

**Nemi Vora** (University of Pittsburgh) examined the US Food-Energy-Water nexus through quantifying opportunities and interventions in food trade networks.

**Yaoping Wang** (The Ohio State University) built an accounting framework to assess the impact and system properties of the energy-water nexus networks within China.

**YSSP’16**

**Roshan Adhikari** (Oregon State University) developed a conceptual framework for integrated assessment of agricultural and environmental policies, and methods for linking farm level models with national level models.

**Kemen Austin** (Duke University) compared land management strategies for minimizing environmental consequences of oil palm expansion in Indonesia.

**Sudhanya Banerjee** (University of Minnesota – Twin Cities) explored the optimal pathway of CO2 storage and unitization and utilization procedures for a particular location.

**Philip Cantu** (University of Texas at Austin) examined trajectories of health and aging in the Health and Retirement Survey using latent class analysis and a latent variable approach to measuring health and aging.

**Lu Liu** (University of Maryland) developed high-resolution surface water availability indicators for long-term energy infrastructure planning models.

**Omid Mazdiyasni** (University of California, Irvine) analyzed major water reservoirs in Asia by outlining a unique multivariate approach as a measure of socioeconomic drought.

**Vera Pfeiffer** (University of Wisconsin – Madison) conducted a network analysis of the dynamics of pollination networks.

**Julia Puaschunder** (The New School) proposed an innovative climate change mitigation approach with bonds funded through taxation imposed on future generations.

**Yue Qin** (Princeton University) evaluated the potential air quality-carbon-water impacts of different unconventional gas projects to prioritize national and regional natural gas projects in China.

**Stephanie Roe** (University of Virginia) investigated the impact, feedbacks and tradeoffs of land use decisions and allocations on biosphere-atmosphere interactions, and assess their implications for climate change, water security and food security in tropical developing countries.

**Marcus Thomson** (University of California, Los Angeles) used downscaled climate and measured environmental data to reproduce occupation patterns seen in the archaeology of Native American (Fremont) maize farmers in Utah and generalize this to predict future dynamics of similarly environmentally dependent subsistence farmers in arid climate regimes.

**Mingshu Wang** (University of Georgia) studied the effects of spatial urbanization pattern on the emissions in the transportation sector.

**Easton White III** (University of California, Davis) investigated the plasticity and evolution of species in a changing climate.
Honglin Zhong (University of Maryland) assessed alternative multi-cropping adaptation options and explore their potential application and impact on water saving, in particular on reducing unsustainable groundwater use under climate change.

**YSSP'15**

**Arda Aktas** (Stony Brook University) investigated how “subjective age”—how long people think they have left to live—changes with characteristics such as gender and education.

**Miguel Poblete Cazenave** (Stony Brook University) developed a model in which individuals decide their optimal retirement age according to changes in demographic and economic variables.

**Julio Enrique Herrera Estrada** (Princeton University) characterized the spatiotemporal dynamics of drought around the world during the past 30 years, identifying patterns of motion and behavior.

**Gillian Foster** (Vienna University of Economics and Business), a US citizen, estimated the future demand for ethylene in the US and the impact of gas prices.

**Zhaomiao Guo** (University of California) used a stochastic game-theoretic model to study energy security and energy capacity issues in the US, China, and the Organization of the Petroleum Exporting Countries (OPEC).

**Alexandra Karambelas** (University of Wisconsin-Madison) studied how urban and rural emissions contribute to air quality in very populous northern India and how air quality may change in the future with new policies and further population growth.

**Zhimin Mao** (Pardee RAND Graduate School) analyzed a proposed action plan to cut air pollution in China, showing that rapid reduction of air pollution can be achieved. (Funded by the Roger Levien Fellowship, part of the IIASA Annual Fund)

**Daniel Sanchez** (University of California, Berkeley) quantified the spatial and temporal variation of renewable energy sources in the Alpine region to determine the potential contribution of each energy source to different sectors, including electricity, heating, and transportation.

**YSSP'14**

**Robert Barron** (University of Massachusetts) examined the welfare impact of R&D investment on the supply side across a range of demand, transportation sector, and climate policy scenarios.

**Etienne Fluet-Chouinard** (University of Wisconsin-Madison) presented a classification of wetland ecosystems that are biodiversity hotspots in Africa and South America.

**Margaret Garcia** (Tufts University) studied how to improve the evaluation of water supply reliability alternatives using a case study of Las Vegas, US.

**Jessica Gephart** (University of Virginia) investigated how the global seafood trade network responds to environmental and policy perturbations.

**Danielle Haak** (University of Nebraska at Lincoln) assessed how humans aid the movement of an aquatic species and what effects this species has on an ecosystem after introduction.

**Madeleine McPherson** (University of Toronto), a US citizen, incorporated distinct time scales for the variability of renewable energy resources into the MESSAGE model.

**Jon Nordling** (University of Maryland) explored ways to utilize F-VGI (Facilitated–Volunteered Geographic Information) ground observation information, remote sensing, and GIS to gain a month-to-month understanding of production crops on a global scale.

**Guilherme De Paula** (Yale School of Forestry and Environmental Studies) conducted a project to explain the significant cost reductions in sugarcane ethanol production in Brazil since 1975.

**Adriana Reyes** (Pennsylvania State University) used a harmonized global database of international migration flows to investigate the determinants of migration with a special focus on the relationship of fertility in sending and receiving countries.
Thanicha Ruangmas (University of Wisconsin-Madison) investigated if emission reduction in Europe is due to adoption of pollution abatement technology or to a relocation of production to other regions. (Funded by the IIASA Annual Fund)

Daniel Suarez (University of California, Berkeley) examined the spread and uptake of ecosystem services approaches in global environmental governance.

Jie Zhang (University of Maryland) examined the sensitivity of different MODIS-derived indicators for agricultural drought and investigated their effectiveness for agricultural drought monitoring during the growing season on the Southern Great Plains of the US.

YSSP'13

Eleanor Brush (Princeton University) explored if it is possible for discriminators to stabilize cooperation and how this may depend on how much information the discriminators store and use.

David Eitelberg (VU University in Amsterdam), a US national, compared the downscaling methods of scenarios modeled using the CLUMondo, GCAM, and GLOBIOM models to explain differences in spatial allocation of global agricultural lands.

Kandice Harper (Yale University) assessed the regional importance of short-lived climate pollutants mitigation measures in China using updated emission projections.

Kalaivani Ramea Kubendran (University of California, Davis) developed a bridging approach to bring consumer behavioral parameters—specifically for the transport sector—into a linear-programming IAM framework, testing the approach through scenario analysis.

Nicholas Lam (University of California, Berkeley) assessed the potential benefits of reduced kerosene use to meet lighting demand in developing countries plus the viable alternatives for its replacement.

Mathieu Leduc (Stanford University) researched how the strategic solicitation and provision of insurance can affect systemic risk.

Benjamin Leibowicz (Stanford University) represented spatial technology diffusion in an energy system optimization model to bring diffusion projections more into line with reality.

Joshua Ramos (University of Denver) analyzed religious conversions and secularization within a global perspective, and their overall impact on population dynamics.

David Shanafelt (Arizona State University) provided new insights into a pivotal ecological model, as well as perspective on the spatial insurance hypothesis.

Jacob Teter (University of California, Davis) looked at policies for the wise use of scarce water resources in energy infrastructure development, under GHG mitigation targets.

Melissa Whitaker (University of California, Berkeley) modeled the effects of interaction asymmetries in order to explore the role of functional diversity on interaction dynamics.

YSSP '12

Yuche Chen (University of California, Davis) re-analyzed emission measurement data to identify the amount and contribution of high emitting vehicles in order to ascertain whether targeted measures specifically at those vehicles could be a very cost-effective approach to reducing air pollution.

Sarah Elizabeth Evans (Colorado State University) researched what mechanisms explain soil carbon dioxide flux under fluctuating rainfall patterns.

Vijay Limaye (University of Wisconsin-Madison) analyzed new research on the relationship between levels of the air pollutant, particulate matter, and human health to provide a health impact analysis for IIASA’s GAINS model.

Pheak Kdey Nguon (Clark University) explored the perceptions of stakeholders involved in schemes to reduce emissions from deforestation and forest degradation.
Colin Payne (University of Pennsylvania) researched the role of education in the aging process for those on the lowest income levels in Malawi.

Debra Perrone (Vanderbilt University) explored past trends and drivers in water use in the US to help improve projections of future water use.

Xiaopeng Song (University of Maryland) used satellite observations, FAO statistics, and socioeconomic parameters to better understand deforestation.

Sam Hyun Yoo (Arizona State University) investigated the contribution that female education has had on the decline in fertility in South Korea since the mid-twentieth century.

YSSP ’11

Inbal Becker-Reshef (University of Maryland) developed a generalized approach for wheat yield forecasting at national scales using coarse-resolution remotely-sensed data.

Danielle Mousseau Davidian (Stanford University) reviewed current renewable energy supply curve studies and applied this knowledge to improving energy supply curves in the IIASA developed MESSAGE model.

Mary Leeann King (University of Maryland) used the IIASA–FAO GAEZ model to evaluate potential yields and the extent of agricultural production by incorporating finer, more recent agricultural statistical data within the newest version of the GAEZ model.

Matthew James Labrum (Washington State University) investigated the ecological consequences of incorporating intransitive competition in a habitat-destruction model.

Matthew Lampert (University of Cambridge), a US national studying in the UK, explored how social mood is expressed within a population and used this knowledge to produce a model complementary to financial markets to anticipate mood change and concomitant changes in the tenor and character of social events.

Pallavi Marrapu (University of Iowa) used the IIASA GAINS model and the Weather Research Forecasting–Chemistry (WRF-Chem) model to understand issues associated with air pollution in India, including: the contribution of various sectors to pollutant concentrations at regional and megacity scales, specifically focusing on New Delhi, and the role of aerosol feedbacks in air quality models to observe interactions between meteorology, chemistry, and aerosols.

Ethan Jennings Sharygin (University of Pennsylvania) studied the impact of social and demographic changes on population projections in China to produce a new population forecast for China that takes the interaction of the relative scarcity of women and the educational attainment of men and women into account.

Fang Yan (University of Illinois Urbana-Champaign) identified and parameterized super-emitters in emission models and investigated the effectiveness of policies which aim at eliminating super-emitters.

Aika Yano (Georgia Institute of Technology) researched the impacts of the 2010 Russian wildfire emissions on air quality in the surrounding region, the effects this had on local communities, and how deaths may have been avoided if the fire had burnt differently.

YSSP ’10

Regina Clewlow (Massachusetts Institute of Technology) examined how regional variation, competition, and cooperation, in addition to traditional factors that shape transportation demand, influence intercity demand for aviation and high-speed rail.

Avery Cohn (University of California, Berkeley) estimated beef yield potential in a sub-regional of the Brazilian Cerrado and a sub-region of the Brazilian Amazon.

Maud Comboul (University of Southern California) developed a forest model to explore the ecological and evolutionary impacts of disturbance regimes on vegetation structures.

Siyi Feng (Texas A&M University) evaluated the international effect of US climate policies.
Rennie Lee (University of California, Los Angeles) examined the health of immigrants in thirty-two countries to assess whether there are differences between immigrants and the native born in self-rated health.

Alice Nixon (University of Maryland, College Park) assessed the potential for global disease-specific health initiatives to address gaps in global public health good.

Katrina Running (University of Arizona) examined the role carbon offsets play in international climate negotiations between developed and developing nations.

Carl Salk (Duke University) implemented a set of simulations to assess the relative uncertainties in forest carbon balance.

Wei-Shiuen Ng (University of California, Berkeley) examined non-technological measures that should be introduced to create low carbon transportation systems in the United States.

Arame Tall (Johns Hopkins University, School of Advanced International Studies) examined reducing vulnerability to hydro-meteorological disasters through the use of climate/weather forecasts.

Alma Vega (University of California, Berkeley) investigated migration histories, health outcomes, familial characteristics, living arrangements, and employment status of Mexican immigrants who remain in the US in old age and those who return migrate.

Chen Wang (University of Wisconsin-Madison) modeled uncertainty of threats from group judgments for designing efficient response strategies.

Glenn Wright (University of Colorado) examined the cases of variation in public goods provision at the local level in the developing world.

Special Awards

Candidates from the US have also been recipients of the annual YSSP Peccei and Mikhalevich Awards, which reward YSSP participants whose research papers meet standards of the highest quality, originality, and relevance of research. The winners receive a scholarship to return to research at IIASA.

In 2016, the Mikhalevich Award with Honors went to Marcus Thomson (University of California, Los Angeles (UCLA) for his paper on “Climate, Corn, and Culture: Simulated Impact of Paleoclimate Change on Fremont Native American Maize Farming in Utah”
The second Peccei Award for 2015 went to Zhimin Mao (Pardee RAND Graduate School) for her evaluation of the costs and effectiveness of Pearl River Delta’s Air Pollution Reduction Action Plan. In the preceding year the Peccei Scholarship was awarded to Danielle Haak (University of Nebraska-Lincoln) for her research on ecological and social network modeling of invasive species.

Both the Peccei and Mikhalevich Awards for 2013 were awarded to Americans, as well as one of two honorable mention awards. Eleanor Brush (Princeton University) received the Mikhalevich Award for her paper, “The Stabilization of Cooperation by Discriminators Using Imperfect Information.” Ben Leibowitz (Stanford University) received the Peccei Award for his paper, “Representing the Spatial Diffusion of Technologies in an Energy System Optimization Model.” Matt Leduc (Stanford University) was granted an honorable mention for his paper, “Systemic Risk with Strategic Interactions.” In 2010, Carl Salk (Duke University) won the 2010 Peccei Award for his research into how climate change will alter the carbon balance of temperate forests.

**Regional Young Scientists Summer Program**

In 2012 IIASA launched its first expansion of the successful YSSP with the Southern African Young Scientists Summer Program (SA-YSSP) at the University of the Free State in Bloemfontein, South Africa. The Program is organized jointly by IIASA and the South African National Research Foundation, the South African Department of Science and Technology, the University of the Free State. In a competitive selection process, five US doctoral students were awarded fellowships to take part in the program:

- **Lucas Henneman** (SA-YSSP’14/15 & Georgia Institute of Technology) used the Greenhouse Gas Interactions and Synergies (GAINS) model to assess emissions and control costs associated with eight energy and air pollution scenarios in South Africa.
- **Simon Nampindo** (SA-YSSP’13/14 & University of Massachusetts) researched the competing land use and ecosystem services options to ensure the sustainable management of Greater Virunga Landscape.
- **Valentina Prado** (SA-YSSP’12/13 & Arizona State University) explored the potential of three main thermal electricity-generation technologies as viable options for an energy transition period.
- **Maria Rivera** (SA-YSSP’14/15 & University of Maryland) used a comprehensive review to examine whether reducing emissions from deforestation and degradation (REDD+) is the best policy instrument for the Virunga Park in the Democratic Republic of Congo.
- **Nathaniel Tindall** (SA-YSSP’13/14 & Georgia Institute of Technology) analyzed energy demand, reduction, and environmental impact of the energy systems of South Africa.

**Postdoctoral Program**

Postdoctoral researchers at IIASA work in a rich international scientific environment alongside scientists from many different countries and disciplines. The Institute’s research community helps its postdoctoral researchers to develop their research from fresh angles, to publish widely in international journals, and to establish their own global network of collaborators. Six fellowships have been awarded to young scientists from the US since 2010:

- **Alison Heslin** (2017 – present) is focusing on globalization, food security, and collective action, looking specifically at the relationship between resource scarcity and conflict. She is a recipient of IIASA Peter E. de Janosi Fellowship. (PhD in Sociology from Emory University)
- **Adam French** (2015–present) is combining meta-analytical and empirical research to examine the implementation of the Integrated Water Resource Management (IWRM) paradigm in contexts of the Global South. This work is targeted at the production of policy-relevant insights and analytical tools, including a conceptual framework for identifying key governance factors that facilitate and hinder the development of more integrated—and ultimately more just, adaptive, and sustainable—watershed management practices. (PhD in environmental studies from the University of California, Santa Cruz)
Daniel Jessie (2014–present) is developing different analytic approaches to questions that arise in the analysis of complex systems, in particular, the nature of strategically interacting agents. This includes extending his methodology to include, among other things, dynamic agents situated on a network. (PhD in mathematics from the University of California, Irvine)

Carl Salk (2013–2015) used IIASA’s GeoWiki geographical crowd sourcing tool to generate better land cover maps at different scales. These maps will in turn be used to address a variety of problems, such as how much land is available for different human needs to how natural resource users cooperate to manage ecosystems. (PhD in biology from Duke University)

Narasimha D. Rao (2011 to 2013), originally from India, researched the relationship between electricity access, livelihoods, and carbon dioxide emissions in India. His methods included economic simulation models of the electricity sector and social welfare, input–output analysis, and carbon accounting. His work emphasized modeling policy and institutional influences, such as supply rationing and energy subsidies. He used his analysis to project the impacts of different urban and rural consumption patterns on carbon emissions. (PhD in environment and resources from Stanford University, California)

Jose Siri (2009–2011) researched how urbanization patterns and urban structure affect the transmission of mosquito-borne disease, and how better understandings of the dispersal of humans, vectors and infection in this context can lead to more effective and efficient public health policy. (PhD in epidemiology from the University of Michigan)
Several IIASA research scholars hold associate or full positions with universities in the US. These include: Bruce Beck, University of Georgia; Brian Fath, Towson University; Günther Fischer, University of Maryland; Arnulf Grubler, Yale University; Warren Sanderson, Stony Brook University; Laixiang Sun, University of Maryland; Stefan Thurner, external professor at Santa Fe Institute; and Fabian Wagner, Princeton University.

Other IIASA staff hold advisory positions at universities in the US. IIASA Director General and CEO Professor Dr. Pavel Kabat is a member of the International Science Advisory Board of the NSF National Center on Earth Surface Dynamics at the University of Minnesota. Deputy Director General and CEO of IIASA Professor Nebojsa Nakicenovic is a member of the Mitigation Board of the Global Network for Climate Solutions (GNCS) at The Earth Institute, Columbia University. In addition, IIASA World Population Program Director Wolfgang Lutz is a member of the Committee on Population of the US National Academy of Sciences. IIASA Risk, Policy and Vulnerability Program Director Joanne Bayer has served two terms on the National Science Foundation panel on decision, risk, and management sciences.

Other examples of scientific exchange include:
- US residents have participated in IIASA events over 600 times since 2010.
- 1039 publications have resulted from collaborations between IIASA and US residents since 2010.
- On average, over 20 US nationals have been employed by IIASA each year since 2010.
- Since, 2010 91 doctoral students from or studying in the US have gained international, interdisciplinary research experience participating in either the Young Scientists Summer Program (YSSP) at IIASA or the Southern African YSSP.
- Since, 2010 over 330 researchers, advisors, and diplomats from the US have visited IIASA and IIASA scientists have visited the US over 600 times.

Appendices

The details behind the above facts can be found in the following appendices to this IIASA Info Sheet. The appendices are either attached or available on request from Tom Danaher: danaher@iiasa.ac.at:

3. Travel by IIASA scientists to the US (2010–2017)
Prospects for Future IIASA–US Activities

This Info Sheet summarizes recent research collaborations between IIASA and the US (see Recent Research Collaborations, page 10). Significant potential remains to further intensify IIASA interactions with the US through developing joint activities, including:

- **Using International scientific cooperation to support diplomacy** IIASA was established in 1972 to use scientific cooperation to build bridges across the Cold War divide and research growing global problems on a truly international scale. Today the soft power of science diplomacy continues to help the US through using scientific cooperation to improve international relations. And IIASA’s neutral venue provides the US with opportunities to lead or participate in multinational research collaborations to jointly research controversial issues to find consensus across multiple national perspectives. (see Research to support science diplomacy, page 9).

- **Academic training opportunities for early-career US scientists** There is potential to further enhance participation by young US doctoral and post-doctoral students in IIASA’s programs to develop international and interdisciplinary research skills (see Capacity Building, page 20). Becoming a partner in IIASA’s forthcoming International Postgraduate School of Excellence will be another fine opportunity.

- **Conducting international assessments in areas of US strategic interest** The US was a significant contributor to IIASA’s Global Energy Assessment, which brought together over 500 specialists, including a significant number from the US, to transform the way society thinks about, uses, and delivers energy. At the request of its member countries, IIASA is currently embarking on four new assessments, whose focus will be on issues of strategic interest also to the US: holistic, integrative assessments of plausible futures for the Arctic, global water challenges, Eurasian economic integration, and tropical forests. In addition, IIASA has launched a major international project, The World in 2050, to bring together leading modeling teams from across the globe to identify the smartest ways to achieve the UN Sustainable Development Goals in an integrated way.

- **New partnerships between IIASA and US institutions to strengthen international cooperation** IIASA provides a platform for the US and other member countries to develop new innovative partnerships between business, civil society, government, and science that are needed to support global transformations to sustainability. The Alpbach–Laxenburg Group, for example, brings together some of the best minds in the world from academia, government, business, and civil society to identify positive narratives for sustainable development and business opportunities, grounded in cutting-edge international systems science. David Eitelberg (YSSP’13 & VU University in Amsterdam), a US national, compared the downscaling methods of scenarios modeled using the CLUMondo, GCAM, and GLOBIOM models to explain differences in spatial allocation of global agricultural lands.
About IIASA

Founded in 1972, the International Institute for Applied Systems Analysis (IIASA) conducts policy-oriented research into problems of a global nature that are too large or too complex to be solved by a single country or academic discipline. IIASA research is across and at the intersection of natural, human, social, knowledge and technology systems to support the development of integrated solutions to global sustainability challenges.

IIASA is at the center of a global research network of around 3,500 scholars and over 700 partner institutions in over 65 countries. It is funded and supported by its National Member Organizations which represent the scholarly community in the following countries:

Australia, Austria, Brazil, China, Egypt, Finland, Germany, India, Indonesia, Iran, Malaysia, Japan, Netherlands, Norway, Pakistan (Observer), Republic of Korea, Russia, South Africa, Sweden, Ukraine, United Kingdom, United States of America, Vietnam.

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