Activities with Member Countries

China

Research collaborations between IIASA and the People’s Republic of China have been highly productive since China became a national member of IIASA in 2002 through the National Natural Science Foundation of China (NSFC). Multiple research collaborations with partners ranging from universities to institutions of the Chinese Academy of Sciences to governmental bodies have brought new insights to the challenges that China faces. In particular, IIASA’s applied systems analysis has brought a global perspective and interdisciplinary research expertise to Chinese agricultural policy, demography, energy scenarios, air pollution, and risk mitigation among others. Greater collaboration with IIASA has also contributed to China’s research base through enhancing modeling knowledge and skills. And joint projects have brought Chinese researchers into contact with the Institute’s global network of around 2,500 active researchers and 600 research partners. These formal and informal connections, including projects initiated by IIASA and NSFC, have resulted in over 300 joint publications since 2008. IIASA’s academic training programs have also been successfully building the next generation of systems analysts in China. This IIASA Info Sheet provides a summary of this growing and mutually beneficial relationship since 2008.

### Highlights of Interactions Between IIASA and China (since 2008)

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<td>Membership start date</td>
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<td>35 Chinese organizations collaborate with IIASA including:</td>
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<td>- Chinese Academy of Agricultural Sciences (CAAS)</td>
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<td>- Chinese Academy of Sciences (CAS) and many of its institutions</td>
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<td>- Energy Research Institute, National Development and Reform Commission</td>
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<td>- Peking University</td>
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<td>Capacity building</td>
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<td>3 young scientists from China have received IIASA Postdoctoral Fellowships</td>
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<td>Publication output</td>
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<td>Other interactions</td>
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Activities with Member Countries: China

IIASA Info Sheet 2016/02
March 2016

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Prepared by
Iain Stewart, Head
Communications–Library–Media
IIASA, Schlossplatz 1, A-2361 Laxenburg, Austria
E-mail: stewart@iiasa.ac.at

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 China during 2008–2016; the research collaboration section covers 2008–2015. 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 Iain Stewart.
IIASA’s National Member Organization in China

In 2002 China formally joined the Institute, with the National Natural Science Foundation of China (NSFC) as the National Member Organization (NMO) of IIASA. NSFC is directly under the jurisdiction of China’s State Council and is responsible for administering the Central Government’s National Natural Science Fund which has been approved by the National People’s Congress.

Professor Congqiang Liu, Vice President of the NSFC, is the IIASA Council Member for China and along with representatives of each of IIASA’s member countries governs the Institute. Professor Liu is also Vice Chair of the Outreach, Capacity Building and Science Engagement Committee, which advises IIASA on capacity building and outreach activities. Mr. Chuang Zhao, Program Officer in the Division for Asia, Africa and International Organization at NSFC’s Bureau of International Cooperation, is the NMO Secretary for China.

NSFC has established a NSFC Advisory Expert Group on Cooperation with IIASA, the Belmont Forum, and other International Organizations. The Group has the following members:

- Dr. LIU Congqiang (Chair), Member of CAS (Chinese Academy of Sciences); Vice President, NSFC
- Dr. FU Bojie, Member of CAS; Professor, Research Center for Eco-Environmental Sciences, CAS; President, The Geographical Society of China
- Dr. GUO Zhengtang, Member of CAS; Professor, Institute of Geology and Geophysics, CAS; Vice President, University of Chinese Academy of Sciences
- Dr. WANG Huijun, Member of CAS; Professor, Institute of Atmospheric Physics, CAS; President, The Meteorological Society of China
- Dr. CUI Peng, Member of CAS; Professor of Institute of Mountain Hazards and Environment, CAS; Vice President, The Geographical Society of China
- Dr. DENG Xiangzheng, Professor, Center for Chinese Agricultural Policy, CAS
- Dr. LI Xiubin, Professor, Institute of Geographic Sciences and Natural Resources Research, CAS
- Dr. PENG Xizhe, Professor, Fudan University
- Dr. SHI Peijun, Professor and Executive Vice President, Beijing Normal University

The National Natural Science Foundation of China represents China and its scholarly community on IIASA’s governing Council.

Web: www.nsfc.gov.cn
E-mail: zhaochuang@nsfc.gov.cn

Some leading personalities from academia and government in China associated with IIASA:

Professor Jining Chen, Minister of Environmental Protection and former President of Tsinghua University, helped promote cooperation between IIASA and Tsinghua University in the fields of air pollution control, energy modeling, and maximizing resource productivity.

Professor Jing-Yun Fang, Director, Key Laboratory for Earth Surface Processes at the Ministry of Education as well as Director of the Institute of Botany at the Chinese Academy of Science, has been a member of IIASA’s Scientific Advisory Committee since 2011.

H.E. Liangyu Hui, former Vice Premier of the State Council of the People’s Republic of China from 2003 to 2012, promoted findings from IIASA research to agricultural policymakers in China.

Professor Zheng-hua Jiang, former Vice-Chairman of the Standing Committee of the National People’s Congress of the People’s Republic of China, has collaborated with IIASA for many years. He is currently President of the China Science Centre of the Eurasia Academy of Science in Beijing.

Professor Jianhua Lin, President, Peking University

Professor Yi-fu Lin (Justin Lin), Professor and Honorary Dean, National School of Development, Peking University and Former Senior Vice President and Chief Economist, The World Bank

Dr. Xu Tang, former Director General of the Shanghai Meteorological Service, now at the World Meteorological Organization, collaborated with IIASA on research into China’s agro-ecosystem.

Professor Jie Wang, Vice President of Peking University, was IIASA Council Member for China from 2002 until 2013 when he served as Vice President of NSFC.

Professor Yang Wei, President, NSFC

Professor Qiu Yong, President, Tsinghua University

Professor Dadi Zhou worked closely with IIASA’s energy researchers when he was Vice Chairman of the State Expert Advisory Committee to the National Energy Leading Group of China and Director of the Energy Research Institute, among other affiliations.
Dr. YU Guirui, Professor and Deputy Director, Institute of Geographic Sciences and Natural Resources Research, CAS; Vice President, The Ecological Society of China

Dr. ZHANG Wei, Professor and Dean, College of Management and Economics, Tianjin University

Dr. ZHANG Xiliang, Professor and Director, Institute of Energy, Environment, and Economics, Tsinghua University

Dr. ZHOU Tianjun (Secretary for Belmont Forum affairs in the Committee), Professor and Deputy Director, State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics, Institute of Atmospheric Physics, CAS

Dr. ZHU Bing, (Secretary for IIASA affairs in the Committee), Professor and Executive Deputy Director, Institute of Circular Economy, Tsinghua University; Guest Research Scholar, IIASA

IIASA works with research funders, academic institutions, policymakers and individual researchers in China. The following list includes the names of the organizations or the individual’s affiliated institutions that have all recently collaborated with IIASA.

- Beihang University
- Beijing Forestry University
- Beijing Normal University
- China Conservation and Research Center for the Giant Pandas, State Forestry Administration of the People’s Republic of China (SFC)
- China Council for International Cooperation on Environment and Development (CCICED)
- China University of Mining and Technology
- Chinese Academy of Agricultural Sciences (CAAS)
- Chinese Academy of Sciences (CAS), including: • Coal Liquefaction Research Center • Institute for Atmospheric Physics • Institute of Geographic Sciences and Natural Resources Research (IGSNRR) • Institute of Soil Science • Institute of Zoology
- Chinese Research Academy of Environmental Sciences (CRAES)
- Chongqing Normal University
- Clean Air Alliance of China (CAAC)
- Development Research Center of the State Council of the People’s Republic of China (DRC)
- East China Normal University (ECNU)
- East China University of Science and Technology (ECUST)
- Energy Research Institute National Development and Reform Commission (ERI)
- Fudan University
- Huazhong Agricultural University (HZAU)
- Lanzhou University
- Nanjing University (NJU)
- National Geomatics Center of China (NGCC)
- National Natural Science Foundation of China (NSFC)
- Peking University (PKU)
- Renmin University of China
- Shanghai Meteorological Bureau
- Shanghai Ocean University (SHOU)
- Shanghai University (SHU)
- Sichuan Academy of Forestry
- Sichuan University (SCU)
- South China University of Technology (SCUT)
- South University of Science and Technology of China (SUSTC)
- State Energy Administration of the People’s Republic of China
- State Forestry Administration of the People’s Republic of China (SFA)
- Tianjin University (TJU)
- Tsinghua University (TH)
- Xinjiang University (XJU)

IIASA is continually developing collaborations with China and has recently been working with 35 organizations in China via formal and informal connections.
Recent Research Collaborations

Food security in China

China’s agricultural sector is changing. Driving this transformation is rising food demand due to a growing population, that is expected to reach 1,436 million by 2030, increasing urbanization of up to 60 percent by 2030, and rising incomes as the country’s economic growth benefits more and more people. At the same time, industrialization and climate change are expected to lead to a loss of crop land of some 6.5 million ha and trade liberalization and technical progress will continue to drive further change.

Understanding the impacts of these driving forces on farmers and consumers across the diverse 2,885 counties that make up China is not easy. Setting the right agricultural policies is even harder. In a number of collaborations with partners in China, IIASA has developed a range of research tools to help identify the right policies as part of on-going cooperation with China since 1995. More recent activities include:

- The Global Agro-Ecological Zones (GAEZ) model has been developed by the Food and Agriculture Organisation (FAO) of the United Nations and IIASA to help identify areas for increased food production, while maintaining the natural resource base and facing the challenge of climate change. GAEZ underpins many of the following studies. Feeding into GAEZ is a database of world soil resources (HWSD) developed by FAO, IIASA, ISRIC – World Soil Information, Institute of Soil Science at the Chinese Academy of Sciences (ISSCAS), and the Joint Research Centre of the European Commission.

- IIASA with the Institute of Geographic Sciences and Natural Resources Research (IGSNRR) at the Chinese Academy of Sciences, and Center for Chinese Agricultural Policy Center (CCAP) among others developed Chinagro II—a highly detailed model of Chinese agriculture—in a series of projects starting in 2001.

- The CATSEI-project extended the Chinagro study to explore the impacts of China’s vigorous agricultural transition, on the country itself, as well on its trading partners, the EU in particular. This EU-funded project ran from 2007 to 2010 and was an international collaboration including IIASA, CCAP, and several European institutions.

- Climate change and intensive human activities are also affecting China’s agro-ecosystem and its supply potentials. Shanghai Meteorological Bureau (SMB), IGSNRR, Chinese Academy of Agricultural Sciences (CAAS), and IIASA assessed this impact as part of a NSFC-IIASA funded project from 2010 to 2012. Results from the project were presented at a workshop in 2013 in Shanghai entitled Opportunities and Challenges of China’s Agriculture Under Climate Change.

- The trade-offs between intensifying agricultural production and harming the environment is the focus of several recent studies into nitrogen management. With Beijing Forestry University IIASA assessed global nitrogen flows in croplands and concluded that globally, two-fifths of nitrogen used in agriculture is lost to ecosystems with harmful environmental effects. Southern China, Western Europe, and eastern United States were particularly vulnerable due to the prevalence of wet soils that encourage nitrate leaching. IIASA researchers also explored nitrogen management in China through combining results from the CATSEI project and greenhouse gas emissions from IIASA’s GAINS model. The resulting spatial modeling framework has since been adopted by Chinese scientists, with the results serving as a basis for further national work.

- Further models and research tools are being developed in a collaboration between IIASA, IGSNRR, and Chongqing Normal University. From 2012 to 2017 the NSFC–IIASA funded project is conducting an integrated analysis and modeling of land use efficiency and security under rapid agricultural transformation due to urban–rural dynamics in China.

These studies have resulted in numerous peer-reviewed publications (see Appendix 5, Publications Relevant to IIASA–China Collaborations). They are also contributing to national reports. For instance, studies with the Chinese Academy of Agricultural Sciences on the impacts of climate change on the agricultural production and crop yields in China have been cited by both the Chinese Third National Climate Change Assessment Report and the Second National Communication for Climate Change. IIASA research has also influenced Chinese agricultural policy on regulating the quality of livestock feed and the excessive application of fertilizers.
Smart ways to clean up China’s air

IIASA’s GAINS model is a scientific tool that has been helping policymakers and researchers across the globe to select a smart mix of measures to simultaneously cut multiple air pollutants and greenhouse gas emissions. Experience from Europe, whose policymakers use GAINS, show this multiple pollutant approach is the most cost-effective.

IIASA has worked closely with Tsinghua University, the Energy Research Institute (ERI) of the National Development and Reform Commission in Beijing, and other international partners to implement the GAINS model for Asia and for China. Additionally, GAINS has been extended to cover short-lived climate pollutants such as ozone and aerosols.

IIASA and Tsinghua University researchers are using this capability to assess emission abatement strategies for these pollutants as part of the EU-funded ECLIPSE project.

Over the last five years, these versions of GAINS have underpinned various policy analyses, including:

- Two NSFC-funded projects exploring (1) controls of emissions from the Chinese energy sector, and (2) technologies to control greenhouse gas emissions in China.
- An ongoing collaboration with Tsinghua University and funded by Toyota has projected tropospheric ozone concentrations across South and East Asia and so inform efforts to limit the air pollutant ozone in the region.
- A joint project with ERI studied the greenhouse gases mitigation potentials for China and was funded by the Climate Works Foundation.
- A current study into strategies to control multiple air pollutants in China with the Chinese Research Activity for Environmental Sciences (CRAES) and funded by the Norwegian Ministry of Environment.
- A project with Peking University, since 2014, on coal, natural gas, and clean air in China.

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

- Nitrogen oxides (NOx) are air pollutants that help form acid rain, contribute to global warming, hamper the growth of plants, and have adverse impacts on human health.

A research collaboration between IIASA and Tsinghua University explored historical trends and future perspectives of NOx emissions in China. The study calculated that NOx emissions increased rapidly in China from 11.0 Mt in 1995 to 26.1 Mt in 2010 driven by the fast growth of energy consumption. Exploring six future scenarios, the researchers projected that NOx emissions would increase by 36% by 2030 under business as usual conditions. However, implementing stringent end-of-pipe pollution control measures in power plants, industry, and transport sectors could reduce up to 61% of emissions by 2030.


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

- Reducing air pollution and greenhouse gas emissions simultaneously (GAINS model)
- Planning a sustainable energy system (MESSAGE model, Global Energy Assessment Scenario Database)
- Reducing energy poverty (Energy Access Interactive Tool—ENACT)
- Improving food security through identifying yield gaps (GAEZ model) and assessing competition for land use between agriculture, bioenergy, and forestry (GLOBIOM model)
- Financial disaster risk management (CATSIM model)
- Projecting future population (Demographic multistate modeling)
Activities with Member Countries: China

Findings from these policy analyses have been communicated to the Chinese government through a variety of channels. Recent interactions include:

- IIASA researchers delivered a session on the GAINS model at the China Clean Air Training seminar for local air quality managers, organized by the Clean Air Alliance China (CAAC) in Beijing in 2013.
- In 2012 Markus Amann contributed to the report of the China Council for International Cooperation on Environment and Development (CCICED) to the Chinese government on “Full Implementation of Action Plan on Prevention and Control of Air Pollution.”
- Lessons learned from GAINS-China on the co-benefits of low-carbon strategies on local air quality informed the development of the 12th Five Year Plan.

In addition, a city-scale implementation of the GAINS model has been developed by researchers from IIASA and Tsinghua University to help urban planners assess practical policy options for controlling urban air pollution that simultaneously maximize reductions in greenhouse gas emissions. GAINS-City has been implemented for Beijing and Tianjin with funding from the Energy Foundation.

Since 1998 IIASA has been organizing annual workshops to compare results from atmospheric dispersion models for Asia and published the results. Researchers from the Institute for Atmospheric Physics of the Chinese Academy of Sciences and Tsinghua University have taken part.

**Advancing energy and integrated assessment modeling in China**

Chinese national interests are integrally connected to complex global systems that impinge on the country’s economy, energy systems, and climate among others. IIASA’s recent collaborations with Chinese researchers and institutions are improving energy and integrated assessment modeling and thereby contributing to China’s strategic research base through enhancing modeling knowledge and skills. In addition, the research improves understanding of how today's energy and climate policies, both global and national, may impact China’s development.

Recent collaborations include:

- A global model comparison 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 global collaboration between multiple modeling teams including ERI and Renmin University, and ran from 2009 to 2012.
- ERI and Tsinghua University are also members of the Integrated Assessment Modeling Consortium (IAMC), which IIASA and partners in Japan and the US coordinate. IAMC is a consortium of scientific research organizations that facilitates and fosters the development of integrated assessment models. Recent work for the climate change research community involved in the IPCC Fifth Assessment Report includes: (1) the Representative Concentration Pathways (RCP) database that provides greenhouse gas emission and other projections (see IIASA’s global contribution, page 13); and (2) the Shared Socioeconomic Pathways that facilitate the integrated analysis of future climate impacts, vulnerabilities, adaptation, and mitigation.
- Multiple collaborations between IIASA, ERI, and/or Tsinghua University are researching:
  - Development of a Chinese version of IIASA’s MESSAGE (Model for Energy Supply Strategy Alternatives and their General Environmental Impact) model to help energy planners develop a sustainable energy system (ERI and Tsinghua University).
  - Strategies for investing in carbon capture and storage technologies in China and the impact of climate policy on these investments (Tsinghua University).
  - The co-benefits of climate policy for air pollution, energy security, and economic growth as part of the EU-funded project, LIMITS (ERI).
  - Climate change mitigation pathways and associated mitigation costs as part of the EU-funded project, AMPERE (ERI). And the potential for technology to reduce China’s carbon dioxide emissions as part of the UK-funded project, AVOID.

In addition, China is a key region in IIASA’s MESSAGE Access model which assists national and regional policymakers in their strategies to improve energy access for the rural poor in developing countries.
Global Energy Assessment and China

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.

Dr. Fei Feng, Director of the Industrial Economics Research Department and Research Fellow, Development Research Centre of the State Council of China, was a co-chair of GEA. Dr. Kebin He and Zheng Li were Convening Lead Analysts, and ten Analyst positions were also held by China. In addition, Professor Dadi Zhou was a council member of the GEA.

Findings relevant to China were outlined at the China launch of the GEA by IIASA in Beijing in 2012. Areas of particular interest were the implications of a rapid shift to urbanization and increasing energy densities; along with the key issues of energy access and the associated health and development issues associated with poor levels of access to clean energy.

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.

Water scarcity in China

IIASA, Beijing Forestry University, and other partners were involved in a global assessment of “green” and “blue” water (withdrawn for irrigation from rivers, lakes, and aquifers) availability. The study looked at the need to improve understanding and management of “green water” (precipitation to the soil) as this may prove an important resource as water scarcity escalates.

China was one of the six countries identified in the study as of high significance given it has one of the highest rates of blue water consumption in the world supporting agriculture.

Related research, also involving NSFC, Beijing Forestry University, and IIASA was launched in April 2012 on “Grey water footprint and water scarcity assessment.” The project aims to quantify pollution-induced water scarcity (PIWS) based on an assessment of the grey water footprint for the Heihe River Basin, in China.

Geo-Wiki, a crowdsourcing tool developed by IIASA and partners, has established a global network of volunteers who help improve the quality of land cover maps and data. A new project in collaboration with researchers from the National Geomatics Center of China among others is using Geo-Wiki to validate the water layer of a new 30m-resolution global land cover product currently being produced for China.

Research to support science 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 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 is also exploring closer collaboration with countries in the Middle East, including Iran and Israel.
IIASA demographers are providing independent analysis and projections of China’s future population. The impact that education and urbanization may have on China’s future demographics.
Enhancing disaster preparedness in China

Through Beijing Normal University (BNU), IIASA is a collaborator on activities such as:

- Establishing the Integrated Disaster Risk Management Society and organizing associated conferences.
- The Integrated Risk Governance Project of the International Human Dimensions Programme (IHDP) which is exploring mechanisms, trends, impacts and the predictability of risks in the context of global change, and developing risk assessment models and methods for integrated risk simulation.

A project examining mega-disasters and socioecological transition in Sichuan Giant Panda Sanctuary World Heritage is seeing IIASA researchers collaborating with researchers at multiple Chinese institutions, including the Sichuan Academy of Forestry, the Institute of Zoology of the Chinese Academy of Sciences, the Research Center for Eco-Environmental Sciences, Sichuan University, and the China Conservation and Research Center for the Giant Pandas. The project is having an impact through enhancing disaster preparedness in world heritage management and promoting reform in protected area legislation to the National People’s Congress and the Chinese People’s Political Consultative Conference.

Terrestrial carbon management in China

On-going modeling work with collaborators at IGSNRR has been calculating the contributions of China’s forests and land-use practices to the country’s national carbon inventories. Recent studies have also explored:

- The impact of forest management practices on the carbon dynamics in woody biomass of forest ecosystems in China.
- The extent of the carbon sink across the world’s forests in a study with international collaborators including Peking University, as part of the Global Forest Carbon Budget Group, which was published in Science.
- The optimal grassland location for sustainable photovoltaic water pumping systems in China in collaboration with researchers from the South University of Science and Technology of China, Beijing Forestry University among others and as part of the NSFC collaborative project on water and ecology.

Selected publications resulting from IIASA–China collaborations

IIASA’s 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 5.

**Evolution of cooperation**

Building on the success of the Evolution of Cooperation conference held at IIASA in 2009, NSFC and IIASA organized another conference to bring together leading cooperation researchers from China, IIASA, and elsewhere to discuss empirical insights and theoretical methods underlying the evolutionary theory of cooperation. The conference took place in Beijing in April 2014 and showcased complementary approaches to evolutionary problems dealing with the social dilemmas surrounding human cooperation. Eighteen speakers from Chinese institutions, ranging from Beijing Normal University to the Chinese Academy of Sciences, presented their latest theories via model-based lectures.

Other collaborations in the field of ecology and evolution include:
- Exploring financial market stability in the presence of heterogeneous adaptive agents with a researcher from Tianjin University.
- A study on evolutionary community assembly with size-structured populations with a Chinese researcher based at Umea University in Sweden.

**Advanced systems analysis**

The NSFC–IIASA-funded project Optimization of Resource Productivity for Sustainable Economic Development is exploring the dynamic mechanism of resource productivity to characterize the optimal strategy for improving resource productivity on a macro-level, with a specific focus on mid-term economic development in China. The project, which runs from 2012 to 2015 and brings together researchers from IIASA, Tsinghua University, and Renmin University, has already published early findings.

An on-going collaboration since 2010 between researchers from IIASA and Beijing Normal University is applying network analysis to study urban metabolism in Chinese cities. Nearly 20 peer-reviewed journal articles have resulted including a new model for analyzing Beijing’s water resources and a spatially explicit network model of urban metabolism.

Researchers from the China University of Mining and Technology and IIASA have collaborated to develop a three-dimensional model to analyze the sustainable development of energy and agricultural industries in China under competition for land and water resources and implications for policy.
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 Chinese National Member Organization unless otherwise indicated. Since 2008 the following 67 Chinese students have participated in this program:

Chuchu Chen (YSSP’15 & Tsinghua University) modeled ammonia emissions to identify the best agricultural management for reducing air pollution.

Shaoquing Chen (YSSP’12 & Beijing Normal University) examined a new system technique, information-based network analysis, and applied it to ecological risk assessment.

Yuche Chen (YSSP’12 & University of California Davis, US) re-analyzed emission measurement data again to identify the amount and contribution of high emitting vehicles, and explored possible policies to reduce the emissions. (Co-funded by US NMO and IIASA)

Jing Dai (YSSP’11 & Beijing Normal University) conducted a network analysis of a socioeconomic consumption system based on ecological thermodynamic theory via a case study of China.

Qiuying Ding (YSSP’14 & Shanghai Climate Center) looked at the coupling of crop models across different spatial scales and the multi-scale evaluation of adaptive technologies locally, for different cropping regions, and China as a whole.

Jiayi Fang (YSSP’15 & Beijing Normal University) demonstrated that although marine disaster reduction measures by the Chinese government have been effective, they will face new challenges under climate change.

Zhaomiao Guo (YSSP’15 & University of California, USA), a Chinese citizen, used a stochastic game-theoretic model to study energy security and energy capacity issues in the USA, China, and Organization of the Petroleum Exporting Countries (OPEC). (Funded by US NMO)

Rui Hu (YSSP’15 & Imperial College London), a Chinese citizen, conducted an international comparative study to examine China’s wind energy knowledge and technology accumulation, showing that China is making rapid progress. (Self-funded)

Long Ji (YSSP’13 & Huazhong Agricultural University) measured the geographic concentration and regional localization of vegetable production in China with newly developed indicators. (Funded by IIASA)

Zhuoran Liang (YSSP’12 & Shanghai Climate Center) assessed climate change impacts on the potential productivity of major crops in China using a fusion model system.

Fangyi Li (YSSP’12 & Institute of Geographic Science and Natural Resources Research, Chinese Academy of Sciences) studied how China can meet its energy intensity targets by 2020 considering the country’s rapid increase in consumption and GDP.

Shengfa Li (YSSP’14 & Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences) estimated the amount of abandoned croplands in 2000–2010 and the future changes expected in China’s mountainous areas.

Yang Li (YSSP’11 & Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences) focused on the determinants and spatial structure of interprovincial migration in China, and how they have changed over the period 1985–2005.

Huayi Lin (YSSP’11 & Uppsala University, Sweden) built a model involving the multiple socioecological factors influencing sustainable management of the Swedish wolf population.

Fei Liu (YSSP’11 & Tsinghua University) developed and applied the GAINS-City Model for Chinese Cities.

Jun Liu (YSSP’14 & Peking University) explored the potential benefits in terms of air pollutant reduction through natural gas substitution strategies in power plants, residential combustion, and industrial boilers in the Jing-Jin-Ji region.
**Wenfeng Liu** (YSSP'15 & Swiss Federal Institute of Technology Zurich and the Swiss Federal Institute of Aquatic Science and Technology), a Chinese citizen, used a biophysical crop model to identify hotspots of global nitrogen and phosphorus pollution. (Self-funded)

**Kun Ma** (YSSP’14 & Beijing Forestry University) used the EPIC model to estimate soil organic carbon stocks in the Roige wetland in western China.

**Zhimin Mao** (YSSP'15 & Pardee RAND Graduate School, USA), a Chinese citizen, analyzed a proposed action plan to cut air pollution in China, showing that enable rapid reduction of air pollution can be achieved. (Funded by the Roger Levien Fellowship)

**Yilong Niu** (YSSP'15 & Shanghai Institute of Technology and Climate Change) coupled three agricultural models together to give an accurate picture of greenhouse gas emissions from rice cultivation.

**Xi Pang** (YSSP'13 & KTH Royal Institute of Technology) connected existing models for calculating timber, pulp, and bioenergy production, with new methods for biodiversity, carbon stock, and recreation evaluation to conduct a sustainability assessment of forest bioenergy options. (Funded by the Swedish NMO)

**Xilei Pang** (YSSP’11 & Beijing Normal University) analyzed typhoon-flood risk from a dynamic perspective and applied it to a case study of Guang Zhou, China.

**Xiaopeng Song** (YSSP’12 & University of Maryland, US) used satellite observation, FAO statistics, and socioeconomic parameters to project global deforestation. (Co-funded by US NMO and IIASA)

**Cuiqing Sun** (YSSP'15 & China University of Mining & Technology), applied integrated modeling to tackle interconnected environmental and socioeconomic issues for the robust energy, food, and water provision in coal-rich areas of China, using Shanxi, China, as a case study.

**Zepeng Sun** (YSSP'14 & University of Amsterdam, Netherlands), a Chinese national, assessed how populations in seasonal environments would need to adjust their life histories in order to cope with changing seasonal patterns in their environments. (Funded by the Dutch NMO).

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**IIASA’s global contribution**

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’s 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, policymakers, 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 policymakers 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.
Haochen Wang (YSSP’14 & Peking University) projected how human capital will change in Beijing to 2050 from the education and health perspectives in different policy scenarios.

Tao Wang (YSSP’14 & Tsinghua University) constructed an aggregate model of China’s economy for 1980–2010 to retrospectively analyze the sensitivity of resource productivity to variations in investment scenarios.

Wei Wang (YSSP’13 & Tsinghua University) analyzed how to improve resource productivity using optimal control models under the supervision of IIASA’s system analysts.

Xue Wang (YSSP’13 & Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences) explored how different land use change and climate change scenarios would impact the sowing of winter wheat and its associated agriculture water footprint in the North China Plain.

Zhiquang Wu (YSSP’11 & Tianjin University) analyzed the interplay between investor types and financial market dynamics by modifying the agent-based Santa Fe Institute artificial stock market model.

Fang Yan (YSSP’11 & University of Illinois-Urbana and Champaign, US) studied the role of superemitters in transport emissions and what policies would be effective at eliminating these air pollutants. (Partially funded by IIASA)

Siyuan Yang (YSSP’15 & Beijing Normal University) used input-output analysis to investigate particulate matter pollution, showing that the petroleum, coking, and chemicals sector was the main source of direct PM2.5 emission.

Shasha Yin (YSSP’13 & South China University of Technology) explored potential control measures for ammonium in the Pearl River Delta area of China.

Yadong Yu (YSSP’12 & Tsinghua University) used optimal control theory combined with an economic growth model to explore raising resource productivity by substituting old raw materials with new, more technologically-advanced materials.

Chuanfu Zang (YSSP’11 & Beijing Forestry University) assessed the tradeoffs between green and blue water uses with ecosystem services and humans in the Heihe River Basins in China.

Zihan Zhai (YSSP’15 & Peking University) studied the actions needed to reduce hydrofluorocarbon (HFC) emissions in China, showing that there is substantial potential for minimizing China’s HFC emissions by using alternatives.

Jie Zhang (YSSP’14 & University of Maryland, USA) examined the sensitivity of different MODIS-derived indicators for agricultural drought and investigated their effectiveness agricultural drought monitoring during the growing season on the Southern Great Plains of the USA. (Funded by the US NMO)

Jie Zhang (YSSP’15 & Tsinghua University) investigated ways of improving agricultural management to maintain crop yields while reducing phosphorus pollution.

Xinxin Zhang (YSSP’13 & Beijing Forestry University) conducted a spatially explicit downscaling of future land use change from IIASA’s GLOBIOM model for a regional case study of the Heihe River Basin in China.

Yuanyuan Zhao (YSSP’12 & Tsinghua University) assessed the accuracy of global volunteers who are categorizing land cover for the online crowdsourcing tool, Geo-Wiki, using local knowledge and satellite data.

Bo Zheng (YSSP’13 & Tsinghua University) projected future energy use and emissions in the transportation sector at a provincial level in China, taking account of the different growth patterns of vehicles between provinces.

Hongmei Zheng (YSSP’14 & Beijing Normal University) analyzed how the three regions within the Jing-Jin-Ji agglomeration interact with each other and their roles in its development.

Honglin Zhong (YSSP’11 & East China Normal University) studied—through a quantitative approach involving data and model analysis—future crop management and land use patterns that minimize negative risks to food production.

Lei Zhou (YSSP’11 & Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences) used IIASA’s G4M model to help estimate the carbon sink/source of China’s forests under a range of scenarios. (Self-funded)
YSSP’10
Wenfang Chen, Beijing Normal University • Yang Cheng, Queen’s University, Canada (Funded by IIASA) • Siyi Feng, Texas A&M University, US (Funded by IIASA) • Haiguang Hao, Chinese Academy of Sciences • Linke Hou, Chinese Academy of Sciences • Ling Liu, Shandong Audit Office • Wei-Shiuen Ng, University of California, Berkeley, US (Funded by US NMO) • Chen Wang, University of Wisconsin-Madison, US • Rui Xing, Uppsala University, Sweden (Funded by Swedish NMO) • Xuchao Yang, Shanghai Typhoon Institute of China Meteorological Administration

YSSP’09
Lin Fan, Johns Hopkins University, US (Funded by US NMO) • Min Hong, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences • Wei Li, Beihang University • Jun Wan, University of Illinois at Urbana Champaign, US (Funded by US NMO) • Lei Wang, Shanghai Ocean University • Yun Wu, North Carolina State University, US (Self-funded) • Lai Zhang, Technical University of Denmark

YSSP’08
Jinsong Chen, Virginia Polytechnic Institute and State University, US (Funded by US NMO) • Yingchun Li, Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences • Shuo Liu, Beihang University • Liangjie Xin, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences • Dongling Zhang, Graduate University of Chinese Academy of Sciences • Wenji Zhou, Tsinghua University

Markus Amann  “Experience with PM2.5 control in Europe” at Beijing Municipal Government workshop on Air Quality Management in Beijing (2013).
Brian Fath  “Network-Based Information Indicators: Configurations toward Optimal Robustness” at the 9th International Conference on Ecological Informatics in Nanjing (2014).
Günther Fischer  “Assessing the Impact of Climate Change and Intensive Human Activities on China’s Agro-Ecosystem and its Supply Potentials” at the NSFC–IIASA Forum on Opportunities and Challenges of China’s Agriculture under Climate Change in Shanghai (2013).
Zbigniew Klimont  “Recent updates in GAINS for Asia (and World) including time series back to 1990 and new projections until 2050” at the 5th International Workshop on Atmospheric Modelling Research in Xiamen (2014).
Florian Kraxner  “From Sustainable Bioenergy to Negative Emissions – BECCS” at the Applied Energy Innovation Institute and the University of Nottingham China international workshop on Sustainable Energy in Ningbo (2014).
Wei Liu  “Landscape as An Emergence of Social-Ecological Interactions Department of Landscape Architecture” at Tsinghua University (2015).
Regional Young Scientists Summer Program

In 2012 IIASA launched the first expansion of its 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 was organized jointly by IIASA and three South African partners: the National Research Foundation (NRF), the Department of Science and Technology, and the University of the Free State. The following Chinese nationals have participated in the program:

Liu Haoqi (SA-YSSP’13/14 & Xinjiang University) explored habitat loss and biodiversity impacts as part of the stability and complexity of adaptive ecological networks theme.

Zhang Hui (SA-YSSP’13/14 & Nanjing University) explored air pollution controls for coal-fired power plants in South Africa.

Delin Fang (SA-YSSP’13/14 & Beijing Normal University) conducted a socioeconomic analysis of a socioeconomic water system.

F Le Feng (SA-YSSP’12/13 & Beijing Normal University) used network analysis to develop robust measures for river ecological systems.

Yinghui Yang (SA-YSSP’13/14 & Lanzhou University) studied commonness and rarity in ecological communities as part of the stability and complexity of adaptive ecological networks theme.

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.
Activities with Member Countries: China

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 journal articles, and to establish their own global network of collaborators. Three postdoctoral fellows from China have participated in the program since 2008:

Fei Guo (from 2016), a Chinese national, is exploring socioeconomic heterogeneity and non-cost factors influencing consumer energy and appliance choices and demand in China, as understanding consumer decisions is a crucial component for bottom-up type energy policy modeling. (PhD in Energy and Environmental Policy from University of Delaware, US)

Wei Liu (2012–2014), originally from China, is developing models and scenarios to investigate integrated adaptive management of complex socioecological systems, with a focus on how changing land use affects ecosystem service provision and natural hazard vulnerability in Wolong Nature Reserve in China. His research topics include spatiotemporal dynamics of ecosystem service trade-off and synergy, multi-scale disaster resilience in complex socioecological systems, and integrated assessment of conservation policies. (PhD in wildlife conservation and wildland management from Michigan State University)

Xiaojie Chen (2010–2012), focused on evolutionary dynamics in biological and social systems, especially the emergence and stability of cooperation in social networks, using evolutionary game theory and adaptive dynamics. (PhD in Dynamics and Control of Complex Systems [2011] from Peking University, China)

In addition Dr. Dan Zhao, from Northwest A&F University in Yangling, received a scholarship from the Eurasia-Pacific Uninet (EPU), funded by the Republic of Austria, to work for six months in 2013 with IIASA demographers Bilal Barakat and William Butz on issues related to challenges in rural education.

Other capacity-building activities

IIASA participates in the European Forestry Masters program, a training program for advanced university students. As part of the EU sponsored program successful candidates work for a three-month period with IIASA researchers to further their studies. Two Chinese students have participated in the program since 2005.

IIASA’s air pollution experts regularly host students from Tsinghua University to train them in the use of IIASA’s GAINS model in order to foster cooperation with the Chinese science community in controlling air pollution. In addition, Professor Allen Zheng of South China University spent six months researching at IIASA in 2012 and 2013, and subsequently implemented the GAINS model for the Pearl River Delta.

Several IIASA research programs are co-supervising PhD students at Chinese universities as part of these universities’ training programs. These include:

Haoqi Liu, of Xinjiang University, carries out research with IIASA’s Evolution and Ecology Program.

Junlian Gao, of the China University of Mining and Technology, researches with IIASA’s Advanced Systems Analysis Program and Exploratory and Special Projects.

Yibo Luan, of the Academy of Disaster Reduction and Emergency Management at the Ministry of Civil Affairs & Ministry of Education and Beijing Normal University, studies with IIASA’s Water Program.

Three postdoctoral fellows from China have developed their research and published widely at IIASA

Several other activities have helped develop the system analytical skills of young Chinese researchers
Several IIASA research scholars hold positions at universities and research centers in China. These include:

- **Joanne Bayer** Beijing Normal University and the Science Committee of the Chinese Academy of Disaster Reduction and Emergency Management
- **Gui-Ying Cao** Adjunct Professor, Peking University and Scientific Advisory Committee Member, Shanghai Climate Research Center
- **Qionglin Dai** Associate Professor, Beijing University of Posts and Communications
- **Brian Fath** Deputy Director, Low Carbon Research Center, Beijing Development Area
- **Luis Gomez-Echeverri** Member, China Council – Task Force on Rural Development and its Energy, Environment and Climate Change Adaptation Policy
- **Pavel Kabat** Visiting Professor, Peking University
- **Junguo Liu** Professor, Beijing Forestry University
- **Tie-Ju Ma** Professor, School of Business, East China University of Science and Technology
- **Laixiang Sun** Visiting Professor, Institute of Geographic Sciences and Natural Resources Research (IGSNRR); China Center for Agricultural Policy (CCAP), Chinese Academy of Sciences; and Senior Research Fellow, Guanghua School of Management, Peking University
- **Bing Zhu** Professor, Department of Chemical Engineering, and Executive Deputy Director, Institute of Circular Economy, both at Tsinghua University

Other examples of scientific exchange include:

- Over 250 Chinese nationals have participated in IIASA events since 2008.
- On average 18 Chinese nationals have been employed by IIASA every year since 2008.
- Since 2008, 67 doctoral students from China have participated in IIASA’s Young Scientists Summer Program, five have taken part in the Southern African Young Scientists Summer Program, and three IIASA Postdoctoral Fellowships have been awarded to young scientists from China.
- Over 130 researchers, advisors, and diplomats from China have visited IIASA since 2008, while IIASA scientists have visited China over 230 times.
- 313 publications have resulted from collaborations between IIASA and Chinese nationals since 2008.

**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 [Sanja Drinkovic](drinkovs@iiasa.ac.at):

4. Travel by IIASA scientists to China (2008–2015)
Prospects for Future IIASA–China Activities

This Info Sheet summarizes recent research collaborations between IIASA and China (see Recent Research Collaborations, page 5). Significant potential remains to further intensify IIASA interactions with China through developing a range of new joint activities, including:

- **Enhancing Chinese expertise in applying system analysis to national problems**
  
  Developing bespoke Chinese versions of IIASA’s global models would allow researchers and policymakers to look at complex global problems and their impact on China in a holistic and integrated way. For example, there is a national version of the IIASA GAINS model for China, which identifies cost-effective measures to improve air quality and reduce greenhouse gas emissions in China.

- **Conducting international assessments in areas of Chinese strategic interest**
  
  China contributed to IIASA’s Global Energy Assessment which brought together over 500 specialists 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 China: holistic, integrative assessments of plausible futures for the Arctic, global water challenges, Eurasian economic integration, and tropical forests. In addition, IIASA is exploring the development of a quantitative foresight capability for Asia to explore future resource security (materials, energy, land, and water) for nations in the region.

- **New partnerships between IIASA and Chinese institutions to win grants from international research funders**
  
  IIASA’s high-quality research and international research network makes it highly competitive in its applications for international research funds. Between 2006 and 2014, IIASA nearly doubled its income by winning research grants that amounted to €69 million. This was part of a total funding portfolio of €329 million of the external projects in which IIASA was and is involved.

- **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 IIASA’s member countries through using scientific cooperation to improve international relations, and through international teams jointly researching controversial issues to find consensus, free from the constraints of national self-interest (see Research to support science diplomacy, page 8). IIASA recently launched a new international project to analyze the prospects for economic integration between Europe and the countries of the former USSR.

- **Academic training opportunities for early-career Chinese scientists**
  
  There is potential to further enhance participation by young Chinese doctoral and post-doctoral students in IIASA’s programs to develop international and interdisciplinary research skills (see Capacity Building, page 12). Becoming a partner in IIASA’s forthcoming International Postgraduate School of Excellence will be another fine opportunity.
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’s research areas are energy & climate change; food & water; and poverty & equity.

IIASA is at the center of a global research network of around 2,500 scholars and nearly 600 partner institutions in over 65 countries. It is funded and supported by its National Member Organizations which represent the scholarly communities in the following countries:

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

Contact

IIASA, Schlossplatz 1, A-2361 Laxenburg, Austria

Phone: +43 2236 807 0
Fax: +43 2236 71313
E-mail: info@iiasa.ac.at
Web: www.iiasa.ac.at

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