Research collaborations between IIASA and the UK have been highly productive throughout IIASA history, but even more so, since the UK rejoined IIASA as a member in 2015. Since 2010, this cooperation has involved over 50 UK organizations and led to over 200 joint scientific publications. Current collaborations between IIASA and the UK are enhancing UK expertise in developing and applying systems analysis, especially integrated assessment models. Establishing multinational and multidisciplinary teams of researchers is a key building block in IIASA work and many productive partnerships exist between IIASA and UK researchers as this Info Sheet shows. These activities are complemented by scientific exchange with over 550 researchers visiting the UK from IIASA and over 370 researchers, advisors and diplomats visiting IIASA from the UK, over the same period. Beyond continuing these research collaborations, there is significant opportunity to grow the relationship between IIASA and the UK scholarly community, through joint research projects, scientific exchange and collaborative capacity building activities. Opportunities for such activities will be facilitated through the forthcoming IIASA strategic plan 2021-2030 and new IIASA membership strategy, which United Kingdom Research and Innovation (UKRI) are helping to shape via their role on the IIASA governing council. This IIASA Info Sheet provides a summary of this expanding relationship since 2010.

<table>
<thead>
<tr>
<th>National Member Organization</th>
<th>United Kingdom Research and Innovation (UKRI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Membership start date</td>
<td>2015</td>
</tr>
<tr>
<td>Selected key research partners</td>
<td>69 UK organizations have collaborated with IIASA including:</td>
</tr>
<tr>
<td></td>
<td>- Natural Environment Research Council (NERC)</td>
</tr>
<tr>
<td></td>
<td>- Centre for Ecology and Hydrology (CEH)</td>
</tr>
<tr>
<td></td>
<td>- Department for International Development (DIFID)</td>
</tr>
<tr>
<td></td>
<td>- Government Office for Science</td>
</tr>
<tr>
<td></td>
<td>- Imperial College London</td>
</tr>
<tr>
<td></td>
<td>- London School of Economics and Political Science (LSE)</td>
</tr>
<tr>
<td></td>
<td>- Met Office</td>
</tr>
<tr>
<td></td>
<td>- Tyndall Centre for Climate Change Research</td>
</tr>
<tr>
<td>Areas of research collaboration</td>
<td>- Tackling climate change</td>
</tr>
<tr>
<td></td>
<td>- Supporting the UK’s changing energy landscape</td>
</tr>
<tr>
<td></td>
<td>- Protecting ecosystems, biodiversity, farmlands and forests</td>
</tr>
<tr>
<td></td>
<td>- Projecting demographic change in the UK</td>
</tr>
<tr>
<td></td>
<td>- Increasing disaster resilience</td>
</tr>
<tr>
<td></td>
<td>- Advancing the methods of systems analysis</td>
</tr>
<tr>
<td>Capacity building</td>
<td>26 doctoral students from the UK or funded by the UK NMO have participated in IIASA Young Scientists Summer Program since 2010</td>
</tr>
<tr>
<td>Publication output</td>
<td>over 200 publications have resulted from IIASA-UK collaborations</td>
</tr>
<tr>
<td>Scientific exchange</td>
<td>Over 370 researchers, advisors, and diplomats from the UK have visited IIASA or participated in IIASA events, while IIASA scientists have visited the UK over 550 times</td>
</tr>
</tbody>
</table>
Activities with Member Countries: UK

IIASA Info Sheet 2020/02

The electronic version of this document is available at www.iiasa.ac.at/uk

© 2019 IIASA
ZVR 524808900

Prepared by
External Relations, Communications and Library Department
IIASA, Schlossplatz 1, A-2361 Laxenburg, Austria
E-mail: externalrelations@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 recent interactions with the UK. It includes highlights with links to further information but is not meant to be a comprehensive report on all interactions.

Feedback and updates are encouraged and should be sent to the External Relations Department.
IIASA National Member Organization in the UK

United Kingdom Research and Innovation (UKRI) is the National Member Organization (NMO) representing UK membership of IIASA. UKRI is a quasi-autonomous non-governmental organisation of the United Kingdom that directs research and innovation funding, funded through the science budget of the Department for Business, Energy and Industrial Strategy and brings together seven existing research councils. This includes the Economic and Social Research Council (ESRC), Engineering and Physical Sciences Research Council (EPSRC) and the Natural Environment Research Council (NERC), each of whom specifically allocates budget towards IIASA membership.

Professor Dr. Duncan Wingham, Executive Chair of NERC, is the IIASA Council Member for the UK, as well as being a member of the IIASA Council Research and Engagement Committee.

Matthew Dobson, Senior Programme Manager – NERC, is the NMO Secretary for UK.

An NMO Committee advises the UK NMO and is made up of the following members:

Professor Brian Collins, Professor of Engineering Policy at University College London, and Director of the International Centre for Infrastructure Futures (ICIF)

Professor David Fowler, Fellow, The Royal Society and UKCEH Fellow. UK Centre for Ecology and Hydrology

Professor Nigel Gilbert, Professor of Sociology, University of Surrey

Professor Jim Hall, Professor of Climate and Environmental Risks in the School of Geography and the Environment, Senior Research Fellow in the Department of Engineering Science and Fellow of Linacre College, University of Oxford

Dr. Rupert Lewis, Director, Government Office for Science

Professor Sir Alan Wilson, Chief Executive of the Alan Turing Institute and Professor of Urban and Regional Systems in the Centre for Advanced Spatial Analysis, University College London

Email: matthew.dobson@nerc.ukri.org
IIASA is continually developing collaborations with the UK and has recently been working with 69 organizations in the UK via formal and informal connections.

### Research Partners in UK

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

- Agra CEAS Consulting
- AMEC Environment & Infrastructure UK Ltd - NKA: Amec Foster Wheeler
- Anglia Ruskin University Higher Education Corporation
- BirdLife International
- Buro Happold
- CDP Global
- Centre for Ecology & Hydrology
- Climate & Development Knowledge
- Cranfield University
- De Montfort University
- Department for Business, Energy and Industrial Strategy
- Department for International Development (DFID)
- Environmental Research Group Oxford Ltd (ERGO)
- EcoMetric Consulting, Research and Consulting
- European Space Agency (ESA)
- Global Canopy Project (GCP)
- Health UK
- ICF Consulting Limited
- Imperative Space
- Imperial College London
- Institute for European Environmental Policy (IEEP)
- Institute of Development Studies IDS
- International Food Policy Research Institute
- ITP Energized
- King’s College London
- Lancaster University
- Local Government Information Unit
- London School of Economics and Political Science
- London School of Hygiene & Tropical Medicine
- Met Office
- Natural Environment Research Council (NERC)
- Open University
- Public Health England (PHE)
- Global Challenges Research Fund (GCRF)
- Ricardo-AEA and MetroEconomica
- Rothamsted Research
- Royal Veterinary College
- RPS Environmental Management Ltd
- Scottish Government
- SOAS University of London
- Systemiq Limited
- Department for Business, Energy & Industrial Strategy
Activities with Countries: United Kingdom

- Natural History Museum
- UN Environment World Conservation Monitoring Centre (UNEP-WCMC)
- Unilever UK Central Resources Limited
- University College London
- University of Aberdeen
- University of Birmingham
- University of Bristol
- University of Cambridge
- University of Dundee
- University of East Anglia
- University of East London
- University of Edinburgh
- University of Essex
- University of Exeter
- University of Leeds
- University of Leicester
- University of London
- University of Nottingham
- University of Oxford
- University of Reading
- University of Sheffield
- University of Southampton
- University of Sussex
- University of York
- Vivid Economics Limited
- Wellcome Trust
- World Energy Council (WEC)
Recent Research Collaborations

**Tackling climate change**
Achieving the UK’s goal of reducing greenhouse gas emissions to zero net by 2050 will require adopting and implementing the most effective and efficient strategies. The holistic approach of systems analysis can help identify strategies that reap multiple benefits across sectors and regions, as well as avoid policies that lead to negative side effects in remotely connected activities. Numerous joint studies between IIASA and UK researchers have adopted this approach through the use of integrated assessment models and have been exploring how to tackle climate change from multiple angles.

The IIASA integrated assessment model, GAINS, identifies smart mixes of measures to simultaneously cut air pollution and greenhouse gas emissions in the most cost-effective way. It has been applied successfully to many international environmental negotiations. UK-IIASA collaborations in the area of tackling greenhouse gas emissions and those using GAINS include:

- The Complex Urban Systems for Sustainability and Health (CUSSH) project is a four-year Wellcome Trust funded project, that began in 2018 and will deliver key global research on the systems that connect urban development and health. The project is focused on the cities of Beijing and Ningbo (China), London (UK), Nairobi and Kisumu (Kenya) and Rennes (France). It will assist decision-makers and the public about areas of development that afford the greatest opportunities for health and sustainability and aims to develop critical evidence on how to achieve the far-reaching transformation of cities needed to address vital environmental imperatives for population and planetary health in the 21st century.

- Various collaborations with NERC’s Centre for Ecology & Hydrology (CEH) on how to reduce emissions of nitrous oxide (N₂O)—now the most significant ozone-depleting substance emission and the third most important greenhouse gas released into the atmosphere. Joint activities included the European Nitrogen Assessment (2013), the EU-funded projects NitroEurope (2006-11) and ECLAIRE (2011-15), and collaboration on the UNEP Synthesis Report “Drawing Down N₂O to Protect Climate and the Ozone Layer (2013)”

- In 2014, in collaboration with King’s College London, among other partners, IIASA explored the socio-economic implications of individual responses to air pollution policies in Europe as part of the EU-funded SEFIRA project.

- Research with CEH, King’s College London, the Stockholm Environment Institute in York, and various US institutions among others identified strategies to reduce short-lived climate pollutants, methane and black carbon, and was published in Science (2012). The integrated approach identified measures that would simultaneously increase human wellbeing through reduced local air pollution, 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.

- The Convention on Long-Range Transboundary Air Pollution, of which the UK is party to — is one of the first international environmental treaties that has helped Europe slash air pollution. At the centre of the treaty is the IIASA GAINS model, and convention, through its Network for Integrated Assessment Modeling (NIAM), has encouraged parties to collaborate with IIASA and develop their own national integrated assessment models as a means to enhance national activities to cut air pollutants. Imperial College London is part of NIAM and has collaborated with the GAINS team to establish a UK integrated assessment model to analyze measures to tackle air pollution. In addition, the GAINS team regularly consults with Defra to ensure its model uses the best data for the UK.

- A IIASA led a consortium of organizations including UK partner, Ricardo-AEA and MetroEconomica as part of the EU-funded ECIMACS project, to develop a toolbox of well-established modelling tools to enable policy makers to explore the synergies and interactions between climate change, air quality and other policy objectives including EU energy, transport and agricultural policies. The research has informed the revision of the EU’s Thematic Strategy on Air Pollution, and was completed in 2013.
Other collaborations in applying integrated assessment models have used IIASA MESSAGE (Model for Energy Supply Strategy Alternatives and their General Environmental Impact) model which aids medium- to long-term energy system planning, energy policy analysis, and scenario development. These include:

- University College London and other partners are working with IIASA on the project, ADVANCE. The project aims to develop a new generation of integrated assessment models for the analysis to support climate policy making. It will critically improve the capability of Integrated Assessment Models (IAMs) to inform the design and evaluation of climate policies, by targeting major advancements in describing transformative change in the economy, in technology and in consumer goods and services and in describing distributional impacts of climate change and climate policy. The project will run until 2023.

- IIASA energy experts worked with the London School of Economics’ Grantham Research Institute on Climate Change and other global partners to carry out a rigorous assessment of what a stringent climate policy entails, and what is needed to overcome major impediments as part of the EU-funded project, LIMITS which ran from 2011 until 2014.

- In 2011, IIASA and the Imperial College London’s Grantham Institute for Climate Change jointly studied low-carbon transition technologies and policies for China to 2050 as part of the AVOID research program. This provides advice to the UK Government (DECC and Defra) on avoiding dangerous climate change. The research also look at the feasibility of global and regional mitigation pathways as part of the second phase of AVOID and the findings informed international policy discussions at the UN Climate Change conference in Paris in 2015.

- The project, AMPERE, which was completed in 2014, explored mitigation pathways and associated mitigation costs under real-world limitations and offered insights into the differences across models and the relation to historical trends. IIASA, the UK’s Met Office and 19 other international partners were part of the project’s consortium.

- Collaborations with multiple UK researchers also took place via the Intergovernmental Panel on Climate Change with IIASA and UK researchers working closely together in the Working Group III of the Fifth Assessment Report on Chapter 7 on energy systems and the summary for policy makers.

**Addressing the impacts of global warming**

IIASA, UK researchers and other international partners are contributing to a growing body of knowledge about the impacts of global warming of 1.5°C above pre-industrial levels and how to achieve this ambitious target. Scientific input from IIASA and UK researchers focuses on mitigation pathways compatible with the 1.5°C target in the context of sustainable development and the possible impacts on natural and human systems. The results of this work has included, advice for decision makers on feasible policies to limit global warming to 1.5°C and contributions to the Intergovernmental Panel on Climate Change (IPCC) Special Report on the Impacts of Global Warming of 1.5°C, which cited more than 6,000 scientific references, involved 91 authors from 40 countries and 133 contributing authors. 12 of those authors were from IIASA. UK collaborators on these studies were based at Imperial College London, University of Exeter, University of Oxford, University College London and University of Leeds.
Supporting the UK’s changing energy landscape

In 2008 the UK Committee on Climate Change called for a focus on reducing emissions from the power and energy sectors as one of the top priorities in decarbonizing the economy. This has been a huge success within the UK, with emissions now down 68% from 1990 levels. However, achieving future targets requires a thorough understanding of the complex global energy system and its multiple connections with the UK economy, environment and society. Integrated, international assessments are one of the few research approaches that has the breadth and depth to explore such complex problems across multiple sectors, regions, and timeframes. IIASA has developed substantial expertise in international energy assessments ever since the Institute’s researchers carried out the first comprehensive, truly global assessment of energy issues (1973 – 1981).

IIASA led the Global Energy Assessment (GEA), until 2012, in which a new global energy policy agenda is defined—one that transforms the way society thinks about, uses, and delivers energy. GEA involved over 500 specialists from a range of disciplines, industry groups, and policy areas, to identify pathways and policies to facilitate equitable and sustainable energy services for all. The UK was a significant contributor to the GEA with contributions from partners at University of York, University of Oxford, Imperial College London and University of Exeter, to name a few. The findings relevant to the UK were outlined at the UK launch of the GEA by IIASA at Chatham House in 2012. Areas of particular interest were the analysis of the major energy challenges, the evaluation of the energy resources and technological options available to build a sustainable energy system, and the policies and investments needed to make these future systems a reality.

Other UK-IIASA collaborations have explored the roles that technology, risk, and the environment can play in energy transitions:

- IIASA researchers recently studied demand side management (DSM), which has been recognized as a powerful tool to balance renewable energy in the UK energy grid and if done well can help the UK transition to a more sustainable energy system. The outcomes showed this is possible, but that a better regulatory framework will be required in the future, to counteract the negative effect from competing electricity utilities. The findings were published in Advanced Computational Methods for Knowledge Engineering in 2017.

Selected publications resulting from IIASA-UK collaborations

IIASA work is underpinned by high-quality science, which is regularly published in high impact publications. A selection of current publications is presented here and full list can be found in appendix 4:


**Projecting demographic change in the UK**

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. 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 to explore how changes in society, economy, and the natural environment influence the health and mortality, migratory patterns, and reproductive behavior of human society.

An 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 ability to adapt to climate change. In 2014 IIASA published the first projections of educational attainment by age and sex for 195 countries in *Oxford University Press*. Findings for the UK show how different policies over the next few decades could lead to the country’s 2010 population of 62.7 million rising to 77 million by 2060 or remaining close to 71 million.

Other population and demographic studies related to the UK include:

- A recent report by the UK’s Office of National Statistics entitled *Living Longer: Is Age 70 the New Age 65?* used the new approach to population aging pioneered at IIASA. The report contained an innovative section on the historical relationship between health and measures of population aging. It concluded that the IIASA approach is more consistent with changes in health over time than is the conventional approach. The Office of National Statistics report is an example of how IIASA research on population aging is increasingly being applied to aid in policy discussions.

- A study published in *Obesity* in 2018 by IIASA researcher Raya Muttarak, revealed that overweight and obese adults in the UK are more likely to underestimate their weight status and less likely to try to lose weight, especially among lower-income, lower-education, and minority groups.

- A six-year study focused on demographic techniques to project changes to people’s skills, productivity, attitudes and beliefs in Europe over the coming decades and was completed in 2015. Another project, which developed new demographic tools to study aging and its impact on European pension and health systems and was completed in 2018.
IIASA Info Sheet 2020/02

Protecting ecosystems, biodiversity, farmlands and forests

IIASA works with a range of UK research institutions to explore different aspects of the global carbon cycle in order to reduce the huge scientific uncertainties surrounding how the natural world both releases and absorbs greenhouse gases, which in turn will improve climate change predictions. Collaborations range from remote sensing to forest management to biofuels and include the following collaborations:

- The LandSense project which has been running since 2016 and will be completed in 2020, includes the UK partners, BirdLife International and University of Nottingham. The project has helped to build an innovative citizen observatory in the field of Land Use Land Cover (LULC), which collects data both actively (through citizens) and passively (from authoritative, and open access sources) and integrates them to provide valuable quality-assured in-situ data for SMEs, larger businesses, government agencies, NGOs and researchers.

- IIASA with partners at the University of Leeds and University College London and other international partners, are currently working on building an International Forest Biomass Network. The network would openly share their data on biomass for the benefit of different communities and bring together as much on-site data on biomass as possible to prepare for new satellite missions, with a view to improve the accuracy of current remote sensing based products, and to develop new synergies between remote sensing and ground-based ecosystem research communities.

- The UK RSA Food, Farming and Countryside Commission, IIASA and other international partners are part of the Food Agriculture, Biodiversity, Land-Use and Energy (FABLE) Consortium which seeks to establish a model-aided decision-support environment for sustainable development pathways in the land use space. FABLE brings together knowledge institutions from developed and developing countries to advance the analytical capacity for strategic land use planning.

Many of today’s most pressing challenges do not stop at 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 that their investment in IIASA is a contribution to a global public good. And the benefit of this contribution is paid back to global researchers, policymakers, and citizens in multiple ways as the following examples show:

1. 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 IPCC’s (Intergovernmental Panel on Climate Change) Fifth Assessment Report.

2. 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 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.
In 2017 researchers from Imperial College London asked IIASA researchers to join a consortium that was carrying out a comparative assessment and region-specific optimization of greenhouse gas removal technologies. IIASA is contributing its expertise to develop a techno-economic engineering model for bioenergy and carbon capture and storage in the UK and Europe with a focus on the biomass feedstock supply from existing and possible future energy crop and forest species. This aspect necessarily brings together social science, engineering and environmental sciences. An important part of the joint research is an active exchange of staff members between IIASA and Imperial College London.

Forests are the focus of multiple IIASA studies with partners in the UK, including the London School of Economics, the Global Canopy Programme in Oxford, and the World Conservation Monitoring Centre in Cambridge. Current projects include analyzing incentives to protect global forests in the future via REDD (reducing emissions from deforestation and forest degradation) schemes, and developing technical know-how and capacity in designing efficient, effective and environmentally relevant policy strategies for REDD.

Other collaborations with UK researchers at Imperial College London and the University of Bristol have explored the emerging bioenergy sector. In particular, the research showed how land-use modelling tools can help distinguish the bioenergy options that can address energy security and greenhouse gas mitigation from those that cannot.

Global warming of 2°C will impact agriculture, forests and tourism among many other land uses. IIASA contributed to the IMPACT2C between 2011-2015, with its biophysical crop and forestry models to quantify such impacts and is developing its economic land use model GLOBIOM to help in the costing of different adaptation options. UK partners on this project included the Met Office, Paul Watkiss Associates, University of Southampton, and the Stockholm Environment Institute in Oxford.

The different land-use sectors play key roles in the global carbon cycle, and IIASA, the University of Aberdeen, CEH, Cranfield University, and the Met Office worked on the CARBO Extreme project through until 2015. Together they improved understanding of how extreme weather events impact the Earth's ability to absorb carbon and published early findings in Nature in 2013.

Increasing climate and disaster resilience

Joint research has assessed ways to improve proactive climate and disaster risk management through helping countries and sectors prepare for natural disasters, providing management tools for those working in disaster prevention and emergency preparation roles, and identifying effective ways to adapt to anticipated changes from climate change.

IIASA and the London School of Economics’ Grantham Centre, are core members of the Flood Resilience Alliance. An innovative partnership between research, development and humanitarian NGOs and the private sector that work together to make at step change with regard to policy, finance and practice of managing floods and other climate-related hazards towards increased community resilience. In its first phase (2013-2017), the Flood Resilience Alliance focused on shifting efforts from the traditional focus on post-event recovery to pre-event flood risk reducing and resilience-building actions. To further boost community resilience and reduce flood risk around the globe, the project has been prolonged into a second five-year phase (until 2023). The partners will continue to work together to unlock new and innovative pathways and finance for boosting community resilience in more than 15 countries through community-level interventions and cutting-edge research.

A 2017 study by IIASA researchers across Austria, the UK and Romania found that there is room for improvement in both public and private schemes, that could help encourage risk reduction behaviors and reduce loses in future disasters. The study which was published in the journal Risk Analysis, provided a detailed look at different public and private incentives for risk reduction and their association with actual risk reduction behavior across the three case study countries.
Basic research: Advancing the methods of systems analysis

IIASA brought its expertise in modeling complex systems including characteristics such as thresholds, feedback loops, avalanche effects, and irreversibility, to the COMPLEX project which ran between 2012 and 2016. It was coordinated by the University of Newcastle upon Tyne. The researchers developed a suite of modeling tools and decision-support systems to inform national and supra-national policy and support communities across Europe, to work in making the transition to a low-carbon economy.

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. Collaborations with UK researchers include:

- Researchers from IIASA and the University of Sheffield, among others, analyzing the impacts that hybridization has on the process of speciation.
- The development of a theory to explain why a predator switches between different species of prey with a biologist from Royal Holloway, University of London.

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:

- Global food demand could increase by more than 59% by the year 2050, according to an unprecedented comparison of 10 agricultural economic models by researchers from ABARES, IIASA and 8 other countries. The study found that demand is likely to increase by 59-98% between 2005 and 2050, more than the 54% projected by the UN Food and Agricultural Organization’s most recent analysis. The study compared food demand projections for 2050, based on different population and wealth projections, as well as for different regions and products. It found that uncertainties related to population, income, and consumption, often factors which are set as assumptions in agricultural models, are even greater than uncertainties related to climate change. For example, when considering a world with higher population and lower economic growth, consumption per capita drops on average by 9% for crops and 18% for livestock. The maximum effect of climate change on calorie availability is -6% at the global level. (Source: Valin H, Sands RD, van der Mensbrughe D, Nelson GC, Ahmammad H, Blanc E, Bodirsky B, Fujimori S, Hasegawa T, Havlik P, Heyhoe E, Kyle P et al. (2014) The future of food demand: Understanding differences in global economic models, Agricultural Economics, 45(1):51-67).

Many of the research areas in this 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 (Energy Access Interactive Tool (ENACT)).
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. The following 26 young researchers from the UK or undertaking a PhD in the UK have participated in the program since 2010:

YSSP ’19

Safa Fanaian (University of Oxford) provided a context-specific approach that can be applied to improve the resilience of riverine cities in India and the global south.

Rory James Gibb (University College London) conducted a case study on accounting for land use and climate change uncertainty in projections of zoonotic disease under global change, focusing on an outbreak of lassa fever in West Africa.

Matthew Gibson (Imperial College London) studied the food-energy nexus of grain supply chains in India and modeling the role of energy in reducing food loss.

Fortune Faith Gomo (University of Dundee) developed a basin-level system dynamics model to support integrated decisions across water, energy and food (WEF) sectors.

Yoga Wienda Pratama (Imperial College London) considered technology cost and fuel price as endogenous variables in energy system planning, using the UK power system as the case study.

YSSP ’18

Judith Maria Ament (University College London) conducted research into location-specific population density estimates and if they improve predictions of wildlife population abundance trends under future global change scenarios.

Tony William Caar (University College London) studied the impact of climate change and land degradation on global crop yields.

James Hawkins (Lancaster University) identified low emissions development pathways in the East African livestock sector using the REDD+ model.

Aman Majid (University of Oxford) researched a networks based approach to the energy-water nexus to demonstrate that greater efforts to combine modeling and planning going forward are needed as climate change worsens.

Jiamin Ou (University of East Anglia) researched demand-driven ground-level ozone pollution in the Guangdong province of China, in order to provide a new angle in understanding the ever-increasing O3 pollution from the supply and demand side.

Anton Pichler (University of Oxford) looked at the Implications of heterogeneous technologies on climate policy focusing on an agent-based model approach.

YSSP ’17

Hana Mandova (University of Leeds) researched the potential for meeting emission reduction targets of the iron and steel industry using biomass.

YSSP ’16

Munire Koseoglu (University of Edinburgh) researched detecting systemic risk in the financial system by sentiment analysis of textual big data.

Sebastian Maier (Imperial College London) studied risk-managing a portfolio of systemic low-carbon urban infrastructure investments using approximate dynamic programming with decision dependent uncertainties.

Cesar Terrer Moreno (Imperial College London) researched the quantification of the terrestrial CO2 fertilization effect based on nitrogen availability and mycorrhizal association.
Rebecca Pike (University of Bristol) studied cultural evolution of low fertility at high socio-economic status.

Frank Sperling (University of Oxford) looked into realizing the SDGs and the Paris Agreement relating to implications for landuse interactions in Africa.

Dina Subkhankulova (University College London) explored the possibility of decentralised control of plug in electrical vehicles (PEV) charging guided by autonomous agents which is then evaluated in terms of their ability to reach the global system goal of balancing intermittent energy supply with consumer demand.

YSPP '15

Erasmus Zu Ermgassen (University of Cambridge) researched the influence of property size on sustainable agricultural intensification in Mato Grosso, Brazil.

Franziska Gaupp (University of Oxford) identified the risks of correlated droughts to food supply in the world’s breadbaskets.

Rui Hu (Imperial College London) researched the innovation and technological capabilities of the Chinese wind turbine industry.

Asif Khan (University of Cambridge) studied the impact of climate change on spatial and temporal variations in stream-flow components during 1970-2010 in the Upper Indus Basin.

YSPP '14

Edoardo Borgomeo (University of Oxford) researched the water resources system vulnerability to hydrological variability and climate change in the Thames river basin.

William Lamb (Tyndall Centre for Climate Change Research) identified the consequences of delayed mitigation of climate change in the global North for adequate developmental opportunity for the global South by exploring the link between emissions, energy and human well-being, and modelling scenarios of delayed mitigation action.

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.

Other interactions with business include researching with German organizations, 50Hertz and Tennet how to expand the European electricity grid to integrate a growing share of electricity from renewable sources as part of the EU-funded BESTGRID project (2013-15). In addition, IIASA is exploring ways that it can work more closely with multinational corporations, including Anglo-Dutch corporations Unilever and Shell, particularly through input to the development of their global sustainable business plans.


**YSSP ’13**

Dominique Thronicker (University of Stirling) researched the spatial and temporal diffusion of a range of chemical industry production processes (e.g., for ammonia, ethylene, benzene, chlorine, caustic soda) to see what insights were revealed for patterns, drivers and constraints of future technological change. (Funded by the German NMO)

**YSSP ’12**

Lan Ngoc Hoang (Leeds University) used various methods to simulate and analyze different water management options for North Sussex in order to identify the most robust and resilience water policies in the face of climate change. (Funded by the Petr Aven Fellowship—a former YSSP participant, Petr Aven, donated a fellowship fund to IIASA to sponsor one YSSP participant every year)

**IIASA-NERC Collaborative Research Fellowships**

The IIASA-NERC Collaborative Research Fellowships programme will provide three years of support for promising early-career researchers to deliver challenging research and support the development of long-term collaborative working relationships between the UK and IIASA research communities. The selected fellows are expected to spend their time equally between their UK research organisation and IIASA over the lifetime of their award.

In addition to completing a programme of research linked to the remits of both NERC and IIASA, fellows will be required to undertake network-building activities to establish sustainable, collaborative and interdisciplinary relationships between UK and IIASA researchers. Fellows are to be supported in these activities by a senior researcher who will act as both mentor to the fellow and help to facilitate network-building activities. The first three fellows have been accepted onto the program and will begin their research in 2020.

In 2019, NERC who form part of the UK NMO, launched a fellowship program in collaboration with IIASA, to provide three years of support for promising UK based early-career researchers


Several IIASA researchers hold positions at universities and research centers in the UK. These include Michael Obersteiner (Director of the Environmental Change Institute, University of Oxford), Laixiang Sun (SOAS, University of London), and Charlie Wilson (Tyndall Centre for Climate Change Research, University of East Anglia).

IIASA researchers have also made numerous presentations in the UK, a selection follows:

- **Klaus Hubacek** on “Local to Global: Economic and Environmental Trade-offs of the Food-Energy-Water-Ecosystem Nexus” at Cambridge University in 2019.
- **Hugo Valin** on “Landuse Conservation in the 21st Century” at the Land Use Futures Workshop at Cambridge University in 2018.
- **Åke Brännström** on “Adaptive Dynamics for Spatially-Structured Populations” at the International conference in Models in Population Dynamics, Ecology and Evolution (MPDEE’18) at the University of Leicester in 2018.
- **Yoshihide Wada** on “Sustainability of global water use: An integrated water resources modeling framework to assess surface water and groundwater overuses” at University College London in 2016.
- **Wolfgang Lutz** on “Global Population Trends consistent with the SDG Health and Education Goals” at the conference Systems Analysis Applied to Environment and Health at the Royal Society, in 2016.

Other examples of scientific exchange include:

- 213 publications have resulted from IIASA-UK collaborations since 2010.
- Since 2010, 26 doctoral students from the UK, studying in the UK or funded by the UK NMO have gained international and interdisciplinary research experience from participating in the IIASA Young Scientists Summer Program.
- Over 130 researchers, advisors, and diplomats from the UK have visited IIASA and over 240 UK Citizens have participated in IIASA events since 2010.
- IIASA scientists have visited the UK 560 times.

**Appendices**

Summaries detailing the presented information can be requested by contacting the External Relations Department [externalrelations@iiasa.ac.at].
Prospects for Future IIASA-UK Activities

This Info Sheet summarizes recent research collaborations between IIASA and the UK (see pages 6 to 12). Significant potential remains to further intensify the IIASA-UK relationship through developing a range of new joint activities including:

- **Enhancing UK expertise in applying system analysis to national problems**: Developing bespoke UK versions of IIASA global models would allow researchers and policymakers to look at complex global problems and their impact on Germany in a holistic and integrated way.

- **Conducting international assessments in areas of UK strategic interest**: The UK was a significant contributor to the IIASA Global Energy Assessment which brought together over 500 specialists to transform the way society thinks about, uses, and delivers energy. The new IIASA Strategy for 2021-30 will empower its members to collectively initiate large-scale interdisciplinary projects of high relevance to the regions where its members are located.

- **New partnerships between IIASA and UK institutions to win grants from international research funders**: IIASA high-quality research and international research network makes it highly competitive in its applications for international research funds. About half of IIASA income comes from additional funds through contracts, grants and donations. This is growing and has increased by up to 25% from €8.4 million in 2017 to €10.5 million in 2018.

- **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 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 box: Research to support science diplomacy: page 9).

- **Academic training opportunities for young UK scientists**: There is significant potential to enhance participation by young UK postdoctoral students in IIASA programs to develop international and interdisciplinary research skills (see pages 13-15: Capacity Building).
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 830 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:

Austria, Brazil, China, Egypt, Finland, Germany, India (Observer), Indonesia, Iran, Israel, Japan, Mexico, Malaysia (Observer), Norway, 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
facebook.com/iiasa
twitter.com/iiasavienna
linkedin.com/company/iiasa-vienna
youtube.com/iiasalive
blog.iiasa.ac.at
www.flickr.com/photos/iiasa/