



## Activities with Member Countries

# Australia

iiasa info sheet

While collaborations between researchers in Australia and at IIASA date back to the 1980s, formal membership of IIASA began in 2013 through Australia’s Commonwealth Scientific and Industrial Research Organisation (CSIRO). Recent research collaborations on internationally significant projects include developing sustainable livestock systems, creating land cover maps and data, the Integrated Assessment Modeling Consortium whose work supported the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report, the Global Carbon Project, the Global Energy Assessment, and the Water Futures and Solutions Initiative. Such global networks share energies, expertise, and skills in developing and applying advanced systems science as well as strengthening the Australian research communities’ global connections. Significant potential remains to grow the relationship between IIASA and Australia’s scholarly community. Opportunities for additional research collaboration have been identified in the fields of sustainable agriculture and biodiversity, energy, water, and critical resources. Areas for future mutual development could also include research on tropical deforestation, extreme events, and global health. Capacity building through greater scientific exchange via researching at or visiting IIASA, or taking part in IIASA’s programs for young scientists, will also be a priority for the partnership. This IIASA Info Sheet provides a summary of this growing and mutually beneficial relationship since 2008.

Highlights of Interactions Between IIASA and Australia (former member)	
<b>National Member Organization</b>	Commonwealth Scientific and Industrial Research Organisation (CSIRO)
<b>Membership dates</b>	2013 - 2017
<b>Selected research partners</b>	<ul style="list-style-type: none"> <li>■ Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES)</li> <li>■ Australian National University (ANU)</li> <li>■ Commonwealth Scientific and Industrial Research Organisation (CSIRO)</li> <li>■ Curtin University of Technology</li> <li>■ Macquarie University</li> <li>■ RMIT University</li> <li>■ Terrestrial Ecosystem Research Network (TERN)</li> <li>■ University of New South Wales (UNSW)</li> <li>■ University of Technology, Sydney</li> <li>■ Victoria University</li> </ul>
<b>Areas of research collaboration</b>	<ul style="list-style-type: none"> <li>■ Sustainable Agriculture and Food Security</li> <li>■ Sustainable Energy Future and Climate Change</li> <li>■ Global Energy Assessment and Australia</li> <li>■ Water Futures and Solutions</li> <li>■ Projecting Changing Population and Human Capital in Australia and around the World</li> <li>■ Analyzing Ecological and Evolutionary Dynamics</li> </ul>
<b>Capacity building</b>	Three doctoral students from Australia have participated in IIASA’s young scientists summer programs since 2006
<b>Publication output</b>	69 publications have resulted from collaborations between IIASA and researchers at Australian institutions since 2008
<b>Other interactions</b>	<ul style="list-style-type: none"> <li>■ 70 Australians have participated in IIASA events since 2008</li> <li>■ 28 researchers, advisors, and diplomats from Australia have visited IIASA since 2008, while IIASA scientists have visited Australia 30 times</li> </ul>

## Activities with Member Countries: Australia

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

This Info Sheet summarizes IIASA's recent interactions with Australia. It includes highlights with links to further information, but it is not a comprehensive report on all interactions.

Feedback and updates are encouraged and should be sent to Kim Montgomery.

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## IIASA's National Member Organization in Australia

The Commonwealth Scientific and Industrial Research Organisation (CSIRO), is the National Member Organization (NMO) representing Australian membership of IIASA. The Australian Government determined that CSIRO is the Australian NMO and membership began in January 2013. CSIRO is Australia's national science agency, funded largely by the Australian Government, and is one of the largest and most diverse research agencies in the world.

**Dr. Alex Wonhas**, CSIRO Executive Director for Energy and Resources is the IIASA Council Member for Australia.

The NMO Secretary for Australia is **Dr. Mark Stafford Smith**, Chief Coordinating Scientist, Climate Adaption Research, CSIRO.

*Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) represents Australia and its scholarly community on IIASA's governing Council*



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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 (Shared Socioeconomic Pathways 3), 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 Mensbrugge D, Nelson GC, Ahammad H, Blanc E, Boudirsky 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 projects summarized in this Info Sheet draw on analyses from IIASA models, tools, and data including:

- Planning a sustainable energy system (MESSAGE model, Global Energy Assessment Scenario Database)
- Improving food security through identifying yield gaps (GAEZ model), assessing competition for land use between agriculture, bioenergy, and forestry (GLOBIOM model), and looking at social, economic, and environmental earth systems (Felix)
- Financial disaster risk management (CATSIM model)
- Projecting future population (Demographic multistate modeling)
- Reducing energy poverty (ENACT model)

IIASA's models, tools, and data

## Research Partners in Australia

*IIASA is continually developing collaborations with Australia and has recently been working with 27 organizations in Australia via formal and informal connections*

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

- AGL Energy Limited
- Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES)
- Australian Commission on Safety and Quality in Healthcare
- Australian National University (ANU)
- BAEconomics Pty Ltd
- Charles Darwin University
- ClimateWorks Australia
- Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- Curtin University of Technology
- Griffith University
- Macquarie University
- Monash University
- Queensland Centre for Mental Health Research
- RMIT University
- Terrestrial Ecosystem Research Network (TERN)
- University of Adelaide
- University of Melbourne
- University of New South Wales (UNSW)
- University of New England, New South Wales
- University of Queensland
- University of Sunshine Coast
- University of Sydney, Sydney
- University of Western Australia
- University of Tasmania
- University of Technology, Sydney
- Victoria University
- Victorian Infectious Diseases Reference Laboratory

Some leading Australian personalities from government and academia who are associated with IIASA (recent and past)

**Dr. Ian Chubb**, former Chief Scientist of Australia and Alpbach-Laxenburg Group Member

**Dr. Alan Finkel**, Chief Scientist of Australia

**Dr. Andrew Johnson**, Director of the Bureau of Meteorology, former IIASA Council Member for Australia

**Dr. Mark Stafford Smith**, Chair of the Future Earth Science Committee

**Ambassador David Stuart**, Ambassador of Australia to Austria

**Dr. Megan Clark**, former Chief Executive at CSIRO and current non-executive director of Rio Tinto Limited

## Recent Research Collaborations

### *Sustainable Agriculture and Food Security*

Australia is a large agricultural producer and the majority of its land is used for agriculture. Australia produces more food than it needs and exports two-thirds of its agricultural production. The agricultural sector is a vital part of Australia's economy and in 2014-2015 the gross value of Australian agriculture was over US\$50 billion.

Identifying ways to deliver sustained food production, while at the same time understanding the impacts of climate change and potential mitigation strategies to combat those effects, is a complex challenge that countries across the world, including Australia, face.

IIASA has developed significant expertise and research tools in these areas. Recent Australian-IIASA collaborations in this area include:

- An international collaboration including researchers from IIASA and CSIRO analyzed multiple Sustainable Development Goals policies for the management of land-based resources. Using a comprehensive modeling approach, the researchers examined how policies can manage trade-offs among the environmental conservation initiatives and food prices. This framework could help policymakers understand and negotiate potential trade-offs when constructing sustainable development strategies. This research was published in *Science Advances* in 2016.
- Agricultural experts from IIASA have been collaborating with researchers from CSIRO on developing sustainable livestock systems. In one study, the researchers investigated the economic viability of mitigation strategies and found that the economic mitigation potential might be smaller due to barriers and costs of adoption of the mitigation strategy. This research, which has implications for policymakers, was published in *Nature Climate Change* in 2016.

*Joint Australian-IIASA collaborations are developing sustainable livestock systems and tools to guide pathways for food security under climate change*

IIASA's 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 5.

Obersteiner M, Walsh B, Frank S, Havlik P, Cantele M, Liu J, Palazzo A, Herrero M, Lu Y, Mosnier A, Valin H, Riahi K, Kraxner F, Fritz S, & van Vuuren D. (2016). Assessing the land resource-food price nexus of the Sustainable Development Goals. *Science Advances*, in press.

Herrero M, Henderson B, Havlik P, Thornton PK, Conant RT, Smith P, Wirsenius S, Hristov AN, Gerber P, Gill M, Butterbach-Bahl K, Garnett T & Stehfest E (2016) Greenhouse gas mitigation potentials in livestock sector. *Nature Climate Change*, 6, 452-461.

Jackson RB, Candell J, Le Quéré C, Andrew RM, Korsbakken JI, Peters GP, & Nakicenovic N (2016). Reaching peak emissions. *Nature Climate Change*, 6, 7-10.

Lindh M, Zhang L, Falster D, Franklin O, & Brännström A (2014). Plant diversity and drought: The role of deep roots, *Ecological Modelling*, 290, 85-93.

O'Neill BC, Liddle B, Jiang L, Smith KR, Pachauri S, Dalton M, & Fuchs R. (2012). Demographic change and carbon dioxide emissions. *The Lancet*, 380(9837), 157-164.

Lim SS, et al (2012). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*, 380(9859), 2224-2260.

- An international collaboration including researchers from IIASA, CSIRO, and the University of Queensland used the FeliX model—a system dynamics model of social, economic, and environmental earth systems—to investigate emissions pathways when microalgae is used for feedstock. They found that using microalgae could free up 2 billion hectares of land currently used for pasture and feed crops while reducing emissions. This study was published in *Carbon Balance Management* in 2015.

**Selected publications  
resulting from Australia-  
IIASA collaborations**

- Researchers from IIASA and CSIRO investigated the effects of global climate change in the global agricultural system. The researchers covered nine different climate scenarios, 18 crops and 4 crop management systems; as well as interactions between consumption, crop production, prices, and trade. Using IIASA's Global Biosphere Management Model (GLOBIOM), the researchers identified potential adaptations to control the effects of climate change in the global agricultural system. The study was published in *Environmental Research Letters* in 2014.
- An international collaboration that included researchers from IIASA and ABARES compared the leading global economic models looking at the impacts of climate change on agriculture. The researchers were able to harmonize key drivers to make the different models more consistent. For example, the study found that for the particular climate shock chosen, all models report higher prices for almost all commodities in all regions. This study was published in *Agricultural Economics* in 2014.
- Researchers from IIASA, CSIRO, the University of Adelaide, and other research institutions examined the development and use of scenarios as a tool to guide pathways for food security under climate change, which threatens food production, access, and utilization in the developing world. The project involved regional-level workshops in East Africa with decision makers and found that ownership by the stakeholders is important. This project was published in *Global Environmental Change* in 2014.

### IIASA's global contribution

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:

- 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 Fifth Assessment Report.
- IIASA research provides scientific guidance to the Convention on Long-range Transboundary Air Pollution of the UN 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.

Accurate data is key to understanding agricultural potential. Australian-IIASA activities include:

- Geo-Wiki, a crowdsourcing tool developed by IIASA and partners, has established a global network of volunteers to help improve the quality of land cover maps and data. The Geo-Wiki Team in collaboration with the Terrestrial Ecosystem Research Network (TERN) AusCover developed the Auscover Geo-Wiki branch that focuses on reviewing land cover maps created by AusCover and its partners. AusCover Geo-Wiki allows "citizen scientists" to test and validate the maps produced by Australian state and federal agencies, NGOs, and researchers to improve the understanding and management of the Australian ecosystem.
- CSIRO has provided soil data from Australia to the Harmonized World Soil Database (HWSD), which was developed by IIASA and FAO.

## Sustainable Energy Future and Climate Change

The Australian energy sector represents 7% of Australia's GDP and employs thousands of people. Australia exports around 80% of its energy production, which amounts to over \$70 billion. The Australian Government is committed to ensuring energy access while reducing emissions and meeting climate change targets. Specifically, the Australian Government has proposed increasing its share of renewable energy sources so that 20% of Australia's electricity demand in 2020 comes from renewable sources. Along with their domestic energy landscape, Australia's energy future is integrally connected to complex global systems.

*Collaborations between Australian and IIASA researchers are investigating global energy systems and how to transition towards a sustainable energy future*

IIASA has substantial expertise in understanding global energy systems and their connections with economic, environmental, and societal systems. Recent Australian-IIASA collaborations in this area include:

- Energy experts from IIASA and the Australia National University are participating in the Deep Decarbonization Pathways Project (DDPP)—a global collaboration of energy researchers working on practical pathways for countries to reduce greenhouse gas emissions and transition to a low carbon future consistent with maintaining global warming below 2°C.
- Modeling teams from IIASA and ABARES are participating in the Asia Modeling Exercise (AME), an international collaboration, exploring the role of Asia in mitigating climate change. Since Asia accounts for 60% of the world's population and holds almost 40% of the world's GDP, it is necessary to understand the future growth, energy and emissions in Asia when researching future global climate change and mitigation strategies. ABARES is participating with the Global Trade and Environment Model in this project.
- The Global Carbon Project (GCP) was established in 2001 to develop a complete picture of the global carbon cycle. IIASA's Deputy Director General is on the project's scientific steering committee and one of the main GCP offices is at CSIRO. In 2013, the GCP and IIASA organized two workshops on the role of negative emissions for climate change mitigation at IIASA and in Tokyo. Recently, the GCP reported that annual global carbon dioxide emissions from fossil fuels could drop slightly in 2015, representing the first decline in emissions during a period of strong global economic growth. This report was published in *Nature Climate Change* in 2016.
- Researchers from IIASA, the University of New South Wales, and AGL Energy Limited researched the policy implications of the recent reductions in the underlying costs and market prices for solar photovoltaic (PV) systems. The study was published in *Renewable Energy* in 2013.
- ABARES is a member 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 Fifth Assessment Report of the IPCC includes: (1) the Representative Concentration Pathways database that provides greenhouse gas emission and other projections (see box: IIASA's Global Contribution, page 6), and (2) the Shared Socioeconomic Pathways (SSP) that facilitate the integrated analysis of future climate impacts, vulnerabilities, adaptation, and mitigation.
- In the run up to the UN Climate Change Conference in Copenhagen in 2009, IIASA developed a tool to compare the potentials and costs of greenhouse gas mitigation efforts for UNFCCC Annex 1 countries, which includes Australia. The tool was based on IIASA's GAINS model that identifies smart mixes of measures to simultaneously cut air pollution and greenhouse gas emissions, and input data for Australia and New Zealand was verified by researchers from the University of Technology, Sydney. In 2009, Robert Ewing of the Australian Government Treasury, Climate Change Modelling Unit, and Kath Rowley of Australian Government, Department of Climate Change participated in an IIASA workshop on the tool and its comparisons of greenhouse gas mitigation costs.

In related work on energy and climate change, IIASA risks experts are working with the Centre for Risk and Community Safety, RMIT University on lessons from disaster economics for climate change adaptation.

## Global Energy Assessment and Australia

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.

Ten researchers from Australian institutions including CSIRO, ANU, Curtin University of Technology, and BAEconomics Pty Ltd were lead or contributing authors to the GEA. Their contributions examined health and energy; urbanization and energy; and energy efficiency among others. Subho Banerjee, former Deputy Secretary of Australia's Department of Resources, Energy and Tourism, Australia spoke at the Indian launch of the GEA at the 4th Clean Energy Ministerial meeting in New Delhi, India in 2013.

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 (SEforALL) initiative on energy access, energy efficiency, and renewable energy, which in turn have informed the targets of the Sustainable Development Goal on energy.

## Water Futures and Solutions

*Australian-IIASA research collaborations are exploring water management and security issues and the impacts of global climate change*

Australia is the driest continent on earth and has below average rainfall levels leading to unique water management challenges. These challenges are likely to be exacerbated by Australia's increasing population and the impacts of global climate change.

IIASA has significant expertise in this area. In 2013, IIASA and partners launched the Water Futures and Solutions (WFaS) initiative— an interdisciplinary and international scientific project to explore our complex water challenges and identify integrated solutions. The initiative uniquely combines scenario-based water analysis, multi-model ensemble analysis, and stakeholder consultation. CSIRO is contributing to this IIASA-led initiative.

Additionally, the Global Water System Project, which supports global assessments of water research into the development of mitigation strategies due to climate change, is relocating from the University of Bonn in Germany to the Griffith University's Australian River Institute. This relocation provides IIASA and Australia a new opportunity to strengthen collaborations on water projects.

Additional Australian-IIASA collaborations in this area include:

- An international collaboration including researchers from Griffith University developed projections of water availability, changes to irrigated areas, and cropland use for the Middle of the Road (SSP2) scenario. This work is being used to map human water security.
- Additionally, an agro-forestry plantation project located in Narrandera, New South Wales, where innovative underground irrigation will be applied is being considered as a WFaS pilot project. WFaS and partners are currently discussing a research collaboration with the plantation owner and confectioner Ferrero.

## Projecting Changing Population and Human Capital in Australia and around the World

*IIASA demographers are providing independent projections of the future Australian population including population drivers such as education*

Australia's demographics are changing and Australia, like many developed countries, is becoming older. In 1970-71, 31% of the population was aged 15 years or younger, but by 2001-02, that proportion dropped to 22%. In contrast, the proportion of Australians over 65 years has grown from 8% in 1970-71 to 13% in 2001-02 and is expected to almost double to 25% by 2042.

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's demography, the IPCC in 2011 adopted IIASA's population projections as its source



data in all modeling for the Fifth Assessment Report; and UNESCO has adopted IIASA's 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.

A recent innovative example of this broader approach has been the development of research methods to project population by level of education. This equips researchers with the tools to explore the implications of different education policies on a country's future fertility, life expectancy, migration, and population level as well as economic growth and ability to adapt to climate change. In 2014, IIASA published the first projections of educational attainment by age and sex for 195 countries in the Oxford University Press volume *World Population and Human Capital in the Twenty-First Century*. Findings for Australia show how different policies over the next few decades could lead to the country's 2010 population of 22.3 million reaching 39.6 million by 2060 or soaring to 50.7 million by the same date. Additionally, in 2016, *Who Survives? Education decides the future of humanity*, a book summarizing scientific research conducted at IIASA was published detailing the importance of education for societal and economic development. The researchers found that education is often more important than income when looking at health, resilience, and wellbeing.

**Joeri Rogelj** on "Climate Change Policy and Carbon Budgets" at the Australian-German Climate & Energy College, School of Earth Sciences, The University of Melbourne in 2016.

**Dmitry Shchepashchenko** on "Biomass Geo-Wiki and Elaboration on Biomass Map for REDD-PAC Project" at CSIRO in Canberra in 2015.

**Wei Liu** on "Preparedness and Recovery from Disasters in Protected Areas" at the IUCN World Parks Congress in Sydney in 2014.

**Pavel Kabat** on "Integrated Science and Systems Approaches in Support of Global Transitions: Case of Energy and Water" at CSIRO in Canberra in 2012.

**Wolfgang Lutz** on "Human Resources for Sustainable Development. The Demography of Human Capital Formation" at a public lecture at the Australian National University in Canberra in 2012.

**Reinhard Mechler** on "Reframing Risk and Uncertainty in Climate Adaptation" at the SPR World Congress on Risk in Sydney in 2012.

**Mikko Heino** on "Can Harvesting Drive Rapid Evolution, and Does it Really Matter?" at the Applied Evolution Summit on Heron Island in 2010.

#### Selected presentations in Australia

Current Australian-IIASA population studies include:

- Collaborations with researchers from the Crawford School of Public Policy at the Australian National University exploring fertility trends.
- IIASA researchers are working with demographers at the Demographic and Social Research Institute at the Australian National University on a joint project on population and environment.
- An international demographic collaboration between IIASA, the National Centre for Epidemiology and Population Health (NCEPH) at ANU among others established the Asian MetaCentre for Population and Sustainable Development Analysis in Singapore.
- IIASA's demographers assembled a global panel of experts, including Adrian Hayes of the Demographic and Social Research Institute at ANU. Together, they issued the Laxenburg Declaration which outlined the demographic challenges for sustainable development.

In related work, previous research conducted at IIASA found that aging will overtake population growth as the main demographic driver of health expenditure growth.

Additionally, an international collaboration including researchers from Australia and IIASA found that risk factors to disease burden has changed from risks for communicable disease in children towards non-communicable diseases in adults in developed countries, like Australia. These findings, which have significant health and economic impacts, were published in the *Lancet* in 2012.

### **Analyzing Ecological and Evolutionary Dynamics**

*Joint Australian-IIASA studies are exploring how plant diversity is associated with extreme temperature and droughts*

Australia is home to between 600,000 and 700,000 species and of those, over 80% of plants, 80% of mammals, and 40% of birds are found only in Australia. Changes to the landscape and native habitat have put many of these species at risk. The Australian Government is working with multiple stakeholders to ensure the protection of Australia's native species and their ecosystems.

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.

IIASA and Australian researchers are advancing our understanding of how ecological and evolutionary dynamics shape populations, communities, and ecosystems. Recent Australian-IIASA collaborations include:

- Researchers from IIASA and Macquarie University developed a framework for investigating the effects of size and traits on the demography of individual plants. This project was published in *Methods in Ecology and Evolution* in 2016.
- An international collaboration including researchers from IIASA and Macquarie University extended a model of plant canopies to explore how plant diversity is associated with extreme temperature and droughts. This project was published in *Ecological Modelling* in 2014.
- An international collaboration including researchers from CSIRO, University of Western Australia, and IIASA, developed a blueprint (PSARM Blueprint) for documenting ecosystem service assessments. This blueprint provides a guideline to compare different assessment results and helps decision makers and stakeholders structure their ecosystem service assessments. This project was published in *Ecological Indicators* in 2012.
- A collaboration with CSIRO researchers and other researchers investigating how evolutionary principles could be applied to medicine and agriculture. This paper was published in *Evolutionary Applications* in 2011.
- A collaboration with a CSIRO researcher reviewed the modeling of the ecology and evolution of communities. This was published in *Evolutionary Ecology Research* in 2012.
- A paper published in *Science* in 2012 with researchers from IIASA, CSIRO and others that argued for balanced harvesting to mitigate adverse ecological effects of fishing while supporting sustainable fisheries.

#### **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's member countries through using scientific cooperation to improve international relations, and through international teams jointly researching controversial issues to find consensus. For example, researchers and policymakers from Austria (Vienna Institute for International Economic Studies), the European Commission, Finland, Germany, Russia, and Ukraine are jointly analyzing the challenges and opportunities for greater economic integration in 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 members: Back page). For instance, both Russia and the US are members; as are Brazil, China, India, and South Africa. Several key factors also unite all IIASA member countries: their interest in systems analysis, scientific and academic infrastructure, economic stability and the geopolitical role in future global transitions. With this in mind, IIASA recently negotiated membership with Iran and is also negotiating membership with Israel.

## Capacity Building

### Young Scientists Summer Programs

The Young Scientists Summer Program (YSSP) develops the research skills and networks of talented PhD students. Program participants conduct independent research within the institute's research programs under the guidance of IIASA scientific staff. Funding is provided through IIASA's National Member Organizations. The YSSP has attracted over 1800 participants from over 80 countries since it was established in 1977.

In 2012 IIASA launched its first regional YSSP called the Southern African Young Scientists Summer Program (SA-YSSP) aimed primarily at PhD students based in the southern hemisphere. The Program was organized jointly by the South African National Research Foundation, the South African Department of Science and Technology, the University of the Free State in Bloemfontein, South Africa, and IIASA.

Since 2006 the following three Australian students have participated in these programs:

**Stephan Alberth** (YSSP '06 & University of Cambridge), who was an Australian national studying in the UK, developed a stochastic dynamic integrated assessment model of climate change with unfolding uncertainty. (Self-funded)

**Daniel Falstar** (YSSP '06 & Macquarie University) developed an evolutionary model of plant succession. His research earned a Peccei Award for its quality, originality, and relevance, and consequently IIASA funded Falstar a three-month scholarship to return to research at IIASA in 2007. (Co-funded by IIASA and self)

**Lanoi Maloiy** (SA-YSSP 2013-14 & University of South Australia) explored the educational experiences of Kenyan female political leaders evaluating the role of education in their leadership journey. (Funded by the Australian NMO, CSIRO)

*Since 2006, three young Australian researchers have developed research skills and networks by taking part in IIASA's Young Scientists Summer Program and its regional version*

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, **Petrobrás**, 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 works with the Austrian industrial company, **OMV** via IIASA Deputy Director General serving on OMV's Advisory Group on Sustainability and being Chair of the Advisory Board of OMV Future Energy Fund from 2006-11.

IIASA working with business

## Prospects for Future Australian-IIASA Activities

*Enhancing the Australian-IIASA relationship offers opportunities for Australia to strengthen international scientific collaborations and relationships in the Asia Pacific region*

This Info Sheet summarizes recent research collaborations between IIASA and Australia. Significant potential remains to further strengthen the Australian-IIASA relationship through developing a range of new joint activities including:

- **Enhancing Australian expertise in applying system analysis to national problems:** Developing bespoke Australian versions of IIASA's global models would allow researchers and policymakers to look at complex global problems and their impact on Australia in a holistic and integrated way. For example, the Dutch government worked with IIASA to develop a Dutch version of the IIASA GAINS model. The new model helps ministries to identify cost-effective measures to improve air quality and reduce greenhouse gas emissions in the Netherlands at the same time as complying with the country's obligations under European air quality agreements.
- **Conducting international assessments in areas of Australian strategic interest:** IIASA recently completed the Global Energy Assessment which brought together over 500 specialists to transform the way society thinks about, uses, and delivers energy. IIASA has proposed several new assessments, at the request of its member countries that will focus on issues of strategic interest to Australia. These could include a project exploring regional resource security over the coming decades in the Asia Pacific region.
- **New partnerships between IIASA and Australian 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 2010 and 2015 this additional funding reached €51 million. This is part of a funding portfolio of €250 million — the total awarded to external projects featuring collaborations between IIASA and its member countries.
- **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 10). IIASA recently launched a new global project to evaluate issues arising at the nexus of food, water, energy, and climate change.
- **Academic training opportunities for young Australian scientists:** There is significant potential to enhance participation by young Australian researchers in IIASA programs to develop international and interdisciplinary research skills (see page 11: Capacity Building). For example, by developing a new postdoctoral research program for Australian researchers at IIASA.

- 70 Australians have participated in IIASA events since 2008.
- 69 publications have resulted from collaborations between IIASA and researchers at Australian institutions since 2008.
- 22 Australians have been employed by IIASA since 2008.
- 28 researchers, advisors, and diplomats from Australia have visited IIASA since 2008, while IIASA scientists have visited Australia 30 times.

#### **Appendices**

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

1. Employees from Australia at IIASA (2008–2016)
2. Visitors from Australia to IIASA (2008–2016)
3. Conference participants from Australia (2008–2016)
4. Travel by IIASA scientists to Australia (2008–2016)
5. Publications relevant to Australia-IIASA collaborations (2008–2016)

Scientific exchange through people

## About IIASA

IIASA is an international scientific institute that conducts policy-oriented research into problems that are too large or too complex to be solved by a single country or academic discipline. These problems—such as climate change, energy security, and sustainable development—have a global reach and can be resolved only by international cooperation.

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

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

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