



Activities with Member Countries

Malaysia

Malaysia officially became a member of IIASA in 2011 through the Academy of Sciences of Malaysia. Since membership began a number of research collaborations have been developed with IIASA researchers, including projects focused on improving air quality, sustainable land and forest management, the changing energy landscape, and projecting demographics in Malaysia.

Beyond continuing these research collaborations, there is significant opportunity to grow the relationship between IIASA and Malaysia's 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 the Academy of Sciences of Malaysia are helping to shape via their role on the IIASA governing council.

Additionally, capacity building through greater scientific exchange via researching at or visiting IIASA, or taking part in IIASA programs for young scientists, is also a priority for the partnership. This IIASA Info Sheet provides a summary of this expanding relationship since 2010.

Highlights of Interactions Between IIASA and Malaysia (since 2010)

IIASA National Member Organization (NMO)	The Academy of Sciences of Malaysia (ASM)
Membership start date	2011
Selected research partners	<ul style="list-style-type: none">■ Academy of Sciences Malaysia (ASM)■ Malaysian Palm Oil Council■ Ministry of Science, Technology and Innovation of Malaysia (MOSTI)■ Universiti Teknologi Malaysia (UTM)
Areas of research collaboration	<ul style="list-style-type: none">■ Tackling haze and biomass burning in Malaysia and Asia■ Development of a sustainable bioeconomy■ Tropical Futures Initiatives■ Towards zero deforestation palm oil in Malaysia■ Changing energy landscape■ Projecting changing populations and human capital in Malaysia
Capacity building	6 doctoral students from Malaysia have participated in IIASA young scientists summer programs since 2010
Publication output	9 publications have resulted from collaborations between IIASA and researchers at Malaysian institutions since 2010
Other interactions	<ul style="list-style-type: none">■ 47 researchers, advisors, and diplomats from Malaysia have visited IIASA or participated in IIASA events since 2010■ IASA scientists have visited Malaysia over 25 times since 2010

Activities with Member Countries: Malaysia

IIASA Info Sheet 2019/2
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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 interactions with Malaysia during 2010–2019.

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 the External Relations Department.

IIASA National Member Organization in Malaysia

The Academy of Sciences Malaysia (ASM) is the National Member Organization representing Malaysian membership of IIASA

Professor Dr. Asma Ismail, President of the Academy of Sciences Malaysia, is the Council Member for Malaysia.

The NMO Secretary is **Ms. Hazami Habib**, Chief Operating Officer, Academy of Sciences Malaysia.

The Academy of Sciences Malaysia (ASM) represents Malaysia and its scholarly community on IIASA governing Council

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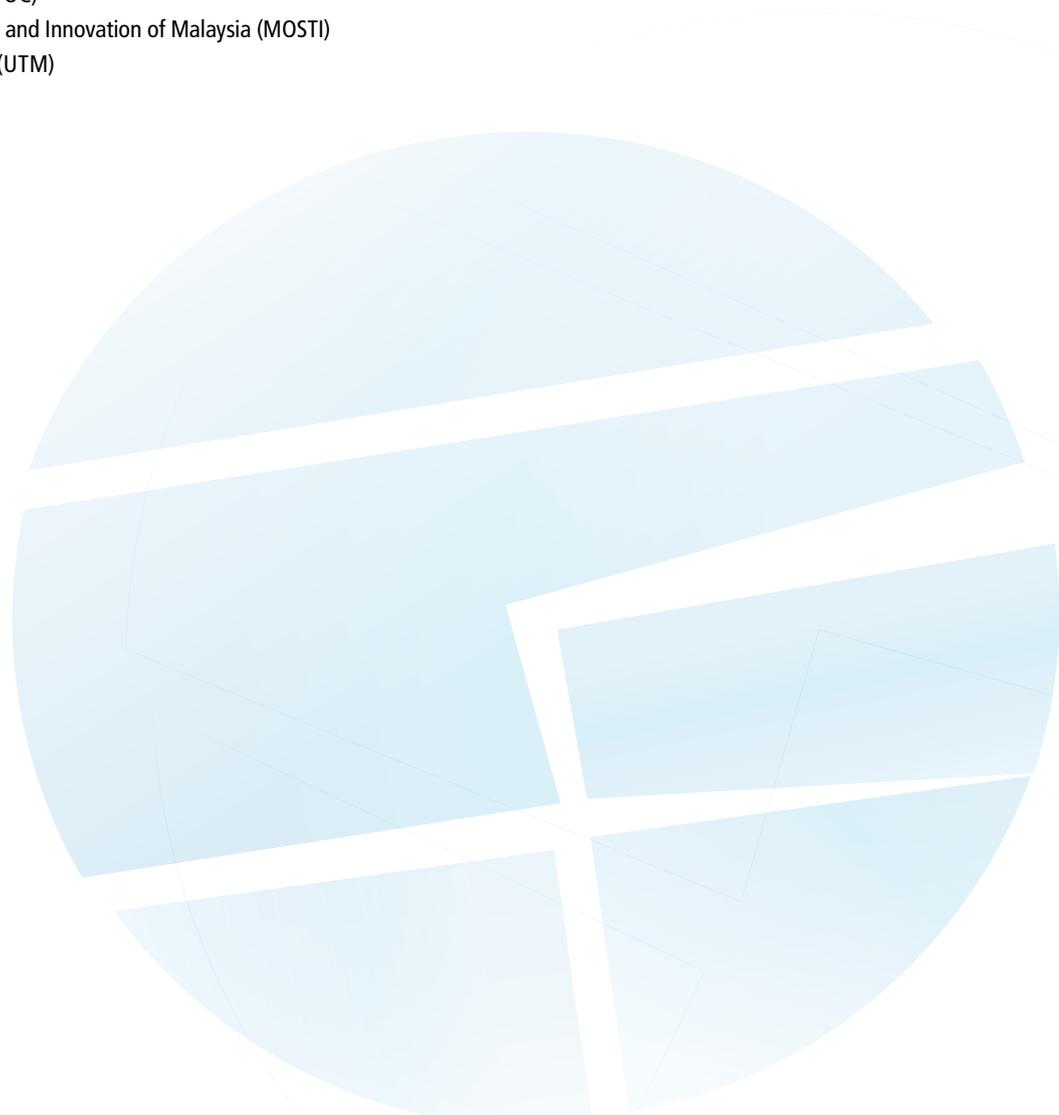


Research Partners in Malaysia

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

- Academy of Sciences Malaysia (ASM)
- Malaysian Palm Oil Council (MPOC)
- Ministry of Science, Technology and Innovation of Malaysia (MOSTI)
- Universiti Teknologi Malaysia (UTM)

IIASA is developing collaborations with Malaysia and has recently been working with 4 organizations in Malaysia via formal and informal connections



Recent Research Collaborations

Tackling haze and biomass burning in Malaysia and Asia

Malaysian and IIASA researchers are working on a joint project to reduce the adverse impacts of biomass burning in Malaysia and Asia

Malaysia faces significant issues of haze associated with agricultural fires in Southeast Asia. Pollutants in the haze can cause serious health problems. For example, fine particulate matter (PM2.5) is dangerous because it can penetrate deeply into the lungs and has been linked to respiratory illnesses. Additionally, the pollution caused has severe economic consequences, ranging from restricted industrial production over closures of schools and airports to lower incomes from tourism.

Researchers from the IIASA Air Quality and Greenhouse Gases Program and the Academy of Sciences Malaysia are currently working on a joint project, which aims to develop a science-based solution-oriented systems perspective on biomass burning in Asia, and to devise a plan for collaborative follow-up research activities to explore systems solutions to reduce the adverse impacts of biomass burning while contributing to development targets.

A workshop organized jointly by IIASA and the Academy of Sciences Malaysia in 2018, brought together participants from a number of southeast Asian countries - Malaysia, Indonesia, Thailand, Vietnam - with expertise in a diverse range of disciplines, together with several international experts. The workshop explored linkages that could increase acceptance of solutions among diverse stakeholders and the outcomes will lead to a joint research proposal to operationalize linkages across sectors and issues, to identify integrated solutions that deliver benefits for a wide range of stakeholders and development goals.

Selected presentations in Malaysia

Raya Muttarak on "Who is Concerned and Does Something about Climate Change? Gender and Education Divide among Thais at the Asian Population Association Conference in Kuala Lumpur in 2015.

K.C. Samir on "Projecting Population at Spatial Level in Nepal and its Application in the Health Sector Planning" at the Asian Population Association Conference in Kuala Lumpur in 2015.

Sergei Scherbov on "Smarter Every Day: The Deceleration of Population Aging in Terms of Cognition" at the Asian Population Association Conference in Kuala Lumpur in 2015.

Anna Lorant on "Comparing National Insurance and Safety Net Arrangements" at the conference on 'Evidence for Disaster Risk Reduction and Climate Change Adaptation Effectiveness of Insurance: Challenges and Opportunities' at the University Kebangsaan Malaysia in 2014.

Keywan Riahi and **Luis Gomez-Echeverri** attended the IPCC Fourth Core Writing Team Meeting for the AR5 Synthesis Report in Putrajaya in 2014.

Florian Kraxner delivered a keynote presentation at the Strategic Consultation 4 on Inter-sector Water Demand Management in Kuala Lumpur in 2013.

Development of a sustainable bioeconomy in Malaysia and South East Asia

Bioeconomy explores the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy. The vast potential contribution of bioenergy to Malaysia's sustainable development requires comprehensive assessment that is conducted using a system perspective covering land use, energy and biophysical productivity issues.

IIASA researchers are collaborating with researchers at Universiti Teknologi Malaysia (UTM) and the Academy of Sciences of Malaysia to generate a spatially explicit energy system model based on the IIASA BeWhere model. The model will be used to examine options for enhancing the role of sustainable bioenergy in Malaysia using a systems perspective covering land use, energy, and biophysical productivity. The sustainable bioenergy assessment will serve as an entry point for potential wider bioeconomy assessment for the country.

Tropical Futures Initiative

60% of Malaysia is covered by forests. However, in recent years Malaysia has faced significant deforestation. It is estimated that between 2000 and 2012, Malaysia has lost over 45,000 square kilometers of forest.

Tropical forests have been globally recognized as a significant sink and source for greenhouse gas emissions, with the implementation of initiatives such as Reduced Emissions from Deforestation and Forest Degradation (REDD) and REDD+. In Malaysia, around eighty percent of Malaysia's greenhouse gas emissions are generated from land-use change, particularly deforestation.

Moreover, tropical forests exist in countries and regions that face intensive development pressures, leading to a need for transformation options that both reserve natural assets and create development pathways and that reflect both the complete value of ecosystem services and the complex social structures of the localities.

The Tropical Futures Initiative was a multiyear project developed and coordinated by IIASA to focus on tropical deforestation, greenhouse gas emissions, air pollution, agriculture, and water.

The first step of the initiative was to carry out a consistent quantitative global, regional, and national REDD+ assessment for Indonesia. As part of this assessment, researchers assessed policy options, mitigation potential, investment costs in forestry and agriculture, linkages to carbon markets, and synergies, as well as trade-offs with other environmental policies and the bio-economy in general.

IIASA and Malaysian researchers are working on developing IIASA models to help enhance the role of sustainable bioenergy in Malaysia

Malaysia has been participating in the tropical futures initiative, a multiyear project developed and coordinated by IIASA to focus on tropical deforestation, greenhouse gas emissions, air pollution, agriculture, and water

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.

- Steidinger BS, Crowther TW, Liang J, et al. (2019) Climatic controls of decomposition drive the global biogeography of forest-tree symbioses. *Nature* 569(7756):404-408 DOI:10.1038/s41586-019-1128-0
- Hoo P, Patrizio P, Leduc S, Hashim H, Kraxner F, Tan ST, & Ho WS (2017). Optimal Biomethane Injection into Natural Gas Grid – Biogas from Palm Oil Mill Effluent (POME) in Malaysia. *Energy Procedia* 105: 562-569. DOI:10.1016/j.egypro.2017.03.357
- Pirker J, Mosnier A, Kraxner F, Havlik P, Obersteiner M (2016). What are the limits to oil palm expansion? *Global Environmental Change*, 73-81.
- Tan ST, Leduc S and Kraxner F (2015). Renewable Energy Production from Municipal Solid Waste to Mitigate Climate Change: A Spatially Explicit Assessment for Malaysia. In: *Systems Analysis 2015 - A Conference in Celebration of Howard Raiffa*, 11 -13 November, 2015, Laxenburg, Austria.

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

The project used GLOBIOM and the Global Forestry Model, G4M, as a basis for developing tailored national and regional models that helped to identify REDD+ and other development policies that are economically efficient, socially fair, safeguard and enhance ecosystem values, and help meet the goals of the Convention on Biological Diversity.

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Moreover, tropical forests exist in countries and regions that face intensive development pressures, leading to a need for transformation options that both reserve natural assets and create development pathways and that reflect both the complete value of ecosystem services and the complex social structures of the localities.

In addition to the Tropical Futures Initiative, IIASA researchers assessed the area of suitable land for sustainable palm oil and investigated the limits of future palm oil expansions. The researchers found that Malaysia might face land scarcity for sustainable palm oil production. This research was published in *Global Environmental Change* in 2016.

IIASA researchers have been working with confectionery company Ferrero to research the impact of a zero deforestation commitment within Malaysia

Towards zero deforestation palm oil in Malaysia

Palm oil is essential for the economy of Malaysia, which is one of the world's largest producers of the commodity. The confectionery company Ferrero sources 80% of the palm oil for its products from plantations within Malaysia, with this Ferrero has pledged to source deforestation-free palm oil only.

In 2017, IIASA researchers in collaboration with Ferrero researched the impact on the ground of the company's zero-deforestation commitment. Doing so, they used open source and publicly available datasets to showcase that committed companies can verify the impact of their procurement policy on the ground with little effort. The paper was published in *Zero deforestation: A commitment to change*.

Changing Energy Landscape

Malaysian-IIASA researchers are exploring global energy systems and how to transition to a sustainable, diverse energy mix

The energy sector is a vital part of Malaysia's economy making up almost 20% of the total GDP. Malaysia is the world's second-largest exporter of natural gas and second-largest oil and natural gas producer in Southeast Asia.

In addition to traditional energy sources, Malaysia has significant potential for renewable energy generation. Hydropower is part of the Malaysian energy mix already, but Malaysia has potential for solar and biomass energy sources as well. The Malaysian Government has recognized this potential and has implemented a "five fuels" policy, which includes adding renewable energy

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 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 negotiated membership with Iran and Israel.

sources to the mix of oil, gas, coal, and hydropower. Furthermore, the Malaysian Government has set a target energy mix that includes at least 5.5% of energy from renewable energy sources.

IIASA has substantial expertise in understanding global energy systems and their connections with economic, environmental, and societal systems. Additionally, IIASA has developed tools, including the crowdsourcing tool Geowiki that could improve how to estimate the extent of biomass in Malaysia.

Recent Malaysian-IIASA collaborations in this area include researchers from the Universiti Teknologi Malaysia (UTM) and IIASA researchers developing a spatial-techno-economic optimization model of biogas generation and utilization network.

Projecting Demographics in Malaysia

In 2013, Malaysia had almost 30 million people. Malaysia's population is uneven with more than 20 million Malaysians living in Peninsular Malaysia and the minority of Malaysians living in East Malaysia.

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 research, 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.

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

IIASA demographers are providing independent projections of the future Malaysian population including population drivers such as education.

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. 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's (Intergovernmental Panel on Climate Change) 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 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.

IIASA global contribution

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 Malaysia show how different policies over the next few decades could lead to the country's 2013 population of almost 30 million reaching over 60 million by 2060 depending on which policies are adopted. 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.

IIASA models, tools, and data

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 eight 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 a higher population and lower economic growth (SSP3), 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, 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 projects summarized in this Info Sheet draw on analyses from IIASA models, tools, and data including:

- Planning sustainable energy systems (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 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 National Member Organizations. The YSSP has attracted over 1800 participants from over 80 countries since it was established in 1977.

Since 2010, six young Malaysian researchers have developed research skills and networks by taking part in IIASA Young Scientists Summer Program

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 is 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 2010, the following six Malaysian students have participated in these programs:

YSSP '18

Muhammad Nurariffudin (Universiti Teknologi Malaysia) used the IIASA BeWhere model to solve oil palm biomass co-firing issues in Malaysia in the aspects of technical, economic and the environment

YSSP '16

Poh Ying Hoo (Universiti Teknologi Malaysia) developed a spatial-techno-economic optimization model of biogas generation and utilization network. (Co-funded by Malaysian NMO and self)

YSSP '15

Sie Ting Tan (Universiti Teknologi Malaysia) evaluated the energy and climate change mitigation potential of municipal solid waste in Malaysia. (Funded by Malaysian NMO)

YSSP '14

Nur Rosni (International Islamic University Malaysia) studied determining urban sprawl geospatial indices using remote sensing and GIS. (Funded by Malaysian NMO).

YSSP '12

Maragatham Kumar (Malaysian Nuclear Agency) assessed the different air pollution and greenhouse gases mitigation strategies in Malaysia using the GAINS model. (Funded by Malaysian NMO)

Pin Pin Oh (University of Nottingham, Malaysia Campus) developed a novel process scheme for biodiesel production in a multiphase membrane reactor system. (Co-funded by Malaysian NMO and IIASA) Ms. Oh won the Mikhalevich Award, which are given annually for outstanding work by participants in IIASA's YSSP, in 2012. Awardees are provided with financial support to return to IIASA for an additional three months of research.

Prospects for Future Malaysian-IIASA Activities

Enhancing the Malaysian-IIASA relationship offers benefits for Malaysian research, government policy, and international relations

This Info Sheet summarizes recent research collaborations between IIASA and Malaysia. Since Malaysia recently joined IIASA, there is significant opportunities for strengthening the IIASA-Malaysian relationship through developing a range of new joint activities including:

- **Enhancing Malaysian expertise in applying system analysis to national problems:** Developing bespoke Malaysian versions of IIASA global models would allow researchers and policymakers to look at complex global problems and their impact on Malaysia 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 Malaysian strategic interest:** IIASA 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 Malaysia.
- **New partnerships between IIASA and Malaysian 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. Between 2012 and 2017, this additional funding reached €52 million. This was part of a total funding portfolio of €265 million, the total awarded to external projects featuring collaboration between IIASA and 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 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 global project to evaluate issues arising at the nexus of food, water, energy, and climate change.
- **Academic training opportunities for young Malaysian scientists:** There is significant potential to enhance participation by young Malaysian researchers in IIASA programs to develop international and interdisciplinary research skills (see page 8: Capacity Building).

Scientific exchange through people

- 47 Malaysian researchers, advisors, and diplomats have visited IIASA or have participated in IIASA events since 2010
- 9 publications have resulted from collaborations between IIASA and researchers at Malaysian institutions since 2010
- IIASA scientists have visited Malaysia 25 times since 2010

Appendices:

Summaries detailing the presented information can be requested by contacting the External Relations Department (externalrelations@iiasa.ac.at).

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, Indonesia, Iran, Israel, Japan, Mexico, Malaysia, Norway, Republic of Korea, Russia, South Africa, Sweden, Ukraine, United Kingdom, United States of America, Vietnam.

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