



International Institute for
Applied Systems Analysis
www.iiasa.ac.at

science for global insight

IIASA: Research Highlights and UK Partnership

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Officer, International Institute for Applied
Systems Analysis

Royal Society, 2 December 2016



IIASA, International Institute for Applied Systems Analysis

THE EARLY 1970s

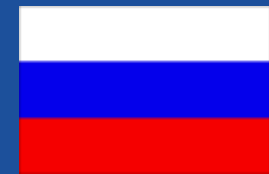




24 MEMBER COUNTRIES (NMOs)



➤ International, independent, interdisciplinary



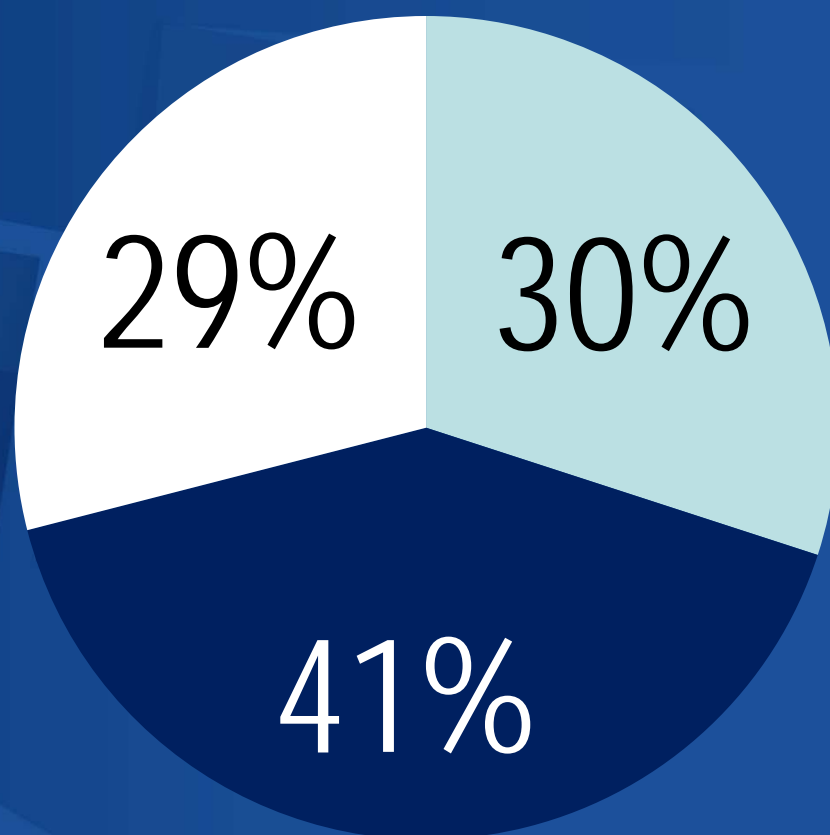
➤ Research on major global problems



➤ Solution oriented, integrated systems analysis



About 350 (trans- and multidisciplinary) scientists from 50+ countries @ IIASA in the host country Austria



- Natural Scientists & Engineers
- Economists & other Social Scientists
- Mathematicians and others

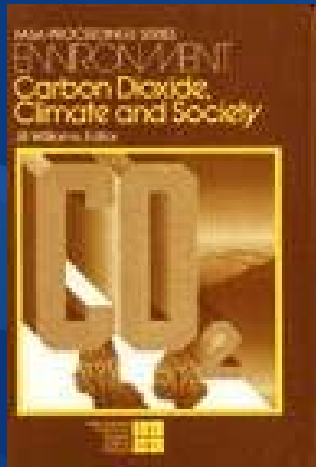
IIASA as a global hub for system analysis research

- 1,445 visitors & collaborators in 2014
- Plus ~25% of IIASA alumni (3,505 people worldwide) remain actively involved in IIASA research
- Plus ~600 partner institutions
- In sum, ~2500 researchers from some 65 countries involved in IIASA's research network (external faculty)
- And it is not just research networks: IIASA researchers took part in 112 advisory boards and steering committees in 2014

INTERNATIONAL COLLABORATIONS



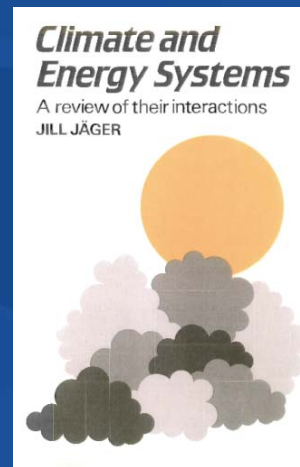
EXAMPLES OF EARLY RESEARCH



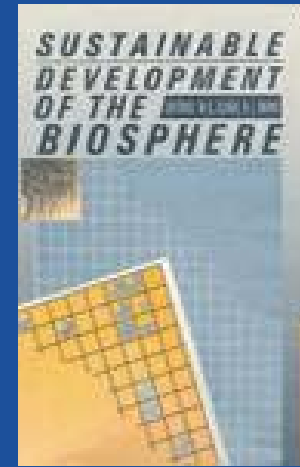
1978



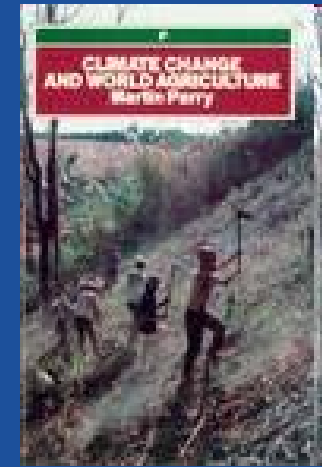
1981



1983



1986



1990

IIASA SYSTEMS RESEARCH STRATEGY & RESULTS



The diagram features a central blue circle labeled 'Food &'. Below it are two overlapping circles: a green one labeled 'Energy & Climate Change' and a blue one labeled 'Poverty & Equity'. Surrounding these are four white curved banners with blue text: 'al Transformations' (top-left), 'Advanced System' (top-right), 'Policy and Governance' (bottom), and 'Drivers' (left) and 'ysis' (right) on the sides.

IIASA HIGHLIGHTS 2011-2015

<http://www.iiasa.ac.at/web/home/about/achievements/Highlights.html>

Science, Policy, Society
Partnerships

**Systems Approaches for Global
Transformations**
IIASA Research Plan 2016 – 2020

<http://www.iiasa.ac.at/web/home/about/leadership/strategicplan/IIASA-Research-Plan2015-2020.pdf>

Integrated Systems
Analysis

IIASA'S NICHE

[Blurred text]

Summer

summer
temperate
Rough winds
summer
hot
fair fair
nature summer
fair
time shade
life

Shall I Compare Thee To A Summer's Day?

by William Shakespeare

Shall I compare thee to a summer's day?
Thou art more lovely and more temperate.
Rough winds do shake the darling buds of May,
And summer's lease hath all too short a date.
Sometime too hot the eye of heaven shines,
And often is his gold complexion dimm'd;
And every fair from fair sometime declines,
By chance or nature's changing course untrimm'd;
But thy eternal summer shall not fade
Nor lose possession of that fair thou ow'st;
Nor shall Death brag thou wander'st in his shade,
When in eternal lines to time thou grow'st:
So long as men can breathe or eyes can see,
So long lives this, and this gives life to thee.

IIASA's Systems Science Approach

- Integrated
- Interdisciplinary
- International
- Independent
- Solution-oriented
- Long term
- Trade offs



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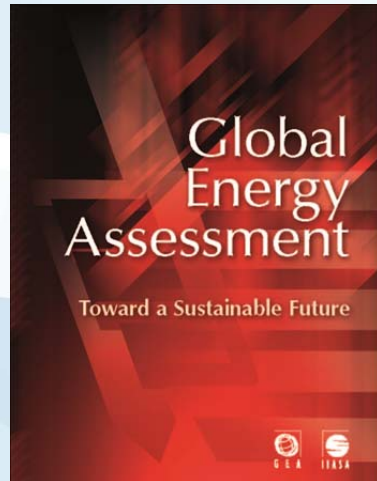
**Systems
Analysis**

SELECTED RESEARCH TEASERS

Power of
systems
analysis
(applied and
international)

- Interdisciplinary– Global Energy Assessment
- Science to Policy – GAINS (Europe & Global)
- Research Methods – Population (All countries)
- International – Tropical Forests (Global → Regional → National)

GLOBAL ENERGY ASSESSMENT



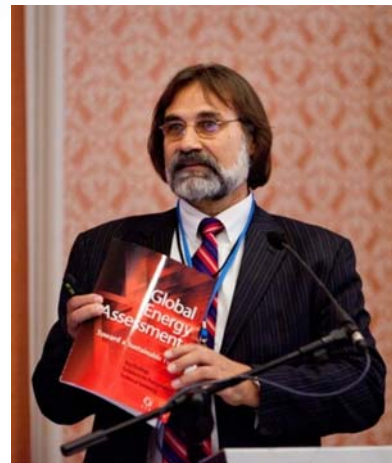
2006-12: GEA defines a new global energy policy agenda—one that transforms the way society thinks about, uses, and delivers energy.



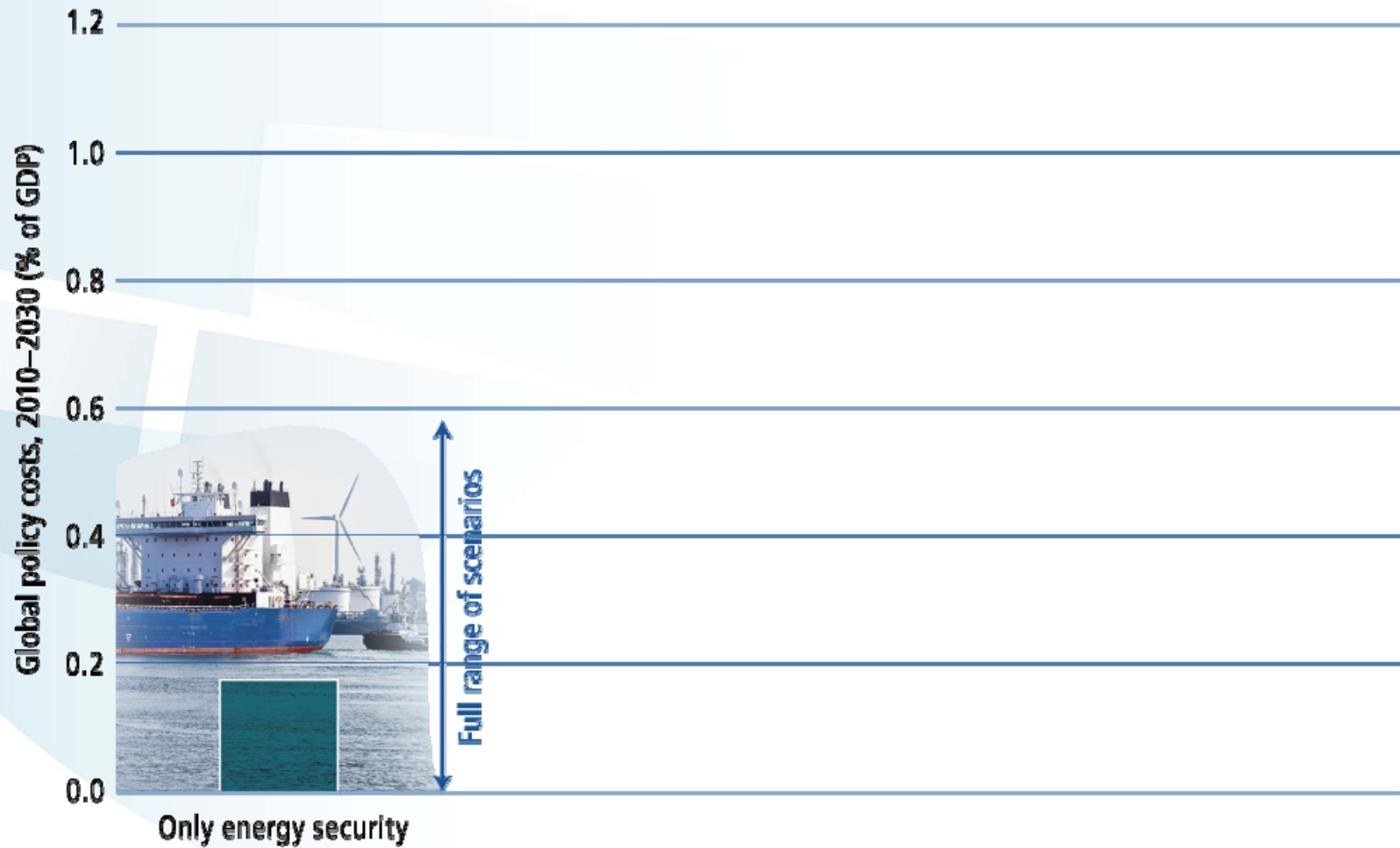
GEA guides targets of UN Secretary-General's



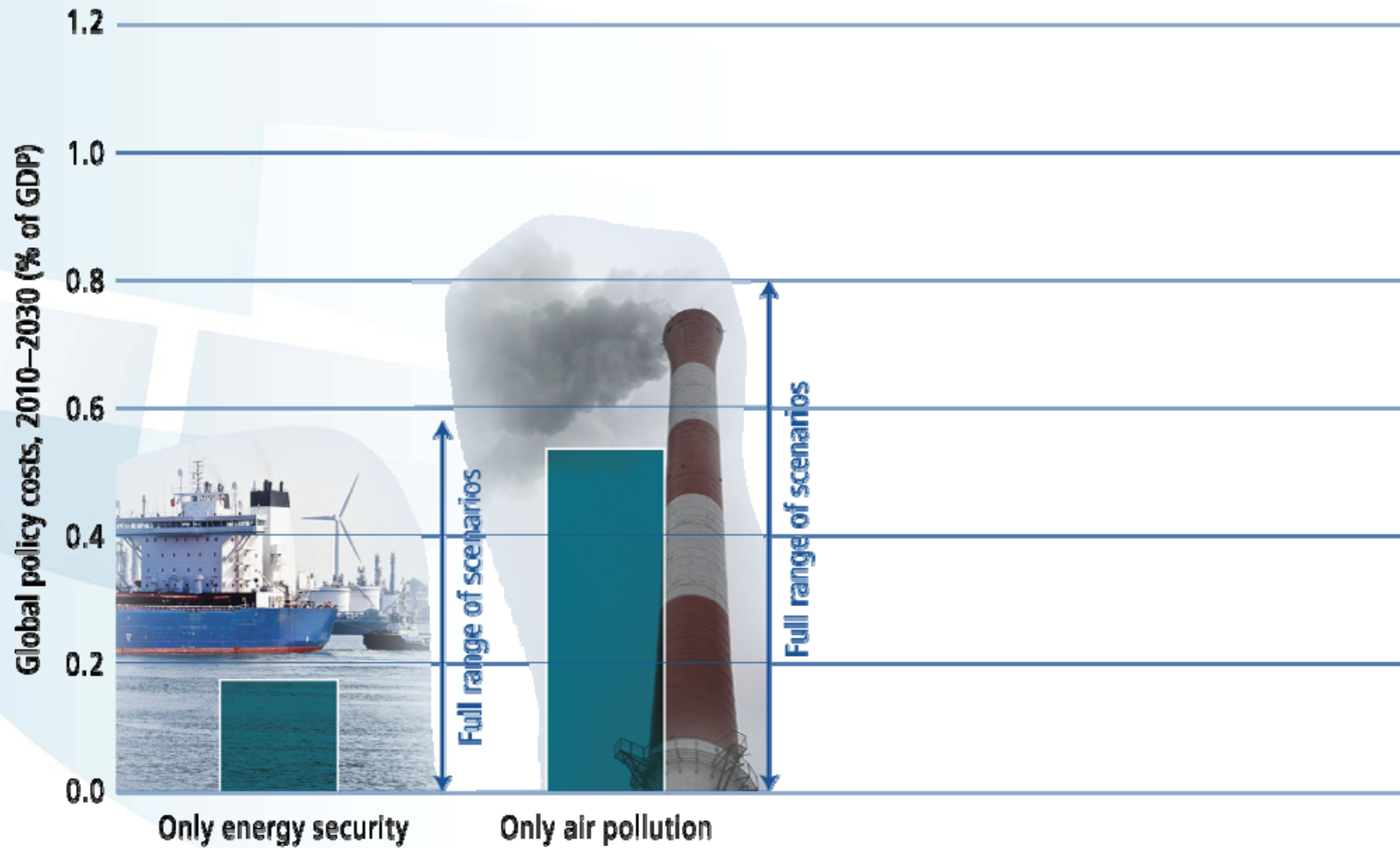
GEA became basis for adoption of Sustainable Development Goal # 7



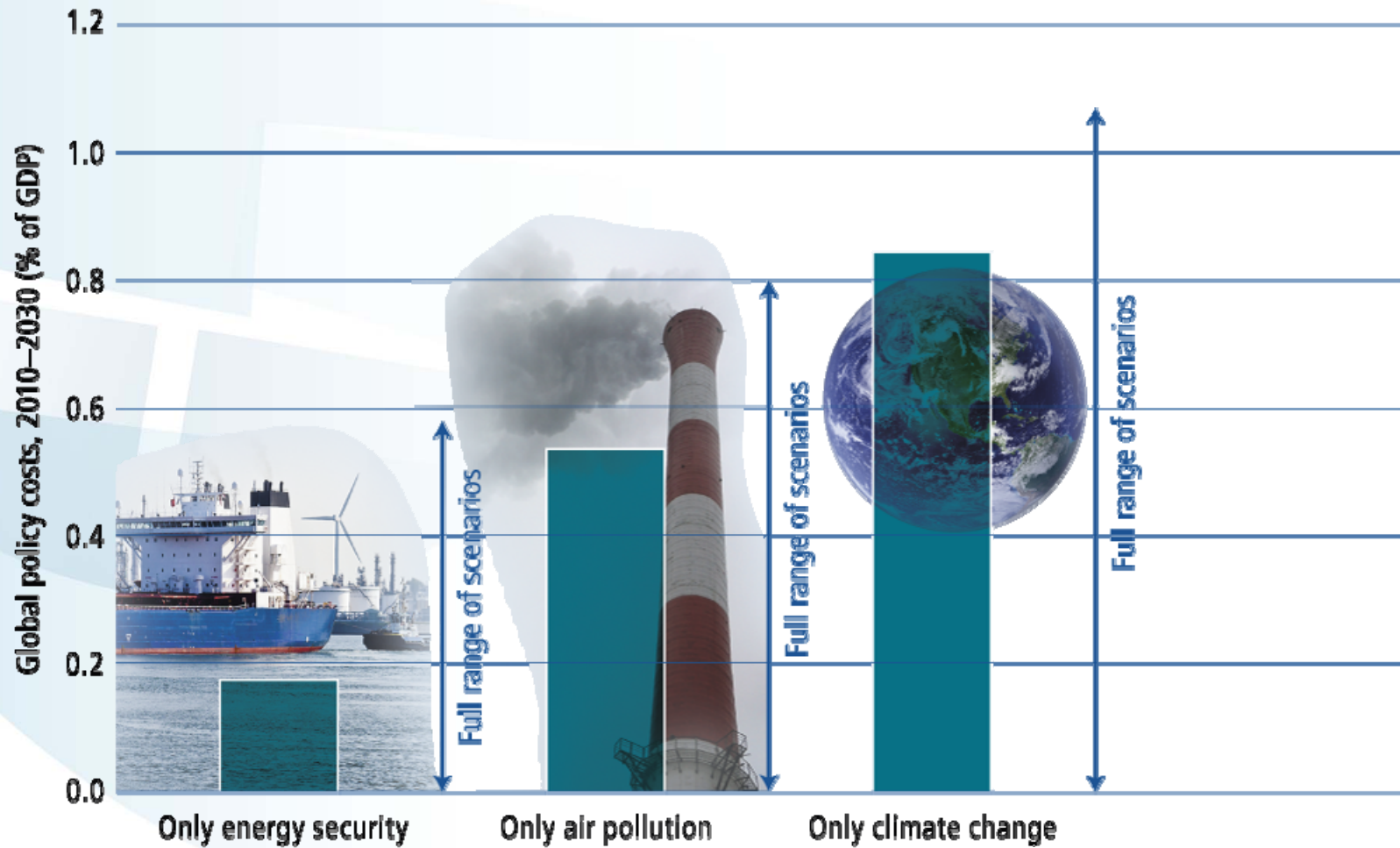
GEA: MULTIPLE BENEFITS OF INTEGRATED POLICIES



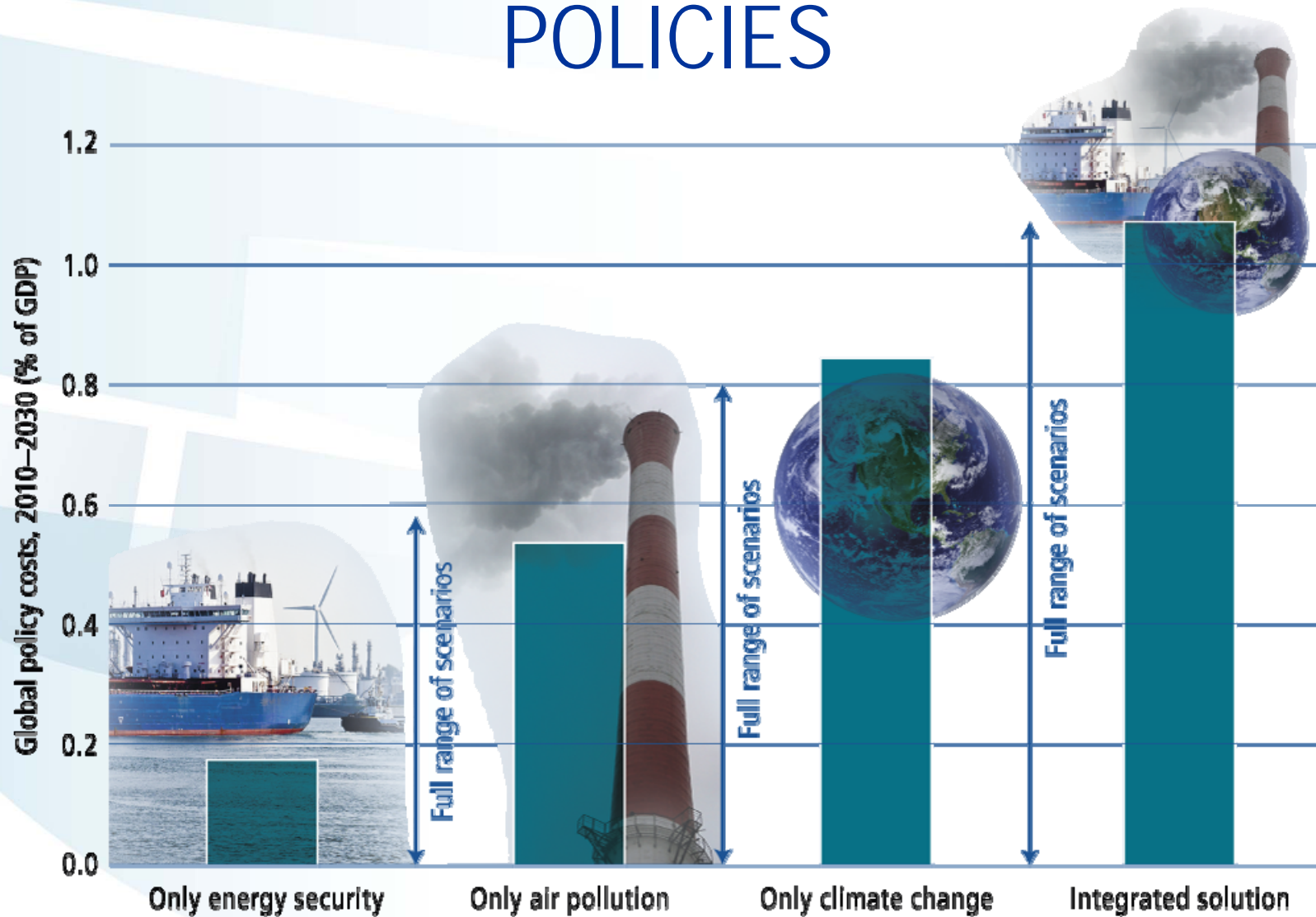
GEA: MULTIPLE BENEFITS OF INTEGRATED POLICIES



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GAINS POLICY APPLICATIONS

Convention on Long-range Transboundary Air Pollution

- 1994 Second Sulphur Protocol
- 1999 Gothenburg Multi-pollutant/multi-effect Protocol
- 2012 Revision of the Gothenburg Protocol



European Union

- 1999 National Emission Ceilings Directive
- 2004 Thematic Strategy on Air Pollution
- 2010 Energy & Climate package, etc.
- 2013 Revision of the Thematic Strategy

Further analyses for UNFCCC, Arctic Council, UNEP, Chinese, Japanese and Korean Governments

GAINS: CLEANING EUROPE'S AIR

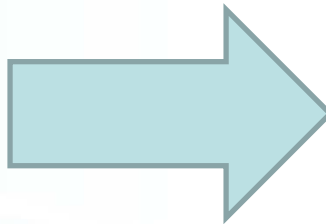
Dec 2013: European Commission proposed a new package of measures to reduce air pollution. Poor air quality is the number one environmental cause of premature death in the European Union. By 2030, the package will:



- Avoid an extra 58,000 premature deaths
- Protect an extra 123,000 km² of ecosystems from nitrogen pollution (more than half the area of Romania)
- Save 19 000 km² forests from acidification by the year 2030.

IIASA's GAINS model guided European policymakers at every step of this process.

GAINS: HELPING TO TACKLE GLOBAL WARMING, GLOBAL HEALTH & GLOBAL FOOD PRODUCTION

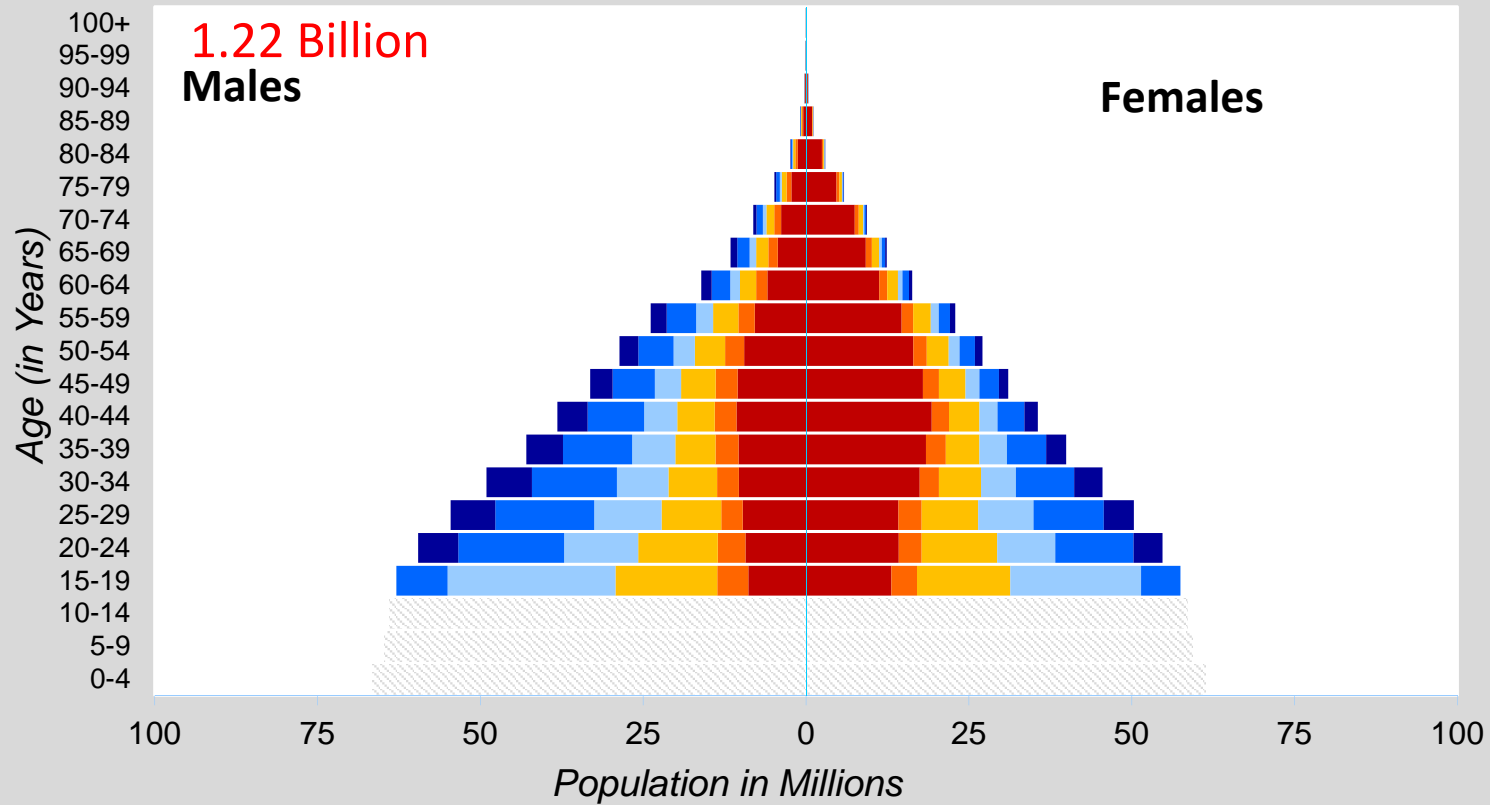


GAINS identified 14 key air quality measures that if implemented could slow the pace of global warming, save millions of lives, and boost agricultural production.

Feb 2012: The governments of Bangladesh, Canada, Ghana, Mexico, Sweden and the United States launched the Climate and Clean Air Coalition to Reduce Short Lived Climate Pollutants

PROJECTING INDIA'S FUTURE POPULATION

India - Base Year 2010



Pop < 15 yrs
 No Education
 Incomp. Primary
 Primary
 Lower Secondary
 Upper Secondary
 Post Secondary

IMPACT OF EDUCATION ON POPULATION

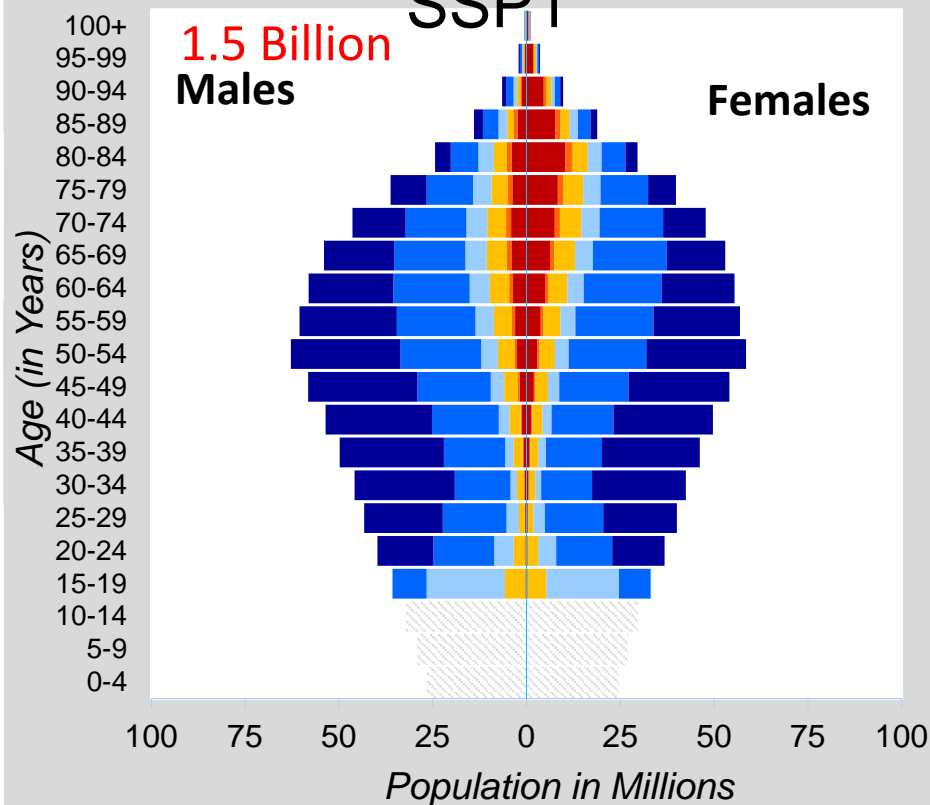
RAPID VERSUS STALLED DEVELOPMENT

India - Projections 2060 -

SSP1

1.5 Billion
Males

Females

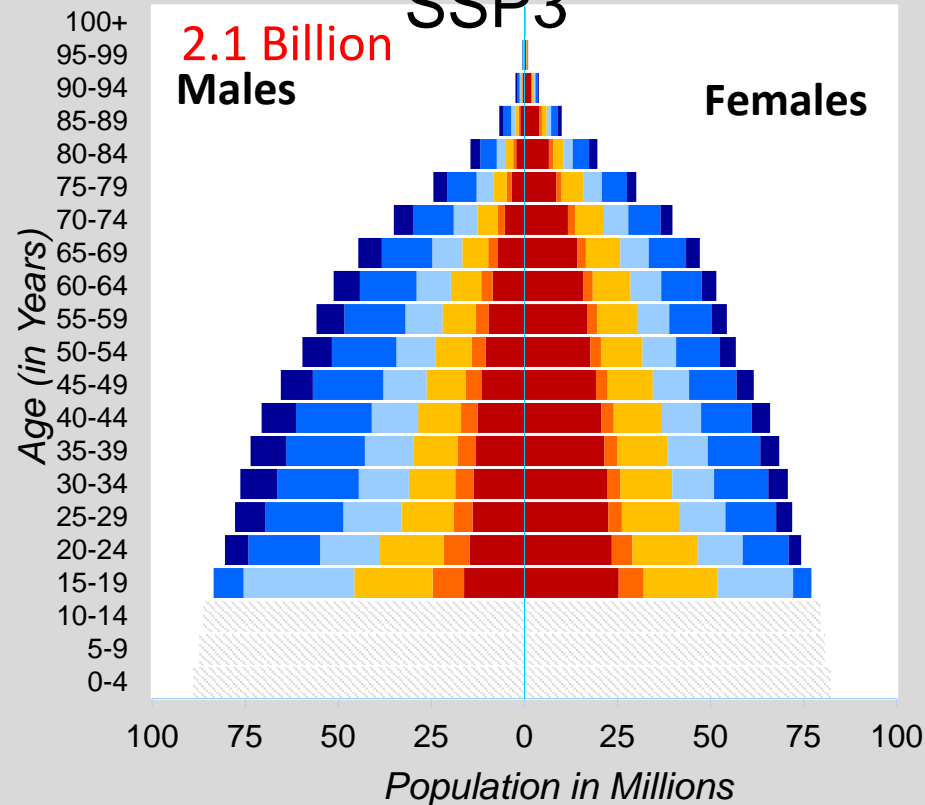


India - Projections 2060 -

SSP3

2.1 Billion
Males

Females



Pop < 15 yrs
 No Education
 Incomp. Primary
 Primary
 Lower Secondary
 Upper Secondary
 Post Secondary

INVESTING IN EDUCATION ACHIEVES MULTIPLE GOALS

Economic growth

Adaptation to
climate change

Movement toward
democracy



[10.1126/science.1151753](https://doi.org/10.1126/science.1151753)

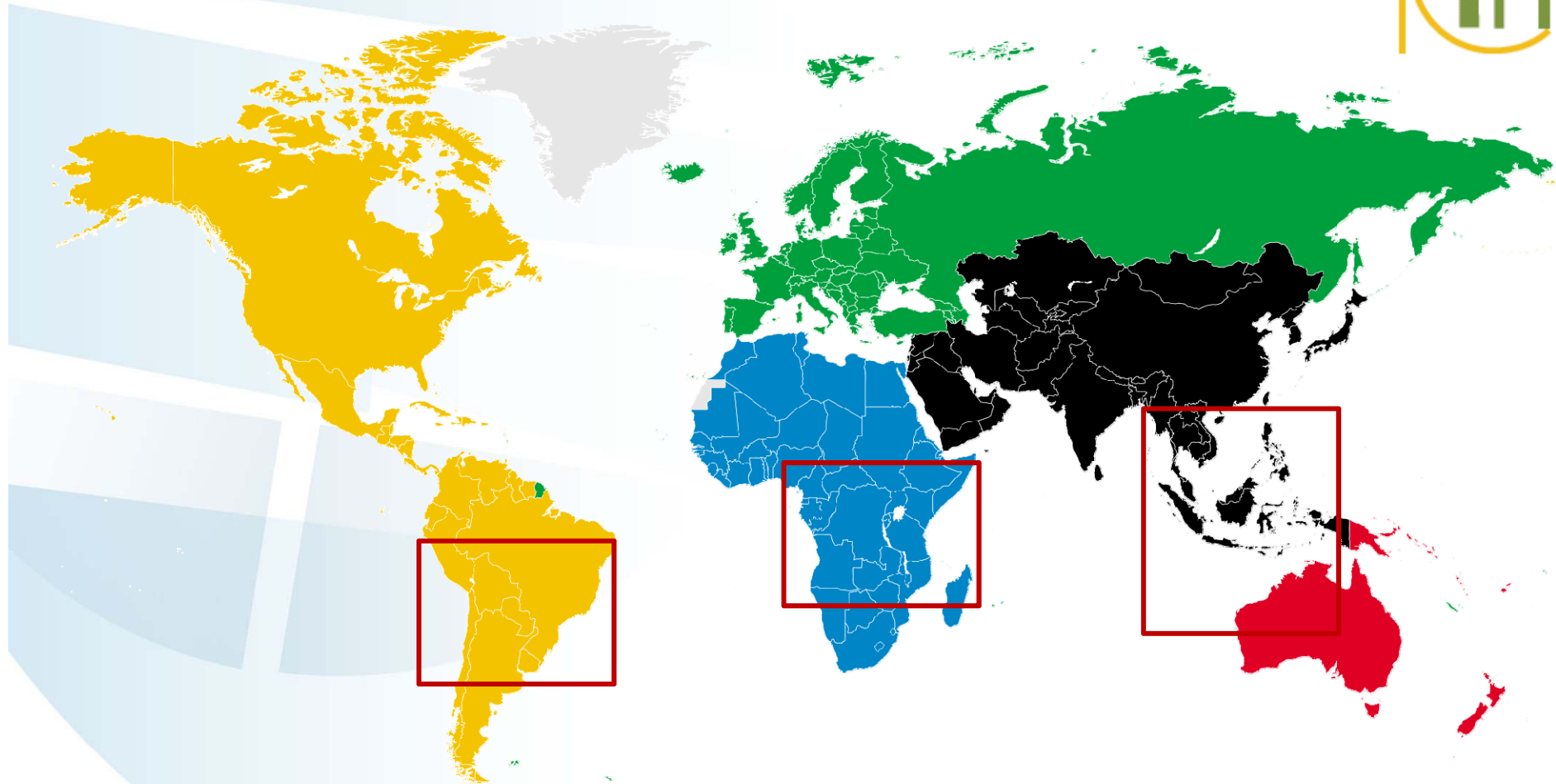


[10.1126/science.1257975](https://doi.org/10.1126/science.1257975)

**POPULATION AND
DEVELOPMENT REVIEW**

DOI: [10.1111/j.1728-4457.2010.00329.x](https://doi.org/10.1111/j.1728-4457.2010.00329.x)

TROPICAL FUTURES INITIATIVE



- Tropical deforestation as entry point
- Expand to other interdisciplinary issues i.e. GHG emissions, food security, energy security, water security, etc

TROPICAL FUTURES INITIATIVE



IIASA tools



A global model to assess competition for land use between agriculture, bioenergy, and forestry



Crowdsourcing tool to improve quality of land cover data

Work with local partners to co-design project, source local data, adapt tools to local conditions and build capacity locally to use the tools

Projects in Brazil, Congo & Indonesia. E.g. Brazilians used GLOBIOM to produce the country's INDCs for the Paris Climate Change conference in 2015

IIASA & UK PARTNERSHIP

COMPLEMENTARY EXPERTISE: IIASA AND UK

1. Modelling
2. Big data
3. International and interdisciplinary approaches to global challenges
4. Science diplomacy
5. Facilitating engagement between UK and IIASA researchers

COMPLEMENTARY MODELING EXPERTISE



UK has world-class expertise in modeling such as at the Met Office's Hadley Centre (e.g. climate modeling)



IIASA has world-class modeling expertise (e.g. integrated assessment modeling - energy, air pollution and greenhouse gas, land-use change)

COMPLEMENTARY BIG DATA EXPERTISE



HM Government

Seizing the data opportunity

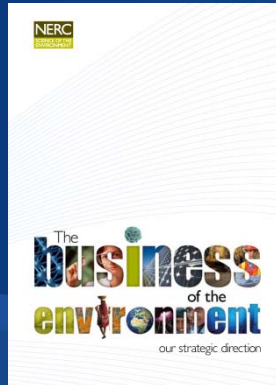
A strategy for UK data capability



“The growth in data is a global phenomenon; so are the efforts to research and develop new tools and techniques, and innovative ways to generate and use data”

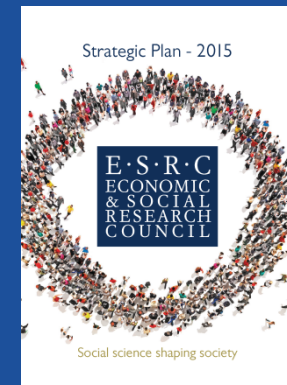
A new app designed at IIASA makes agricultural data available for gardeners and smallholder farmers in Kenya and Tanzania to help boost crop yields and production. It also allows the farmers to share tips and information about pests and disease. In turn all this data helps further inform IIASA research.

COMPLEX AND INTERCONNECTED GLOBAL CHALLENGES NEED INTERDISCIPLINARY AND INTERNATIONAL APPROACHES



"Enable the most ambitious Earth-system science by funding long-term, global-scale programmes that **integrate research across disciplines.**"

"Challenges, such as how to achieve sustainable economic growth and how to improve health and wellbeing for all sectors of society, **require interdisciplinary collaboration**, with a major contribution from social science."



"The challenges we must tackle do not respect geographical, political or scientific boundaries – and our strategy will allow the UK research base to **take a multidisciplinary and international approach to solving them.**"

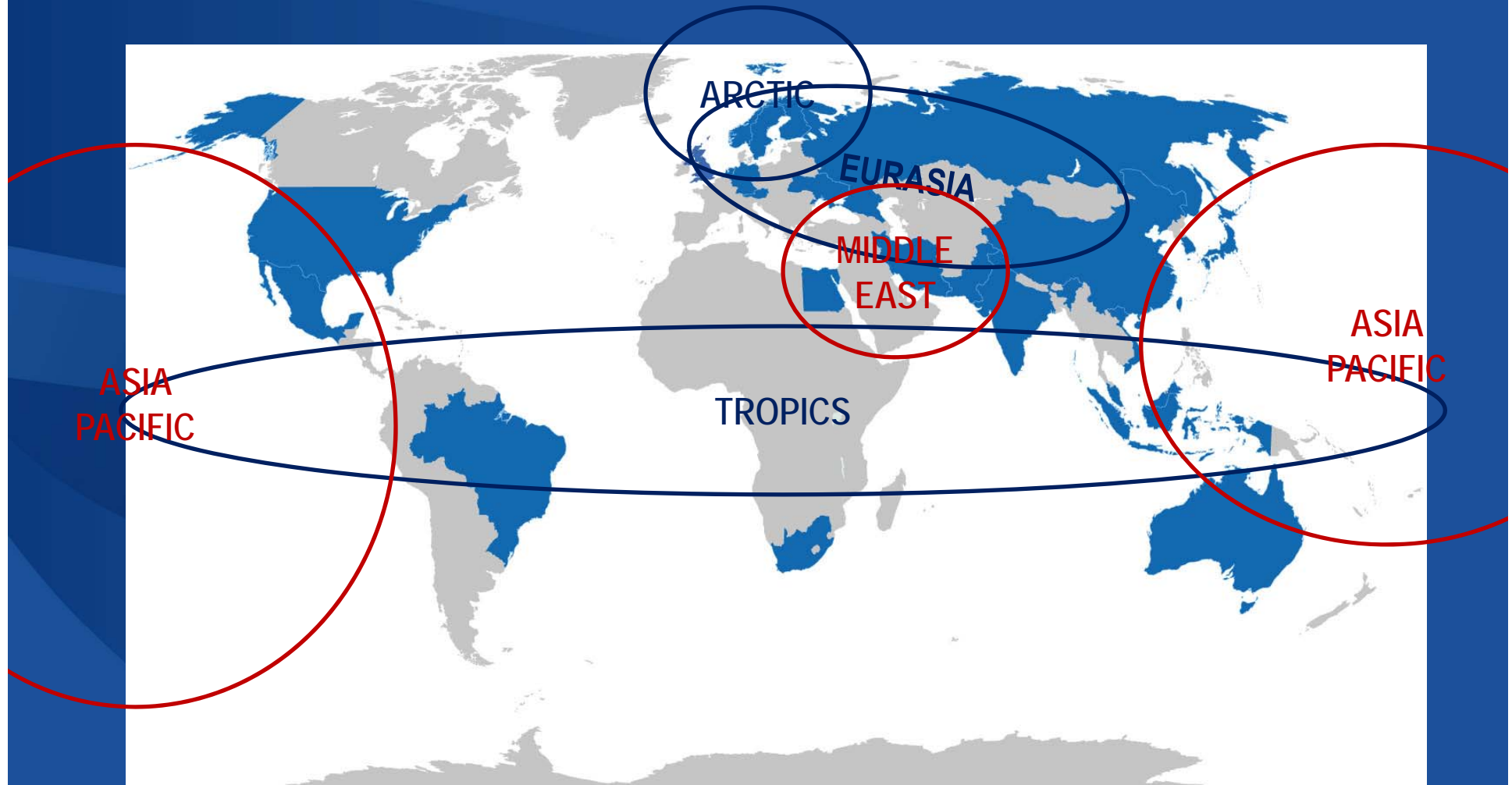
INTERNATIONAL INTEGRATED SYSTEMS APPROACH HAS IMPACT

1. Convention on Long-range Transboundary Air Pollution of the United Nations Economic Commission for Europe
2. EU National Emissions Ceiling Directive
3. EU Thematic Clean Air Strategy
4. EU Climate and Energy Strategy for 2030
5. Climate and Clean Air Coalition to reduce short-lived climate pollutants
6. Objectives of the UN Secretary General's Sustainable Energy for All Initiative
7. Helps Brazil with long term planning for future energy
8. Emission scenarios for IPCC Third, Fourth and Fifth Assessment Reports
9. Catastrophe Bonds to make Mexican public finances resilient to major natural disasters
10. Pest management practices in forests in North America and Scandinavia
11. Forest management practices in Russia
12. Underpins US Dept of Justice antitrust case against Microsoft (technology lock-in)

SOME UK & GLOBAL CHALLENGES BENEFITING FROM A SYSTEMS APPROACH

- Policies for aging societies in the 21st century
- Long term impact of migration
- Opportunities and threats of shale gas
- Building sustainable cities
- Resilience to flooding
- Resilience of the financial sector
- Integrated assessments of the synergies and trade-offs related to the Sustainable Development Goals, and breaking these down to UK targets and policies
- Climate change (e.g. the role of negative emission technologies; achieving well below 2°C targets)
- Global technology transitions
- Global health systems

SCIENCE POLICY and SCIENCE DIPLOMACY



WAYS TO ENGAGE (1)

IIASA gives researchers access to complementary knowledge, new perspectives, new methodologies, new data, new partnerships, and new sources of funding.



WAYS TO ENGAGE (2)

- PhD students – Young Scientists Summer Program (apply Oct to Jan for 3 month program (June to July))
- Postdocs – Postdoctoral Program (ongoing applications reviewed twice a year)
- All levels:
 - Employment (c 125 newcomers each year)
 - Shared appointments (40% IIASA researchers between 1 and 6 months a year at IIASA)
 - Visitors & conference participants (c 1400 a year spending between a day and one month at IIASA)
 - Partners on externally funded projects (c 95 a year)
 - Co-authors on publications (c 850 a year)
- IIASA is interested in developing new mechanisms to engage researchers from its member countries (e.g. secondments, sabbaticals, etc)

**Increasing
International
Competition**



**Increasing
International
Collaboration**

**Increasing
Investment
(R&D as % of
GDP)**

Germany	3% by 2015
Japan	4% by 2016
Sweden	4% in 2011
China	2.2% by 2015
UK	2.5% by 2014



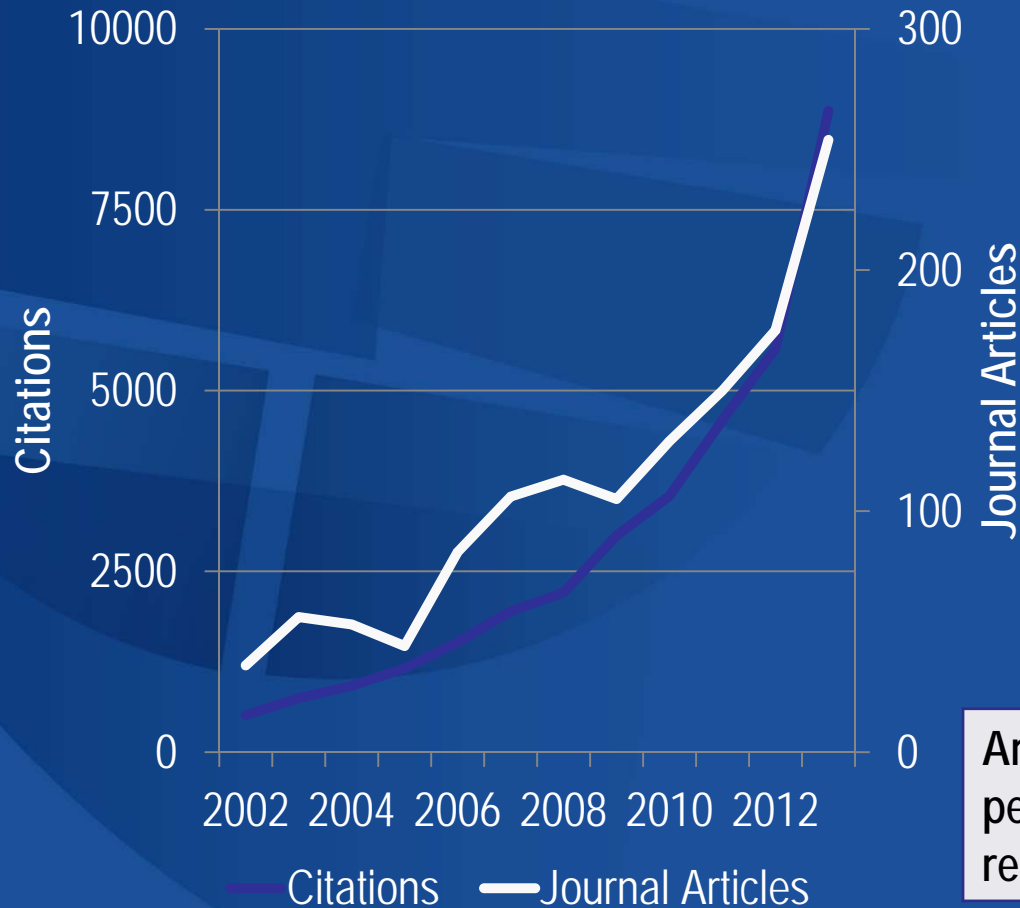
Researched
in UK



Researched in
UK + 2 years
abroad

Some 80-90% of productivity
attributable to technology
transfer derives from foreign
research

Both IIASA and UK pursue research excellence



UK has 4.1% of global researchers and 11.6% of citations and 15.95% of world's most highly cited articles

Articles per researcher	USA	UK	IIASA
	0.4	0.5	0.8



Young Scientists
Summer Program
2008-2014

China 47

USA 68

UK 6



Publications from
country collaborations
2008-2014

Germany 691

USA 605

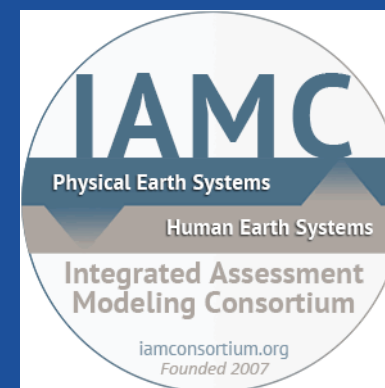
UK 186

GAINS – Integrated Assessment Model to identify cost-effective measures to improve air quality and reduce greenhouse gas emissions



National versions of GAINS model	China	Netherlands	Republic of Korea	Russia	Sweden	UK?
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IAMC - Advancing the methods of integrated assessment modeling



IAMC Founders	IIASA 	Japan 	USA 	UK?
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GOALS FOR THE DAY

- Identify themes and subjects of common interest where IIASA and UK researchers skills complement one another and there is mutual benefit to UK and IIASA
- Identify next steps to engage both UK and IIASA researchers in scoping and implementing the above activities



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