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

science for global insight

SYSTEMS SCIENCE TO BRIDGE A DIVIDED WORLD

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS

IIASA

Professor Dr. Pavel Kabat
IIASA Director General and Chief Executive Officer
Professor Earth System Science
Wageningen, Netherlands

Summer

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

Political Divide: THE EARLY 1970s

Sources: nuclearweaponarchive.org, The Guardian

Sources: US Department of Interior, IIASA

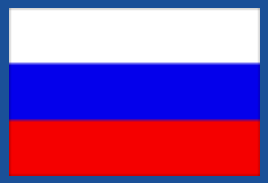
… today - addressing the global challenges of the 21st century

22(25) NATIONAL MEMBER ORGANIZATIONS









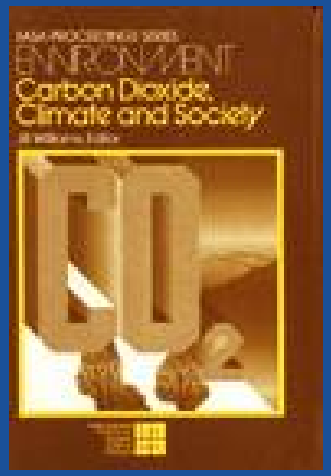


- International, independent, interdisciplinary
- Research on major global problems
- Solution oriented, integrated systems analysis



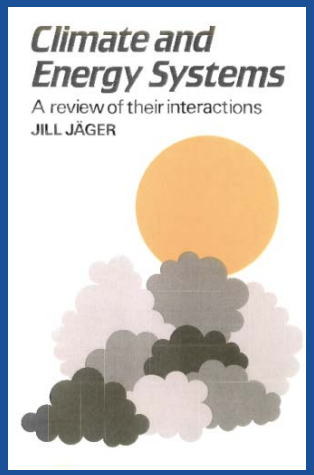



EXAMPLES OF EARLY RESEARCH

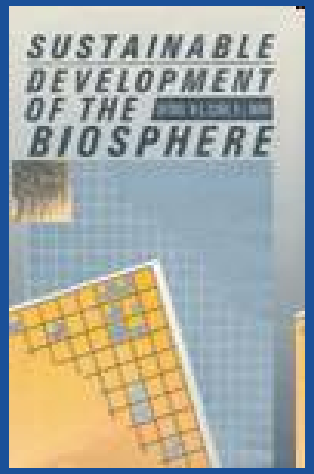


1978

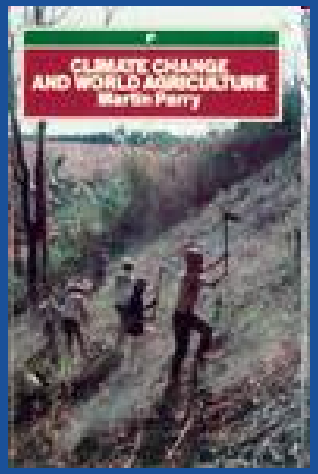
1981



1983

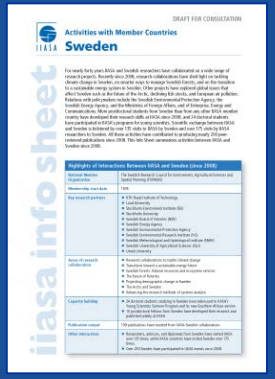


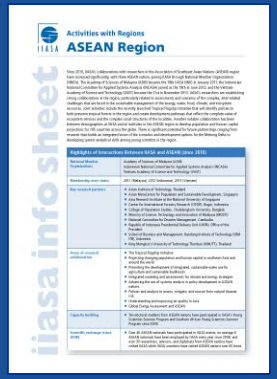
1986



1990

Portfolio of activities *within* and *across* member countries

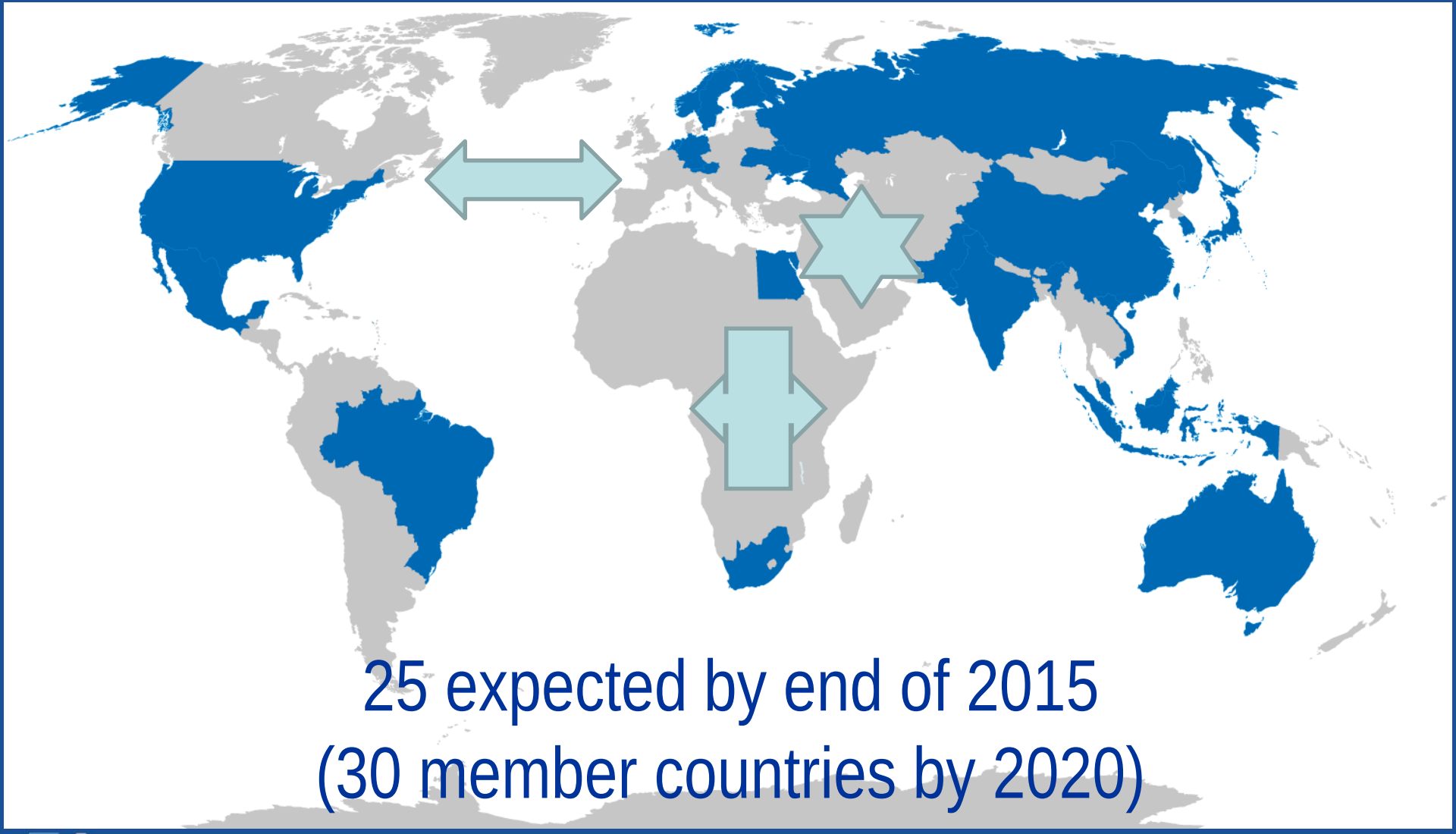




Bridging Political Divide:

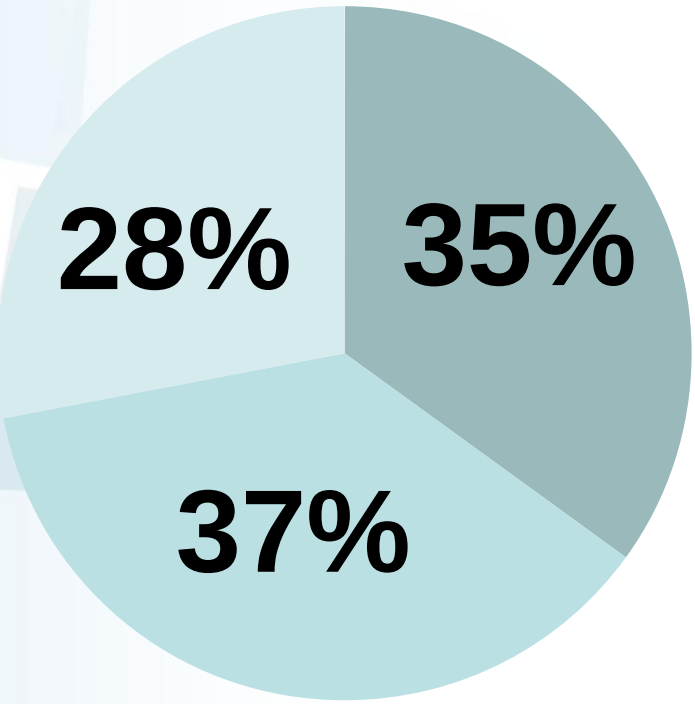
GROWING IIASA MEMBERSHIP
&
INTERACTIONS WITH CURRENT MEMBERS

22 COUNTRIES - NATIONAL MEMBER ORGANIZATIONS



25 expected by end of 2015
(30 member countries by 2020)

BRIDGING DISCIPLINARY and PEOPLE's DIVIDE



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

IIASA: TRULY INTERNATIONAL

- ~ 300 researchers in house include researcher scholars, research assistants, postdoctoral research scholars, and young scientists from more than 50 countries
- ~25% of IIASA alumni (3,475 people worldwide) remain actively involved in IIASA research
- Active and formalized collaboration with over 300 institutions worldwide
- 900 visitors (science & science diplomacy) coming to IIASA and 180 international meetings hosted in 2013
- ~2050 researchers from some 65 countries involved in IIASA's research network in 2013

NOBEL PRIZE WINNERS

Professor Tjalling Koopmans and
Professor Leonid Kantorovich
Nobel Prize in Economics
(1975)

NOBEL PRIZE WINNERS

Professor Paul Crutzen

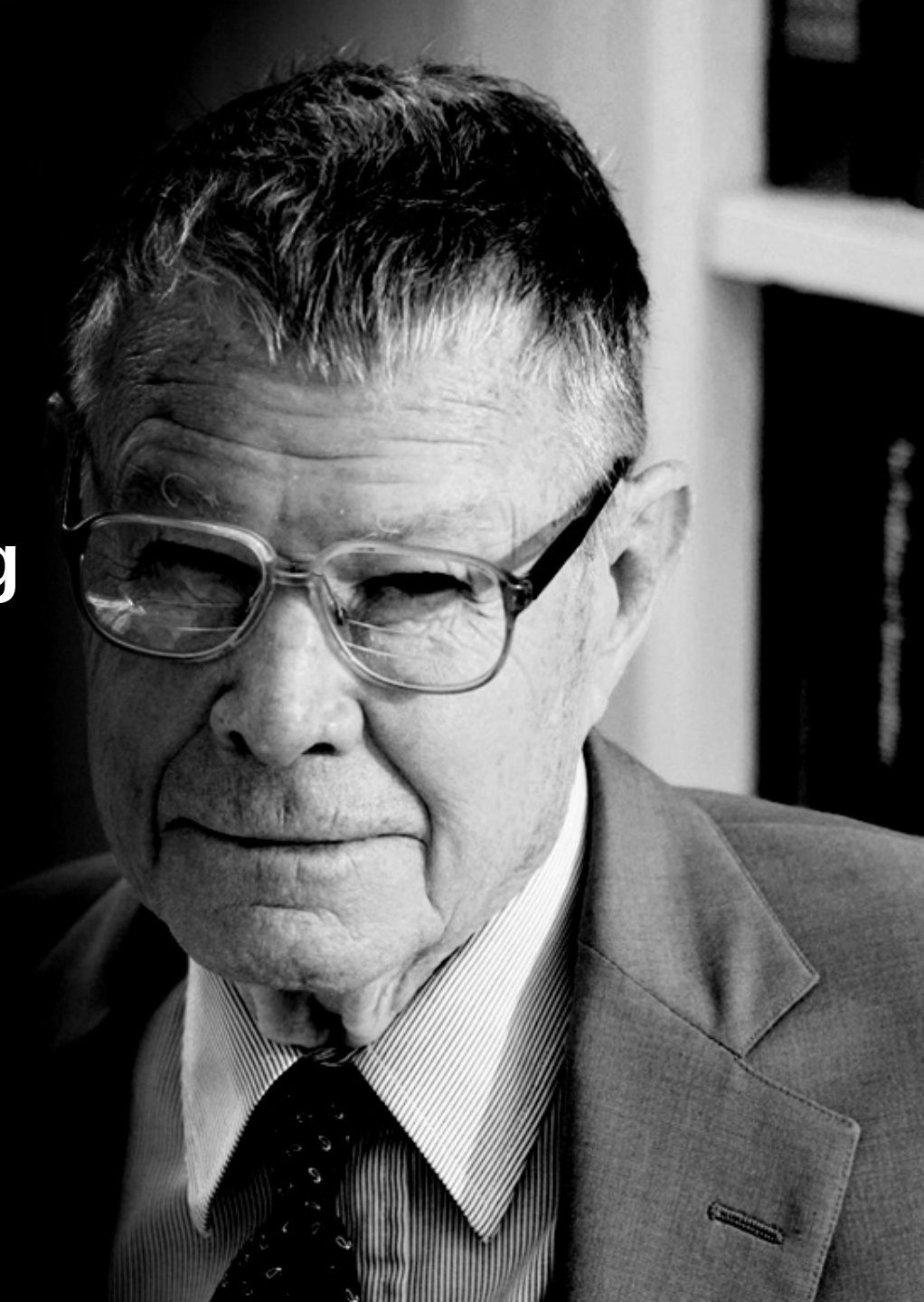
Nobel Prize for Chemistry (1995)

IIASA

NOBEL PRIZE WINNERS

Professor Thomas C. Schelling

Nobel Prize for Economics (2005)



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NOBEL PRIZE WINNERS

Intergovernmental Panel on Climate Change

Nobel Peace Prize (2007)

IIASA

IIASA's DISTINGUISHED VISITING SCHOLARS PROGRAM

Bridging Generational Divide: CAPACITY BUILDING AND ACADEMIC TRAINING

through *research triplets* concept

YOUNG SCIENTISTS SUMMER PROGRAM (YSSP)

INTERNATIONAL GRADUATE SCHOOL OF EXCELLENCE

- Global network of 35–45 postdoctoral, across-disciplines fellows working at IGSE-affiliated institutions
- Coordinated 5-year program of work on one complex issue
- Issue proposed by IIASA Global Think Tank
- Postdoc group spends 3–4 months per year at IIASA
- Target launch: early 2015

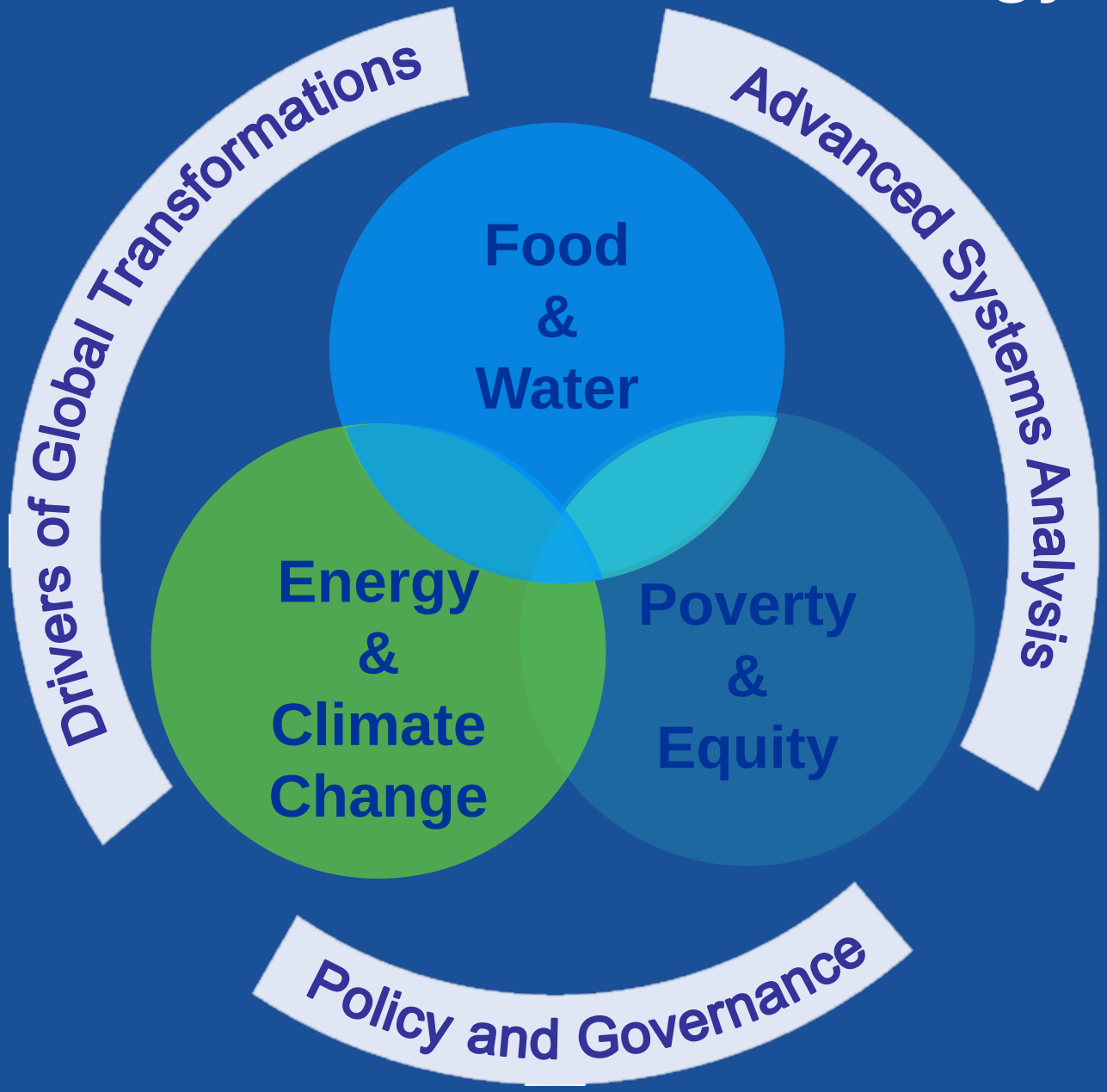
IIASA'S SYSTEMS SCIENCE APPROACH

RESEARCHING GLOBAL CHALLENGES

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

} = Systems Analysis

IIASA Research Strategy



ADVANCED SYSTEMS ANALYSIS

PAST SUCCESSES

- Dynamic Systems
- Multi-criteria decision analysis
- Adaptive dynamics theory
- Game theory
- Agent-based modeling
- Stochastic optimization

NEW RESEARCH

- Advances in Modeling Dynamic Systems
- Extreme events, Systemic Risks and Robust Solutions
- Integrated Modeling and Decision Support
- Advanced Systems Analysis Forum

BRIDGING SCIENCE TO POLICY DIVIDE

Does inter-action with policy compromises on science quality & excellence ?

H-INDEXES - IIASA

SCOPUS	93
Web of Science	98

This h-index measures the productivity and impact of the journal articles by IIASA authors in different databases of peer-reviewed literature. An h-index of 93 means that of all IIASA journal articles, 93 articles have been cited more than 93 times.

IIASA AS THE EXPERT ADVISOR

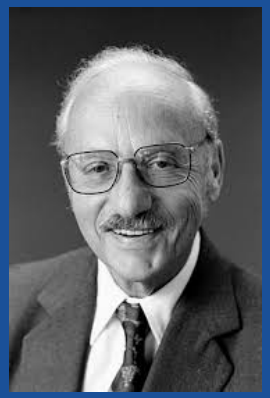
IIASA researchers take part in 80 advisory boards and steering committees, including:

- Leadership Council of the Sustainable Development Solutions Network (SDSN) – input to define Sustainable Development Goals (SDGs)
- UN Secretary General Technical Group on Sustainable Energy for All
- Advisory Council of the German Government on Global Change (WBGU)
- Arctic Council
- UN Food and Agriculture Organization Land and Water Division

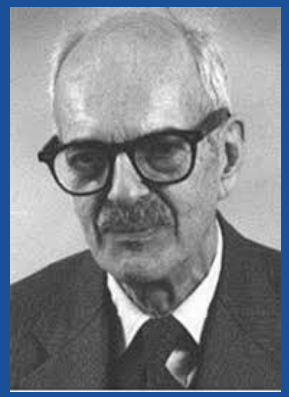
Bridging Science – Policy Divide: Example USA (2008-2014)

National Member Organization	National Academy of Sciences (NAS)
Membership start date	1972 (founding member)
Research partners	59 organizations in the US
Areas of research collaborations	Advancing Energy and Integrated Assessment Modeling in the US Global Energy Assessment and the US Curbing the Release of Black Carbon and Methane Projecting Changing Population in the US Improving the Use of Land for Food and for Combating Climate Change Advising Countries with Economies in Transition Increasing the Resilience of Vulnerable Communities Analyzing Ecological and Evolutionary Dynamics
Capacity Building	68 young scientists from the US have participated in IIASA's Young Scientists Summer Program 3 in IIASA's Postdoctoral Fellowship Program 3 in the Southern African Young Scientists Summer Program
Publication output	605 publications
Staff	Over 40 US nationals have been employed by IIASA every year

SOME LEADING US PERSONALITIES FROM ACADEMIA AND ASSOCIATED WITH IIASA



George Dantzig



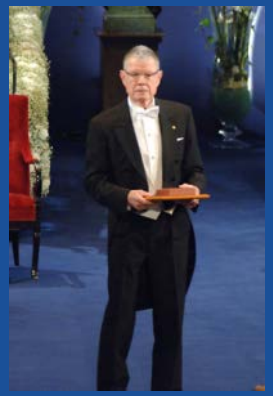
Nathan Keyfitz

Tjalling Koopmans

Donella & Dennis L Meadows

William D. Nordhaus

Jeffrey Sachs



Thomas C. Schelling

SOME LEADING US PERSONALITIES FROM GOVERNMENT AND ASSOCIATED WITH IIASA

McGeorge Bundy

Steven Chu

E. William Colglazier

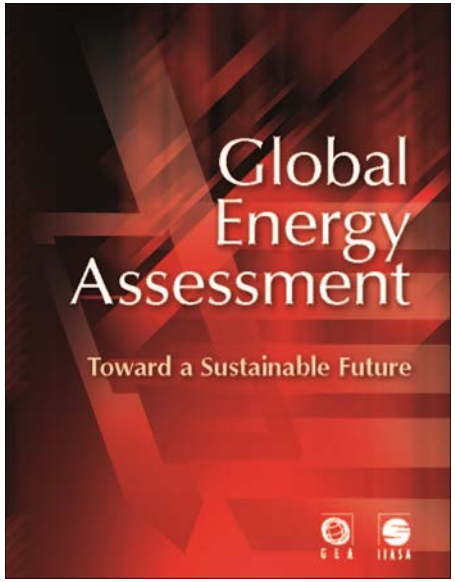
John P. Holdren

Robert S. McNamara

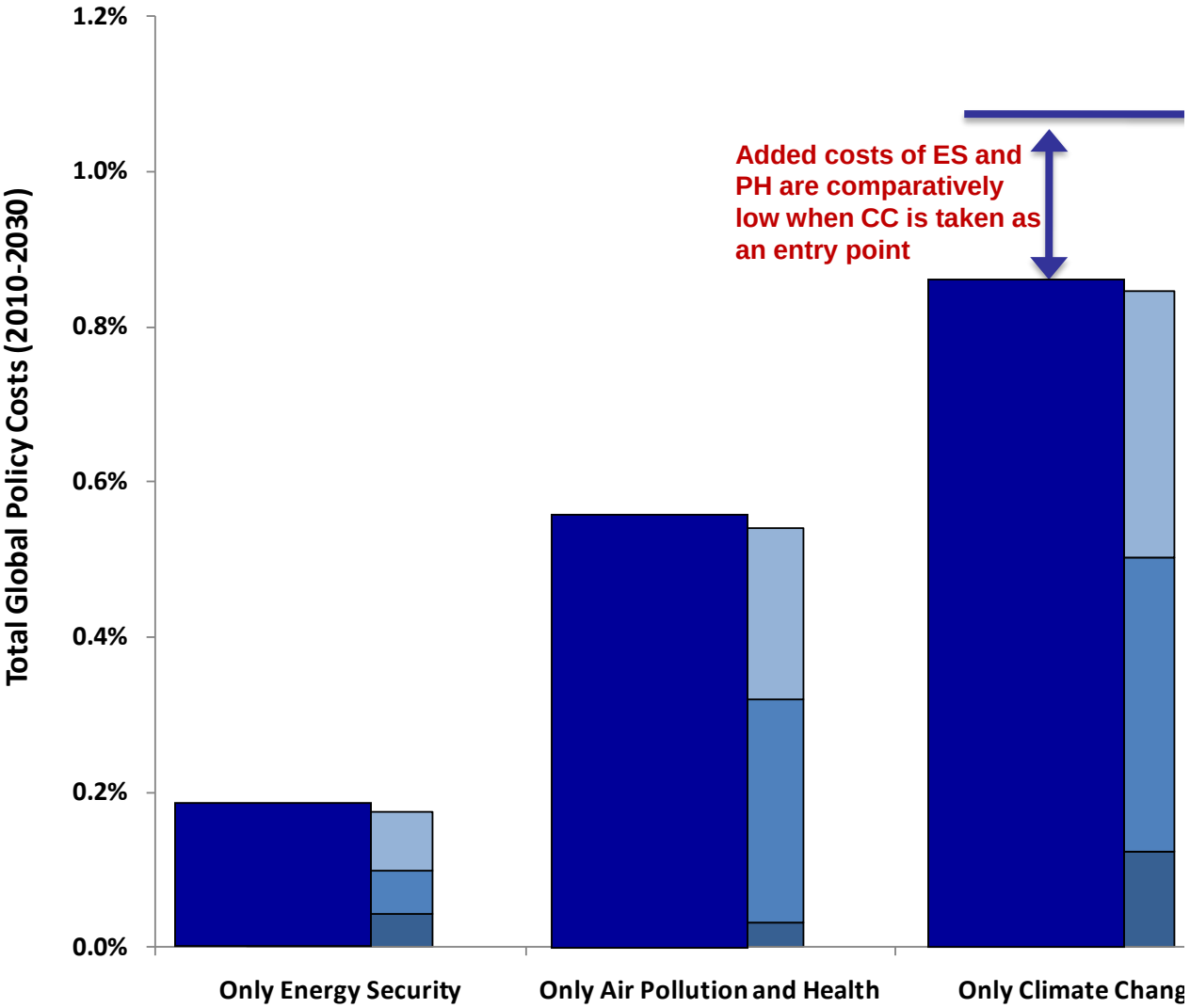
Norman Neureiter

Benefits of Systems Approach: Bridging across research and policy making silo's (Example 1)

- 2006-12: Global Energy Assessment involving 500 experts around the world
- 2009 to date: GEA provides critical input to Un Secretary-General's Sustainable Energy For All Initiative including defining the aspirational yet feasible objectives:
  1. Ensure universal access to modern energy services
  2. Double the global rate of improvements in energy efficiency
  3. Double the share of renewable energy in the global energy mix



Costs Benefits (% global GDP)



Benefits of Systems Approach: Bridging across research and policy making silo's (Example 2)

- 2011: IIASA model GAINS identifies 16 measures to curb the release of either black carbon or methane (pollutants that harm human or plant health while simultaneously exacerbating climate change).
- Feb 2012: US State Secretary Hillary Clinton launched the Climate and Clean Air Coalition to Reduce Short Lived Climate Pollutants
- Today, CCAC has 33 member countries, 39 International Organizations and IIASA's Markus Amann on scientific committee

DOI: 10.1126/science.1210026

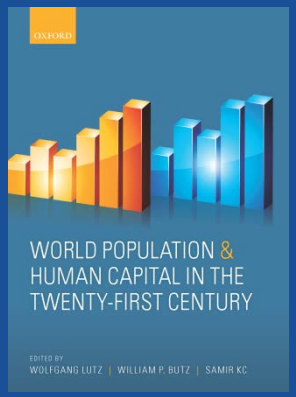
Benefits of Systems Approach: Bridging across research and policy making silo's (Example 3)

Jan 2014: European Commission announce 2030 climate and energy goals for a competitive, secure and low-carbon EU economy. These include:

- A reduction in greenhouse gas emissions by 40% below the 1990 level
- An EU-wide binding target for renewable energy of at least 27%

Goals were informed by an extensive impact assessment, for which IIASA researchers contributed data and model results to help policymakers understand future emissions, as well as the potential benefits and costs of various climate policies.

Source: EU Trends to 2050 Update



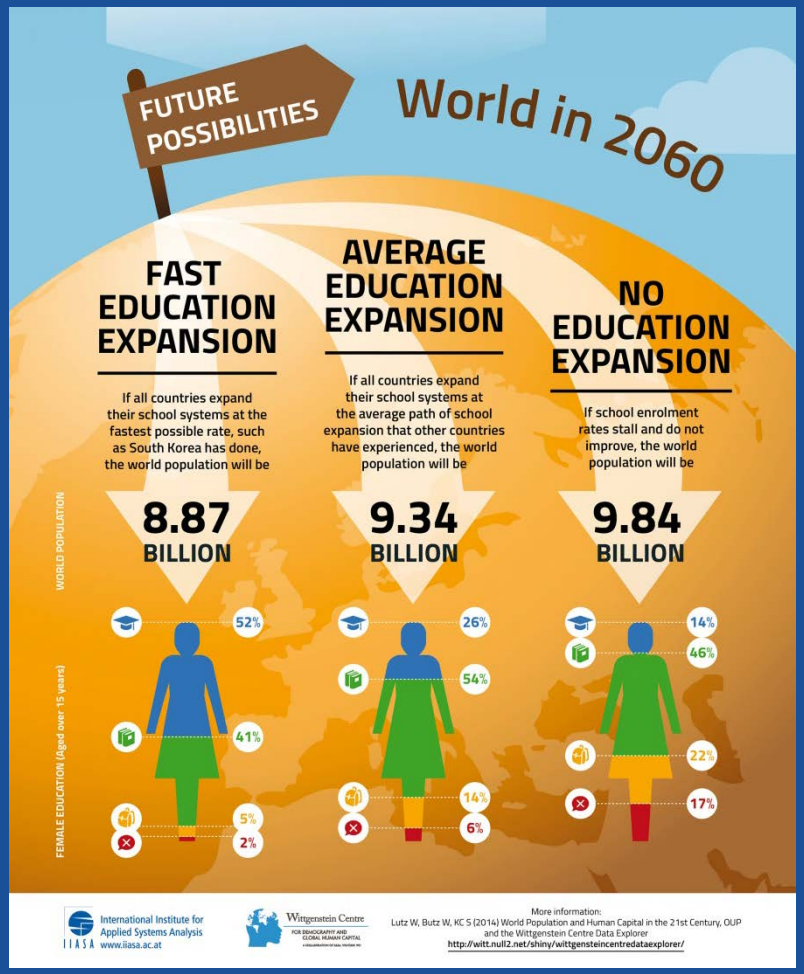
Benefits of Systems Approach: Bridging across research and policy making silo's (Example 4)

UN

80% probability that world population, now 7.2 billion, will increase to between 9.6 and 12.3 billion in 2100, with the median at 10.9 billion.

IIASA

Most likely scenario indicates that world population will increase to 9.2 billion by 2050, peak at 9.4 billion around 2070 and start a slow decline to 9.0 billion by the end of the century.



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science for global insight

SOME IIASA NEW INITIATIVES and NETWORKS:

new opportunities for collaborations

NEW INTEGRATED RESEARCH INITIATIVES

- Accounting for social heterogeneity in IIASA models
- Equitable governance of common goods
- Next-generation vegetation models
- Systemic Risk and Network Dynamics
- Unconventional and Shale Gas: A possible bridge to sustainable futures?
- Arctic
- Tropics
- Water Futures and Solutions

EURASIAN ECONOMIC INTEGRATION

- Challenges and benefits of greater economic integration between Russia, Belarus and Kazakhstan
- Future collaboration between Ukraine, Russia and EU
- Scenarios of Eurasian integration from Shanghai to Lisbon, its global integration, and future roles of key players including China, EU, Japan and Russia
- Partners include:
  - Administration of the President of the Russian Federation,
  - European Commission
  - Russian Academy of Sciences,
  - Eurasian Development Bank,
  - Vienna Institute for International Economic Studies

Российская Академия Наук

Eurasian Development Bank

wiiw

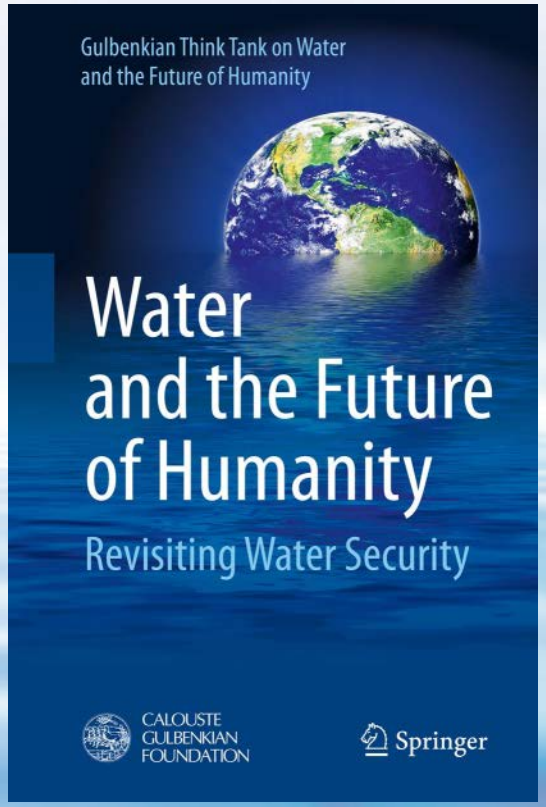
IIASA – Arctic Futures Project

IIASA holistic approach

- Integrating stakeholders, disciplines, issues, information, methods, globally
- For a holistic understanding for all stakeholders

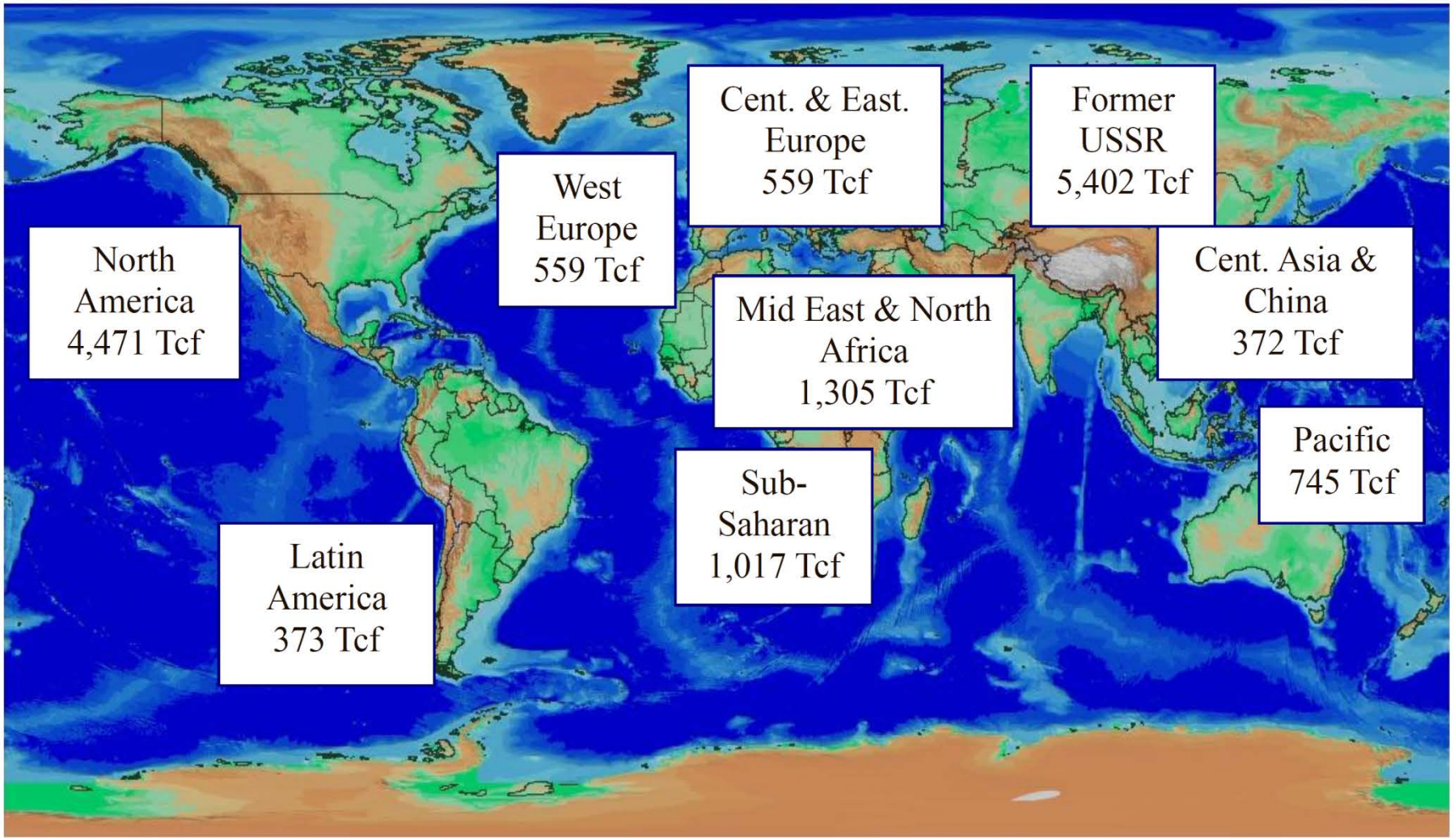
WATER FUTURES & SOLUTIONS (WFaS)

- New book: Water and the Future of Humanity
- Budapest Water Summit
- Changes in water availability and water temperature under climate change are likely to lead to higher electricity prices for most of Europe (Environmental Research Letters)



DOI: 10.1088/1748-9326/8/3/035010

Estimated shale gas resource



14,803 TCF ≈ 15 ZJ → 100 yr of current gas use → 250 PgC

IGU 2003, VNIIGAS 2007, USGS 2008, BGR 2009

New Partnerships

- New Global Think Tank (Alpbach – Laxenburg Group) announced by IIASA and European Alpbach Forum in Sept 2013
- To initiate a new dialogue and partnership between **top-academia, governments, businesses and civil society** for an integrated systematic approach to fair globalization

ALPBACH LAXENBURG GROUP MEMBERS INCLUDE

Petr Aven

Ian Chubb

Ralph Cicerone

Tarja Halonen

Chen Jining

Rajendra Pachauri

Mary Robinson

Jeffrey Sachs

INTERNATIONAL SCIENCE TO POLICY ADVICE: Some Key Principles

- International and Independent (of political influence)
- Solution-oriented; long-term
- Not policy prescriptive, but policy – informative
- Honesty and openness about uncertainties
- Not one (deterministic) option, rather a portfolio of plausible alternatives and (scenarios) options to choose from: decision makers decide, not the scientist
- Inclusive and participative: scientists and policy makers in a sustained dialogue (“engaged scholarship”)
- and……

"A living land builds for it's future"

State Committee of the Netherlands ("Delta Committee")

200 billion Euro investment over the next 100 years (2 billion/annum)

INTERNATIONAL SCIENCE TO POLICY ADVICE: Key Principles

And…

- A Good Communication!

Thank you!

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Thank you and welcome to IIASA!