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Applied Systems Analysis  
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science for global insight

# International research collaborations to develop the tools of systems analysis

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Tel Aviv University  
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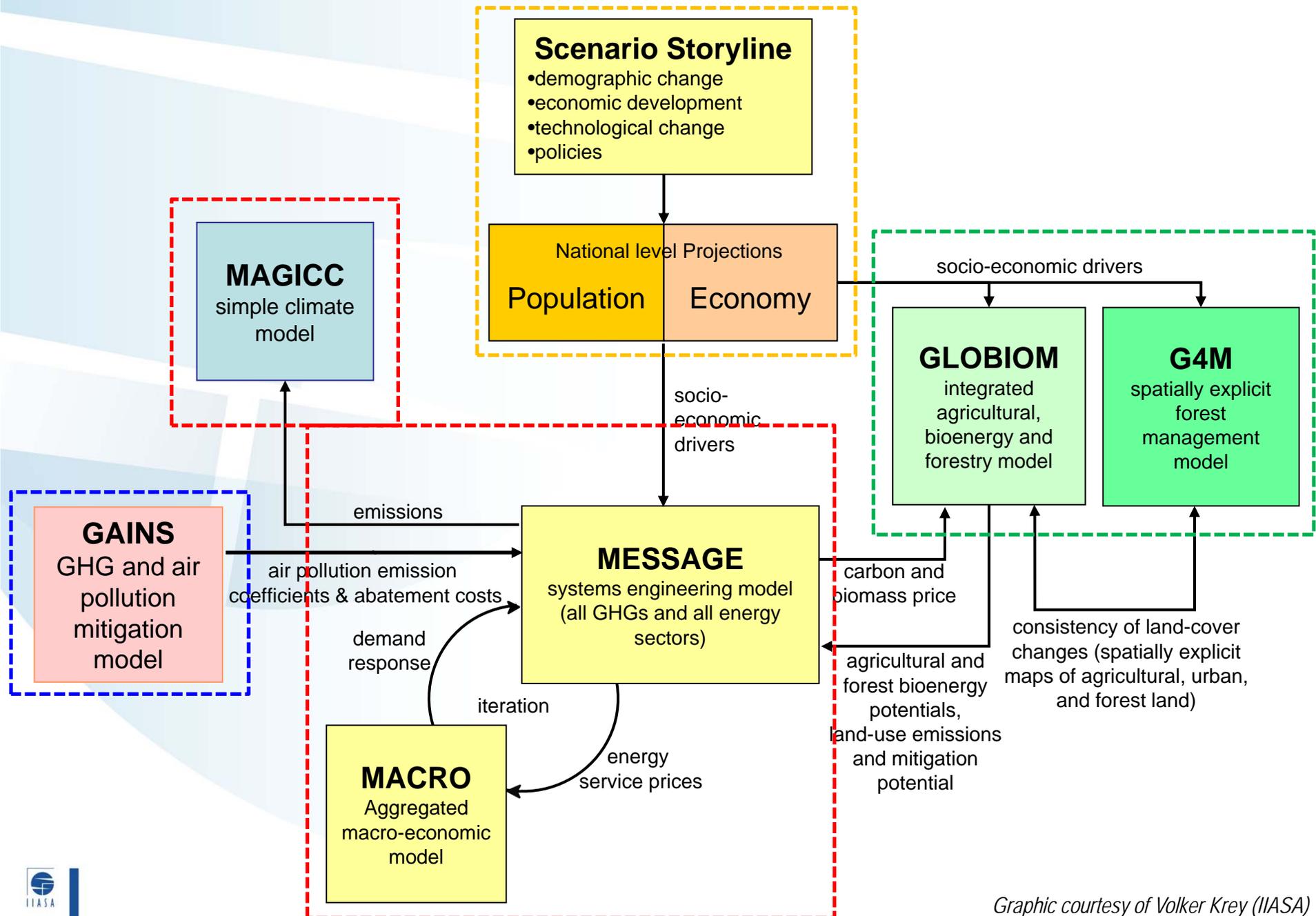
IIASA, International Institute for Applied Systems Analysis

*“integrated assessment is an attempt to combine information, analysis and insights from the physical and social sciences to address the nature of climate change and to develop possible policy responses to it”*

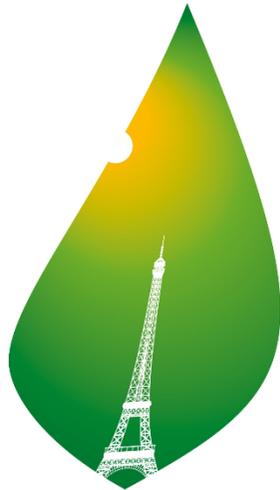
John P. Weyant, *Climatic Change* 95, pp. 317–323 (2009)

- Examples of global integrated assessment and energy-economy models (cost-effectiveness analysis):
  - AIM, GCAM, IMAGE, MESSAGE, REMIND, TIAM, WITCH, ...
- Insights fed into IPCC AR5 WG3 in a big way, via model inter-comparisons (AMPERE, LIMITS, EMF27, ...)

# IIASA Integrated Assessment Framework



# UNFCCC COP21: 2015 Paris Climate Conference

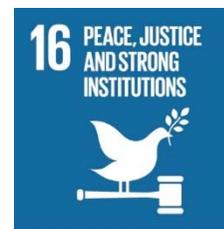
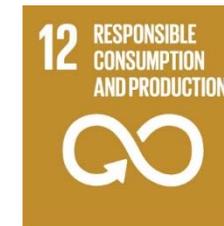


COP21 • CMP11  
**PARIS 2015**  
UN CLIMATE CHANGE CONFERENCE



*195 countries have agreed, by consensus, to reduce their greenhouse gas emissions “as soon as possible” and to do their best to keep global warming “to well below 2 degrees C”.*

# United Nations' Post-2015 Sustainable Development Goals (SDGs)



Source: <https://sustainabledevelopment.un.org/>

# Generated a large scenario ensemble



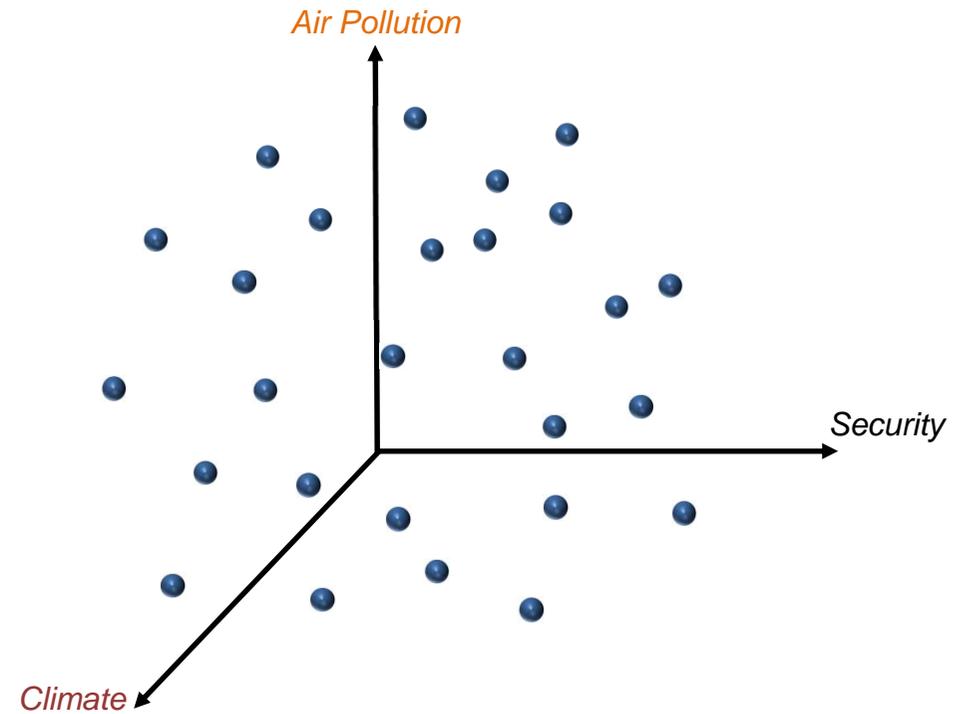
Climate Change



Energy Security



Air Pollution



>600 unique scenarios spanning the feasible scenario space (energy-climate-pollution-security futures)

# IIASA Energy-Multi Criteria Analysis Tool (ENE-MCA)

Science for  
Global Insight

About
Tool
Documentation

IIASA Energy - Multi Criteria Analysis  
Version 1.0

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**(1) Select priorities for energy sustainability**

← Decreasing Priority      Increasing Priority →

Climate

Energy Security

Health

Costs

**(2) Select indicators to view scenario results**

Objective Fulfillment

**Cost Indicators**

Policy Costs     Total Investments

Climate Mitigation Investments     Pollution Control Costs     Energy Security Investments

**Air Pollution & Health Indicators**

PM2.5 Emissions     DALYs

**Energy Security Indicators**

Energy Import Dependence     Energy Diversity & Resilience

**Climate Change Indicators**

GHG Emissions     CO<sub>2</sub>-equiv. Concentration     Temperature Change

**Energy System Development Indicators**

Primary Energy     Final Energy     Electricity Generation

**Figure**

## Objective Fulfillment

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**Notes**

**Objectives & Indicators**

1. **Health** -- Globally-Aggregated Disability-Adjusted Life Years (DALY) in 2030 [millions]
2. **Air Pollution** -- Total Global PM2.5 Emissions in 2030 [Mton]
3. **GHG Emissions** -- Global Annual Greenhouse Gas Emissions in 2050 [Gton CO<sub>2</sub>-eq]
4. **Climate Change** -- Probability of limiting global maximum temperature increase to 2 degrees Celsius above pre-industrial levels over the 21st century [%]
5. **Energy Import Dependence** -- Total Global Imports as a Share of Total Primary Energy Supply (TPES) in 2030 [%]
6. **Energy Diversity & Resilience** -- Globally-aggregated compound primary energy diversity indicator in 2030 [-]
7. **Policy Costs** -- Total Cumulative Discounted Global Policy Costs (Relative to Baseline) from 2010 to 2030 [% of GDP]
8. **Investments** -- Average Annual Global Energy Supply System and Infrastructure Investments (including Climate Mitigation, Pollution Control and Energy Security) from 2010 to 2030 [Billion 2005US\$ / year]

# Why is an MCA-type tool useful?

- 1. Difficulty in quantifying some objectives economically**
- 2. Diverging views about which energy challenges are most important**

# GEF-UNIDO-IIASA Workshops



Cape Verde



India



Armenia

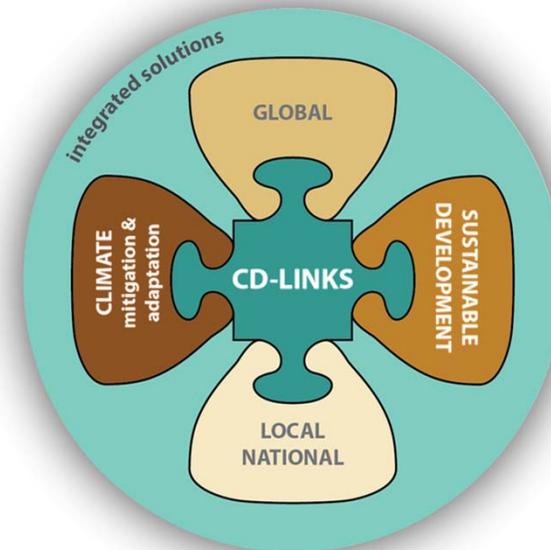


# CD-LINKS (Horizon 2020)

*Linking Climate and Development Policies –  
Leveraging International Networks and Knowledge Sharing*

## Objectives:

- Improve scientific understanding of linkages between **climate change** and multiple **sustainable development** objectives
- Develop **globally** consistent, **national low-carbon development pathways**
- Broaden evidence base on **policy effectiveness** (learn from past experience)
- Establish research network and **capacity building platform** among institutions from Europe and several Non-European G20 countries



# CD-LINKS consortium



# Capabilities/plans for modeling sustainable development objectives

	Climate		Linkages to Sustainable Development					Economic Develop.
	Mitigation	Adaptation/ Resilience	Energy Poverty	Air Quality	Water	Food Security	Energy Security	
  AIM/CGE	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
 China-TIMES	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
  DNE21+	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
  GEM-E3	<input checked="" type="checkbox"/>							
  GCAM#	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
  IMAGE	<input checked="" type="checkbox"/>							
  IPAC	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
 KAIST#								
 MESSAGE-Brazil	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
  MESSAGE-GLOBIOM	<input checked="" type="checkbox"/>							
  SLIMS	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
  WITCH-GLOBIOM	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
 TERI India MARKAL	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
 TERI India CGE	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>
  REMIND-MAgPIE	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				
 RU-TIMES	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
  CATSIM*		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			
 GAINS*	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				

# Questions? Comments?



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