IIASA Integrated Assessment Framework

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IIASA Energy Program

The World in 2050, 10-12 March 2015
IIASA Integrated Assessment Framework

**Scenario Storyline**
- demographic change
- economic development
- technological change
- policies

**POP**
- National level Projections
- Population
- Economy

**ESM**
- GLOBIOM: integrated agricultural, bioenergy and forestry model
- G4M: spatially explicit forest management model
- socio-economic drivers

**MAG**
- MAGICC: simple climate model
- emissions
- carbon and biomass price
- consistency of land-cover changes (spatially explicit maps of agricultural, urban, and forest land)

**ENE**
- MESSAGE: systems engineering model (all GHGs and all energy sectors)
- energy service prices
- agricultural and forest bioenergy potentials, land-use emissions and mitigation potential

**GAINS**
- GHG and air pollution mitigation model
- air pollution emission coefficients & abatement costs
- demand response
- iteration

**MACRO**
- Aggregated macro-economic model
- demand response
- energy service prices

**ASA**
- Multi-Criteria Analysis Methods
Synergies of Multiple Energy Objectives

CC – Climate Change
PH – Pollution & Health
ES – Energy Security

Added costs of ES and PH are comparatively low when CC is taken as an entry point.

Integrated Climate-Pollution-Security Policies

D. McCollum, V. Krey, K. Riahi (2011)
PM2.5 Exposure

Methodology: Rao et al. (2012)
PM2.5 Exposure

- > 10 ug/m³
- > 15 ug/m³
- > 25 ug/m³
- > 35 ug/m³

WHO Standard

No populations exposed to >35 ug/m³
>3 billion lack access to modern cooking energy
>1.3 billion lack access to electricity

Mapping of Energy Access
People without access to electricity or clean cooking fuels

Source: Pachauri et al. (2012)
Policy Scenarios for Universal Modern Cooking Access

An additional 200 million without access by 2030

Fuel subsidies coupled with grants or microfinance schemes most effective

Subsidies alone reduce dependence by one-third

Microfinance alone not effective

People gaining access to modern energy carriers

Population dependent on solid fuels in billions

Source: Pachauri et al. 2013
Livestock development and environmental impacts

Source: Havlík et al. PNAS 2014

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CD-LINKS project

Approaches

• Empirical policy analysis
• Developing integrated national and global scenarios

Dimensions relevant to TWI2050

• Economic development
• Energy poverty and inequality
• Air quality and health
• Water
• Food security
• Adaptation and resilience to climate impacts and risk
• Energy security
CD-LINKS consortium
Thank you!
Additional Material
Relevant project and processes

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

- **SSPs**
  Shared Socio-economic Pathways
# CD-LINKS project

## European partners

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<tr>
<th>Institution</th>
<th>Country</th>
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<tbody>
<tr>
<td>International Institute for Applied Systems Analysis (IIASA)</td>
<td>Austria</td>
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<tr>
<td>Potsdam Institute for Climate Impact Research (PIK)</td>
<td>Germany</td>
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<tr>
<td>Centro Euro-Mediterraneo sui Cambiamenti Climatici (CMCC)</td>
<td>Italy</td>
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<td>Planbureau voor de Leefomgeving (PBL)</td>
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<td>Institute of Communication and Computer Systems (ICCS)</td>
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<td>Wageningen University (WUR)</td>
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<td>University of East Anglia (UEA)</td>
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<tr>
<td>Institut du développement durable et des relations internationales (IDDRI)</td>
<td>France</td>
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## Non-European partners

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<td>Energy Planning Program, COPPE, Federal University of Rio de Janeiro</td>
<td>Brazil</td>
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<td>Energy Research Institute, National Development Reform Commission (ERI-NDRC)</td>
<td>China</td>
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<td>Tsinghua University</td>
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<td>Indian Institute of Management Ahmedabad (IIMA)</td>
<td>India</td>
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<td>The Energy Resources Institute (TERI)</td>
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<tr>
<td>High School of Economics (HSE), Moscow</td>
<td>Russia</td>
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<tr>
<td>National Institute for Environmental Studies (NIES)</td>
<td>Japan</td>
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<tr>
<td>Research Institute of Innovative Technology for the Earth (RITE)</td>
<td>Japan</td>
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## Associate partners

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<tr>
<td>Joint Global Change Research Institute (JCGRI)</td>
<td>United States</td>
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</table>
PM2.5 Exposure

- > 10 ug/m³
- > 15 ug/m³
- > 25 ug/m³
- > 35 ug/m³

WHO Standard

- Baseline w/ currently planned legislation
- Baseline w/ 450 ppm w/ currently planned legislation
- Stringent pollution legislation

No populations exposed to >35 ug/m³

2005 2030