IEA Buildings Webinar Series

Webinar 4 – Modeling and Data Peer Review

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Paris, 23 June 2014

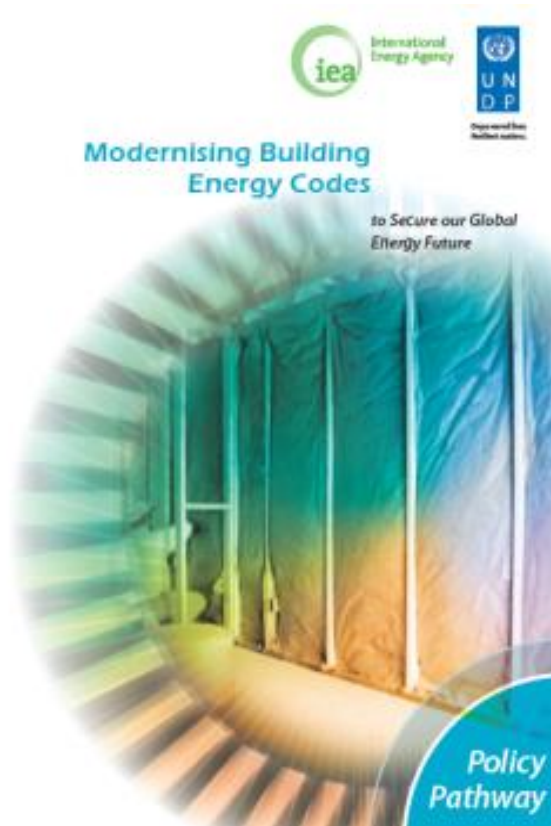www.iea.org

2013 BUILDING PUBLICATIONS

Dec 2013

Aug 2013

Jun 2013

Importance of Buildings Sector
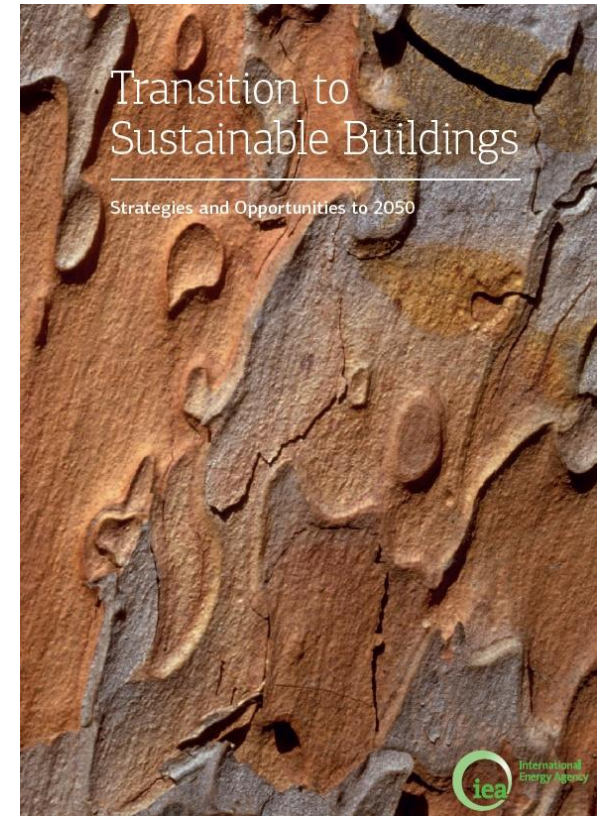
- **Largest end-use sector**

- **1/3 carbon emissions**

- **50% of electricity**

- **Major portion of GDP**

- **Opportunities/challenges:**
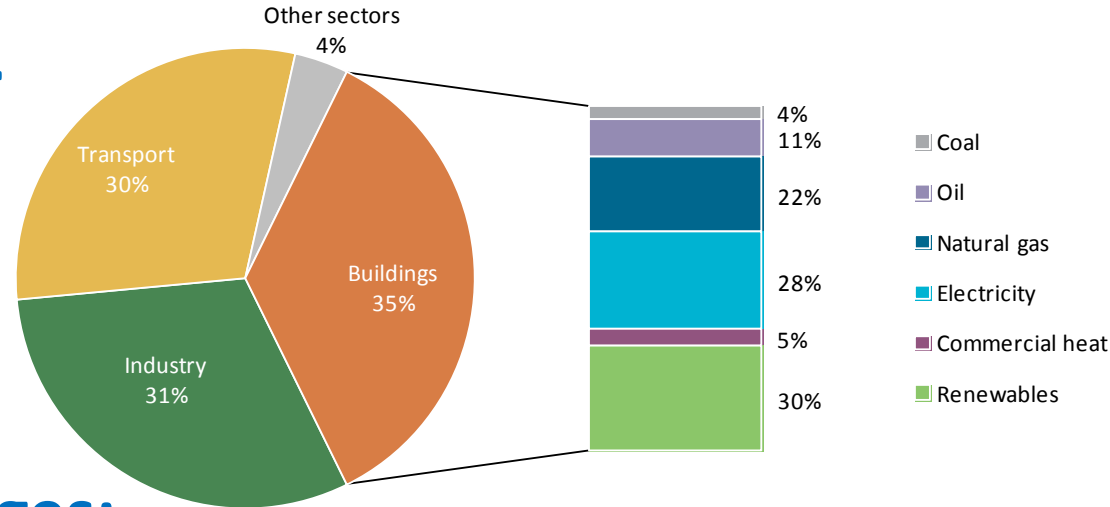
  - 75% - 90% of OECD building stock still in service by 2050

  - Large population growth in developing world will drive new floor area that needs to be efficient (2.5 billion more by 2050)

Pie chart:
- Transport 30%
- Buildings 35%
- Industry 31%
- Other sectors 4%

Buildings breakdown bar:
- Coal 4%
- Oil 11%
- Natural gas 22%
- Electricity 28%
- Commercial heat 5%
- Renewables 30%

Sectors
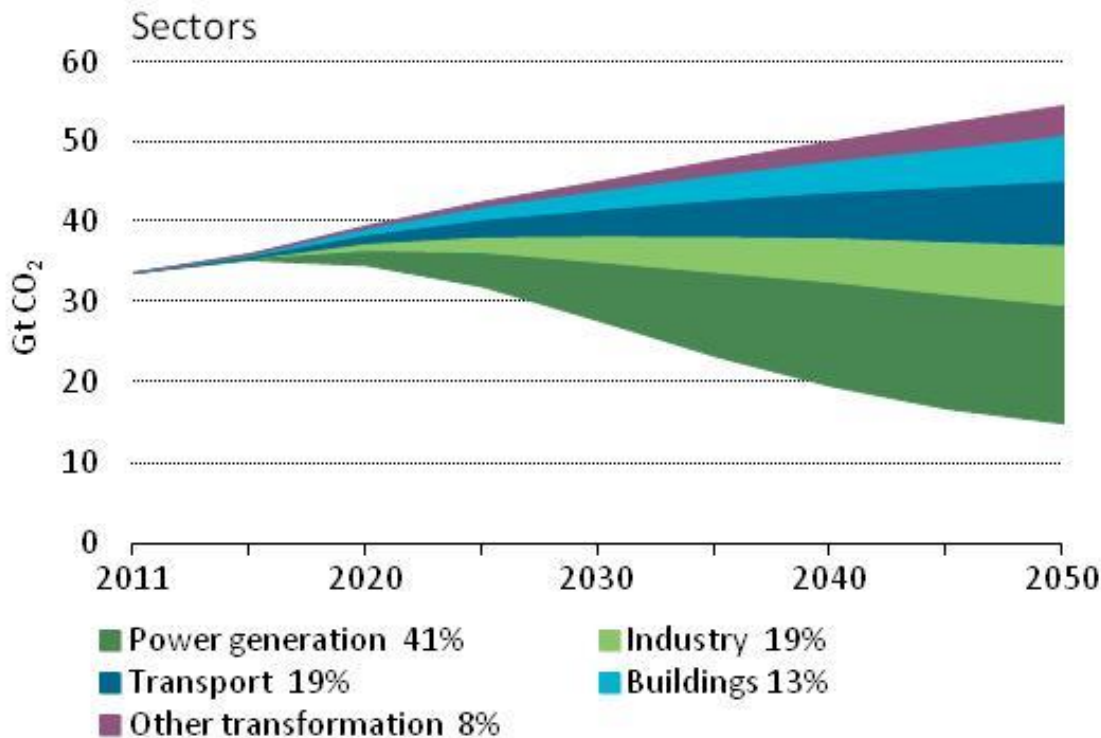
Source: Energy Technology Perspectives 2014

- **6°C Scenario – business-as-usual; no adoption of new energy and climate policies**

- **2°C Scenario - energy-related CO_2-emissions halved by 2050 through CO_2-price and strong policies**
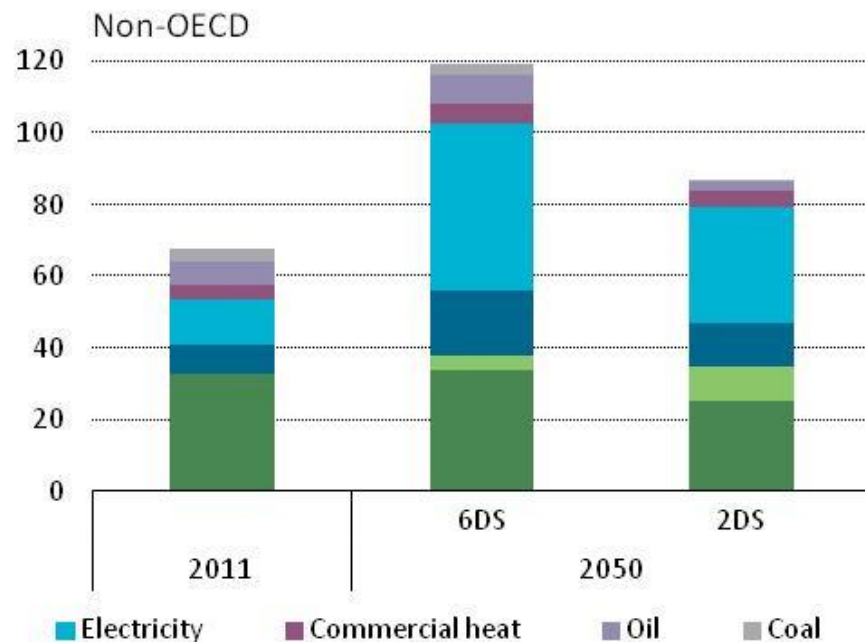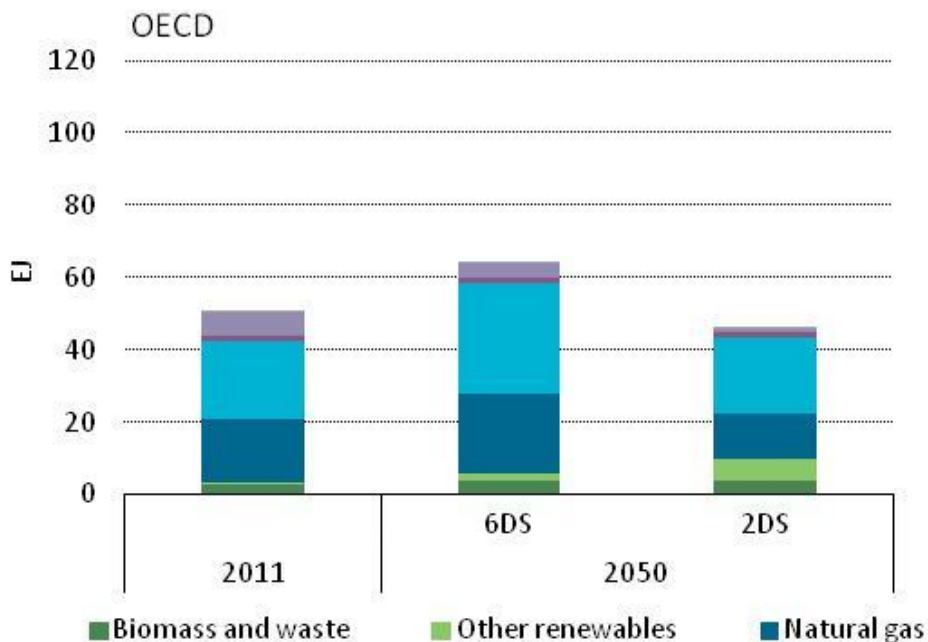
6 degree scenario (business as usual) → 2 degree scenario (assertive policies)

ETP Model Structure
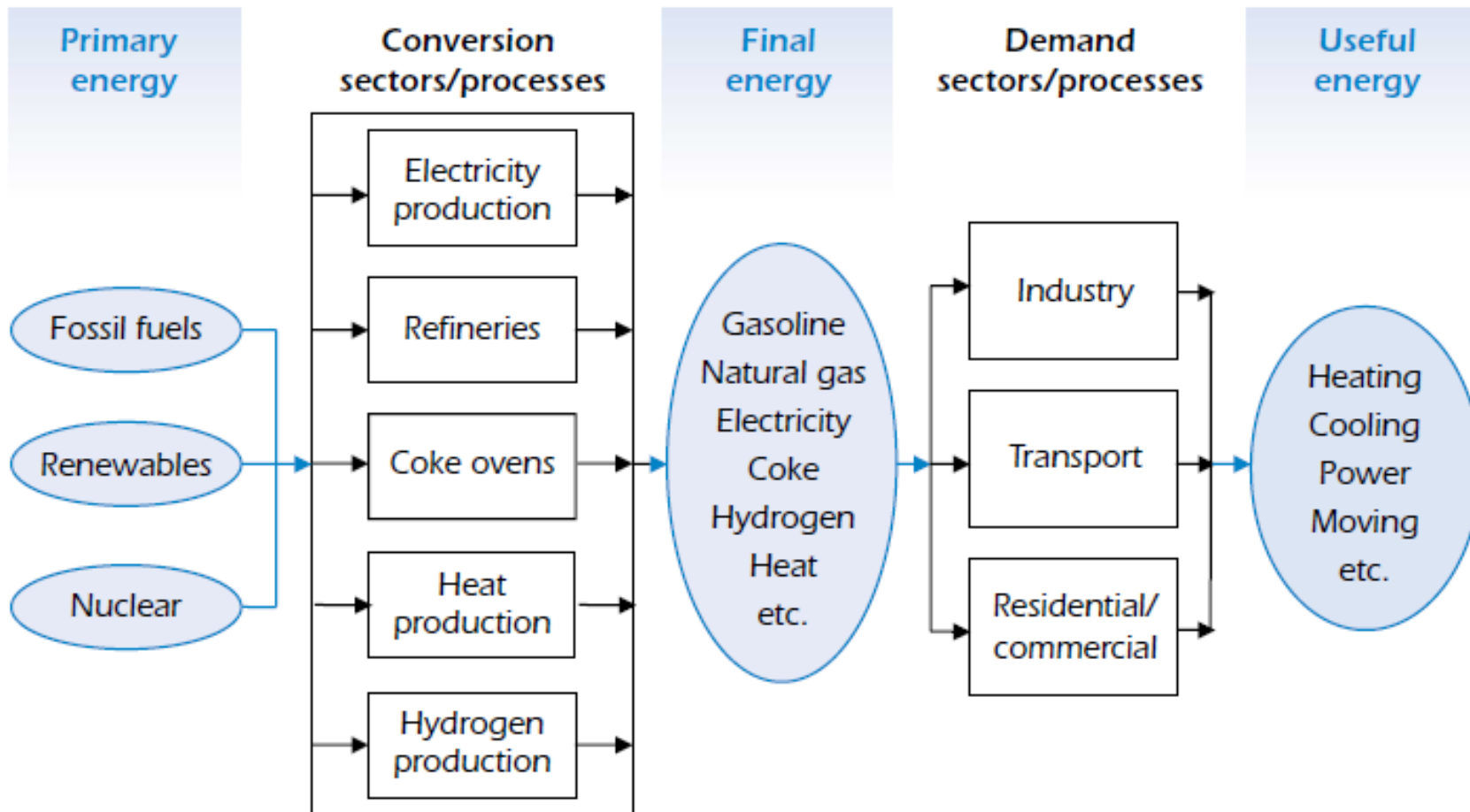
Buildings Model
31 Country/Regional Forecasts

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Countries		
Brazil	Germany	Mexico
Canada	Iceland	Norway
Chile	India	Russia
China	Israel	South Africa
Denmark	Italy	Sweden
Finland	Japan	United Kingdom
France	Korea	United States

Regions
ASEAN
Other Africa
Other developing Asia
Other Latin America
Other non-OECD Europe and Eurasia member non-member of the EU
Other non-OECD Europe and Eurasia member of the EU
Other OECD Asia Oceania
Other OECD Europe member of the EU
Other OECD Europe non-member of the EU
Middle East

Excel Based Model – Potential to Migrate to New Platform

- **Residential Module**
  - Floor area and households
  - Space heating
  - Water heating
  - Lighting
  - Cooking
  - Space cooling
  - Appliances
    - Refrigerators & freezers
    - Washers & dryers
    - Televisions
    - Miscellaneous electricity

- **Services Module (commercial)**
  - Floor area
  - Space heating
  - Water heating
  - Lighting
  - Space cooling
  - Other

- We derive floor area forecasts to 2050 based on existing floor area data, GDP and population forecasts

- We derive household occupancy forecasts to 2050 based on existing data, GDP and population forecasts – then the number of households are determined with population forecasts

Floor Area Correlation to GDP and Population

Legend:
- ◆ Canada
- ■ USA
- ▲ Mexico
- ✕ Japan
- ✳ South Korea
- ● Australia
- + New Zealand
- – Denmark
- – Norway
- ◆ Finland
- ■ Sweden
- ▲ Germany
- ✕ Italy
- ✳ France
- ● UK

Y-axis: Floor Area per capita (Square metres)

X-axis: GDPPP per capita (Thousands)

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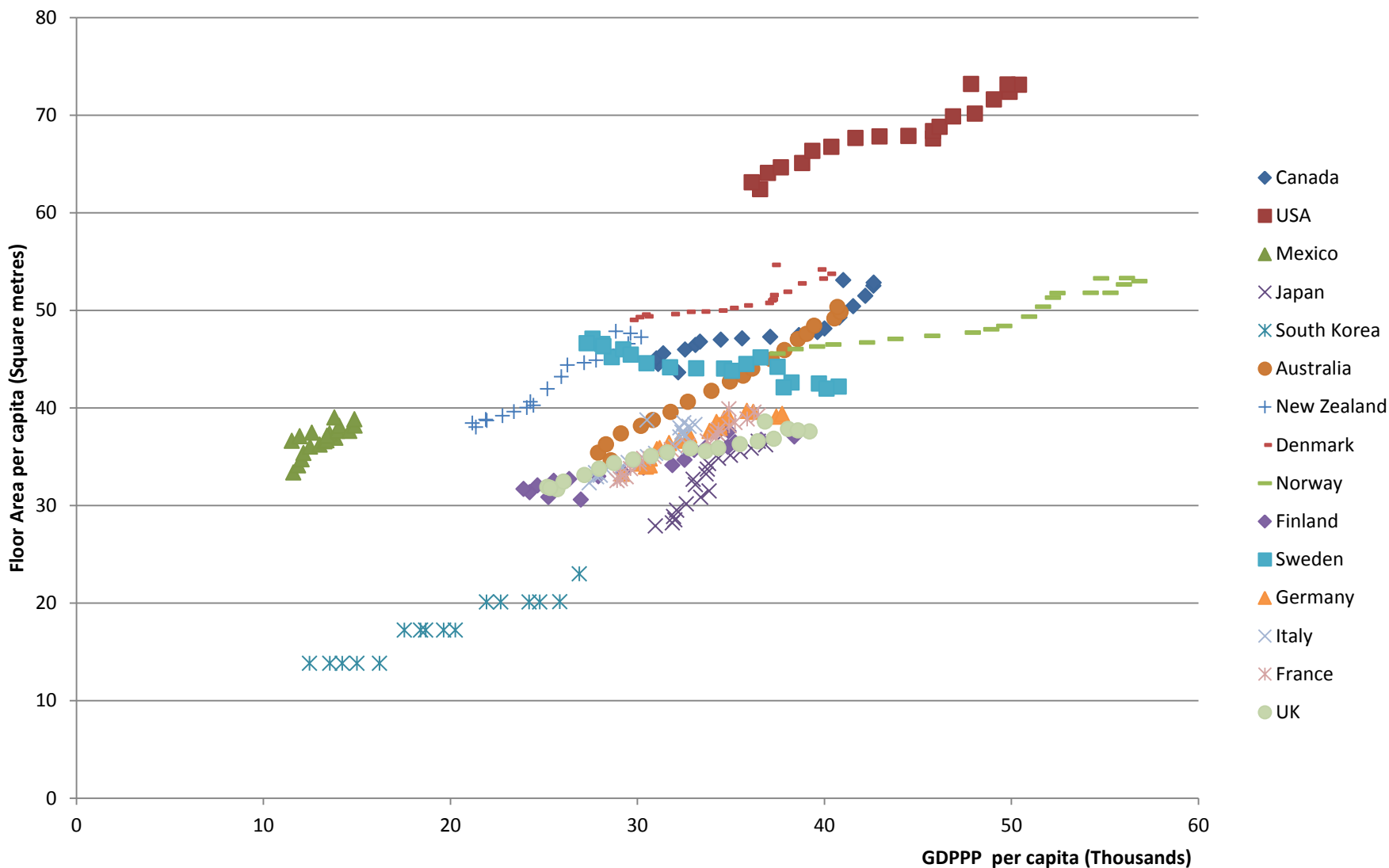
- **Floor area forecasts using gompertz curve function, need to collaborate with other forecasts**

- **Considering the possible impact of floor area regulations as a policy being considered by China (preliminary analysis, sample forecasts)**
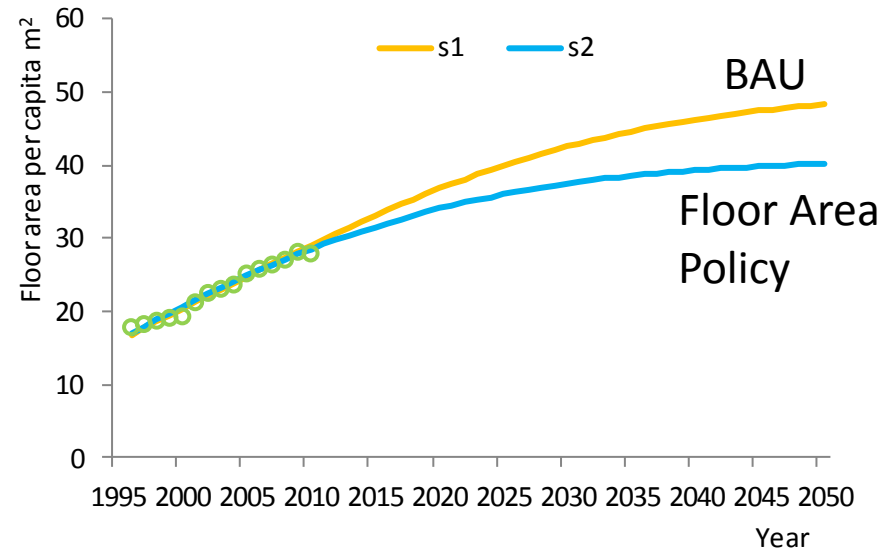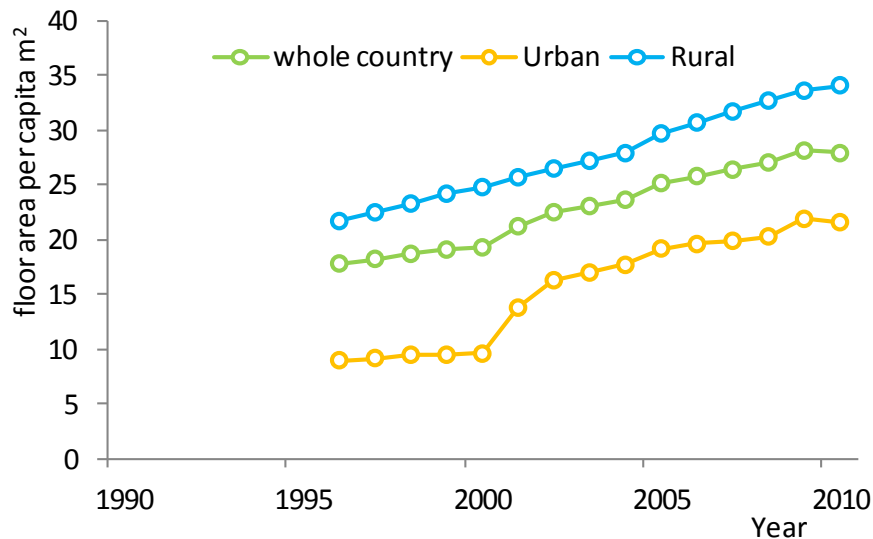
- **Need to collaborate with other organisations and compare forecasts for full set of countries and regions**

- **Example for China**

Possible scenarios/sensitivity analysis
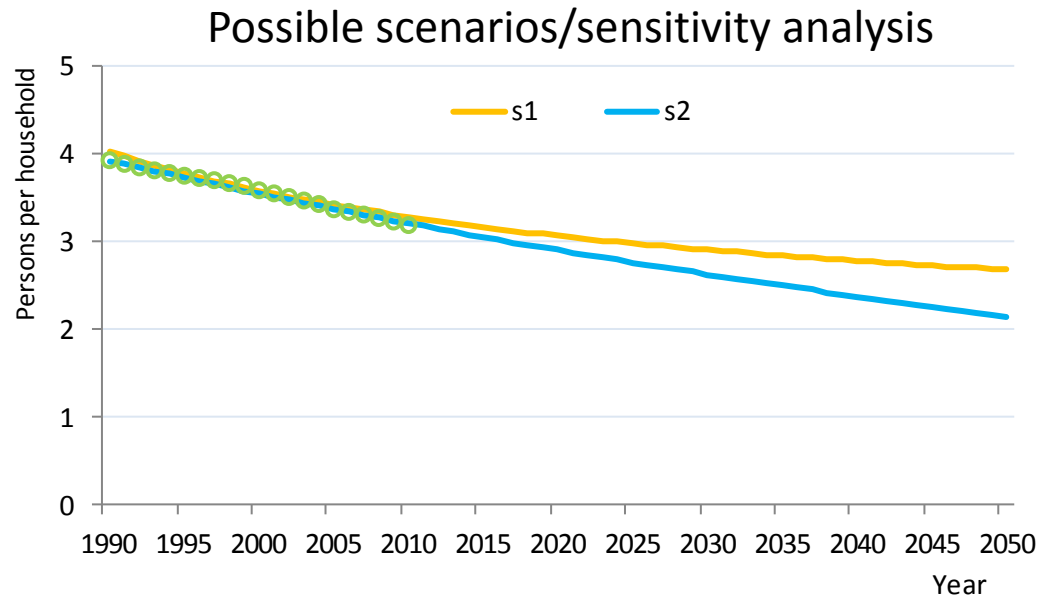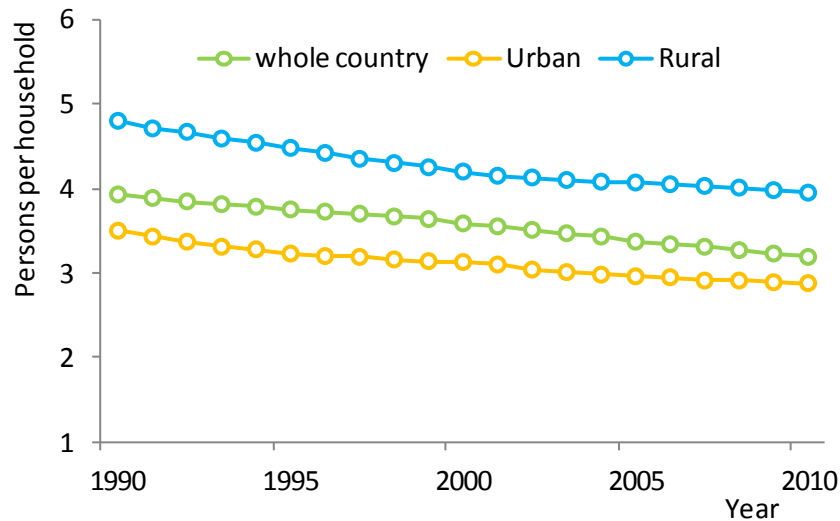
- **IEA seeking updated and improved data**

- **Recent success with LEDs would suggest more assertive assumptions for saturation**

- **How likely will halogens be banned in coming years?**

Residential Lighting		2011	2030			2050		
			6DS	4DS	2DS	6DS	4DS	2DS
Incandescent	most countries	70%-85%	30%-35%	25%-30%	20%-25%	25%	20%	0%
Fluorescent	most countries	7%-10%	10%-15%	15%	15%	15%	15%	15%
CFL	most countries	11%-18%	30%	35%	40%	35%	40%	50%
LED	most countries	0%	1%	1%	5%	5%	5%	15%
Halogen	most countries	1%	20%	20%	20%	20%	20%	20%
Oil lamp	India (only)	35%	35%	30%	30%	30%	25%	20%

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- **Efficiency is indexed to incandescent then assumed to increase from the base**

- **We want realistic assumptions for efficiency not just technical measures since certain numbers of the population will increase lumens with advanced lighting (current LED probably quite low)**

Residential Lighting		2011	2030			2050		
			6DS	4DS	2DS	6DS	4DS	2DS
Incandescent	most countries	100%	100%	100%	100%	100%	100%	100%
Fluorescent	most countries	400%	400%	400%	500%	400%	400%	500%
CFL	most countries	300%	350%	350%	400%	350%	350%	450%
LED	most countries	215%	400%	500%	500%	550%	550%	550%
Halogen	most countries	130%	130%	130%	130%	130%	130%	130%
Oil lamp	India (only)	15%	17%	17%	17%	17%	17%	17%

Energy Demand

- **Energy intensity used as a proxy for demand, derived for current year then forecasted with assumptions for increasing or decreasing**

- **Actual future intensity is calculated with saturation, efficiency and proxy demand intensity**

Lighting kWh/m²/year	2011	2030			2050		
		6DS	4DS	2DS	6DS	4DS	2DS
most countries	4.0-9.0	4.2-9.2	4.0-9.0	3.8-8.9	4.3-9.3	4.1-9.0	3.9-8.7
South Africa	23.6	24.8	24.8	23.9	26.1	26.1	23.9
China	1.8	3.1	3.1	2.5	5.6	5.6	3.3
Sweden	14.6	14.9	14.6	13.6	15.2	14.6	12.3
US	13.1	13.0	12.8	12.4	13.0	12.6	11.7

Heating and Cooling Energy Consumption

- **IEA is using energy intensity by building vintage but there is insufficient data for most countries to allow for high quality analysis**

- **Many organisations conduct detailed building simulation that derives energy savings forecasts by building component, however they are highly dependent upon existing building characteristics**

- **IEA is in the process of updating our thermal forecast methodology and seeks inputs on data sources and approaches that builds upon existing sources through collaborations**

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- **Peer review and feedback from all stakeholders and partners**

- **Establish long-term partnerships to collaborate in detail on all facets of modeling**

- **Long-term strategy to conduct more detailed policy related forecasting with full range of sensitivity analysis**

- **Consider a new project to pursue much more in-depth building equipment and materials data to improve model quality and policy assessment**

- **Webinar participants and stakeholders provide modeling approach and data feedback by July 11th (review data file)**

- **Express commitments to work with the IEA, possible secondment at the IEA**

- **Consider and express interest in more in-depth data effort, in-kind and potential financial support**

- **Express interest in the IEA hosting an October/November 2014 workshop along with potential support**

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