



PBL Netherlands Environmental
Assessment Agency

Buildings: The perspective of IAM models

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Buildings from an IAM perspective

- Scope: **Long Term** and **Global**.
 - Aggregated enough to project long-term dynamics
 - Detailed enough to represent mitigation costs/potential in a relevant manner

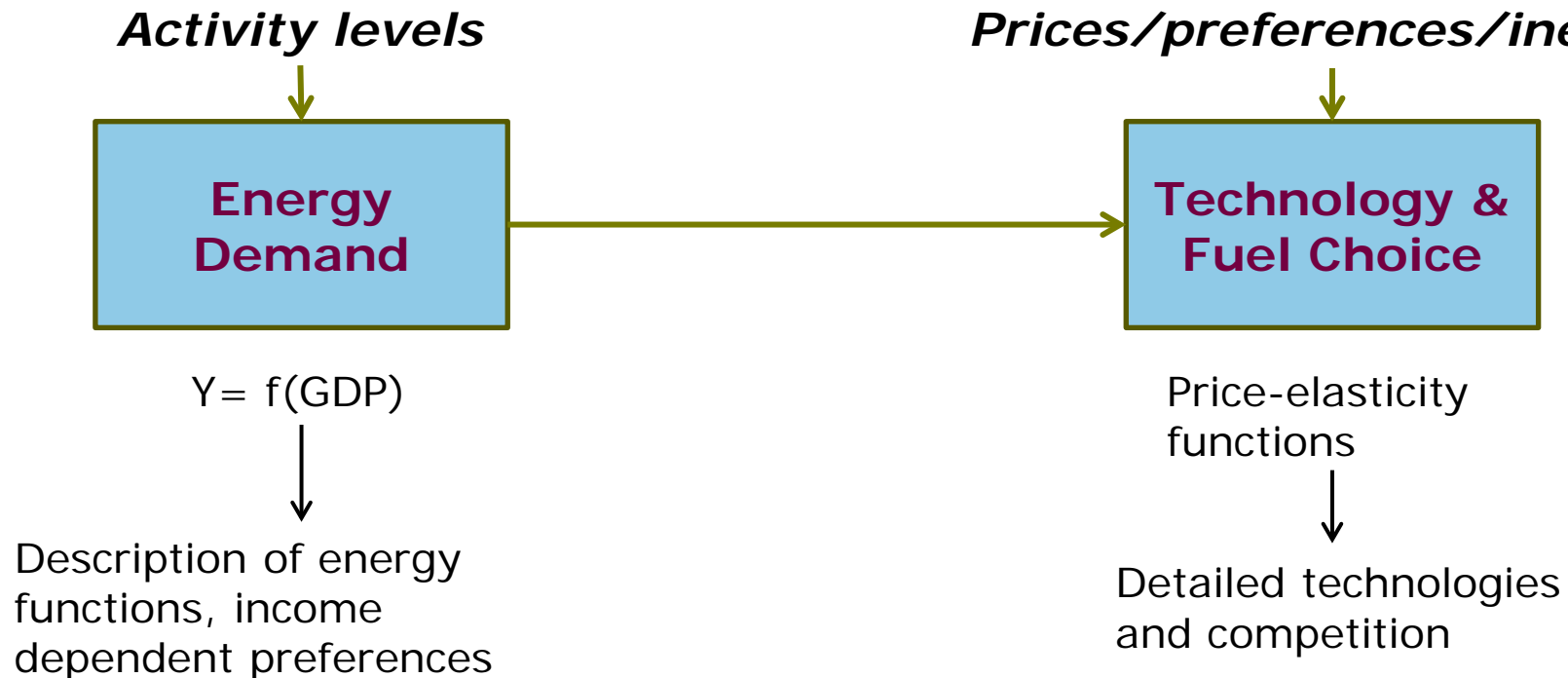


IMAGE Example: Step 1

- Dissaggregated **Residential** and **Service** sectors
- Related to **Household Expenditures** or **Value Added**
 - Dissagregation between urban/rural and rich/poor households
- Energy Demand Functions:
 - *Cooking, Lighting, Space Heating/Cooling, Water Heating, Appliances*
- Asymmetric Logistic Growth
 - *Gompertz Function:*
 - **Saturation** depends on
 - › Behaviour (appliance ownership)
 - › Local conditions (temperature)

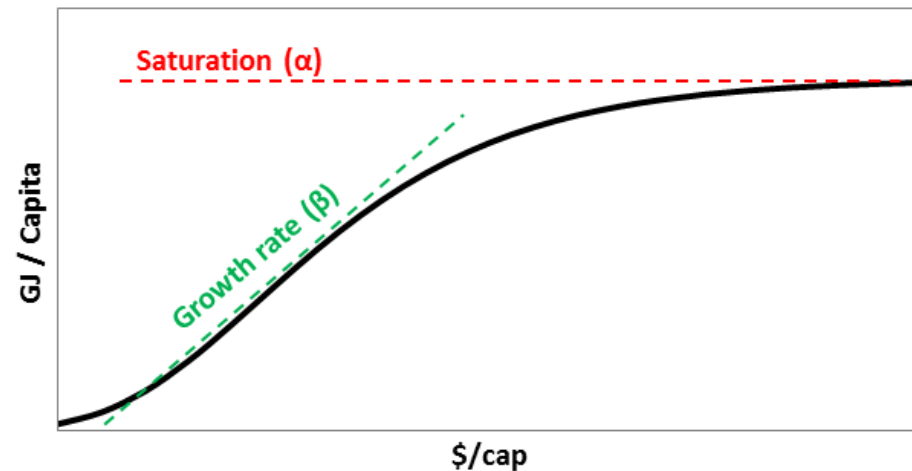
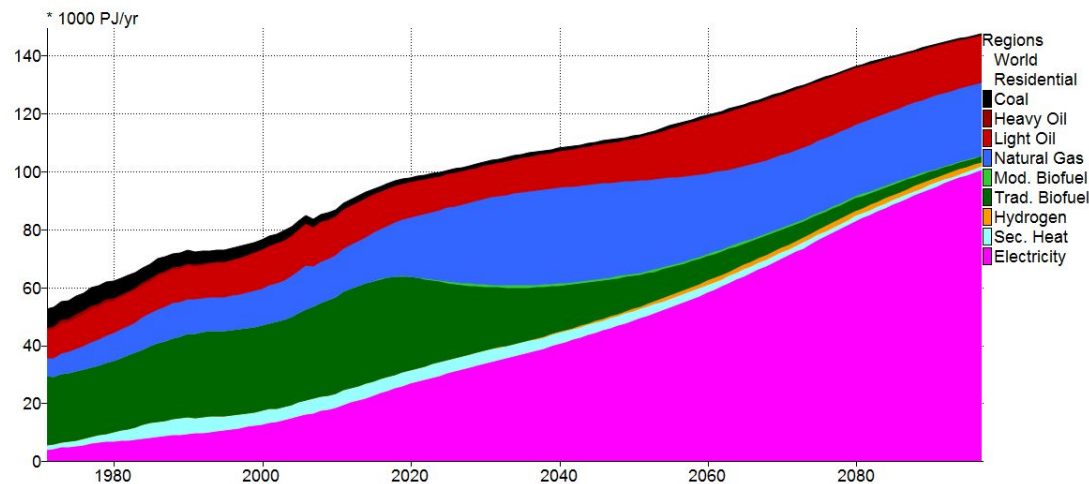


IMAGE Example: Step 2

- Conversion technologies compete based on
 - Annualised Capital Costs
 - Fuel costs
- Changes in efficiency
 - Autonomous (extrapolation of trends, technology analysis)
 - Reactive to fuel costs
- Household behaviour calibrated to national household surveys
- Fuel use calibrated to IEA data 1971-2008
 - Entire sector (not function)
 - 26 global regions





Issues and Questions

- Methodology very data intensive
- Uniform treatment of diverse regions and cultures
 - Effect on useful energy demand?
 - Cultural preferences for fuel choices?
- Aggregate treatment vs. Heterogenous reality
 - Service sector
 - Different household types
- Inherent uncertainty about future behaviour
 - Appliance ownership?
 - Game changing technologies?
- Unclear price driven improvements in efficiency



We would like to improve understanding on...

- Modelling the relationship between ***economy, energy demand*** and ***technology choices***
 - Economic drivers: Welfare, consumer discount rates, rich vs poor
 - Cultural drivers: information, preferences
 - Diversity and possible development of the service sector
- Elasticity of Demand
 - Difference amongst social classes
 - Per energy function
- Mitigation potential and associated costs
 - Potential, possibilities and costs of game changing technologies
 - Per energy function
 - Regional variation



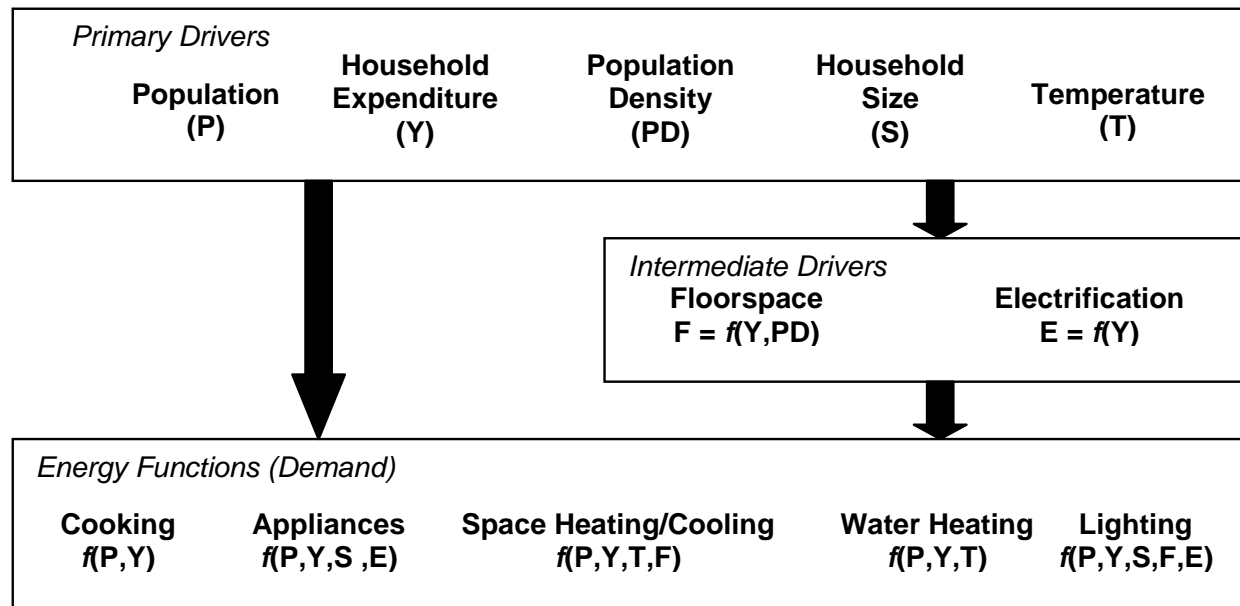
Thank you

■ References:

- van Ruijven, B. J., et al (2011). Model projections for household energy use in India. *Energy Policy* (39), 7747-7761
- Daioglou, V., et al (2012). Model Projections for household energy use in developing countries. *Energy* (37), 601-615.

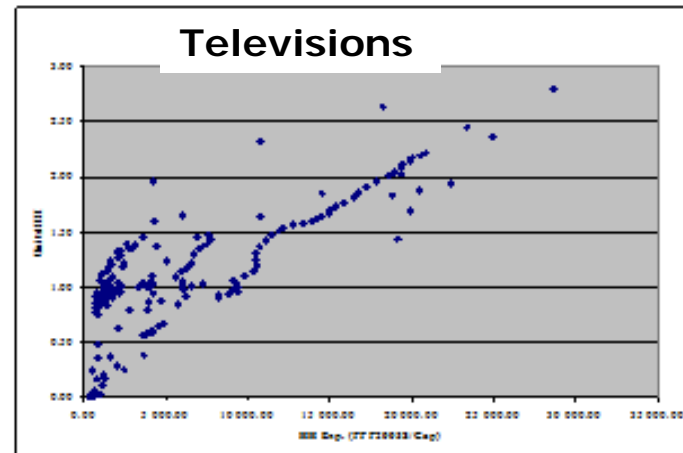
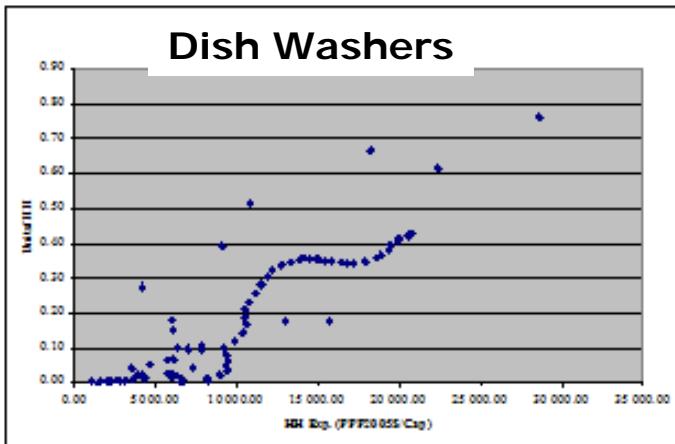
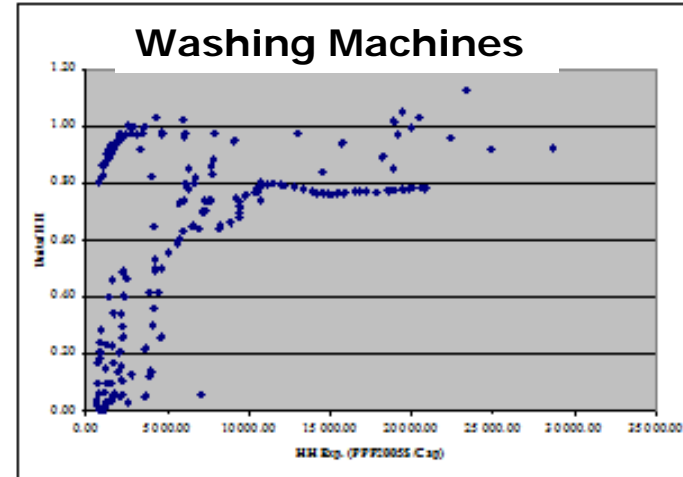
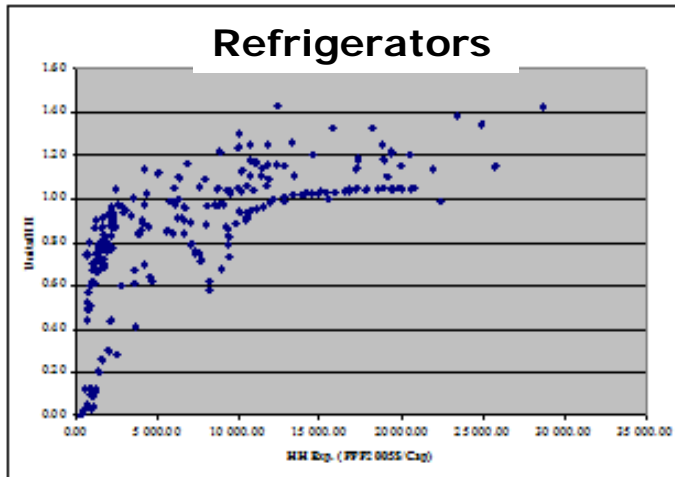
Supplementary Information

- Model Outline



Supplementary Information:

- Data on appliance ownership vs Households Expenditures



Supplementary Information

- Projection to 2030
- Scenarios:
 - GEA Low: Low demand (High efficiency)
 - GEA High: High demand (Low Efficiency)

