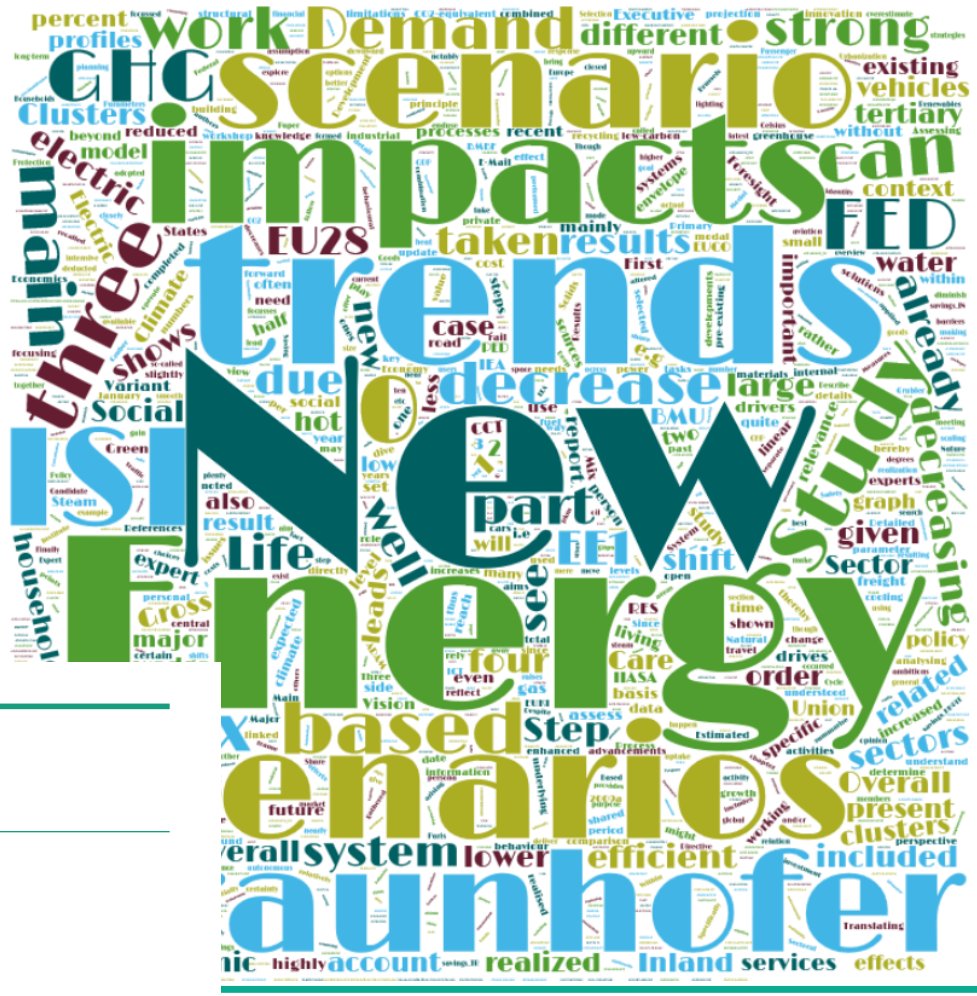
STUDY ON ENERGY SAVINGS SCENARIOS 2050



N ENERGY SAVINGS
OS 2050



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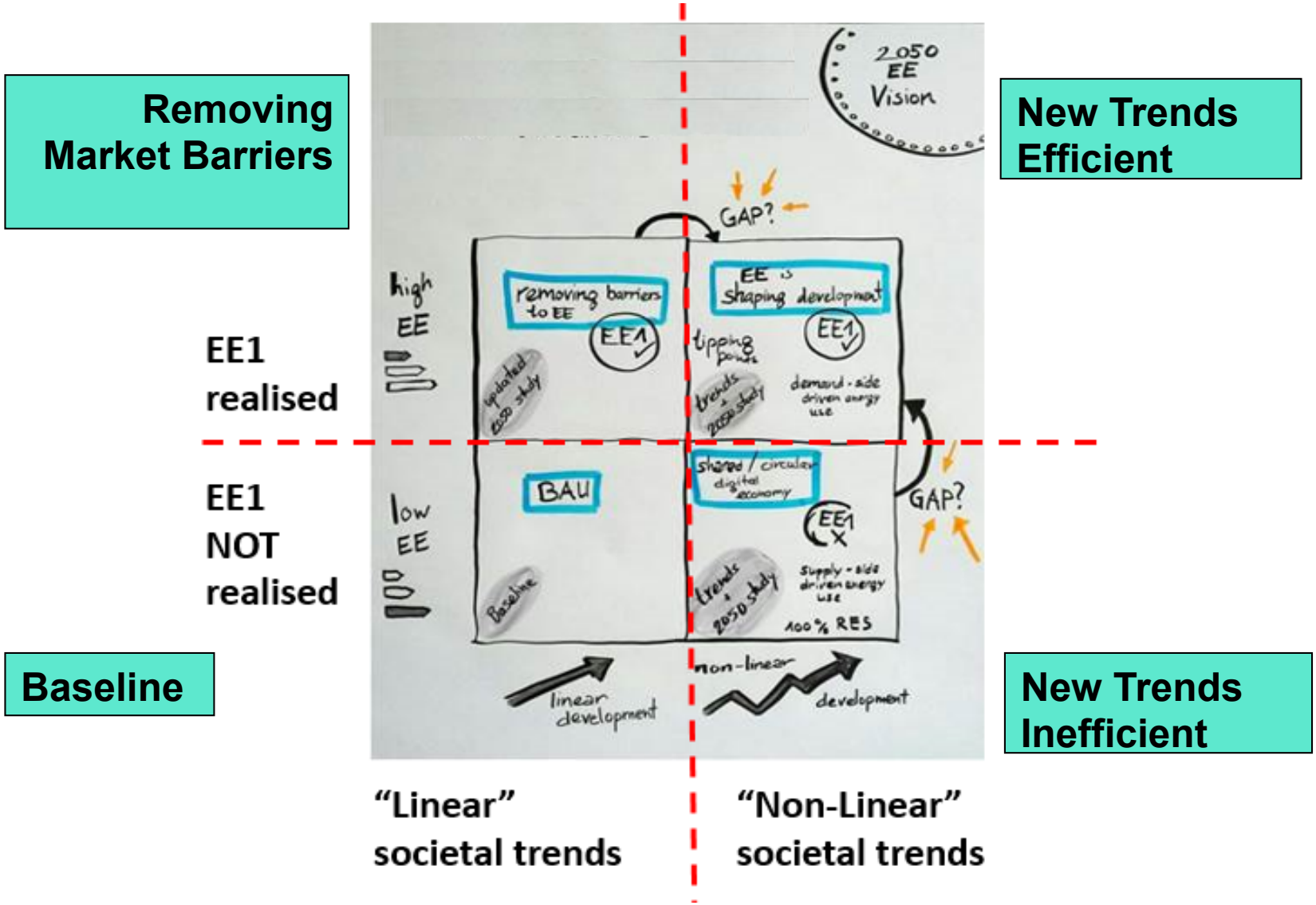
How do we want to move, work and live in the future?



Which impact does this lifestyle have on energy demand and sustainability?

https://www.fastcompany.com/3052699/these-historical-photos-show-how-amsterdam-turned-itself-into-a-bike-riders-paradise

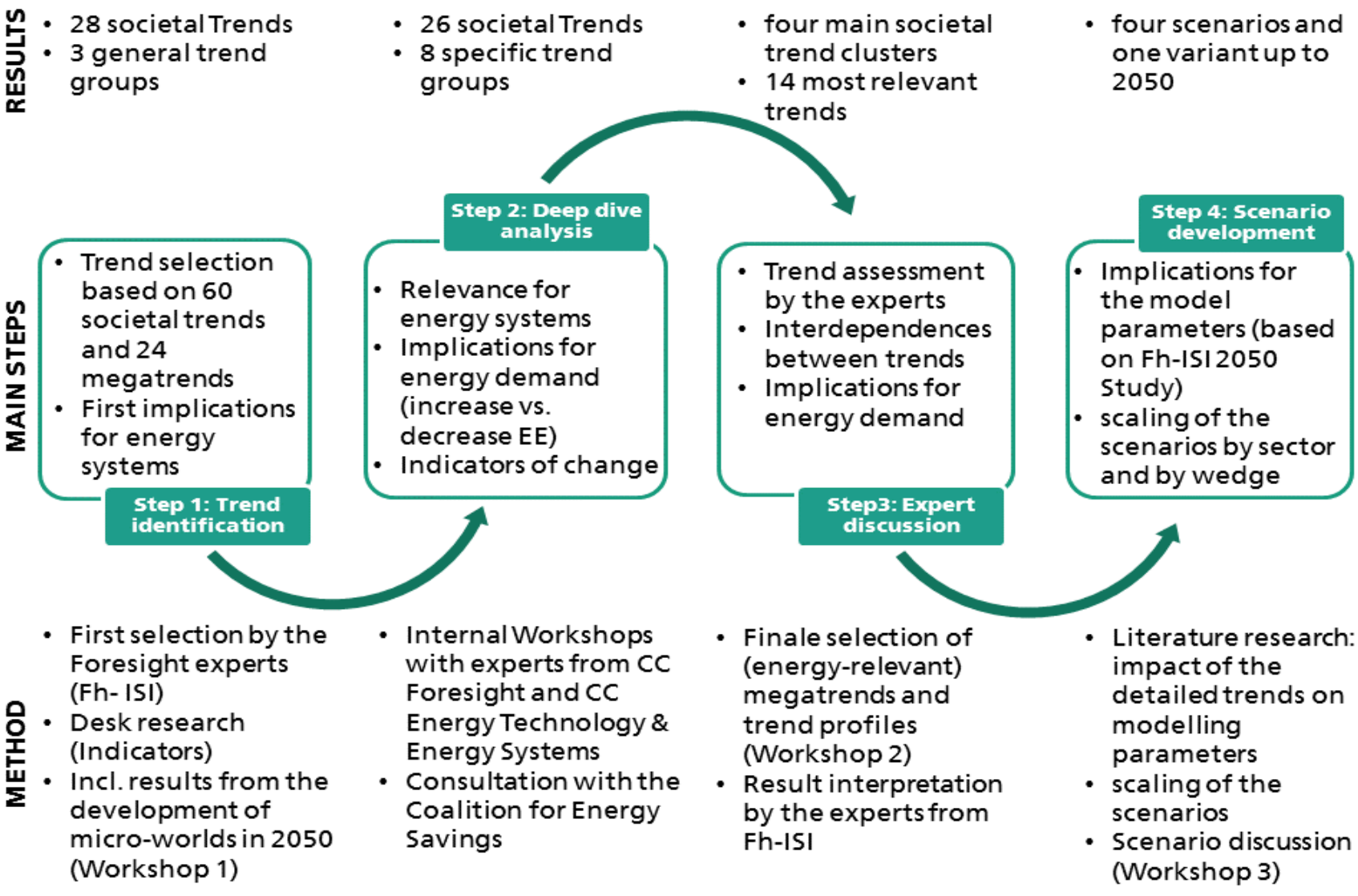
Four Scenarios that Show the Space of Possibilities



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Trend Selection and Scenario Development



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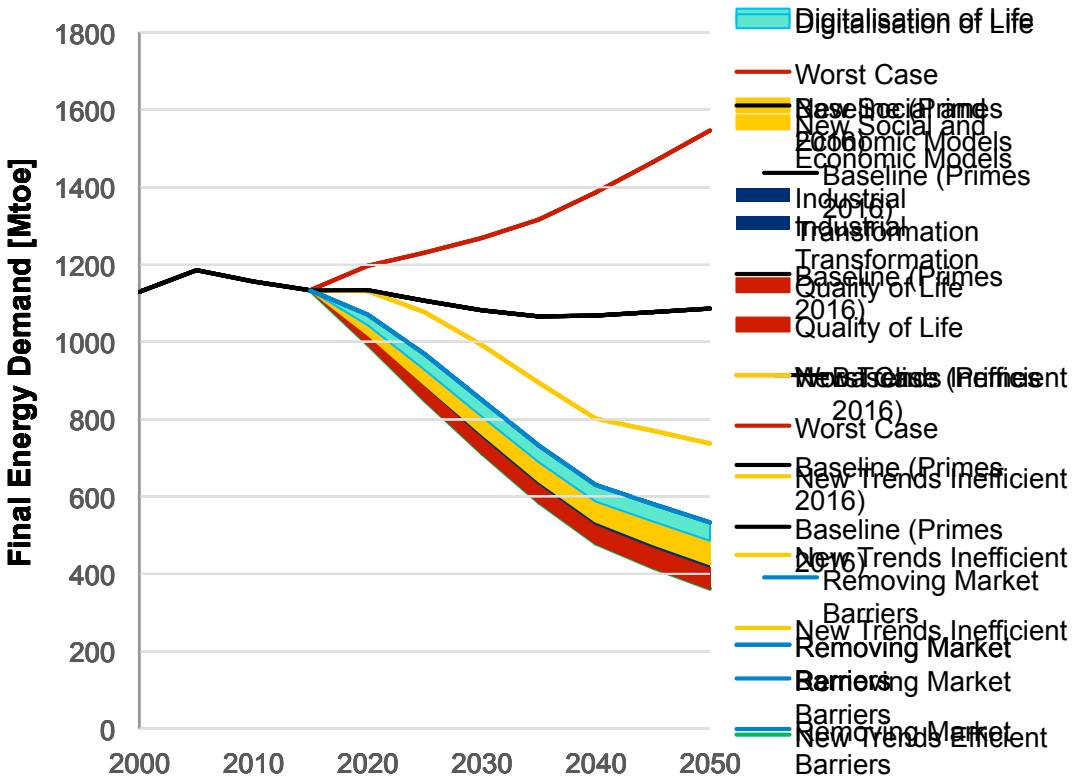
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Definition of Societal Trend Clusters & Detailed Trends

Cluster	Trend
Digitalisation of Life	Human Machine / Shift towards smart products and services
New Social and Economic Models	Sharing Economy
	Prosumer
	Awareness (of personal footprint)
	Social Disparities / Energy Poverty
	New forms of funding - Public spending towards greener and more efficient options
Industrial Transformation	Reindustrialisation
	Circular Economy - new requirements for material flows for consumer goods
	Decarbonization of the Industry
Quality of Life	Increasing importance of health (e.g. air quality, noise, heat)
	Regionalisation - Urban governance solving global challenges locally in cities
	Urbanisation - Global trend towards larger shares of the population living in cities

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Overall Final Energy Demand (EU28)



Reduction potentials:

- 51% in the Removing Market Barriers Scenario
- 32% in the New Trends Inefficient Scenario
- 67% in the New Trends Efficient Scenario
- Up to 42% increase in the Worst Case Scenario

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Exemplary Implementation of the Approach in the Household Sector

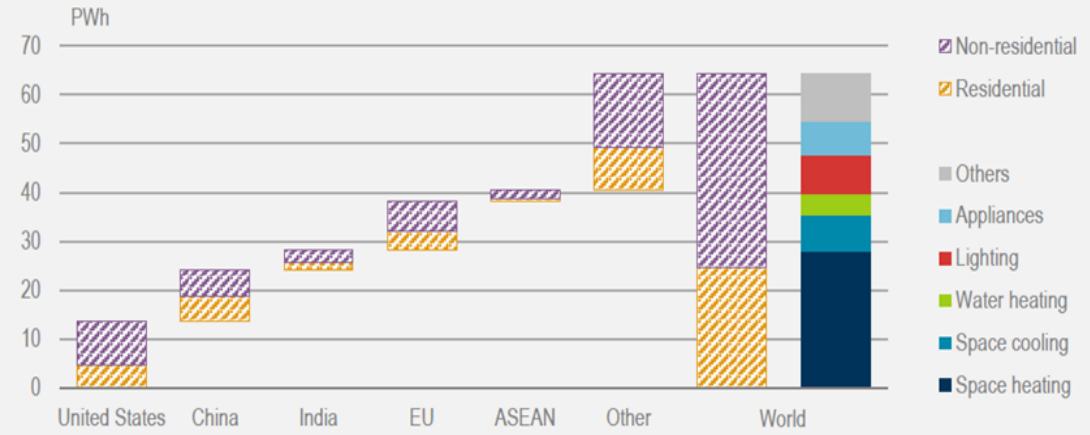
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Assumptions on Main Impacts in the Household Sector

- In the New Trends Inefficient Scenario (increasing impacts on energy consumption):
  - Building automation and interconnection of appliances increases the energy demand of the buildings
  - Despite a widespread awareness consumers have increasing energy demands (e.g. due to changes in comfort levels)
- In the New Trends Efficient Scenario (decreasing impacts on energy consumption):
  - Building automation raises consumer awareness
  - Decentral generation of electricity raises the awareness of the value of energy
  - Urbanization contributes to reducing living areas and adapting them to the living context.
  - Consciousness about the personal (carbon) footprint impacts consumer choices on buildings and appliances.

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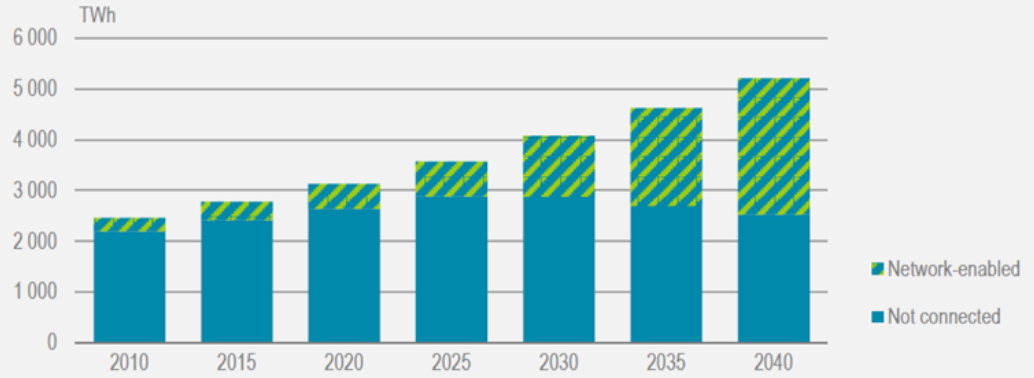
Figure 2.4 Cumulative energy savings in buildings from widespread digitalization



Key message: The widespread deployment of active controls, assuming limited rebound effects, would save up to 65 PWh cumulatively to 2040, or twice the energy consumed by the entire buildings sector in 2017.

IEA, 2017

Figure 2.5 Household electricity consumption of appliances and other small plug loads



Key message: The share of connected "network-enabled" appliances in total household electricity consumption is set to grow rapidly, presenting opportunities for smart demand response but also increasing the need for standby power consumption.

IEA, 2017

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Quantification Approach

Own estimate based on projections by *IEA 2017 - Digitalization & Energy*

Gains through increased public spending in renovation

Increasing demand based on longer heating and cooling hours due to remote control

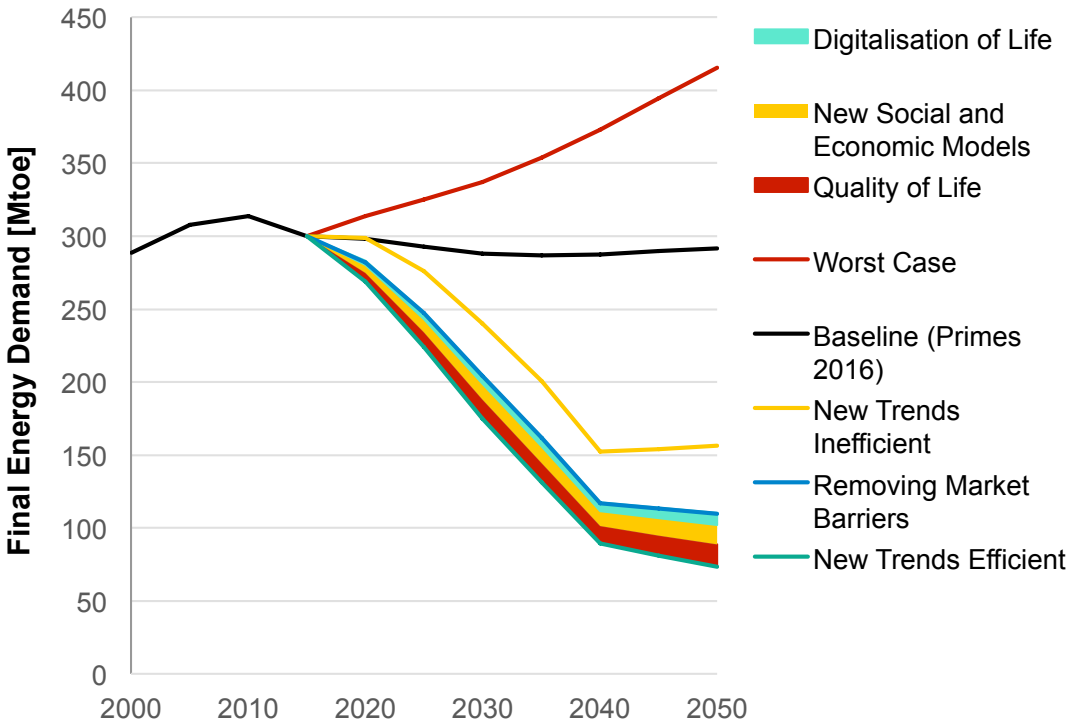
	Energy demand	
	Heating and Cooling	Appliances and Lighting
New Trends Efficient Scenario		
Digitalisation of Life	0.95	0.79
New Social and Economic Models		
Consumer / Citizens	0.8	0.9
Sustainable Finance	0.95	1
Industrial Transformation	1	1
Quality of Life		
Health & Comfort	1	1
Regionalization / Urbanization	0.9	1
Total Scenario Changes	0.65	0.71
New Trends Inefficient Scenario		
Digitalisation of Life	1.1	1.5
New Social and Economic Models		
Consumer / Citizens	1.1	1.1
Sustainable Finance	1	1
Industrial Transformation	1	1
Quality of Life		
Health & Comfort	1.1	1.1
Regionalization / Urbanization	1	1
Total Scenario Changes	1.33	1.82

Own estimate based on *UKERC - Energy 2050 - Energy Demand Lifestyle and Energy Consumption*

Changes in comfort levels, e.g. room temperatures

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Final Energy Demand in the Household Sector (EU28)



Reduction potentials:

- 62% in the Removing Market Barriers Scenario
- 46% in the New Trends Inefficient Scenario
- 75% in the New Trends Efficient Scenario

- Up to 43% increase in the Worst Case Scenario

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What‘s next?

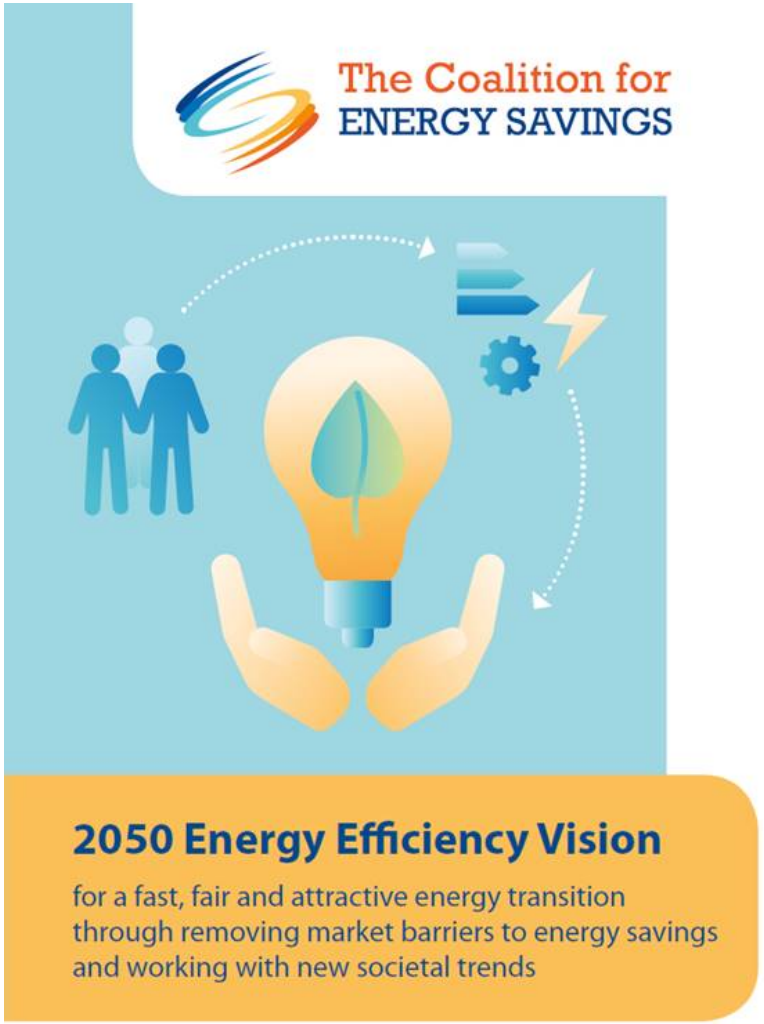
Work on further quantifying the impacts of societal trends:

- **Status Quo Analysis:**
  What trends can already be modelled with our current energy demand models ... and to which extent?
- **Gap Analysis:**
  How do current energy demand models have to be adapted in order to be able to model the impacts of these trends?

→ **Model development** in order to address recent challenges,
such as digitalization, prosuming and a circular and sharing economy

... the work has just begun!

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- Dr. Heike Brugger

  heike.brugger@isi.fraunhofer.de

- Study on Energy Savings Scenarios 2050

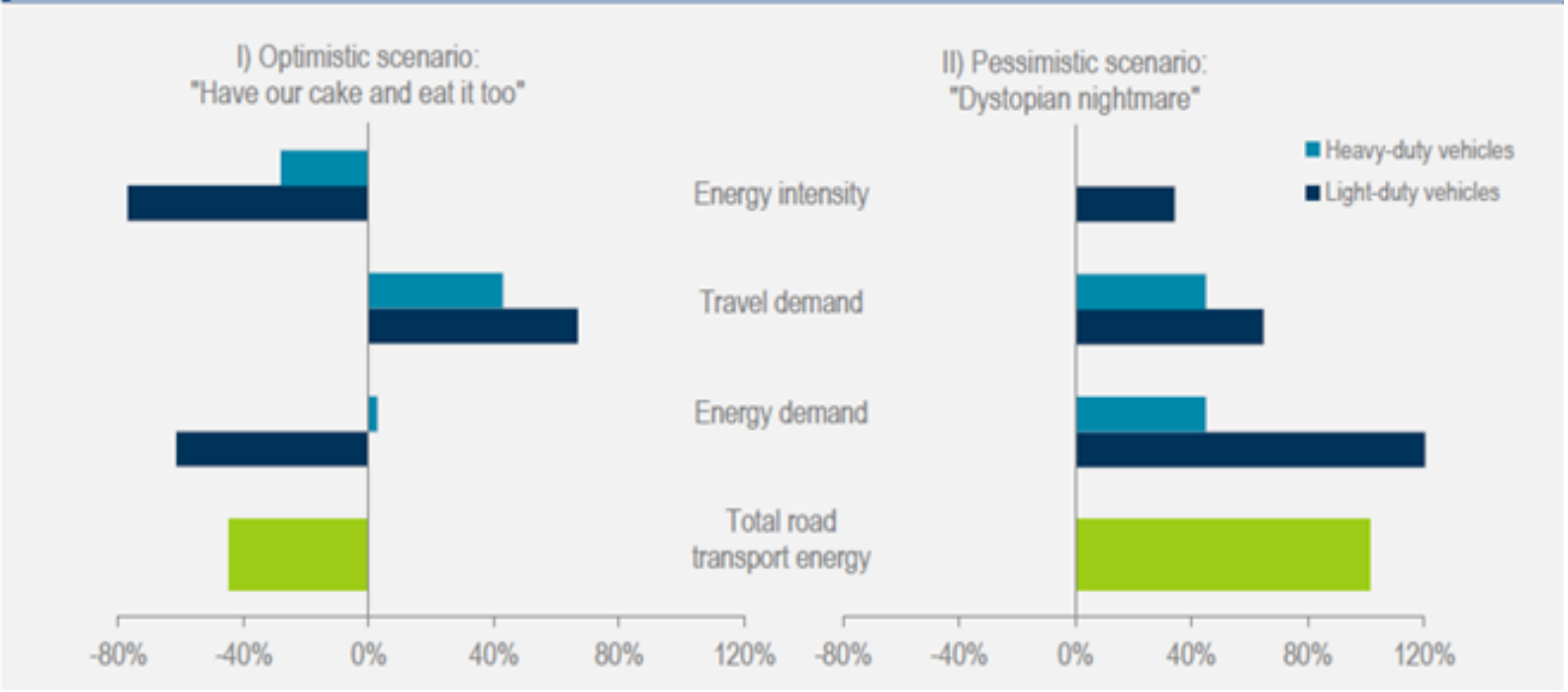
  Brugger, Eichhammer & Dönitz (2019)

  https://www.isi.fraunhofer.de/de/competence-center/energiepolitik-energiemaerkte/projekte/energy-saving-scenarios-2050.html

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Why efficient is not sufficient...
... the trend of automatisation

Figure 2.2 Range of possible energy impacts from vehicle automation in the United States



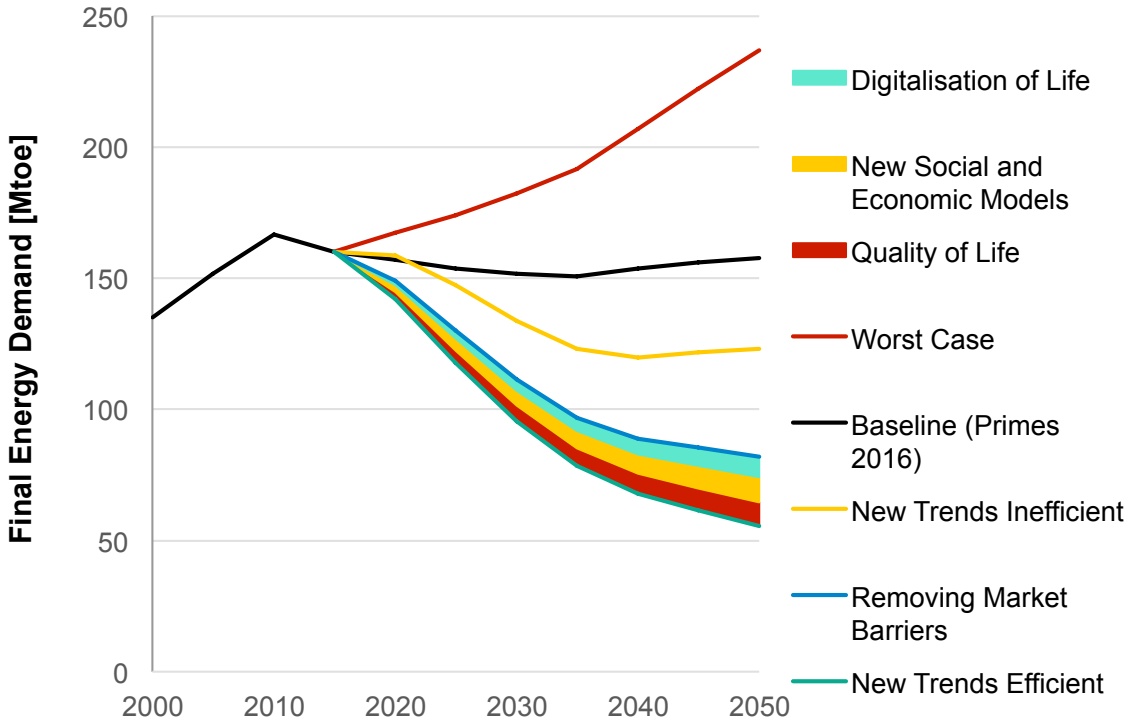
- US road transport energy demand is reduced by almost half under an optimistic scenario
- but more than doubles in a pessimistic scenario

(IEA, 2017)

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Final Energy Demand in the Tertiary Sector (EU28)



Reduction potentials:

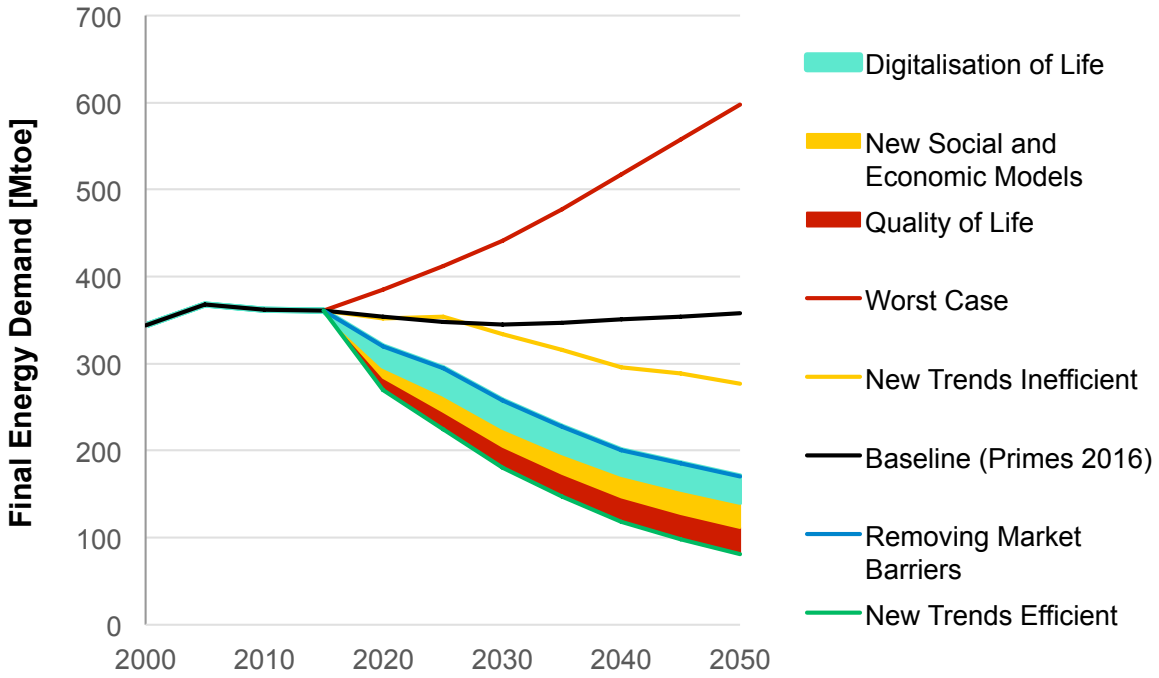
- 48% in the Removing Market Barriers Scenario
- 22% in the New Trends Inefficient Scenario
- 65% in the New Trends Efficient Scenario

- Up to 50% increase in the Worst Case Scenario

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Final Energy Demand in the Transport Sector (EU28)



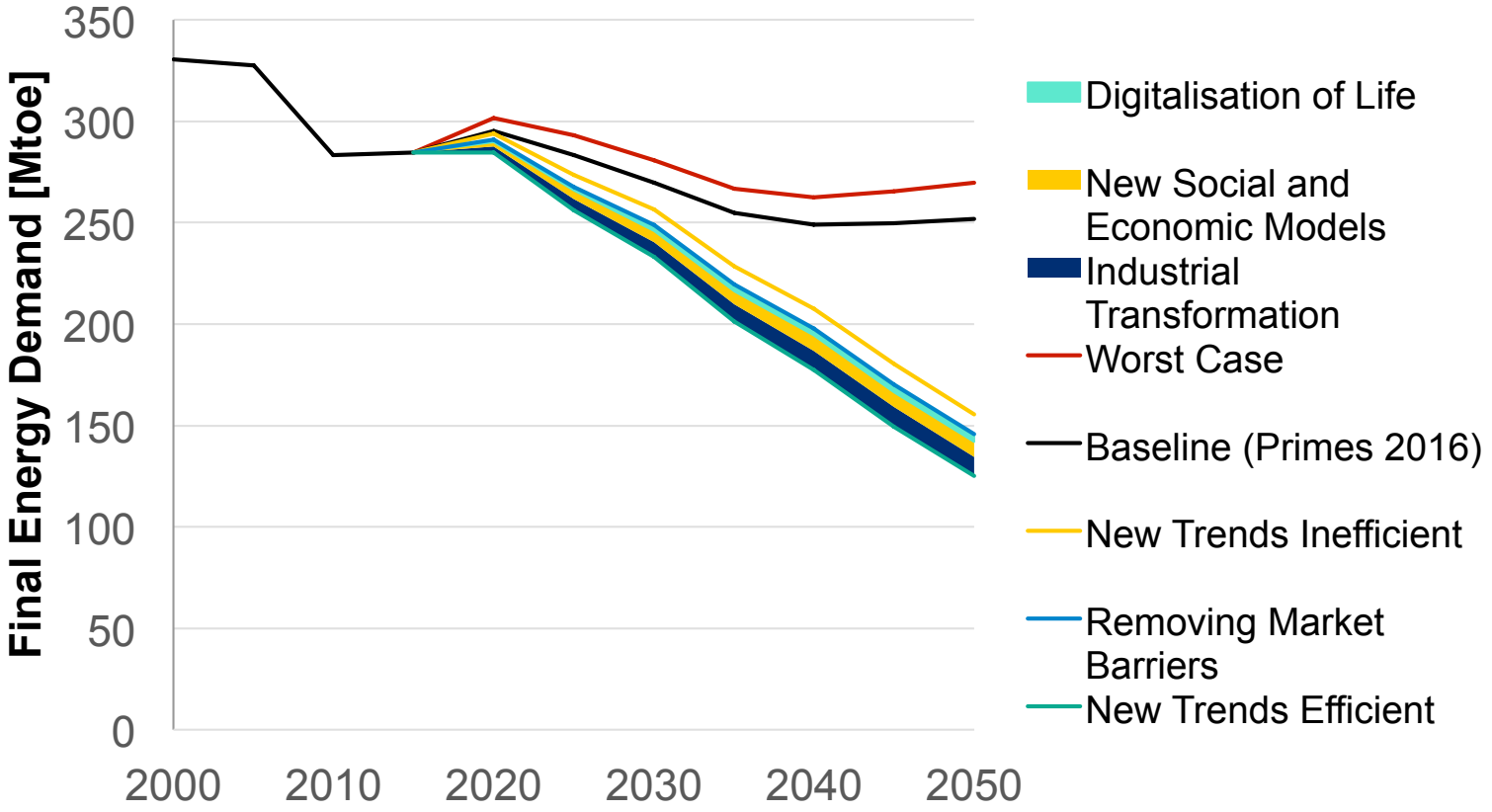
Reduction potentials:

- 52% in the Removing Market Barriers Scenario
- 23% in the New Trends Inefficient Scenario
- 77% in the New Trends Efficient Scenario
- Up to 67% increase in the Worst Case Scenario

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Final Energy Demand in the Industry Sector (EU28)



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