newTRENDs

What are the new societal trends that will shape our future energy demand and how?

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POLICY BRIEF

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Key messages:

- Identifying the new societal trends which will have an impact on the future energy demand is essential for a complete picture in national and EU energy scenarios.
- The identified new societal trend clusters and narratives will inform the understanding of changes in energy demand, which are not linear extrapolations of historical trends.
- The identified new societal trend clusters and narratives will improve energy demand models often used to model European long-term scenarios.
- Through an in-depth examination of new societal trend clusters, the newTRENDs H2020-funded project has analysed how such trends may influence future European energy demand and how they can be integrated into relevant demand-side models.
- The new societal trends can have a low, medium or high impact on the energy demand, at micro, meso and macro levels and in a linear or disruptive way.
- Additional aspects (e.g. sufficiency matters, uncertainties, cross-impact and cross-sectoral analysis) should be considered for a comprehensive picture of the influence of new societal trends on future energy demand.
- Different aspects of how the new societal trends influence future energy demand (controversial impacts, disruptiveness, and interlinkages) need to be considered in policy making to design effective policies that contribute to achieving the EU climate goals.
- The interlinkages between the new societal trends lead to overlapping policy fields and therefore require a new style of policy making beyond the traditional policy arenas, fully accounting for the inter-dependencies of the trends.

What are new societal trends and why do we need to understand them?

New societal trends can be understood as **emerging aspects of our dynamic, interrelated societies– unpredictable in both their individual and collective impact**. They can be economic, political, environmental, cultural and social in nature, and can have a significant influence on the European future energy consumption as well as the cross-sectoral demand shifts.

The new societal trends are not simply an extrapolation of trends already observed ("continuous or linear trends") but can gain momentum if embraced by larger parts of society or after reaching a certain threshold ("disruptive or non-linear trends").

Achieving the EU long-term climate goals will require continued progress towards a low-carbon society, with both technological and non-technological factors influencing the success of national and regional energy and climate targets.

Currently, national low-carbon energy scenarios up to 2050, developed in European countries, consider the overall social context of the energy transition (e.g., population, average living standards, education levels, etc.). However, non-technological factors influencing energy demand are often not yet included in these scenarios.

Further progress is needed to improve the empirical basis for new societal trends and their representation in models and policies, especially on the demand side.

In addition, little research has been done on how new societal trends can impact opposite directions at the same time (i.e., reducing and increasing energy demand simultaneously), and how they can reinforce or contradict each other.

To fill this gap, the EU-funded project newTRENDs has identified the potential new societal trends that may influence future European energy demand, assessed their potential to influence change, integrated these assessments into relevant demand-side models for quantitative analysis in scenario development, and analysed their relevance for policy making.

How are the new societal trends selected?

The new societal trends were identified, assessed, and prioritised following a three-step approach (Figure 1).

- **Step 1**

Energy relevant new societal trends were identified based on an analysis of previous foresight studies and long-term energy demand scenarios.

- **Step 2**

In three expert workshops, the trends were clustered, and their interrelationships and potential impact on future energy demand were assessed (Figure 2).

- **Step 3**

The 15 most influential trend clusters were prioritised and their narratives developed, describing the high-impact compositional factors, their interrelationships and the potentials for disruptive changes through combinations or dynamic environmental conditions (Figure 3).

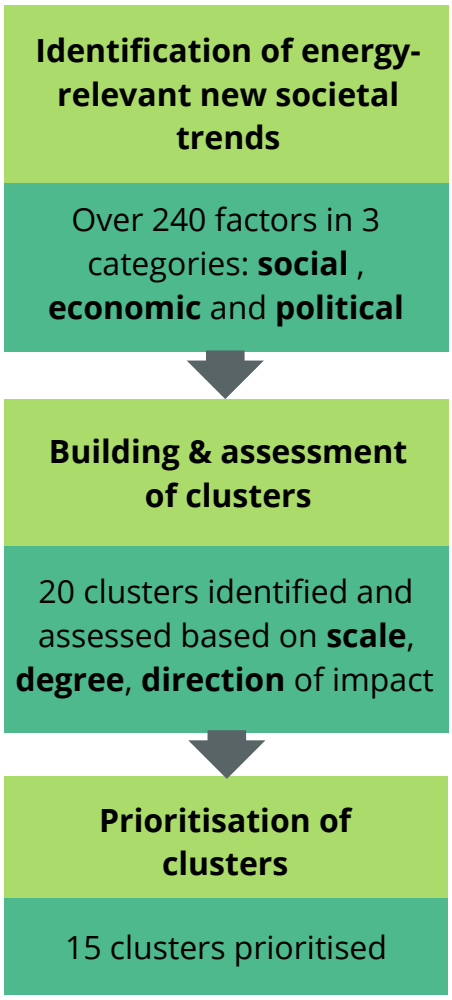

Figure 1 : Selection process for new societal trend clusters

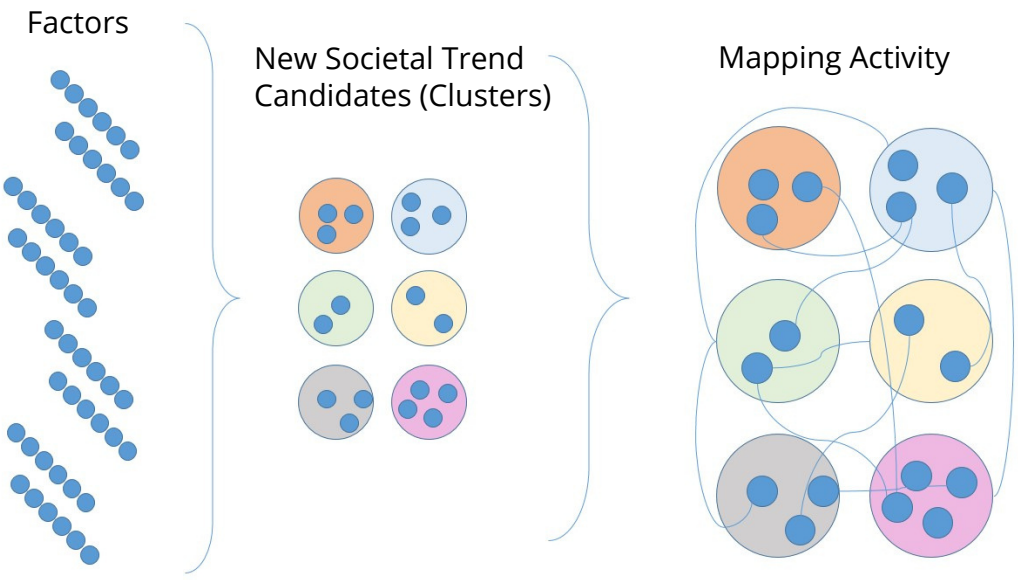

Figure 2: Schematic overview of the new societal trend identification and mapping process

Figure 3: Prioritised clusters and their descriptions

Decentralised work: Impacts energy demand in the transport and residential sectors. Working from home and moving away from city centres increases commuting time but reduces the frequency of work-related travel.

Water issues: Water is interconnected with all aspects of human life, magnifying the impact of disruptions. Changes in water availability increase the need for energy to extract and transport water, and water scarcity can lead to migration, further impacting energy demand.

Sustainable cities: Focuses on overcoming the future challenges of urban environments. Relevant topics include food and water supply, transport, land use, etc.

Climate change and behaviour: Individual actions have a significant impact on future energy demand, driven by national policies and regional governance, including extraction, production, transport and domestic use.

From owning to sharing: It covers a wide range of areas, from cars and appliances to publications and living spaces, and changes the energy required to extract, manufacture and transport materials.

New labour: It mainly focuses on acquiring new work skills and their energy implications, linked to trends in digitalization and remote work. It also includes macro-level factors such as labour market fluctuations, unemployment rates, and skills shortages that affect energy demand, influenced by evolving policy agendas.

Digitalisation: Summarizes various digitalization trends: growing digital data storage and traffic, leading to increased energy use in data centres and networks, rising digital hardware production, and shifts in sectoral energy demand due to digitalization (e.g., virtual work in transport and Industry 4.0 in industry).

Green transition: The EU green transition requires intense initial energy requirements to build new systems, infrastructure, and capacities. Rebound effects of these efforts should be monitored and necessary policies and financial instruments should be considered.

Green finance: Green finance can drive among others the efficiency improvement and electrification process, and at the same time, trigger behavioural change of actors (individuals and private sector).

Geopolitics and global forces: Global population growth, the rise of the BRICS middle-class growth and potential economic growth in Africa, are expected to increase energy demand. Rising inequalities and North-South relations, as well as the US-China technological rivalry, may also alter energy demand across sectors or regions.

Evolving democratic system: Regulatory shifts and evolving democracies can impact energy demand in regions, while the rise of right-wing populism and nationalism may also influence energy demand.

Great Depression II: Depending on the impact of the depression on the global economy, total energy demand may initially fall. In the longer term, the energy demand could increase as nations and regions attempt to restart economies with inefficient experiments and large infrastructure build outs.

Socio-economic dynamics: Deep inequalities (e.g. varying capabilities of healthcare systems across the EU) can redirect investment and development, initially increasing the energy demand for infrastructure, operational and services. Over time, addressing these inequalities can reduce energy demand by promoting healthy and energy-efficient lifestyles.

Demographic change: In regions with a 'youth bulge', energy consumption is expected to increase or to shift to other regions as the population migrates. In ageing regions, energy demand depends on the activities of older people and their physical health.

Circular economy: The transition to a circular economy requires significant changes in socio-economic structures and industrial processes. Transforming the EU economy, in particular the production and consumption of CO2-intensive materials, into a material-efficient circular economy could contribute significantly to a CO2-neutral economy.

How do new societal trends affect the future energy demand?

3-dimensional metrics

The clusters and their underlying trends can influence the energy demand in the following dimensions:

- **Impact degree:** High / Medium / Low
- **Impact scale:** Macro / Meso / Micro
- **Impact direction:** Decreasing/ Increasing / Shifting

The dimensions could be examined at both cluster and trend level, and the impact may vary within a given cluster; one trend may affect energy demand at the macro level and the other one at the micro level, or one trend may increase energy demand while the other causes a shift in energy demand to other sectors.

Linear or disruptive

The clusters and their underlying trends can influence the energy demand in a linear or a disruptive way.

The analysis of the cluster assessment based on the 3-dimensional metrics indicates that most of the identified clusters could have a controversial influence on future energy demand in terms of the degree, scale or direction.

Many high impact trends (high decreasing or high increasing) have been identified as "disruptive", as they are essential in terms of their influence on energy consumption and development in different sectors. Clusters with many disruptive trends have the greatest impact on future energy demand.

The most disruptive trends include:

High- or medium-decreasing disruptive trends (e.g. Acceleration of virtual work (COVID-19), Disruption of ownership models, Car-free city)

High-increasing disruptive trends (e.g. Hyper-connectivity, Unconditional minimum basic income)

High-shifting disruptive trends (e.g. Universal health coverage)

Regional effects

Regional specifications have an influence on how the trends affect future energy demand, so the clusters may affect energy demand differently in specific regions.

Therefore, additional information on how new societal trends may influence regional development needs to be taken into account when assessing the trends.

Table 1 presents an exemplary cluster assessment.

Underlying trends	Degree assessment	Scale assessment	Direction assessment	Linear / Disruptive
Sustainable Cities: The development of urban living spaces to meet future challenges.				
1) Population size of urban settlements	Low	Meso	Shifting	
2) Rise in the number of urban settlements	Medium	Meso	Shifting	
3) Increased urbanisation	Medium	Macro	Decreasing	
4) Increasing land area of cities	Medium	Micro	Increasing	
5) Urban governance – solving global challenges locally in cities	Medium	Meso	Decreasing	
6) The global urban middle class – tipping the scales of sustainable urban development?	-	-	-	
7) Local food circles	Medium	Micro	Decreasing	
8) Localised food systems	Medium	Micro	Decreasing	
9) Car-free city	Medium	Meso	Decreasing	Disruptive
10) New transport models (hubs)	Medium	Macro	Decreasing	
11) New cities without the necessity of a car	Low	Meso	Decreasing	
12) Transportation systems Autonomous driving / sharing cars or vehicles (not only for cities)	High	Macro	Decreasing	
13) Community gardening	Low	Meso	Decreasing	
14) Reconquering the public space	Low	Micro	Decreasing	
15) Hyper-connectivity	High	Macro	Increasing	Disruptive
16) Greening urban areas	Low	Meso	Decreasing	

Table 1: Cluster assessment (example: sustainable cities)

How are the new societal trends interrelated?

Understanding the interrelationships between new societal trends is crucial for enhancing the energy demand models to consider these trends individually and in an integrated way.

We applied a network analysis (Figure 3) to analyse and visualise the interrelationships between new societal trends influencing future energy demand, which allows to see the overall picture of connections between new societal trends. It thus provides information on how such trends need to be considered and modelled in an integrated manner to account for their inter-dependencies. This informs the modelling discussion and enhancement of the project and is discussed further in the newTRENDs project [1].

Each of the trends shown in Figure 4 is a cluster of several of the 241 factors previously identified. The network visualises how many underlying factors the clusters have in common.

The more underlying factors that two of the trends have in common, the stronger the link between them is. The size of the nodes does not represent their overall importance, but rather their interconnectedness. The larger the node of a trend, the more it is connected to other trends through factors.

The strong link between some identified clusters and the high number of common underlying factors points to the complexity of the new societal trends and their influence on future energy demand, and underlines the need to consider these interlinkages in policy design.

This requires a new style of policy making, which goes beyond the traditional policy fields and explicitly takes the interrelations into account. The screening of existing policies shows that the individual trend clusters have been addressed by some policies, but that these interlinkages have yet to be considered by policy makers.

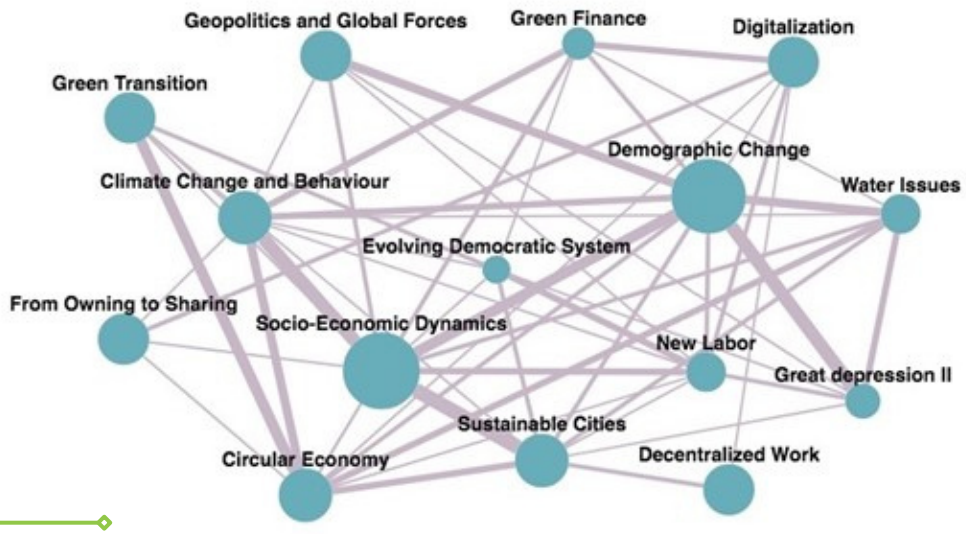

Figure 4: The network of new societal trends

[1] See Deliverable 3.1 : Pathways for New Societal Trends and gap analysis for demand models

How do we integrate the new societal trends into energy models?

After analysing how the new societal trends may influence future European energy demand, their integration into the relevant demand side models [2] of the newTRENDs project was discussed.

The identified clusters are classified into different categories with different levels of integration in the models and quantitative scenarios [3].

What are the limitations?

Uncertainties

It is important to investigate uncertainties and risks that are unlikely but could have a significant impact on future energy demand. New approaches and methods are needed to explore the energy transition as a complex, interconnected, multi-level and fragile process that can respond to both systemic risks and creative opportunities.

Sufficiency aspect

Despite the importance of "sufficiency" in energy demand debate, the policies needed to realise the sufficiency potentials have not yet been adequately discussed, so the inclusion of sufficiency issues in the models is still an open question. The analysis of lifestyle changes would shed light on a clearer understanding of their potential and the narrative insights on sufficiency and behavioural change, but an extensive discussion of the policies that lead to such lifestyle changes is needed.

[2] To learn about the models and the results of all sectors see https://newtrends2020.eu/

[3] To learn more about how each of the prioritised clustered are considered in the models read Deliverable 3.1 : Pathways for New Societal Trends and gap analysis for demand models

What are the findings?

Controversial impact: The direction of impact of a particular trend is not always obvious, so the controversial implications of the trends for future energy demand should be analysed in more detail.

Disruptive trends: Some trends may influence many sectors, creating whole new markets and even displacing others soon. Therefore, it would be particularly important to analyse how such disruptive clusters and trends may influence the other trends in different sectors. Furthermore, exploring the links between disruptive new societal trends seems to be very useful to better understand their joint contribution to energy demand and the energy transition.

Interrelationships and trend-connectors: Individual trends in each trend cluster and the clusters themselves are interconnected. Cross-sectoral analysis can answer the question of how the clusters and trends actually influence future energy demand in different sectors and identify the "trend-connectors" between the sectors.

Policy relevance: There is a need to draw conclusions about which parameters of the new societal trends are particularly important for energy policy and what still needs to be regulated or managed to avoid the negative impacts of specific trends.
Building on the identified new societal trends, two reports [4][5] of the newTRENDs project provide a diagnosis of the energy demand-side policy needs at European level and recommendations for policy makers.

Policy implication: It is necessary to consider all the different aspects of the impact of new societal trends on future energy demand (controversial impacts, disruptiveness, and interlinkages) in policy making to design effective policies that contribute to achieving the climate goals of the Paris Agreement. The interlinkages between the new societal trends lead to overlapping policy fields and therefore require a new style of policy making beyond the traditional policy arenas, fully accounting for the interdependencies of the trends.

[4] Deliverables 4.1: Diagnosis of energy demand-side policy needs at European level
[5] Deliverable 4.4 : Recommendations for better design of energy-demand modeling based on policy makers' needs

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newTRENDs partners:

Fraunhofer ISI

E3Modelling Energy Economy Environment

WiseEuropa

TU WIEN Technische Universität Wien Vienna University of Technology

Politecnico Milano 1863

Research and Innovation Centre PRO-AKADEMIA

ethink Energy Research

TEP

IEECP Institute for European Energy and Climate Policy

This policy brief is mainly based on the results of WP2 of the newTRENDs project.

Corresponding author: Mahsa Bagheri - Fraunhofer ISI

Design: Anousheh Parsaei - IEECP

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