

## Innovation Pathways, Strategies and Policies for the Low-Carbon Transition in Europe

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## Partners



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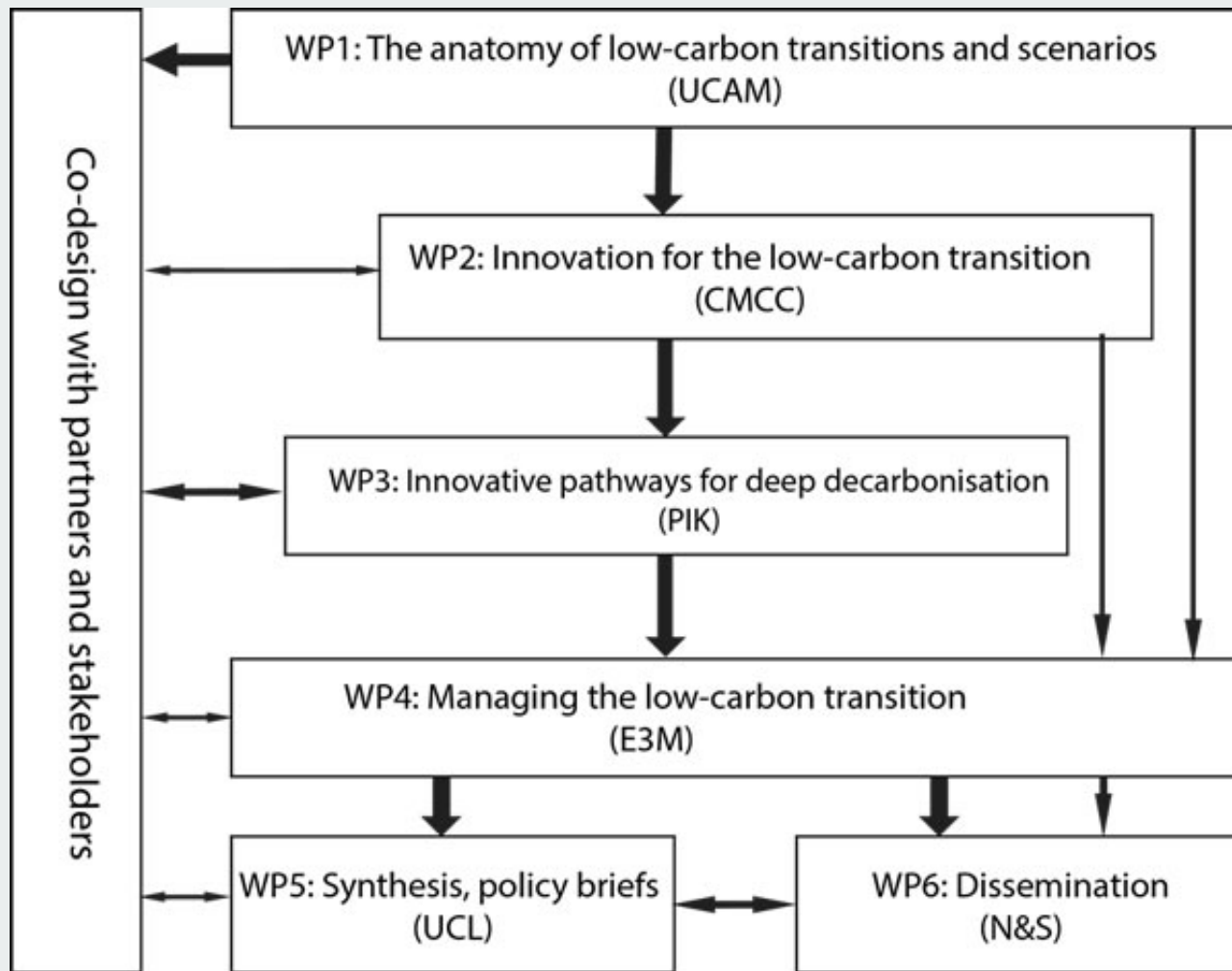


# Project objectives

1. **Understanding the challenges** of decarbonisation and the innovation needed to address them
2. Presenting a detailed **assessment** of low-carbon technologies, their **uncertainties, future prospects** and system characteristics
3. **Proposing policy and innovation system** reforms that will help the EU and Member States meet their greenhouse gas emission reduction targets
4. **Creating** new, co-designed deep decarbonisation **pathways** with novel representation of **policy and innovation process** for low-carbon technology development
5. **Making clear the social, economic and environmental dimensions** of the low-carbon transition and how they can be managed

# Main steps

- Assessment of the anatomy of existing scenario and pathway studies for the low-carbon transition from technical, economic and social perspectives
- Examination of innovation systems and policy landscapes for key energy-using sectors of the economy
- Proposition of structure of new low-carbon pathways
- Assessment, quantitative and qualitative, of these scenarios for their technical, economic and social outcomes
- Assessment of how the benefits of these pathways, e.g. new industries, jobs and competitiveness, may be maximised, and how any negative impacts, such as those on low-income households, or on carbon-intensive sectors, may be mitigated.



# WP Objectives

- **WP1 - Anatomy of Energy Transitions and Decarbonisation Scenarios**
  - Provides a detailed understanding of the components of low-carbon modelling and narrative scenarios that have been produced over the past decade by a wide range of organisations.
- **WP2 - Innovation for the energy transition**
  - It has the main objective of providing novel evidence on the effectiveness (or lack thereof) of the recent EU experience in decarbonisation.
  - This WP will not only identify the major challenges to the energy transition, but will put forward innovative solutions to overcoming them.

# WP Objectives

- **WP3 Innovative pathways for deep decarbonisation**
  - Create deep decarbonisation pathways co-designed with economic and societal actors, with novel representation of policy and innovation process for low-carbon technology development.
  - Build a platform where stakeholders can explore the core scenarios and develop a full quantitative understanding of the cross-sectoral decarbonisation challenges.
  - Go beyond the state-of-the-art of energy-economy modelling by increasing the sectoral detail and introducing insights about sector-specific dynamics and innovation processes from WP1 and WP2 into the models.
  - Analyse the effectiveness of different policy portfolios for achieving a deep decarbonisation transformation.

# WP Objectives

- **WP4 - Managing the low-carbon transition**
  - The objective is to assess the low-carbon transition pathways from all perspectives, including their implications for economic growth, industrial competitiveness, employment, social issues (affordability, poverty), and environment and resources (land, materials, water, etc.).
  - The aim is not only to evaluate impacts, but also to propose adjustments of the pathways and their implementation, which will allow reaping benefits for growth and employment from industrial strengthening in Europe enabled by low-carbon innovations, while alleviating adverse effects.
- **WP5 - Synthesis and Policy Briefs**
  - The objective is to integrate and synthesise all the outputs and insights from the different WPs and formulate the messages from them in such a way that they are accessible to the different target stakeholders identified.



# Priorities

- **A more integrated approach:** moving away from a vertical and technology-specific focus, to embrace a more horizontally integrated approach, identifying the new opportunities made possible by research and innovation, such as increased flexibility and resilience in the system.

Source: SET Plan

**A more targeted focus:** as underlined in the Research and Innovation and Competitiveness dimension of the Energy Union, actions should be grouped around 4 core priorities - renewables, consumer, energy efficiency, transport - on top of which 2 research priorities - CCS and nuclear – could be added for those Member States interested in those technologies

Source: SET Plan

# Coverage

## Sectorial coverage

- **Power sector** (electricity, gas, heat, oil; generation, transmission, distribution; energy infrastructure; centralised (utility), decentralised (residential))
- **Transport** (mode of transport (road, rail, aviation, shipping); passenger and freight (car, LDV, medium truck, heavy truck, bus, ; distances; means of transportation; fuel used (ICE, BEV, PHEV, alcohol, LPG/gas, hydrogen); transport infrastructure)
- **Industry** (NACE, energy consumption and GHG emission criteria; ETS and non-ETS, carbon-leakage endangered; energy efficiency potential, CCS in power and heavy industry)
- **Buildings** (public, commercial, tertiary, private) + building equipment (HAVAC, heating, equipment, appliances) + **Services**
- **Agriculture** (crop use, LULUC, biofuels)

## Geographical coverage

EU and national

# Time, boundary, dependence

## Time horizon

1990 to 2050 (x-year time steps)

## System boundary

**The entire energy system** (energy demand, supply, prices and investments to the future) and all GHG emissions and removals (whole economy)

## Scenarios dependence

**Development of many technologies will be heavily scenario dependent.** It refers mostly to different market size, R&D incentives and price. These have to be considered in global terms. And vice versa, different development of technologies, e.g. PV or e-mobility will have impact on energy sectors like coal, oil or gas.

# Data requirements

Three types of data are needed:

**Type A.** Data already used in the models. Our task will be to check their viability, correctness, latest estimation.

**Type B.** Data not used but which should be included since the modellers consider them important. This should be proposed by modellers – if they know weak points in the models they used.

**Type C.** Data neither used nor requested by the modellers but found important during our research, including emerging data, e.g. from latest political decisions, breakthrough technologies, EU ETS reform.

Data should be EU and country related (market regions, subnational regions).

Different types of data projection in long-time perspective: linear, piecewise, nonlinear (functional relation), look-up table.

Time resolution: Average over several years; Annual average.

Development over time: Constant, Development over time.

# Discussion

## **What is your focus in the sister project?**

- It embraces all possible dimensions of low-carbon transition, e.g. political, economic, technological, environmental and social.
- It focuses on energy related technologies both on supply and demand sides.
- It operates on well established long-term energy models with some ambitions for improvement, e.g. by better prediction of technology development.
- Cross-sectoral decarbonisation challenges.
- ‘Co-designed’ with a wide range of stakeholders from government, industry, academia and civil society.

# Discussion

**What could have a transformational effect in industry? What major trends do you see in the coming years?**

- **Results**
- EU will continue to face growing global competition in traditional industries, e.g. steel, chemical, cement.
- EU will encounter global competition in traditional industries where new products enter into market, e.g. e-vehicle, RES.
- Industrial policies and technological development are still too weak coupled and coordinated. Barriers of moving from RDD to market phase remain. See The 2017 EU Industrial R&D Investment Scoreboard (“IRI - The 2017 EU Industrial R&D Investment Scoreboard,” n.d.)
- EU, as the whole and individually as MSs, has too low potential to compete in the majorities of industries (products) in which the world’s powers want to be the leaders, e.g. PV, wind technologies.
- EU will further be a witness of “carbon-leakage” in all carbon- and material intensive industries.
- EU foreign policy has failed to secure MSs access to energy and mineral resources needed for many high-tech future products, e.g. rare earth mineral deposits.

# Discussion

## What role are European industries going to play on a global perspective in the future?

- **EC Plans**
  - Industry is undergoing a deep transformation: new technologies, the need for greater resource efficiency, new business models, greater consumer demand for manufacturing activities being bundled with services (EC Juncker Plan, autumn 2017).
  - EU plans new key industry sectors, e.g. construction, steel, paper, green technologies and renewable energies, manufacturing and maritime shipping? (EC Juncker Plan, autumn 2017).
- **Reality**
  - Industrial policy of the EU has for years been weak and “forgotten” element of its future.
  - Globalisation in natural way makes EU industry less competitive in all no high-tech branches.
  - EU cannot precisely control its industry development whereas the potential of individual MSs may turn out to be insufficient to stand global competition.
  - EU industry development depends much on progress in climate policy implementation – “carbon leakage” vs. new markets for “green technologies”.
  - EU will steadily lose the ground in all industries which require high energy and material consumption, can be easily automated and despite technological progress remain harmful for environment. Climate-energy policy, circular economy and digitisation are the right directions.
  - Working in industry is not attractive for young people. Profession of “engineer” or “technician” is not socially “cool”.
- **Remedy**
  - EU industry to survive shall be transformed towards “low energy and raw materials” being based on novel manufacturing principles, e.g. Industry 4.0, ICT based management.
  - EU industry framework continuous refinement - regulation, financing and education require further fostering to secure long-term global competitiveness, e.g. new business venture formation, more friendly framework conditions for entrepreneurial activities, determinants and outcomes of firms' innovative activities, supporting business and innovation dynamics, better human resource reallocation and skills growth.
  - Strengthening of EU defence policy should result in more joint military projects and faster transferring of military technology to civil area.