

High-Level Panel of the European Decarbonisation Pathways Initiative

Interim Recommendations

1 - The Paris Challenge

The climate accord struck by 194 nations at COP21 aims to stop anthropogenic global warming somewhere between 1.5 and 2°C. Overwhelming scientific evidence indicates that this political aim can only be met if the world economy is fully decarbonized around 2050. And industrialized countries will need to phase out GHG emissions even earlier. This, in turn, requires an unprecedented technical and socioeconomic transformation dwarfing the Industrial Revolution in terms of depth, scale and speed. Practically all sectors will have to undergo a rapid transition to low/zero-carbon operation. This would be impossible without an Apollo-type initiative for RD&D in the pertinent fields, accompanied by a rapid roll out of existing CO₂ reducing technologies.

2 - Europe's Role

Democracy, Renaissance, Enlightenment – the history of human progress through the last three millennia was shaped by a wide range of European contributions. It is in Europe where industrialisation started, generating a shift in human development but also initiating the pervasive use of fossil fuels. The next big project advanced by our continent should be the great social, cultural and technological transformation that will bring about sustainability for both economic prosperity and nature, in the context of an increasingly integrated global economy. Europe must and shall play a leading role in global decarbonisation for two compelling reasons.

Capability: Europe has the required cultural diversity, technical intelligence, economic capacity, institutional strength, social cohesion and political experience. If we will not be able to decarbonise our production-consumption systems quickly, no one else will.

Opportunity: Europe has many comparative advantages (e.g. human capital, cultural heritage, quality media, fertile soils, benign climate, world leading technologies), while it strongly depends on the import of raw materials and is challenged by high production costs. These weaknesses could be largely overcome by fully exploiting renewable energy sources and by closing material loops within a more circular economy. The continent's competitiveness almost entirely relies on cognitive capacities, which must now be put to the tasks of decarbonisation and greatly enhancing resource productivity.

3 - A Decarbonisation Narrative

The Paris challenge can be met if deep decarbonisation pathways are followed in the technically and economically leading countries, including large emerging economies. Such a transformative development can result from complex supply-demand interactions punctuated by disruptive innovations. Evidently, distinct successive phases of decarbonisation will have to be realised, where specific advances can generate the biggest climate dividend.

In the *first* phase (next five years) most of the low-hanging fruit on the decarbonisation tree needs to be harvested, also through investments in the engineering and commercial development of technologies today already at high TRL (7-8). Simultaneously, unprecedented investments in research and innovation have to be made to prepare the ground for the deep decarbonisation required in the subsequent years. In the *second* phase (until 2030), on the one hand, a number of critical fossil-fuel based business mega-cases (e.g. coal-based power,

combustion engines and conventional steel production) need to be gradually phased out. The development of substitutes/alternatives to cement and non-degradable materials through mission-oriented research and innovation programmes needs to be kicked off by 2020. On the other hand, demonstration and deployment at scale of the innovations of previous years have to be undertaken in order to prepare the full replacement of these obsolete schemes by sustainable alternatives in the *third* phase (until 2040). The deep digitalization of agriculture will also be part of this development. In the *fourth* phase (until 2050) failures will be corrected and successes will be amplified.

If one adopts the timeline of the narrative sketched above, one needs to accomplish specificity by identifying the crucial (and mostly difficult) "cardinal" changes that are likely required in the respective sectors: power, production, construction, mobility, land use and cities. A preliminary overview of relevant "cardinal" innovations in those realms is given in Figure 1.

4 - Novel Approaches and Instruments

On top of the concrete sectoral advances, one can formulate high-level strategic schemes that Europe should explore and possibly implement in line with its above-sketched role in the global decarbonisation theatre. Here are several suggestions that also account for the skills our continent can muster.

First of all, we should understand why the low-hanging decarbonisation opportunities have not been sufficiently exploited, in particular for improving energy efficiency in residential and commercial buildings as well as in industries, and launch a carbon abatement initiative based on existing economically viable options.

The complexity of the decarbonisation challenge cannot be solved just through technological changes. It implies deep changes at system-level, also through social and economic innovation, that fully exploit the potential of the digital revolution. Europe should show leadership in particular by choosing to specialise in high-added value segments of the different product portfolios and value chains.

In this context, **it is recommended to establish in FP9 a broader cluster around decarbonisation, connecting energy-mobility challenges (and related industrial value chains) with climate science**. This will better frame – within virtuous decarbonisation pathways – the prioritisation of research and innovation actions that will allow Europe to lead on climate action while increasing its competitiveness.

A system-level approach should be completed with **research and innovation "missions"**, which would target specific decarbonisation bottlenecks and where breakthroughs can significantly lower the costs and timespan of the zero-carbon transition. With the target of delivering applicable results **in the medium term (before 2030)**, capable of curbing emission towards Paris Agreement-compatible decarbonisation pathways, a set of **mission-oriented research and innovation programmes** are proposed (see also Figure 1):

- **smart storage, transmission, distribution, and energy system integration**
- **renewable and sustainable plastics**
- **zero-carbon and sustainable construction materials (zero-carbon cement, wood, composites)**
- **European soils as carbon sinks**
- **Climate-neutral, "circular" and liveable cities, also through social innovation (includes electromobility, energy-plus housing, smart solutions, digitisation, closer loops, etc.)**

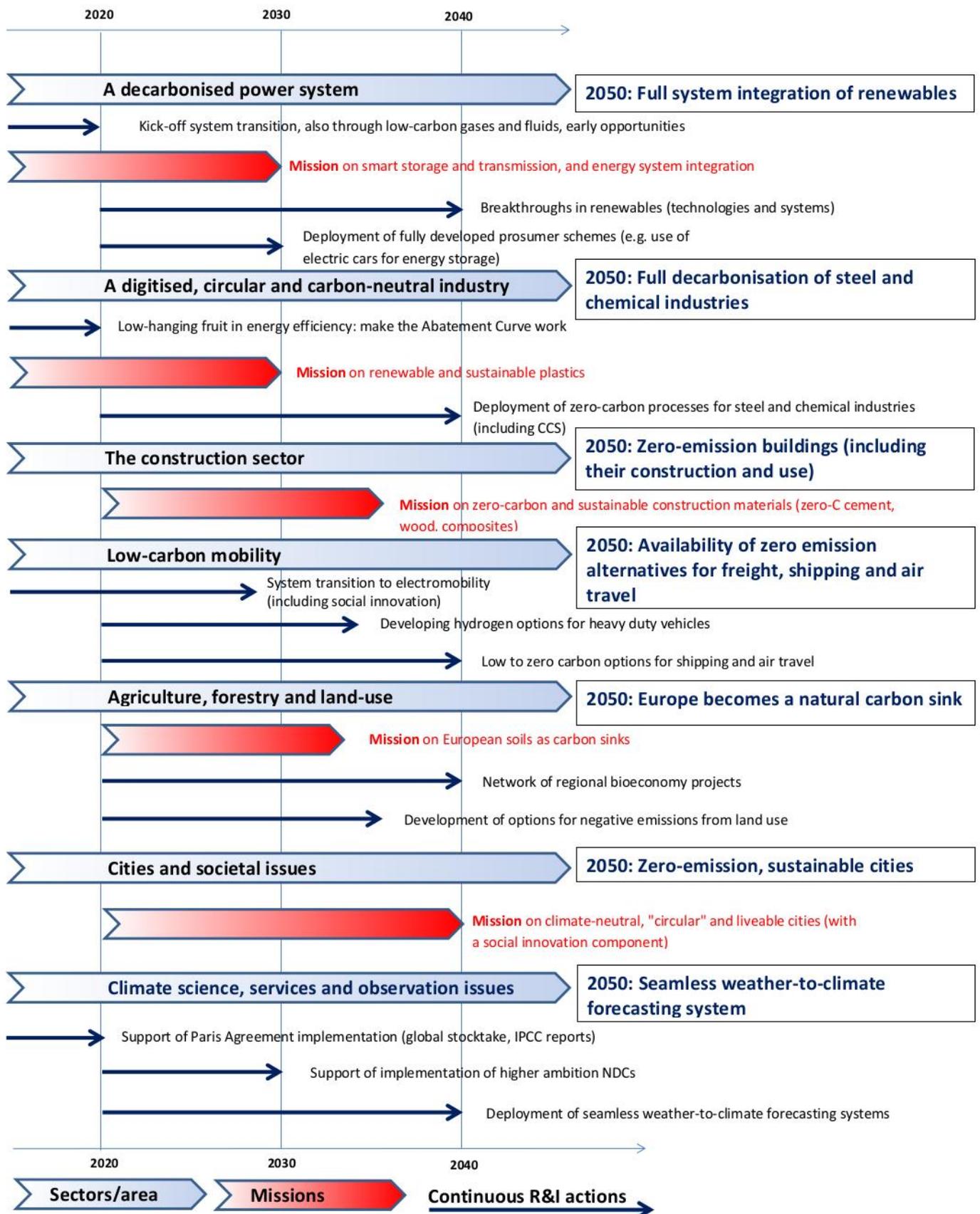


Figure 1: Proposed priority research and innovation actions for supporting the decarbonisation process in different sectors/areas along the time frame 2017-2040, in order to get the 2050 goals indicated in the boxes. Red arrows represent mission-oriented actions; all arrows have to be intended as roadmaps that produce various outputs throughout their time frame until their end-date, when the activity should be completed and deployed in society.

R&I "missions" should be accompanied by sustained research and innovation that may support **the longer-term** breakthroughs that can evolve into deployable technologies **in the 2040-2050 horizon**, such as:

- **breakthroughs in renewables** (technologies and systems)
- **zero-carbon processes for steel production and the chemical industry**
- **development of negative emissions technologies and options**
- **low- to zero-carbon options for freight, shipping and air transport**

A continuous effort will also be needed in climate change science - with the goal of providing the tools for the operationalisation of the Paris Agreement and for achieving a seamless and reliable weather-to-climate prediction system.

FP9 instruments should be designed to enhance the effectiveness of R&I actions, also through monitoring of impact. This would require a closer cooperation across the different actors on the innovation chain and a better use of financial resources. Such instruments may include for instance: a match-making program, for identifying industrial and academic partners who could deliver disruptive innovation if working together; or a de-risking instrument – such as a Transformation Fund – leveraging private capital for no-carbon business cases.

A well-designed and effective R&I policy at regional, national and European levels is essential for making the zero-carbon transition happen, with the appropriate mix of short-to-medium and longer-term research and innovation actions required for developing the set of decarbonisation solutions for achieving a carbon-neutral economy and society around 2050.

FP9 comes indeed at a crucial time to further enhance the momentum of the zero-carbon transition.

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