European Commission

Climate, Energy and Mobility

European Research and Innovation for a Clean and Healthy Planet

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EUROPEAN COMMISSION

Climate, Energy and Mobility

European Research and Innovation for a Clean and Healthy Planet

Summary of the discussions held at the European R&I Days
Brussels, 24-26 September 2019

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Directorate-General for Research and Innovation

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Foreword

The European Research and Innovation Days attracted around 4000 stakeholders to Brussels from 24 to 26 September 2019, and was hosted in an original and flexible venue, which allowed co-creation and co-design of future EU R&I priorities to take place.

Some 23 sessions featuring over 100 speakers were held on topics of key importance for the 'Climate, Energy and Mobility' Cluster under the forthcoming Horizon Europe programme (2020-2027). The presentations and discussions enabled constructive interactions with almost 2000 stakeholders from Member States, the business community, research organisations and NGOs, amongst others.

This publication highlights the key messages from these sessions, including descriptions of the people involved and the policy framework governing each session. These key messages will help inspire the orientations for the first Horizon Europe Strategic Plan, which will guide the implementation of the programme first's four years.

The sessions tackled key questions including the nature of scientific evidence, how to engage and communicate with citizens on science and research, and effective collaboration across disciplinary silos. Spanning climate science to the aviation of the future, from batteries to energy efficiency. The sessions aimed to connect the threads that should lead Europe to a carbon-neutral economy by 2050 in line with the major priority of the incoming European Commission: A European Green Deal.

The 'Science is Wonderful' exhibition at the R&I Days put the spotlight on real stories that result from EU-funded research and innovation projects. Hydrogen-powered cars, electric boats and automated vehicles were in operation and experienced by hundreds of participants. The 'Climate, Energy and Mobility' hut at the R&I Village was visited by more than 100 stakeholders and hosted 50 lively face-to-face meetings.

Overall, the R&I Days was a great success. The event demonstrated that R&I priorities can be designed and co-shaped by public and private actors, by academics and entrepreneurs, by governmental and non-governmental organisations.

The R&I Days showed that science, research and innovation do have tangible results for citizens. Sustainability is not a theoretical word. Climate, Energy and Mobility are working for a better world. A clean and healthy planet needs, first of all, strong roots in R&I.

John Bell
Director, DG Research and Innovation, European Commission

Clean Europe: Making Carbon-Neutrality a Reality

Speakers

- Anna König Jerlmyr (Mayor of Stockholm)
- Sandrine Dixon-Declève (Energy Transition Committee)
- Philippe Samyn (Architect)
- Magnus Agerström (Cleantech Scandinavia)

Chair: Clara de la Torre (Deputy Director-General, DG Climate Action, European Commission)

Rapporteur: Jeroen Schuppers (DG Research and Innovation, European Commission)

Description

The session discussed future EU energy and mobility systems - both critical to any decarbonisation strategy. How they could look like, and what needs to be done to achieve such a futuristic scenario, in particular from a R&I perspective. Overall, the session offered insights on which sectors need more investments, and of which magnitude.

Policy framework

The European Commission has recently unveiled its long-term climate and energy strategy for 2050. It presents a vision to achieve climate neutrality by 2050 through a fair transition encompassing all sectors of the economy. The session showed that, despite a highly ambitious target, such a transition is achievable if bold but realistic decisions are made, particularly in terms of a decisive investment on Research and Innovation (R&I). The session showed that the envisioned transition represents the least cost and socially optimal solution to prevent catastrophic climate change.

Key messages

There is a planetary emergency situation. Most of the technologies are available, but a strong political will and short-term interventions are needed.

The next decade should be used to invest in infrastructure. The taxation on labour should be shifted to taxation on products. A carbon border tax should be introduced. A Just Transition Fund should be set-up to protect those that are most affected by the shift away from the carbon society.

The vision that the transition is a win-win situation for all citizens should be better communicated.

Cities are the best test beds for achieving the EU climate goals. Clean cities require not only ambitious goal setting but also taking brave and difficult decisions for example by removing cars from cities and boosting public

transport that uses renewable energy. Smart practices such as combining delivery logistics with waste collection should be implemented.

Construction materials should be looked at with a life-cycle analysis perspective. Sustainable architecture is a key element. For example, the production of concrete has raised CO_2 emissions worldwide. Construction materials and designs for buildings must be re-thought to have less net emissions, by using high-strength steel for lighter concrete, and ensuring that every space has daylight and natural ventilation. Unfortunately, regulations do not always allow using new construction materials.

There is a good flow of innovations in clean technology, but the pace to the market is much too slow. Entrepreneurs should dare to go global, which is possible today. This opens the access to big markets. How innovation and how the future is explained to citizens must be improved

Climate Science
for a climate neutral and resilient society

Speakers

- Heleen de Coninck (Environmental Science department at Radboud University's Faculty of Science, coordinator of Horizon 2020 project CARISMA)
- Daniela Jacob (Climate Service Center – GERICS and Leuphana University's Faculty of Sustainability)
- Colin Jones (School of Earth and Environment, University of Leeds, coordinator of Horizon 2020 project CRESCENDO)
- Artur Runge Metzger (Director, DG Climate Action)

Chair: John Bell (Director, DG Research and Innovation, European Commission)

Rapporteur: Miles Perry (DG Climate Action, European Commission)

Description

Horizon 2020, the current R&I programme, supported scientific work that improved our fundamental understanding of the climate system. This contributed to recent IPCC conclusions used by governments and civil society to guide the development of climate action in the context of global goals such as those of the Paris Agreement. The session focused on the next R&I programme, Horizon Europe, and how it will support the next generation of climate analysis that can guide the development of policy measures, societal responses and low- and zero-carbon technologies.

This work should further advance climate science and enable the design of efficient decarbonisation pathways in line with the 2050 strategy. It will involve, for example, advancing efforts of the climate science community to perform research that furthers our knowledge, closes knowledge gaps (e.g. IPCC reports), developing the tools that support decision makers, and evaluating the societal impact of climate change and the technologies required for a low-carbon transition.

Policy framework

The IPCC special report 'Global Warming of 1.5 °C' confirmed that limiting the rise of global temperatures to 1.5 ºC is still possible, provided action is taken now using all the tools and means available. In the EU, the report gave further urgency to the debate on how to reach carbon neutrality by 2050. However, our knowledge of the interactions between climate change and key Earth systems is not complete. Further advances are needed to plan for mitigation action consistent with EU & global policy goals; for adapting to the varied impacts of climate change in the short, medium and long-term; and for understanding how climate change interacts with other goals, such as those related to biodiversity and sustainable development. Horizon Europe also seeks to promote development of a knowledge base that is user centric and can guide the

development of the policy measures, pathways and innovations needed to achieve our policy goals in a changing climate.

Key messages

'We need to understand fundamental science better'. There are massive 'known unknowns' in climate science: potentially big risks that we still do not know about. We already know we need to drastically reduce CO_2 but:

- How will Earth system feedbacks play out? What are the irreversible impacts (e.g. ice sheet loss and sea level rise)? How much of these changes have we committed to already (e.g. permafrost thaw releasing even more greenhouse gases?
- How quickly will greenhouse gas emissions translate into temperature change? Could we reach +2°C by 2070? Or already by 2040?

There is no choice anymore between mitigation and adaptation: transformation is needed across industry, governance and our way of life. 'We need to reduce emissions dramatically and adapt to climate change. There is no choice between the two'. 'We know we need negative emissions starting yesterday: but how to scale up the technology (enhancing natural sinks in a changing climate, developing carbon capture technologies) and practical arrangements for how they might be deployed in real life (incentive systems)?

'We need to cope better, already now, with our changing global and local climates'. A more variable climate at the local level is taking place. Already in Europe, regions can face drought one year, yet it can be too wet for farmers to harvest the next. This variability is increasing.

Systems transition is the solution, but how to do it? Theoretical advice and solutions need to become real over the next 5-10 years. New decarbonised models for each industry need to be demonstrated and scaled up. New business models need to be developed across agriculture, forestry and renovation. 'We need institutional and social innovation, to deploy both new technologies and those we already have, and to turn science-based advice into practical action'.

Smarter action needs better information. So continued investment in monitoring and user-relevant climate services is needed. 'We have a lot of knowledge in the bank from observations, but this needs to get better as conditions on the ground are changing more rapidly'.
Better knowledge means it should be more relevant, more local, and ready-to-use in the short term.

- 'How should I renovate my house over the next 5-years or climate proof my business'?
- 'How do we design the arrangements to deliver negative emissions at a granular level (not just an offset market)'?

Decarbonisation: Pathways from vision to reality

Speakers

- Maria van der Hoeven (former Minister and Executive Director of IEA)
- Elena Verdolini (EIEE and Università degli Studi di Brescia)
- Kirsten Dunlop (CEO, EIT Climate-KIC)
- Artur Runge Metzger (Director, DG Climate Action, European Commission)

Chair: Philippe Tulkens (Deputy Head of Unit, DG Research and Innovation, European Commission)

Rapporteur: Grazyna Krzywkowska (DG Research and Innovation, European Commission)

Description

The session is about the main findings and recommendations of the High-Level Panel on Decarbonisation, which delivered its final report at the end of 2018. The session demonstrated how these recommendations can be applied to the R&I activities to support the European strategic vision for a prosperous, modern, competitive and climate neutral economy, as described by the 'Clean Planet for All' Communication, using the most modern trends like for instance artificial intelligence.

Policy framework

The session disseminated, discussed, debated and moved towards operationalisation of the recommendations of the High-Level Panel on Decarbonisation. The panel delivered a strong set of recommendations identifying the essential R&I elements of a coordinated response to climate change. This is at a time when the 'Clean Planet for All' Communication is debated everywhere.

Key Messages

A recent shift from 'climate change' to 'climate emergency' rhetoric is omnipresent and demands action. Among the conclusions from the panel and the discussions:

- Challenges to the energy sector decarbonisation, including full electrification of industry, sources other than renewables, research required in energy storage or supportive policy measures (incentives).

- The final report of the High-Level Panel on Decarbonisation has conveyed the idea that decarbonisation is very complex and cannot be dealt with sector by sector. The report put forward recommendations that are cross-cutting. The concept of transition super-labs outlined in the HLP report allows for ideas listed by the report to be tested locally, and most

importantly with citizens being involved, citizens that should and can benefit from circular, carbon-neutral technologies. Inaction on climate change will only accentuate social stratification. The report not only gives recommendations on what has to be done but also how to do it.

- 'Deep demonstration' of a net-zero emissions, resilient future deployed mechanisms is currently run by Climate-KIC in different European regions and in 15 medium to large cities. This means putting the concept of transition super-labs in practice, to be an inspiration to other regions and cities, to show that it is possible to transform.

- Panellists and audience acknowledged that decarbonisation will bear costs so social transition has to be managed, 'losers' have to be turned into 'winners' of decarbonisation, critical mass of social acceptance for the change has be gained (for example, by influencing mobility's demand side).

- Many new business models, thanks to which decarbonisation can be achieved, already exist but they are not deployed at scale, they are not being replicated. This is where organisations like Climate-KIC step in, to make it happen. This is where the EU can also show its (international) leadership.

- The 'Clean Planet for All' Communication and the HLP report reinforced and complemented each other – they were issued on the same date last year. This coherence is particularly important, because of the size of the planned budget of the Horizon Europe R&I framework programme (EUR 100 Billion).

In conclusion, the recommendations of the HLP on Decarbonisation concern R&I, but they can inspire policy changes required to achieve carbon-neutrality by 2050. Moreover, solutions proposed in the report can be tested by demonstration mechanisms, some of which may be proposed within the Missions of the Horizon Europe.

Future generations of sustainable batteries

Speakers

- Philippe Jacques (EMIRI)
- Kristina Edström (Uppsala University)
- Oliver Schauerte (VW)
- Patrick De Metz (SAFT)

Chair: Clara de la Torre (Deputy Director-General, DG Climate Action, European Commission)

Rapporteurs: Julija Sakovica (DG Research and Innovation, European Commission) and Stefaan Vergote (DG Climate Action, European Commission)

Description

Europe's objective is to develop a world-class R&I ecosystem on next generation of batteries, with a view towards European industrial leadership underpinned by a sustainable European value chain. R&I Partnership is fundamental in delivering results for advanced and future emerging battery technologies. In fact, Europe is committed to delivering on the Paris Agreement. Electrification is one key technological pathway to decarbonise transport, energy, and industry. In a world that is increasingly electrified, batteries will become a key technological component of a low-carbon economy.

From a competitiveness perspective, batteries are becoming a crucial component with high added value, notably in the automotive sector, and large scale battery manufacturing will drive major employment opportunities. A world-class R&I ecosystem that can deliver next generations of sustainable battery technologies for different types of applications and sectors is essential for European industry to come back in this sector.

Building on what has already been done (cf. previous EU framework programmes, Strategic Energy Technology Plan), the session's round table tackled the following issues: EU strategy on batteries and electrification; R&I on batteries so far and rationale to the future partnership; R&I challenges and priorities on batteries; Circular economy of batteries – how? Industrial Projects focusing on R&I aspects; Role of industry within the co-programmed partnership – what are the specific commitments?

Policy framework

To discuss the 'Consultation Document towards the Strategic Plan', taking account of the results of the public consultation. The discussion has been structured around a few defined questions, with public directly participating and voting. The session gathered views on the design of the future partnership, regarding the scope, linking research to industry, and aligning national and regional priorities and plans to EU research and innovation.

Key Messages

- All key points made by speakers were fully in line with the Horizon Europe Cluster 5 approach for the new partnership on batteries; value chain approach (cradle to cradle), importance of sustainability and recyclability, combine short term needs that support fast industrialisation and long term research, need for cooperation between researchers and industry, work on improving Li-ion as well as working on new chemistries; and work on advanced production processes. Many applications are important with automotive the key and the driver.

- How should the success of the partnership be measured? Facing tough competition, ambition is a must in terms of technological leadership by EU companies, in the battery value chain and building a substantial global market share.

- EU initiatives like the 'Battery alliance' or the 'Partnership' are very welcome. There is a need to build bridges with other partnerships, e.g. with Clean Sky.

Energy storage

Speakers

- Els de Wit (Dutch Ministry of Infrastructure and Water Management)
- Patrick Clerens (EASE)
- Hege Brende (EERA Joint Programme Hydropower, NTNU)
- Michael Geyer (DLR)
- Mich Hein (CEO Electrochaea GmbH and STORE&GO project)

Chair: Tudor Constantinescu (Principal Advisor, DG Energy, European Commission)

Rapporteur: Thomas Schleker (DG Research and Innovation, European Commission)

Description

Current energy system transformation with an increasing share of volatile renewables requires innovative, effective and efficient methods to store energy and to allow for adequate answer to various demands / users, also in the context of the electricity market design directive. Energy storage technology continues to evolve and is able to provide efficient and innovative solutions for changing energy requirements, based on capacity and response time. Besides the role of batteries, which is not discussed in this session, innovation covers technologies such as pumped hydropower, compressed air storage, flywheels, hydrogen and electrochemical storage.

In addition, storage solutions for heat and energy carriers are important elements for the overall energy system as well as for cross-sector renewables integration. Also relevant are the storage of solar energy with CSP and in solar fuels, as well as intermediate bioenergy carriers. Integration of different storage technologies and the role of innovation in the overall optimisation of energy storage calibrated to answer user's specific needs, as a fundamental pillar of energy system transformation, have been discussed.

Policy framework

Inform about innovative Energy Storage technologies and highlight importance of storage technologies in energy system transformation and in better answering energy demand.

Key Messages

There was ample consensus on the necessity of an increased focus on energy storage innovation. This current importance of energy storage is rooted in the transition to an energy system with higher shares of variable renewables. As a number of technologies developed very fast, it is now important to move ahead and make storage an integral part of the energy system. 'We come from Stone-Age and we arrive now in Store-Age'.

One important message was that efficient sector coupling and integration can create huge synergies and can be enabled by innovative uses of traditional (e.g. hydropower) and new storage technologies (e.g. renewable electro-fuels, hydrogen). Here, in particular for demonstration of technologies, for system integration and for the combination of different storage solutions, R&I is needed. 'Large-scale demonstration, that is what we are asking for'.

Furthermore, it was stressed that besides electricity storage also other forms of energy storage are important. In particular thermal energy storage has to be considered, also using low quality heat. It was highlighted that mechanisms to de-risk investments, viable business cases for uptake of new technologies as well as for valuing services to the energy grid are needed.

Alternative fuels and energy carriers

Speakers

- Cédric Philibert (IEA E-fuels)
- Franziska Mueller-Langer (DBFZ)
- Benoit Charpentier (Total)

Chair: Alexandre Paquot (Head of Unit, DG Climate Action, European Commission)

Rapporteur: Maurizio Maggiore (DG Research and Innovation, European Commission)

Description

Decarbonising transport according to Paris objectives is challenging, and the availability of sustainable alternative fuels and energy vectors will play a fundamental role. Beyond electricity (discussed in Session 'The future is electric'), for long range heavy duty applications like freight shipping and aviation, other possible solutions such as bio and e-fuels need to be explored.

Policy framework

Debating preferred option by sector to inform strategic research agendas and topics for energy and transport in Horizon Europe. Considering that electrification is covered in different parts of the R&I Days, other decarbonisation options should also be explored.

Key Messages

The presentations looked at the potential and research needs of electrofuels and biofuels. The discussion showed the importance of supporting R&I for alternative fuels which will need to be part of the transition towards climate neutrality by 2050 and for which a number of technological, environmental and economic challenges remain.

One message is to prioritise direct electrification wherever possible, with the five-fold difference in efficiency and therefore in electric power needed for the same distance travelled by a car. There is also a large potential of ammonia as a maritime fuel, a path that is strongly pursued in Japan but not so much in Europe. Finally, 'we should be careful about the source of carbon for these fuels'. There are doubts about direct air capture and flue gas (which can lead to paradoxal situations). Synergies with biofuels can be better exploited as 98% exploitation of carbon content is achievable, around double the current value if only the direct biofuel path is considered.

There are high potential synergies between biofuels and clean hydrogen, but other by-products should find a market in order to reach a business case for the

whole process. Regional and frame conditions are essential from this point of view, and in the end determine the sustainability and the final cost of the fuel.

Biorefineries can also play a crucial role for decarbonizing the aviation sector. To this end, the role of pre-treatment of biomass is fundamental.

Overall, it is clear that there are no silver bullets to replace liquid fuels where they are essential. But a number of different alternative fuels exist depending on sectors, place of production, and feedstock availability.

During the discussion, the following specific points were highlighted as R&D priorities:

- sustainability considerations of the whole value chain;
- synergies between different fuel types (bio / electro based);
- pre-treatment of biomass;
- support of pre-commercial units;
- commercialisation of by-products;
- importance of ammonia and green hydrogen.

Mission on Climate-Neutral and Smart Cities

Speakers

- Hanna Gronkiewicz-Waltz, Mission Board Chair
- World Café and interactive debate with the participants

Chair: John Bell (Director, DG Research and Innovation, European Commission)

Rapporteur: Jean-François Aguinaga (Head of Unit, DG Research and Innovation, European Commission)

Description

As more than 75% of EUs population is living in urban areas it is essential to adopt new system approaches for optimising our space/cities to address common challenges such as efficient and smart energy and mobility systems, smart buildings, climate change resilience, social inclusiveness and prosperity. Climate-Neutral and Smart Cities' is about engaging in solutions and preparedness for the challenges of cities in the context of climate change and other common challenges, it means anticipating their adverse effects, taking appropriate action to prevent or minimise the damage they can cause, or taking advantage of opportunities that may arise. This session will discuss key targets, impacts and the roll out of a Mission to increase the prospective of achieving Climate-Neutral and Smart Cities'.

Policy framework

This session discussed the needs, impacts, targets and content of a Mission approach to bolster Climate-Neutral and Smart Cities, including technological challenges and societal transformation, with the public and a wide range of stakeholders (practitioners, businesses, NGOs, etc.).

The Mission will identify and further stimulate the interaction between R&I activities and prioritise actions that should be undertaken to drive sustainable and resilient cities. The session will help to further define the roll out of the planned Mission. The session will be an important occasion to convene, and engage with, the cities and urban R&I community, to discuss the strategic programming for future R&I with citizens and stakeholders.

Key Messages

Inspirational challenges for the Mission:

- Link the goals of the mission to the wellbeing/health of the citizen and air quality was one of the recurrent points proposed by the groups; similarly 'a better balance between wellbeing and environmental/climate concerns'. The quality of life and well-being include biodiversity, green infrastructures, public space, social innovation and inclusion;

- Stress that cities are for people (and not for cars): 'one tree for each car'. New ways of transport and the use of shared services (not only for transport) must be promoted. Behavioural change must be stimulated. Cities contract/Urban Climate Alliance as basis for agreeing and committing cities to undertake actions to achieve smart and climate neutrality

- Let the young generation inspire the mission and not the other way around. Inclusiveness ensures accessible infrastructure and jobs.

- Creating energy positive districts, a 'Climate Atlas' mapping all cities buildings and creating virtual cities and bring this in a symbiosis with the 'real environment'.

Citizens and stakeholders' engagement – a few examples:

- Retrofitting of districts and engaging young generation in using biomaterials (Oslo), stimulation of circular economy (Ljubljana), and cooperation between several regions to implement mitigation measures improving air quality (Po regions).

- Barcelona, Nantes, Amsterdam, Copenhagen (climate-neutrality by 2030), Stockholm district of 20,000 inhabitants as example of a sustainable district development (energy, mobility).

- Empowering citizen engagement in city with the 'buy and sell' system of energy

- Social innovation calls (up to EUR 15,000 for local SMEs) where citizens can vote themselves on projects that should go forward (Paris)

In conclusion, the open session led to the beginning of a brainstorming and 'co-creation' process. Even when most of the ideas, observations and actions have been identified in policy/research reports, the enthusiasm and reactions of the participants were very positive: 'the Commission was really listening'.

City as Innovation Lab

Speakers

- Riccardo Crescenzi (London School of Economics and Political Science – LSE and Rapporteur of the High Level Expert Group report on 'The human-centred city'
- Jürgen Rüttgers (University of Bonn, Special Adviser to the Commissioner for R&I)

- Nathalie Guri (EUROCITIES) moderating the Round Table discussion with the two keynote speakers and:
    - Margit Noll (Austrian Research Promotion Agency - FFG and Chair of JPI Urban Europe Management Board)
    - Bassem Asseh (Vice-Mayor Nantes Metropole, iCapital 2019)

Chair: Jean-François Aguinaga (Head of Unit, DG Research and Innovation, European Commission)

Rapporteurs: Giulia Facelli (DG Research and Innovation, European Commission) & Sandro Nieto Silleras (DG Climate Action, European Commission)

Description

To present and discuss the High Level Expert Group Report 'The Human Centred City: Opportunities for Citizens through Research & Innovation' and EU's R&I future objectives for and with cities in view of Horizon Europe and its Mission on 'Climate-neutral & Smart-Cities'. The session provided the occasion to present and discuss the highlights and recommendations of the High Level Expert Group report with a panel of experts and the participants (through Sli.do support). The session inspired public debate on how EU can look like by 2030.

Policy framework

Cities are not only home to 75% of the population in the EU, but they are the driver of economic and social innovation, serving as global innovation hubs for the exchange of ideas and testing of new models and technologies contributing to EU key challenges and objectives:

- To present and discuss the main findings of the High Level Expert Group report as input to the 'Mission on 'Climate-neutral & Smart-Cities';
- To discuss EU R&I future strategies in view of Horizon Europe and the Mission on 'Climate-neutral & Smart-Cities';
- To co-create an innovation ecosystem where cities, citizens, innovators and policy-makers are key actors;
- To promote the European Capital of Innovation 2019 Award winners as role model for other cities.

Key Messages

- Cities are labs where problems become more acute but also where we can find the solutions. Cities have to be human centred. Four key dimensions are identified in the Report to address this objective: People, Place, Prosperity, Resilience.

- Cities can support EU re-industrialisation processes, defending the European way of life. To address global challenges, cities need to be more than just smart, but inclusive, safe, resilient and sustainable.

- Cities have to be practitioner of democracy, promoting civic dialogue where solutions are co-designed and co-implemented. As a result this would increase the efficiency of public policy and consolidate the social bonding between people;

- A new integrated approach in the governance of cities is needed. Emphasis should be put to neighbourhoods as entry point to integrated approaches.

- The digital world can support cities in addressing the challenges of the future, including efficient public data management and control. New frameworks are needed to support public authorities.

- There is an increasing need of capacity building for researchers to go to the local level to co-create and methodologies for upscaling experience from local experimentation. Administration could build capacity in order to moderate those co-creation processes.

- Transition pathways are neither bottom-up nor top-down. A middle point is needed to engage a participatory culture into great city challenges such as Nantes' experience with the Great Debate 'Energy Transition is up to us!' engaging around 50,000 citizens.

- Best practices and replication need to be context-sensitive and understand the specific local challenges of each city.

Technological leadership in renewables and energy efficiency

Speakers

- Daniel Cueff (Mayor of Langouët)
- Simon Perraud (Deputy-Director of CEA-LITEN)
- Jutta Paulus (MEP)
- Dirk Vansintjan (President of REScoop.eu)
- Andrea Voigt (Director-General of EPEE, the voice of the refrigeration, air-conditioning and heat pump industry in Europe)

Chair: Vincent Berrutto (Head of Unit, Executive Agency for SMEs)

Rapporteur: Piero De Bonis (DG Research and Innovation, European Commission)

Description

The EU is a worldwide technological leader on renewables and energy efficiency. Besides cutting energy cost and lowering the demand, what about creating jobs, competitive industries and a positive commercial balance? The discussion focused on energy at local/community level.

This EU leadership is not only crucial in terms of cutting energy cost, but also in relation to creating jobs, competitive industries and a positive commercial balance. The session marked the importance of investing in research and technology development to stay ahead of the international competition by technological leadership. Investing in R&I is critical to keep EU's technological leadership and hence reap the co-benefits associated with it.

Policy framework

- To demonstrate that investing in R&I is critical to keep EU's technological leadership and hence all the co-benefits associated with it.
- To stress the importance of working together on R&I and the development of R&I agendas.
- To present examples of EU technological leadership in renewables and energy efficiency.
- To increase the knowledge about innovative clean energy technologies and gather support to higher investment in R&I in the sector.

Key Messages

There was substantial consensus among the speakers and the audience on the main challenges and targeted impacts presented in the Orientations towards the first Strategic Plan implementing Horizon Europe.

R&I work should encompass the whole value chain, from e.g. material research, through the higher levels of technological readiness and up until market uptake,

in the framework of a smart industrial policy that benefits European competitiveness (the example of PV was mentioned as a counter-example, while that of batteries was cited as good practice). Also, solutions should be 'localised' to meet the needs of specific contexts, markets and regulatory environments.

The current societal mobilization against climate change and the European *Green Deal* proposed by President-elect von der Leyen were mentioned several times.

It was emphasised that a circular economy approach should be applied when designing the technologies that are used in the renewable energy and energy efficiency sectors.

Several areas were specifically mentioned as important such as sector coupling; heating and cooling; hydropower; energy efficiency; low-tech innovation; and socio-economic research.

Energy cooperatives were considered as a very good European asset when it comes to developing and testing on the ground innovative solutions, and aggregating small projects to a scale that is bankable. But it was also noted – as shortcoming - that the results often remain property of the industrial players.

Synergies between EU and regional instruments were mentioned as an effective instrument to advance research and create 'innovation ecosystems' at the local scale.

Greater energy efficiency is critical to act fast enough against climate change. It was stressed that the power and the heat/cool sectors should 'talk to each other' much more in order to promote integrated solutions.

The importance of being able to adapt in third countries the solutions developed for the European geographical conditions was mentioned.

It was also highlighted that many renewable energy and energy efficiency solutions are already developed and available to decarbonise the system, but their adoption is lagging behind because of market barriers, including the absence of adequate regulatory and financial incentives. There is also a lack of trained installers of these technologies.

Clean and affordable energy and mobility for citizens

Speakers

- Chris Foulds (Anglia Ruskin University, co-lead of EU ENERGY-SHIFTS platform)
- Robert Braun (Institute for Advanced Studies Vienna, Coordinator NewHoRRIzon)
- Imre Keseru (Mobility, Logistics & Automotive Technology, Vrije Universiteit Brussel - MOBI VUB and European Transport Mobility Forum (user-centered) and H2020 Mobility4EU project)
- Marianne Ryghaug (EU ENERGY-SHIFTS platform)

Chair: Helen Spence-Jackson (Climate Knowledge and Innovation Community)

Rapporteurs: Oana Melinceanu and Gerd Schonwalder (DG Research and Innovation, European Commission)

Description

Decarbonising energy and mobility is crucial for maintaining the global competitiveness of the European economy, but going carbon-neutral affects all other areas of society as well. Technology breakthroughs are part of the puzzle, but they need to be embedded in broader societal needs. Changing values, preferences and lifestyles are driving the emergence of new business models (cf. car-sharing or automated driving).

Social innovation is pushing the boundaries not just of local governance (think energy cooperatives). How can Europe's enterprises benefit from these transformations, and how can these advance society as a whole? The session explored ways of involving citizens in setting the R&I agenda and the role of 'citizen science' in energy and mobility research. It also looked at the many non-technical aspects of the clean-energy transition where citizen engagement is vital. The session contributed to the co-creation of appropriate policies, fostering more inclusive, anticipatory, open and responsive R&I in Europe.

In short, it is not just about technology. Understanding these changes and creating more space for citizens requires contributions from both STEM (Science, Technology, Engineering, Mathematics) and SSH (Social Science and Humanities) disciplines. The session provided a forum for promoting citizens' involvement and engagement in generating a shared vision of future R&I priorities around energy and mobility challenges, encouraging, cultivating and driving responsible R&I practices across Europe. Among the points discussed were also the social fairness and democracy to the future of transport (obviously through an RRI lens) as well as the affordability/energy poverty.

Policy framework

- To bridge the gaps between different science, research and innovation communities, as well as society at large, by fostering more inclusive, anticipatory, open and responsive energy and mobility R&I contexts.
- To reaffirm that the European Commission remains committed to integrating social sciences and humanities aspects across all its R&I support.
- To demonstrate the important role citizens play in designing the mobility and energy research and innovation landscape: their involvement extends to many non-technical areas, including business model development, organisation and expression of consumer interests, social organisation, as well as social and governance innovation.
- To raise awareness, mainstream best practices and share results by providing recommendations on how to better integrate citizens' participation into the next European Framework Programme.
- Develop and disseminate a concept of Societal Readiness Levels (SRL) of technology and create a sustainable network/platform providing a voice for citizens.

Key Messages

There is too much focus on social acceptance and how to increase it. Citizen engagement needs to go beyond that, starting with listening to people and then responding and acting on their concerns.

Looking at people only as mostly passive 'consumers' or 'users' of technology is too restrictive. People want to play an active role as 'citizens'. They want to be listened to, participate in defining R&I agendas, and take part in the actual research process.

Concrete mechanisms to ensure public engagement are missing. Existing expertise – from Science for and with Society (SwafS), Citizen Science or Responsible Research and Innovation (RRI) – is being forgotten. More social laboratories are needed to bring together citizens, governments, and stakeholders from business, academia and elsewhere.

Too often still, people are seen as barriers, and not as facilitators and incubators for new ways of doing R&I. New, incipient forms of participation in R&I already exist, in urban transport and elsewhere. They need to be more broadly disseminated and developed further.

Citizen involvement needs to be part of project proposals already at the concept stage. Citizens need to participate throughout the development of a project or programme, from problem identification all the way to monitoring and evaluation.

Citizens should not only be used as subjects of data collection: citizens should themselves define what data is needed to best address their concerns, and collect such data themselves.

Socio-economic Sciences and Humanities (SSH) can drive behavioural change, such as by demonstrating how innovation in energy or transport can lead to better air quality and therefore better health outcomes for citizens.

Finally, two questions and answers:

- How can SSH research and societal outreach bring value to more technical research and innovation activities, for instance in aviation? In connecting with citizens, SSH research and citizen involvement helps to better orient R&I towards societal needs, increase impact and avoid unintended consequences.

- What can SSH and societal outreach do to lower risks for innovators? Remember Nokia? By better understanding societal needs, SSH research and citizen involvement can lower the risk of obsolescence and help to save jobs, even create new ones.

Digitalisation of energy and transport: data-driven services

Speakers

- Marisca Zweistra (Stichting ElaadNL)
- Germán Herrero Carcel (Transport Sector – ATOS)
- Nikolina Apostolova-Riehl (Founder and CEO of Stockbooking)
- Peter Hermans (CTO – Stedin)

Chair: Eddy Hartog (Head of Unit, DG Connect, European Commission)

Rapporteur: Cristobal Irazoqui (DG Energy, European Commission)

Description

The session discussed the digitalisation of the energy and transport sectors and their transformation into data-driven services. Where do we have to act and what R&I actions are needed to make it a reality? Where is digitalization of smart grids most needing EC support? Where is digitalization of logistics most needing EC support? What are we forgetting when looking at Data to support the new multisector services in energy and transport? How can digitalisation of the transport and energy sector contribute to make our planet cleaner? How can European R&I tackle the issues mentioned in the above questions?

Policy framework

- How do mobility, energy and de-carbonization interact with one another? Can digital platforms be the enabler?
- Demonstrating that the Digitalization, new ICT technologies and the smart use of Data will support the Energy Transition and the decarbonisation of the energy and transport sector.
- Support the digitalisation of the energy sector while ensuring a synergy between the Energy Union and the Digital Single Market.
- Support the digitalisation of the transport sector; enable multimodal door-to-door mobility of freight and passengers; enable more sustainable transport systems.
- Raising social awareness and gain trust in the possibilities linked to the digitalization of grids in the energy and transport sectors (e.g. for the connection of electric vehicle and charging stations; or for a flexible and optimised integration of clean energy storage in the electricity grid)
- Bringing together relevant stakeholders to breach silos and integrate linked but still separate domains as energy, transport, built environment, and new ICT technologies.

Key Messages

- The EU needs to make progress in decarbonizing transport so that it makes its contribution to tackling climate change while improving the quality of life especially in cities.

- A full coverage of a charging infrastructure is needed to boost the market of electric vehicles. Charging might create severe problems for the grid without cooperation if the grid peak load will grow to levels that cannot be accommodated by the grid capacity at distribution levels.

- Smart charging station should be connected and intelligently interact with the energy grid allowing that EV use green energy to be charged in an optimal way. This could be done through an open standard or open source to exchange data between vehicles and the grid.

- The challenge of Digital Platforms is the design of open interfaces and standards, which would allow a vibrant ecosystem behind to scale. More ambitions could be set for environmental data.

- The distribution network as such runs into Local Flex Dilemma: more flexibility needs through more renewable energy and through an agile charging infrastructure. Both will result into more complexity for system design. DSO are transformed into System Operators rather than just distributors of energy.

- There is a need for a transversal approach connecting different sectors and different systems to achieve energy efficiency and manage flexibility through volatile energy sources and increasing demands from electric vehicles. 'The new energy / systems of the future won't be built on silos of the past'.

- Digital platforms may overcome fragmentation between different sectors, and lead to intelligent services like App for Uber, AirBnB, Share & Charge. There is a huge potential. The data platforms will create more business value in the future (direct trade target consumers and transversal services; decentralised community of buyers and sellers).

- There is a platform dilemma: Digital Platforms could experience fast growth – with a risk that the winner takes it all. Europe risks to fall behind strong US Internet platform providers like Google, Apple, Tesla, Uber et al. – and has to put its stakes together.

- What should the EU do: supporting platforms and cross-sector business models. For this to happen, different actors from different sectors, charging station operators, parking space providers, smart city, DSPs, car manufacturers, etc. have to agree on common data interfaces and settle an agreement to exchange data. Otherwise services will remain fragmented.

- The EU should stimulate the creation of a transversal data exchange frameworks and provide incentives for cross sectoral use cases.

- Trust is key in the value proposal for logistics platform, especially for small companies. Start-ups would benefit from data standards which would allow to extend their business and enabling different sectors to work together (small business are often reluctant to share data).

- The audience recommends to establish fair principles to create trust and provide incentives for consumers. Blockchain has also the potential to optimize energy management processes in almost all stages of the value chain and at the same time to cope with transparent data sharing and trust. Blockchain technology seems used and mature, e.g. for mobile payments for EV charging across different vendors.

- It is also important to engage with cities as a potential prime innovator, to cooperate on citizen engagement and co-create a transversal policy approach for urban areas.

- Concerning future R&I policy, it is recommended to organise a dialogue within the existing energy and transport Horizon 2020 project calls where cross sectoral consortia are requested. Horizon Europe should cut across sectors, build on open standards, protocols and boost new business cases. EU should be in the lead in setting the standards for the new local flex as well as the EV-Grid interface. Monopolies of emerging Tech/Internet platforms could shake the energy and transport sector if the EU does not act swiftly.

Nurturing champions in energy and transport

Speakers

- Pierre Chehwan (Strategic-Alliance and Institutional Relationship at NAVYA – Project AVENUE)
- José Miguel Pinheiro (EPDR – WINDFLOAT project)
- Walter Schneider (Austriatech)
- Elsa Lopez Formoso (EIB)
- Niklas Galonske (Consulting Transport & Logistik; HaCon Ingenieurgesellschaft mbH - IMIS project)
- Irene Bonvissuto (DG ENER)

Chairs: Dirk Beckers (Director, Innovation and Networks Executive Agency)

Rapporteurs: Alan Haigh (Innovation and Networks Executive Agency) and Hadrien Michel (DG Climate Action, European Commission)

Description

The session showcased success stories from EU R&I supporting market uptake and future champions in energy and transport. It looked at lessons learned on establishing innovation/take up ecosystems and at synergies between EU instruments and programmes.

Policy framework

The session fostered the discussion on how to improve the R&I project results uptake by the market and potential users, thus increasing the impact of EU funding through programme, topic and project design. The session delivered concrete hands-on experience resulting from successful projects, looking at the conditions that have helped them to achieve market take up.

Among the questions to be raised to the projects: what is your business? Where are you in terms of technology/solution development? What are your market/business perspectives? What do you need/what will you do to become a champion (to do and not to do)? The questions raised to the other speakers: What are the conditions for innovation uptake and what are the policy measures that need to be taken to support the birth of champions? What EU funding scheme can support the birth of champions? How Member States can ensure that the technology is deployed in the country?

Key Messages

On the policy side:

- A policy package for the electrification of transport across Europe is needed (regulation on emissions, automation, support to deployment of infrastructure).
- From research to deployment stage, industrial policy to encourage and protect innovators with international competitors is needed.

- In the energy sector, the policy package should continue to provide business visibility to the players. Incentives for further penetration of renewables in the electricity market is necessary and the current targets should be increased.
- The European Green Deal is deploying now and will influence all policies and mark a policy shift.
- EU funding will be key to influence not only the technologies and solutions developed but also support the policies that will be developed.
- The Commission should build on prior programmes, increase resources (e.g. from Horizon2020 to Horizon Europe, climate mainstreaming) and improve financing conditions (e.g. from NER300 to Innovation Fund).

On the implementation side:

- Further support to innovative champions through funding is needed. Companies are often survivors, which had to use different instruments to progress to the market and become successful. The complex road from research to demonstration to deployment should be eased (e.g. seal of excellence) and should take more into consideration challenges such as standardization, permitting and other regulatory barriers in various EU countries.
- Both transport and energy projects mentioned that further support to large demonstration is needed even after a first pilot, in particular as any newly deployed solution contains numerous unsolved technical challenges.
- From a financing point of view, it is crucial that the EIB keeps playing its role in de-risking the steps from demonstration to deployment. However, more should be done to encourage other banks to join along this support as it is proven that private banks are still hesitant to finance projects even when income stream becomes tangible and the EIB is involved.
- It is important to have a project pipeline and to design complementary instruments and programmes that 'match'. Moreover, fragmentation is often an issue (i.e. in logistic sector) and projects should be encouraged to have a more dynamic exploitation strategy.
- Developing and streamlining advisory services is necessary to help stakeholders find their way in the numerous funding tools that exist.
- In addition, advice on how to plan and deploy a good exploitation approach is needed. Best practices from successful projects should be used and shared among the community.
- More synergies with the other programmes should be developed. Pragmatic steps should be taken to ensure that in particular the support of high TRL solutions is ensured until a full deployment on the market.

Europe's Clean Energy Future

Speakers

- Socratis Dimitriadis (Vice-Mayor of Thessaloniki)
- Alvaro Beltran (Founder and CEO Onyx Solar - Mission Innovation Champion)
- Ana Bartolo (Professor of Polytechnic School of Setubal (PT) and CEO of the construction company Debartolo)
- Heather McKay (Climate Crisis Foundation – Clean Energy Ministerial – Mission Innovation Youth Leader)
- Álvaro Beltran (CEO Onyx Solar and Mission Innovation Champion)
- Rapporteur: Linette Knudsen, University of Copenhagen – Clean Energy Ministerial - Mission Innovation Youth Leader

Chairs: Patrick Child (Deputy Director-General, DG Research and Innovation, European Commission) and Hans Van Steen (Acting Director, DG Energy, European Commission)

Rapporteurs: Laurent Bochereau and Maria Yeroyanni (DG Research and Innovation, European Commission) and Alessia Clocchiatti (DG Energy, European Commission)

Description

The session discussed how clean energy innovative solutions in cities and local communities can be shaped and developed in cooperation and dialogue with citizens, innovators and young professionals.

Policy framework

- Bring together relevant stakeholders to discuss how to accelerate the development of innovative clean energy solutions responding to cities and local communities needs
- Promote public-private-people partnerships as effective methods for communicating between stakeholders and delivering beneficial innovation outcomes
- Engage the young generation as representatives of today's society and tomorrow's leaders
- Replicate and upscale solutions to fit diverse local contexts through innovative financial mechanisms and governance models
  Highlight the role of international cooperation (such as the Mission Innovation initiative) to drive ambitious climate action.

Key Messages

Europe's clean energy future is not purely technical. Holistic approaches to urban planning where smart and technical solutions are combined with a focus on humans with inclusivity at its core are needed. Solutions without inclusion are not sustainable. There was an emphasis on the need for youth and

community participation in the discussion. In relation to this point the concept of a 'Human centred city' plays a key role to ensure a just transition and to increase interest, buy-in and engagement from the public.

The focus on a holistic approach to Europe's clean energy future feeds into the second point, which was highlighted by panellists and audience alike. To achieve a clean energy future, it is necessary to 'break silos' between sectors especially between policy making and R&I. It is key that synergies take place across all sectors at all levels.

The two points above lead to the overarching take-away from the session. That 'Co-creation' is central to unlock Europe's clean energy future and achieve decarbonisation in Europe by 2050. Spaces that brings together professionals, policy-makers and young people to create a dialogue on Europe's clean energy transition help to achieve the above-mentioned points.

Sustainable built environment for people

Speakers

- Sue Arundale (President of ECCREDI and Technical & Environmental affairs at FIEC)
- Paula Rey Garcia ('Buildings' Team Leader, DG Energy)
- Paul Cartuyvels (ECTP member of board)
- Emmanuelle Causse (Director of International Affairs UIPI)

Chair: Helene Chraye (DG Research and Innovation, European Commission)

Rapporteurs: Ilektra Papadaki (DG Internal Market, Industry, Entrepreneurship and SMEs, European Commission), Josefina Lindblom (DG Environment, European Commission)

Description

Climate change, resource shortage, increasing population and urbanisation call for rethinking our approach to built environment, an area that is critical for the EU and its citizens. In fact, the built environment embraces most of the challenges that Europe is facing.

Most of the EU policy roadmaps (energy, climate, sustainability and user's demands) underline its relevance towards the achievement of 2050 strategy 'A clean Planet for all' priorities by aligning actions in key cross-cutting research areas linked to social and technological innovation. The session followed a co-creation process setting an holistic vision on R&I for the built environment, underpinned by a co-programming partnership under Horizon Europe, bringing together researchers and innovators with relevant background (climate, energy, digital, health, social sciences, materials), built environment professionals, policy experts and government officials.

Policy framework

- To highlight relevant EU policy roadmaps for the built environment (energy, climate, sustainability, user demands) and link to R&I
- Consult the community on a holistic vision for R&I on the built environment, underpinned by a partnership, under Horizon Europe
- To co-create an innovation ecosystem to successfully implement this vision.

Key Messages

By definition 'Built environment' goes beyond buildings as it comprises all human-made space and not only buildings (e.g. parks, infrastructures, buildings) therefore the partnership should reflect this definition.

Built environment features strongly in the New European Green Deal, with strong focus on Circular Economy, resource flows and decarbonisation.

There was a long discussion on how to grasp citizen needs, and a recommendation to not only look at them but to integrate citizen's parameters and social innovation tools at all steps of the partnership.

Digitalisation has helped to rationalise the use of materials in construction and to reduce the use of actual resources.

The EU should encourage new business models, their scale up, development and deployment, and maintain the European know-how in the EU market. Strategic public procurement can also support innovative solutions.

There is a call to the EU to take action, put stakeholders together, engage the cities and regions, and avoid increasing social gap including all citizens and looking at everyone's needs.

Euratom research for All

Speakers

- Patrick Child (Deputy Director-General, DG Reserch and Innovation)
- Bernard Bigot (Director-General, International Thermonuclear Experimental Reactor)
- Eric van Walle (Director-General, SCK-CEN nuclear research centre)

Moderator: Nathan Paterson (ENS-YGN, Nuclear Young Generation Networks)

Chair: Elena Righi-Steele (Head of Unit, DG Research and Innovation, European Commission)

Rapporteurs: Roger Garbil and Georges Bonheure (DG Research and Innovation, European Commission)

Description

Innovative Euratom research and technological developments, energy and non-energy applications for the benefit of society and for the future. Euratom R&I development in nuclear science and technology, safety and security have high impacts throughout society:

- Scientific excellence, promoting the creation and diffusion of new knowledge and skills;
- Energy and non-energy applications, technologies and cutting-edge solutions contributing to sustainable global challenges;
- Economic and societal impact by fostering breakthrough innovation, strengthening EU technological leadership and market deployment of innovative solutions.

Policy framework

Euratom research and training and Horizon Europe contributions to EU society, energy and non-energy applications' impact (societal, economic and technological), support to implementing the Energy Union, Climate, Industrial and Health policies, and benefits from any uptake of innovative solutions in industry and society have been shown.

Key Messages

Significant role played by nuclear energy in certain Member States as a component of low carbon electricity supply, supporting EU climate change objectives and contributing to the competitiveness of European Industry. The understanding that all EU Member States, even those with no nuclear power plants, have an interest in ensuring nuclear safety throughout the EU, engaging with society and the Young Generation.

Ensuring a vibrant education and training culture, involving basic academic education as well as continuous professional development and mobility, focused on advanced technology across all nuclear, engineering and science topics to guarantee a new generation of experts will be available when needed, to maintain high levels of safety throughout the sector, in Europe and around the world. In this regard, Europe is in danger of ceding leadership in both advanced reactor systems and fuel cycle technologies to China, India and Russia, and in so doing could fail to bring to bear its significant expertise, know-how and influence.

The important role played by nuclear technology benefitting all citizens in their daily life, and related competence and expertise, in the fields of medicine, radiation protection and non-power applications. And the need in general for the Euratom programme to be an integral part of the broader Horizon Europe framework programme, missions and clusters, able to capitalise on synergies over a much wider range of research areas e.g. through SET-Plan.

The need for a robust, enduring and efficient infrastructure base across the EU to underpin all aspects of R&I throughout the sector and the need for Member States to prioritise in order to ensure meaningful progress with limited resources available.

Development of big science projects goes beyond frontiers. ITER is an excellent illustration of global planning and international cooperation that no single country can afford alone. It is our duty for future generations to check whether fusion energy is a viable source of electricity.

Energy for All – International Cooperation and SDGs

Speakers

- Linda Davis (Giraffe Bioenergy)
- Lucia Bakulumpagi-Wamala (Bakulu Power)
- Joachim von Braun (University of Bonn)

Chair: Signe Ratso (Deputy Director-General, DG Research and Innovation, European Commission)

Rapporteur: Thomas Schleker (DG Research and Innovation, European Commission)

Description

Energy is the major challenge in tackling climate change today and is a Sustainable Development Goal - SDG 7 'Affordable and clean energy'. This session focused on developing countries with the example of Africa and highlighted the benefit of international cooperation on sustainable energy innovation. In fact, access to energy is essential for citizens, jobs and economic growth.

Achieving SDG 7 is crucial for achieving all the SDGs including climate neutrality, lowering negative climate and environmental impacts, mitigating hazardous air pollution and promoting societal inclusiveness and prosperity in developing countries. The importance of international cooperation in renewable energy and sustainable energy system innovation for developing countries and in particular Africa, have been highlighted in the session.

Policy framework

Inform and highlight the importance of Clean and Sustainable Energy Innovation in mitigating and adapting to climate change and its imperative role in achieving all the SDGs, in particular in developing countries to achieve inclusive and sustainable growth.

Key Messages

There was substantial consensus among the speakers and the audience that sustainable clean energy is a very important area for cooperation with Africa. It is at the same time the backbone for achieving all other SDGs. Most SDGs and in particular SDG 1 'End poverty in all its forms everywhere' are unachievable without access to clean energy. A systematic approach regarding the Water-Energy-Food-Nexus is essential.

Cooperation is particularly necessary for finance, for science and technological exchange. Renewable energy and energy efficiency are important areas for cooperation, as is access to electricity. It was highlighted on the example of

mini grids that also Europe can benefit from the experience in Africa in off-grid electricity and in adapting technological solutions to the local circumstances.

One further important message was that Clean Cooking is an important challenge for Africa, as it poses substantial environmental, socio-economic and health issues. ‘

Interesting local business models for clean cooking and electrification with promising ways to prosperity going hand in hand with behavioural change were presented in the session.

In short, ‘Innovation and Cooperation, there is so much we can do in Africa!’

Safe Journey!

Speakers

- Manfred Müller (Lufthansa)
- Luc Tytgat (European Aviation Safety Agency)
- Manuela Tomassini (European Maritime Safety Agency)
- Ingrid Skogsmo (VTI Leuven)
- Christopher Irwin (European Passenger Federation)

Chair: Elizabeth Werner (Director, DG Mobility and Transport, European Commission)

Rapporteurs: Barry Kirwan (Eurocontrol) and Pablo Perez-Illana (DG Research and Innovation, European Commission)

Description

How to keep safe and "cool" while moving around the globe? E.g. On the air, on the sea or on the road! The session explained and illustrated risks, detection, avoidance and mitigation of safety hazards (e.g. physical phenomena on air/sea/road) and human factors (both individual like fatigue, startle, interaction with automation; and organisational such as management, regulation, oversight, search and rescue). The session exchanged best practices and lessons learnt from one sector to the other for e.g. from automation in aviation to automotive.

Policy framework

- Explore inter-national & inter-sectorial co-creation for new solutions.

- Reduce accidents in global transportation (e.g. aviation/ waterborne/ road) by raising international safety research needs and opportunities; and learning from each others' best practices.

'Saving the Planet in the mid-term is important (Sustainability) and Saving the People in the short-term is even more important (Safety)'.

Key Messages

- The trend towards deeper decarbonisation and automation requires also more resources for R&I dedicated to safety (and security), both per transport mode and across modes. New fuels/energy systems pose new risks. 'Saving the planet is important. Saving the people is imperative': one person dies every 20 minutes on a European road (cf. (speeding, alcohol, seat-belt); and 61 maritime accidents reported per week in Europe. For railways, more attention should be given to passengers' and staff slips, trips and falls.

- 'We need to drive technology for safety, and not merely do damage limitation when new tech arrives. We need to be less reactive and more proactive. We need to drive for changes not only accepted/tolerated by the operators/users but also attractive for them'.

- Address together human factors and automation, not separately. In some cases automation can be fall-back for human operation, in others it is the opposite. Full automation (level 5) is much more challenging than initially foreseen. Just adding automation will not make it safer and secure. The balance and interplay between human factors and automation should be carefully addressed – including the adaptation of the roles, qualification and training of operators/users.

- A smooth interaction between all users, their vehicles and infrastructure in a safe system approach applies to all transport modes. Safety for users should be considered not only in the vehicles but also in the infrastructures (e.g. users injured at train stations or, air/ports). Special attention is needed to anticipate not only technologies and disruptive transformations but also user behaviours: 'Remain flexible and agile to be able to adapt also to unknown changes'.

- The traditional long cycle of R&I (from ideas to entry into service) is not suitable anymore. Acceleration is needed. Regulators need closer involvement on what R&I is doing, and also on validation. R&I needs to feed regulation more effectively (evidence-based regulation) and spread best-practices. More synergies among EU/national research and EU agencies/National Authorities is key.

- More emphasis needed on Safety Risk Management. For Safety Risk Management all stakeholders must be involved. More synergies with security programme, in particular with cyber-security, are needed.

- There was a plea for more cross-modal research. Aviation sets the pace in transport safety, but other sectors are also doing good work. EU synergies between aviation and maritime safety are increasingly being exploited. The following cross-modal priorities have been highlighted:
  - Safety Culture: 'We need to move beyond rule books and simple compliance to safety culture, not only for operators, also for users. The most important stakeholder is the passenger'.
  - Data for safety: sharing and exploiting better safety data and safety intelligence (e.g. applying artificial intelligence)
  - Cybersecurity and safety.

Infrastructure and network/traffic management for efficient multimodal mobility

Speakers

- Elena De La Peña (STRIA Infrastructure Rapporteur)
- Johanna Tzanidaki (ERTICO ITS Europe)
- Jos Arts (University of Groningen)

Chair: Herald Ruijters (Director, DG Mobility and Transport, European Commission)

Rapporteurs: Rafal Stanecki and Dimitros Vartis (DG Mobility and Transport, European Commission)

Description

Infrastructure and network/traffic management are vital components for an efficient multimodal mobility system: raising capacity and safety, reducing delays, emissions and costs, as well as enabling seamless multimodal travel for passengers and freight. EU transport infrastructure should be maintained, upgraded and expanded to ensure competitiveness of the transport system while reducing unwanted impacts.

New solutions are to be developed and validated to increase efficiency, inter-modality, resistance, safety and security of the transport system, for passengers and freight, reducing at the same time greenhouse gas emissions. Europe also needs to develop and prepare for the deployment of an advanced multimodal network and integrated traffic management capability. This will help overcome system-wide capacity constraints, allow for better management of traffic flows of passengers and freight and enable seamless door-to-door multimodal mobility and transport.

Policy framework

- Support the development of transport infrastructure, which will accommodate new and evolving transport modes and improved integration (national, regional) of transport infrastructure and energy systems through deployment of relevant infrastructure;
- Integration of physical and secure digital infrastructure;
- Develop tools for information and data collection and management to monitor the performance of the infrastructure (asset utilisation rate) and the efficient management of mixed vehicle fleets on road networks;
- Develop and prepare for the deployment of an efficient, resilient and adaptable multimodal network and traffic management capability;
- Traffic optimisation of conventional, (semi-) automated and unmanned vehicles within a multimodal NTM system;
- Seamless multimodal door-to-door mobility and transport, resulting in an optimal traffic mix and circumventing capacity limitations;

- A network-wide system view of mobility and transport, with a user-centric focus;
- To link R&I with deployment on the TEN-T network – supported by CEF/other funds.

Key Messages

Top three priorities for Horizon Europe funding in the area of infrastructure:

- Green infrastructures during their entire life-cycle, supporting alternative fuels;
- Digital infrastructures for connected and automated mobility;
- Safe and secure infrastructures, addressing both physical and cyber-security.

Top three priorities for Horizon Europe funding in the area of network/traffic management:

- Design of multimodal network and traffic management systems;
- Optimisation of demand-capacity balancing;
- Execution of pilots, tests and demonstrations.

Top three priorities for Horizon Europe funding in the area of multimodality:

- Interfaces within and across transport modes;
- Spatial analysis and optimisation;
- Multilevel governance and institutional dimension.

Smart electric mobility

Speakers

- Stephan Neugebauer (BMW Group, European Green Vehicles Initiative)
- Julien Martin (EDF)
- Laurianne Krid (Fédération Internationale de l'Automobile)

Chairs and closing remarks: Clara de la Torre (Deputy Director-General, DG Climate Action, European Commission)

Moderators: Claire Depré (DG Mobility and Transport, European Commission) and Tadhg O'Briain (DG Energy, European Commission)

Rapporteurs: Frédéric Sgarbi and Guido Sacchetto (DG Research and Innovation, European Commission)

Description

This session on Electric road vehicles shared the main achievements of Horizon 2020 and discussed the R&I challenges and opportunities of automotive and energy companies for the next decade in view of a partnership within Horizon Europe, as well as the 'Orientations towards the Strategic Plan' and the main results of co-design via public consultation. In fact, transport sector is an important source of emissions, and electrification shall contribute significantly to reduce greenhouse gas enabling the use of renewable energy.

The electrification of transport and the massive deployment of electric vehicles requires a reliable, affordable and efficient e-charging infrastructure for the supply of electricity. The adaptation of transport infrastructure and energy supply is a crucial element for mass deployment of battery-electric vehicles and accessing the flexibility provided by the car batteries. The state-of-play and future scenarios have been presented by transport and energy sector stakeholders, while the European Commission (DG RTD, DG ENER and DG MOVE) concluded on support to R&I activities and links with deployment (e.g. Horizon Europe, CEF) to enhance this process.

Policy framework

- To raise awareness of the main progress made so far in terms of Electric Vehicles and e-charging infrastructure R&I;

- To discuss the challenges related to deployment and mass production, as well as the priorities and actions for future partnership in Horizon Europe.

- To discuss the 'Consultation Document towards the Strategic Plan', taking account of the results of the public consultation.

Key Messages

EU is very successful in e-mobility, with all manufacturers having ambitious plans for present and future, also thanks to EU and Member States support and funding. But the introduction in the market is still limited.

R&I can provide strong support improving vehicle and infrastructure systemic approach and fast deployment. There are levels of activities:

- Fundamental research;
- Integration into vehicle;
- wide dissemination including deployment of physical and digital infrastructure.

Grid integration is not an issue due to the limited percentage of energy needed: e-mobility is an opportunity if managed with system approach and smart grids. Recharging system configuration has to be optimised based on demographics, user's needs and capacity to find correct balance by area/Member State.

Access barriers to consumer/user must be tackled by R&I to improve acceptance on 3 levels:

- Infrastructures;
- Vehicle performance and cost;
- Data access and privacy.

In short, 'charging a car shall become as easy as recharging a mobile phone'.

Connected and automated mobility

Speakers

- Erik Jonnaert (ACEA Secretary General)
- Françoise Guaspare (Paris/Île-de-France Region, ERTRAC Vice chair for cities and regions)
- Angelos Amditis (Research Director of ICCS, Chairman of ERTICO)

Chair: Claire Depré (DG Mobility and Transport, European Commission)

Rapporteur: Ludger Rogge (DG Research and Innovation, European Commission)

Description

The session discussed the main R&I priorities in the area of connected and automated mobility for the next decade and identified ways to buy-in potential users and increase public acceptance of connected and automated vehicles. The potential benefits of connected and automated mobility to society are immense and automated vehicle technologies are likely to help solve problems but could also create new ones, such as cyber-security threats, overreliance on, and misuse of technology, which could hinder the public acceptance and deployment of these technologies.

Ensuring acceptance of these vehicles will depend on resolving challenges, including safety, security, and managing public perception and expectations. This session discussed the main R&I priorities and touched upon questions on how to increase societal acceptance and user's trust in automated vehicles.

Policy framework

- Develop and deploy key technologies, services and infrastructure for connected and automated driving for a safer, more sustainable, efficient and inclusive transport system.

- Identify R&I questions and challenges to increase the safety and user acceptance of connected and automated mobility systems and services and contribute to the development of a trustworthy safety assessment methodology.

Key Messages

The potential benefits of Connected and Automated Mobility to society are immense. Automated vehicle technologies are likely to help solve problems but could also create new ones, such as cyber-security threats, overreliance on, and misuse of technology, which could hinder the public acceptance and deployment of these technologies. Acceptance of these vehicles will depend on resolving challenges (including safety and security) and managing public perception and expectations.

The following main R&I challenges were mentioned:

- Social acceptance and trust in automated vehicles technology and in CCAM in general;
- User Centred, all Inclusive Mobility by design;
- Validation of the safe functioning of connected and automated vehicles;
- Interaction between the automated vehicles and physical and digital infrastructure;
- Smooth and safe coexistence of automated vehicles with all other road users;
- Evolution from standalone vehicles towards cooperative connected and automated transport systems (and services);
- Integration of new Networks and Connectivity, Internet of Things, Data access and analytics, Cloud and Edge tech, Cybersecurity.

There was support for a European partnership on Safe and Automated Mobility. Such partnership is essential to give a long-term framework for the strategic planning of R&I and large-scale testing activities in Europe, making sure that investments at local, regional and national level, both of public and private nature, are complementing each other more effectively. Some quotes from the speakers:

- Supporting large-scale demonstrations in real traffic conditions are essential to increase societal acceptance and user's trust in automated vehicles and to better understand the impacts.

- Developing technologies for connected and automated driving is not a goal in itself. 'We have to move towards a more user centred, all-inclusive mobility by design'.

- In order to solve the mobility problems 'we have to get out of our comfort zone and we have to better cooperate with other industries, public authorities and in particular with the users'. The new European partnership on Safe and Automated Road Transport will be a very useful tool for cooperation across sectors.

- A lot of research and testing is already on-going in Europe, but 'we can be better at sharing the results'. The new European partnership on Safe and Automated Road Transport can help to improve cooperation of on-going projects and support the exchange of good and bad practices.

Railways of the future

Speakers

- Carlo Borghini (Executive Director Shift2Rail Joint Undertaking)
- Corinne Talotte (Director Tech4Rail4 Innovation Programme, SNCF)
- Christopher Irwin (Management Board European Passenger Federation)
- Gilles Peterhans (Secretary General International Union of Wagon Keepers)

Chair: Keir Fitch (Head of Unit, DG Mobility and Transport, European Commission)

Rapporteurs: John Cleuren and William Bird (DG Research and Innovation, European Commission) and Leonardo Dongiovanni (DG Mobility and Transport, European Commission)

Description

Rail markets demand higher capacity, better quality, comfort and safety, competitive costs and integration in multi-modal logistics and mobility solutions. Important focus of the R&I activities is on digitalisation, automation and decarbonisation.

The session dealt with the EU rail policy perspectives complemented by the rail sector's vision and R&I priorities. Building on the achievements of Shift2Rail, the debate focused on the socio-economic impact of rail research and innovation, key priorities for passengers and freight business and possible new business models. The focus was on delivering sustainable, competitive and attractive multi-modal mobility and transport with railway at the core. Finally, the session was an opportunity to discuss how to bring R&I solutions to the market in order to create long term impact.

Policy framework

- Ensuring inclusiveness in the definition of R&I needs
- Understanding the application of the policy objectives driving EU mobility/competitiveness through a R&I initiative
- Clear overview of the results of Shift2Rail and its contribution to transform the railway system
- Clarify market uptake orientations and deployment possibilities
- Dare to challenge the status quo through R&I and a new rail system architecture
- Multimodal synergies

Key Messages

Rail transport will play a pivoting role in achieving a carbon-free European transport system.

Already today, rail is transporting every day billion of people at urban, local and long-distance level. In order to increase the capacity and the attractiveness of rail transport, trains have to become more and more connected and autonomous. This digital evolution should impact both passenger and freight operations.

Rail transport has to become the preferred mode of transport at local, regional and long-distance level, as the backbone of multi-modal carbon-free door-to-door transport solutions. Accessibility, reliability, attractiveness, affordability and simplification of railway operations are key requirements. The needs and expectations of customers should drive this transition for passenger and freight operations.

Passenger and freight rail transport are competing for the same rail capacity and thus share a strong demand for radically increased rail transport capacity.

Cross-discipline research, involving ICT from other sectors, should lead to more rapid deployment of connected and autonomous rail transport, by using solutions from other sectors and applications.

Stakeholders welcome the sectorial collaborative approach developed under Shift2Rail. The modernisation of the railway systems require stronger collaboration at EU level, not only in terms of R&I but also on regulatory aspects such as standards and certification. Regulatory stakeholders, such as national transport safety authorities should be involved from the beginning.

In order to convince stakeholders, such as national and local authorities, manufacturers, train operators, infrastructure managers and customers, about the need and feasibility of deployment of new technologies, it is necessary to demonstrate these new solutions in real environments.

Tomorrow's Aviation

Speakers

- Grazia Vittadini (Vice President and Chief Technology Officer, Airbus)
- Stéphane Cueille (Vice President and CTO, SAFRAN)
- Marco Protti (Head of Advance Research, Leonardo)

Panel Discussion on aviation research policy questions:
- Philippe Beaumier (Directeur Aéronautique Civile, ONERA)
- Kolja Kindler (Head of Aeronautics Program Strategy Unit, DLR)
- Miguel Ángel Castillo (Head of R&D, Aernnova)
- Henri Werij (Dean of the Aerospace Engineering, TU Delft)

Chair: Herve Martin (Head of Unit, DG Research and Innovation, European Commission)

Rapporteur: Michael Kyriakopoulos (DG Research and Innovation, European Commission)

Description

Aviation is critical to social and economic development and drives global growth and prosperity. The session focused on transformative aviation research, necessary towards significantly cleaner aviation. New electric aircraft architectures are under development and will have a transformative impact to the environment (emissions and noise). While the timing is critical, evolutionary technologies can still substantially contribute in the short-medium term. Europe has the lead in many of these technologies and aims to maintain it with a concerted effort and synergies from many disciplines.

Policy framework

- To set the baseline for a European aviation research policy framework, in line with the objectives of the Horizon Europe proposal and aligned with the priorities of Member States, industry, research establishments and academia.

- To contribute to a drastic reduction of aviation emissions and noise by 2050 and a European leadership.

- To contribute to relevant EU Policies (energy union, mobility package, digitalization, industrial leadership).

Key Messages

Decarbonisation of aviation passes through a coherent roadmap of technological, operational and fuel solutions. Different aircraft platforms require different solutions. An impact-driven EU aviation research policy requires a consensus between flexibility and timely delivery of key enabling demonstrators

(e.g. MW electric systems, hybrid electric architectures, development and integration to allow new energy carriers).

Disruptive aviation technologies require adequate funding for exploration and further development in order to accelerate their maturity at high technology, manufacturing and integration readiness levels (TRL, MRL, IRL respectively). Long-lasting commitment by all stakeholders (industry, RTO, academia, Member States and European Commission) as well as alignment with National programs is deemed necessary.

An ecosystem approach is recommended for the next EU research FP, that includes Air-Traffic management (ATM), Maintenance-Repair-Overhaul (MRO) and new certification approaches. Synergies should be exploited. Future needs for airport infrastructures, in particular for new energy options and mix (drop-in fuels, non-drop-in-fuels, electrification) should be in-line with the technological and operational roadmaps.

European leadership depends on the development of advanced methods and tools (e.g. simulation, digitalization, AI, safety and certification by design) as well as cost-effective manufacturing technologies that will accelerate and enable a clean aviation paradigm.

The future of shipping starts now!

Enabling low carbon, clean and competitive waterborne transport

Speakers

- Sinikka Hartonen (Finnish Shipowners' Association)
- Faig Abbasov (Transport&Environment)
- Henk Prins (MARIN, Chairman of Waterborne Technology Platform)
- Paolo Guglia (Fincantieri)

Chair: Magda Kopczynska (Director, DG Mobility and Transport, European Commission)

Rapporteur: Peter Crawley (DG Research and Innovation, European Commission)

Description

Is European shipping ready to meet the global challenges like decarbonisation, connectivity and automation, and remain competitive? How can EU R&I be helpful in providing the solution? The role of R&I in meeting challenges for shipping like decarbonisation, connectivity and automation, and competitiveness of European shipping sector in context of the 'Strategic Plan' for Horizon Europe.

Policy framework

Support the discussion on the Strategic planning for Horizon Europe in context of shipping. European shipyards are still global leaders in the building of complex ship types, whilst European waterborne equipment manufacturers are global leaders in the production of (advanced) waterborne equipment, systems and technologies. Decarbonisation and Connected and Automated Shipping are both opportunities and top challenges for the EU shipping sector. But questions about place of the EU shipping in a dynamic and competitive environment, in particular from China, are becoming more and more important.

Key Messages

- Zero emission shipping is possible, first short distance, inland, Europe, later intercontinental.

- Smart and digital technology is important to improve efficiency. Safety and other efficiency measures are also needed.

- Having the technological capability is an essential precursor to speed up regulation. Lack of regulation should not be an excuse preventing deployment. Alternate design rules and dedicated safety cases can be used to deploy innovative ships on the market.

- Need to bring stakeholders together, including from outside of the waterborne sector and involving wider operators, ports and infrastructure providers.

- Zero carbon fuels for maritime were widely identified as being essential for long distance shipping and need to be addressed by R&I; including their production. In this respect Hydrogen and Ammonia as maritime fuels were raised (cf. also the session on 'Alternative fuels' where ammonia as a maritime fuel was also raised).

- Potentially, the link between energy and transport synthetic shipping fuel production could be reinforced within the strategic planning for Horizon Europe orientation paper.

- In line with the orientation paper priorities, strong links towards to EU Green Deal and agenda for the new commission such as ETS for shipping.

- All stakeholders should be brought together in systemic R&I approach to achieve decarbonisation and clean shipping (cf. carbon neutral Europe and global shipping carbon reduction targets by 2050) thanks to the proposed Zero Emission Waterborne Transport co-programmed partnership in Horizon Europe.

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This publication highlights the key messages of 23 sessions in the field of 'Climate, Energy and Mobility' of Horizon Europe, the Research and Innovation Framework Programme. These sessions took place during the first European Research & Innovation Days and allowed 2 000 stakeholders to interact and to shape the future R&I priorities.

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