

# Efficient, Safe, Secure & Environmentally Friendly Mobility

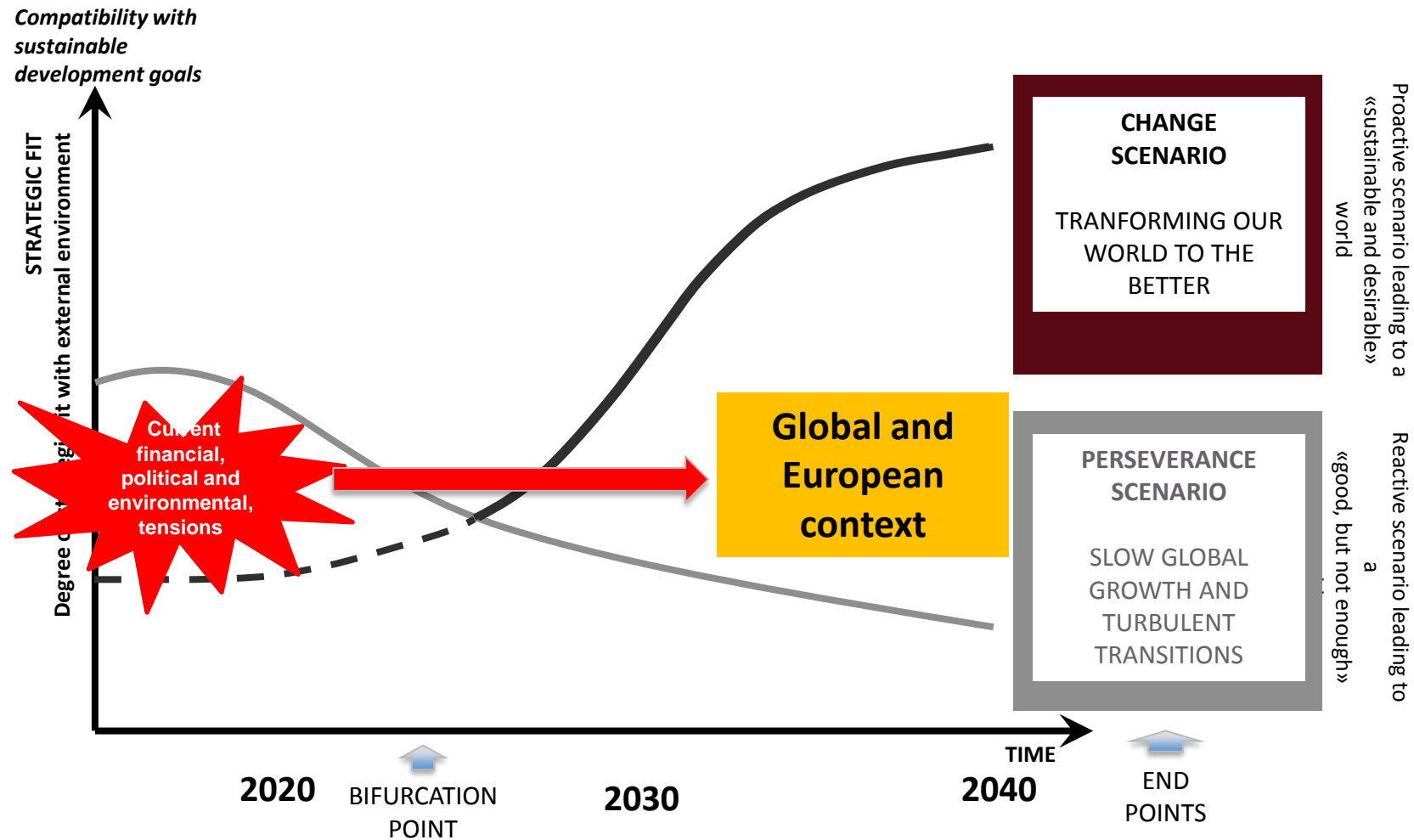
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# Beyond the Horizon –Scenarios

Foresight in Support of the Preparation of the EU's Future Policy  
in Research and Innovation (BOHEMIA)

# Perseverance or Change?



# Urbanisation and transport scenarios (from BOHEMIA)

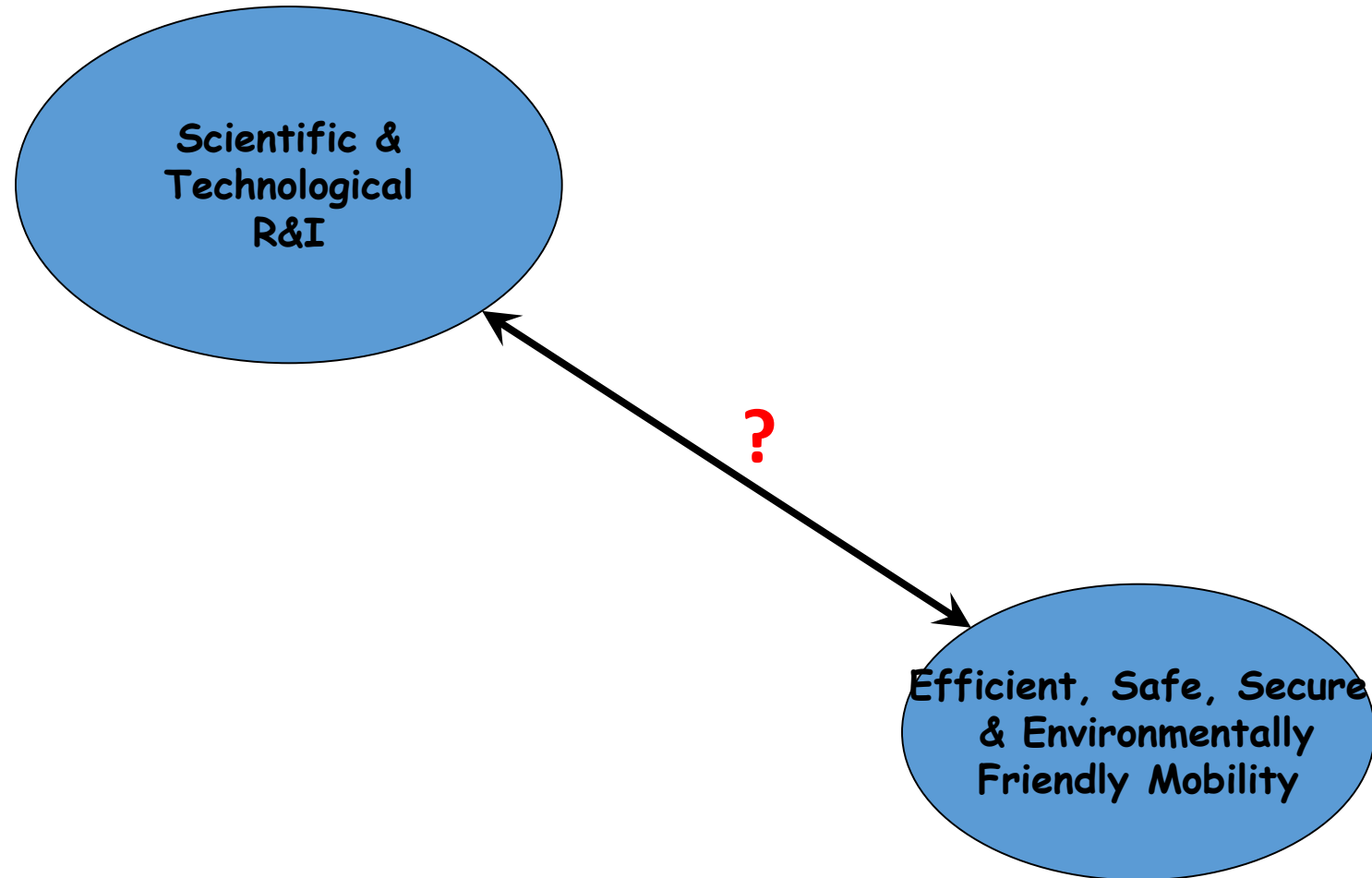
# The „Perseverance“ Scenario - Urban jam: impaired mobility

- Global urbanization proceeds unabated
  - ✓ By 2030 more than 40 Megacities > 10 M
  - ✓ Fast urbanization of low income groups => slum formation
  - ✓ Urban sprawl => poor accessibility, car emissions dominate
  - ✓ Overstretched infrastructure + extreme weather events => congestion, urban decay
- Traditional transport market unfit
  - ✓ Transition to automated vehicles: technology driven
  - ✓ Overestimation of reliance on technological progress alone
  - ✓ No radical change in mobility paradigm and business models (people and goods)
  - ✓ Decarbonisation but no absolute decoupling
  - ✓ Innovation (ICT, Big Data) set by new entrants
  - ✓ EU transport industry suffers, leadership at risk

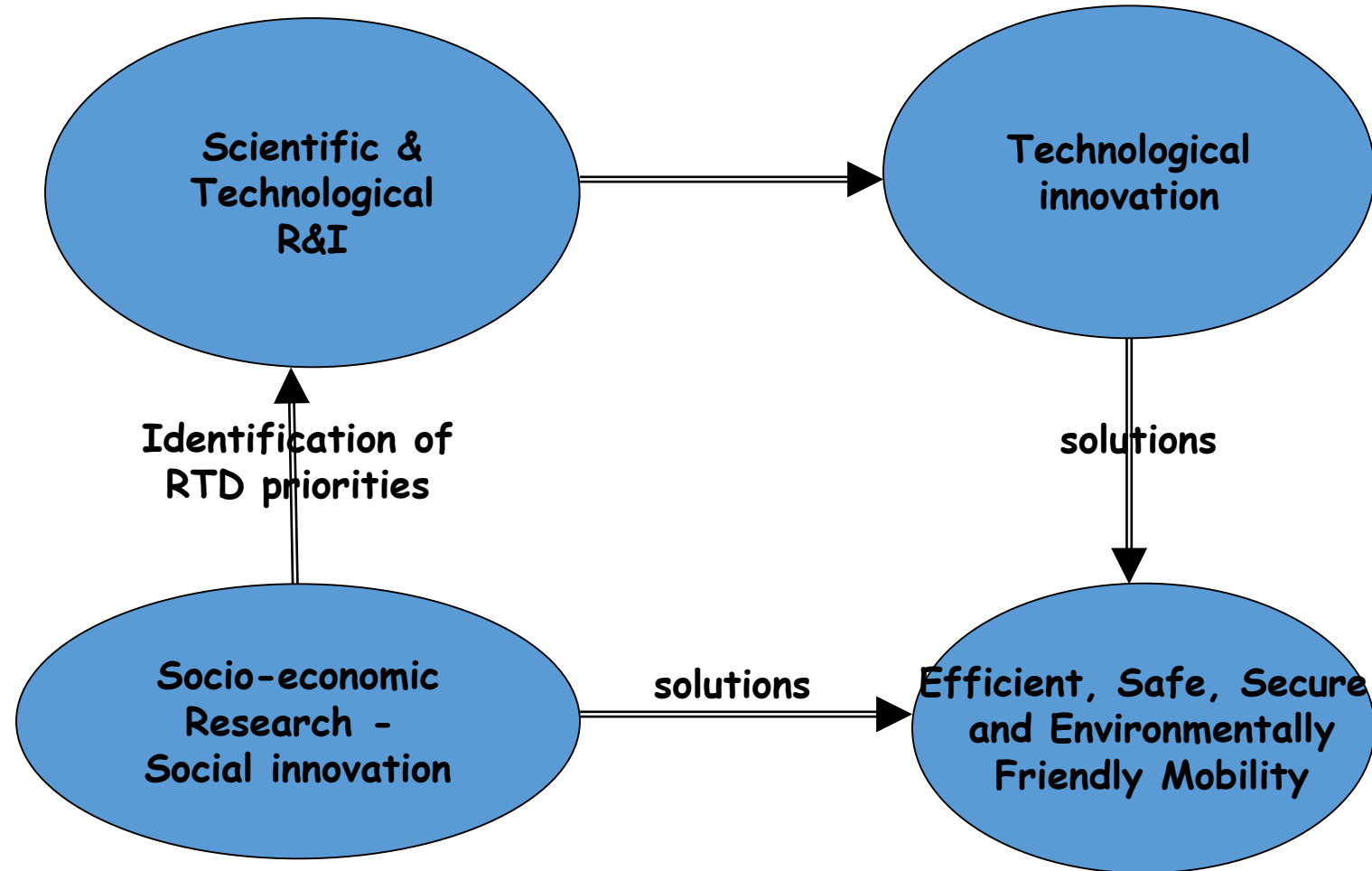
# The „Perseverance“ Scenario - Urban jam: impaired mobility

- Smart cities as interconnected systems
  - ✓ ICT, sensors, IoT => interconnection of utility and transport networks, near-zero maintenance infrastructure
  - ✓ Built environment and mobility system based on collaborative economy
  - ✓ Compact cities => productivity, accessibility, carbon efficiency
  - ✓ By 2050, Urban sprawl reduced by 30 000 km<sup>2</sup>
- Changing mobility paradigm: a service-oriented transport market
  - ✓ Behavioural changes & social innovation drive technological progress
  - ✓ Connected & autonomous vehicles boosted by shared economy
  - ✓ Sustainability concerns => internalisation => decoupling (55% emissions reduction by 2030)
  - ✓ High speed, high efficiency inter-city connections (hyper loops)
  - ✓ Virtualisation of freight movement + local economies
  - ✓ Transport decarbonised (95%) by 2050
  - ✓ New business models + intersectoral cooperation => EU competitiveness/leadership
  - ✓ 80% reduction of costs/p.km by 2050

# R&I driven by societal challenges



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# Transport R&I priorities the view of the Transport Advisory Group

# Accelerating decarbonization with energy efficiency in all transport modes

- More energy efficient vehicles (all modes) and the adaptation of construction and maintenance standards of infrastructure and services.
- Address current knowledge gaps in several enabling areas:
  - (i) regulation and measure of the environmental impact of vehicles (local and global)
  - (ii) how transport system choices lead to different climate footprint;
  - (iii) monitoring and reporting of performance targets, norms;
  - (iv) the interconnection with other relevant fields such as land use, urban and regional planning, climate science and ecology, business models and value chains, technology and innovations, and health.

# Advancing electromobility, including energy harvesting and storage for clean and competitive Transport

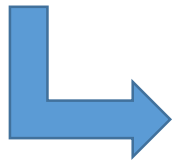
- Charging infrastructure (private, semi-public and public), including technologies to charge while running
  - Improvement in battery performance, i.e. batteries' capability to store electricity
  - Energy harvesting technologies for road vehicles
  - Energy storage and ubiquitous energy provisioning
  - Advancing improved and alternative combustion (biofuels, electromobility).
- and
- How to make the most of, and facilitate, the transition towards electromobility and automated vehicles

Learning from other sectors, such as manufacturing, and across transport modes

# Restoring maintenance as an efficient & effective management of assets in support of mobility for all, smart decarbonisation, smart greening and EU leadership

(Near) zero maintenance infrastructure

- Predictive maintenance
- Self-maintaining or -repairing systems which

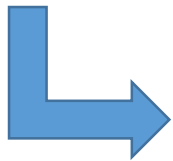


- ✓ Higher efficiency
- ✓ Increase in life times of infrastructure and assets of road, rail, maritime and air.

Strong link to research on networks

# Driving the automation and digitalization for safer and more efficient transport

- Automation and digitalization => transition phase not understood so far (both passenger and freight)
- Combine technical, societal and business/organizational fields to understand requirements, needs and demands, acceptance and resistance



- ✓ Mobility for all
- ✓ Reduce environmental effects
- ✓ Support EU leadership while offering system oriented solutions.

Research should include testing and demonstration.

# Allowing the contribution of Key Enabling Technologies to drive new transport solutions

Key Enabling Technologies (KET) increasingly recognized as a major potential contributor to both

- reshaping the demand of transport systems and services (through e.g. substitution effects and modal shifts) and
- enhancing the supply side performance (increasing effectiveness, ensuring better response to users' needs, increasing economic and environmental efficiency).

While research on KETs follows its own, multi-purpose and mostly technology-driven agenda, there is a need to explicitly incorporate the specific requirements of the transport community in the design of novel solutions.

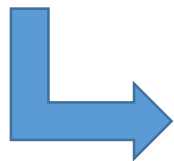
# Enhancing door to door safety for all

Technological and behavioural transitions are occurring simultaneously

- Safety standards of electro-mobility
- Safe introduction of automated vehicles, platooning and full automation of trucks, and drones
- Aging population and knowledge gaps on driving and mental issues
- Mixed and evolving traffic
- Ergonomics of dummy for safety trials (both women and men)
- The rapid diffusion of drones => opportunities and challenges in all areas of safety, including maritime navigation and of aerial traffic safety.
- Driver Assistance Systems and automated vehicles

# Proofing the transport system for Resilience and Security

- Better ability to withstand disruption, recover and re-bounce (all systems, all locations, all times).
- Non-intrusive security checking for all modes that preserve efficient traffic flows, including user profiling and face screening technologies, abnormal behaviour recognition.
- Drone security
- Transport related cyber security.



- ✓ Security improvements
- ✓ Traffic management.
- ✓ Gaining/maintaining the EU competitive position for technology exports.



# Supporting the shift of transport offer and mobility choices towards environment friendly transport

- Address the current knowledge gap concerning the costs and benefits of mitigation on local economies => system approach for the evaluation of land use and business models that affect transport demand, and synergies with other sectors.
- Beyond just decarbonization
  - ✓ adaptation of construction and maintenance technologies and standards of infrastructure and services
  - ✓ extreme weather proofing for aircrafts, ships and vessels

# Establishing Big Data as a secure platform for the new Transport business model

- Key innovation area in transportation in the coming years => enormous benefits of efficiency, while mitigating security and privacy risks (all modes, both passengers and freight)
- How Big Data can be used to optimise transport systems, and how it will allow the development of new business models.
- Governance, use and misuse of Big Data, guaranteeing information security and privacy of users and providers.

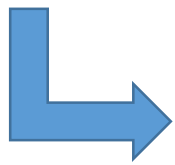
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# Understanding and anticipating the dynamics of mobility drivers, accounting for the human.

Better understanding of interactions and feedbacks between

- (i) technological advancements
- (ii) changing socio-economic paradigms,



- a) identify and promote most acceptable technological and organizational solutions
- b) devise policies and instruments to nudge end users towards the most effective and sustainable mobility solutions.

- highly participatory research
- equal and combined attention to the mobility of people and goods

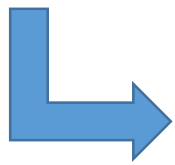
# Updating and enhancing the knowledge toolbox

Robust and comprehensive set of information and of tools to simulate, assess and predict

- traditional toolbox (databases, models) largely obsolete
- new variables play an increasingly important role, such as comfort, security, and in general indicators that measure the perceived acceptance of users.
- innovative techniques (big data, internet of things etc.) will radically improve the availability of data and information

# Multisector-based transport foresight for new transport technologies and solutions across markets

Foresight as a holistic, interdisciplinary approach to deal with the complexity of transport systems



- Develop more normative, long term visions, from which radically new solutions can emerge, and back cast into short term R&I and policy decisions.
- Develop the transport and mobility dimension of forward looking exercises, currently represented at a level of aggregation that does not allow to effectively feed into transport policies and strategies.

## **Easing transition by mainstreaming ex-ante impact assessment of policies and technologies, their effectiveness and efficiency and their potential rebound / unexpected effects**

- Forecast if and how the desired degree of effectiveness and efficiency of policies and technologies can be achieved addressing in particular the effects of automation and digitalization on improved accessibility
- Rebound / unexpected effects may emerge with the implementation of new technologies and services. Model based tools are needed to allow anticipating the uptake and the impact of novel technologies
- Both long and short term impacts,
- Urban, suburban and rural areas.

# Establishing the framework conditions for new business models to succeed

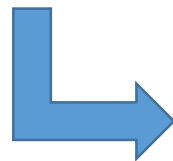
- Combined effect of technological innovation (electromobility, automation, big data) and of socio-economic and cultural paradigm shifts => new actors and new business models emerge
- Attention to the corporate perspective and dimension in transport research, to sustain the transport industry capacity in EU and its competitive positioning in the global markets.

Public research funding to leverage industry R&I efforts and facilitate industrial cooperation between firms and across Member States.



# Developing a flexible Governance framework, including the legal and regulatory dimension, to promote ethical transport, safe mobility for all, decarbonisation, innovation and competitiveness

- Regulation supportive of innovation, ethics, privacy, safety, security, and social premises on which transport decisions are taken
- Data and big data access, sharing and use related to the mobility, identity, activity, security or safety of travellers and freight, development of drones
- Public procurement of new products with economies of scale => balance competition and cooperation among suppliers,
- Distribution of risks, responsibilities, data governance, and safety associated with long term concessions for design, build and operate



- ✓ Smoother and safer technological transition
- ✓ Market regulation and enabling of new business models
- ✓ Avoiding revenue capture by quasi monopolies

Challenges common to many sectors and should be addressed accordingly.