infra 4D future

Innovation Focus Areas for Transport Infrastructure Innovation Across the Modes

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Welcome note from the Coordinator

Dear reader,

Facing a variety of emerging challenges, such as climate change, resilience, ageing infrastructure, maintenance, digitalisation, automation, energy and electrification, National Transport Infrastructure Authorities (NTIAs) have an urgent need to modernize their transport infrastructure and smarter manage infrastructure innovation and implementation. A transition towards new business models and organisational structures is necessary. In view of the long cycle times in infrastructure management and the rapid mounting pressure from these challenges, there is a need for fast delivery of ready-to-implement, cost-effective innovative solutions matching the requirements of the NTIAs that jointly build the TEN-T network.

The future challenges in the transport sector have to be tackled now and cannot be overcome on national level alone or within only one mode or sector. Transnational, cross-modal and new public–public cooperation approaches are needed as well as consolidation of partnerships and alliances from NTIAs with industry and the research community. From this background 19 NTIAs from 17 countries joined forces in the infra4Dfuture (i4Df) initiative, a Coordination and Support Action (CSA), funded by the H2020 programme, with a duration of 24 months (1 October 2018–30 September 2020). i4Df focuses on transport infrastructure innovation and implementation for road, rail, waterborne and airborne transport of passengers and goods from origin to destination.

To gather proper input and support and to achieve its ambitious goals, i4Df organized various consultations which relevant stakeholders and experts through e.g. conferences and workshops. From these, a demand-driven overarching strategy and cross-modal coordination mechanism for the modernization of transport infrastructure emerged. It includes a shared strategic vision on capabilities needed for NTIAs to effectively meet future challenges concerning transport infrastructure innovation and implementation, resulting innovation focus areas and related competences.

This booklet will guide you through the capabilities and innovation focus areas (IFAs) that were harvested from the various consultation rounds in the i4Df initiative. Each IFA is led by a coordinator who address in this booklet the strategic context and challenges, as well as the priority topics. I hope you will enjoy reading it!

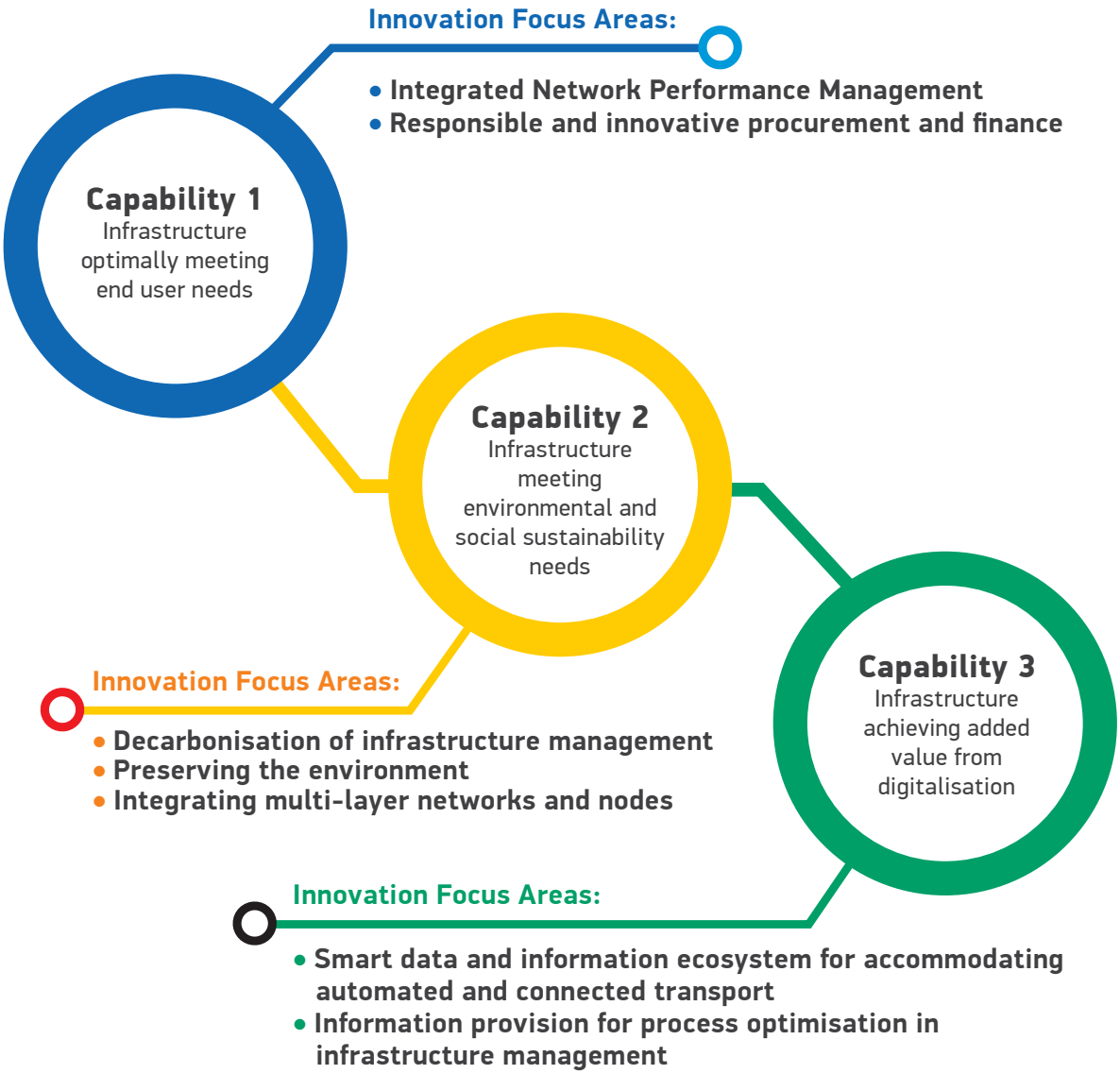
Although the project faced quite a few obstacles due to COVID-19, all deliverables and milestones were timely delivered, goals achieved and alternatives were found for cancelled events. i4Df has delivered common pathways for innovation development and implementation towards 2040 from which elements will feed into the CEF and Horizon Europe programming.

30 September 2020, the end of the CSA, will mark the end of an intense and successful project. But the further implementation and operationalisation of the cross-modal coordination mechanism, for which there is wide support from all involved NTIA and relevant stakeholders, will only start now. The mechanism is ready for take-off. You may contact the IFA coordinators if you want to contribute to the operationalisation of the coordination mechanism.

We invite everyone to watch the i4Df video, visit the i4Df website and above all, to jointly breath life into the coordination mechanism and to implement it.

With warm regards,
Peter Wilbers
i4Df Coordinator
Rijkswaterstaat / Ministry of Infrastructure and Water Management

Innovation Focus Areas for Cross-modal Infrastructure Innovation and Implementation



Capability 1: Infrastructure optimally meeting end user needs

The ability to provide optimal transport infrastructure network capacity in order to accommodate increasing transport needs, and balancing cost, performance, safety and risk to provide infrastructure as a high quality service to end users.

Capability 2: Infrastructure meeting environmental and social sustainability needs

The ability to embed transport infrastructure networks in their immediate surroundings, optimally balancing interests from economy, society, and environment.

Capability 3: Infrastructure achieving added value from digitalisation

The ability to harvest the benefits from digitalisation in internal processes of transport infrastructure management as well as in the relation between transport infrastructure management and its end user, to better serve the achievement of sustainability targets and needs of infrastructure end users.

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„Contemporary infra management has shifted from cost efficient problem solving towards creating societal value in partnerships.“

IFA Coordinator:
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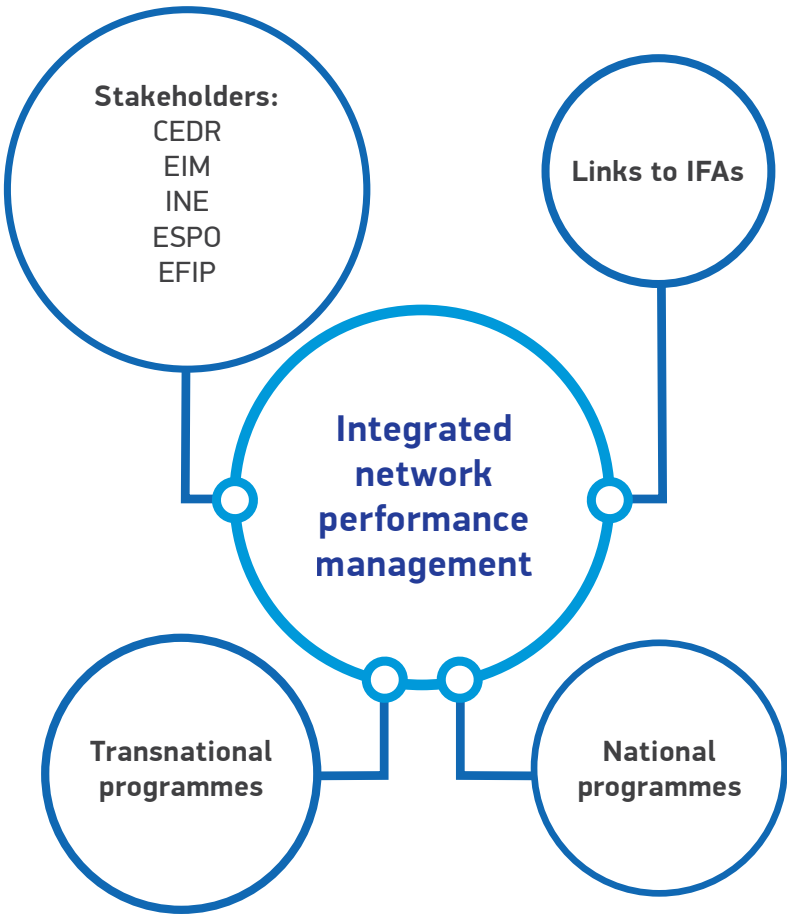
IFA 1.1: Integrated network performance management

Strategic context and challenges

- User Needs and Expectations:
  - fluid mobility across the scales and borders
  - preserving the environment
  - improving living conditions
  - connecting the physical world with the digital world.
  - information sources influence daily mobility decisions on a now-time basis.
- Role of Infrastructure agencies:
  - respond adequately to all upcoming changes and demands
  - coordinate connected issues such as environment, finance, synchromodality, urban/regional transport, digitalization, climate and circularity.

Priorities towards 2030

- Compatible service levels and associated sustainability targets and KPIs for European linked regions to facilitate cross-border and cross-modal network management.
- Digital twinning of the integrated transport infrastructure
- Future proofing of infrastructure planning



IFA 1.2: Responsible and innovative procurement and finance

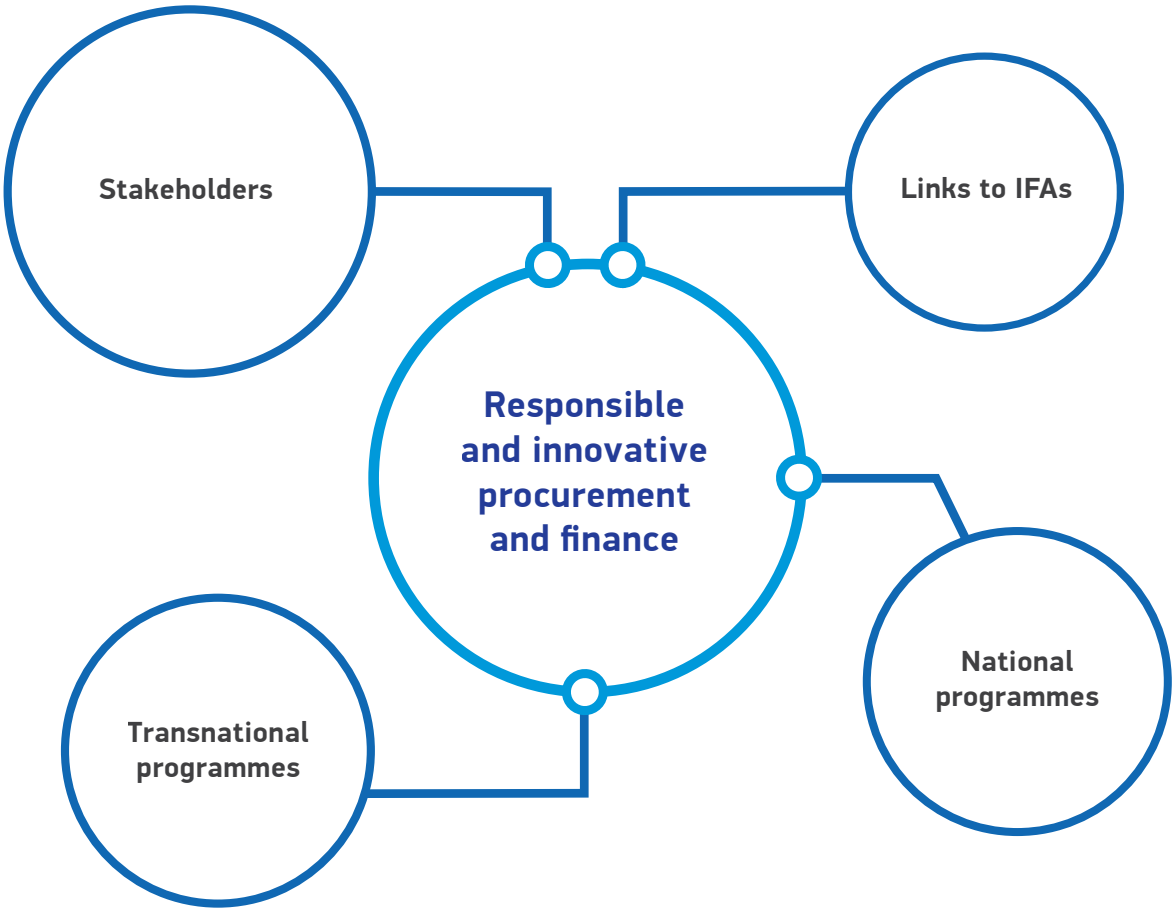
Strategic context and challenges

- Infrastructure owners and managers are under increasing pressure to use their purchasing power in support of societal and environmental goals.
- Current procurement procedures and instruments need to evolve in order to speed up the uptake and implementation of innovations in infrastructure management.
- Key is an mutually endorsed risk sharing model for larger scale demonstration, validation and first deployment of innovative solutions on the transport infrastructure.

Priorities towards 2030

- Life-cycle costs analysis in innovative contracting
- Risk sharing approaches
- Simulation models in procurement
- Innovative financing and investment schemes

The position of the IFA coordinator is currently vacant. Please contact the project coordinator Peter Wilbers (peter.wilbers@rws.nl) for further information.



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„Transport infrastructure has a considerable potential to accelerate the energy transition and to contribute to the achievement of the GHG emission targets for the entire transport sector.“

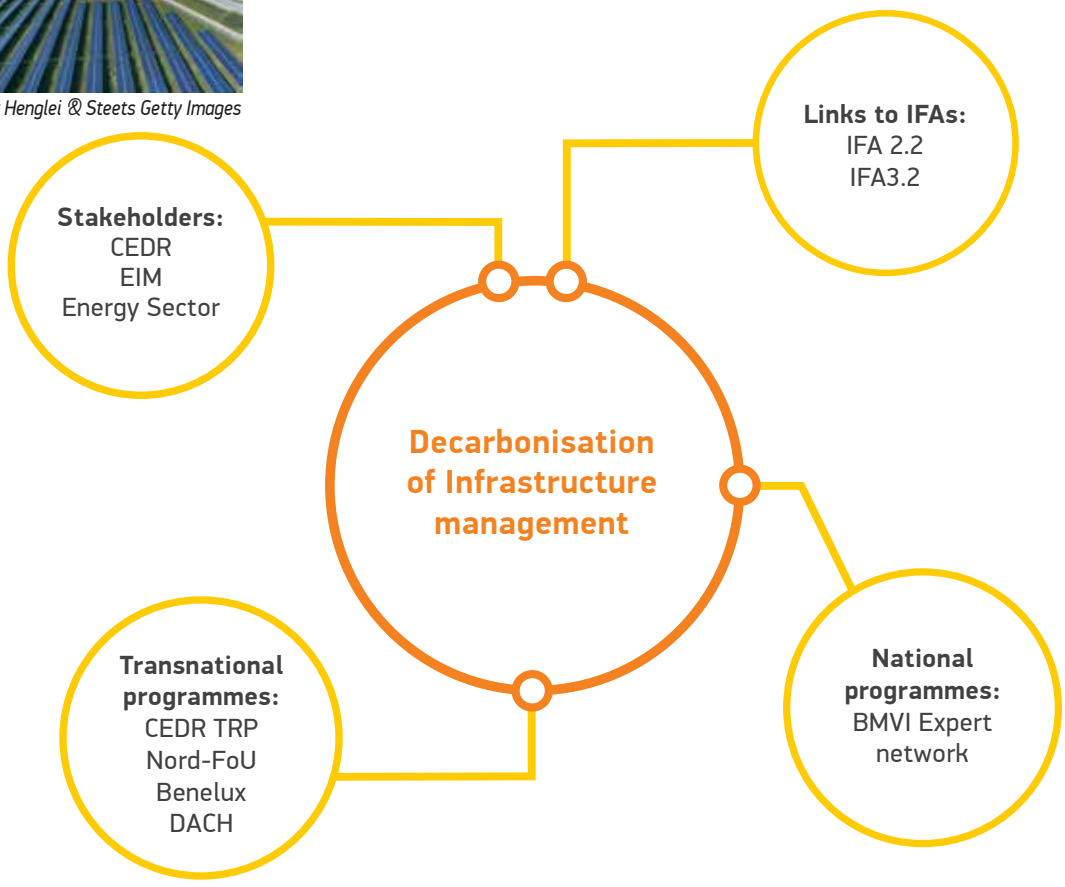
IFA 2.1: Decarbonisation of infrastructure management

Strategic context and challenges

- GHG emission targets have to be met sectorwise
- Share of infrastructure of carbon emissions is not negligible
- Significant leverage on energy transition of transport system
- (Disruptive) change in energy supply: fossil fuels electricity
- A new stakeholder ecosystem (crossmodal and cross-sectoral)

Priorities towards 2030

- Electric road systems - cross-border demonstrators including pre-standardisation
- Energy Harvesting - Developement of a European portfolio of technologies proven through demonstrators
- Developement of new legal and governance models for the emerging new cross-sectoral (e.g. energy and transport) and cross-modal technologies and collaborations
- Assessing the sustainability of scaled-up approaches integrating circular economy principles



IFA 2.2: Preserving the environment

Strategic context and challenges

- Transport infrastructure authorities will need to deliver their share in reducing the total environmental impact from transport.
- They hold significant leverage on the level of impact from the other components of the transport system, including the manufacturing construction industry
- Their responsibility for the surface area and adjacent areas of transport infrastructure offer opportunities for mitigation and adaptation.

Priorities towards 2030

- Automation of noise mapping
- Next generation impact assessment tools
- EU-regional scale monitoring network
- Improved understanding of dose-response relationships
- Source measures for noise abatement
- Next generation noise abatement techniques
- Introduction of drones in monitoring, inspection
- Common pricing techniques as a tool to reduce pollutant emissions
- Assessment of natural water treatment solutions
- Habitat reconnection measures

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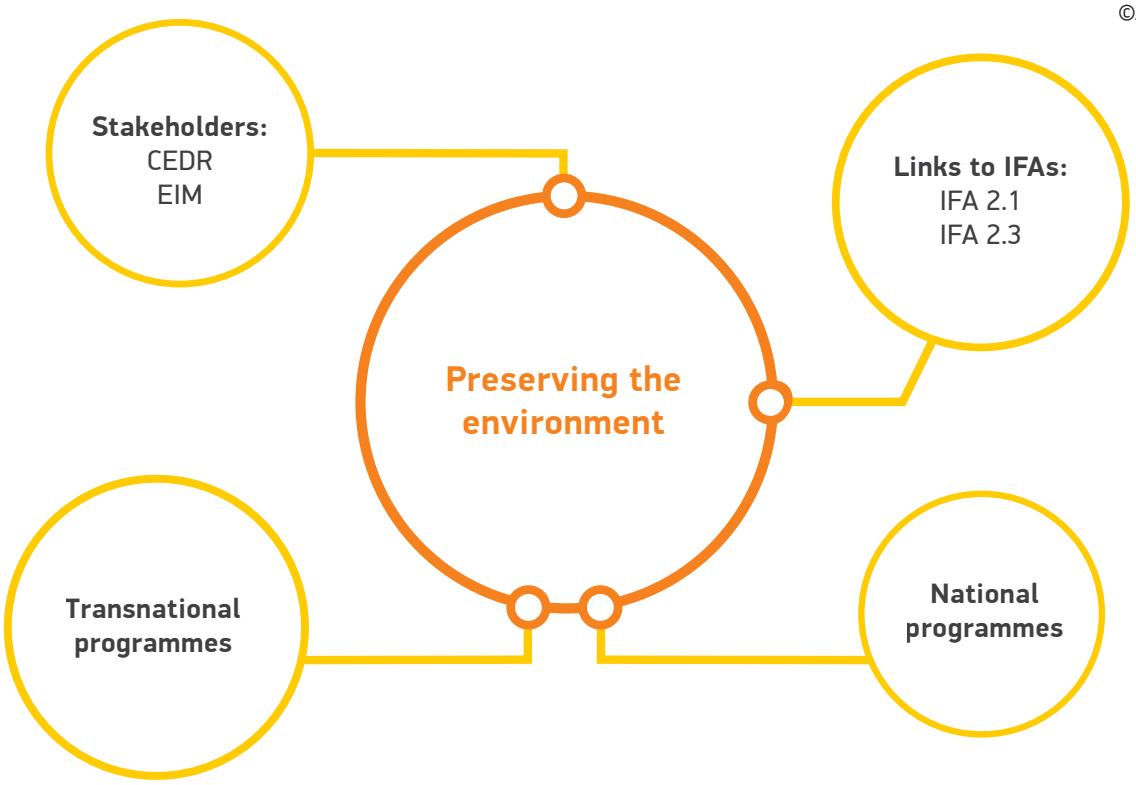

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„Achieving a smart, green and integrated transport system is essential. There is need for a coordinated approach that connects the world of infrastructure, mobility and freight/logistics with the world of urban and spatial development.“

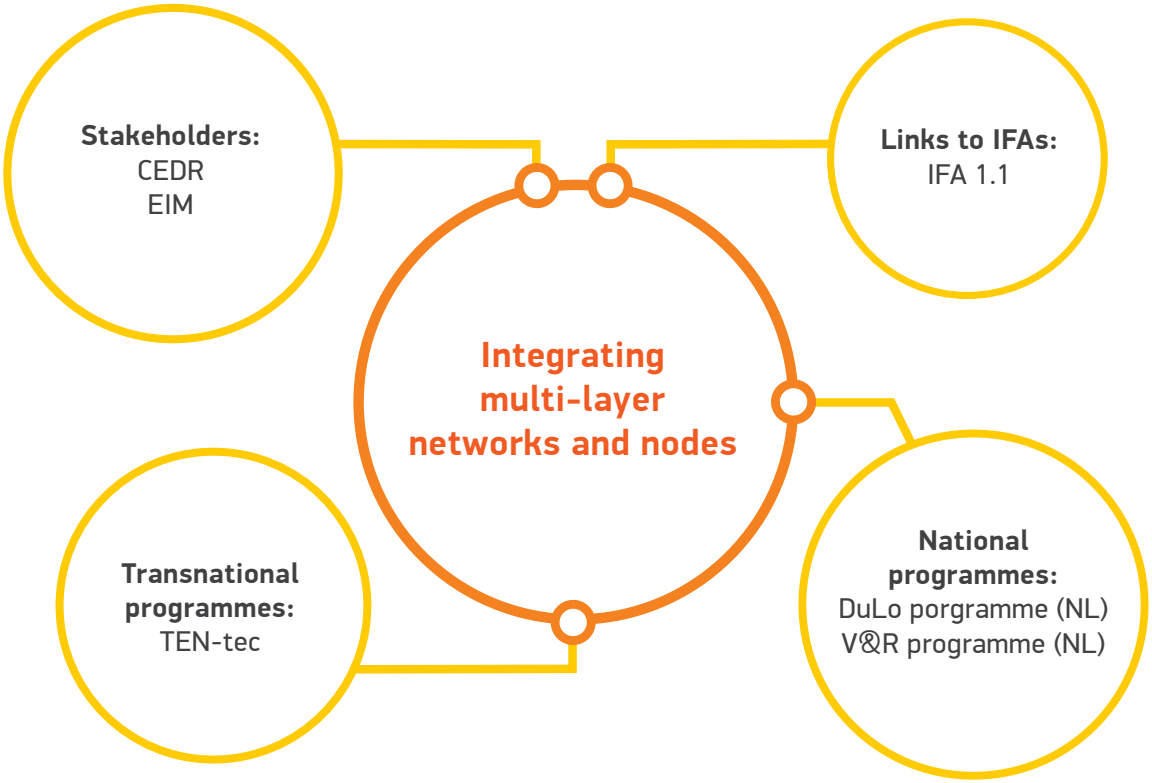
IFA2.3: Integrating multi-layer networks and nodes

Strategic context and challenges

- Further development towards a European single transport area will require significant upgrading of the current ageing infrastructure networks both in quantitative and qualitative terms.
- The associated national and local investment plans need to consider optimization across a multitude of economic, societal and environmental boundary conditions and stakeholders.
- The synergies from the spatial settings of the plans are often disregarded, resulting in sub-optimal economical, societal en environmental performance of the network as such.
- A common multi-parametric approach needs to be implemented that enables optimization of the performance of transport links and nodes, with care for the preservation of the environment and the liveability of urban centres, simultaneously considering the impact on the local scale, the functional urban area scale, and the TEN-T scale.

Priorities towards 2030

- Data warehouses at the Functional Urban Area (FUA) scale.
- Mobility labs at the Functional Urban Area (FUA) scale.
- Multi-scalar infrastructure planning.
- Integration of transport energy distribution.



IFA 3.1: Smart data and information ecosystem for accommodating automated and connected transport

Strategic context and challenges

- For infrastructure managers there is a high uncertainty about penetrations rates of automated and connected vehicles, automated functionalities, and digital and physical infrastructure requirements.
- The division line between "intelligence/knowledge" in the vehicle or infrastructure will become increasingly blurred, which will have a multitude of effects on the relationship between vehicle owner, vehicle manufacturer and infrastructure manager.
- The role of infrastructure managers in a multimodal and transnational data sharing eco-system needs to be defined and developed to enable infrastructure managers to benefit more from digitalisation and big data in their internal processes.

Priorities towards 2030

- Large-scale demonstrations focusing on the needs of the infrastructure owners/managers.
- Efficient transition of physical and digital infrastructure aided by the Infrastructure Support Levels for Automated Driving (ISAD)
- Governance models for infrastructure owners and managers to accommodate Cooperative, Connected and Automated Mobility (CCAM).

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„Through joint research and innovation activities, National Transport Infrastructure Authorities are provided with the opportunity to shape the deployment of automated and connected mobility on their networks."

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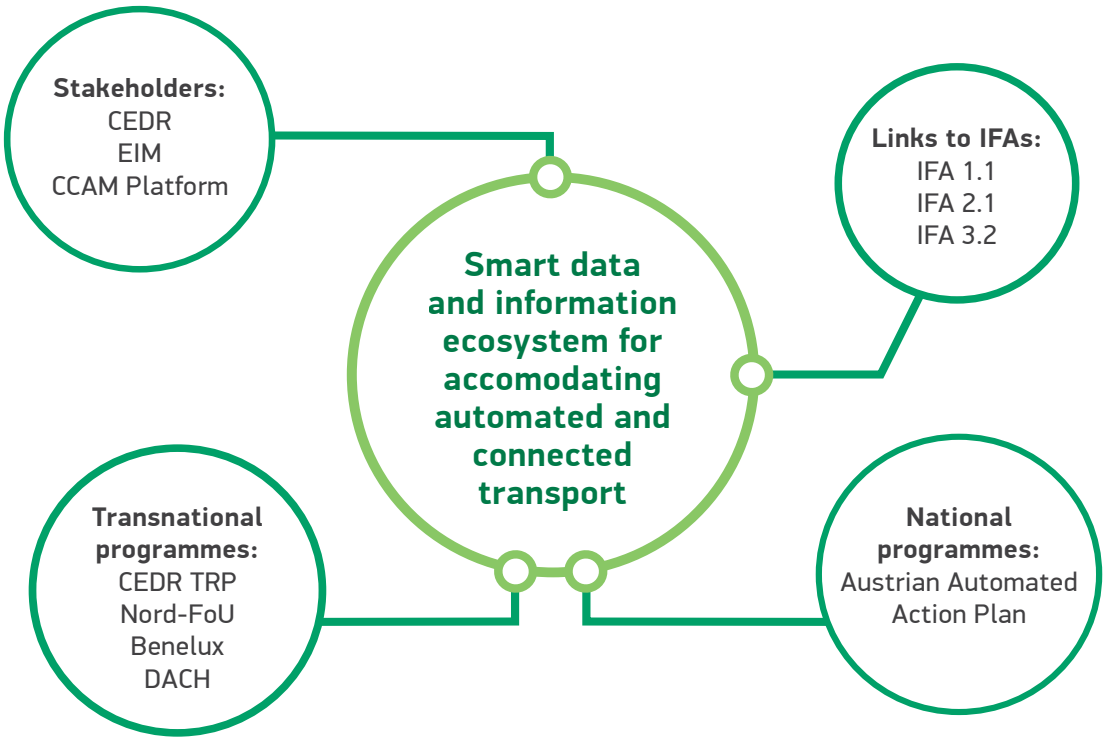

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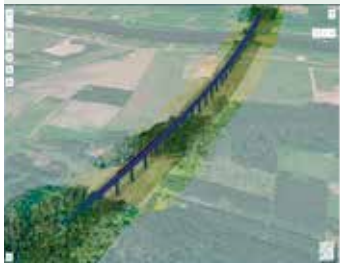
LATVIJAS VALSTS CEĻI

„Big data, BIM and advanced data analysis are going to be the lifeblood of the future's asset management"



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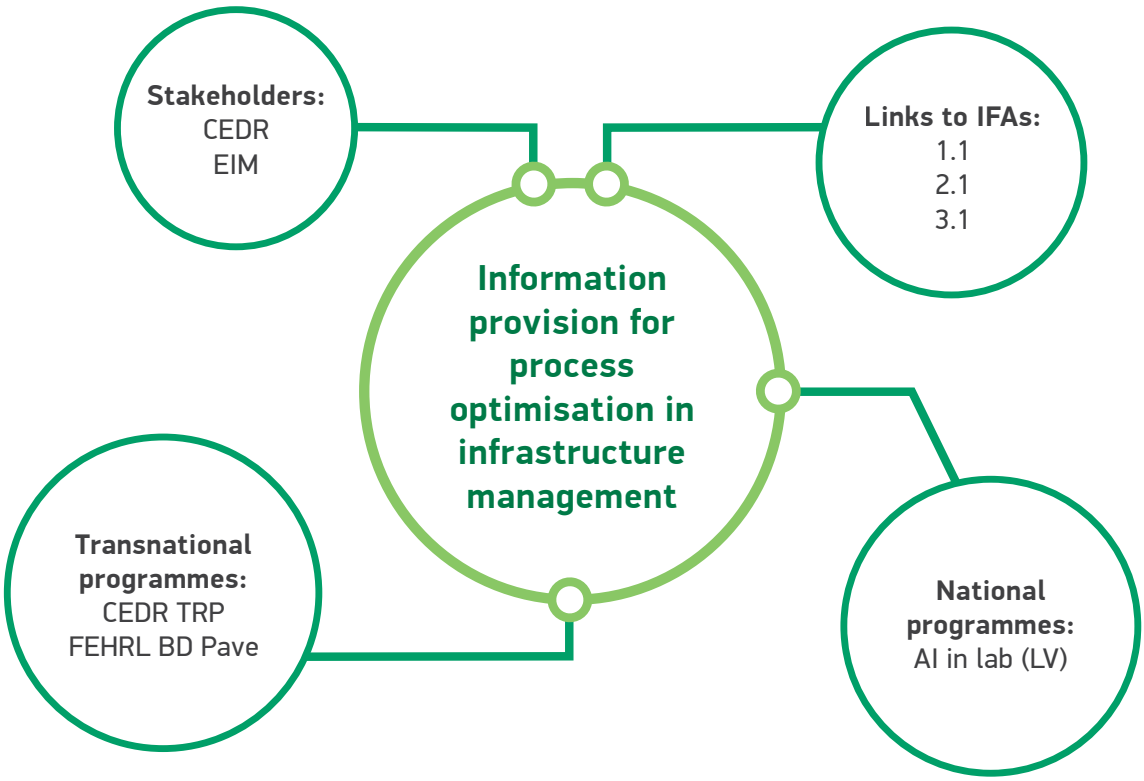
IFA 3.2: Information provision for process optimisation in infrastructure management

Strategic context and challenges

- Infrastructure owners to identify possibilities to benefit from the developing data-driven eco-system, e.g. through digital twins.
- Big-data (BD) and artificial intelligence (AI) to provide an important decision-support tool for infrastructure asset management.
- The use of robotised equipment, drones or other (semi)-automated remote-piloted solutions and AI is developing fast, but applications need to support the needs of infrastructure owners.

Priorities towards 2030

- Development of legal and organizational frameworks for use of BD and AI in infrastructure management.
- Assessing the barriers for the use of robotization (and its enabling activities) in construction processes.
- Dynamic Asset Management Systems that allow for dynamic analysis with a short detection-to-action period and feed on new data sources.
- Synthetic digital twin that can combine high speed and remote sensing to synthesise reliable data for creation of digital twins.



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