

Roll2Rail WP4 Running Gear

Ansätze zur Reduktion der Kosten des Systems Bahn

Moderne Schienenfahrzeuge – Graz – 05.04.2016

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No: 636032

The consortium participants

Rolling stock



Infrastructure operators



Institutes



Consulting



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Agenda

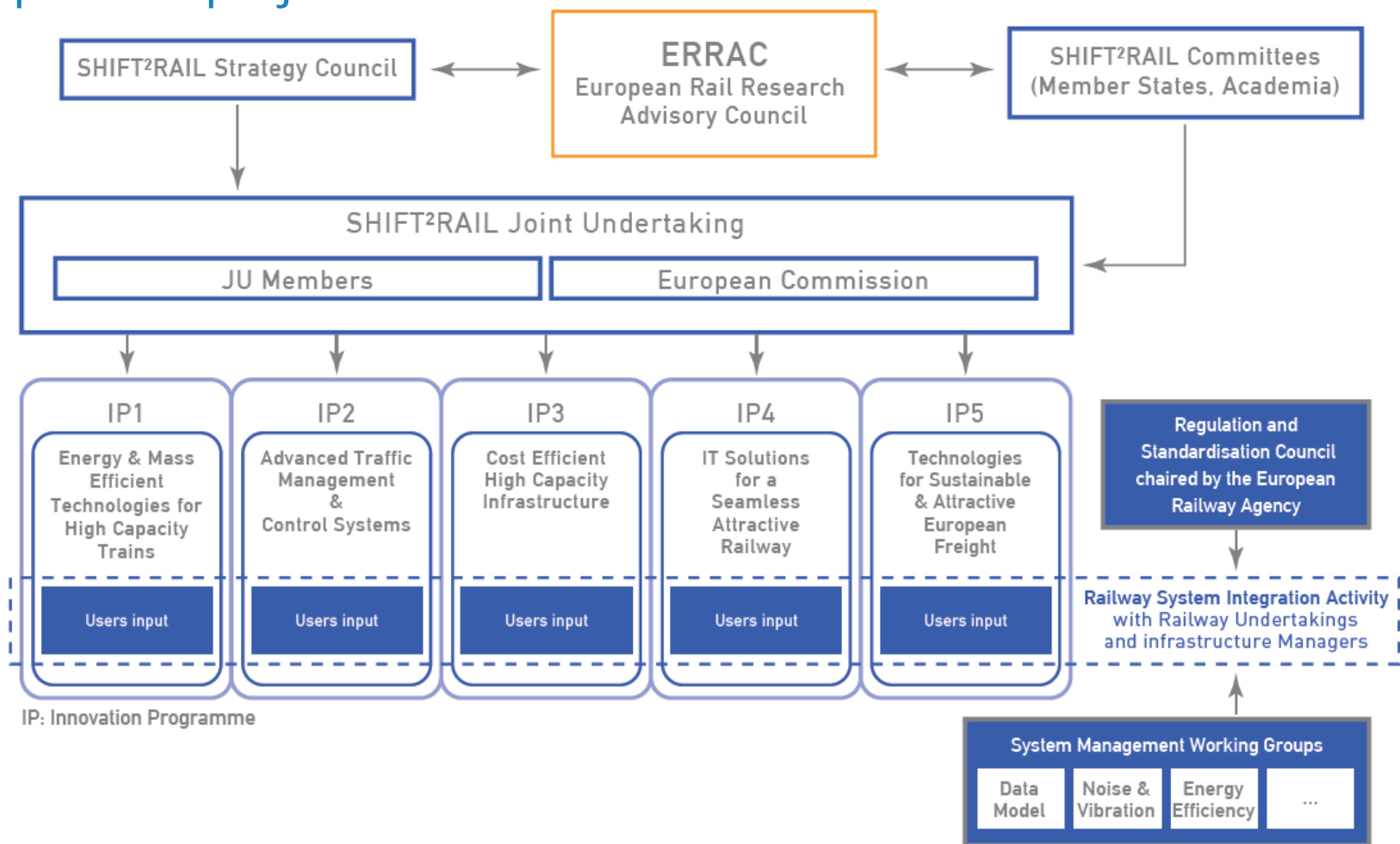
1. Work package “Running Gear” of Roll2Rail
2. Need for system cost reduction
3. Opportunities for reduction of system cost
4. Limitations
5. Mitigation
6. Progress and next steps
7. Summary



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Shift2Rail

Map of the project



Shift2Rail

Development priorities

- IP1 – Cost-Efficient and reliable trains, including high capacity & high speed
- IP2 – Advance Traffic Management & Control Systems
- IP3 – Cost efficient and reliable high capacity infrastructure
- IP4 – IT solutions for attractive railway services
- IP5 – Technologies for sustainable & attractive European Freight

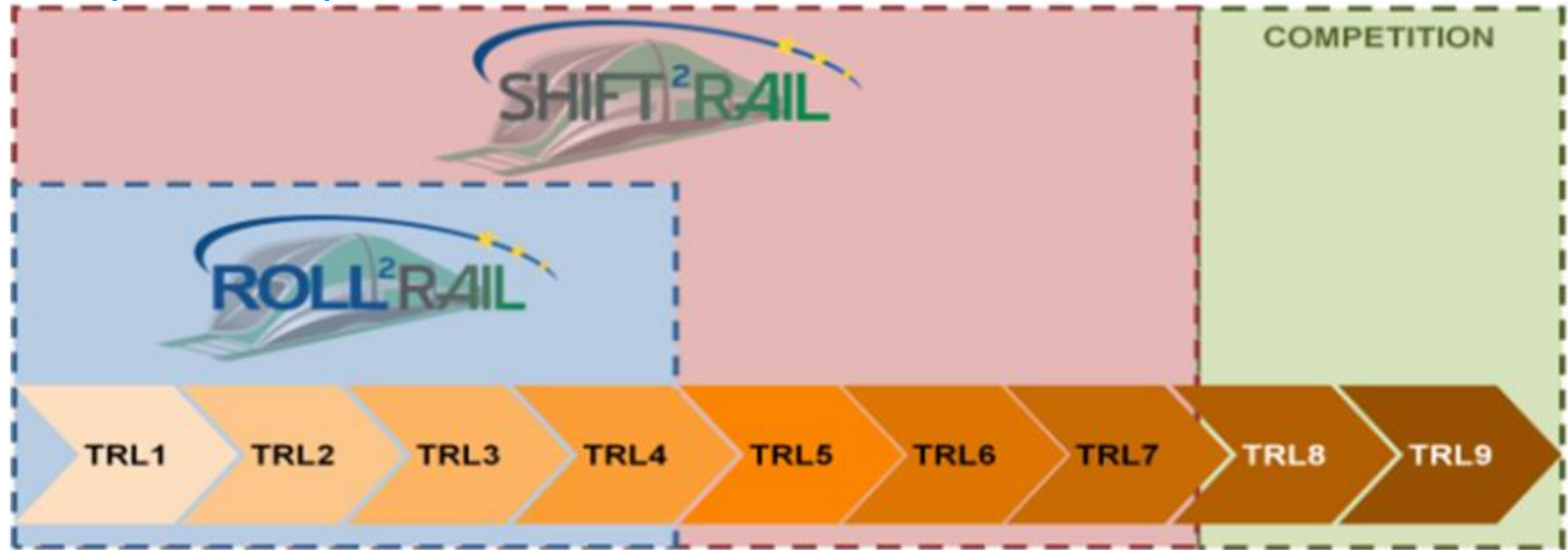
Note: IP=Innovation Program



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Shift2Rail

Preparation phase Roll2Rail



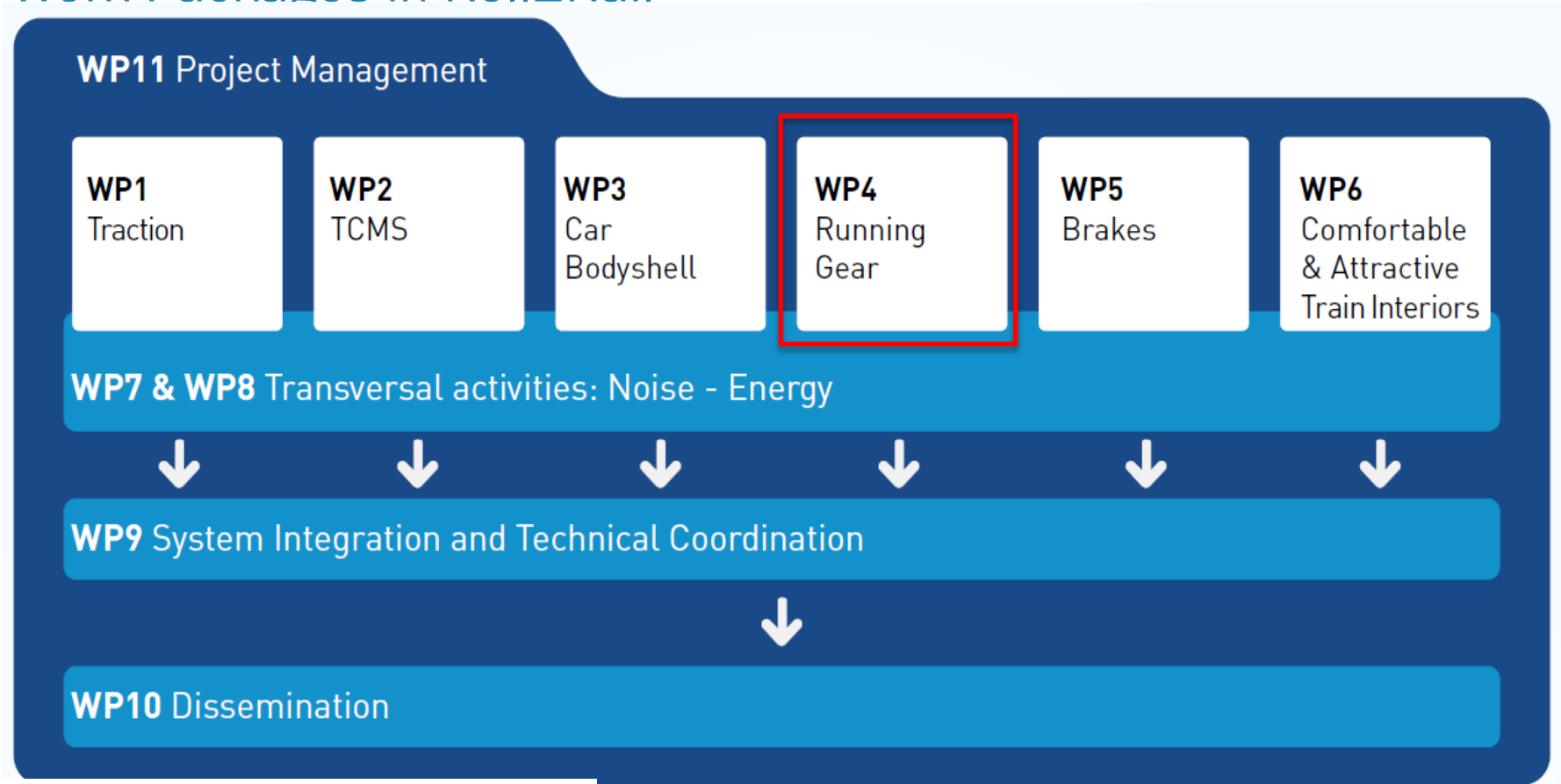
Note: TRL=Technology Readiness Level



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Roll2Rail

Work Packages in Roll2Rail



Note: WP=Work Package

[Return to Intro on Roll2Rail](#)



1. Work package Running Gear of Roll2Rail

Vision

“Significantly reduce System Cost by incentivising investment in innovative Running Gear through a Universal Cost Model accepted by mayor stakeholders”

Objectives

- Reduction of Railway System Cost

by:

- Incentivizing Application of Innovative Running Gear Solutions

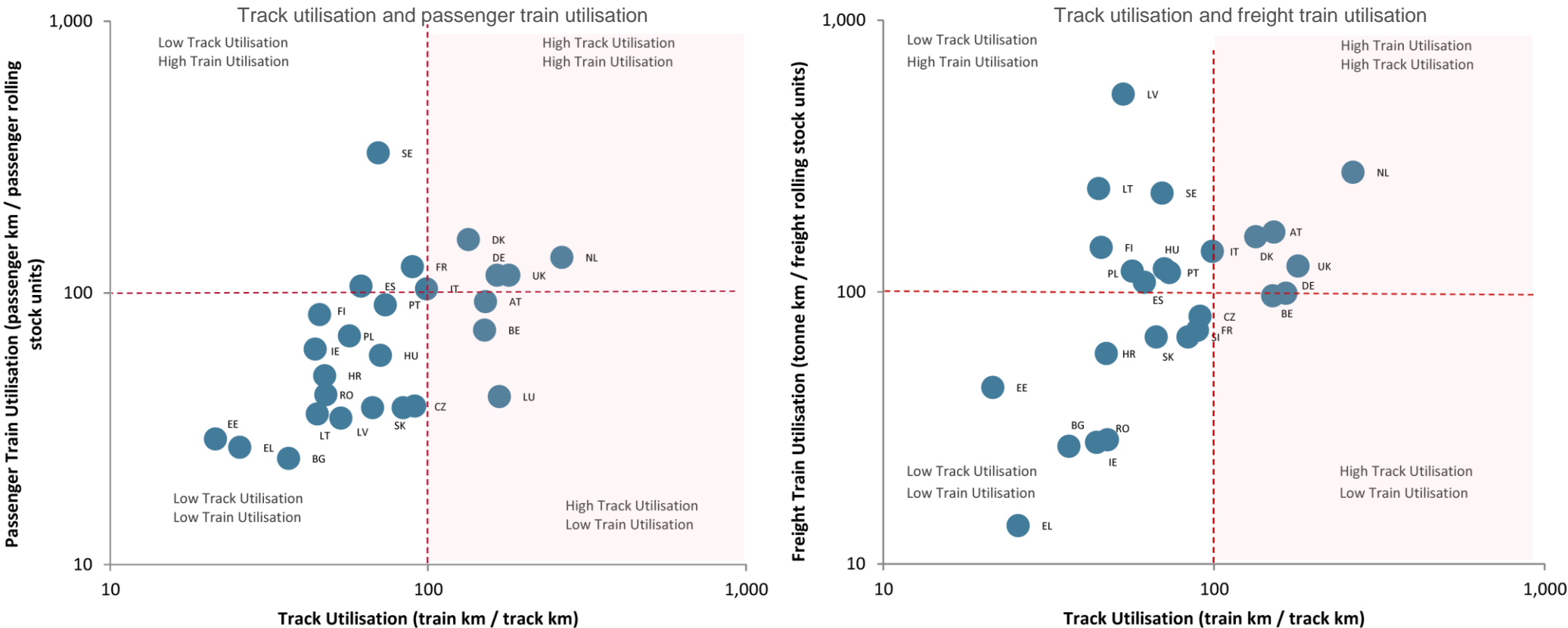
through:

- Development of economic impact Assessment Methodology



2. Need for system cost reduction

Train and Track Utilisation in EU. (Tendency Increasing)



Source:

European Commission Directorate General for Mobility and Transport,
Study on the Cost and Contribution of the Rail Sector, Final Report September 2015

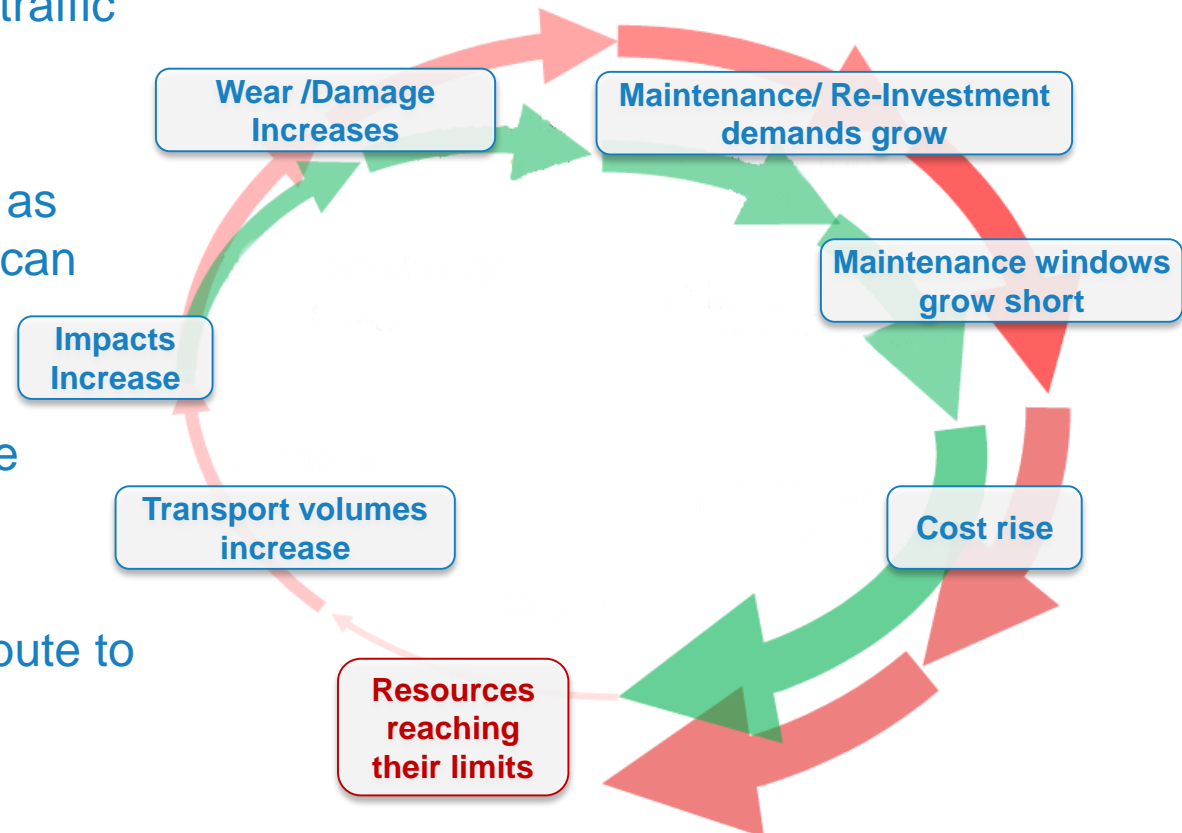


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2. Need for system cost reduction

System-Costs experienced by the Infra Structure Manager

- Infra operates network enabling traffic increase
- Strain and demands grow faster as maintenance and re-investment can cover
- Increasing traffic volumes require reduced impacts
- Vehicle operators need to contribute to cope with the challenge!



Source: Mr Holzfeind(SBB), Mr Nehrlich(SBB), Mr Marschnig (TU-Graz)

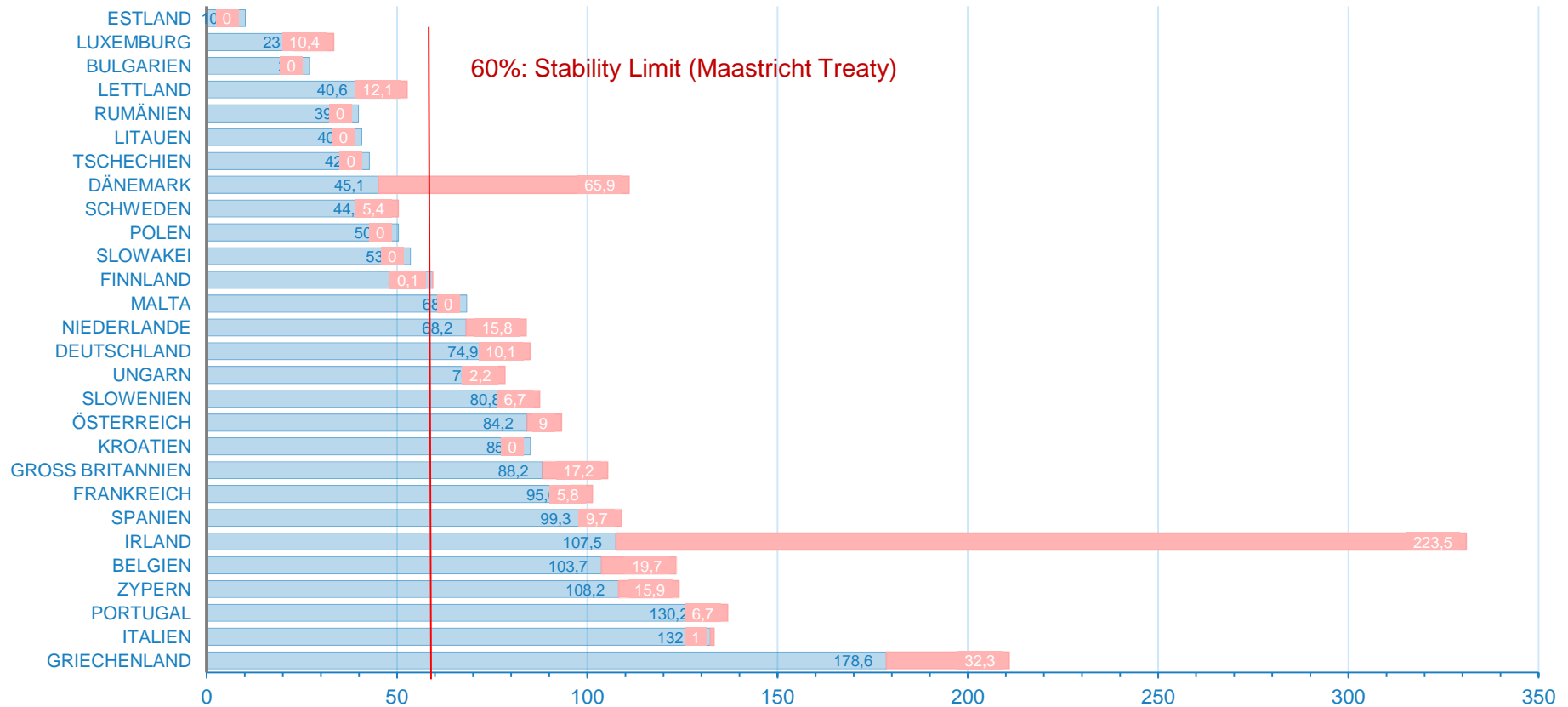


2. Need for system cost reduction

Outlook, Availability of resources

EU State debt positions [% BIP]

Note: EuroStat data exclude bank crisis expenditures (added in red)



Source: Eurostat



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3. Opportunities for system cost reduction

Running gear concepts impacting system costs

- Vehicle concepts: Enabled by bogie concepts
- Bogie concepts: e.g. Inboard bearing
- Infra loading: Active / passive control
- Environmental: Reduction of noise & vibration impact
- Maintenance: Concepts enabled by condition monitoring

Bogie
Concepts

Maintenance
Concepts

....

Materials




Controlled
Systems

Condition
Monitoring



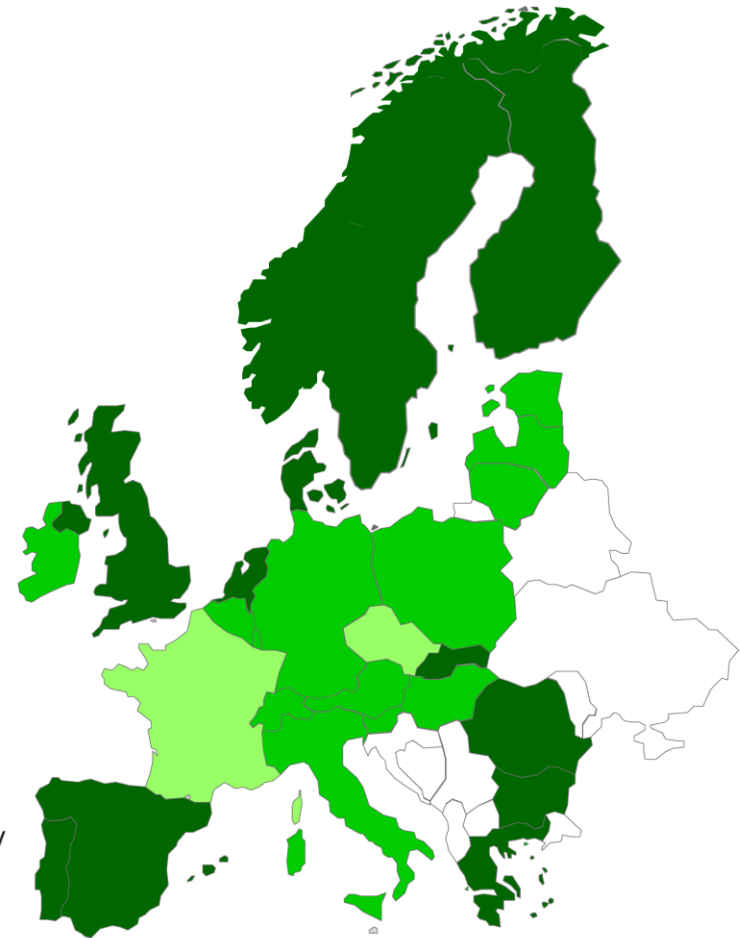
4. Limitations, organisational

Separation of stakeholders (infra and operation)

	Separation model (complete ownership separation of infrastructure manager): BG, DK, ES, FI, GR, NL, NO, PT, RO, SE, SK, GB
	Integration Model (legally and functionally separated infrastructure manager, located within a holding company that also owns at least one RU): AT, BE, CH***, DE, EE**, HU***, IE, IT, LT**, LU**, LV**, PL*, SI**
	Hybrid model (independent infrastructure manager that has delegated specific tasks back to the incumbent as part of an agency agreement) CZ, FR

- * Separation of the infrastructure manager from the incumbent is planned.
- ** Integrated infrastructure manager with specific tasks (e.g. train path allocation) transferred to the railway authority.
- *** CH, HU: integrated infrastructure manager with a separate train path allocation body

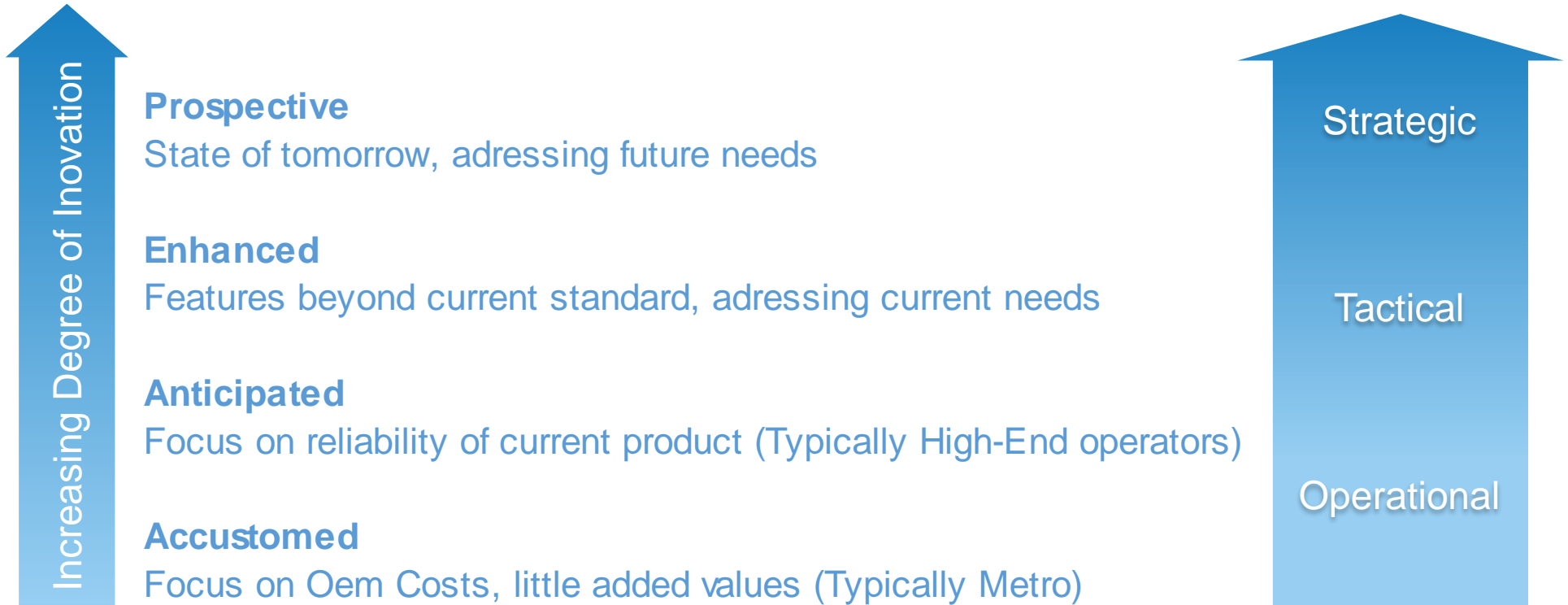
Source: Rail Liberalisation Index by IBM



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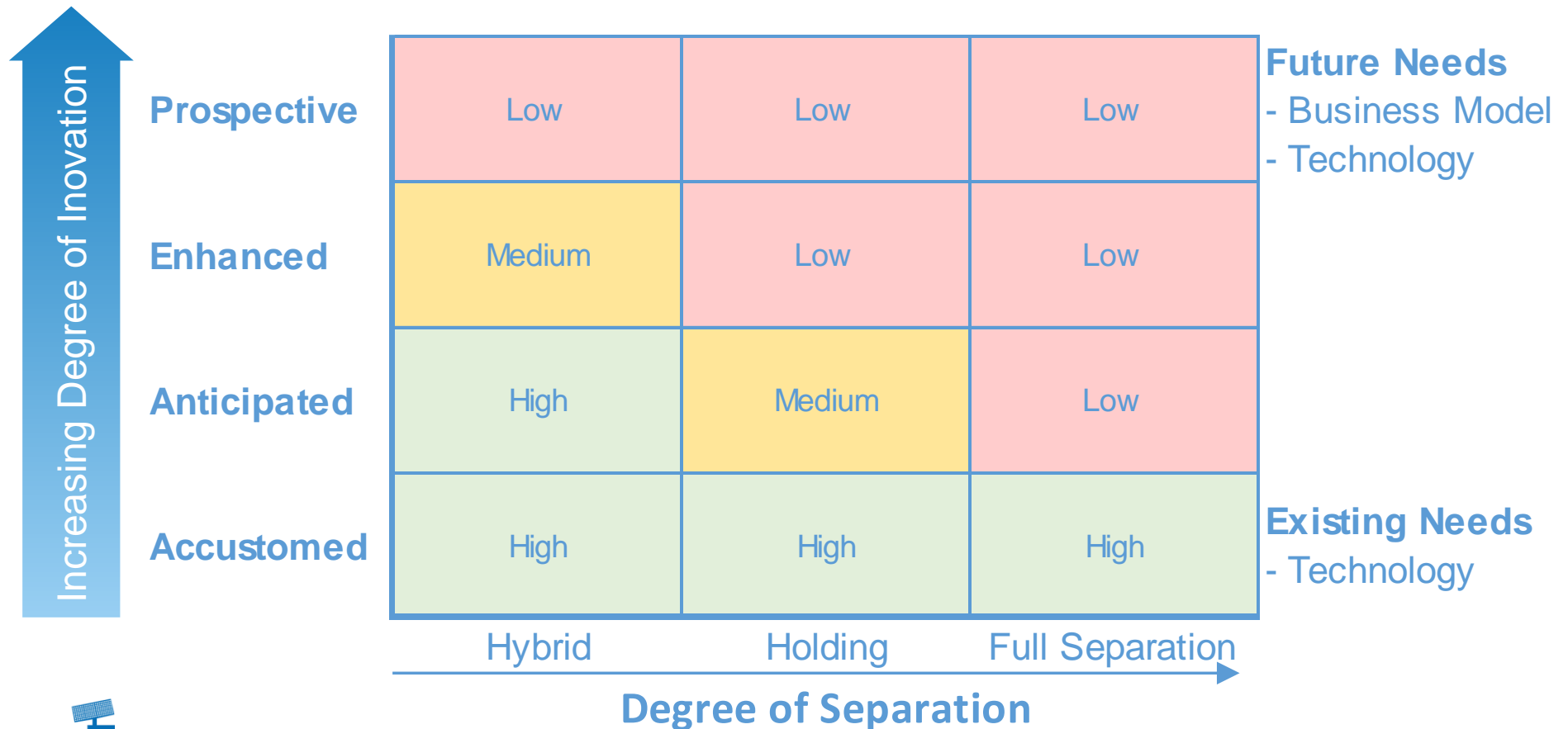
4. Limitations, organisational models of separation

Degrees of innovation



4. Limitations, organisational models of separation

Accessibility of Innovation without incentive . . .



4. Limitations, technical

Integration of Data by
Technology development
- New Data (incl. Processing)



Fragmentation of Data by
Change of Business Model
- Outsourcing of Maintenance



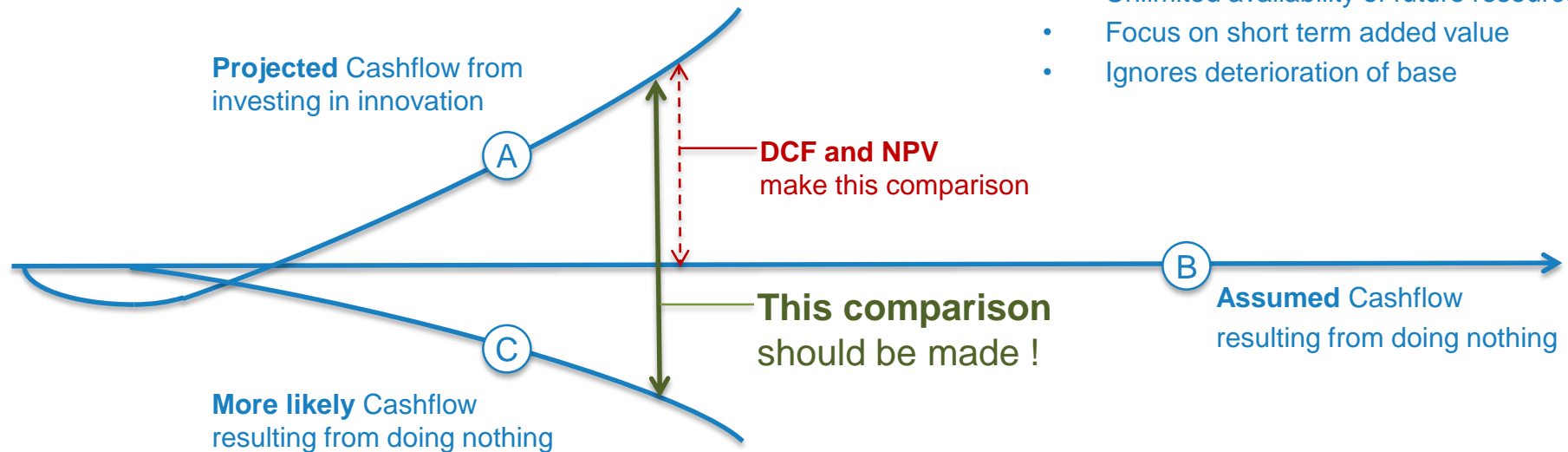
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4. Limitations, financial

Discounted Cash Flow (DCF) and Net Present Value (NPV)

DCF and NPV implicitly assume:

- Interest rate to absorb “any thing”
- Unlimited availability of future resources
- Focus on short term added value
- Ignores deterioration of base



Reference: Innovation Killers; How Financial Tools Destroy Your Capacity to Do New Things
Clayton M. Christensen, Harvard Business School Boston



5. Mitigation

Restore balance: Access to cost saving potentials by innovation

Recent years of Railway Conferences in Graz/Dresden show:

- Decreasing quantity of running gear innovations ...

Only incentivized environments have access to long term innovations

- ARS /Waco in SBB (Bombardier)
- Vectron Locomotive (Siemens)
- Hall-Bush in CH and UK (Various)

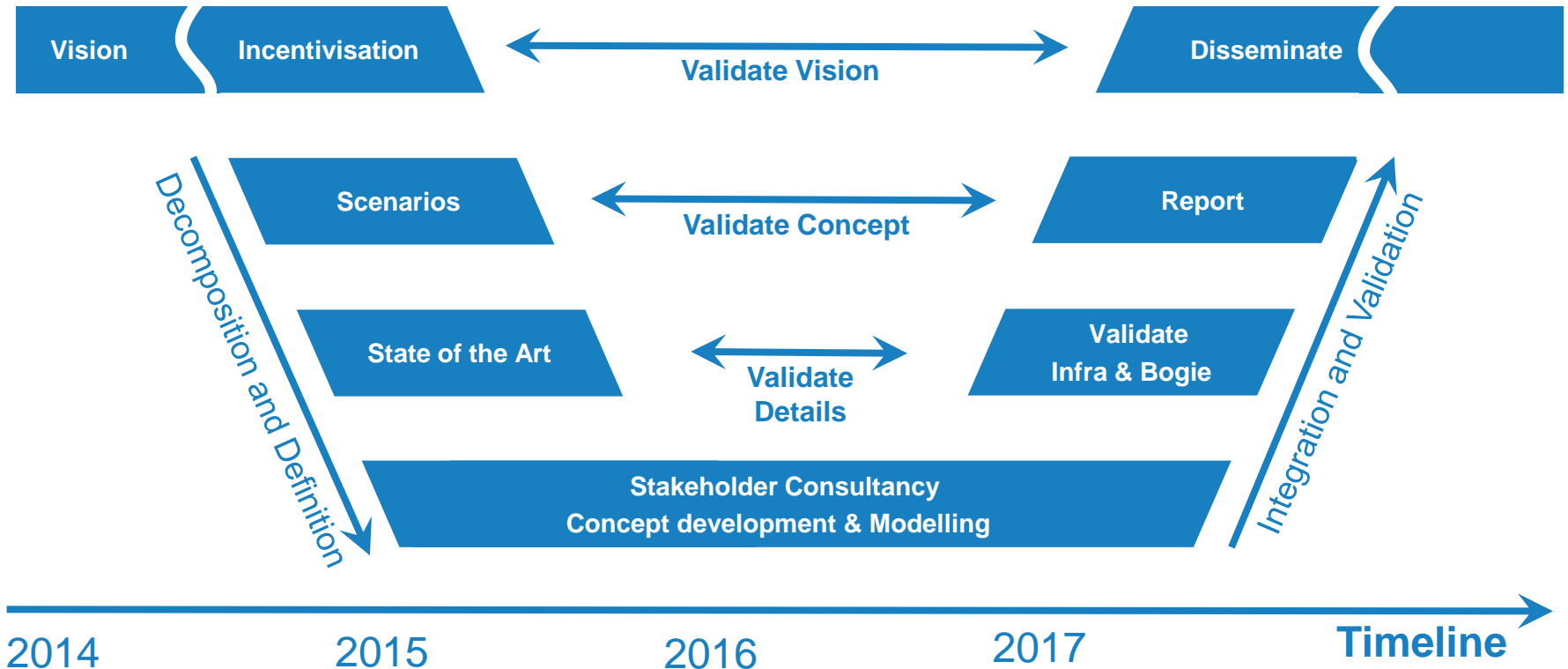
Incentivisation enables implementation of cost saving innovation



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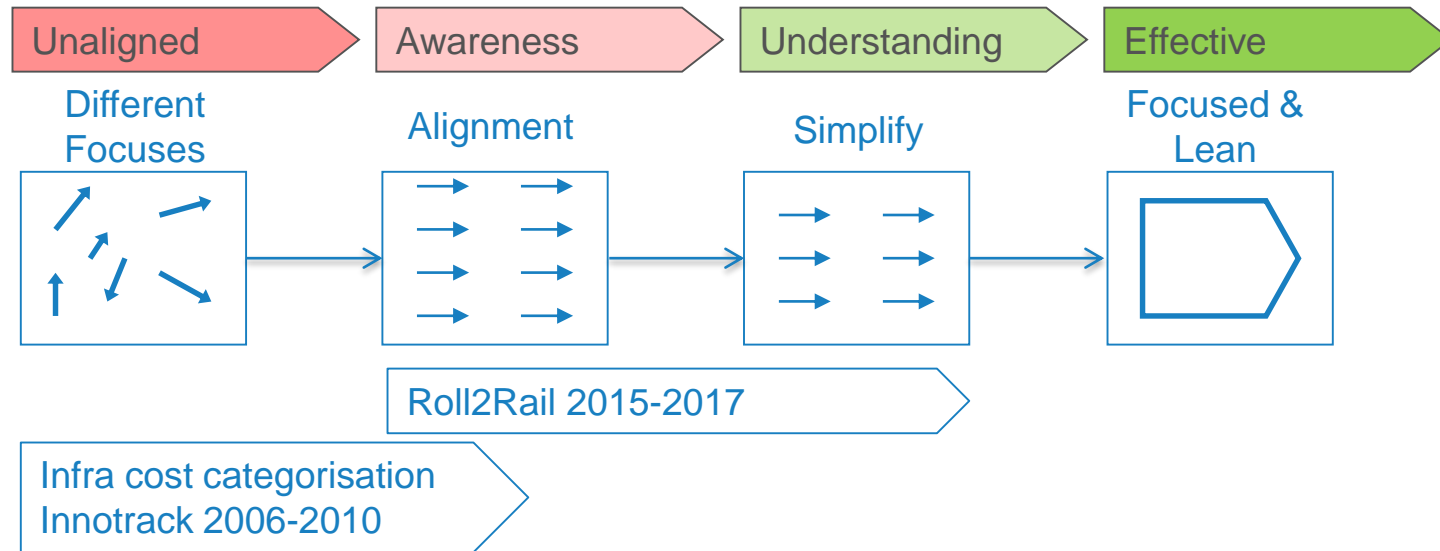
6 Progress and next steps

Cost Model Development



6. Progress and next steps

Harmonisation of cost models



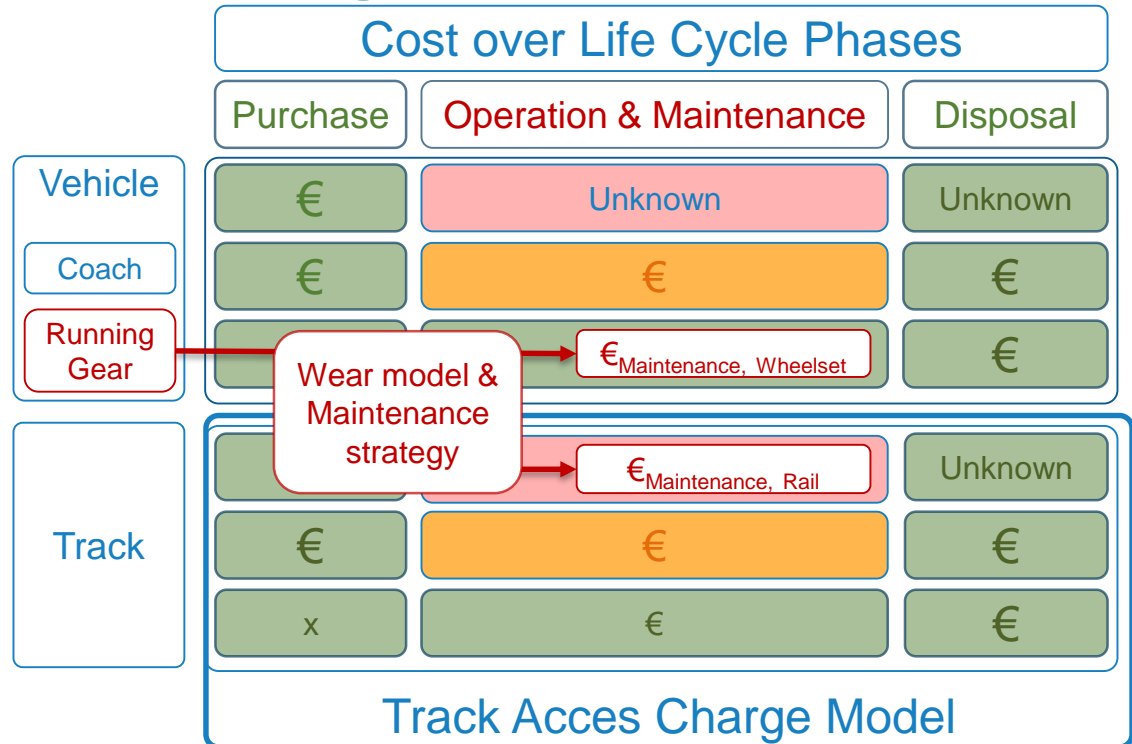
Paving the way track to incentivise innovative track-friendly trains



6 Progress and next steps

Connecting railway system cost to rolling stock characteristic

- Cost impact assessment of different technologies
- Modular approach covering different stakeholder structures
- Technical/physical models for assessment of
 - Wear
 - Noise & Vibration
 - RAMS requirements
 - ...
- Structure of based on EN60300-3-3 Life Cycle Costing



Priority 1 - Essential

Priority 2 - Desirable

Priority 3 – Optional

Priority 4 - NA



6 Progress and next steps

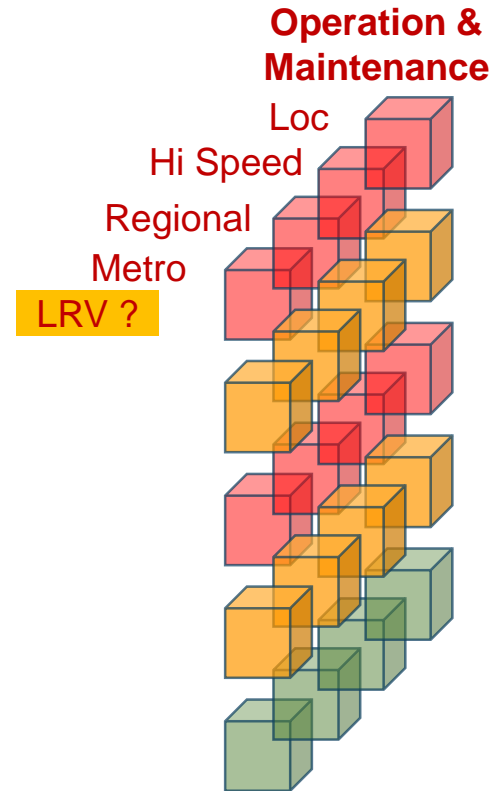
Potential structure of universal cost model 1/2

Priority 1 - Essential

Priority 2 - Desirable

Priority 3 – Optional

Priority 4 - NA



Noise & Vibration Costs

Energy Costs

Track Infrastructure Damage Costs

Cost Damage to Bogie

Cost Damage to Vehicle



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6 Progress and next steps

Potential structure of universal cost model 2/2

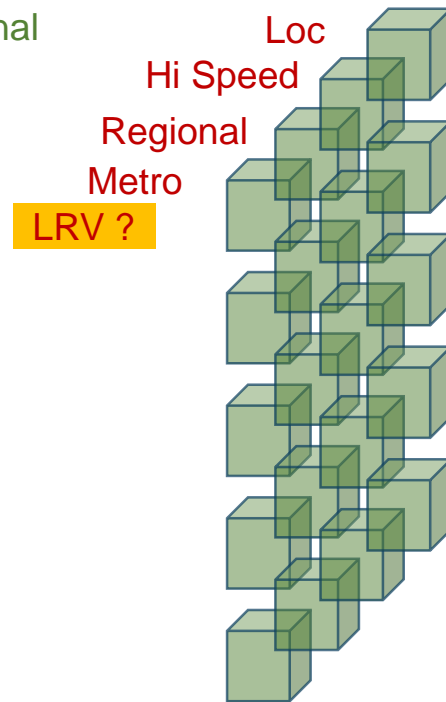
Priority 1 - Essential

Priority 2 - Desirable

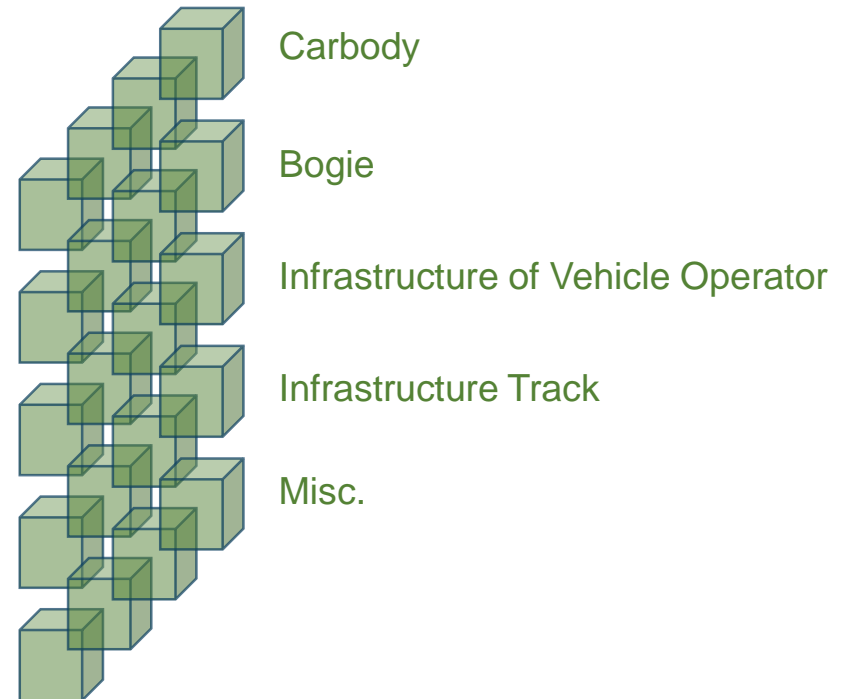
Priority 3 – Optional

Priority 4 - NA

Purchase



Disposal



These are mainly within the remit of the Operators – But these complete the Total Cost of Ownership



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7. Summary

- Roll2Rail offers opportunity for cross stakeholder cooperation
- Cross stakeholder engagement in place
- Methodology / modelling under joint development with stakeholders
- Harmonisation of models necessary
- Systematically assessment of topics
 - Access to cross stakeholder innovation impacted by separation of organisations
 - Limitations of financial methods strongly impact long term innovation
 - Heterogeneity of models limits investments for cost reductions



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Thank You for Your Attention !



Vehicle
Procurement
...
Infra Maintenance
...
Noise & Vibration
...



System Cost Optimisation is a shared responsibility !

More Information:

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- www.shift2rail.org
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Figure courtesy: Mr Johannes Stephanides



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