Ben@Rail

Benefits at rail, top-down holistic approach of impact and benefits to make rail attractive for stakeholders

KTH Railway Group Spring Seminar
18.05.2022

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Sec. General EURNEX

EURNEX

RWTH AACHEN UNIVERSITY

KTH VETENSKAP OCH KONST

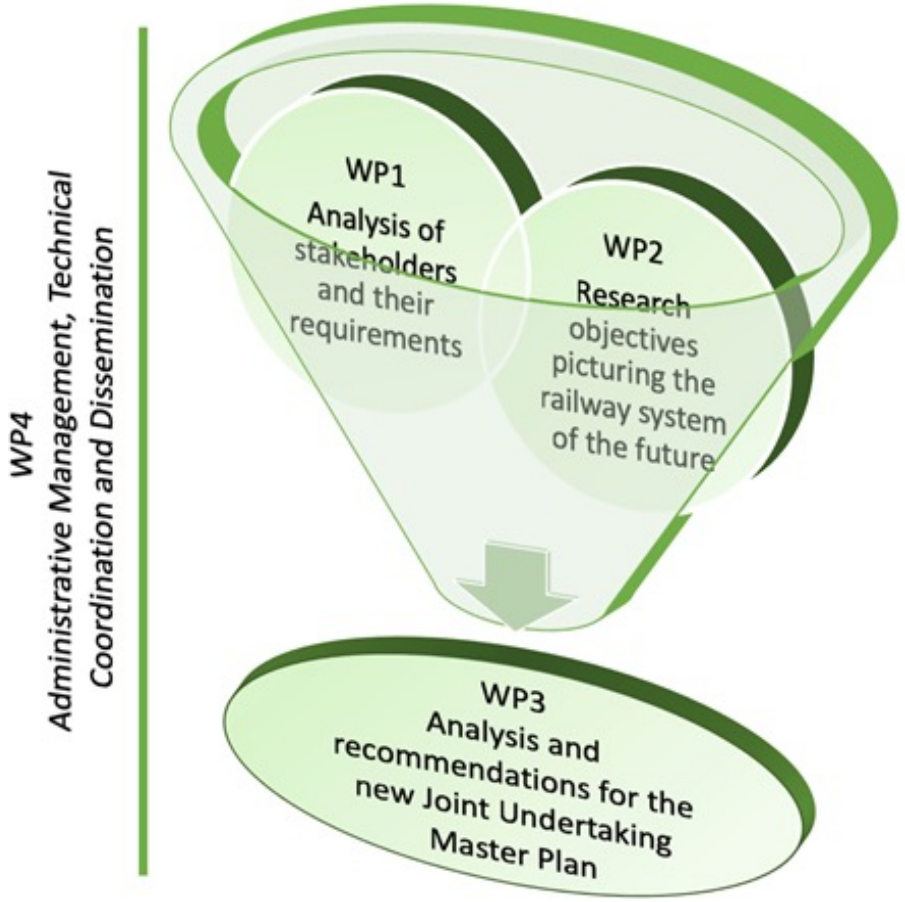
European Commission
Horizon 2020
European Union funding for Research & Innovation

Shift2Rail

"This project has received funding from the European Union's Horizon 2020 research and innovation programme, European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101046258."

Ben@Rail Structure

- WP1 is developing a **stakeholder tree** identifying stakeholders and requirements.
- WP2 is developing an overview of **key technical concepts** envisioned at the European level and the underlying development areas.
- WP3 will perform a **top-down analysis** of stakeholders' requirements and expected benefits, merging the results from previous WPs.



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Structure

WP 1	**Analysis of stakeholders and their requirements**
WP 2	**Research objectives picturing the railway system of the future**
WP 3	**Top-down analysis and recommendations**

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Collection of relevant stakeholders

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- End User
- Train Operating Company
- Infrastructure Managers
- Vehicle Manufacturing Industry
- R&I and Academia
- Rail Supply and Service Industry
- Regulatory Bodies
- Public/ Society
- Employees
- Organisations
- Environment & Health
- Investors/ Creditors
- Other Transport Systems

13 Main stakeholder categories divided in 51 sub-stakeholders

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Approach of gathering requirements

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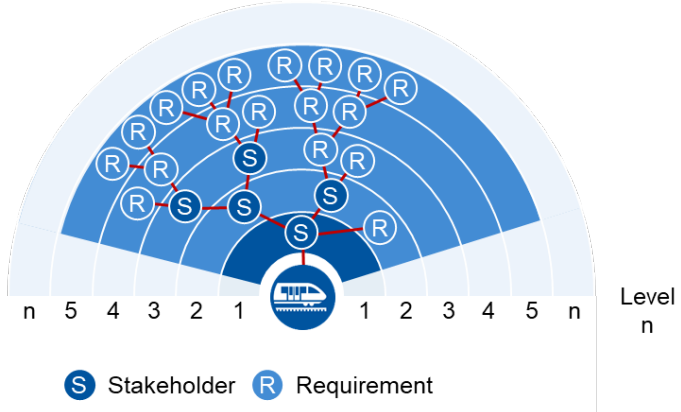
a) Gather and compile the requirements of the defined stakeholders (literature research, targeted interviews, methodical approach)

b) The requirements are systematically integrated into the stakeholder tree, where each requirement is assigned to a specific stakeholder.



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End User – Traveller

End User

1 Traveller	1.1 Short travel time from door to door	1.2 Low costs	1.3 High level of comfort	1.4 Low access/change resistance
2 Freight Customer	1.5 High reliability	1.6 Maximum information with minimum effort	1.7 Maximum safety & security	1.8 Reducing environmental impact

~ 200 relevant in total for all stakeholders

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End User – Traveller

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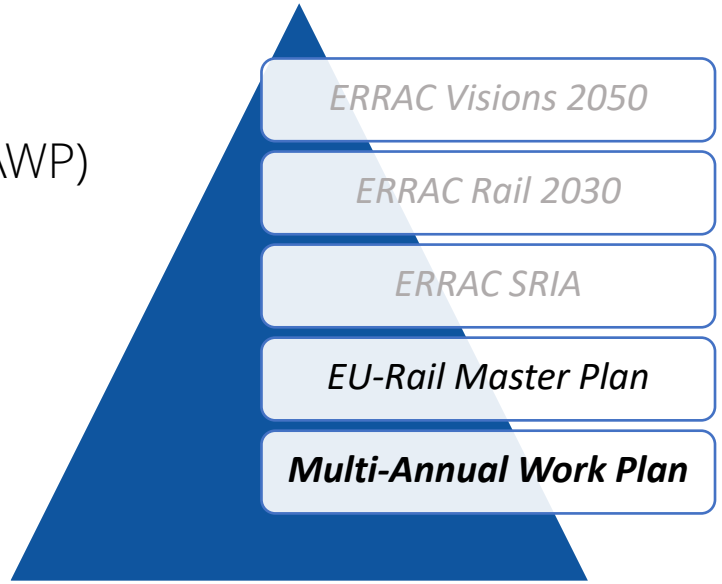
Collecting and summarizing R&I objectives

- The following ERRAC documents have been evaluated:
  - Europe's Rail Joint Undertaking Master Plan (MP)
  - Europe's Rail Joint Undertaking Multi-Annual Work Programme (MAWP)
- Shift2Rail research projects:
  - TER4RAIL
  - Mobility4EU
  - Representatives of other transport sectors



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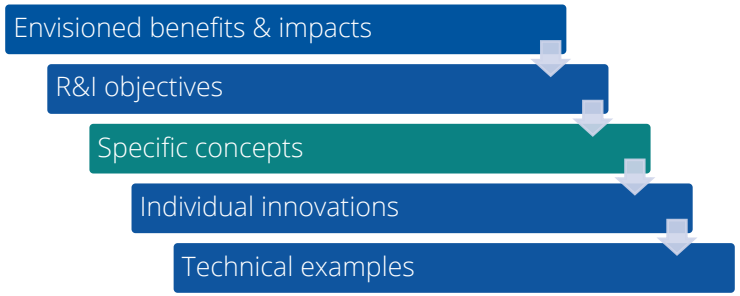
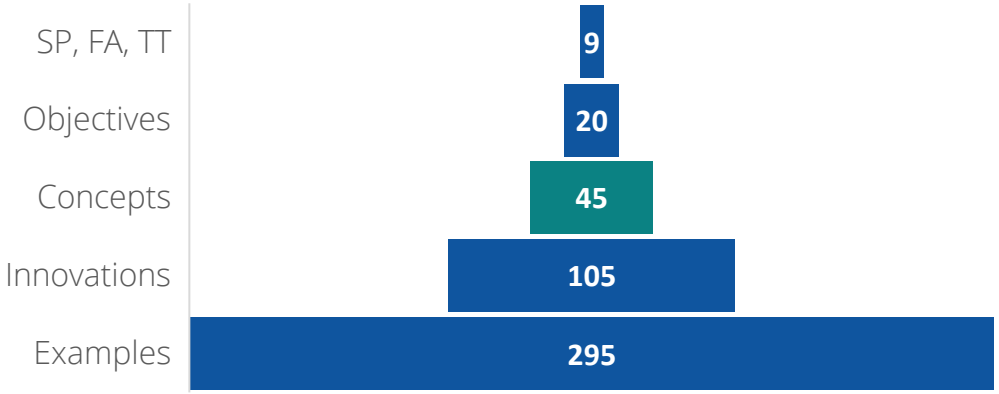
Extraction structure

To extract the objectives a top-down method has been used, whereby five layers have been defined:





The main document used is the MAWP, which considers the following Flagship areas:

1. System Pillar (SP)
2. Network and mobility management (FA1)
3. Digital & automated up to autonomous train operations (FA2)
4. Intelligent & integrated asset management (FA3)
5. A sustainable and green rail system (FA4)
6. Sustainable competitive digital green rail freight services (FA5)
7. Regional rail services / Innovative rail services to revitalise capillary lines (FA6)
8. Innovation on new approaches for guided transport modes (FA7)
9. Transversal Topics (TT)

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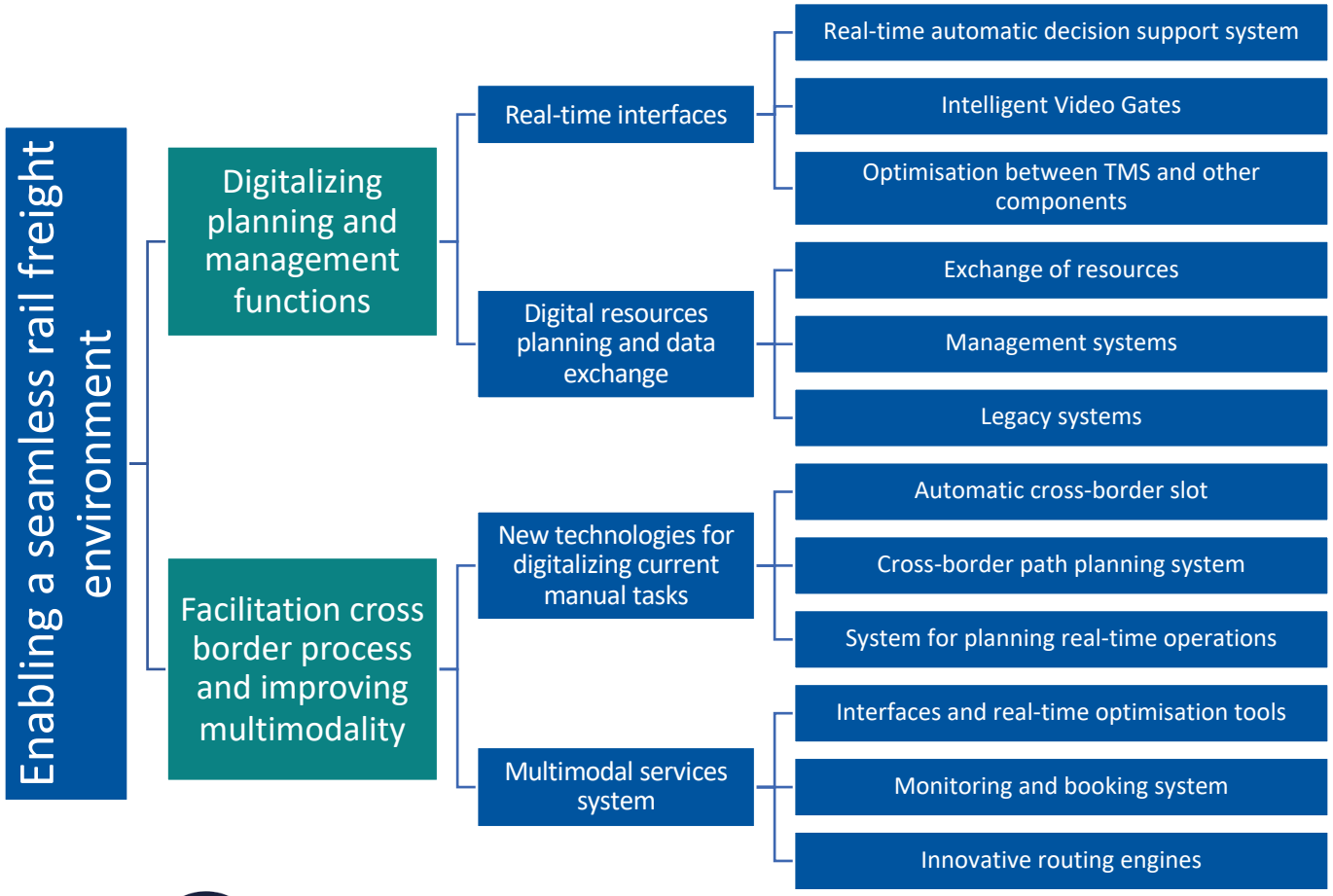
Example from FA 5: Sustainable competitive digital green rail freight services



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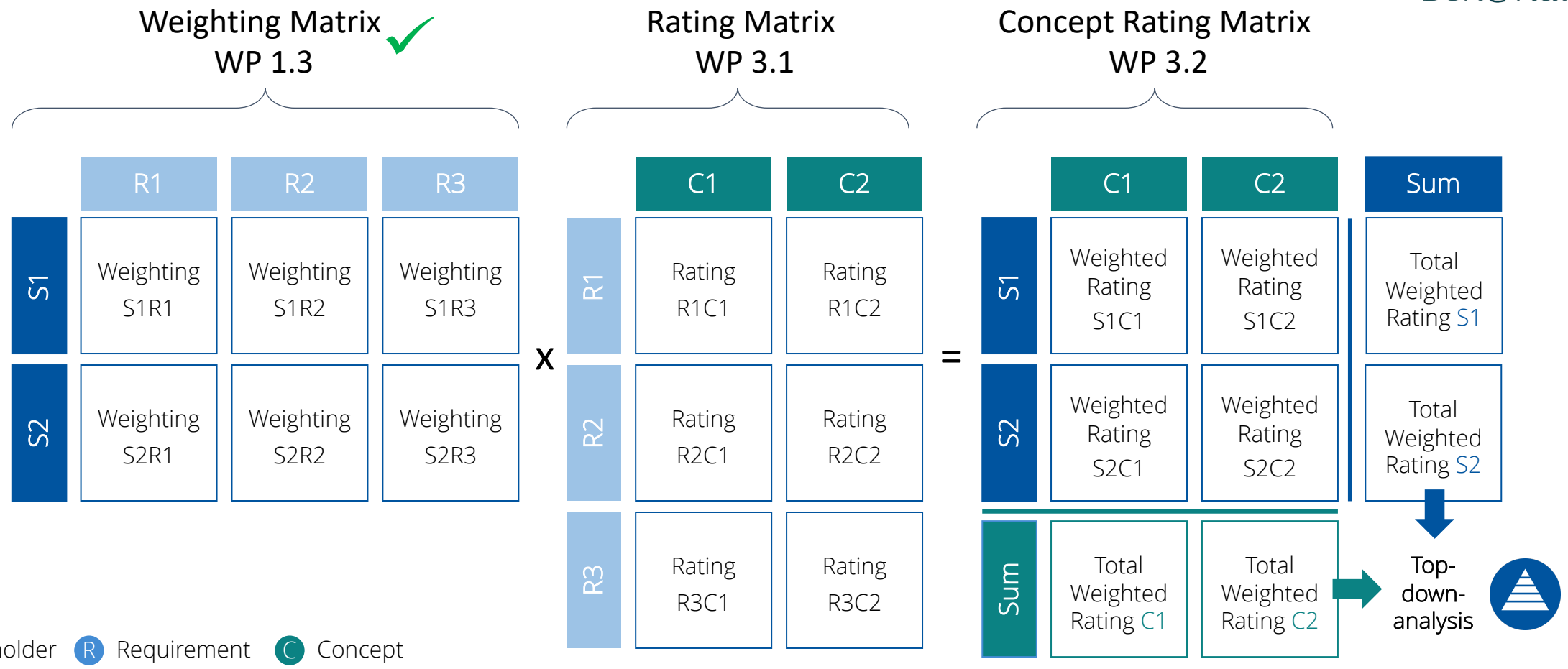
Creating concept rating matrix



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Draft of concept rating matrix

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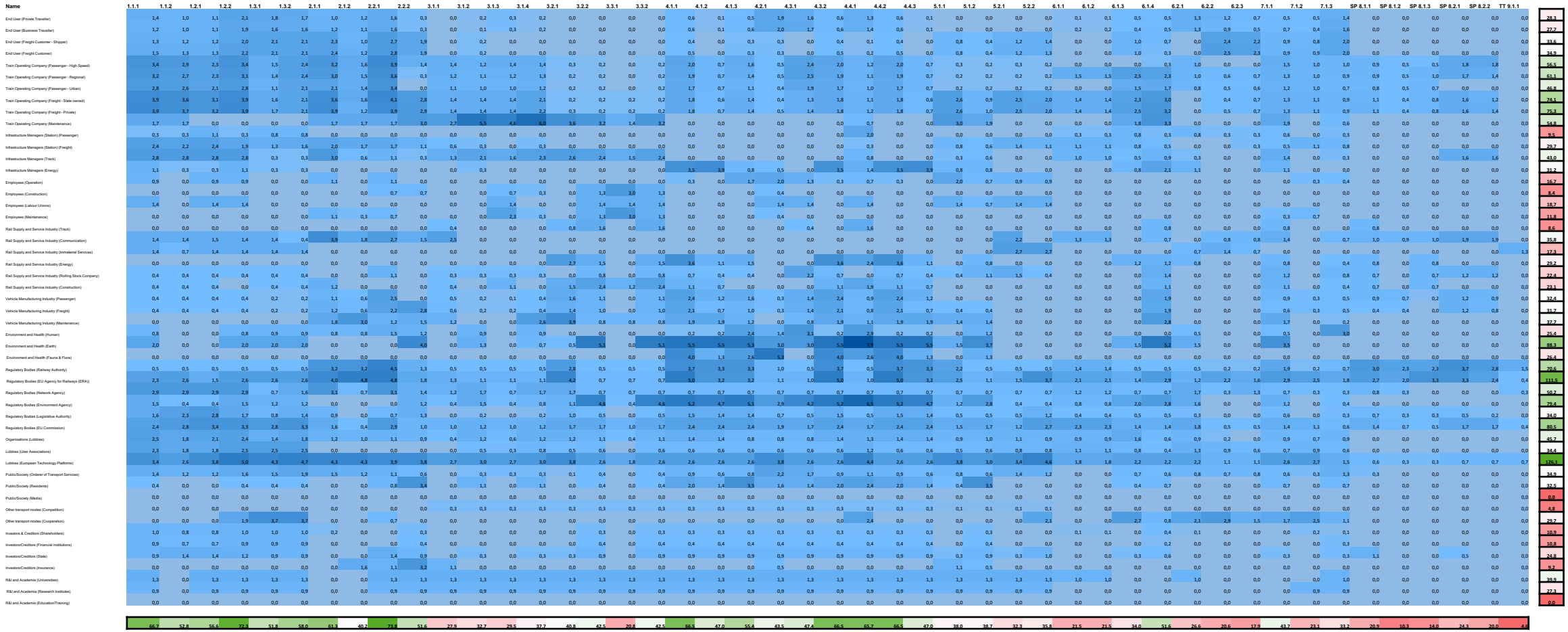
Concept

Stakeholder



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Top-down-analysis of concepts I/II

Ranking	Concept		Total weighted rating
1	FA 2.2.1	New DATO (Digital ATO) technology solutions for interoperable automated driving	73,8
2	FA 1.2.2	Connected traffic management	72,3
3	FA 1.1.1	Methods and algorithms for capacity planning and management	66,7
4	FA 4.1.1	Alternative energy solutions for the rolling stock (Minimize energy consumption)	66,5
5	FA 4.3.2	Alternative energy solutions for the rolling stock (Attractiveness)	66,5
6	FA 4.4.2	Alternative energy solutions for the rolling stock (Climate change)	66,5
7	FA 4.4.1	Sustainability and resilience of the rail system in a holistic approach to asset management, delivering more value	65,7
8	FA 2.1.1	Train Control and Management System (TCMS) technologies	61,3
9	FA 1.3.2	Integrated rail traffic within door-to-door mobility, mobility orchestration	58,0
10	FA 1.2.1	Capacity interaction - nodes and network	56,6
11	FA 4.1.3	Systems improvement including electro-mechanical components for low consumption, low emissions, low noise, low vibrations levels	55,4
12	FA 1.1.2	Cross-border planning	52,8
13	FA 1.3.1	Overall mobility approach	51,8
14	FA 2.2.2	Freight Automatic Train Operation	51,6
15	FA 6.1.4	Sustainable rolling stock	51,6

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Top-down-analysis of concepts II/II

Ranking	Concept		Total weighted rating
33	FA 3.1.3	Unmanned non-invasive monitoring and inspections	29,5
34	FA 3.1.1	Information and data sharing	27,9
35	FA 6.2.1	Modular, safe & secure railway station	26,6
36	SP 8.2.1	CCS+ system operational principles	24,3
37	FA 7.1.2	Fully automated multi-modal mobility system based on Pods and Pod carriers	23,1
38	FA 6.1.1	Regional system solution	21,5
39	FA 6.1.2	CCS & Operations	21,5
40	SP 8.1.1	Concept of system operations	20,9
41	FA 3.3.1	Remotely controlled and unmanned interactions	20,8
42	FA 6.2.2	Passenger information system	20,6
43	SP 8.2.2	CCS+ system architecture	20,0
44	FA 6.2.3	Congestion rate monitoring and flow optimisation	17,9
45	SP 8.1.3	System architecture migration plan	14,0
46	SP 8.1.2	System architecture concepts	10,3
47	TT 9.1.1	Digital environments	4,6

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Top-down-analysis of stakeholder I/II

Ranking	Stakeholder	Total weighted rating
1	European Technology Platforms	126,1
2	Regulatory Bodies (EU Agency for Railways (ERA))	111,5
3	Environment and Health (Earth)	88,3
4	Regulatory Bodies (EU Commission)	80,5
5	Regulatory Bodies (Environment Agency)	79,4
6	Train Operating Company (Freight - Private)	75,3
7	Train Operating Company (Freight - State owned)	74,1
8	Regulatory Bodies (Railway Authority)	70,6
9	Train Operating Company (Passenger - Regional)	61,1
10	Train Operating Company (Passenger - High Speed)	56,5
11	Train Operating Company (Maintenance)	54,8
12	Regulatory Bodies (Network Agency)	50,2
13	Train Operating Company (Passenger - Urban)	46,8
14	Organisations (Lobbies)	45,7
15	Infrastructure Managers (Track)	43,0

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Top-down-analysis of stakeholder II/II

Ranking	Stakeholder	Total weighted rating
37	Rail Supply and Service Industry (Construction)	23,1
38	Rail Supply and Service Industry (Rolling Stock Company)	22,4
39	Employees (Labour Unions)	18,7
40	Rail Supply and Service Industry (Immaterial Services)	17,3
41	Employees (Operation)	16,7
42	Employees (Maintanance)	11,8
43	Investors & Creditors (Shareholders)	10,9
44	Investors/Creditors (Financial institutions)	10,8
45	Infrastructure Managers (Station) (Passenger)	9,5
46	Investors/Creditors (Insurance)	9,2
47	Rail Supply and Service Industry (Track)	8,6
48	Employees (Construction)	8,4
49	Other transport modes (Competition)	4,8
50	Public/Society (Media)	0,0
51	R&I and Academia (Education/Training)	0,0

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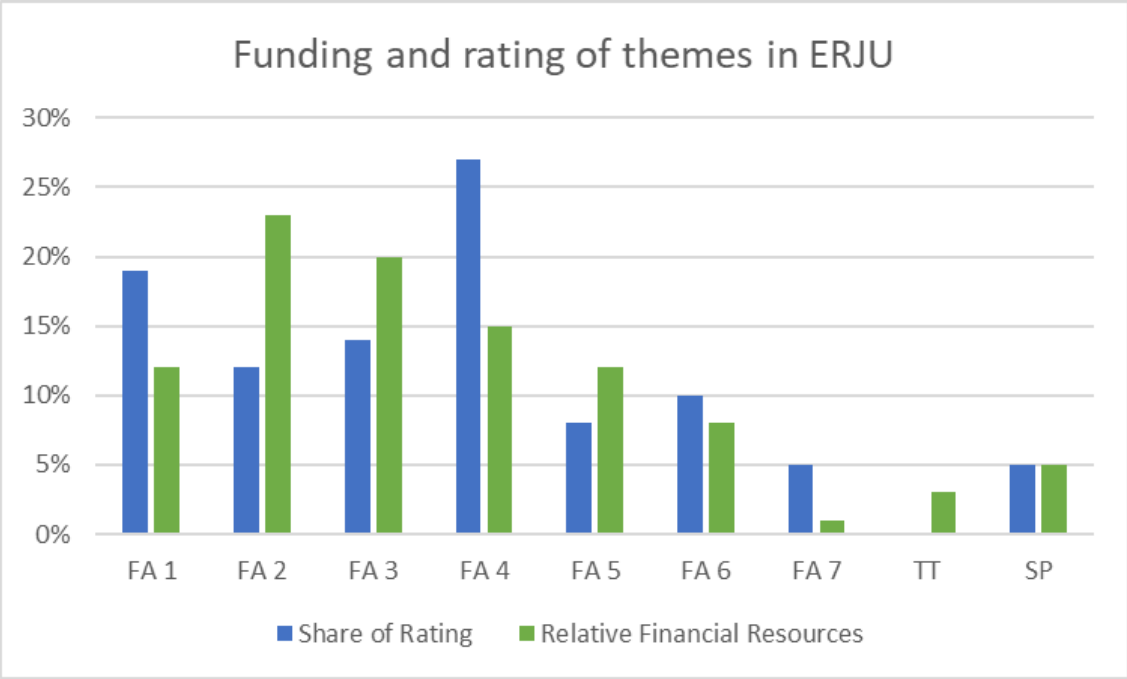
Comparison of funding distribution and impact



FA1: Network and Mobility Management
FA2: Digital & Automated up to Autonomous Train Operations
FA3: Intelligent & Integrated Asset Management
FA4: A sustainable and green rail system (Vehicles)
FA5: Sustainable Competitive Digital Green Rail Freight Services
FA6: Regional Rail Services / Innovative Rail Services to Revitalise Capillary Lines
FA7: Innovation on New Approaches for Guided Transport Modes
TT: Transversal Topic – Digital Enablers
SP: System Pillar

	FA 1	FA 2	FA 3	FA 4	FA 5	FA 6	FA 7	TT	SP
Total points received	358,10	226,87	274,42	505,73	144,84	193,68	100,06	4,65	89,34
Share of Rating	19%	12%	14%	27%	8%	10%	5%	0%	5%
Relative Financial Resources	12%	23%	20%	15%	12%	8%	1%	3%	5%
delta	7%	-11%	-5%	11%	-4%	3%	4%	-3%	-1%

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