Deliverable 7.5
Executive Summary

Industrial production and associated business processes

1. Executive Summary

D7.5 contains the main outcomes of SPIDER PLUS' Task 7.5, which main activity is the **shaping of the 2050 features** related to the **Vision Component "Industrial Production and associated Business Processes"** of rail transport services in the intermodal transport chain context.

Key challenges, drivers of change and gaps to be overcome towards 2050 are analysed on chapter 3.

The Rail transport freight volume expected growth by 2050 - which will have a strong impact on various aspects and components of the rail transport system and will require improvements on both the production and operational sides - is reported on chapter 4.1.

In order to be able to draft a plausible shape for the Vision Component "Industrial Rail Production and associated Business Processes", a number of documents were analysed. The documents are both internal to the SPIDER PLUS Project and coming from external sources: all of them are reported in the D7.5 References. Then, inputs and feedback were mediated by the SPIDER PLUS Consortium expertise: the resulting VC statement is broadly presented on chapter 4.2 (and also broadly summarized at the end of this chapter).

The VC's statement considers that **by 2050**, freight rail service production is an industrialized process. Cargo consolidation is fully exploited, as the logistics clustering concept that fosters the cargo consolidation uptake as well. The assets are collaboratively used by the freight transport chain stakeholders, thus broadly including also the freight hubs. Hubs are multimodal transport service centres offering Added Value Services, also with a network approach at various levels, thus being able to offer flexible services and increase their qualitative and quantitative connectivity. Rail Production processes and equipment are standardized, following the modular concept. Most part of hub operations and the rail network management are automated. Big data, Internet of Things, Augmented Reality are exploited also in the rail freight transport, thus allowing also the exploitation of the above features.

In order to analyse in detail the drafted Vision Component 2050 scenario, some **Elements** have then been selected comparing the AS-IS status of Rail Production system and the preferred Industrial Rail Production shape on 2050. More details on the Elements' identification process are available on Appendix 1. The **final list of Elements** for "Industrial Production and related Business Processes" Vision Component was compiled after an **internal evaluation** and discussion with Task 7.5 Partners, also interacting with the whole WP7 Consortium and is reported in the below Figure. The VC's Elements have been divided by category commonly identified at WP7 level. Each Element with its potential evolution towards 2050 is broadly treated on chapter 4.3. With reference to some specific Elements, various Best Practices that are considered as relevant for them and their potential evolution are reported on Appendix 3.

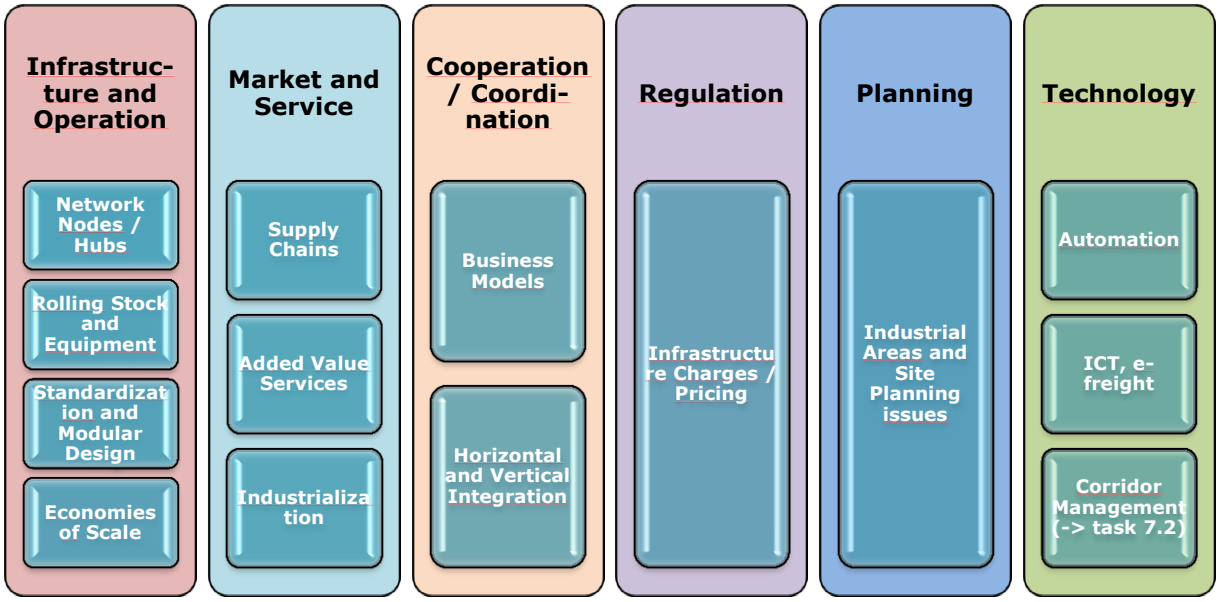

Figure 1: Synopsis of Rail Production and associated Business Processes' Elements [Source: IBI]

Finally, the **Elements' Impact and Feasibility** is analysed on chapter 5. The achievement of VC's Elements preferred scenario on 2050 can have a sound **impact** on the rail modal share and the achievement of one of the "White Paper Roadmap to a Single European Transport Area" key goals; on the other hand, in case the 2050 Industrial Rail Production drafted scenario becomes a fact, effects on the rail production process costs can be expected: a qualitative analysis of such potential impacts and effects is reported per each VC's Element on chapter 5.1. The achievement of the 2050 VC preferred scenario is linked to the **feasibility** of the single Elements' picture, which is related to various dimensions: a table analysing the qualitative aspects of financial, political and technical feasibility is reported on chapter 5.2.

Indeed, **the achievement of the VC 2050 preferred scenario** – which is described in the 2050 VC's statement - **is considered as possible** with adequate funding schemes (Public-Private-Partnership, EU funding schemes, Project Financing, Private investments), proper EU addressing and Regulation and specific development on the technology side led by R&D activities.

Summary of 2050 VC's statement

By 2050, freight rail service production is an industrialized process. The main freight transport hubs are closed to the traffic attraction zones, which can be both industrial areas and cities. **2050 hub concepts** are developed with particular care to their geographical position and role and in relation to the territorial context. Hubs are used as consolidation points to obtain **economies of scale**; such infrastructures are not necessarily bigger than now, but certainly **more efficient**: this is obtained through full technology exploitation and more effective production models.

The industrial site location and rail planning has been optimized in order to enable **clustering** of transport origin / destination. Besides this, a further and proactive

involvement of neighbouring and local governments and the population in the planning issues to shape more liveable cities could be expected, thanks to an increased people's awareness.

Rail transport has gained **competitiveness** thanks also to the **internalization of road transport negative externalities**. This has been achieved with both a specific fuel price policy and the implementation of targeted policy measures able to stimulate the use of intermodal transport.

Rail terminal layout design has evolved to better serve the intermodal traffic: **Intermodal Stations** are fully and largely deployed; hubs are also **multimodal service centres**. As consolidation points, hubs operate in an industrial way as **traffic multipliers and distributors** through the various transport means. The main leg of the transport chain between hubs in Europe is performed by rail; then, first/last mile transport is operated by green vehicles that could be either electric vehicles or other innovative means, e.g. special city vehicles.

Network effects[1] have been fully understood and exploited. The intermodal rail transport markets are large freight volumes - at least the critical mass – moving on established reliable and frequent long-distance rail connections between hubs. Network establishment and **cooperation among hubs** are a fact all-over Europe. This allows the hubs to increase their potentialities and connectivity, also constituting a European network integrating the TEN-T corridors' one.

The **Rail system across Europe is harmonized** and managed at central level, following the TEN-T Corridor approach and the Single European Transport Area. All operators can easily access the rail infrastructure and the hubs; in case of conflict for capacity request, auctions can be made with a clear and transparent selection process. Rail services are **liberalized** and regular international tenders take place to assign the service exploitation: this allows obtaining a higher service standard. Rail Transport inside Europe is seamless and **smoothened administrative and Customs procedures** to access/exit the European Union facilitate the freight circulation / penetration by rail.

Rolling stock and the hub equipment have been modernized and improved to be able to handle the increased rail freight volumes. Finally, **rail transport production is an industrialized process.** Train payloads have increased thanks to the development of lighter wagons, which also allow to have higher commercial speed. The equipment energy profiles and performances have constantly improved as well. **High Automation has been reached as regards both hub operations and rail network management.** Train technical interoperability across borders is a fact, while more efficient shunting and transfer/transit operations at hubs are in place thanks also to various initiatives at EU level (e.g. Shift2Rail).

On 2050, the transport system assets are collaboratively used by the freight transport chain stakeholders, thus broadly including also the freight hubs. New patterns to offer transport services are mature and established. The optimization of all the Supply Chain components is accompanied by the **collaboration** among the actors towards consolidation, so to exploit transport services with optimal load factors and offering

[1] Self-stabilization (critical mass, Mohring effect, redundancy, reliability), competition and dynamic. [Carrillo Murillo et al, 2010]

reliable and punctual services. The final results are **dynamic Supply Chains** able to offer high-level customized and segmented services. Through **synchronic-modal transport**, the LSPs can then organize the delivery using different transport modes in the way they consider more profitable, dynamic and flexible. The cooperative approach among operators has led to **virtual integration** with regard to specific operational processes and/or market offerings. A new logistics "layer" has appeared after 3PL and 4PL: the **5PL** operator, able to fully serve the customers up to the final selling to the market through e-commerce.

Industrially-based flexible **Business Models** are applied also to follow customers' expectations for operational and production models. Rail companies are closer to the client needs and are able to adapt their offer to the market request: they can build customized services and promote the service segmentation approach to attract new customers in both passengers and cargo fields. A new Business Model based on the "selling of capacity" concept has taken place: this is the new paradigm for **capacity management**. Besides this, the **capacity optimization** is the other driver towards the reduction of unit transport cost, direct consequence of rail transport industrialisation. Regular rail services are available and the capacity can be better managed thanks to the full exploitation of IT systems to collect and elaborate real-time data and consequently regulate capacity aspects.

Technologies such as **Big Data**, **Internet of Things**, **Intelligent Objects** and **Augmented Reality** have produced sound impacts in the industrial rail production, also favouring the system full industrialisation by moving the freight consolidation point closer to the market, with the final customized differentiation of goods made at the very end of the process just prior to deliver (e.g. thanks to 3D printers potentialities).