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## C4R project increases rail capacity without laying down new tracks

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### Abstract

Rail freight transport is today characterized by inefficiencies in the use of the existing infrastructure while the growing demand is activated by giant containers vessels handling thousands of units in the ports. Lack of industrialization prevents gaining from economies of scale while bottlenecks penalize the optimization of the network use. The rail freight transport market share remains low whereas for environmental reasons immediate progress is required. Capacity4Rail intends to analyze the key factors enabling rail freight market share to increase on the most promising segments.

The innovations planned by Capacity4Rail are concentrated on three macro-areas from the concept to simulations and tests: wagon structure design, wagon equipment technology and train maneuverability.

For the wagon structure, the project focuses on the new design giving direct efficiency: better payload, less deadweight, extended usable length, maintenance cost reduction. With a reduced weight due to the use of new materials the design evolution allows to make the best use of the gauge profile.

For the wagon equipment technology a continuous electric line carrying a bus of information all along the train and bringing energy to the wagon allows placing various sensors increasing safety and reliability. With this new wagon connectivity, predictive maintenance is developed but also accurate real time information are available for the customers enhancing the planning efficiency of the next supply chain evolution. The wagons are equipped with an electric command of the pneumatic brakes for an instant and simultaneous braking and releasing. The brakes of all wagons reduces drastically the longitudinal forces in the couplings enabling progressive lengthening of the train reducing operational costs and network capacity consumption per ton transported.

For the train, this new braking system improves its maneuverability, giving access to better paths aiming to reduce the wear of the wheels created by the new brake composite shoes imposed for noise reduction.

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All these potential progress are researched and checked in terms of affordability taking into account not only the global added value created but an equitable reward of all the stakeholders having invested for such innovations. Proposed roadmaps incorporate viable business models for a progressive implementation on the basis of simulations. A virtuous circle is initiated improving the use of assets, reducing noise, informing customers more efficiently, reducing maintenance and operational costs in an affordable way.

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*Keywords:* transport industrialization; economies of scale; wagons design and structures; wagons technologies; continuous electric line; safety and reliability; capacity increase; trains manoeuvrability; operational costs reduction

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## 1. Introduction

Rail freight transport is today characterized by inefficiencies in the use of the existing infrastructure while the growing demand is activated by giant containers vessels handling thousands of units in the ports. Lack of industrialization prevents gaining from economies of scale while bottlenecks penalize the optimization of the network use. The rail freight transport market share remains low whereas for environmental reasons immediate progress is required. Capacity4Rail intends to analyse some key factors enabling rail freight market share to increase on the most promising segments.

The innovations planned by Capacity4Rail are concentrated on four macro-areas from the concept to simulations or up to physical test in full operating conditions:

- wagon structure design;
- wagon equipment technology;
- train length extension;
- train manoeuvrability.

## 2. Beyond the state of the art

### 2.1. Wagon structure design

For the wagon structure design, the project focuses on the new design giving direct efficiency such as better payload, less deadweight, extended usable length, increased flexibility and maintenance cost reduction. With a reduced weight due to new materials utilisation, the new design evolution allows to take advantage of the prevailing gauge profile of the European network improving the trains' productivity. The wagons' design incorporated the market demand for increased flexibility in order to reduce the empty running making the skeletal flat wagons for containers/swap bodies, usable for other types of cargos. This is made possible by fitting these wagons with folding elements or platforms adapters perfectly satisfying all operating and safety requirements. These concepts have gone well beyond the test phase since leading wagons keepers and rail/intermodal operators introduced them into their services schedules to be offered in the market place. Some pictures of these wagons in use constitute a better description than any technical commentary.

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