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Dr Clemente Fuggini, Phd, is a civil engineer specialized in structural monitoring, structural control, smart structures and systems, reliability analysis and numerical models. Clemente has worked for D'Appolonia S.p.A. since 2009 being involved in different projects in the area of transport, construction and security. In Sustrail, he serves as assistant project coordinator as well as main contact point for D'Appolonia (TRAIN) activities in WP3, WP4 and WP8



GLOBAL
RAIL
FREIGHT
CONFERENCE

SEAMLESS TRANSPORT CHAINS THROUGH HARMONISATION

Success Stories and Global Perspectives for Rail Freight

Sustrail Project An Integrated Approach in Freight Rail

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Motivations and Aims

Freight transport volumes are expected to grow by 38% by 2030

A modal shift of freights from road to other transport mode (rail and waterborne) of 30% by 2030 is needed

Congestion is becoming unsustainable. Moving freight by road is one of the main causes



Changes are needed, necessary, opportunistic

EU27 rail freight forecasts, 2005&2050 market share (TRANSvisions, 2009)

Source: Eurostat Values in %	2010		
	Roads	Railways	Inland waterways
EU-27	76.4	17.1	6.5
Germany	64.9	22.2	12.9
Greece	98.0	2.0	-
Spain	95.8	4.2	-
France	82.2	13.5	4.3
Italy	90.4	9.6	0.1
Sweden	60.7	39.3	-
United Kingdom	88.7	11.2	0.1

	%tkm 2005	%tkm 2050
%Road	47	40
%Rail	12	18
%Maritime	41	42

Sustrail at a glance

- In this scenario, Sustrail was launched on June 2011 aiming at *Improving sustainability & competitiveness of railway freight, taking a whole system approach (vehicle+track) to allow freight to run at higher speed,*



Consortium

A systemic Approach

Novel design materials
for lightweight high
performance freight vehicles,
bogies and brake systems



Improvements in
braking and
suspension design

Advanced vehicle
dynamics, including new
wheels profile for a low
impact freight vehicle

Demonstration of
technological solutions

Optimised of track
system design and
geometry coupled
with low impact
vehicle.

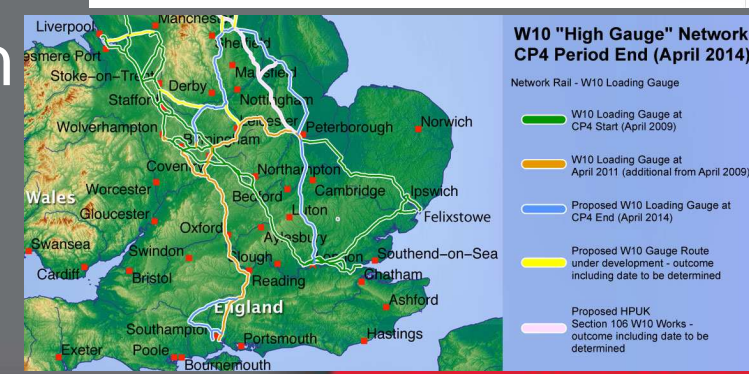
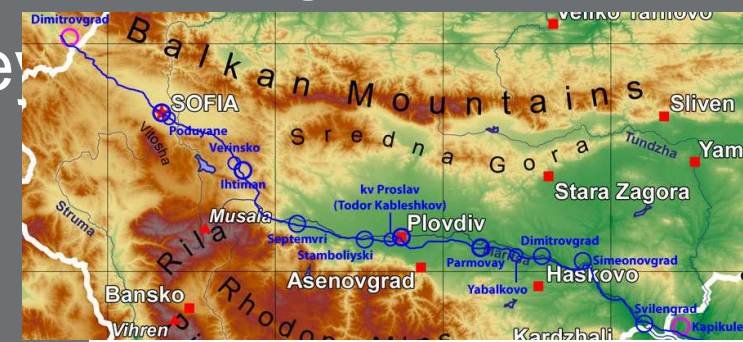
Track condition
monitoring to
reduce track
degradation

Investigation of
economics impacts
LCC and RAMS
under the project
Pillars of
Sustainability,
Competitiveness,
and Availability



Routes - benchmarking

- Bulgaria: Serbian Border to Turkey
 - Average train length 500m
- Spain: Mediterranean Corridor from Barcelona to Valencia
 - Electrified, double track, mixed
- UK: Felixstowe and Southampton to Warrington
 - slow lines, stops by passenger service



Priorities & Opportunities

- Criteria:
 - Availability ↑; Costs ↓; Service Quality ↑;
 - Environmental Footprint ↓; Technical Viability

Priority Level	Duty Requirements for Improvement	System
High	1. Modest increase in freight speed (e.g. 120-140kph UK; 100-120kph ES,BG)	whole
	3. Optimise axle load limits (22.5t / 25t / 17-20t)	whole
	7. (20%) reduction in energy used by rail vehicles	vehicle
	12. Requirement for Vehicle Green Label for sustainability performance	vehicle

EU general	Spain route	UK route	Bulgaria route
Target higher freight operating speeds	e.g. 100→120km/h	e.g. 120→145km/h	increase
Investment in terminals	✓	✓	✓
Gauge enhancement	✓	✓	
Increase axle load capability	✓	?	?
Longer trains	✓	✓	✓

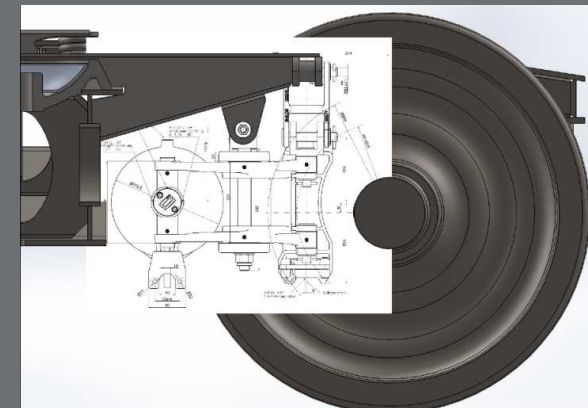
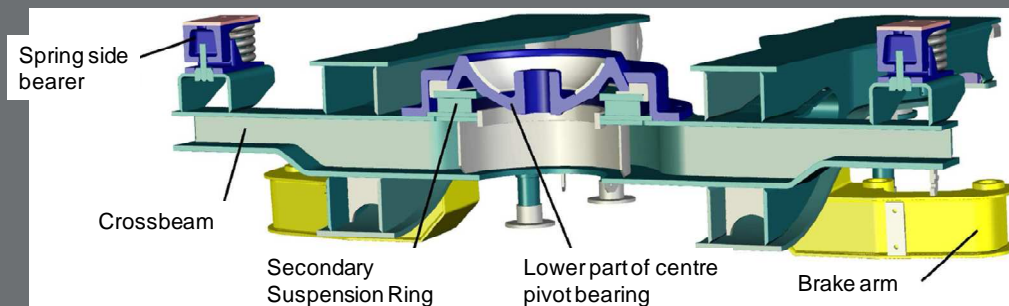
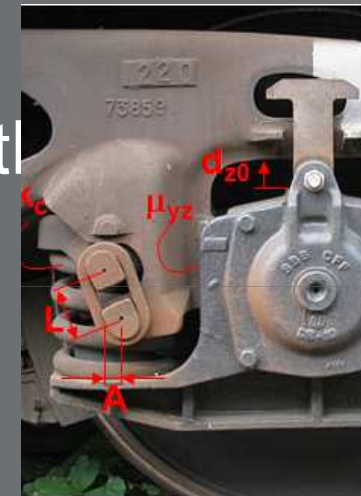
The Sustrail Freight Vehicle

- Improved running behavior with reduced environmental impact
 - Optimized Y25 bogie and wheelset
 - Optimized braking system (disc brakes) for noise emission reduction (3db)
 - Increased capacity & lightweight materials

SUSTRAIL vehicle specification		Max axle load /T		
		17	22.5	25
Max speed	120	√	√	√
/km/h	140	√		

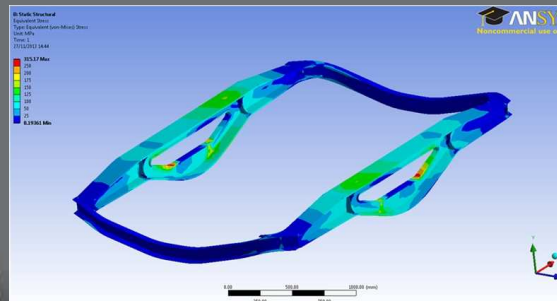
The Sustrail Freight Vehicle

- Highlights:
 - SUSTRAIL bogie (Optimized Y25) with
 - double lenoir links
 - steering links
 - secondary suspension
 - disk brake system



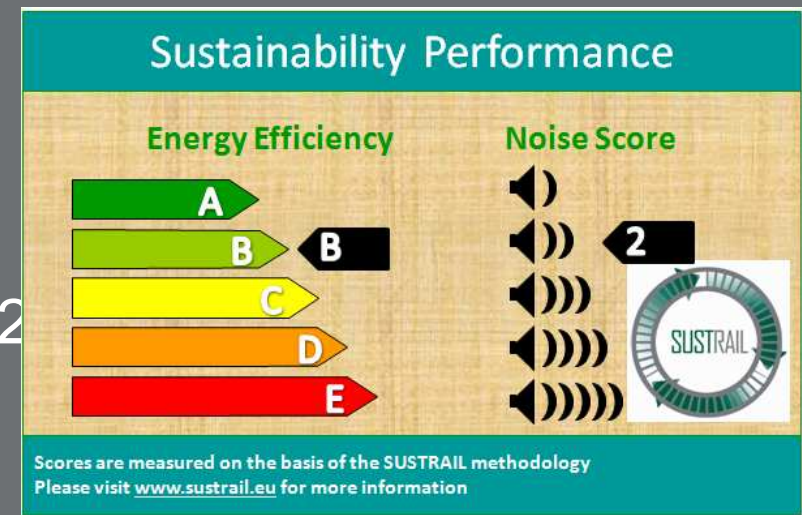
The Sustrail Freight Vehicle

- Highlights:
 - SUSTRAIL body - Special freight vehicle with bogies (Class S) using:
 - Lightweight materials
 - High strength steel vs. Novel steel profiles
 - Multifunctional solutions (different commodities)
 - Modular design



The Sustrail Freight Vehicle

- How to measure the Sustrail sustainability?
 - Through a “Sustrail Environmental Product Declaration (EPD)”
- EPD will account for:
 - Technical specifications
 - Environmental impact (CO₂)
 - Noise emissions



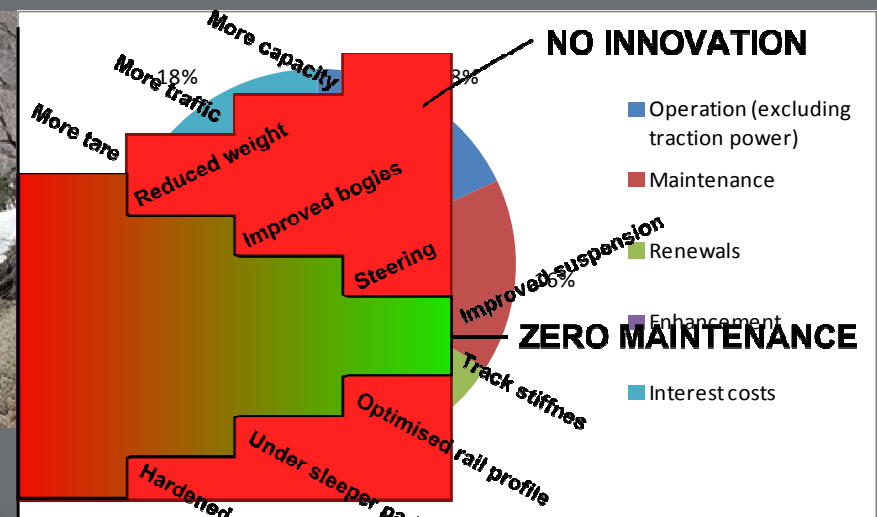
The Sustrail Track

- Where to impact and what is the aim
 - Maintenance + renewal of a typical railway track and represents 50–60% of the total costs of over its service life
 - Geometry deterioration can even increase it



Railway embankment along Plymouth

Endurance gap/total system maintenance



Courtesy of Network Rail



line in UK, 2013

The Sustrail Track

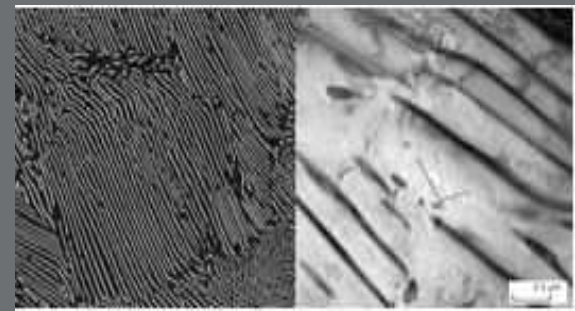
- Main failures and associated Sustrail

“innovations”

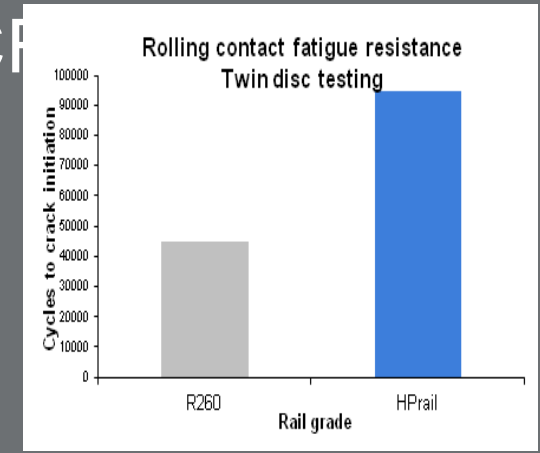
Rail	<ul style="list-style-type: none"> • Increase rail cross section (reduce occurrence) • Rail grinding (minimize severity) through Improved predictions of RCF damage • Improved rail material (reduce occurrence) through the use of premium rail steel
Earthworks	<ul style="list-style-type: none"> • Slope stabilization (minimize severity) through multifunctional geotextiles • Resilient earthworks (minimize severity) through new designs and/or technologies for substructure, validation of previous innovation in the domain
Track	<ul style="list-style-type: none"> • Geometry monitoring on appropriate frequency (improve detection) through improved methods for geometry degradation prediction
S&C	<ul style="list-style-type: none"> • Lubrication system (minimize the severity) to improve lubrication regime for slide plates • Ultrasonic testing (improve the detection) • Improved rail material (reduce occurrence) through Optimised flexibility of S&C

The Sustrail Track

- The Impact of Innovations (an example)
 - The use of Premium Rail Steel to prevent and reduce rolling contact fatigue (RCF)



Courtesy of Tata Steel



Courtesy of Tata Steel


– IMPACT

What	Which component of the infrastructure	Innovation	technical impact	Infrastructure Manager	Railway Operator	Wagon Owner	Freight Owner	Infrastructure Component Supplier	Wagon Builder	Logistic Service Provider	Freight Handling (terminal operator)	Infrastructure Construction & Maintenance Service Provider	Fleet Maintenance Service Provider	Administration	Society
Premium rail steel	Rail	Premium rail steel	Premium rail steel - (reduce occurrence)	reduce occurrence of rail fatigue; potential differentiation of track access charge between lines with standard and premium rail	improved reliability of operation due to reduced track maintenance	less impact on wheel	improved rail transport service	supply of premium rail steel at an economical price		improved rail transport service		adaptation of welding procedures; logistics of various types of rail quality (standard, premium)	observation of wheel wear behaviour	approval of differentiated track access charge; approval of adapted maintenance regime	less rail noise; less emissions due to reduced maintenance

Conclusions

- SUSTRAIL will run until May 2015 aimed at innovations impacting on both infrastructure and vehicles

Contact us @ www.sustrail.eu



The screenshot shows the Sustrail website interface. At the top left is the Sustrail logo, which includes a circular graphic with 'SUSTRAIL' text and a '7' logo for the 'SEVENTH FRAMEWORK PROGRAMME'. To the right is the European Union flag with the text 'Project co-funded by the European Commission'. Below the logo is a search bar and a navigation menu with items: 'About SUSTRAIL', 'Participants', 'Virtual demonstration', 'Publications', 'Deliverables', 'News', 'Events', 'Contact', and 'Members area'. The main content area features the heading 'About SUSTRAIL' and a description: 'The sustainable freight railway: Designing the freight vehicle – track system for higher delivered tonnage with improved availability at reduced cost'. Underneath, there is an 'Objectives' section with a list of goals: 'The Sustrail objective is to contribute to the rail freight system to allow it to regain position and market, accounting for: - The increase of the demand of the total freight transport volumes: 40% (in tonne-kilometres) by 2030 and 80% by 2050; - The shift of 30% of road freight over 300km to other modes such as rail or waterborne transport by 2030 (50% by 2050) as targeted by the European Commission.'

For any questions please emails to

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