



UIC

**HIGHSPEED**

Morocco 2023

*HIGH-SPEED RAIL : THE RIGHT SPEED FOR OUR PLANET*

Under the High Patronage of his Majesty King Mohammed VI

# Session3.4, Room Karam3

## Operational performance / RAMS

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Moderator : Ms. Asako TOGARI  
Deputy Director,

East Japan Railway Company Paris Office, Japan





## Session3.4

### Operational performance / RAMS

### Speaker Lists;

1



Mr.Danilo  
Sorrentino

France

2



Mr.HICHAM  
EI MESKINI

Morocco

3



Ms.Patrícia  
Ferreira

Portugal

4



Ms.Virginie  
PAPILLAULT

France

5



Mr.Valéry  
BOUCLET

France

6



Mr.Jean-Bruno  
DELRUE

France



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11<sup>TH</sup> WORLD CONGRESS OF HIGH-SPEED RAIL

**Marrakech, 7-10 MARCH 2023**

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# **The use of dynamic simulations for the certification of the Moroccan new High-Speed Line Tanger-Kénitra**

**Danilo Sorrentino**, Patrick Dupont, Emmanuel Laurans, Gilles Saussine, Pascal Courcier  
Head of Vehicle-Track Interaction Section, SNCF Réseau, France  
Session4-3.4 Operational performance / RAMS



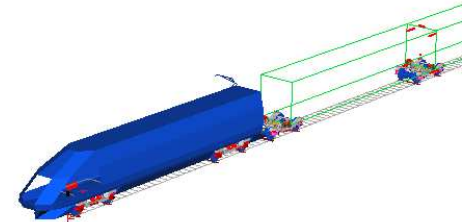
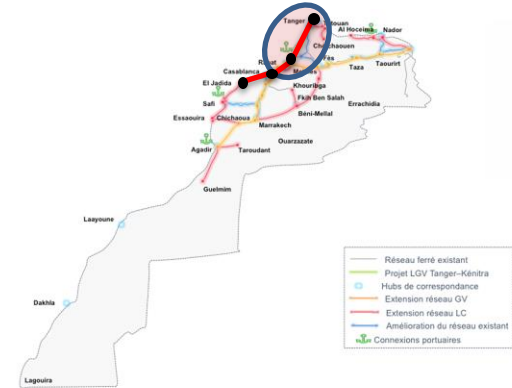


## CERTIFICATION OF NEW LINES BY DYNAMIC INTEGRATION TESTS

### Certification of the infrastructure

- ❖ **Safety**: infrastructure system must work properly
- ❖ **Cost**: large number of test runs at different speeds
- ❖ **Risk**: over-speed derailment

### LGV Tanger - Kénitra





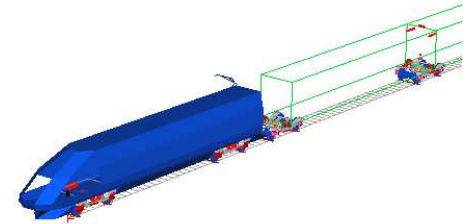
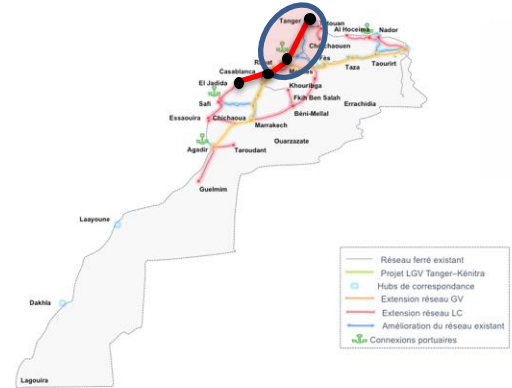
## MULTI-BODY SIMULATION FOR THE CERTIFICATION

Improved infrastructure certification

- ❖ **Safety**: extended test conditions  
(e.g. train speed)
- ❖ **Cost**: reduced number of expensive  
test runs
- ❖ **Risk**: replacement of problematic  
measurements by simulation  
(e.g. over-speed)



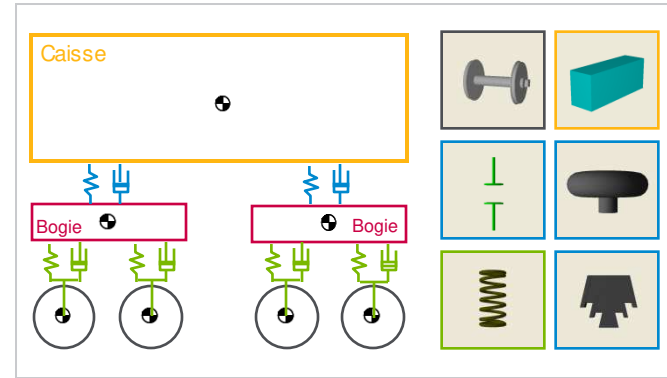
### LGV Tanger - Kénitra



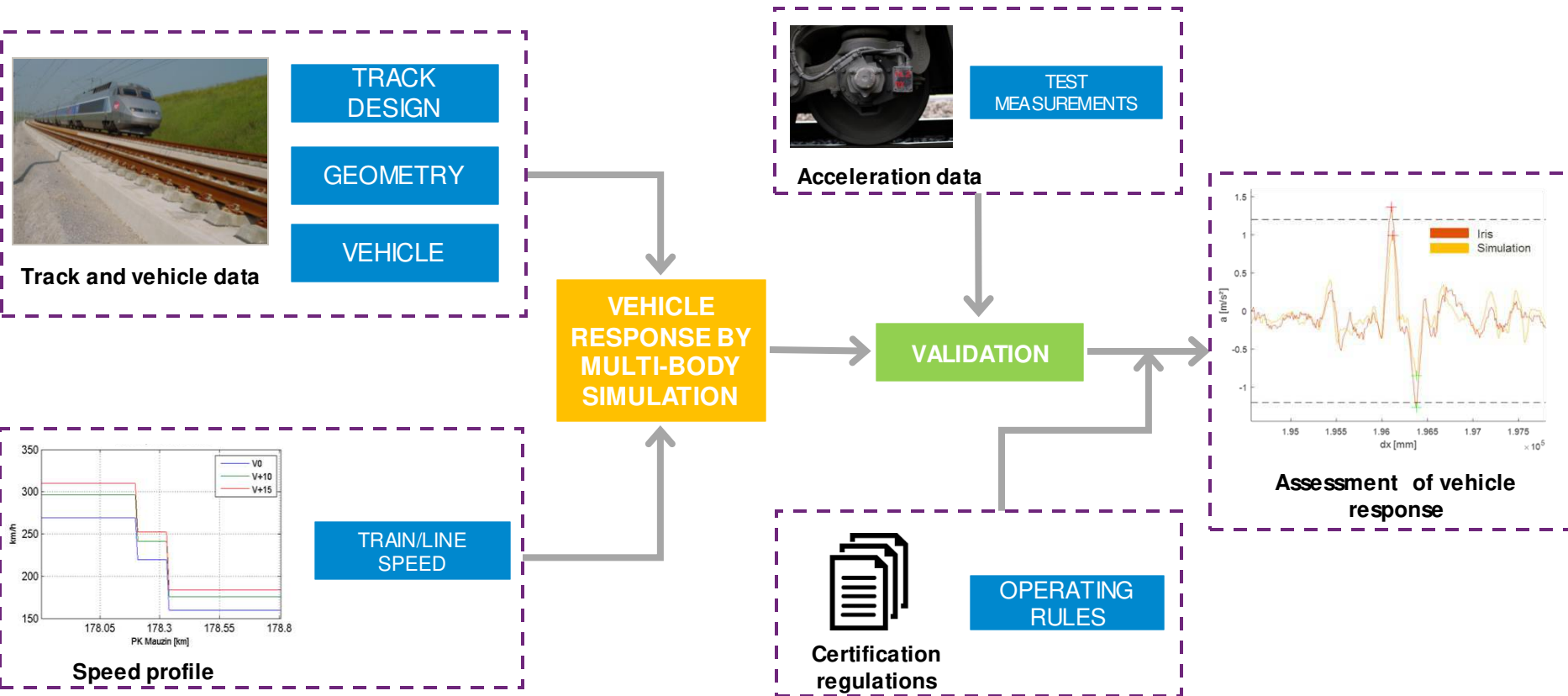
## WHAT IS MULTI-BODY SIMULATION ?

## High-speed train model (TGV Duplex)

- ❖ **Train model:** system composed of rigid bodies and suspensions
- ❖ **Track model:** track geometry and design coming from measurements
- ❖ **Dynamics:** real or theoretical train speeds with simulated wheel-rail contact
- ❖ **Output:** forces and accelerations in measurement points



## THE CERTIFICATION PROCESS

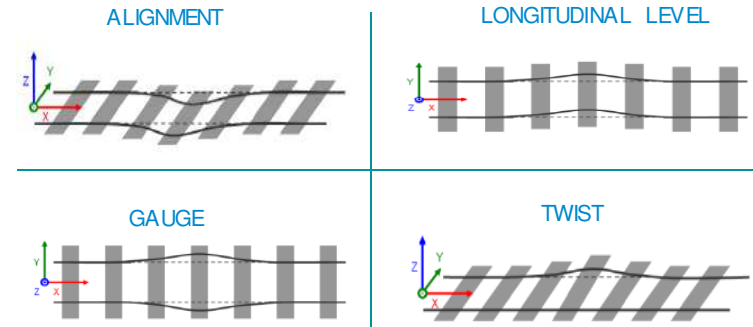




## MEASUREMENT OF THE TRACK GEOMETRY

Dedicated Track geometry recording train

- ❖ **Measurements** for track assessment
- ❖ **Treatment** for simulation purposes
- ❖ **Data Verification** with theoretical data or cross-check
- ❖ **Track defects** as input for simulations



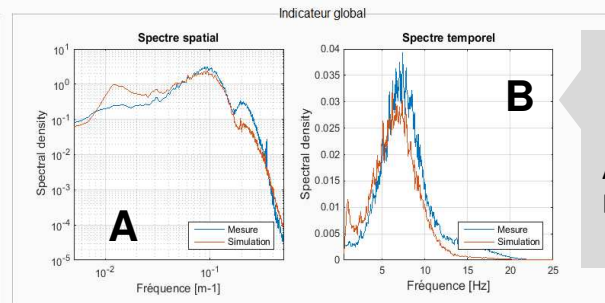
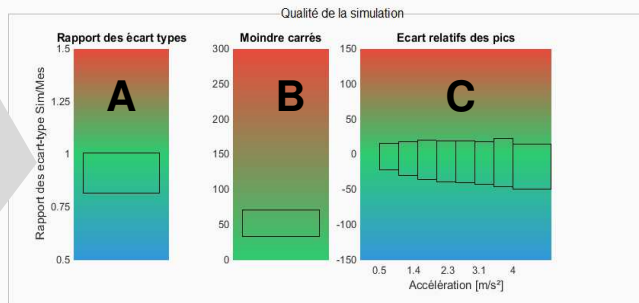


## VALIDATION OF THE VEHICLE MODEL

### Simulation Quality

#### Error distribution

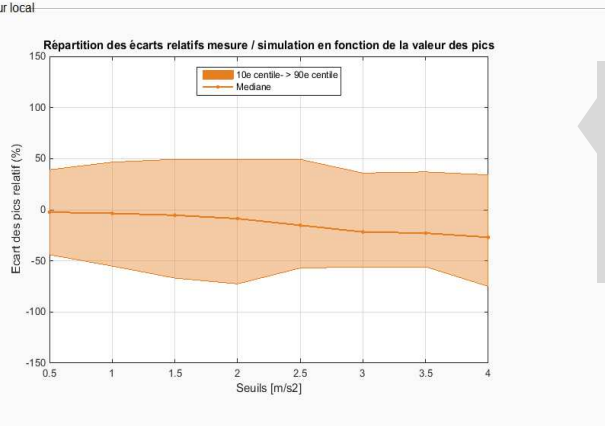
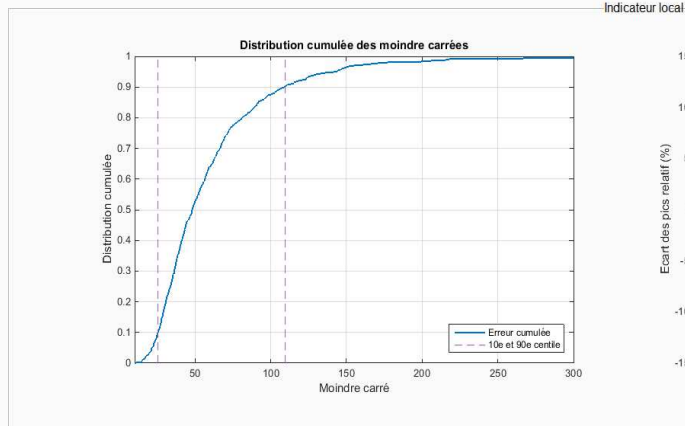
- A. Standard deviation in sections
- B. Least mean square error in sections
- C. Peak error based on threshold level



### Global Indicator

#### Spectral analysis

- A. Space domain
- B. Time domain



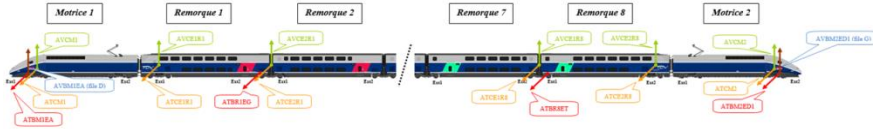
### ted tions

### Uncertainty estimation

Function of the  
response  
amplitude

S VEHICLE

# CERTIFICATION OF THE HIGH-SPEED LINE TANGER – KENITRA

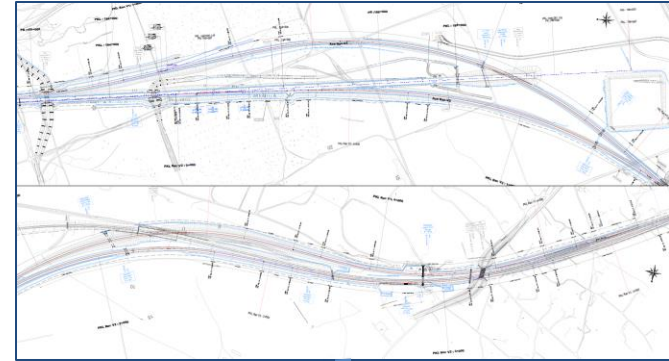


## Analysed measurements of the High-Speed train

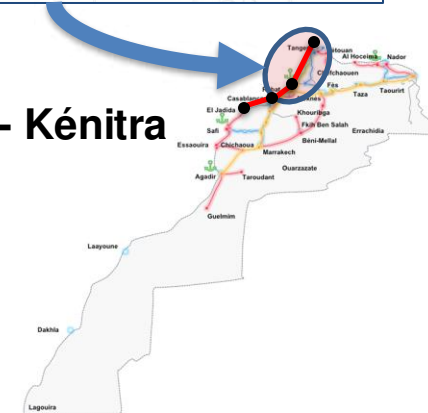
## Numerical simulations for 2 connections to the classic (already existing) railway network



 **Kénitra**



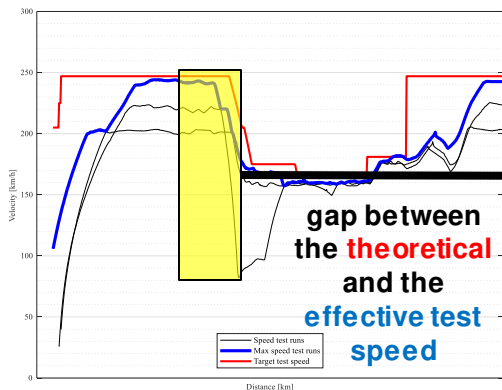
## LGV Tanger - Kénitra





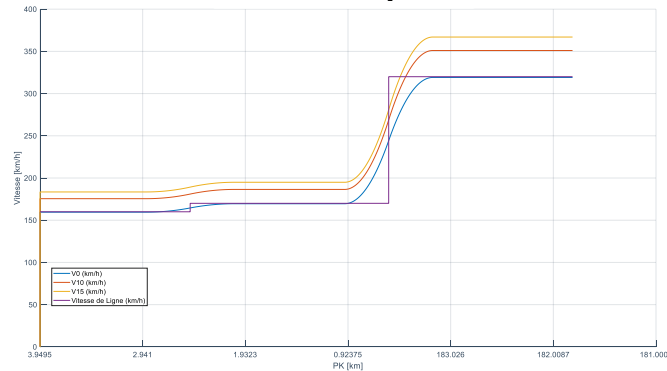
## FOCUS ON KENITRA CONNECTION

Real Speed  
profiles during  
dynamic test  
runs



Simulation at  
theoretical  
speed

Simulated Speeds



## ANALYSIS OF THE DYNAMIC RESPONSE

### Analysis of the three different speed profiles

- + **V0** → Acceleration limits respected
- + **V+10** → One significant zone detected
- + **V+15** → Three significant zones detected

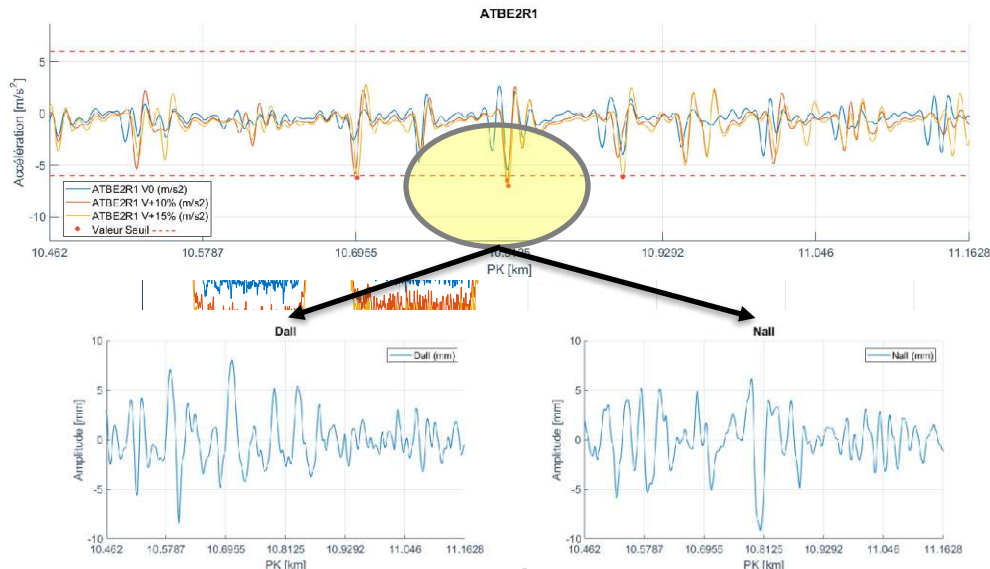
These zones are not critical for the train dynamics, but maintenance is required!

**Three different speed profiles have been analysed**

**V** = future operating speed

**V+10** = future operating speed +10%

**V+15** = future operating speed +15 %



These three speed profiles have been analysed accurately the dynamic behaviour of the vehicle for very different speed profiles



## DYNAMIC SIMULATIONS FOR THE CERTIFICATION

### Dynamic simulations brought additional information

- Analysis of critical zones (gap theoretical and real test speed)
- Flexible and fast analysis for various speed line profiles
- Support for measurement teams
- More reliable and robust high speed line certification (measurements and simulation analysis)





## CONCLUSION AND PERSPECTIVES

- Today simulation can predict with high accuracy train dynamics on real railway tracks
- A new reliable and a robust certification process was applied to the new ONCF High-Speed Line Tanger-Kénitra
- Simulation brings additional information to test run measurements
- Critical track defects can be detected where measurements at target test speed are not available
- Validation process is fundamental, and an international standardised process should be proposed in the future

**Multi-body simulation played an important role for the certification of the new ONCF High-Speed Line Tanger-Kénitra**



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# THANK YOU FOR YOUR KIND ATTENTION

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**Highlighting the  
technological advancement  
of the HSL compared to the  
conventional ONCF line**

HICHAM, EL MESKINI  
Position, ONCF, MAROC

Session4-3.4 Operational performance /RAMS







## plan of the presentation

1. The signaling system.
2. Technological difference
3. Organizational difference of the maintenance
  - 3.1 Maintenance conditions
  - 3.2 Equipment required for HSL maintenance
  - 3.3 HSL maintenance profiles and training



## The signaling system

### The 5 problems

- ❖ Circulation Spacing to avoid catching-up
- ❖ Traffic protection in the establishments (convergence, shear, etc.),
- ❖ traffic, in both directions, on the same way
- ❖ Risk of derailment due to excessive speed,
- ❖ The crossing of railway tracks by roads on the same level (level crossings).



## The signaling system

### Classical signaling limitation

The experience acquired with lateral signaling on conventional lines has shown the limits of this system and the difficulty of transposing it to a high-speed infrastructure:

- ❖ Punctual information when passing each signal (no information on the evolution of the signal between two signals),
- ❖ Visual observation of the next signal is sometimes difficult, for topographical or simply atmospheric reasons (rain, fog, snow, etc.),
- ❖ Lack of flexibility after passing a closed signal as long as the next signal (which may open) has not been identified with certainty.
- ❖ The contribution of the pre-announcement (flashing green light), which adds a block to the stop sequence, does not solve the problem of speeds above 220 km/h.



## Technological difference

### Signaling of the classic line

- ❖ interlocking posts
- ❖ Train spacing installation
- ❖ level crossings

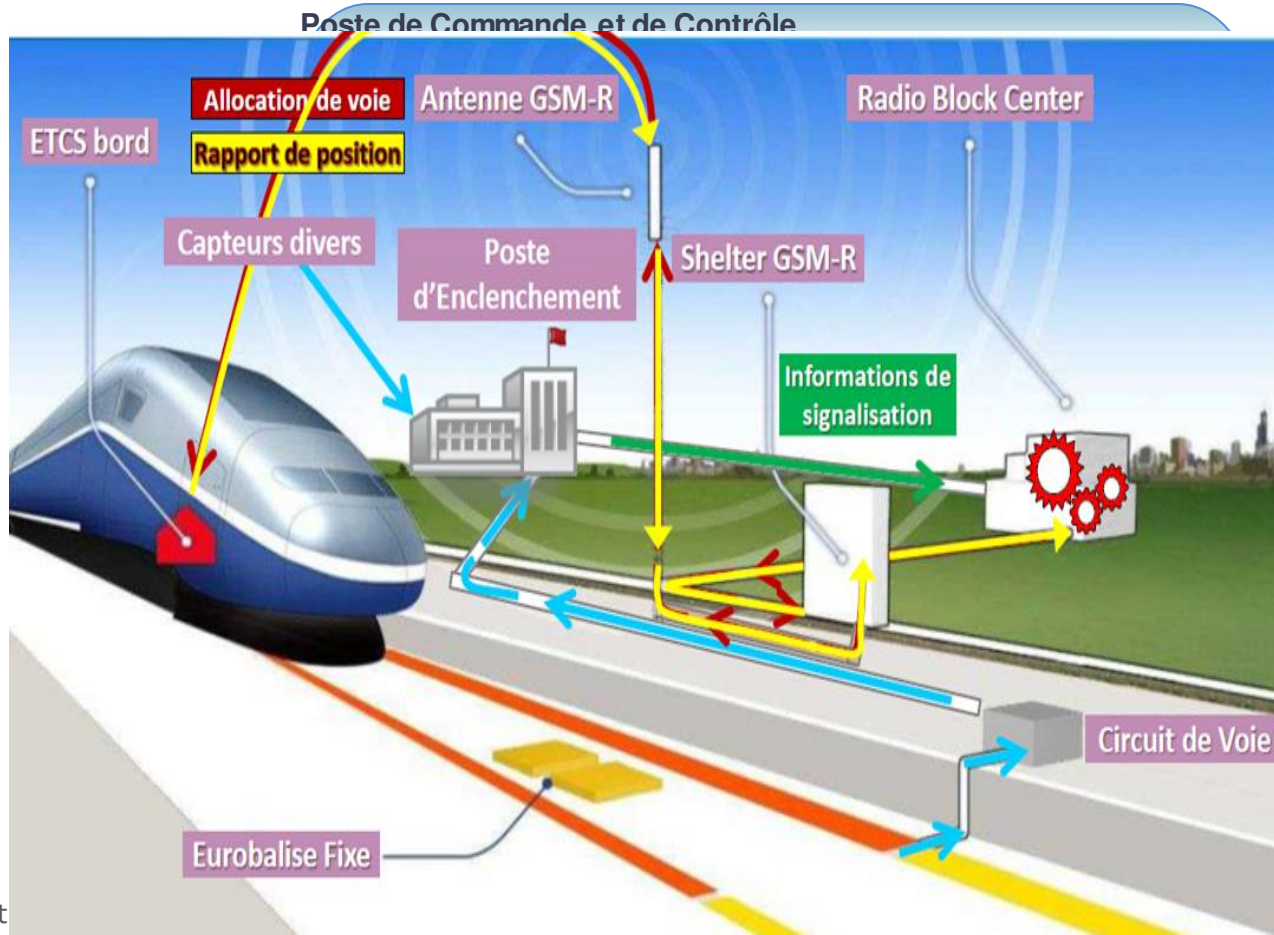




## Technological difference

### High speed signaling

- ❖ Signaling
- ❖ centralized control PCD
- ❖ Remote monitoring
- ❖ Energy
- ❖ safety



Highlighting the technological advancement



## Technological difference

### High speed signaling

#### ❖ Signaling:

- interlocking post SEI 2006
- ERTMS L2 (Continuous transmission ATP (radio GSM-R), RBC, balise)
- Sensors (DVL, DSI, DCV)

#### ❖ Centralized control PCD

- traffic management
- Management of temporary signaling (GEST)
- Automatic train programming

#### ❖ Remote monitoring

- Assistance in the maintenance of signaling subsystems,
- Energy,
- Concentration of maintenance information



## Technological difference

## High speed signaling

❖ Telecommunication :

- Multi-service network
- Telephony

◆ Energy :

- Main and emergency power supply

## Safety

- Anti-intrusion system,
- Video surveillance,
- Access control







## Organizational difference of the maintenance

### Maintenance conditions

In order to ensure the maintenance of the high-speed lines, traffic interruptions are essential both day and night.

- ❖ During the day, to ensure surveillance, work stoppages of 1 hour and 15 minutes between trains, i.e. 1 hour effective, are planned.
- ❖ At night, to ensure maintenance, work stoppages of 6 hours per track, including 4 hours simultaneously, are to be planned.





## Organizational difference of the maintenance

### Equipements required for HSL maintenance

- ❖ Trackside tracks
- ❖ Protective devices for personnel safety
- ❖ Road access
- ❖ Pedestrian access
- ❖ Access devices due to fences (gates and doors).
- ❖ Specific tools



## Organizational difference of the maintenance

### HSL maintenance profiles and training

In addition to the classic line training, HSL maintainers undergo specific training for HSL accreditation:

- ❖ Specific training for the protection of personnel working on the HSL
- ❖ Specific training for the maintenance of HSL equipment (computerized interlocking, ERTMS, centralized control, telecommunications, etc.)



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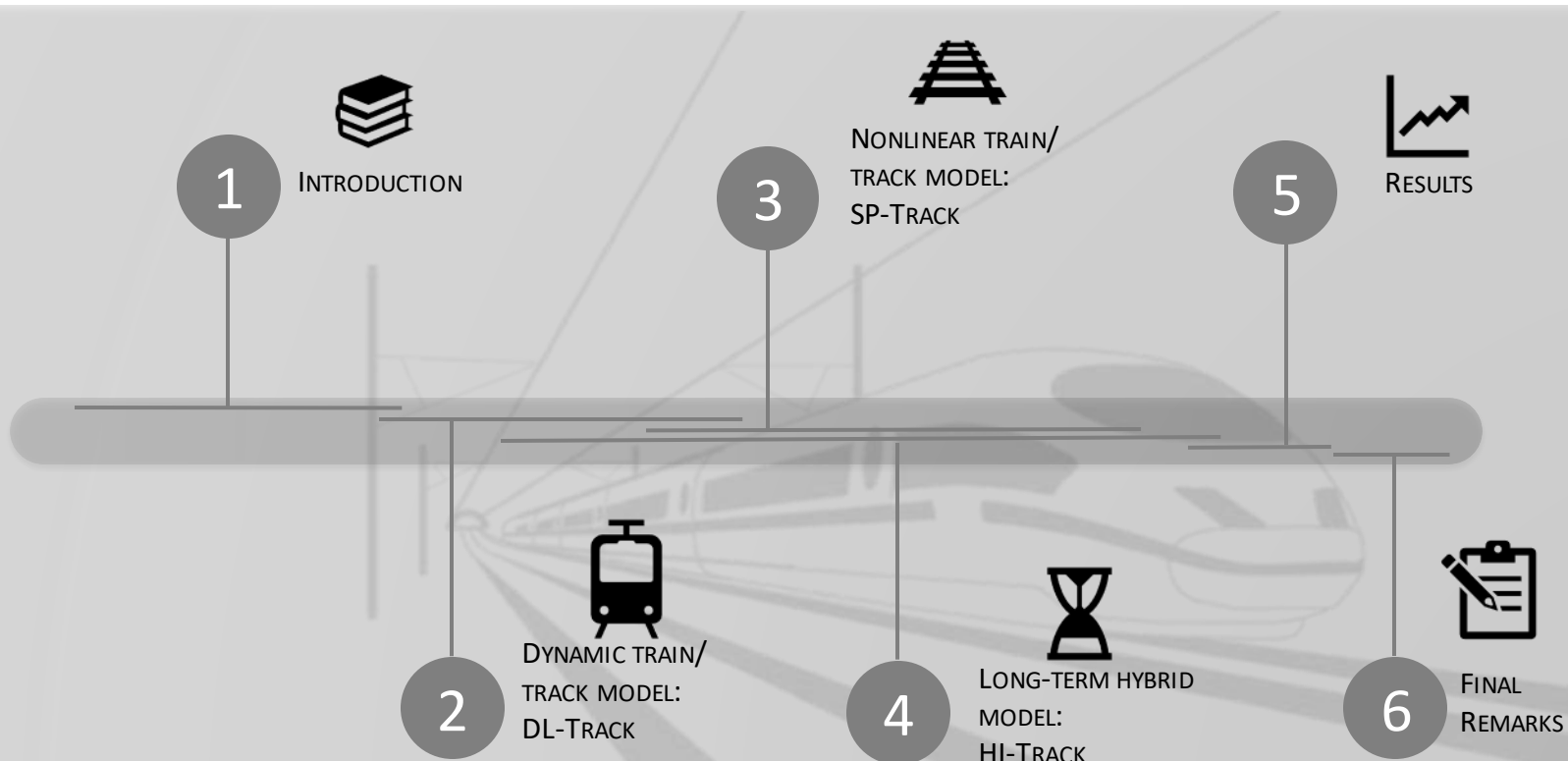
## **A hybrid numerical model for evaluating railway slab track resiliency under atmospheric actions**

Patrícia Ferreira & Samuel Matias  
PhD, Professor      PhD, Researcher  
CERIS, Instituto Superior Técnico, Univ. Lisboa, Portugal



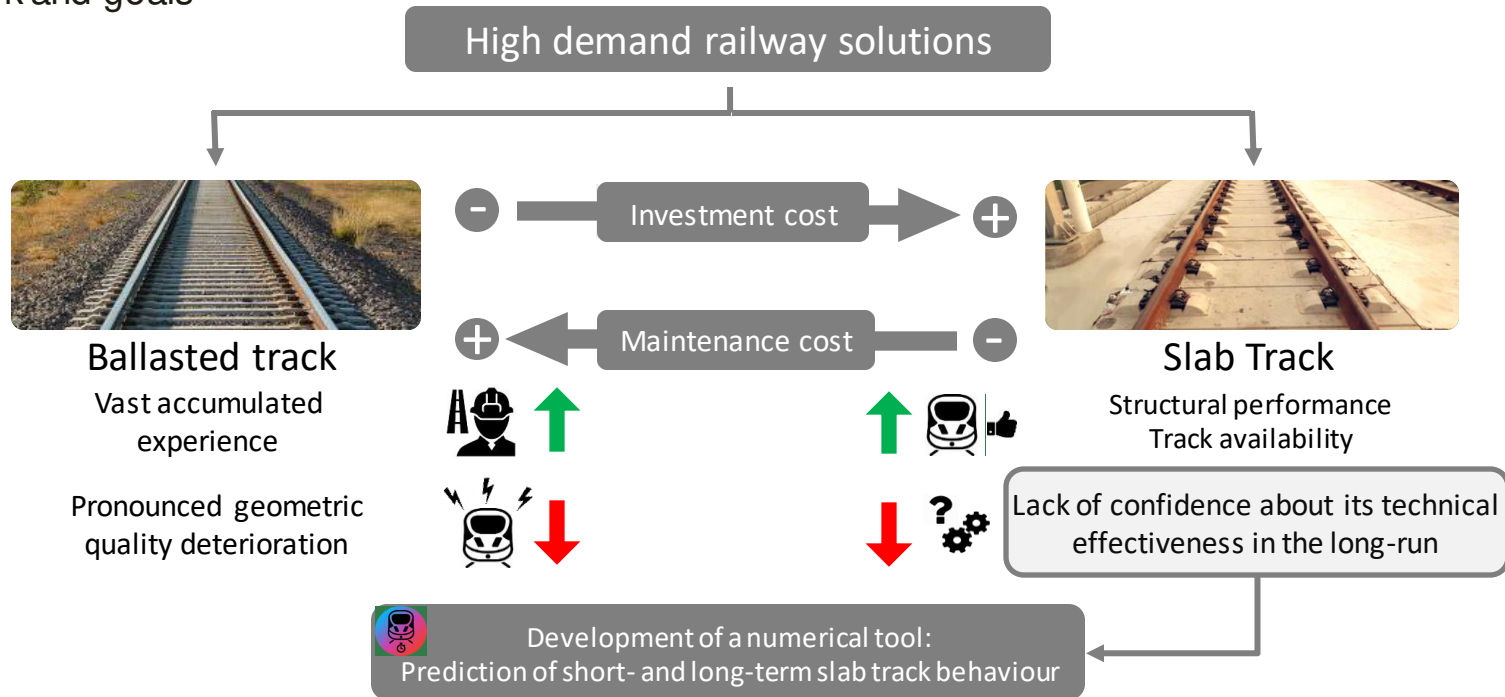
Session4-3.4 Operational Performance/ RAMS





# 1. Introduction

## Framework and goals





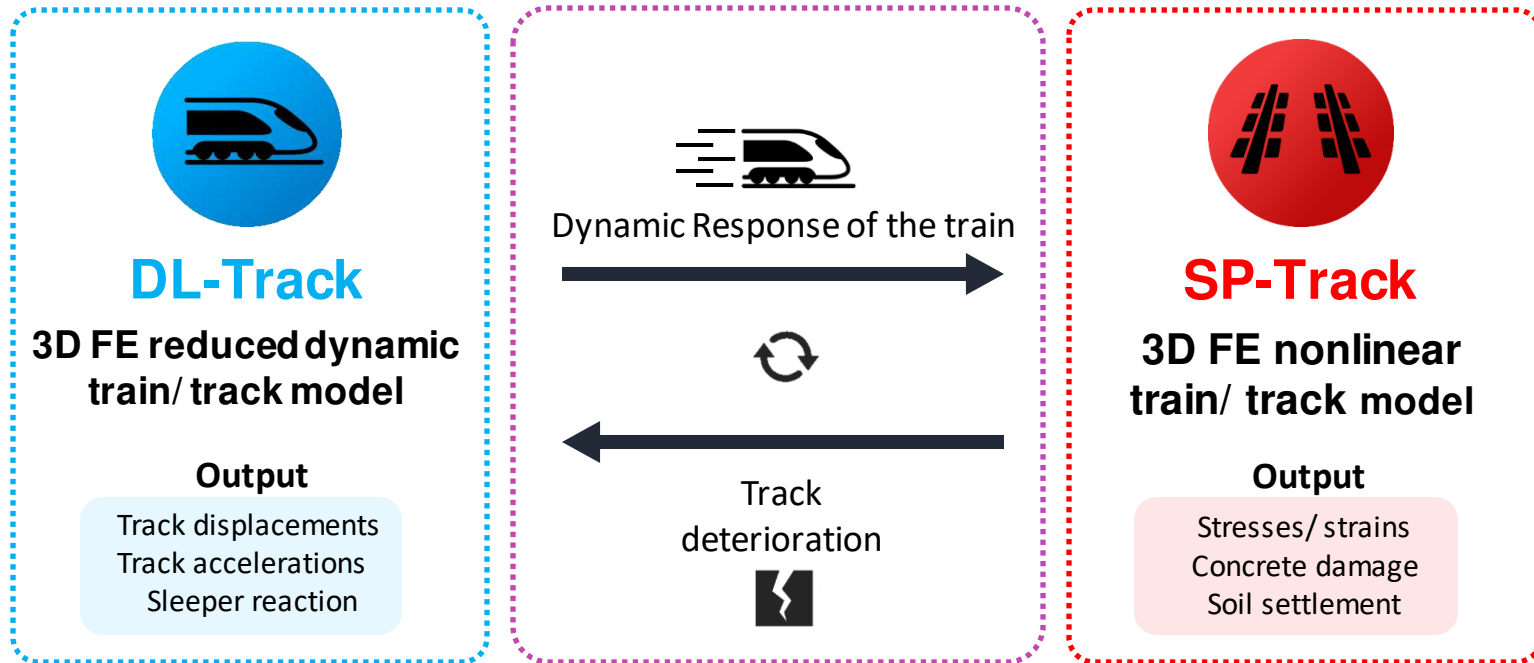
## 1. Introduction

Railway train-track dynamic model

Architecture of HI-Track: a dual approach



**HI-Track**



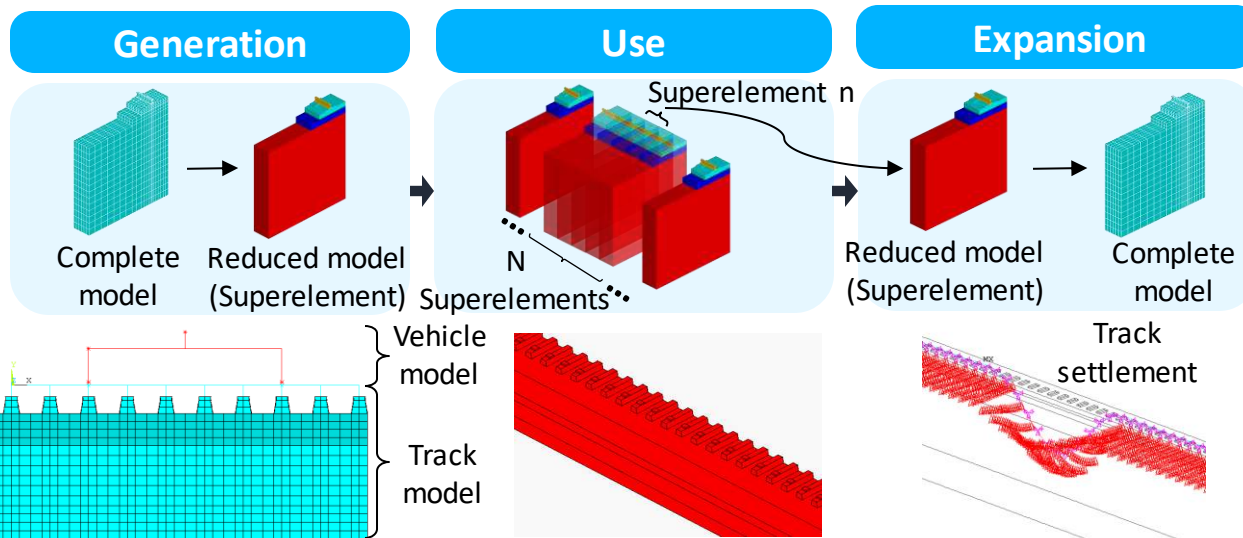
## 2. Dynamic train/ track model: DL-Track

### Track modelling and substructuring analysis



**DL-Track**

**3D FE reduced dynamic train/ track model**



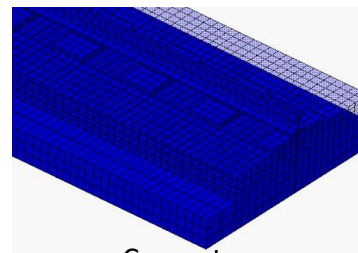
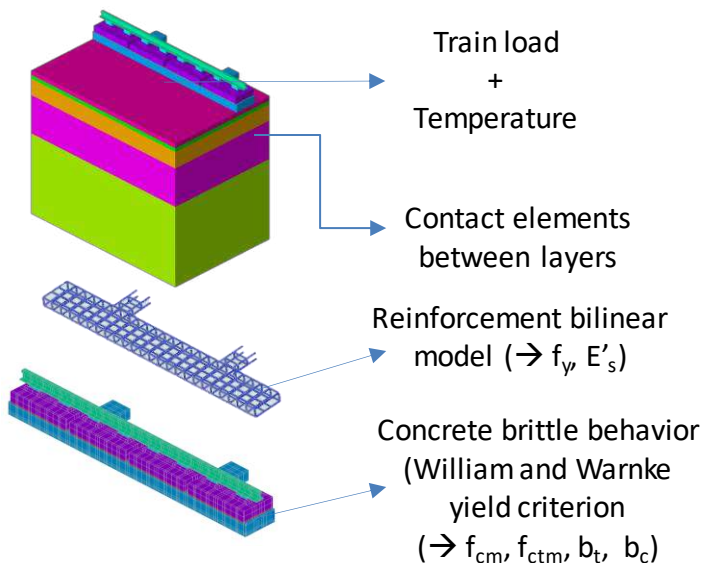


### 3. Nonlinear train/ track model: SP-Track

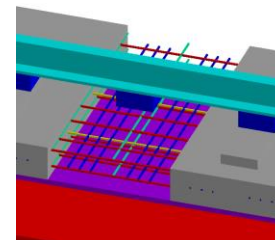
#### Track modelling



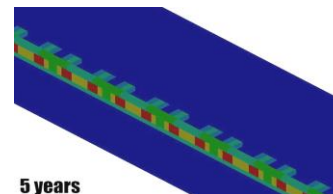
#### **SP-Track** 3D FE nonlinear train/ track model



Concrete  
cracking

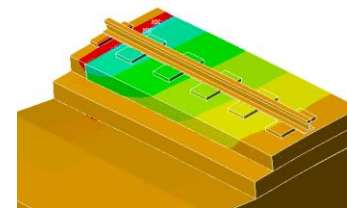


Reinforcement  
detailing



5 years

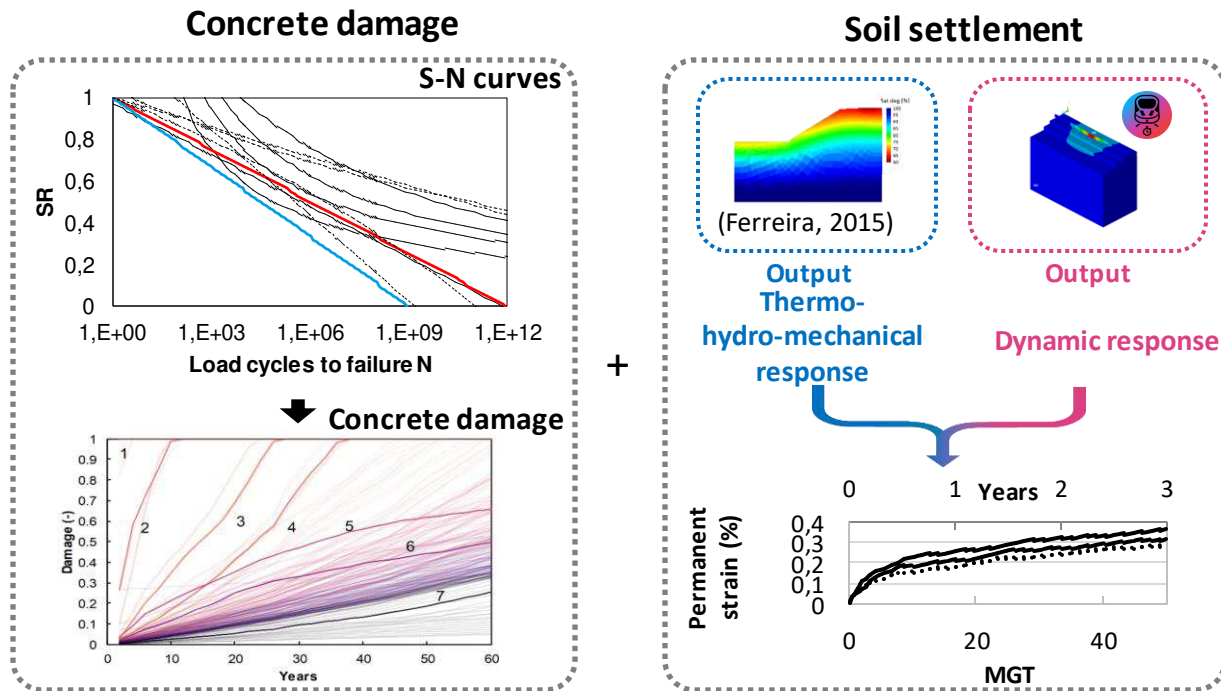
Concrete loss of  
stiffness



Temperature  
differentials

## 4. Long-term hybrid model: HI-Track

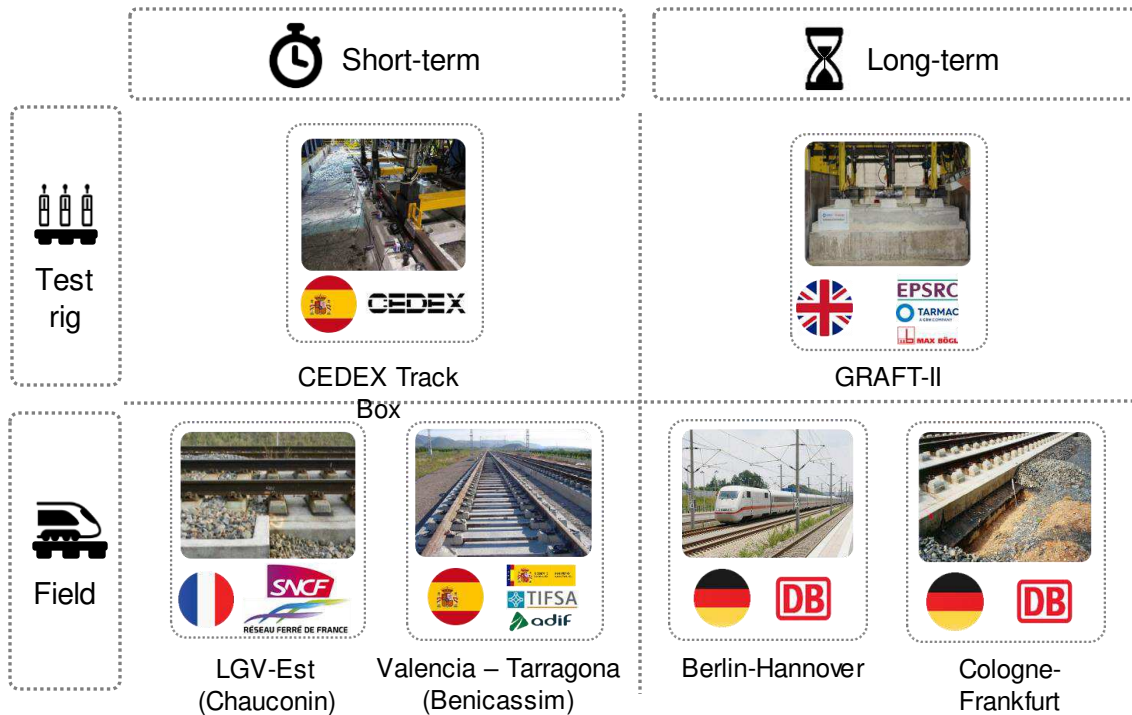
### Track deterioration





## 4. Long-term hybrid model: HI-Track

### Validation and calibration



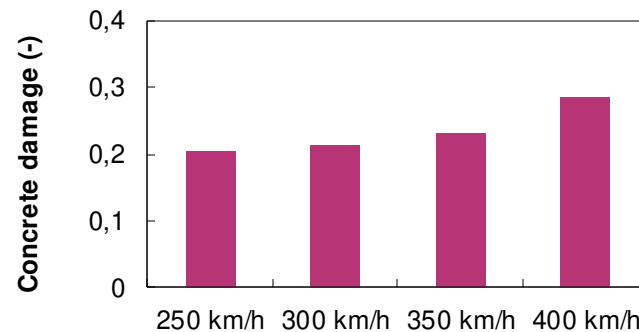
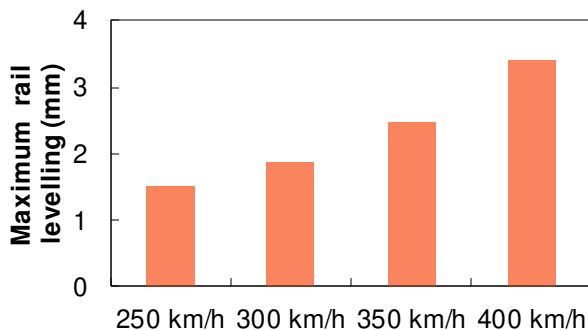


## 5. Results

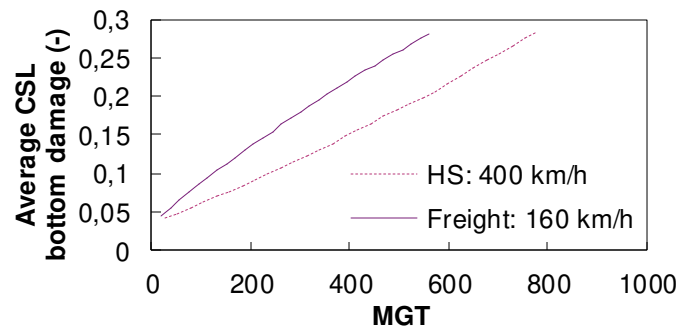
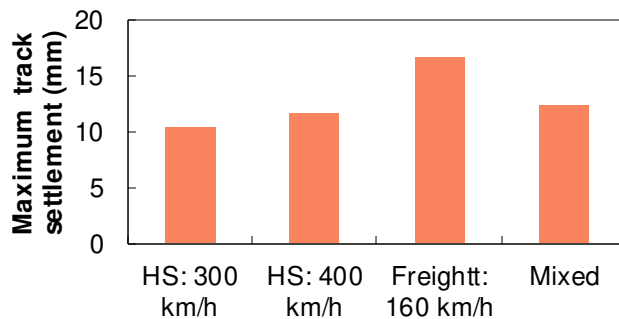
### Traffic



Speed



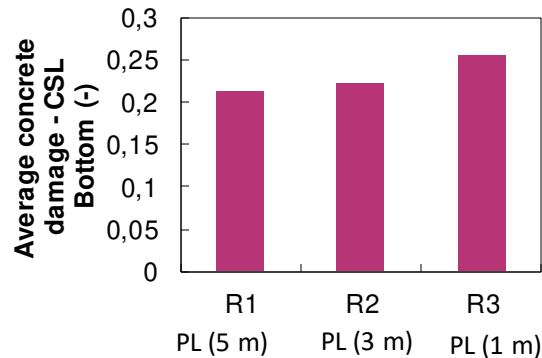
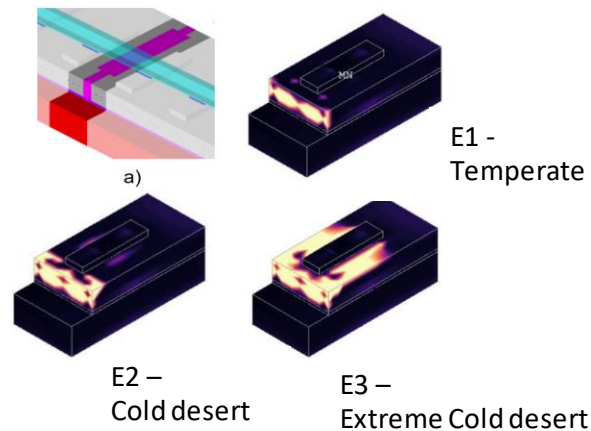
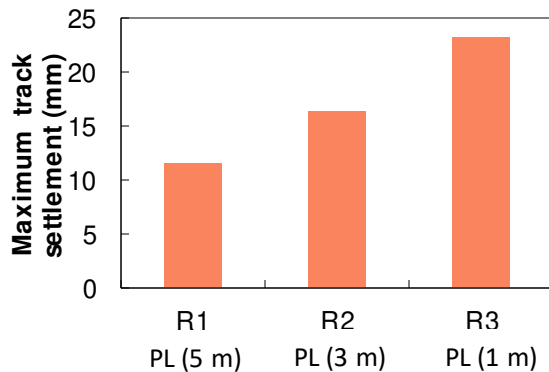
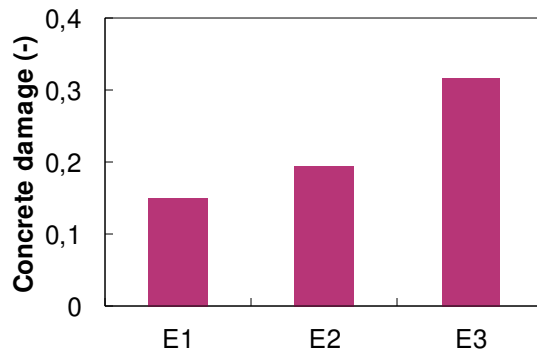
Vehicle





## 5. Results

### Weather events



## 6. Final remarks



### DL-Track

3D FE reduced dynamic  
train/ track model

- ✓ Low file size due to the substructuring technique;
- ✓ Very fast computing;
- ✓ Tridimensional settlement;
- ✓ Fast steady state dynamics.



### HI-Track

Hybrid & Interactive  
long-term model

- ✓ Adaptive time step;
- ✓ Dual approach between sub-models;
- ✓ Properties updating;
- ✓ Weather simulation.



### SP-Track

3D FE nonlinear  
train/ track model

- ✓ Brittle concrete behavior;
- ✓ Rebar detailing;
- ✓ Temperature and transient train load;
- ✓ Slab warping.

It can accurately evaluate:

- Different set and combinations of vehicles;
- Track heterogeneities scenarios;
- Different weather patterns (progressive climate change);
- Different slab track families;
- Upgrading existing systems;
- New reinforcement and recycled material;
- Integration of design recommendations on condition based maintenance programs.



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# THANK YOU



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Samuel Matias  
PhD, Researcher



**CERIS** : Civil Engineering Research  
and Innovation for  
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## **RAIL HOF DIGITAL PLATFORM**

<https://railhof.org/>

Virginie, Papillault  
Manager Human & Organisational Factors and safety  
culture, UIC, France  
Session4-3.4 Operational performance / RAMS







## RAIL HOF – A DIGITAL PLATFORM TO IMPROVE SAFETY

### High level objectives

- ❖ Aviation and nuclear have global networks to build and share knowledge aiming to improve safety and performance in their respective domains;
- ❖ The railway sector does not yet have free access to a similar global network or platform;
- ❖ Concrete cooperation between UIC and ERA and members to promote HOF in the railway sector.
- ❖ What will RAIL HOF be for members?
  - ❖ a knowledge network on HOF and safety
  - ❖ a virtual platform which will evolve according to their needs





## A HOF DIGITAL PLATFORM AT THE SERVICE OF THE RAIL SECTOR

### Approach

- ❖ A user-centred approach has been applied to better capture user needs and then use these to determine design requirements, content and functionality and usability.
- ❖ This approach was used all along the development process of RAIL HOF from the needs analysis to the development of the platform.
- ❖ This platform will be enriched by your knowledge and operational experience



“RAIL HOF is made for you, by you and needs to be kept alive by you-the railway sector”

## INVOLVEMENT OF THE RAILWAY SECTOR

A structure composed of 3 sections:

- ❖ a Website (<https://railhof.org/>)
- ❖ a LinkedIn group (<https://www.linkedin.com/showcase/rail-hof/>)
- ❖ a Private area and secure for members



### Moderation of RAIL HOF

- ❖ The HOFWG also determined the end users of this platform from HOF specialists, through frontline and safety managers, to CEOs as well as their more specific needs in terms of content.
- ❖ An editorial team was established to:
  - ❖ Structure the website's headings and subheadings and to initially populate the site with content.
  - ❖ Moderate the LinkedIn group
  - ❖ Validate the information and new content that will be proposed



# RAIL HOF PLATFORM IN ACTION

## INTRODUCTION AND HOMEPAGE

[Contact us](#) [Extranet](#) [● Suggest a reference](#) [● Share your experience](#)

[JOIN US](#)

[WHAT IS HOF](#)

[RESOURCES](#)



Welcome to the Human and Organisational Factors (HOF) Digital Platform, the new interactive forum for sharing and exchanging knowledge and information on HOF. Are you a HOF Novice, Trainee, Specialist, Manager, CEO in European or international railways?

Are you coming from another mode of transport or from another industrial sector? Come and enter our HOF community-based Digital Platform! It is easy to find, share, exchange information, best practices, articles and more on this secure and user-friendly platform.

This platform brings together materials and resources to support understanding and application of HOF in the railway sector. The platform links to information on recognised HOF topics and methods relevant to the railway community, as well as providing links to other industry sectors such as aviation, nuclear, and healthcare.

You may also be interested in HOF safety documents that are or will be produced based on the experience of railway members. On this platform, railway know-how will be highlighted thanks to case studies, good practices, return on operating experience and, more generally, the experiences of railway members when integrating HOF into the SMS, for example, but also when they have to implement a safety culture or work on safety leadership. Many HOF topics are covered in the "resources" tab and are divided into 4 main themes: Enhancing safety management, HOF regulations, standards and tools, Human performance, HOF in practice.





# RAIL HOF PLATFORM IN ACTION

## JOIN US

The screenshot shows the RAIL HOF platform website. The header includes the RAIL HOF logo and navigation links: Contact us, Extranet, Suggest a reference, and Share your experience. The main content area is titled 'JOIN US' and features three distinct sections:

- Are you interested in HOF?**  
Do you want to learn about Human & Organisational Factors? Safety culture, non-technical skills, health and safety, more?  
Join us on this international and diverse network which captures in one place the valuable and enriching information and material, either academic or practical railways-oriented, on the organizational and human factors that you need.  
[I want to know more](#)
- Are you involved in HOF activities?**  
You want to learn about Human & Organisational Factors? Safety culture, non-technical skills, health and safety, more?  
Join us on this international and transversal network which capitalizes the valuable and enriching information and material, either academic nor Railways oriented, on the organizational and human factors that you need.  
[Join us on LinkedIn](#)
- Are you an HOF expert?**  
Are you a Rail Human and Organisational factors expert, a Rail Safety expert, a Railway Head of safety, or other? This space is made for you. Here, you have access to confidential information and can even create or participate in a discussion forum to initiate conversations and exchanges with your peers.  
[Join our members area](#)



# RAIL HOF PLATFORM IN ACTION

## WHAT IS HOF & FAQ

CONTACT US

EXTRANET

SUGGEST A REFERENCE

SHARE YOUR EXPERIENCE

RAIL HOF

JOIN US

WHAT IS HOF

RESOURCES

### What is HOF?

Human and Organisational Factors (HOF) is a scientific discipline concerned with the understanding of interactions between humans and other elements of a system, and the profession that applies theory, principles, data, and other methods to design in order to optimize human well-being and overall system performance ([International Ergonomics Association](#)). Outside of the rail sector, HOF is often referred to as either Human Factors (HF) or Ergonomics. All three terms have the same definition.

HOF integrates knowledge in the physical and social sciences such as Management Science, Sociology, Design Science, Political Science, Economics, Psychology, Physiology, or Engineering to enlarge the scope of study and investigation while considering organisational, institutional, cultural or political contributors to safety. The term 'organisational' has been introduced to highlight the organisational level of analysis and not only the individual level although obviously organisations are composed of individuals. ([European Railway Agency](#))

Besides supporting the integration of safety at the design stage, the HOF approach provides concepts and methods to identify the gaps between the task (work as prescribed or expected), and the activity (work as actually performed or experienced and reported by workers). These gaps, whether concerning the task or/and the activity are problematic as they are a source of residual risk and need to be taken into account. ([European Railway Agency](#)).

This allows a better managing of workplace reality in complex organisations such as railway socio-technical systems, which is critical to lead to safety improvements. ([European Railway Agency](#)).

What are HOFs in concrete terms?

+

Why do people make errors?

+

What are non-technical skills?

+

What are error prevention techniques?

+

Why do people break rules?

+

What are performance influencing factors?

+



## RAIL HOF PLATFORM IN ACTION

### RESOURCES: ENHANCING SAFETY MANAGEMENT

Contact us Extranet Suggest a reference Share your experience

RAIL HOF JOIN US WHAT IS HOF RESOURCES

## RESOURCES

Enhancing safety management HOF regulations, standards and tools Human Performance HOF in practice

The safety management system (SMS) is part of the business processes of the organisation and is not just a paper-based system specifically developed for demonstrating compliance with the regulatory framework. The ERA identifies that "the purpose of the SMS is to ensure that the organisation achieves its business objectives in a safe manner and complies with all of the safety obligations that apply to it" and that "Adopting a structured approach enables the identification of hazards and the continuous management of risks related to an organisation's own activities, with the aim of preventing accidents."... [Read more](#)

Safety culture Safety leadership Return on operating experience

HOF in change management HOF in event investigation HOF in Design



HOF in risk management Just and Fair Culture Competence management system



# RAIL HOF PLATFORM IN ACTION

## HOF REGULATIONS, STANDARDS & TOOLS

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 [JOIN US](#) [WHAT IS HOF](#) [RESOURCES](#) 

RESOURCES

Enhancing safety management

HOF regulations, standards and tools

Human Performance

HOF in practice

The systematic integration of HOF cannot be done without having a consistent reference base in the form of regulations, standards and tools. This basis makes it possible to develop the integration of HOF in the Safety Management System (SMS). This common reference allows for standardisation of HOF both within and between companies. Indeed, the systematic integration of HOF into the European railway sector at the end of the twentieth century and the beginning of the twenty-first century was not a priority for all. It was necessary to develop a common vision, common definition and tools which allowed the sector to build a common understanding of HOF... [Read more](#)

Safety regulations

Standards

5x5 model

Human centred design

HOF models





# RAIL HOF PLATFORM IN ACTION

## RESOURCES: HUMAN PERFORMANCE

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RAIL HOF

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RESOURCES

Enhancing safety managementHOF regulations, standards and toolsHuman PerformanceHOF in practice

The term Human Performance refers to the contribution that humans make to the performance of a system. It describes how people carry out their work, whether as an individual or as a team, in order to meet a required objective.

From a HOF perspective, human performance is a key focus when considering how a system can be optimized, as well as where it can be vulnerable to failure. When systems are designed to accommodate the capabilities, limitations and skills of the people who utilize them, human performance can ensure those systems are optimized and functioning well. When they are not, human performance can be impacted, and the system becomes vulnerable. Effective systems are tolerant of human error or human failure because they have been designed to anticipate and quickly recover from it – and rail systems are no different.... [Read more](#)



Non-technical skills	Fatigue management	Human error (and violations)
Workload	Vigilance and distraction	Fitness for duty
Physical ergonomics	Stress	Situation awareness
Attention		



## RAIL HOF PLATFORM IN ACTION

### HOW TO SHARE A REFERENCE IN RAIL HOF?

[Contact us](#) [Extranet](#) [Suggest a reference](#) [Share your experience](#)

 [JOIN US](#) [WHAT IS HOF](#) [RESOURCES](#) 

#### Reference

Your name

Virginie PAPILLAUT

Your email address \*

papillault@uic.org

Title \*

Why people makes error?

Company/Organisation \*

International Union of Railways (UIC)

Position \*

Human and Organisational Factors and safety culture manager

Short description

Whenever something goes wrong, we often hear the label 'human error' being applied. Within human factors, human error is the starting point for an investigation, not the end point. Ok, somebody did something wrong, but why? What was it about the person, the task, the team, and most importantly the organisation that influenced the error?

URL (web address)

#### Legal aspects

Author \*

Nora Balfe (Irish Rail)

Co-authors

Jayne Yeo (ERA)

Categories



# RAIL HOF PLATFORM IN ACTION

## HOW TO SHARE YOUR EXPERIENCE IN RAIL HOF?

Contact usExtranetSuggest a referenceShare your experience

RAIL  
HOF

JOIN USWHAT IS HOFRESOURCES

Your name

Nora Balfe

Your email address \*

nora.balfe@irishrail.ie

Title \*

Safety Leadership training in Irish Rail

Author \*

Nora Balfe

URL (web address)

What are key HOF issues?

Irish Rail identified a need to refresh their senior managers on safety leadership, to highlight the importance of leading by example and to create awareness of the pivotal role of leaders in shaping the safety culture of the organisation.

What did you do?

Irish Rail trained six of their safety team in delivering ERAs 1 day Safety Leadership training programme, and rolled this training out to senior managers across the business. The training covers several areas of Safety Leadership and Safety Culture, including an overview of Human and Organisational Factors, developing a safety vision, the importance of anticipated consequences in shaping behaviour, just culture, and organisational decision making. Sessions were held every two weeks at our training centre and approximately 130 managers were trained in the first nine months of 2022. The training is interactive, and participants are encouraged to reflect on how the topics covered apply to their own behaviours and areas of the business, as well as on what their key take-aways from the training are.

What were the results?

The feedback from the training has been very positive, and there is now an initiative to develop similar training for key frontline managers and supervisors as well as further developing our Just Culture policies and processes.



UIC

**HIGHSPEED**

Morocco 2023

*HIGH-SPEED RAIL : THE RIGHT SPEED FOR OUR PLANET*

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UIC

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Morocco 2023

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Under the High Patronage of his Majesty King Mohammed VI

11<sup>TH</sup> WORLD CONGRESS OF HIGH-SPEED RAIL

**Marrakech, 7-10 MARCH 2023**

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**Anticipate catenary  
settings and prevent  
catenary incidents with  
deep learning**

Valéry BOUCLET

Catenary measurements expert, SNCF, France

Session 4-3.4 Operational performance / RAMS





## Using videos of the pantograph-catenary interaction

### Description

- ❖ The choice fell on a "basic" uEye ethernet camera equipped with a simple lens without any special filter (Fig 1a)
- ❖ Images are in jpeg format and are grouped into video sequences (AVI format) of 10 km or 4 minutes maximum to avoid having files too large to view
- ❖ The cameras are installed in each lookout of the train (Fig 1b) and each video will have an inlay of the Ferro localisation (line / track / km / hm), a time stamp (date / time) and the speed of movement.



*Fig 1a : Type of digital camera used by SNCF*



*Fig 1b : View of one of the IRIS320 lookouts*



## Nature of works

SNCF use videos of the pantograph-catenary interaction since many years

- ❖ The videos are already regularly made available to High speed lines within 15 days with dedicated viewing software (Fig 2)
- ❖ On several occasions, these videos have enabled our operators to confirm the causes of catenary disturbances linked to bad weather or to identify poor catenary adjustment
- ❖ The use of the video monitoring is now included in an SNCF maintenance repository



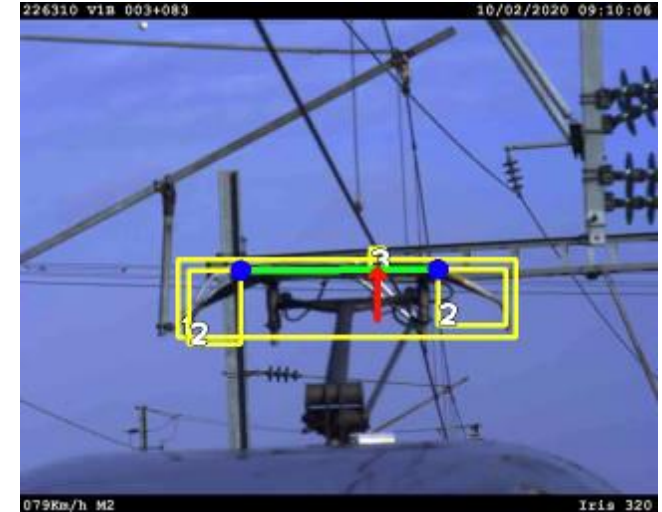
*Fig 2 : Image from IRIS320 videos*



## Nature of works

Analyzing the video recorded by Iris 320 monitoring cameras

- ❖ Discriminate the different components of the catenary (contact wire) and the pantograph(Fig 3)
- ❖ Automatic PK reading is performed by using the OCR



*Fig 3 : Discrimination work for the  
different components*





## Conclusion

The videos are already regularly made available to High speed lines within 15 days through the IRIS320 train (Fig 4). On several occasions, these videos have enabled our operators to confirm the causes of catenary disturbances linked to bad weather or to identify poor catenary adjustment. The use of the video monitoring is now included in an SNCF maintenance repository.

With deep learning, SNCF Réseau hopes has acquiring a system capable of detecting weak signals indicating a drift in catenary settings. In the end, this project would make it possible to anticipate the adjustment work and prevent the risk of catenary forking.



*Fig 4 : IRIS 320*



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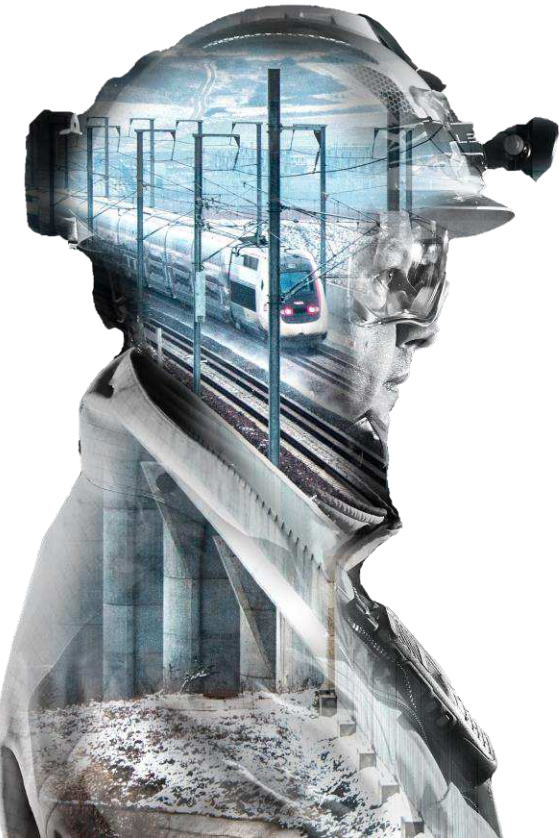
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# MESEA: on the track to Operational Excellence

Jean-Bruno Delrue – CEO

Session4-3.4 Operational performance / RAMS



## FIRST STEPS

**October 14, 2005**

Decision to build the Tours-Bordeaux HSR within the framework of a concession

**September 15, 2008**

LISEA submits an initial offer to RFF

**June 30, 2011**

Award of the LGV SEA concession contract to LISEA

**2012**

Civil engineering works commencement

**Summer 2016**

First test runs of a TGV at 160 kph between Nouâtre - Maillé and Villognon. Gradual increase in speed until 320 kph in August.

**February 28, 2017**

Inauguration in Villognon

**March 31, 2017**

Safety Agreement delivery by EPSF

**July 2, 2017**

First commercial train

**2018**

Lost-time accident rate: FR1=32.46

**January 2019**

Training agreement and start of MESEA Academy

**December 21, 2021**

Triple Crown  
ISO 45001, 14001 and 9001

**March 2022**

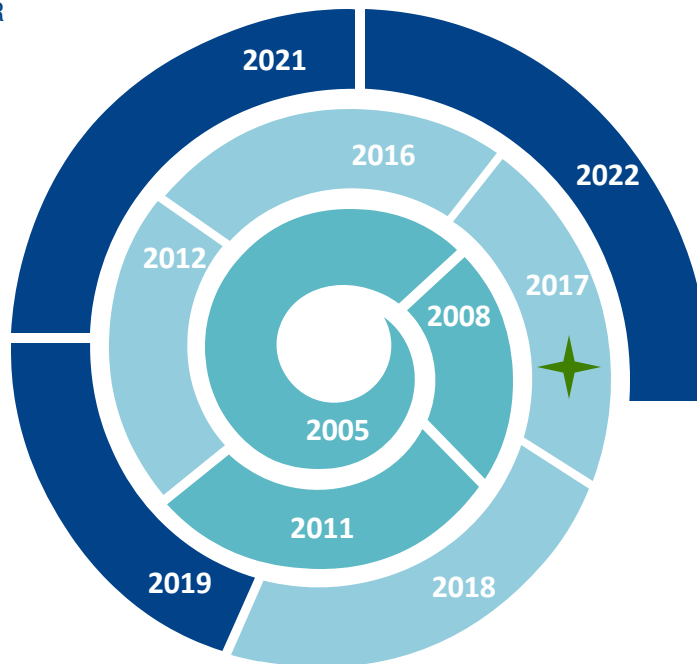
Renewal of Safety Agreement by EPSF

**July 8, 2022**

5<sup>th</sup> anniversary Celebration

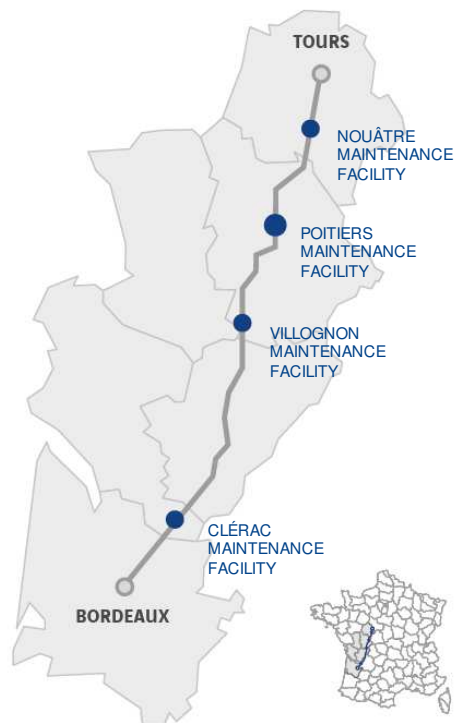
**September 2022**

Lost-time accident rate: FR1=3.15





## FACTS & FIGURES



**302 km**  
of high  
speed rail

**75 million**  
Passengers  
since 2017

**74**  
Trains per day  
on average

**198**  
Members of  
staff

**1 400 km**  
of rail

**4 200 ha**  
surface area

**14 000**  
Overhead  
Line poles

**500**  
Civil engineering  
structures

**35**  
Wayside  
Signaling Rooms

**150**  
Sw itches

## SHAREHOLDERS

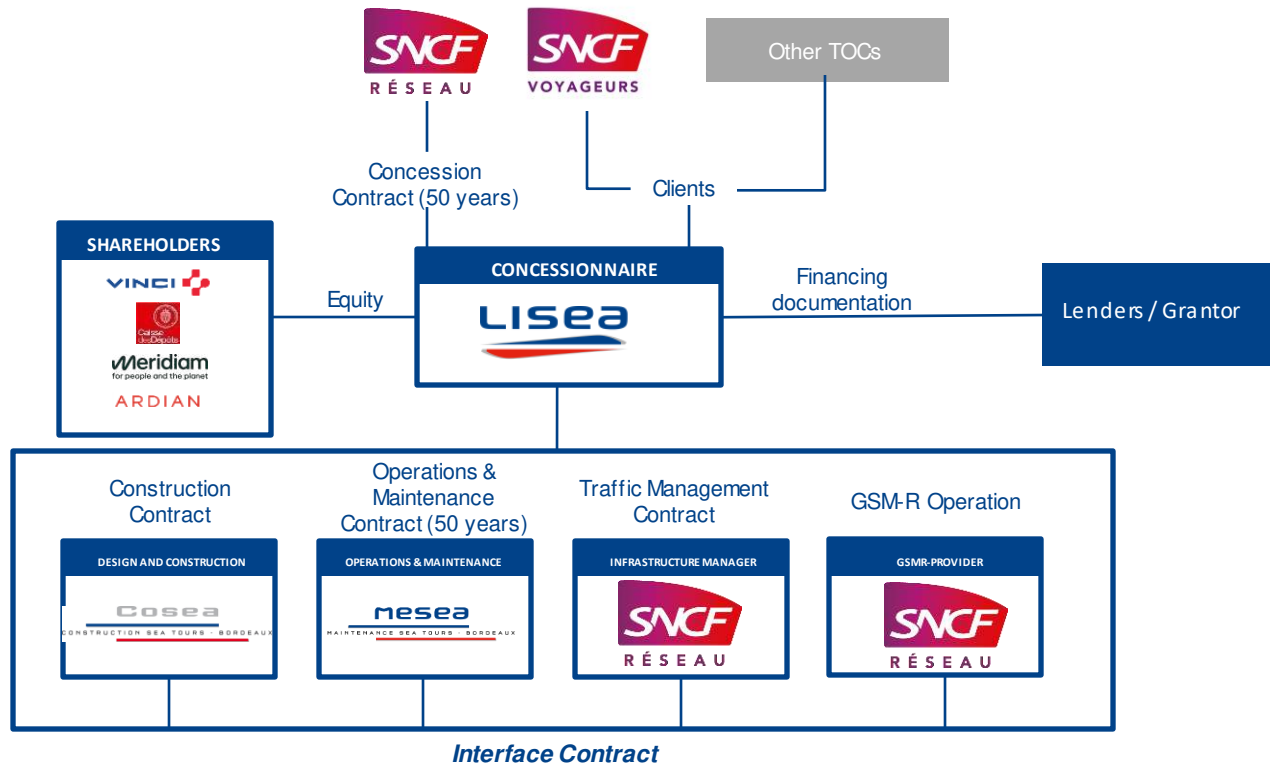
**70%**  
**VINCI**  
CONCESSIONS



**30%**  
**SYSTRA**



# STAKEHOLDERS





Providing operation and maintenance of the SEA HSL under a public-service remit, in order to deliver safe, performant and sustainable route capacities.



**Zero**

Phytosanitary products



**10%**

Electricity savings in office buildings



**50%**

Drinking water savings



**100%**

PPE recycling



**-30%**

GHG emissions by 2027

**SAFETY - PERFORMANCE - SUSTAINABILITY**

# OUR MISSION STATEMENT

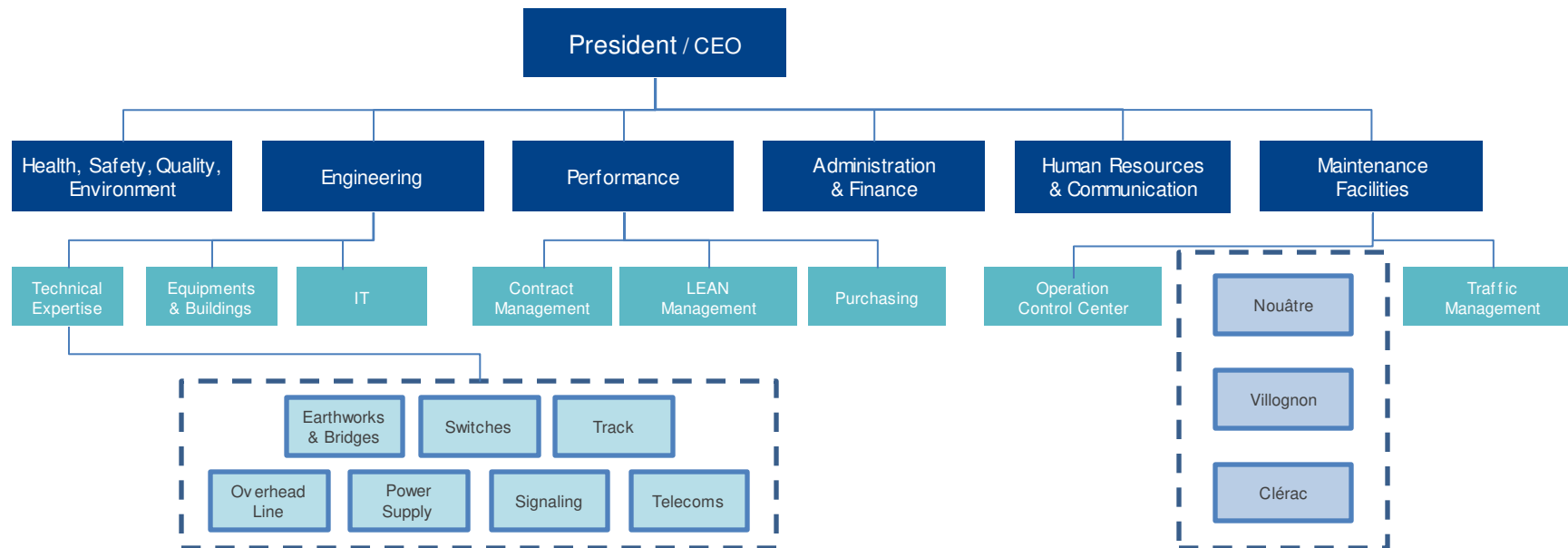


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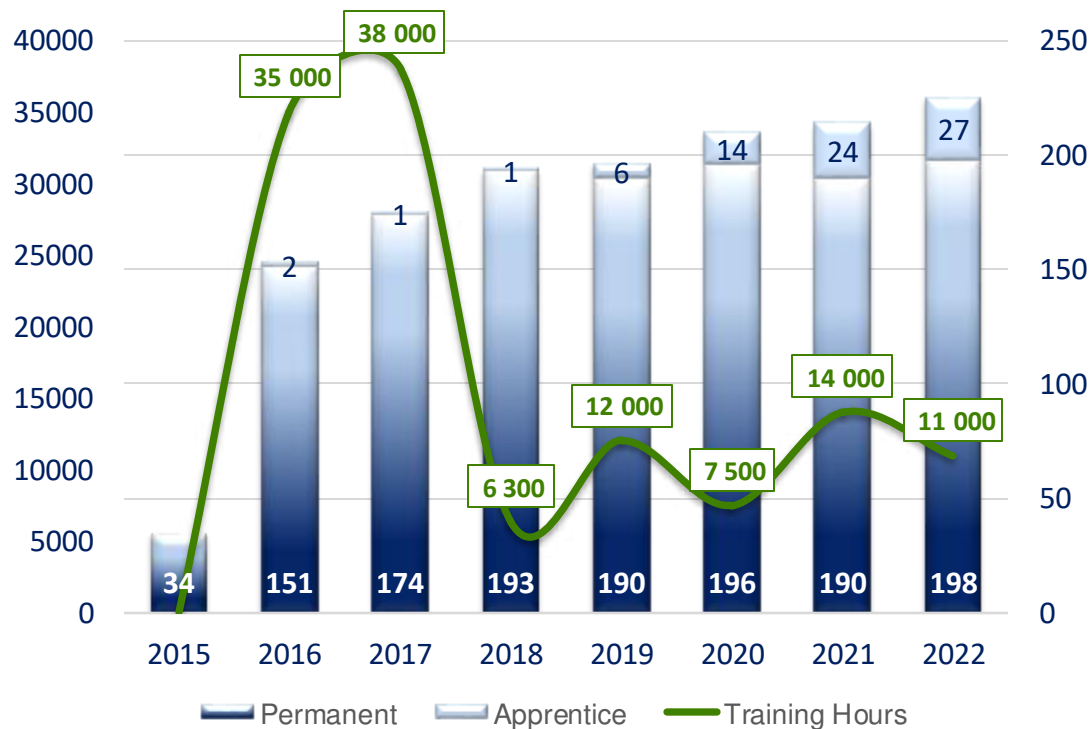
## OUR ORGANIZATION





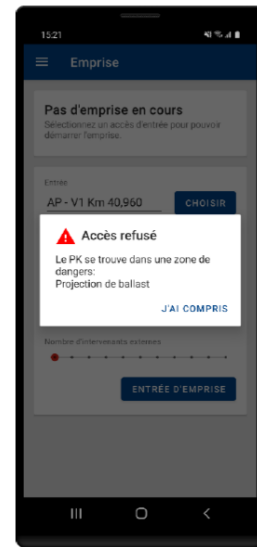
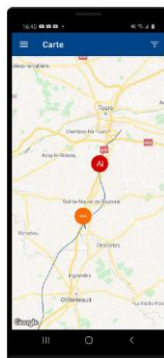
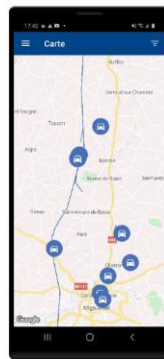
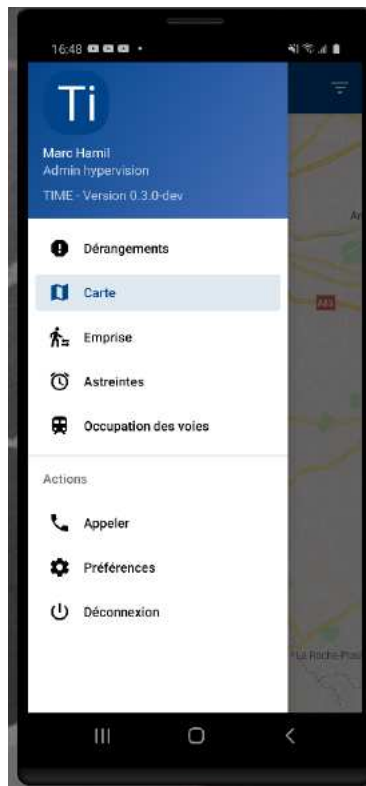
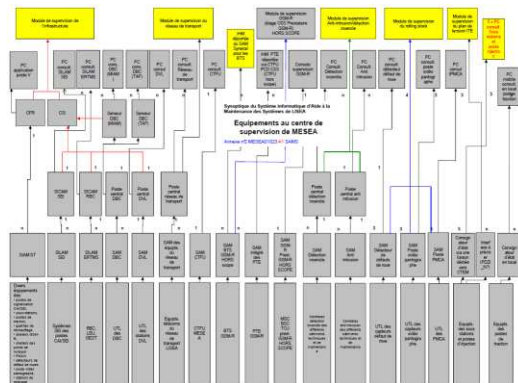
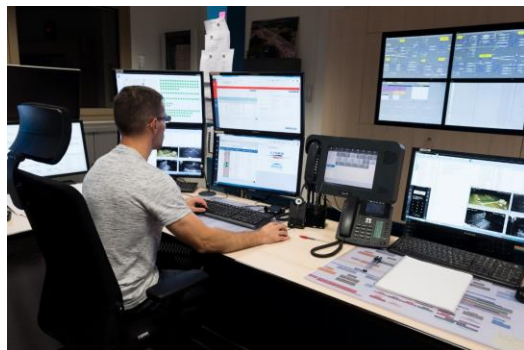


## WORKFORCE & TRAINING



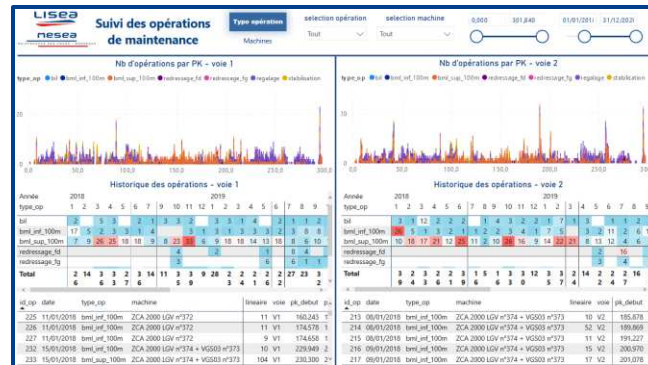
# PERFORMANCE



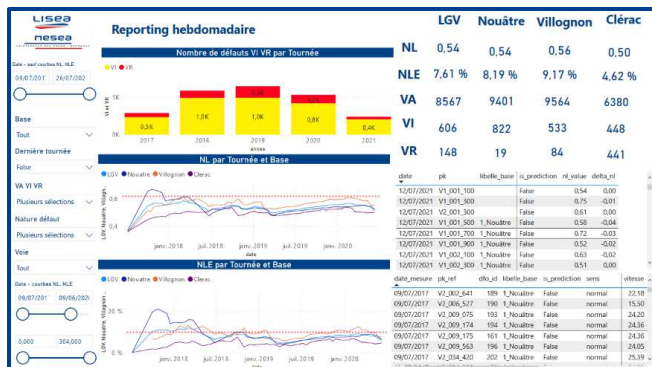




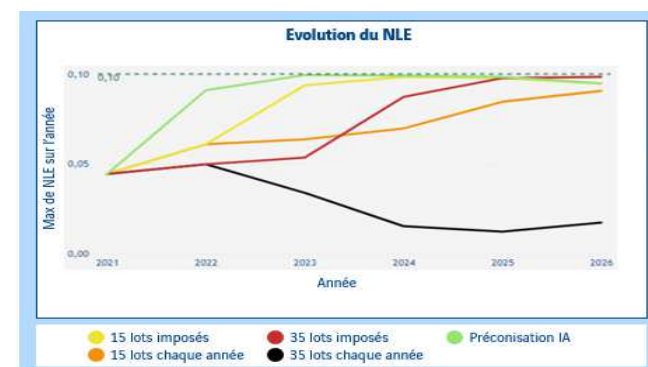
Visualization module



Tamping records



Reporting



Predictive approach



## 2017/2018 (17 months)

B1N/B2N = 263 160 ml  
ZCA MESEA = 101 757 ml  
42% average tamping / yr

## 2019

B1N/B2N = 55 650 ml  
ZCA MESEA = 69 527 ml  
20% cumulative tamping / yr

## 2020

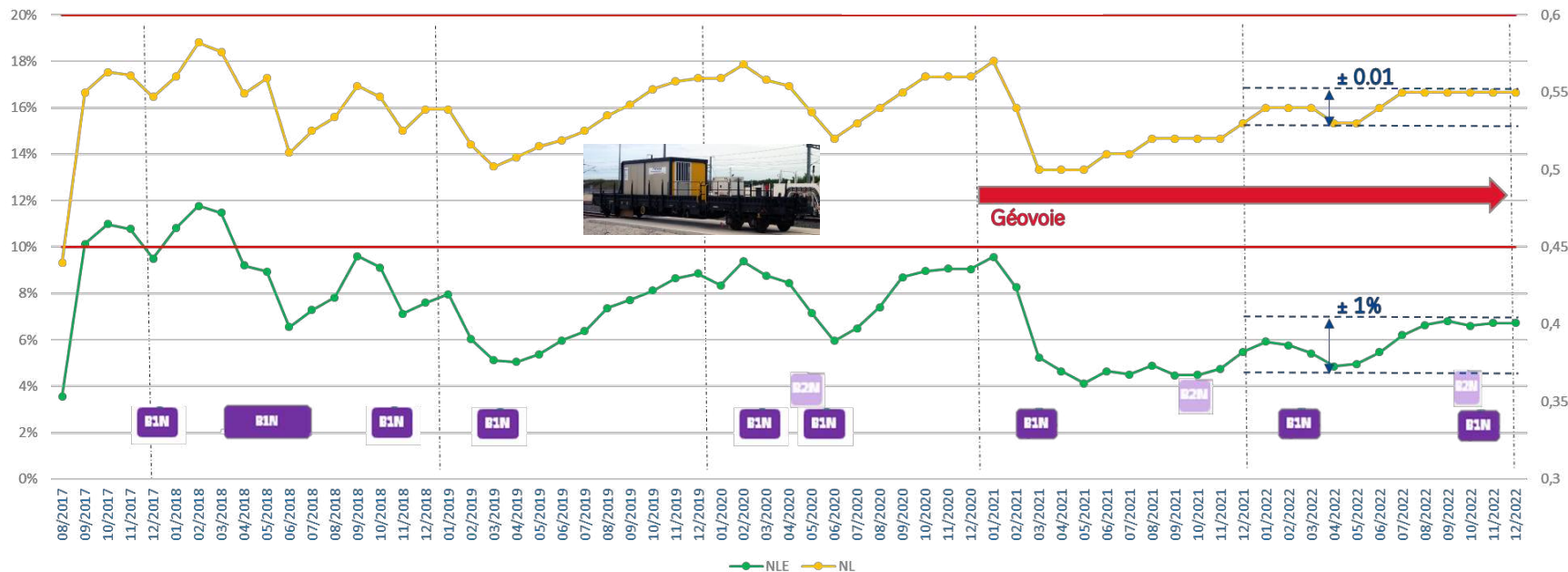
B1N/B2N = 76 696 ml  
ZCA MESEA = 45 154 ml  
20% cumulative tamping / yr

## 2021

B1N/B2N = 101 746 ml  
ZCA MESEA = 50 474 ml  
25% cumulative tamping / yr

## 2022

B1N/B2N = 52 161 ml  
ZCA MESEA = 42 802 ml  
15% cumulative tamping / yr





THANK YOU  
FOR YOUR  
ATTENTION

**mesea**  
MAINTENANCE SEA TOURS · BORDEAUX



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Morocco 2023



**SYSTRA**

**VINCI**  
RAILWAYS