# Session2.3, Room Karam2
# Global rail system economical and environmental optimization

Moderator : Mr.Alvaro MASCARAQUE
Deputy Director for International Organizations,
International Directorate,ADIF, Spain

ONCF UIC

# Session2.3
# Global rail system economical and environmental optimization
# Speaker Lists;

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
| Lovan Pushparatnam | Mr.LARBI OUAJAR | Ms.Kenza BEN ABDERRAZIK | Mr.ALAA EDDINE SEHLI | Ms.Jennifer Jefferies | Ms.Lucie Anderton |
| France | Morocco | Morocco | Morocco | United Kingdom | France |

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**Marrakech, 7-10 MARCH 2023**

# WHY DATA IS SO IMPORTANT FOR HIGH-SPEED RAIL ASSET MANAGEMENT

Lovan Pushparatnam
Development Director, SYSTRA
Session3-2.3 Global rail system economical and environmental optimization

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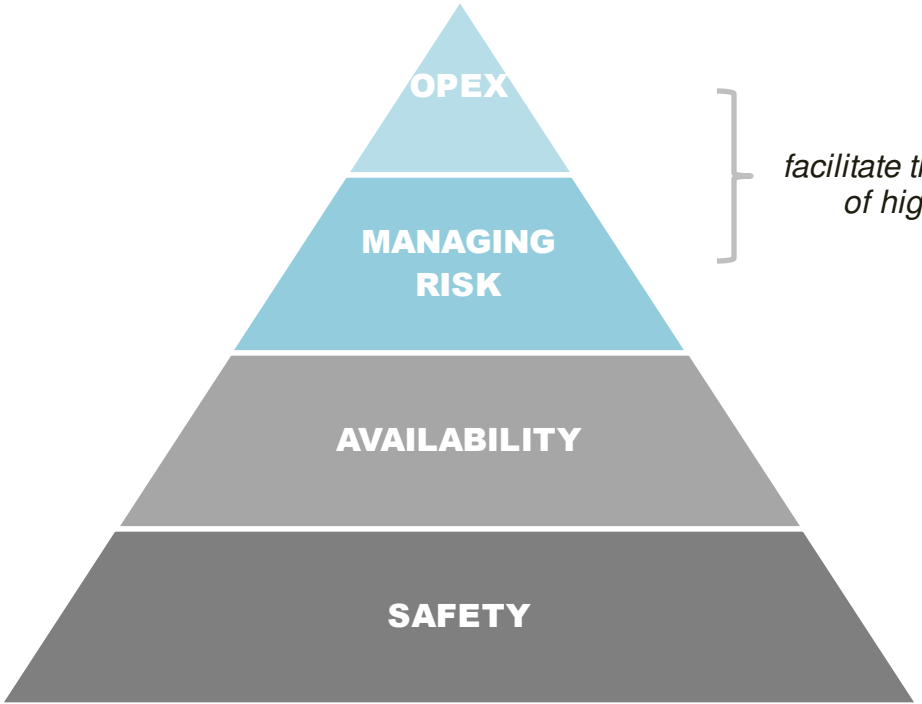
# DATA-DRIVEN MAINTENANCE STRATEGY

Condition-based & predictive maintenance

**DATA**

Enables a permanent trade-off

# HIGH-SPEED RAIL DEVELOPMENT




*facilitate the development of high-speed rail*

- Supervisory systems
- Articificial intelligence
- Internet of Things
- Predictive maintenance

# DATA-DRIVEN MAINTENANCE

## Strategy


Enablers to optimise data & maintenance

- *Team's commitment to digital*
- *Process improvement*

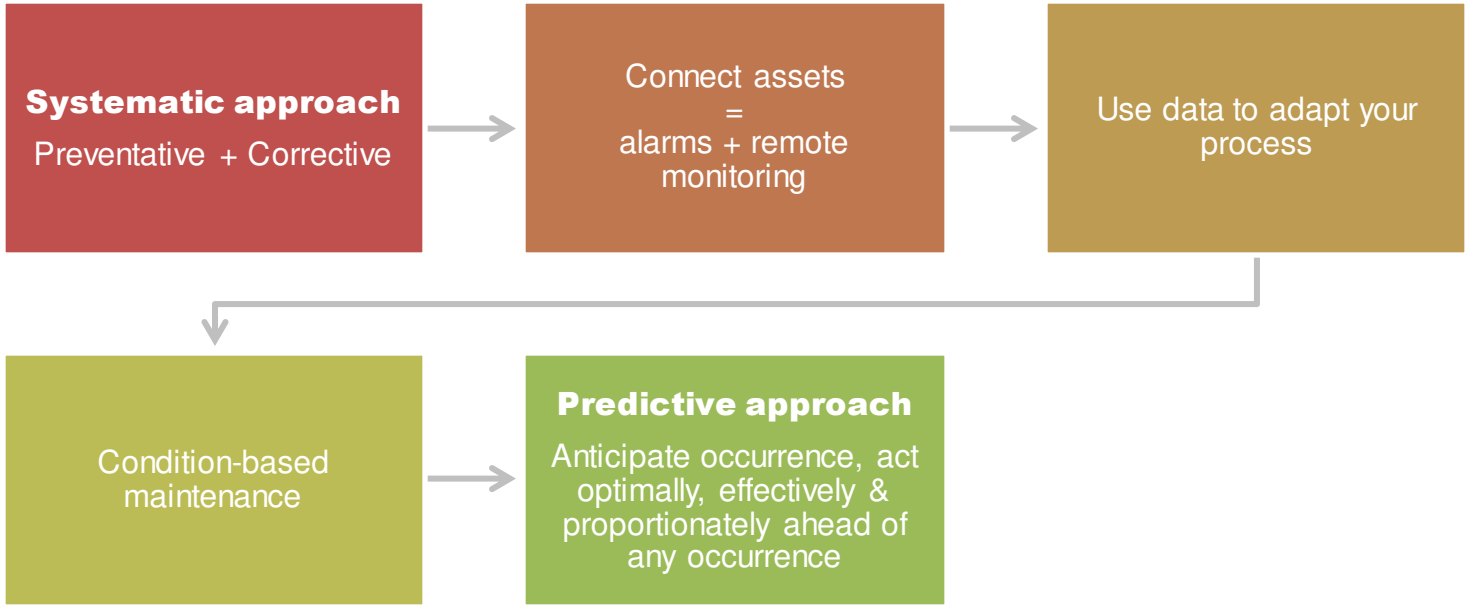
*Enhanced control of risk exposure related to safety & availability*

*Maintenance at the right time & just the right amount*

*Maximum extraction of asset value*

# DATA-DRIVEN MAINTENANCE

## The path to predictive maintenance



# DATA-DRIVEN MAINTENANCE: CASE STUDY

## High-speed line Tours-Bordeaux, France

- Signalling assets daily inspection (BROOM Vehicle)
- Automated track geometry measurement device (DRING vehicle)


**DRING**
Dispositif remorqué d'inspection de la géométrie de la voie.


**BROOM**
La draisine d'inspection quotidienne de la Ligne.

MESEA innove en assurant simultanément le balayage et l'inspection de cette Ligne à l'aide d'un matériel roulant dédié et équipé de capteurs pour surveiller la signalisation (circuits de voie, balises KVB, eurobalises).

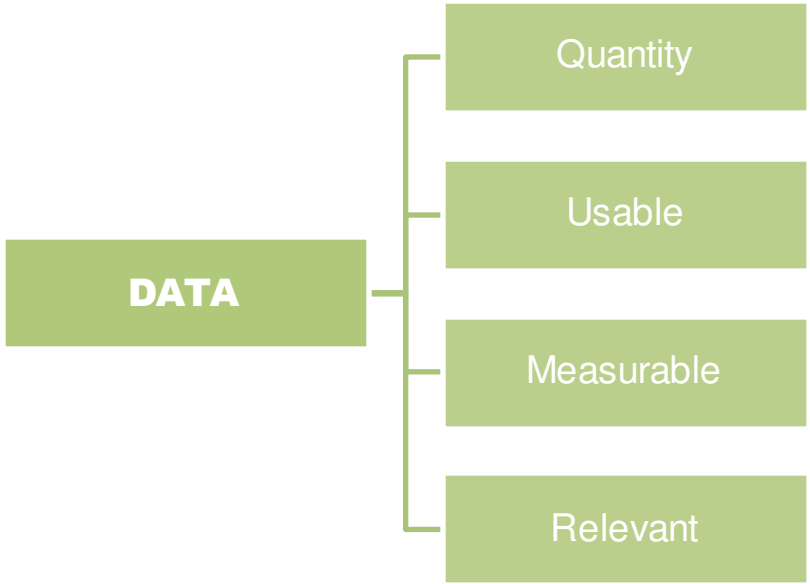
# LESSONS LEARNT

Associate systems and operations & maintenance expertise with data management

| KNOW | ANALYSE & USE | DESIGN OR ADAPT | PROCESS | INTEGRATE |
|---|---|---|---|---|
| Get to know the benefits and the value of the data provided by your systems | Know how to analyse & use your data to optimise your maintenance | Design or adapt your systems to activate the potential of your data | Involve your process - take advantage of data | Integrate people & environment |

# LESSONS LEARNT

## Requirements for data-driven maintenance strategy



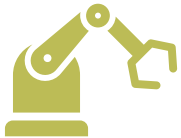

The earlier you implement it the more benefits to you

# DATA-DRIVEN MAINTENANCE

## Opportunities

Dashboards

Prediction



Automation

Just in time

# DATA-DRIVEN MAINTENANCE

## Benefits

- Improve availability
- Reduce impact on environment
- Improve safety
- Optimise costs
- Improve customer satisfaction

# THANK YOU

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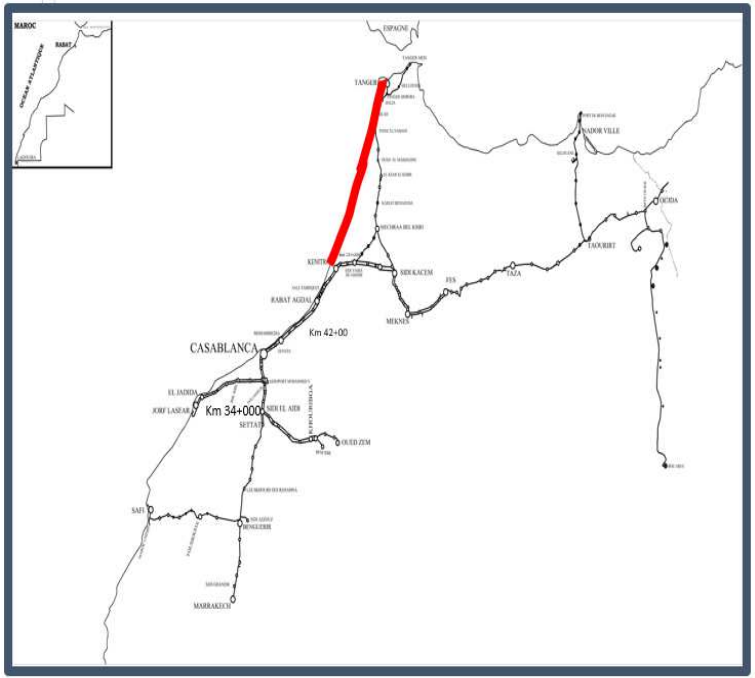
# MAINTENANCE OF MOROCCO'S HIGH SPEED LINE INFRASTRUCTURE

OUAJAR LARBI
ONCF MOROCCO
Session3-2.3 Global rail system economical and environmental optimization

# TANGIER/KENITRA'S HSL INFRASTRUCTURE CONSISTENCY

## MAIN COMPONENTS

- 715 Bridge/Hydraulic structure/Earthwork
- 356 Km Main Line , 9,3 Km Service track, 17 switch of service track, 28 switch for Main Line and 22 Dilatation apparatus
- 2 traction Substation, 10 paralleling post et 01 switching substation



# MAINTENANCE ORGANIZATION OF MOROCCO'S HSL INFRASTRUCTURE

## INTERVALS FOR MAINTENANCE

- At night: 5 hours of traffic stop for maintenance purposes.
- During the day: 01h 30 per section and per track as intervals for track inspection..

## MAINTENANCE OPERATIONS OF THE INSTALLATIONS

A maintenance plan per area is established each year, in compliance with the LGV maintenance guidelines :

- Systematic preventive maintenance (Schedule)
- Systematic preventive maintenance (according to the evolution diagrams of infrastructure degradation)
- Condition-based preventive maintenance (Exceeding thresholds)

# MAINTENANCE ORGANIZATION OF MOROCCO'S HSL INFRASTRUCTURE

- HUMAN RESSOURCES, EQUIPMENTS AND TRANSPORT

HUMAN RESSOURCES : 84 employee:

- District Managers : 03 employees
- Track operators : 36 employees
- Bridges maintenance operators : 09 employees
- Catenary and track substations maintenance operators : 36 employees

Transport: 16 light vehicles and 06 special vehicles for the transport of 14 employees and tools.

Important maintenance equipment

- 03 tamping machines (01 Mixed track tamping machine, for switchs and Dilatation apparatus ; 01 Track tamping machine and 01 Multifunctional track machine)
- 01 Tamping machines with stabilizer
- 02 Rail Grinding machine
- 01 Machine for the replacement of ½ rail and movable facing point
- 05 Catenary machines (02 ELAN, 02 VCP, and one unwinding train)
- One EM120 control machine (track and catenary)

# MAINTENANCE ORGANIZATION OF MOROCCO'S HSL INFRASTRUCTURE

## TRACK DOMAIN

Systematic and predictive preventive maintenance includes:

- Maintenance of track geometry
- Maintenance of the rail
- Maintenance of switches and crossings
- Maintenance of Dilatation apparatus

Operations, organized and carried out, after surveillance of the track and its surroundings, which concern :

- The superstructure (track, switches and crossings)
- The infrastructure (Bridges, earthworks, hydraulic structures)
- The environment of the line (vegetation, fence)

  - Using track patrol : On foot, or condition based, during Hot or bad weather periods, or following reports, due to alerts of periodic surveillance, or the results of recordings by special machine of track and catenary geometry (EM120).

# MAINTENANCE ORGANIZATION OF MOROCCO'S HSL INFRASTRUCTURE

## CIVIL WORKS DOMAIN

Systematic and predictive preventive maintenance includes:

- Vegetation control
- Water flow control (ditches, drains)
- Works to secure the line
- Treatment of anomalies observed on the earthworks (gullies, landslides ...)
- Treatment of the anomalies noted on the bridges and hydraulic structures (cracks, bursting of concrete...)

Operations, organized and carried out, after surveillance of all types of HSL structures and their surroundings:

- Periodic walking tours
- Detailed visits, intermediate visits, detailed inspections, expert visits
- Inspection of drains by camera
- Instrumentation: piezometers, inclinometers
- Topographic monitoring
- Weather forecast, bad weather patrol/surveillance, etc.

# MAINTENANCE ORGANIZATION OF MOROCCO'S HSL INFRASTRUCTURE

## CATENARY AND TRACTION SUBSTATION DOMAIN

Systematic and predictive preventive maintenance, with the aim of :

- Maintaining the geometry of the catenary
- Keeping catenary equipment, Traction substation in good working order

These operations, organized and carried out, after the realization of the monitoring:

- Periodic environmental tours, special (periods, hot and heavy rain);
- Periodic tours at height
- Periodic survey of the geometric dimensions of the catenary
- Periodic survey of the geometric dimensions of the special catenary equipment
- Periodic inspection visits of the traction substation and paralleling post installations and equipment.
- Periodic statements of the adjustment values of track substation and paralleling post protections.

# MAINTENANCE ACHIEVEMENTS ON MOROCCO'S HSL SINCE 2019

## TRACK AND CIVIL WORKS DOMAIN

Since the commissioning of the HSL of Morocco, all maintenance operations have been carried out, as scheduled and planned, with a rate of 100%.

Feedbacks to date shows:

- In terms of monitoring (by human and machine) : the chosen cycles allow adequate monitoring.
- Method of monitoring and intervening to eliminate track faults: a rapid evolution in engineers'competence has been noted, and therefore a continuous decrease over time in the number of track geometry faults.
- Effort of tamping mastered over time
- Continuous optimization of the ballast re-profiling works

# MAINTENANCE ACHIEVEMENTS ON MOROCCO'S HSL SINCE 2019

## CATENARY AND TRACTION SUBSTATION

Since the commissioning of the HSL of Morocco, all maintenance operations have been carried out, as scheduled and planned, with a rate of 100%.

Feedbacks to date shows:

- That the HSL located by sections on very polluted areas (at the seaside (108 Km)), which impact the isolations (Catenary and traction substations), by the risk of ignition. Therefore, the reinforced cleaning operation, on these polluted areas has been specially and carefully operated and has impacted the planned maintenance resources.
- The maintenance plans established are satisfactory.

# PERFORMANCE INDICATORS

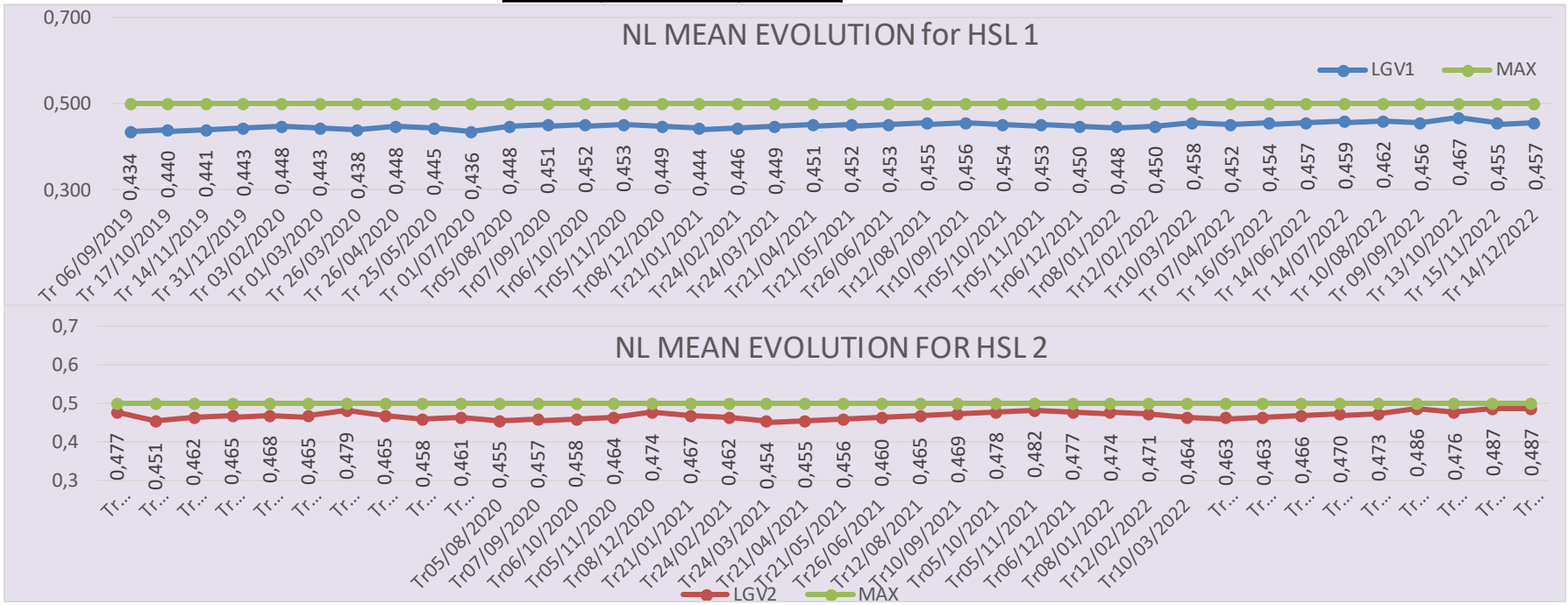
## TARGET

**Mastering :**

- ❑ **Standard deviation (≤ 0,5)**
- ❑ **Tamping efforts**

| Indicator | Designation | Value |
|---|---|---|
| S | Satisfactory | NL ≤ 0.5 |
| A | Acceptable | 0.5 < NL ≤ 0.7 |
| M | Marginal | 0.7 < NL ≤ 0.9 |
| I | Unsatisfactory | 0.9 < NL |

*The NL is satisfactory <0,5*



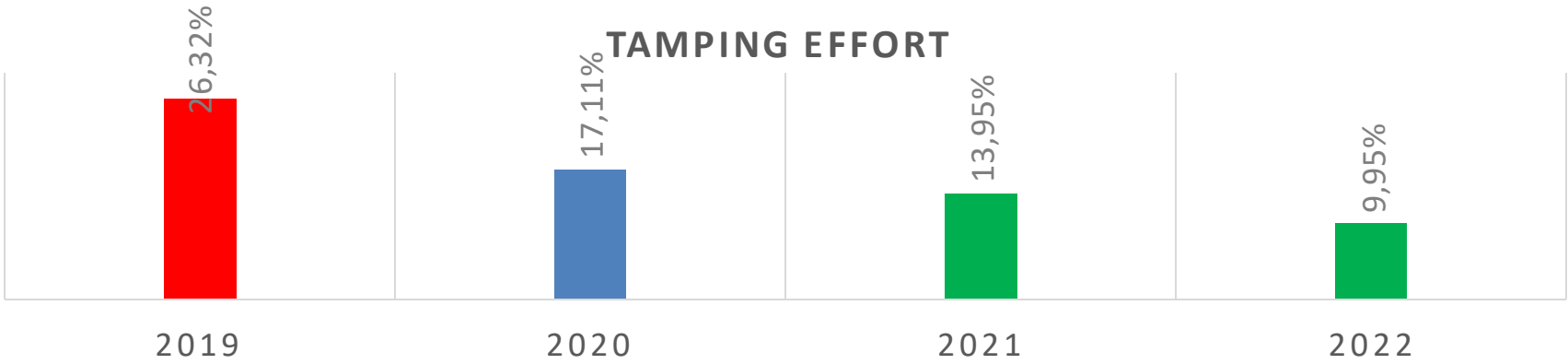
# PERFORMANCE INDICATORS

**OBJECTIF**

**Mastering :**
❑ **Tamping effort**

| Indicator | Designation | Value |
|---|---|---|
| S | Satisfactory | BML ≤ 20% |
| A | Acceptable | 20% <BML≤40% |
| M | Marginal | 40% < BML ≤50% |
| I | Unsatisfactory | 50%<BML |

*- BML EFFORT IS SATISFACTORY ≤ 20%.*
*- BML EFFORT IS CONTINUOUSLY IMPROVING*
*- BALLAST ASSET PRESERVATION IS UNDER CONTROL*




MOROCCO'S HSL INFRASTRUCTURE AVAILABITY SINCE ITS COMMINSIONNING : 100%

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**Marrakech, 7-10 MARCH 2023**

# The importance of planning and methods to improve Rolling Stock reliability and availability

Kenza Ben Abderrazik
Manager of Performance Service,
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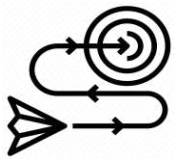
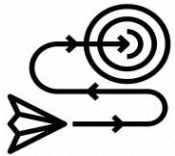
# The importance of maintaining Rolling Stock

Preventive maintenance

Corrective maintenance



- Maintain Rolling Stock
- Restore the proper functioning of the equipments



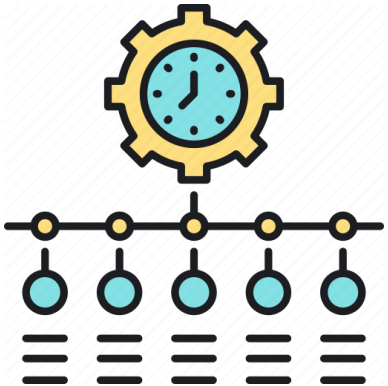
- Provide a Material that meets the requirements of our Client

↗ Reliability

↗ Availability

# Maintain to improve reliability… But how?

- Sequences of operations
- Different periodicities
- Means to implement

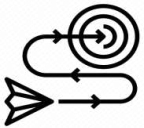


➔ Definition of a maintenance range

Main goal : Guarantee a standard of work

# Maintain to improve reliability… But how?

## ISHIKAWA DIAGRAM

| Manpower | Materials | Machines | Methods | Environment |
|---|---|---|---|---|
|  |  |  |  |  |
| All the workforce involved in the project | Any material or component essential to the product or service | Mandatory tools, machines and equipments | Procedure, organization, process | The environment that could impact the project, |

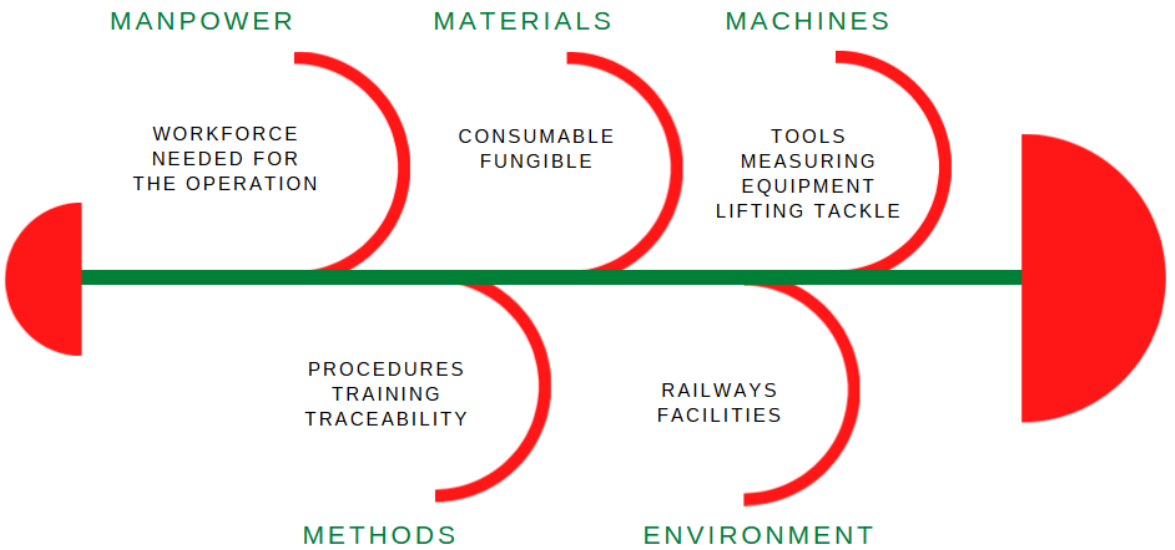
➔ Ensure consistency of settings,

➔ Size ressources,

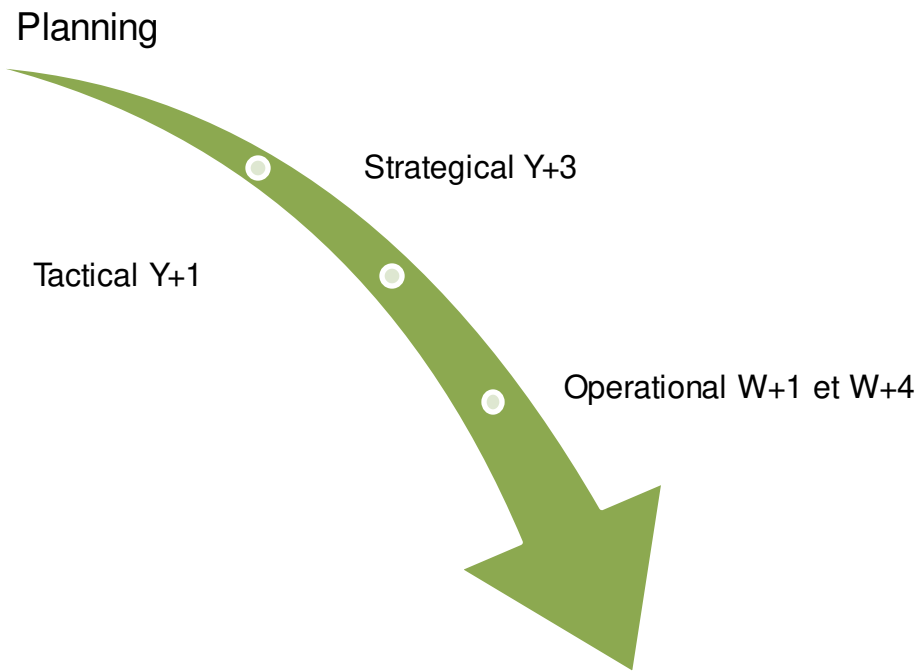
➔ Define the supply policy

# Maintain to improve reliability… But how?

In railway terms



# Controlled planning = Optimal availibility




Y: Year
W: Week

# Controlled planning = Optimal availibility

- Operations of type N2 and N3 following Tactical planning
- Operations at kilometer level
- Organ replacement operations
- Relocation of operations W-1
- Requests for Corrective Maintenance
- List of reforms, restrictions and maintenance postponements
- Cleaning Operations
- Operations on Strategic Facilities

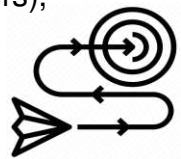
- Skill Rating and Matrix
- Constraint transport plan "m"
- Constraint of railways and facilities

**Operational planning**

Weekly forecast program W+1

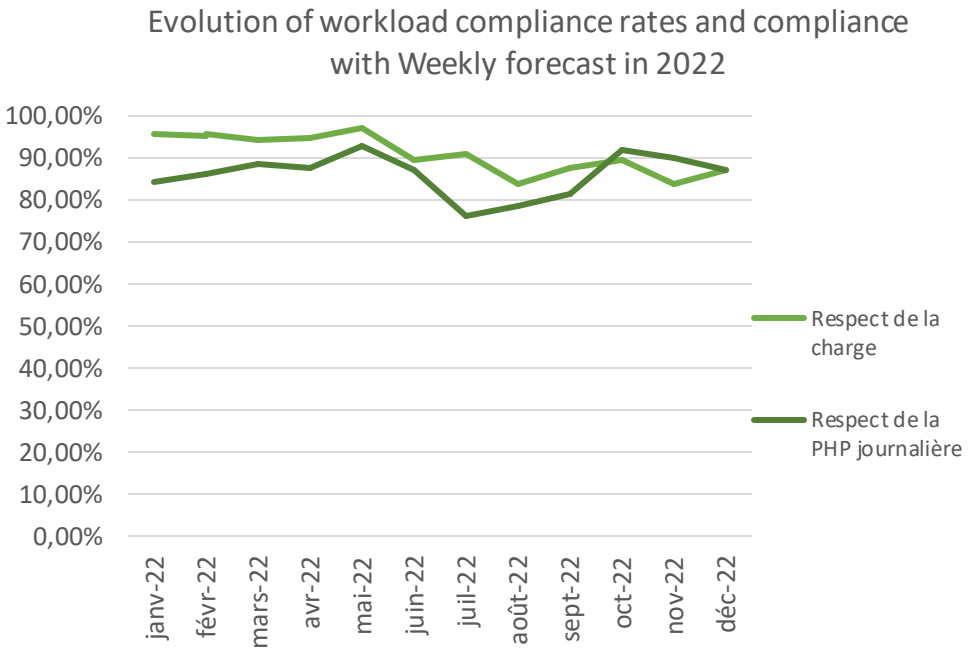
# Controlled planning = Optimal availibility

- Compliance with maintenance limits (time and kilometers),
- Optimization of maintenance cycles,
- Smoothing and massifing operations,
- Compliance with production capacities.



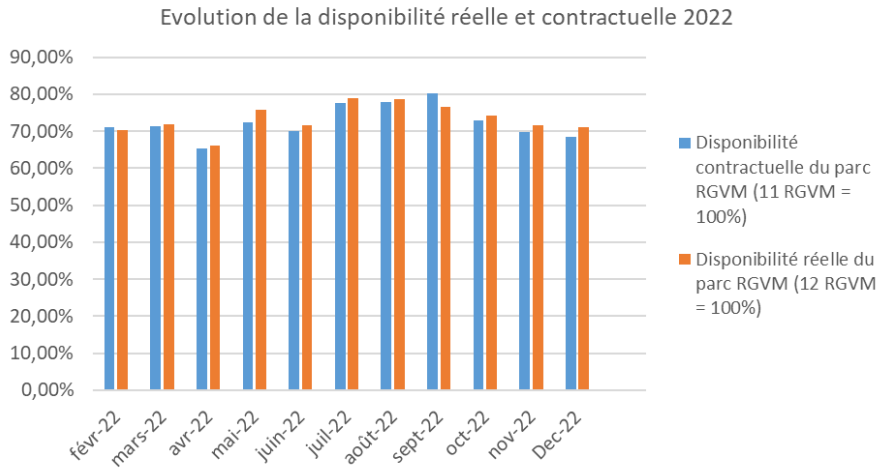
Gain in operational flexibility to adapt in the best way to the demands of our Client that evolve constanlty.

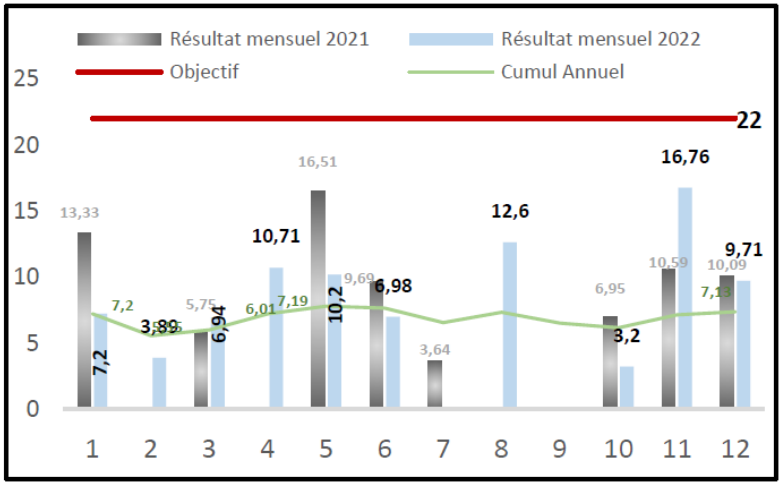
# Controlled planning = Optimal availibility




Planning performance is measured on a weekly and monthly basis to meet the client's requirements in accordance with our maintenance requirements.

# Satisfying results



## Perspectives and challenges

In the 4.0 era, predictive maintenance in the railway sector promises a guarantee of reliability and availability


How can planning and methods can be linked to this technological development?

# THANK YOU

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# OPERATING HIGH SPEED TRAINS IN MOROCCO

Alaa Eddine SEHLI
Head of operations high speed department, ONCF, MOROCCO
Session3-2.3 Global rail system economical and environmental optimization

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SUMMARY

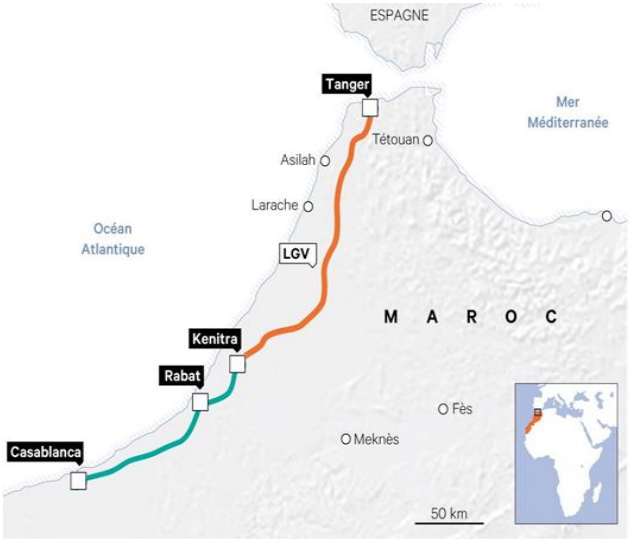
# INTRODUCTION

A journey time reduced by more than half, in the order of **2h10 minutes** between Tangier and Casablanca.


Tangier – Kenitra


Tangier – Rabat


Tangier – Casablanca




200 KM — High speed line — Maximum speed — 320 KM/H

operating high-speed trains in Morocco

## HIGH-SPEED TRAIN


Lenth off 200 meters

| Motor 1 | Trailers 1 à 8 | Motor 2 |
|---|---|---|
| 25 KV AC<br>3 KV DC | 533 places | 25 KV AC<br>3 KV DC |

**Speed on the high speed line : 320 km/h**
**Speed on the classic line : 160 km/h**

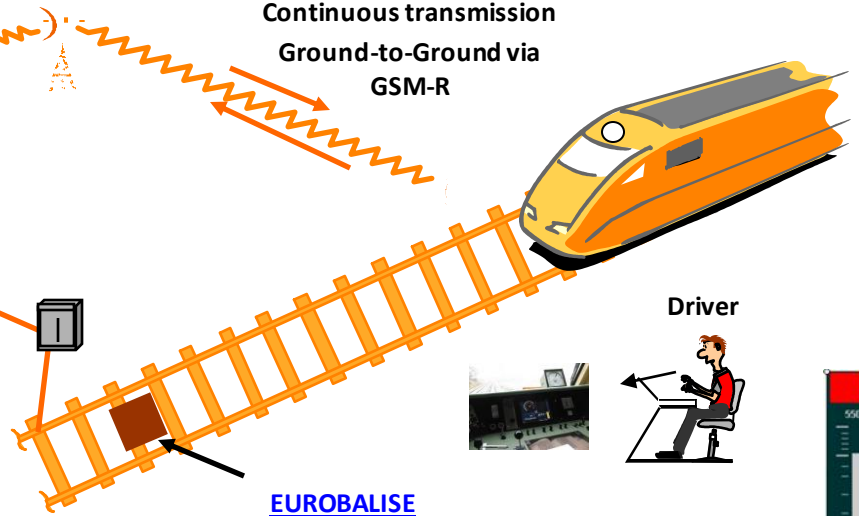
# ERTMS N2 OPERATING SYSTEM

**RBC**

➢**interfaced with the signal box and the train detection system**

**Continuous transmission Ground-to-Ground via GSM-R**





**Driver**





**EUROBALISE**

➢**position recalibration (location point)**

**POSITIVE FALL OUT :** A multipurpose simulator and increased security

**PR/PPOS**

**Priority managment**

**Sequence breakage**

**Approach RAC**

## POSITIVE FALL OUT

HUMAIN CAPITAL

## Selection of drivers with the best skills and qualifications

### Theoretical training

- In-depth training on the high-speed train
- Training on ERTMS N1 and N2 operating systems
- Training on HS regulations

### Driving course

- Clean runs assisted by certified agents on the LGV
- Driving in nominal and degraded mode

### Practical training

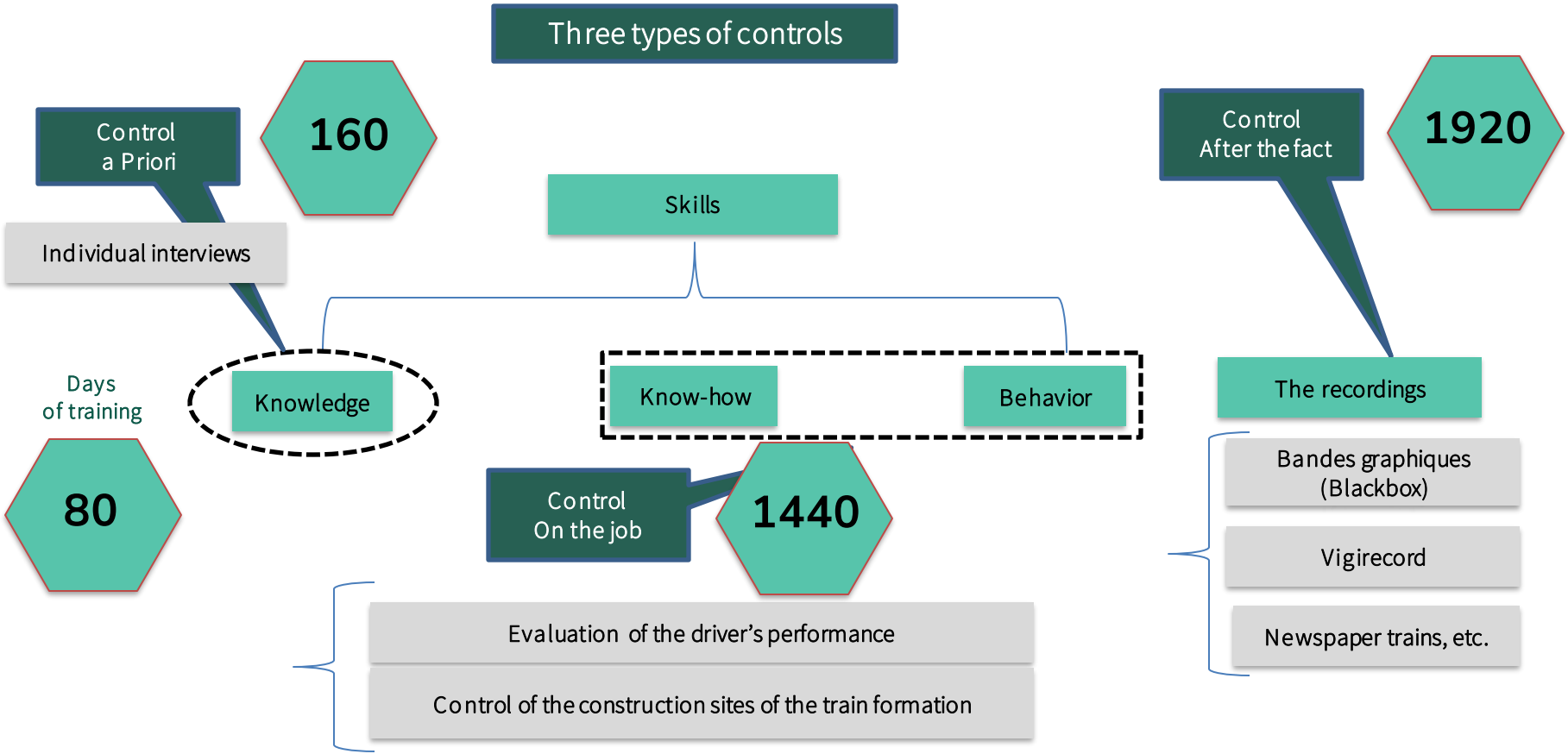
- Training on the RGVM in the maintenance workshop (ATM)
- Driving training on the driving simulator
- On-line training on the High Speed Line and Classic Line

### Enabling

Following oral, written and practical exams

**60** days of training

HUMAIN CAPITAL



ECO FREINDLY TRACTION

Acting on the rules of conduct

When starting up

The speed should be as fast as possible

Speed Factor - Schedule

- Do not always drive at the maximum speed limit Drive as close to the speed limit as possible when it is low.
- Respect the schedule.

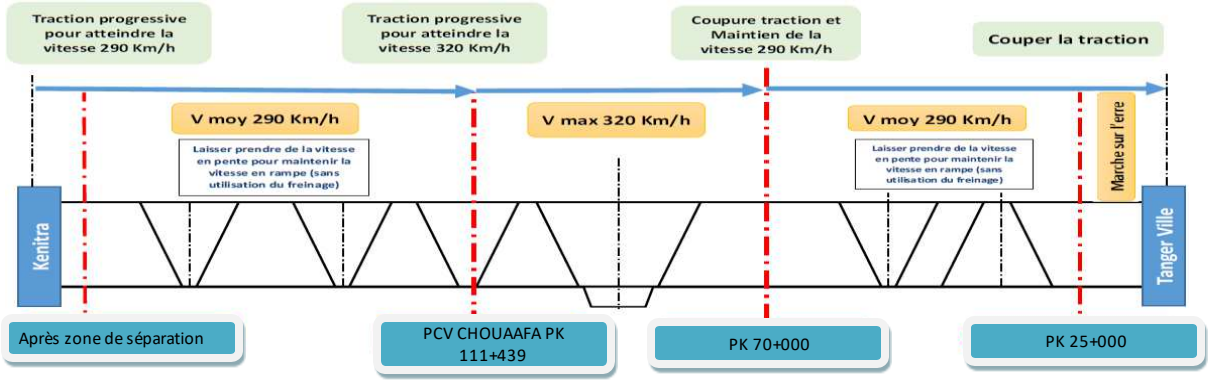
When setting velocity

Energy Profile Factor

- Exploit the kinetic energy related to the speed and tonnage of the train.
- Drive in such a way as to lose as little energy as possible in braking.
- Perform the maximum number of steps on the track.

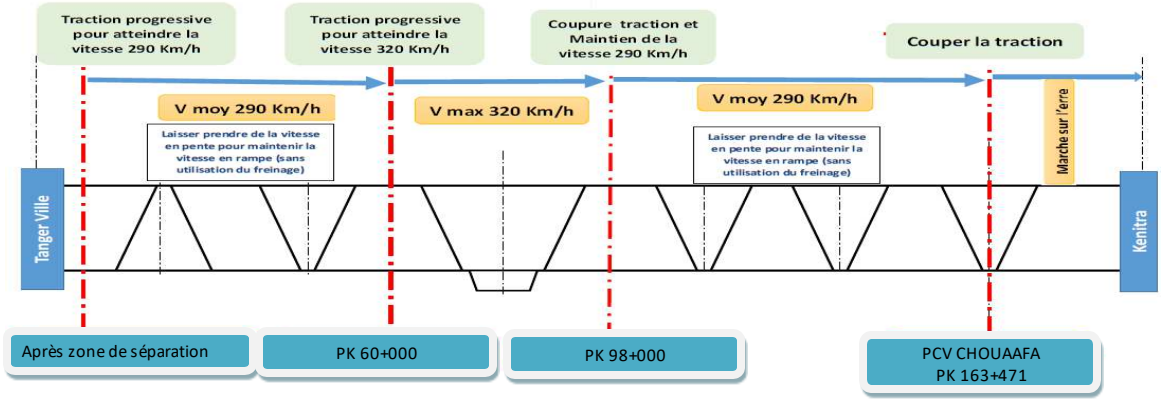
ECO FREINDLY TRACTION

## Kenitra-Tangier route:




This configuration allowed a reduction in energy consumption of **18%** with a walk on the road over a distance of 60 km, i.e. almost **1/3** of the HSL

## Tangier-Kenitra route:




This configuration allowed a reduction in energy consumption of **24%** with a walk on the road over a distance of 68 km, which is almost **1/3** of the HSL.

**Total Annual Gain MAD:**

**10 947 591,00**

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**Marrakech, 7-10 MARCH 2023**

# IMPROVING SOCIAL AND ENVIRONMENTAL IMPACT OF HIGH-SPEED RAILWAYS AND BEST PRACTICES

Jenny Jefferies C.Env, MIEMA
Senior Design Manager - Consents, SYSTRA Ltd, UK
Session3-2.3 Global rail system economical and environmental optimization

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# ENVIRONMENTAL IMPACTS

- Environmental Impact Assessment (EIA) is a legislative tool that must be applied to proposed development projects that are likely to generate significant environmental effects
- EIA is recognised as giving a platform to the environmental and social issues during the consenting process
- In order to avoid and mitigate environmental and social impacts a proportionate and purposeful EIA is required
- Focusing time and resource where significant effects are likely and reducing assessment where they are not
- Committing to clear mitigation measures to avoid or reduce impacts

# MITIGATION

## Mitigation Hierarchy

- From feasibility, detailed design, construction, operation
- Has to be implemented - commitments not suggestions
- Who, What, When
- Monitoring

AVOID

↓

REDUCE

↓

REMEDY

↓

OFFSET

# FROM FEASIBILITY TO OPERATION

- The consideration of the environmental and social impacts does not end as soon as consent is granted
- Not only will there be legislative requirements to consider the environmental and social impact of the project but, a good project should instil this in its workforce
- The environmental assessment may be some time before a high speed railway is operational and therefore there are steps in design and construction to ensure that there are no new or different significant effects
    - Consenting processes
    - Environmental requirements and commitments
    - Code of construction practice
    - Construction Environmental Management Plans
- Everybody from office to site to operators should be briefed on the environmental and social commitments the project has made
- Employing competent environmental managers on a project from start to end is essential

# CONSENTING

## The High Speed Rail Act (2017)

- Grants deemed planning permission for HS2 Phase One of the route
- Schedule 17 of the act imposes conditions on the deemed planning permission
- Deemed planning permission may not apply where works that are not 'Scheduled Works' are likely to have significant effects on the environment (nature, size or location)
- The controls contained in the EMRs, along with the Act and the Undertakings and Assurances, ensure that impacts which have been assessed in the ES will not be exceeded in designing and constructing the works
- If the significant adverse impacts identified in the ES are likely to be exceeded, the nominated undertaker will take all reasonable steps to minimise or eliminate those additional impacts

# CONSENTING

## The Crossrail Act 2008

- Section 10 allows for changes to be made to scheduled works provided they are within the limits specified in the plans. However, if a change is deemed to have new likely significant environmental impacts which are 'material' then another Environmental Statement needs to be completed
- Section 15 allows utility companies to rely on their permitted development rights for works in relation to Crossrail provided there are no new significant impacts than those in the Environmental Statement, otherwise a planning application would be required

# DESIGN

## HS2 Phase 1 – Bromford Tunnel Extension*

- During the design process an opportunity to extend one of the tunnels was identified
- Increasing the length of the tunnel from 2.8km to 5.7km will have the following benefits
- Remove the need for visually complex engineering above ground in an already built-up and environmentally sensitive area
- Less land required and therefore fewer properties and businesses affected
- Reduce the environmental impact on Park Hall Nature Reserve and the River Tame
- Reduce construction traffic on the road network in Birmingham including a significant reduction in HGV movements during construction

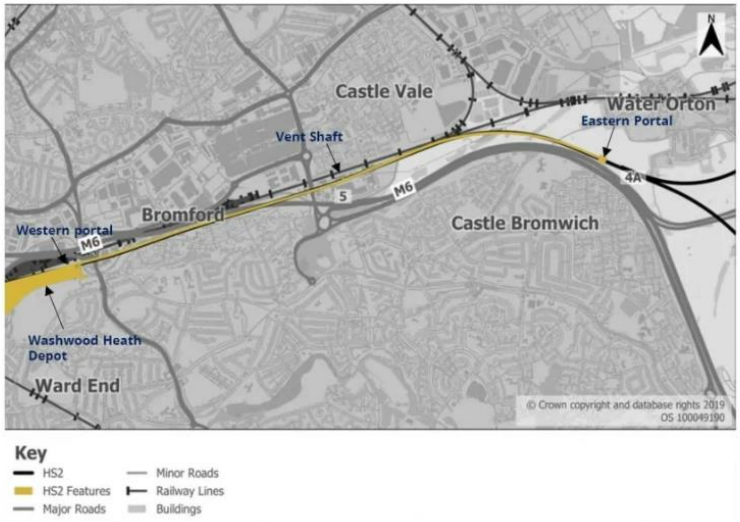



Image via HS2 Its (https://hs2inwarwicks.commonplace.is/proposals/bromford-tunnel)
*Still awaiting TWAO and Sch.17 approval

# DESIGN & CONSTRUCTION

## HS2 Phase 1 – Marston Box Slide

- The first box slide of its kind over a motorway in the UK
- The bridge was originally designed as a traditional structure
- Construction method would have had significant traffic disruption for motorway users and local communities
  - Three months of total overnight closures
  - Two years of reduced lane widths and 50mph speed limits
- The updated design is smaller in size and therefore a reduced visual impact
- Using the 'box jacking' technique to build the box structure meant installation over the motorway could be carried out during two one week closures
- Avoided the need for prolonged periods of night working, reduced disruption to local residents
- Reduced carbon footprint for this structure, less use of materials, particularly concrete and concrete piles

# SOCIAL VALUE

As well as reducing visual, nuisance or disruption, there are often very large opportunities to bring extra benefits to local communities as well as wider society.

Through early consideration and collaboration with supply chain, these opportunities can be optimised

Consider:

- Making public transport more inclusive and accessible
- Local suppliers and employment
- Investing in apprenticeships and other skills training
- Promoting an inclusive and diverse workplace
- Enhancing or providing Community facilities
- Staff Volunteering time in the community
- Enhancing local wildlife sites and other public green spaces or urban placemaking
- Sharing best practices - Learning Legacy

# THANK YOU

UIC HIGHSPEED Morocco 2023
HIGH-SPEED RAIL : THE RIGHT SPEED FOR OUR PLANET
Under the High Patronage of his Majesty King Mohammed VI

11TH WORLD CONGRESS OF HIGH-SPEED RAIL

**Marrakech, 7-10 MARCH 2023**

# Biodiversity and Infrastructure Synergies and Opportunities for European Transport Networks & Application to Rail

Lucie Anderton
Head of Sustainability, International Union of Railways
Session3-2.3 Global rail system economical and environmental optimization

ONCF UIC

UIC HIGHSPEED Morocco 2023

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

Under the High Patronage of his Majesty King Mohammed VI

# BISON

**BIODIVERSITY AND INFRASTRUCTURE SYNERGIES AND OPPORTUNITIES FOR EUROPEAN TRANSPORT NETWORKS**

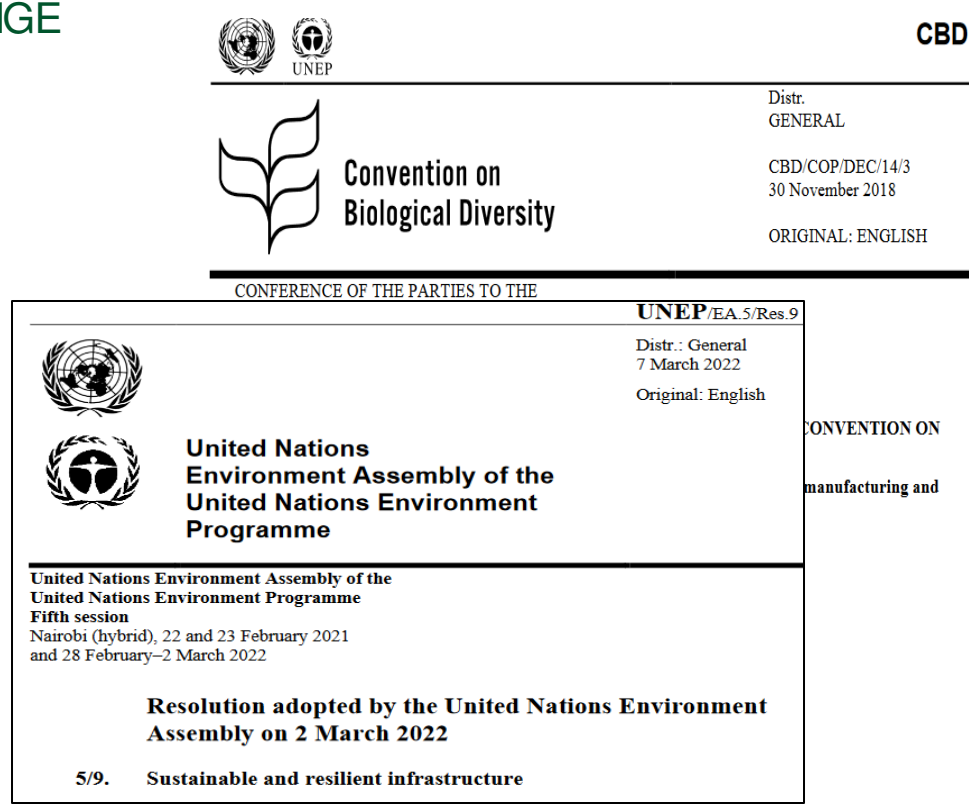
This project has received funded from the European Union's Horizon 2020 research and innovation programme under grant agreement 101006661

ECOLOGICAL EFFECTS OF RAILWAYS ON WILDLIFE REVERSE

ONCF UIC

# PROGRESS AND THE GLOBAL CHALLENGE

- + 50% of new roads network by 2050 (60M of km)
- + 5% of new energy networks/year
- New high speed rail expansion and increased traffic on existing lines
- A very progressive and recent awareness of synergy needs
- EU research funding increasing



UNEP

CBD

Convention on Biological Diversity

Distr.
GENERAL

CBD/COP/DEC/14/3
30 November 2018

ORIGINAL: ENGLISH

CONFERENCE OF THE PARTIES TO THE

UNEP/EA.5/Res.9

Distr.: General
7 March 2022

Original: English

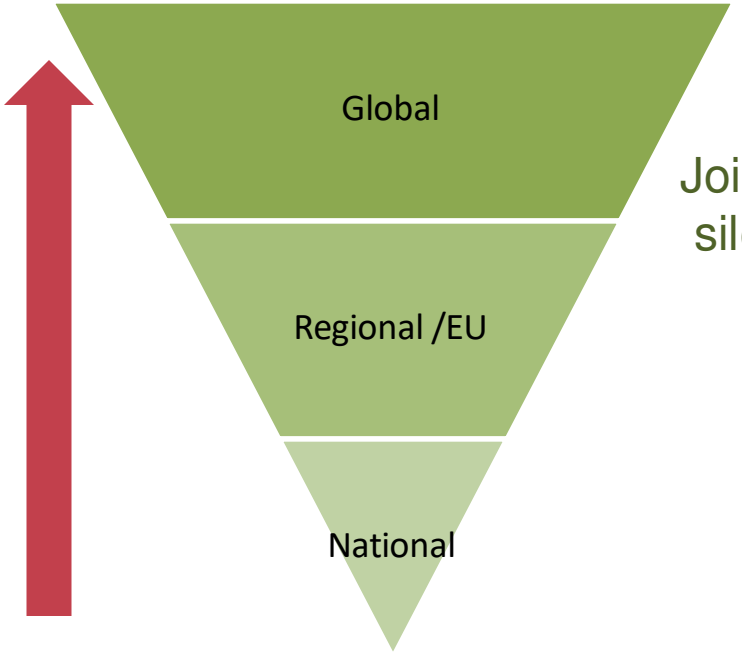
United Nations Environment Assembly of the United Nations Environment Programme

**United Nations Environment Assembly of the United Nations Environment Programme**
**Fifth session**
Nairobi (hybrid), 22 and 23 February 2021
and 28 February–2 March 2022

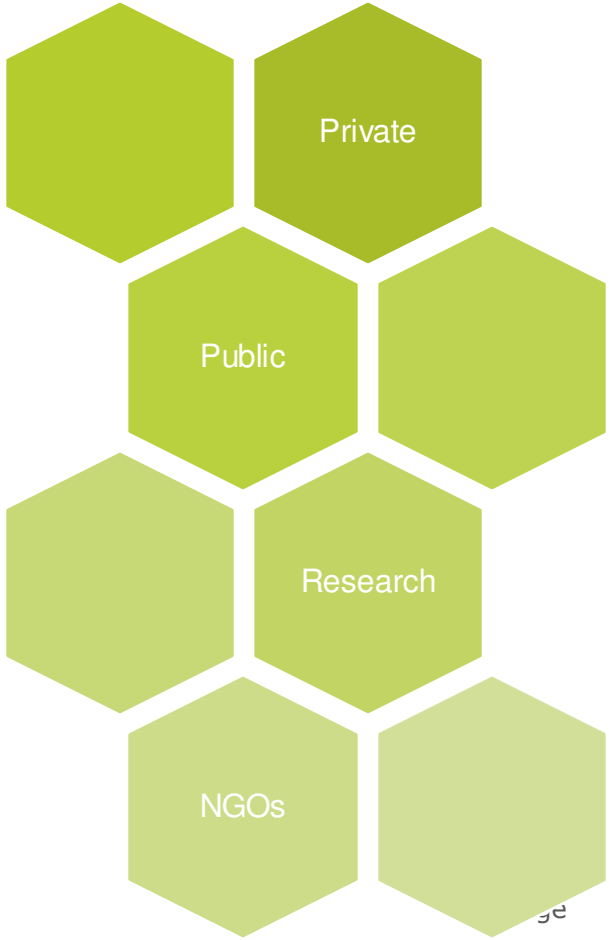
**Resolution adopted by the United Nations Environment Assembly on 2 March 2022**

**5/9. Sustainable and resilient infrastructure**

# POWER OF KNOWLEDGE SHARING



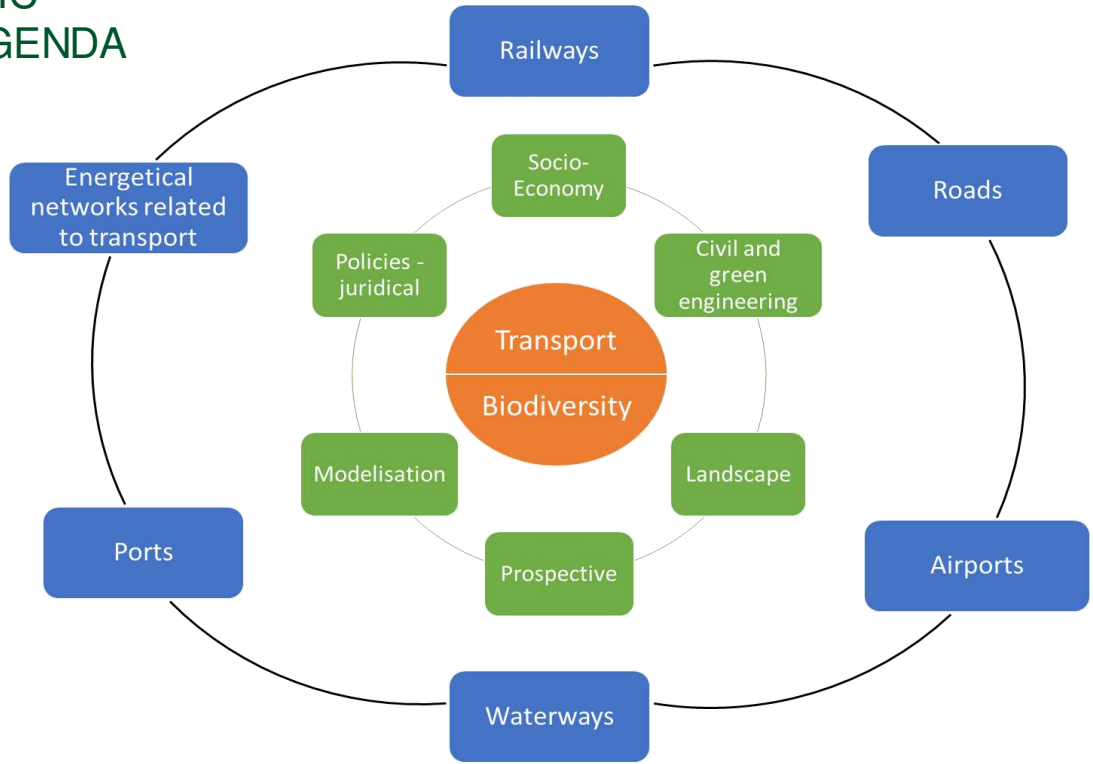

Joint actions to break silos and coordinate actors



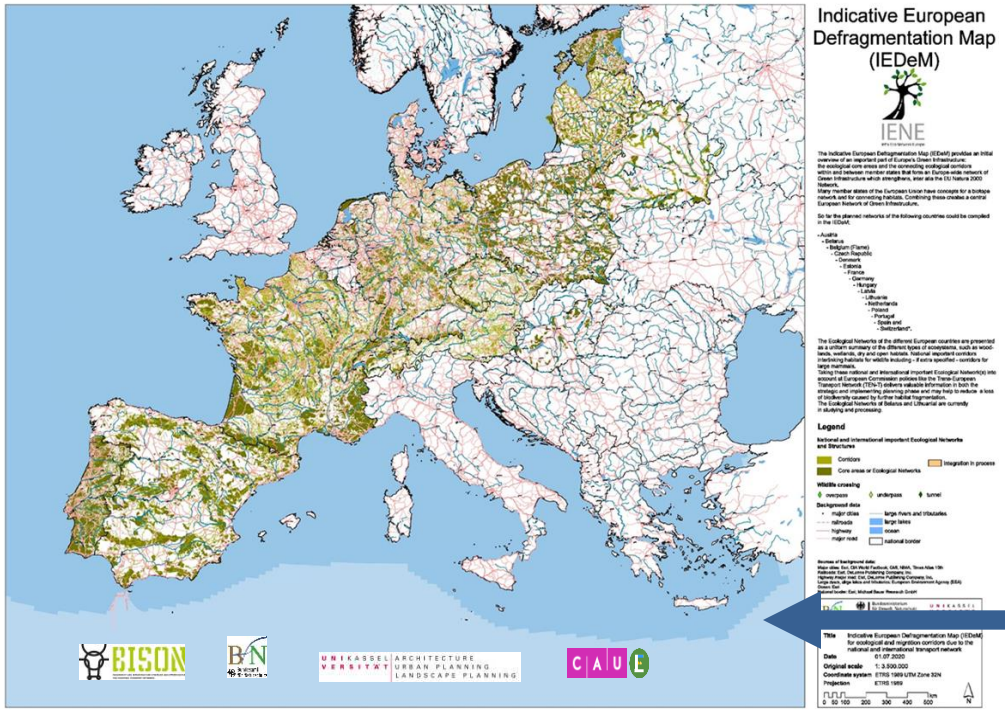
# MULTIPLE OUTCOMES - STRATEGIC RESEARCH AND DEPLOYMENT AGENDA

Merging multi-stakeholder knowledge

- Develop symbiosis between infrastructure and biodiversity
- Step-up research and knowledge from local ecology to societal issues
- Thinking beyond resilience: a change of paradigm in transport and biodiversity policies



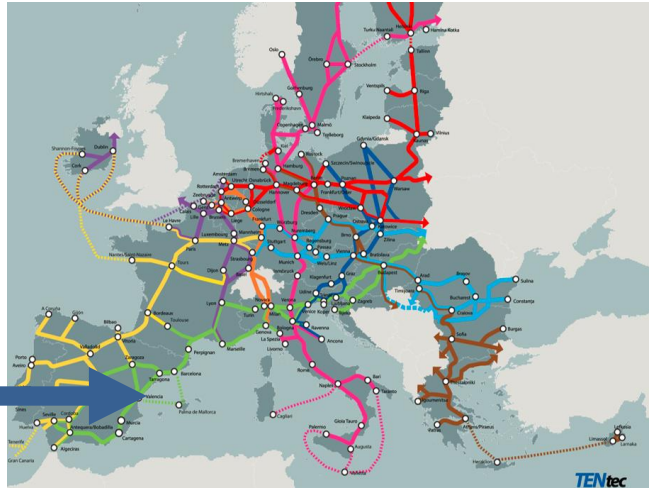
# DEFRAGMENTATION







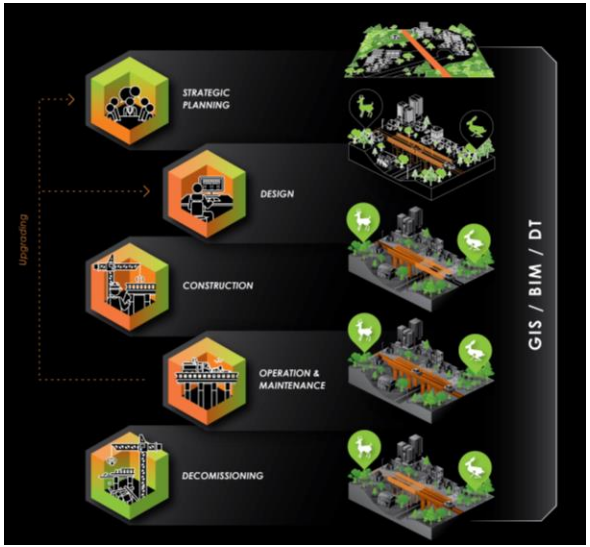
- Identification of important Green Infrastructure
- Defragmentation measures
- Guidelines for use and further development
- How can this coordinate TEN-N and TEN-

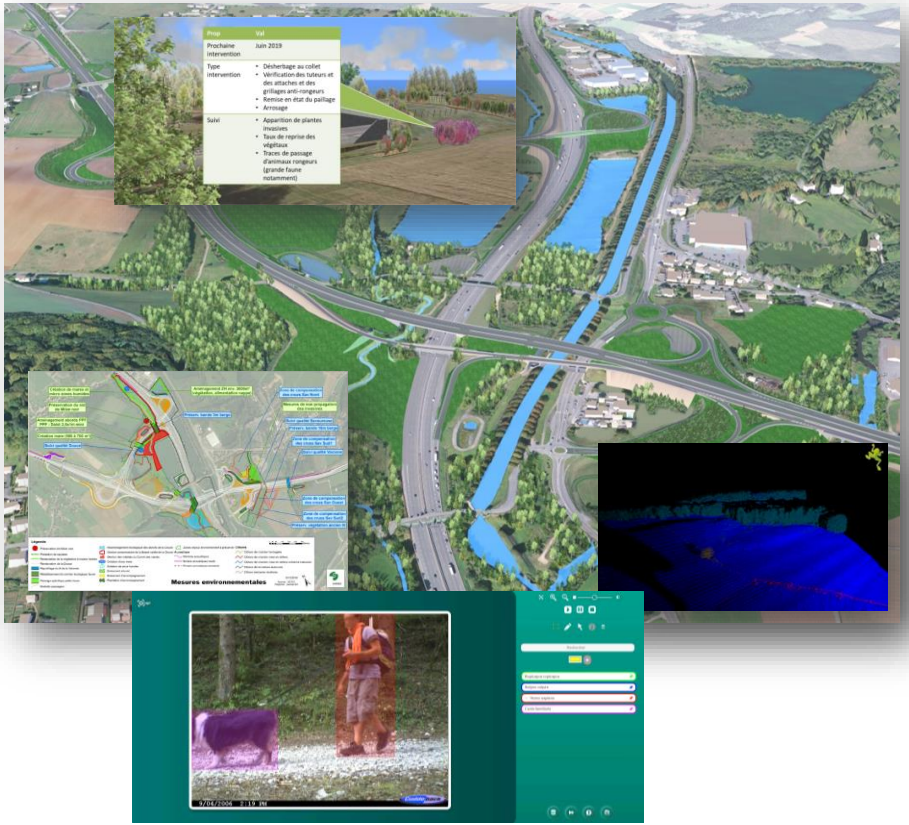



Bison project WP5- D 5.3 . Botcher et al 2022

# NEW DIGITAL TOOLS

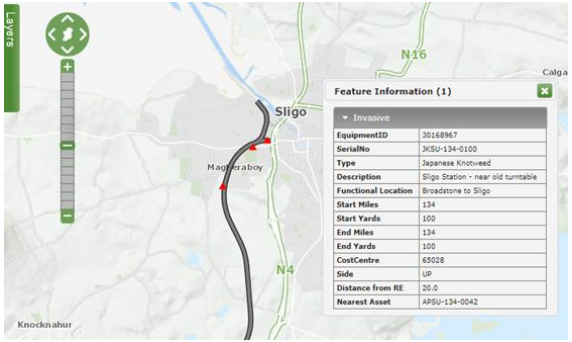
Integration of the biodiversity themes in the digital environment of transport infrastructure.



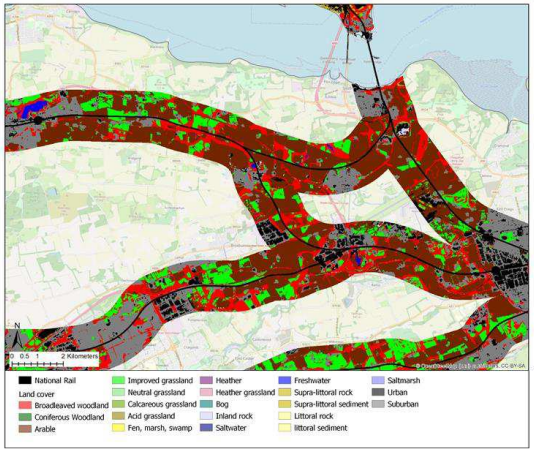
# MONITORING OUTCOMES

Spatial data layer in Irish Railway GIS-based mapping for biodiversity assets © CIE




Tool for the detection and management of invasive alien species at DB Netz AG

Remote sensing data to provide an inventory of habitat types and how they have changed ©Network Rail




Habitat mapping of 1 km either side of the rail corridor in Scotland

# ANALYSE

✓ Common approaches for vegetation management by railway companies

**NOT YET FOR BIODIVERSITY**

| Objectives | |
|---|---|
| Expanding the amount of wildlife habitat | **Area** of biodiverse habitat created or restored (ha) |
| | **Proportion of sealed and unsealed railway real estate** -% |
| Increasing the **connectivity** | Positive **trend** in habitat connectivity indices |
| | Active monitoring of rare and threatened species and habitats |
| **Protection** of rare species and habitats | Areas of invasive (plant) species treatment |
| | Evidence of population growth within railway land |
| | **(Wild) animal collisions**: % of identified hot spots / identified line length [km] equipped with protection measures |
| **Reduction** in number of wildlife collision | **Permeability** - number of culverts per km |
| | **Bird protection** at the overhead lines of tracks: % of track network or line /track length [km] equipped with bird protection measures |
| Improved ground water and water quality | **Use of herbicides** |
| Management of **invasive alien species** | **Areas of invasive (plant) species treatment** |

# PUT IN PLACE THE SPECIALIST SKILLS

*Case Study: ÖBB-Infrastruktur AG*
*Railway Ecology course - part of internal environmental training*

**Key-constrains faced by the sector on biodiversity management**

**LACK OF RESOURCES, SKILLS, AND KNOWLEDGE**

**Training in regulatory frameworks and standards for ecology, to build knowledge of the workforce**

- **Improve data management and reporting (e.g. designated sites and protected species)**
- **Reinforce information regarding habitat management procedures and guidelines**


### Develop a vision for railways and biodiversity

Set out ambitions and commitment to conserving and enhancing biodiversity accompanied by a timeline to deliver changes. This will contribute to rail becoming the most environmentally friendly mode of transport.

### Enable a cultural change to prioritise nature and the environment

Embed conservation and enhancement of biodiversity at every business level, alongside safety, performance and other environmental targets, such as achieving net zero greenhouse gas emissions.

### Recognise the positive role railways have in conserving biodiversity

Engage with policy makers to ensure the beneficial role railways can have on biodiversity is recognised and incorporated into national and European Union nature conservation policies.

### Value biodiversity and natural assets

Monitor and manage the status and condition of habitats and biodiversity associated with railways.

### Put in place the specialist skills

Acquire specialist capabilities and competencies in ecology to fully understand these assets and deliver appropriate management actions.

### Establish management plans to protect and enhance biodiversity

Develop innovative approaches to managing biodiversity assets, taking account of both the lineside and interactions with the wider landscape, and including nature-based solutions specific to railways.

### Implement the biodiversity mitigation hierarchy

Limit the negative impacts of railway development activities by following the principles of avoiding, minimising, restoring or offsetting impacts on biodiversity.

### Monitor the outcomes of biodiversity management

Adopt consistent and repeatable approaches to monitoring the outcomes of land use management to conserve and enhance biodiversity. This is key to setting ambitious targets for biodiversity assets and improving their management, and for corporate accountability.

### Take collective action for biodiversity

Work together to deliver landscape-scale benefits for biodiversity through the provision of wildlife corridors and enhanced landscape permeability for species movement.

### Make a commitment to biodiversity net gain

Set ambitious targets for conserving and enhancing biodiversity, with no net loss of biodiversity by 2030, and net gain by 2050, with progress assessed through regular monitoring.

### Partnership working

Seek partnerships with stakeholders to deliver benefits to biodiversity at scale and in the long term.

### Share best practices

Publish and share best-practice guidelines for managing and conserving biodiversity management with one another and with stakeholders to improve their effectiveness.

### Improve communications

Use a wide range of communication tools to openly communicate plans for, and approaches to, biodiversity management with employees, passengers, society and neighbours, and to disseminate progress and achievements.

REVERSE

*European Railways: Strategy and Actions for Biodiversity.*
*Ecological Effects of Railways on Wildlife (rEvERsE) Project*
UIC Sustainability, May 2022

# CONCLUSION

*" A well-managed green infrastructure will bring biodiversity benefits helps support safer and more reliable railways operations. "*

**To better value and manage the green lineside assets**

- Work collaboratively
- collect comprehensive data
- set targets embedded in short- and long-term planning

**Emerging Trends**

- Integration of innovative digital remote monitoring
- Biodiversity consideration in early design of infrastructure

- Provide operational safety on rail network
- Stabilised earthworks
- Visial screening and landscape value
- Protected from extreme weather

# THANK YOU