

# Introduction: objectives, scope and activities

22/02/2022

Iñaki Beltrán Hernando

Fundación Tecnalia Research & Innovation



MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

# F R O J E C T

## FUTURE PROOFING STRATEGIES FOR RESILIENT TRANSPORT NETWORKS AGAINST EXTREME EVENTS

## Introduction: objectives, scope and activities :

Iñaki Beltrán, Tecnalia Research & Innovation

The overall objective of FORESEE is to provide cost effective and reliable results to improve resilience of transport infrastructure, as the ability to reduce the magnitude and/or duration of disruptive events.

FORESEE has developed and applied:

- New methodologies
- Technologies
- Tools
- Resilience squemes

Aimed to anticipate, absorb, adapt to, and/or rapidly recover from a potential disruptive event.





National Transport Authorities, transport infrastructure operators, engineering companies and consultancy firms





### Users and freight









6

## Disruptive events covered in FORESEE

EarthquakesLandslides

Floodings Accidents

- Fires
- Cyberattack
  - Fog
  - Wind
  - Others

















## CASE STUDIES

#### Case study #1. A24 Highway. Italy



AISCAT

#### Case study #2. A16 Highway. Italy



AUTOSTRADE PER L'ITALIA

#### Case study #3. Montabliz Viaduct. Spain



**UNIV CANTABRIA** 

Case study #6. 25th April suspended Bridge.



INFRAESTRUCTURAS DE PORTUGAL

#### Case study #4. Oebisfede-Berlin Spandau. Germany



IVE

#### Case study #5. M-30 tunnels. Spain



FERROVIAL



8

# FORESEE Key exploitable Results

- 1. Guidelines to select resilience and service indicators set target objectives.
- 2. Governance module
- 3. Risk mapping tool
- 4. Virtual Modelling platform and asset failure prediction
- 5. SHM BIM based alerting SAS platform
- 6. Assessment of traditional solutions in drainage and sustainable drainage systems in linear infrastructures
- 7. Traffic module
- 8. Fragility Functions + Decission Support module.
- 9. New family of permeable pavements
- 10. Smart and integral slope stabilization protection systems
- II. Flooding Methodology
- 12. Algorithm to determine optimal restoration and risk reduction intervention programs

- 13. Hybrid data assessment applied to transport infrastrucutre management
- 14. Methodology for the generation of shakemaps from semiempirical approach
- 15. SHM algortihms
- 16. FORESEE toolkit
- 17. C2. Command and control
- 18. Design, construction and remediation plans
- 19. Operational and maintenance plans
- 20. Management and contigency plans
- 21. Flooding assesment
- 22. Cybertacck Asessment
- 23. Standardisation in the FORESEE project

#### Part of the results have been validated in real Case Studies (in more than I CS), other have been tested in laboratory











## **Stakeholders Reference Group**

## FORESEE's PRESENCE WORLDWIDE



ILUNITED KINGDOM

IRELAND

I. SWEDEN

III NETHERLANDS

CROATIA

GREECH

Count:

Count: 2

A functional and successful SRG has been managed by FORESEE, together with Jesús Rodríguez as Chairman.

Workshops (4), webinars (3), round tables and documents' review has been organized with external experts.

Nowadays, **243 contact** persons from **92 organizations** and aprox **30 countries** from **4 continents** have been involved in the SRG:

- Transport authorities, owners and transport operators of infrastructures (41)
- Engineering, material and construction companies (19)
- European Associations (3)
- Research institutions (27).

## FORESEE; progress beyond the state of art

## ACHIEVEMENTS

SITUATION AVVARENESS AND RESILIENCE DECISION SUPPORT SYSTEMS s b a s p a d

To provide resilience and service definitions, indicators and objectives and how they should be used from the transport infrastructure managers' point of view., applying CBA analysis to support operational decisions.

To demonstrate how structural deformations can be detected from satellites and combined with in-situ sensor data and virtual physical environments (BIM and others) to create a dynamic real-world assets

02

To offers ways of intelligibly processing, integrate, fusing and interconnecting Big streams of Data offering means of extracting adequate conclusions and predictions.

03

To implement an asset failure prediction capability by mapping the highest vulnerability areas, assessing current status and mechanical stability of key assets, traffic behavior and prediction, possible re-routings, failure conditions.





## FORESEE; progress beyond the state of art

## ACHIEVEMENTS

NEW MATERIALS, TECHNIQUES AND SYSTEMS

05

To design new permeable pavements aimed to improve network's resilience to extreme weather events To improve the currents calculations for determining flows of water and floodings.

06

To improve the design of Sustainable Drainage Systems (SDS) for flood-proofing and surface

water management

07

To provide one single smartened slope protection kit (mass retaining + control erosion membrane) which improves resilience while minimising production & installation costs

08

To provide performance-based designs concepts for safety routes for efficiency traffic management

09



## FORESEE; progress beyond the state of art

## ACHIEVEMENTS

## RESILIENCE SCHEMES



maintenance plans

FORESEE incorporates the "dynamic" approach to the communication and contingency plans in which the timedependent evolution of the people and threat is considered.



PSYCHOLOGICAL AND BEHAVIOURAL DIMENSIONS OF SAFETY FROM THE PERSPECTIVE OF USERS

**12** FORESEE has explored the risk perception and decision-making in a way that can capture users' attitudes to transport risks allowing developing a more

detailed contingency plans.



## FORESEE; impacts



Strasbourg, 14.12.2021 COM(2021) 812 final

2021/0420 (COD)

#### Proposal for a

#### **REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL**

on Union guidelines for the development of the trans-European transport network, amending Regulation (EU) 2021/1153 and Regulation (EU) No 913/2010 and repealing Regulation (EU) 1315/2013

(Text with EEA relevance)

{SEC(2021) 435 final} - {SWD(2021) 471 final} - {SWD(2021) 472 final} - {SWD(2021) 473 final}

## Link to lex europa

#### Article 46

#### **Resilience of infrastructure**

 When planning infrastructure, Member States shall improve the security and the resilience of the transport infrastructure to climate change, natural hazards, humanmade disasters, as well as intentional disruptions affecting the functioning of the Union transport system. When implementing projects of common interest, Member States shall take into consideration:

- (a) interdependencies, linkages and cascading effects with other networks such as telecommunication and electricity network;
- (b) safety, security and performance in the presence of multiple hazards;
- (c) structural infrastructure quality during its whole lifecycle, with particular attention to the future projected climate conditions;
- (d) civil protection needs to react to disruptions;
- (e) cyber-security and resilience of infrastructure, with particular attention to cross-border infrastructure.
- Projects of common interest for which an environmental impact assessment must be carried out in compliance with Directive 2011/92/UE shall be subject to climate proofing. The climate proofing shall be undertaken based on the latest available best practice and guidance to ensure that transport infrastructures are resilient to the adverse impacts of climate change, through a climate vulnerability and risk assessment, including through relevant adaptation measures, and through integration of the costs of greenhouse gas emissions in the cost-benefit analysis. Such requirement does not apply to projects for which the environmental impact assessment has been completed before entry into force of this Regulation.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 769373. This document reflects only the author's views. The European Commission and INEA are not responsible for any use that may be made of the information contained therein.

2.





Name: <u>Iñaki Beltrán</u> <u>inaki.beltran@tecnalia.com</u> <u>Contact details</u>

H2020 FORESEE Project Partner www.foreseeproject.eu

Fundación Tecnalia Research & Innovation www.tecnalia.com Parque Tecnológico de Bizkaia C/ Astondo Bidea, Edificio 700 E-48160 Derio Bizkaia Spain

Follow us on:



foreseeproject.eu



@ForeseeProject



Resilient Transport Infrastructure: FORESEE Project

FORESEE Media



MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE