

Future proofing strategies FOr RESilient transport networks against Extreme Events



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Keywords & Outline

Keywords

#Resilience

#Security

#Critical Infrastructure

#Transport Network

#Risk Management

#Asset Integrity

#Business Continuity

#Supply Chain

#Natural Events

#Extreme Events

OUTLINE

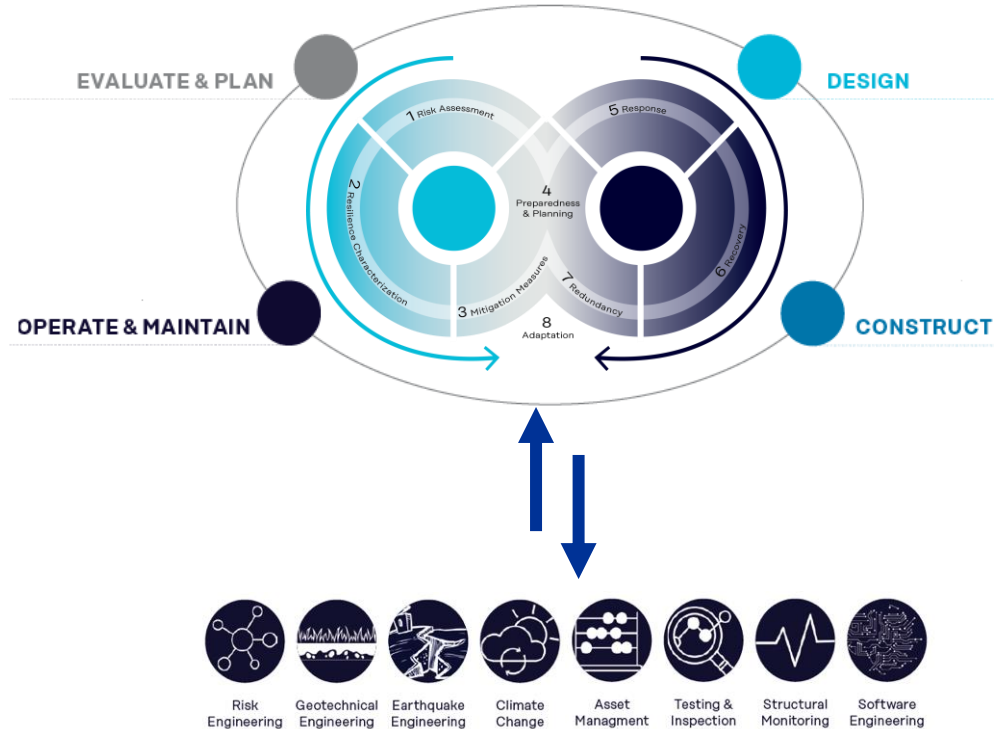
- Why a toolkit might be useful
- What makes the toolkit special and workflow
- How it looks like and how we can help infrastructure managers
- How training can boost adoption
- Recap of benefits for users

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Why a toolkit might be helpful

- ▶ **Making Resilience Operational is a challenge per se**
- ▶ It means moving from a concept-based approach to resilience to a **service-based approach for resilience**
- ▶ The latter should be enabled by **toolkits** to help INFRA managers to understand the benefits and potential of resilience across various **life-cycle stages and for various needs** (e.g. ordinary management, extraordinary management, emergency management, etc.)
- ▶ To implement toolkits we need to integrate **different competences** (e.g. tools) and “connect” different topics (e.g. risk assessment, resilience estimation, mitigation measures) across all life-cycle stages


































































What makes the Toolkit «special»

Asset Component




- Transport system 
- Roads 
- Railway 
- Highways 
- Tunnels 
- Bridges 
- Viaducts 
- All 

Event Detected:

- Flood 
- Landslide 
- Earthquake 
- Storm 
- Fire 
- Geological impact 
- Heavy Rain 
- Heavy Snow 
- Cyberattack 
- Climate impact 
- All 

TOOL NAME	Event Detect	Asset Component	Life Cycle Phase applied	Resilience Cycle applied
Governance Module				
Risk Mapping				
Alerting SAS platform				
Traffic Module				
Decision Support Module DSM				
Algorithms for the selection and definition of efficient and optimal actions / Intervention & Mitigation	  	 		
Hybrid Data Assessment For Diagnosis & Prognosis				 
Command and Control center	  	  		
Definition of framework: use cases, risk scenarios and analysis of impact				
Shakemaps scenarios				
Guidelines for the adoption of sustainable drainage systems				

Life Cycle Phase applied:

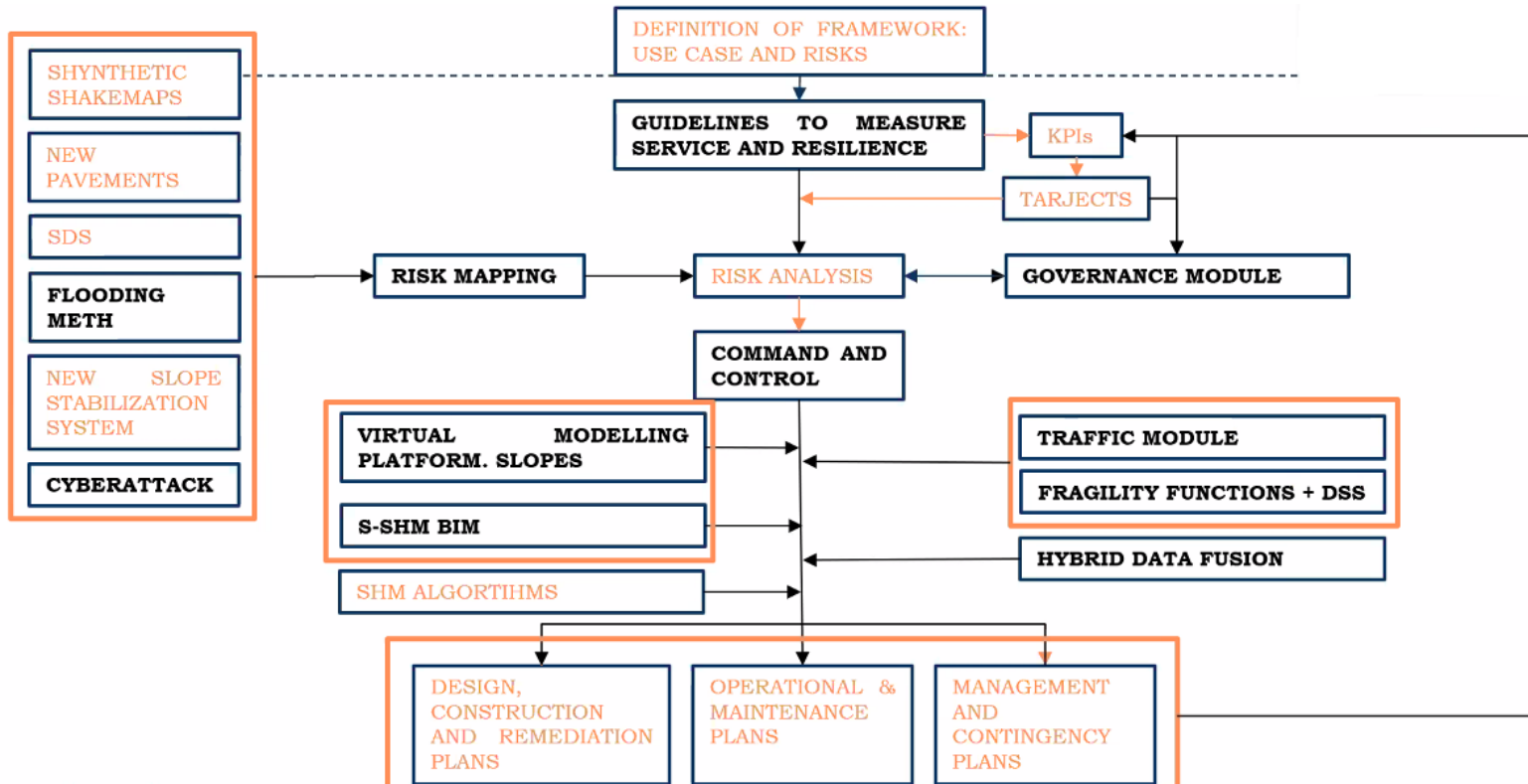
- Design 
- Operations 
- Maintenance 
- Planning 
- Construction 
- All 

Resilience Cycle applied

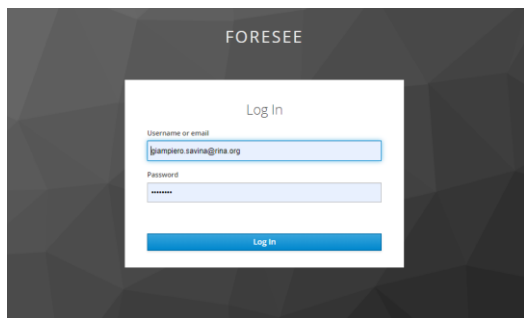
- Prevention 
- Preparedness 
- Response 
- Recovery 



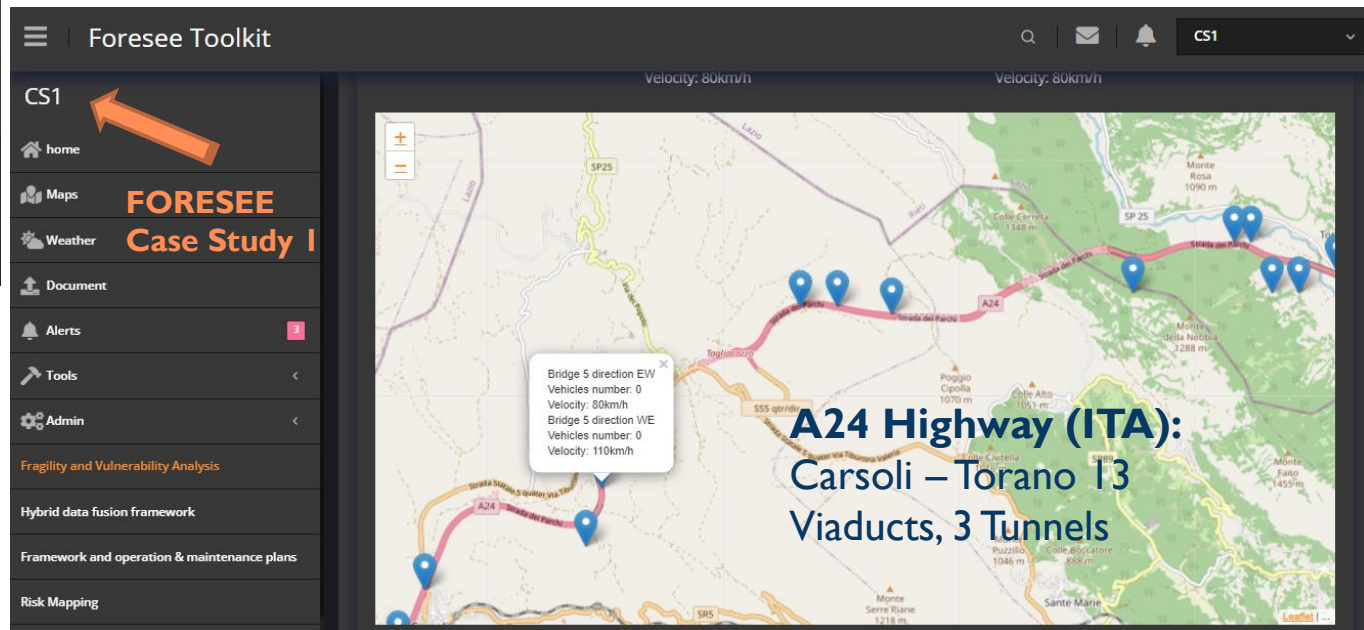
Which is a typical toolkit workflow



Foresee Toolkit: Home page



The operator will have its own access credentials for managing the platform, which for security reasons is only visible to insiders

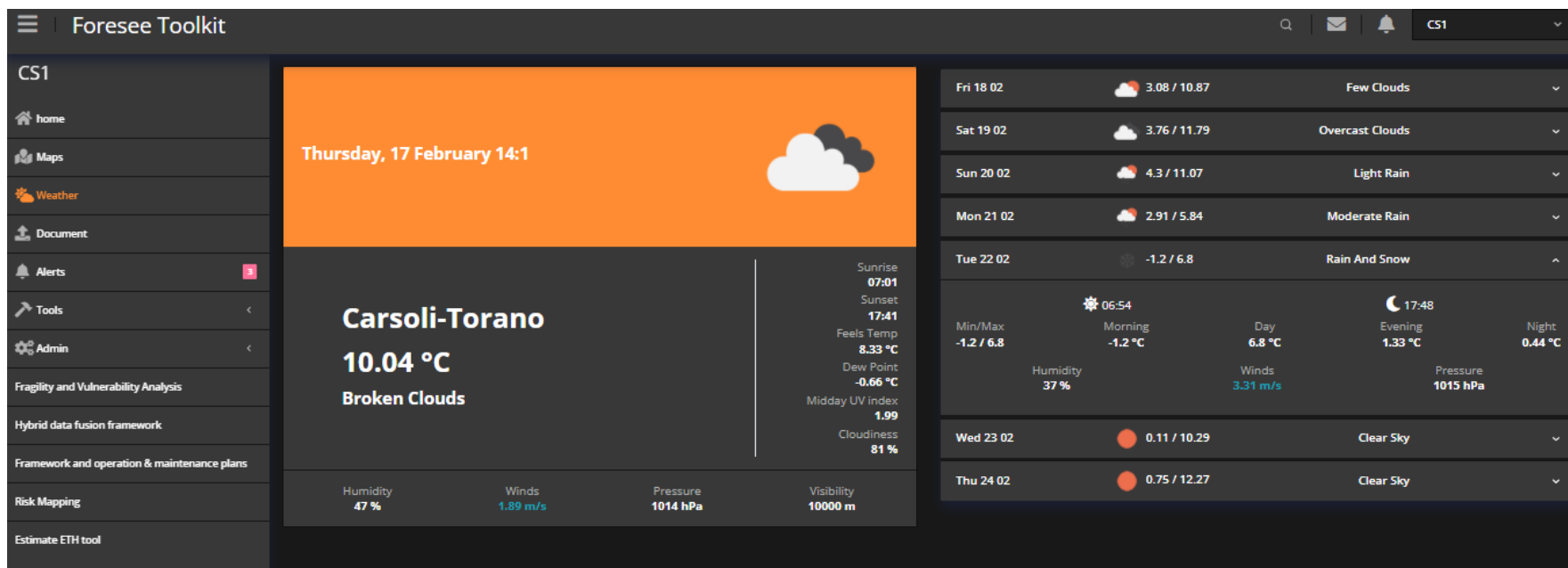


The menu on the left allows you to choose actions to query information about the asset. Choosing one of the 4 available tools we can query the function that the SW automatically analyses

The central map allows quick geographical identification of the section being analysed



Foresee Toolkit: Weather Info



With the Weather function, decisions can be made, for example, on preventive actions such as closures due to adverse weather events or the movement of salt spreaders in agreement with the operational centres.



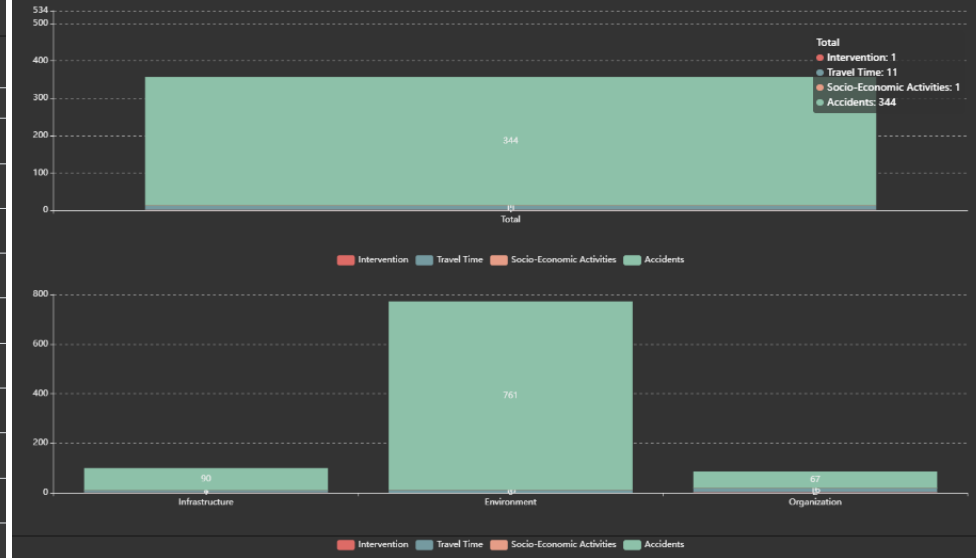
Foresee Toolkit: Resilience Indicators

Selecting a tool from the menu on the left takes you to this screen....

Table of value

Save input values

Input	Symbol	Value
Annual cost of regular maintenance [€/m]	Cm	0.5
Length of the infrastructure [m]*	Li	24500
N. of people traveling per day	P	1000
N. of people traveling per work in a day	Pw	700
N. of people traveling per leisure in a day	Pl	300
Goods travelling per day [trains]	G	10
Cost of work time [€/min]	Cwt	2
Cost of leisure time [€/min]	Clt	1
Socio economic costs per person [€/p.p.]	SECp	0.1
Socio economic costs for goods [€/train]	SECg	2



The most relevant indicators have been identified for the various analyses of the fragility of an asset and each has a score to highlight any gaps in the asset

The graph shows the assets in the asset by type. In this case they all depend on accidents



Foresee Toolkit: Fragility and Vulnerability

The tool allows to analyse the highlighted risk in terms of direct losses/year and the resilience graph shows the time from interruption to recovery

CS1

- Home
- Maps
- Weather
- Document
- Alerts
- Tools
- Admin

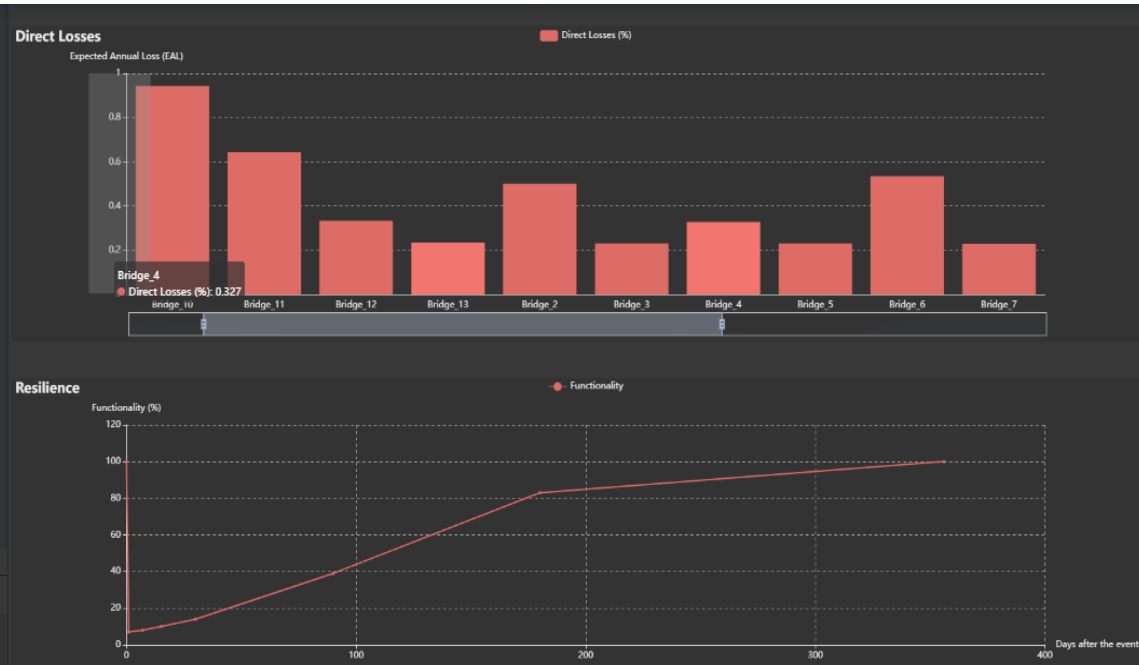
Fragility and Vulnerability Analysis

Hybrid data fusion framework

Framework and operation & maintenance plans

Risk Mapping

Estimate ETH tool



C - Description

Acceptable level of driver comfort; Some delay

A gauge with a yellow needle pointing to 'C' on a scale from A to F. The scale is color-coded: A (green), B (yellow-green), C (yellow), D (orange), E (red-orange), F (red).

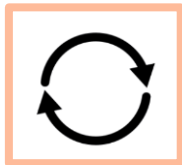
Automatically assigns a score for the level of service that assesses from the user's point of view the degree of acceptability



How training can boost adoption



Toolkit User MANUAL



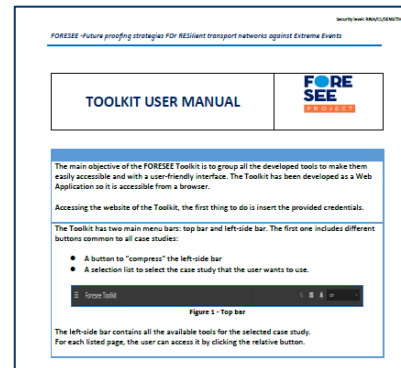
Training lifecycle methodology



Contact persons



Explanatory videos



Recap of benefits for the final users

BENEFITS of the TOOLKIT



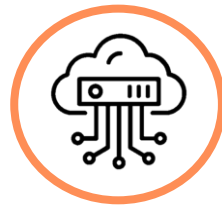
Integrate of different functions and tools



Make Resilience Operational



Provide a single point of access



Allow for complex and correlated (I/O) analysis



Training package to support use



Innovative and aligned with main trends in Transport INFRA



Can be used on different types of infrastructures

TOWARDS THE USERS



(Public) Authorities and Agencies



Infrastructure managers, operators, Concessionaires



General Contractors



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**FORE
SEE**
PROJECT

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