



COST Action  
TU I402

Quantifying the Value of Structural Health Monitoring



# The Vol for the Lezíria Bridge

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## a) About the decision maker

- The decision maker is a private company – BRISA Group
- the users of the bridge, the insurance company and the national authorities

## b) Objective

- Minimize operational costs (i.e. maintenance cost)
- Maximize income (i.e. toll profits)
- Ensure reputation (i.e. brand value)

## c) Regulative constraints

- Finite and limited budget
- Functionality limits (SLS)
- Inspections interval and duration



## d) System

### d.1) System representation

- Design information
- As built information
- Material properties
- Finite Element model
- Inspection records
- Repair records
- Monitoring data

### d.2) System temporal boundaries

- period for analysis covers, at least, the next 30 years, which is in line with the concession period





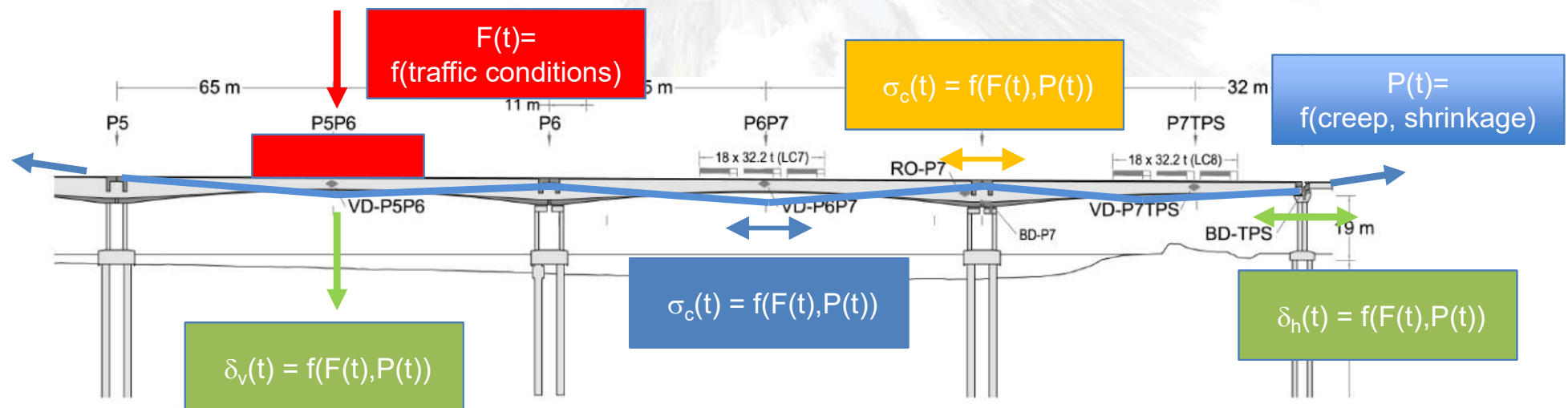
## e) Events

### e.1) Representation


- the occurrence of an extreme traffic load (i.e. short-term event) As built information
- the high rate of creep and shrinkage (i.e. long-term event)

### e.2) Consequences

- Short-term: loss of stiffness (i.e. cracking in concrete)
- Long-term: prestressing losses



## g) Decision alternatives or remedial actions

- 
- Do nothing
  - Monitoring (a second round to re-assess traffic loads)
  - Limitations on traffic speed
  - Limitations on vehicles weight (with potential diversion of traffic)
  - Strengthening
  - Close (temporarily) the bridge

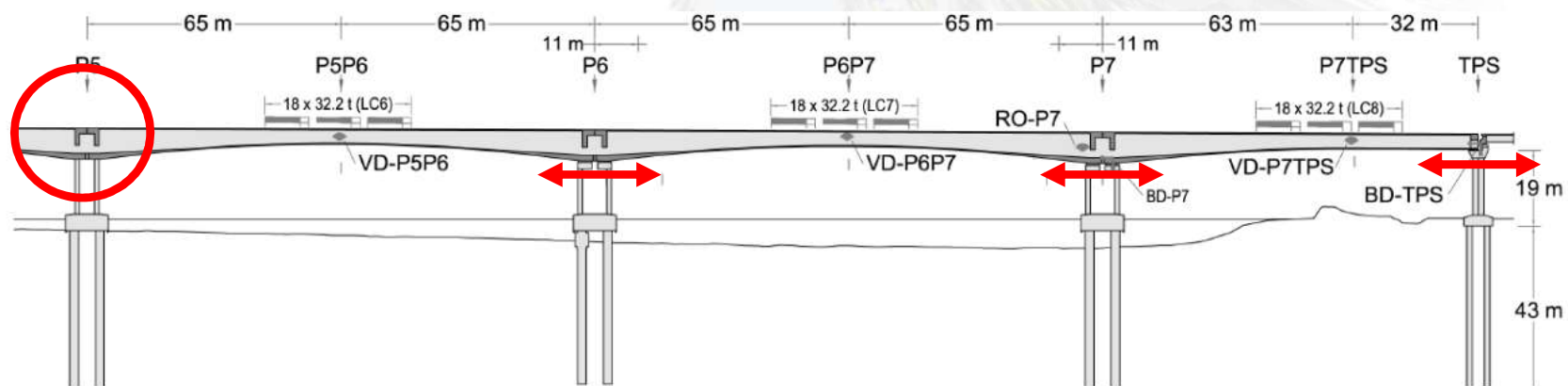
Higher costs/impact



## Critical appraisal, necessary simplifications

### The system

- FE model is being optimized (towards the optimal time-running)
  - Boundaries
  - Calibration (load test)
  - Translational and rotational stiffness

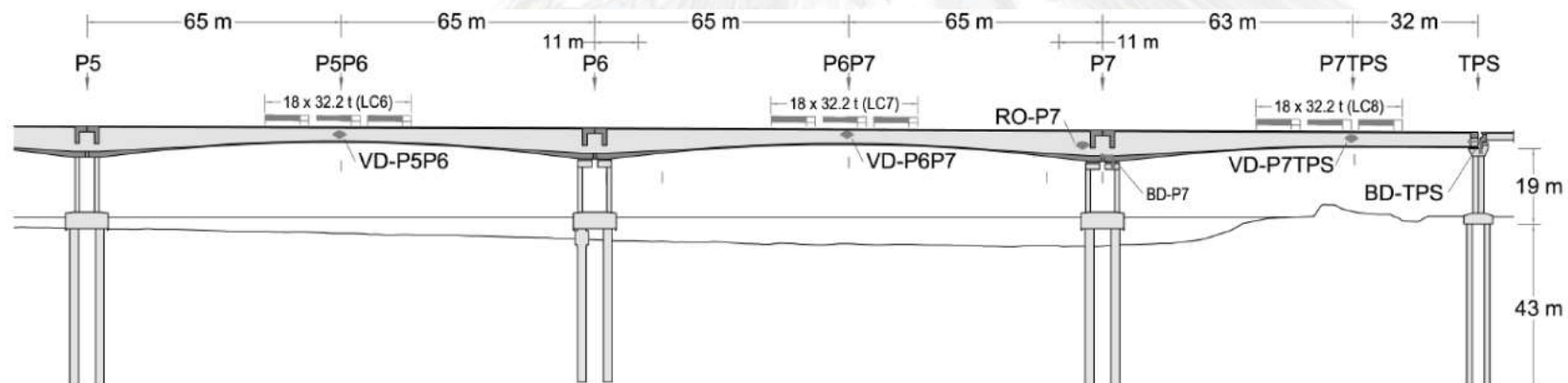




## Critical appraisal, necessary simplifications

### The performance

- Serviceability Limit States (SLS)
  - Quasi-permanent
  - Frequent
  - Characteristic
- Linear behaviour of structural materials (with potential concrete cracking)



**Likelihood functions:**

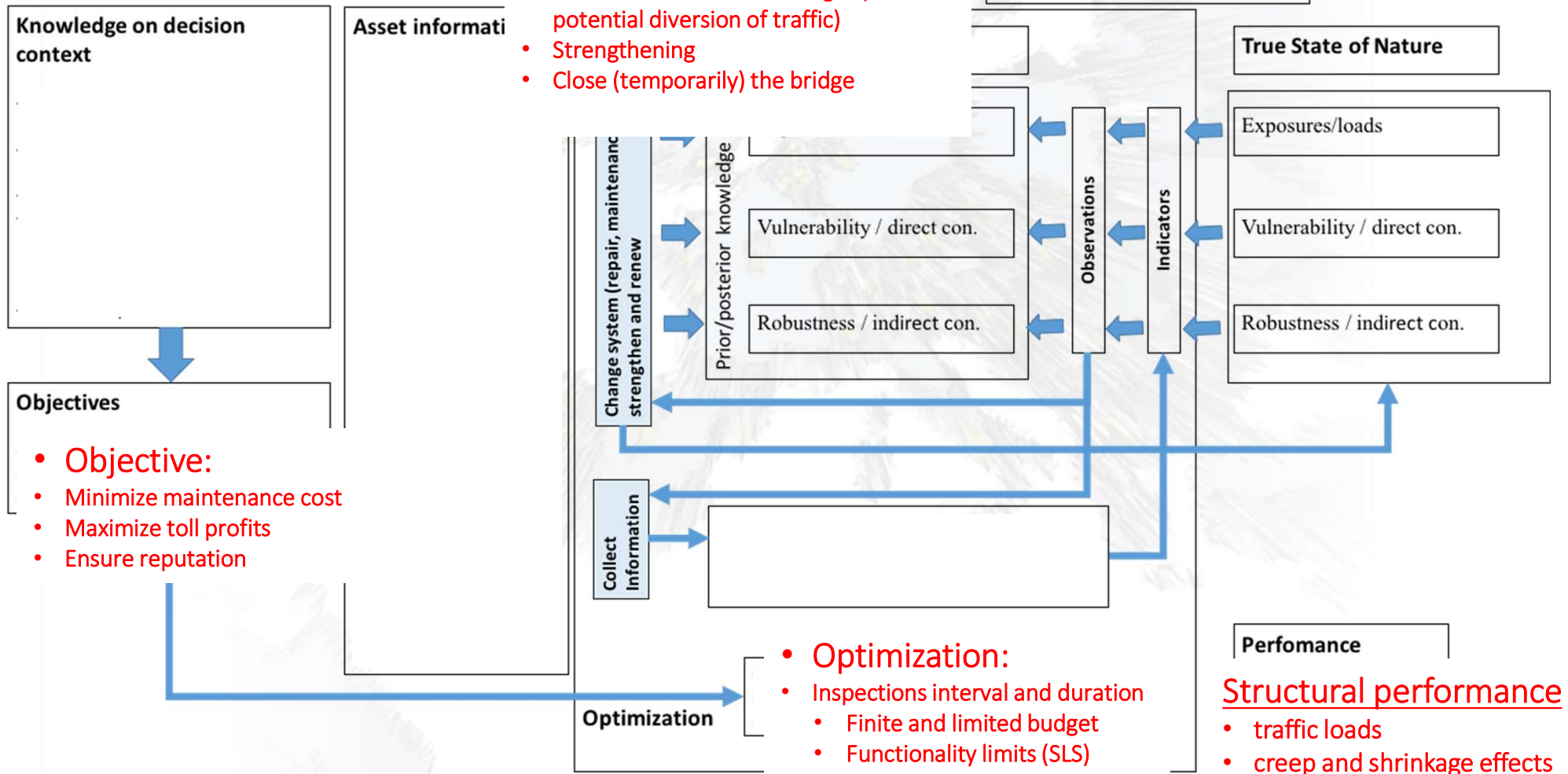
- Creep and shrinkage deformations
- Traffic loads on the bridge

**Actions:**

- Do nothing
- Damage assessment (
- Limitations on traffic speed
- Limitations on vehicles weight (with potential diversion of traffic)
- Strengthening
- Close (temporarily) the bridge

**Performance indicators:**

- Displacement index (bearings and mid-spans)
- Stress index (concrete and tendons)



Thank you for your attention

<http://www.cost-tu1402.eu/>

