Climate Change Impacts and Adaptation Strategies of European Water Utilities

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International Workshop, Nov. 3 and 4

Providing appropriate

LEVEL OF SERVICE

The main concern of

European Water Utilities

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CLIMATE CHANGE

means some

THREATS & IMPACTS

to urban water services provision

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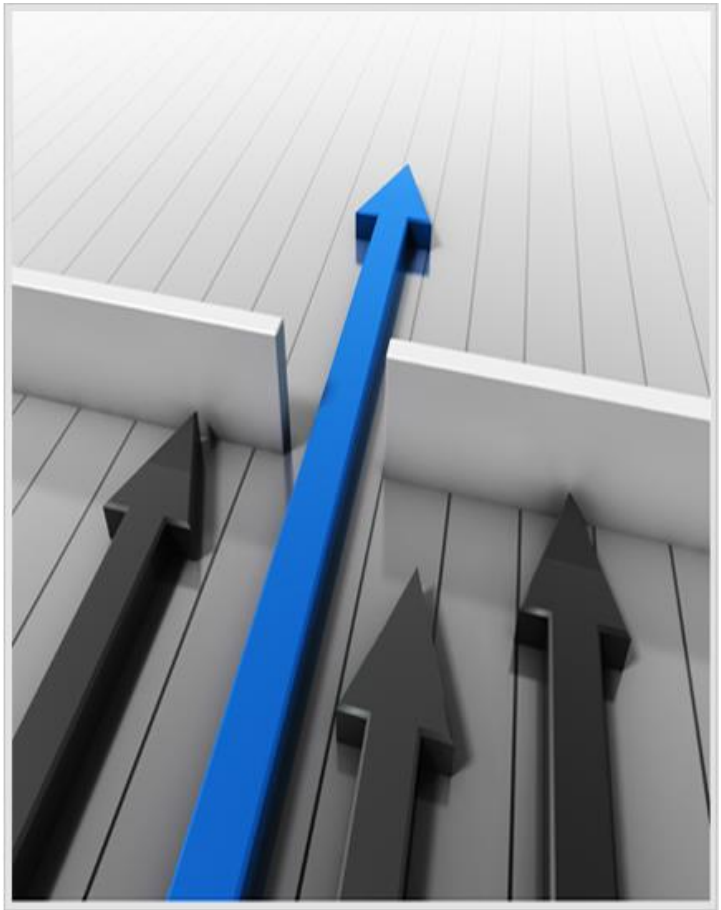
MAIN THREATS



- Different availability and seasonality of water resources
- Different frequency and severity of extreme events (floods and droughts, peak temperatures)
- Changes in raw water quality
- Different characteristics of consumption patterns
- Different weather conditions and their impacts on assets.
- Different receiving water bodies flows regimes

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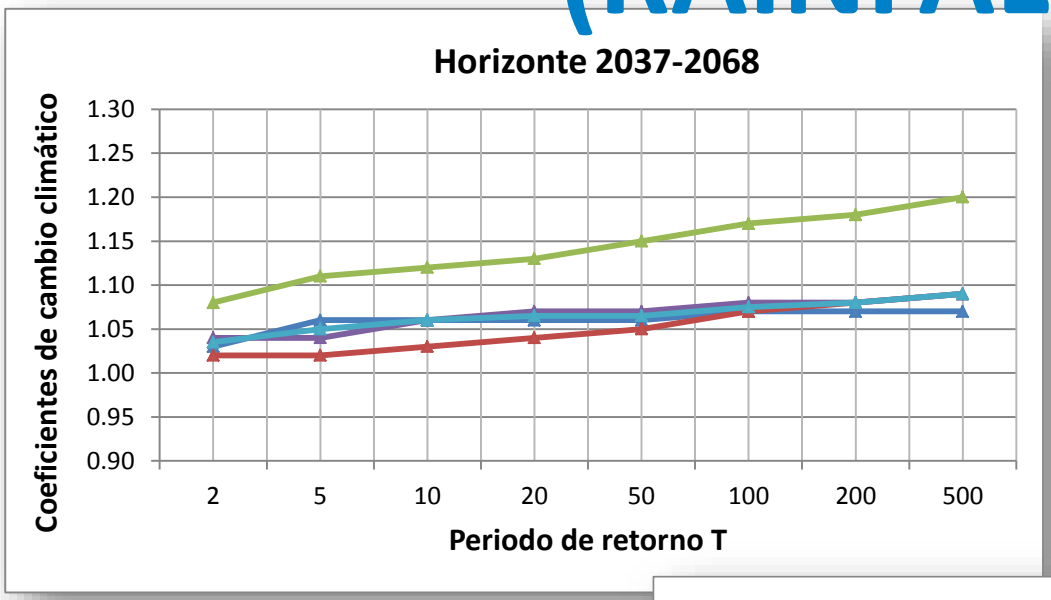
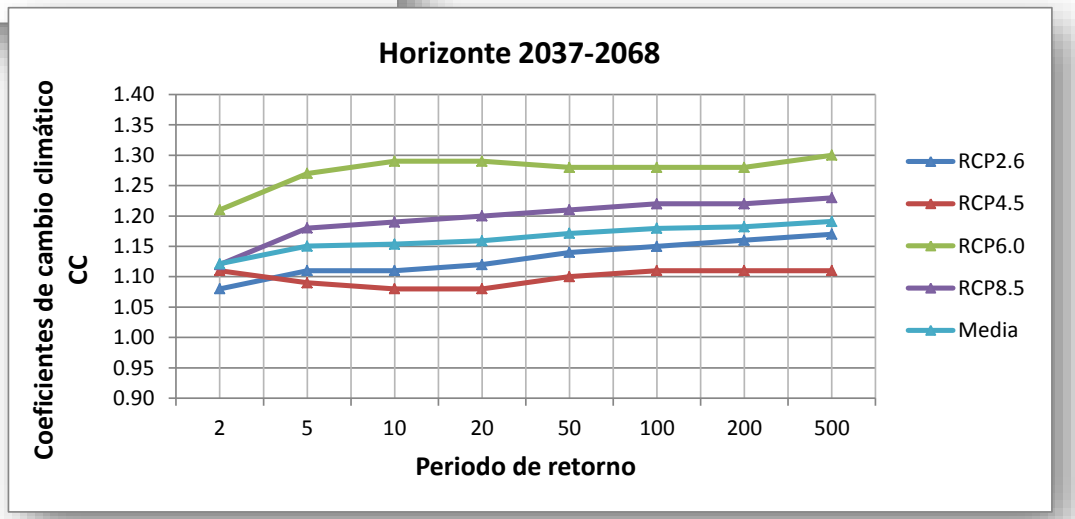
LIKELIHOOD OF THREATS (RAINFALL)





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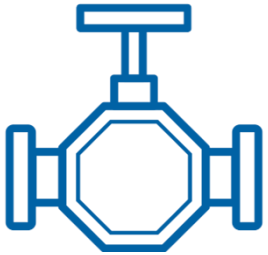
IMPACTS

Affected people citizens customers



Operational Costs

Environmental Impacts

Economic activity

Other Uses

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In summary,

It is a higher likelihood of threats and their related impacts

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Likelihood and impacts

Probability x

Consecuences

RISKS

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RISK

to the

Level of service

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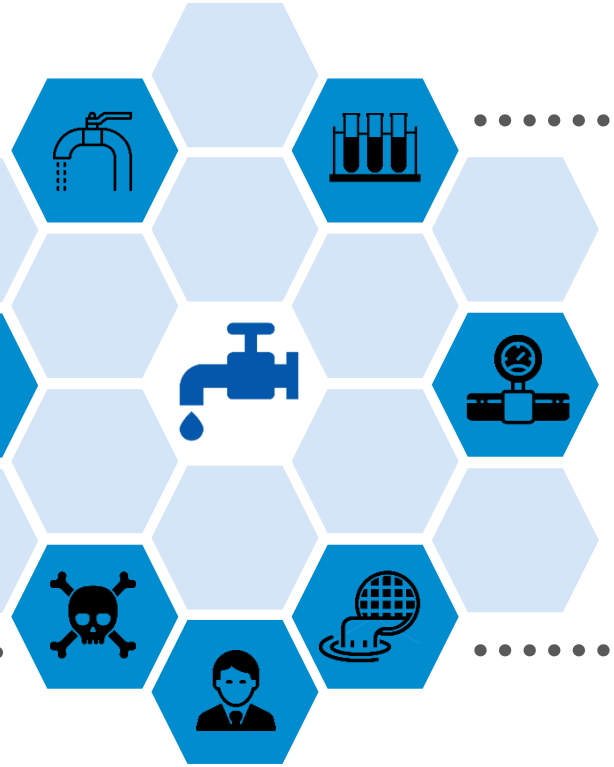
A comprehensive Level of Service



Continuity of service

Properties x Non-compliance hour
Properties x Non-compliance risk hour

Satisfactory relationship with customers

Unsatisfied properties

Inadequate quality discharged to receiving water

Water mass damaged
Spilled volume/receiver volume
x Spill Quality Factor

Compliance with regulation ,Authorities Proprietary

Inadequate quality of water supplied

Properties x Non-compliance hour
Properties x Non-compliance risk hour

Inadequate Pressure

Properties x Non-compliance hour
Properties x Non-compliance risk hour

Inadequate Operation of Sewerage and Drainage Network

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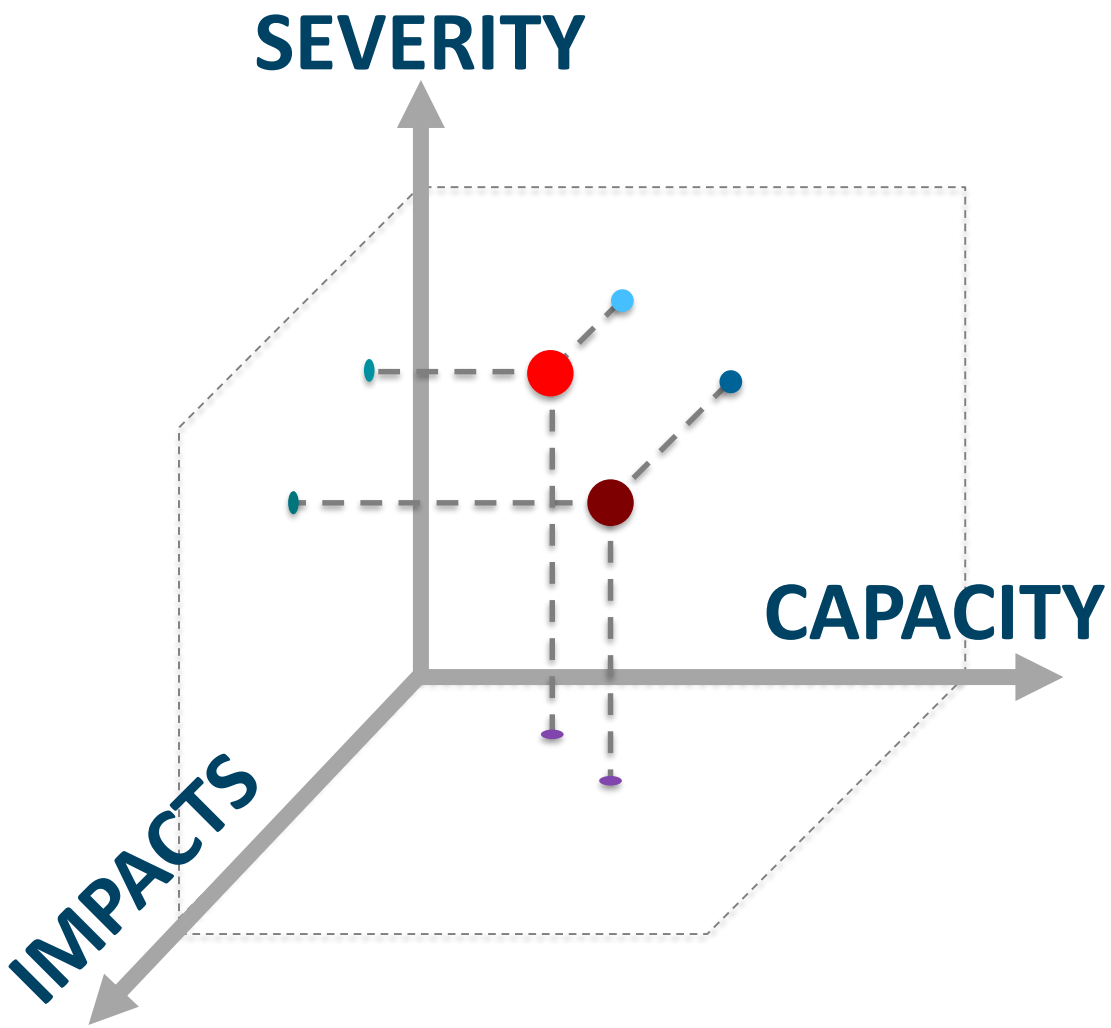
RISK MANAGEMENT



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Solutions for every case and topic will be different,

focused on capacities:

resistance, resilience, robustness or adaptiveness

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A system capacity
to avoid **FAILURES**

RELIABILITY

A system capacity
to recover from **FAILURES**

RESILIENCE

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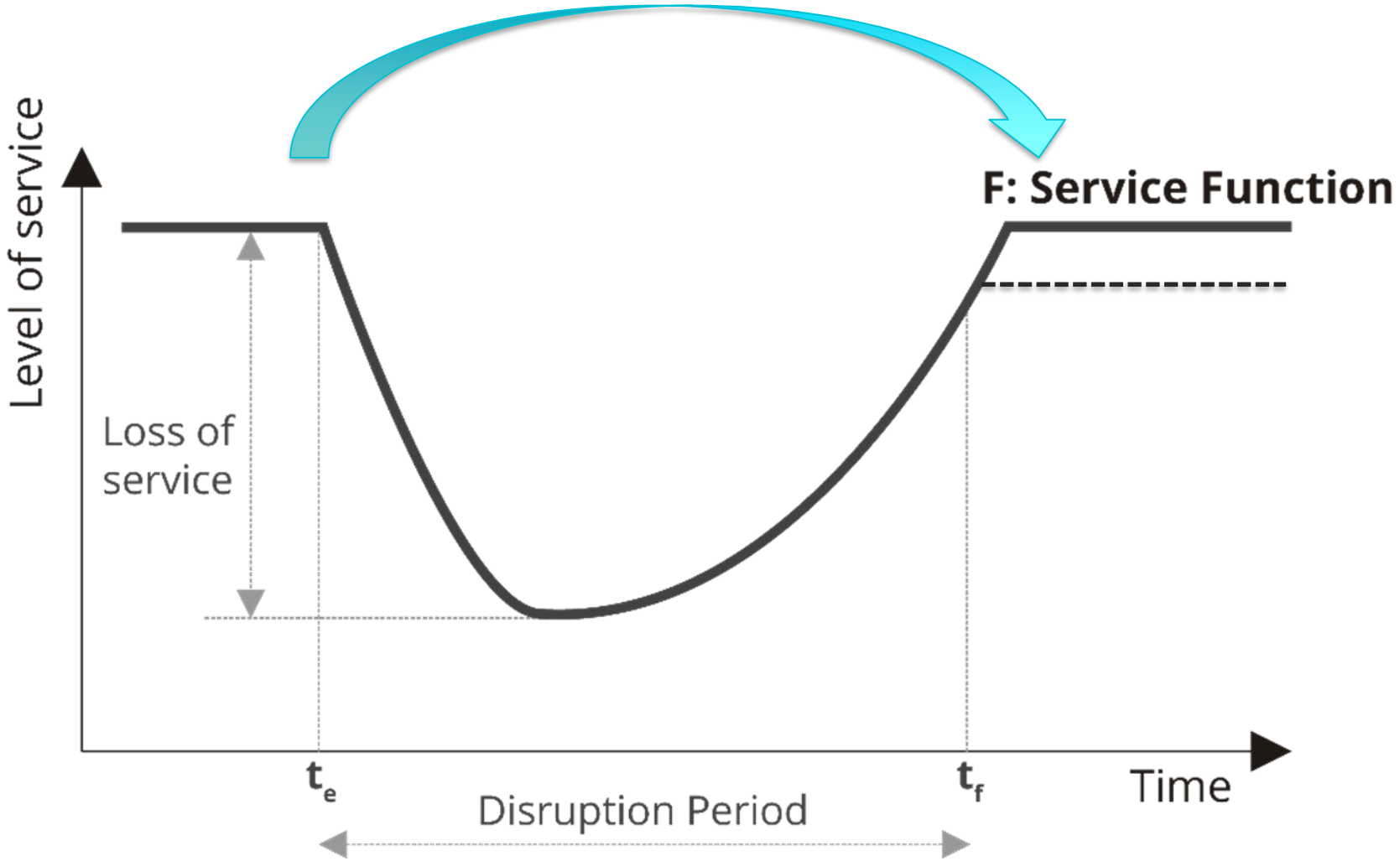
FAILS = LOSS OF FUNCTIONALITY



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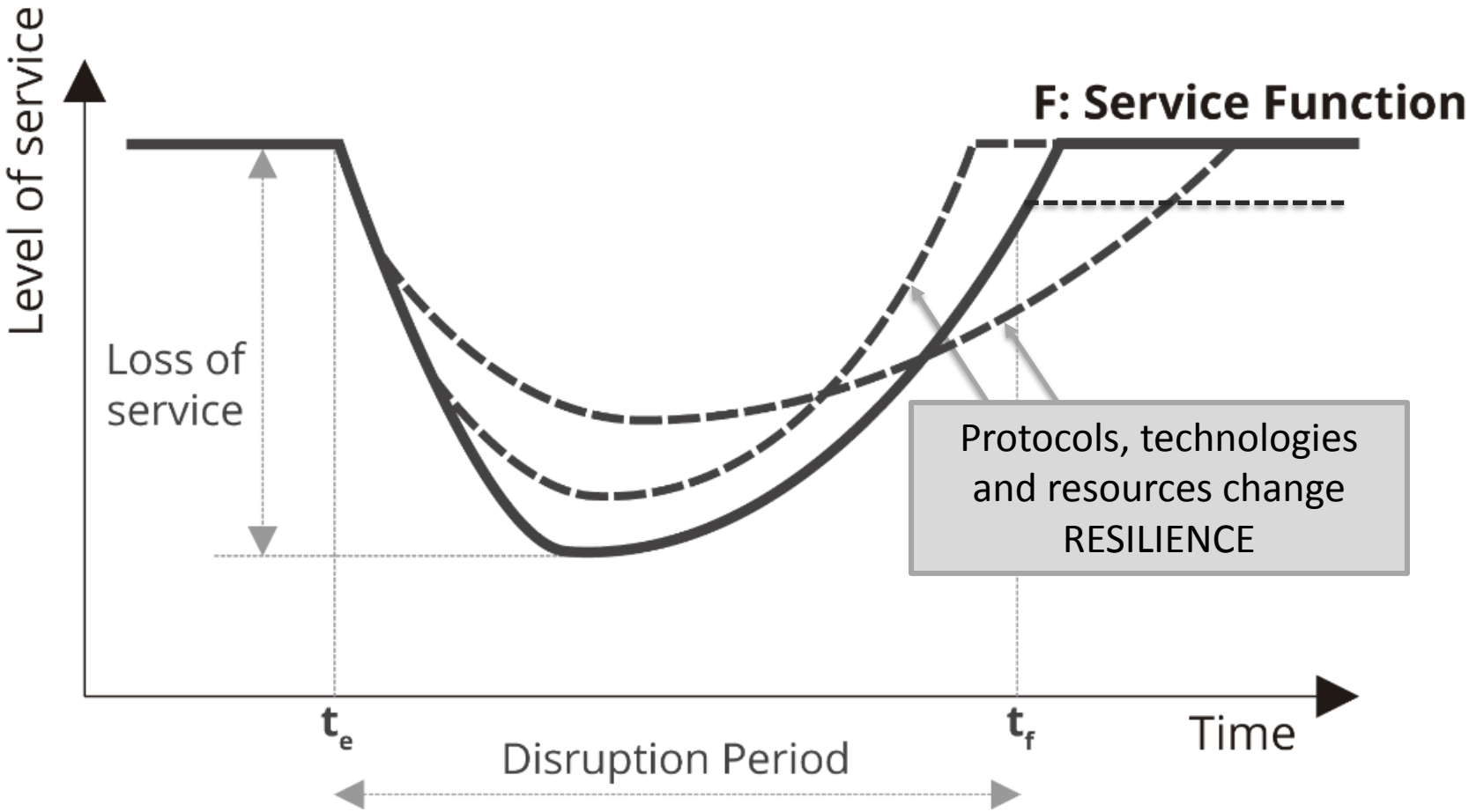
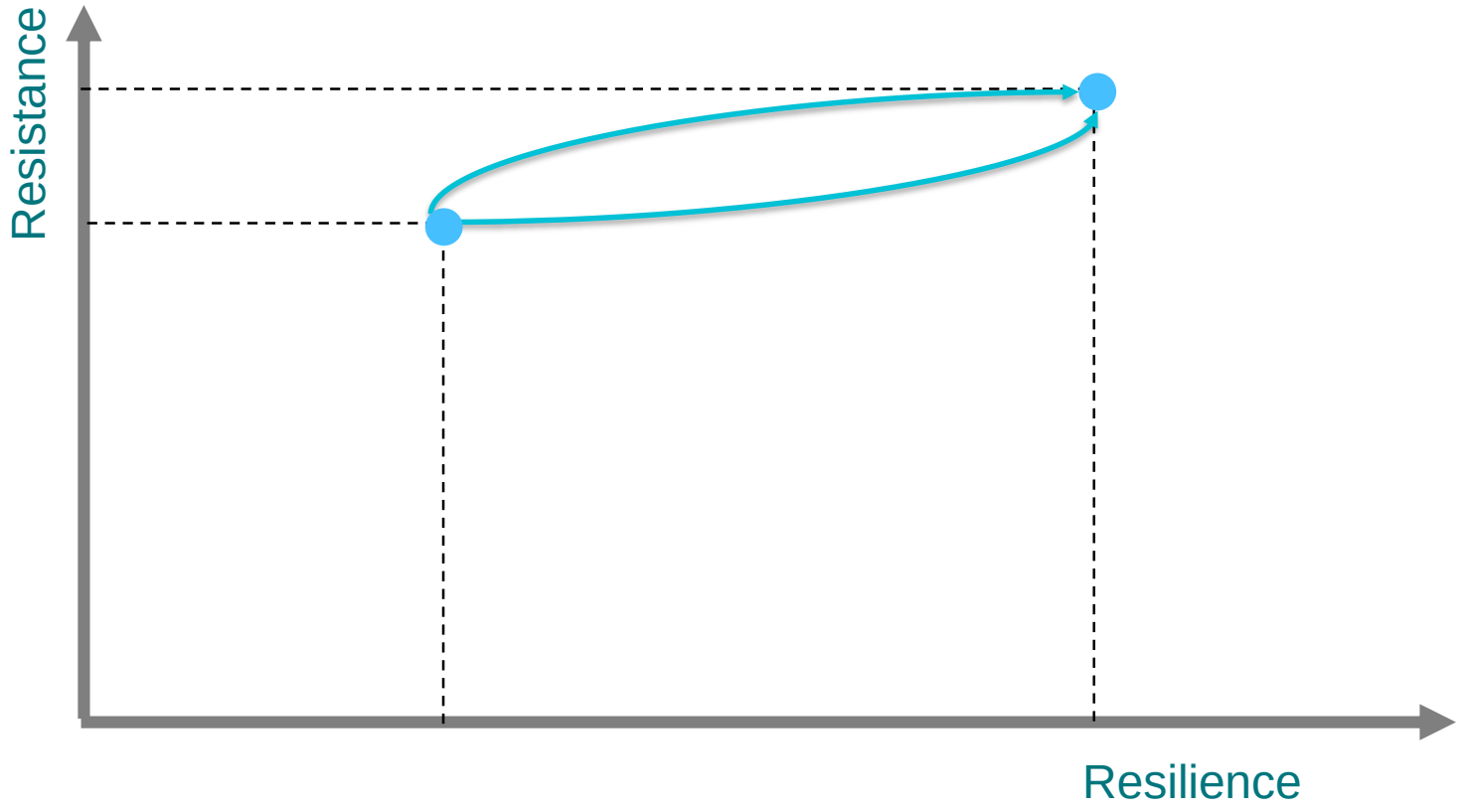
FAILS ASSESSMENT AND MANAGEMENT

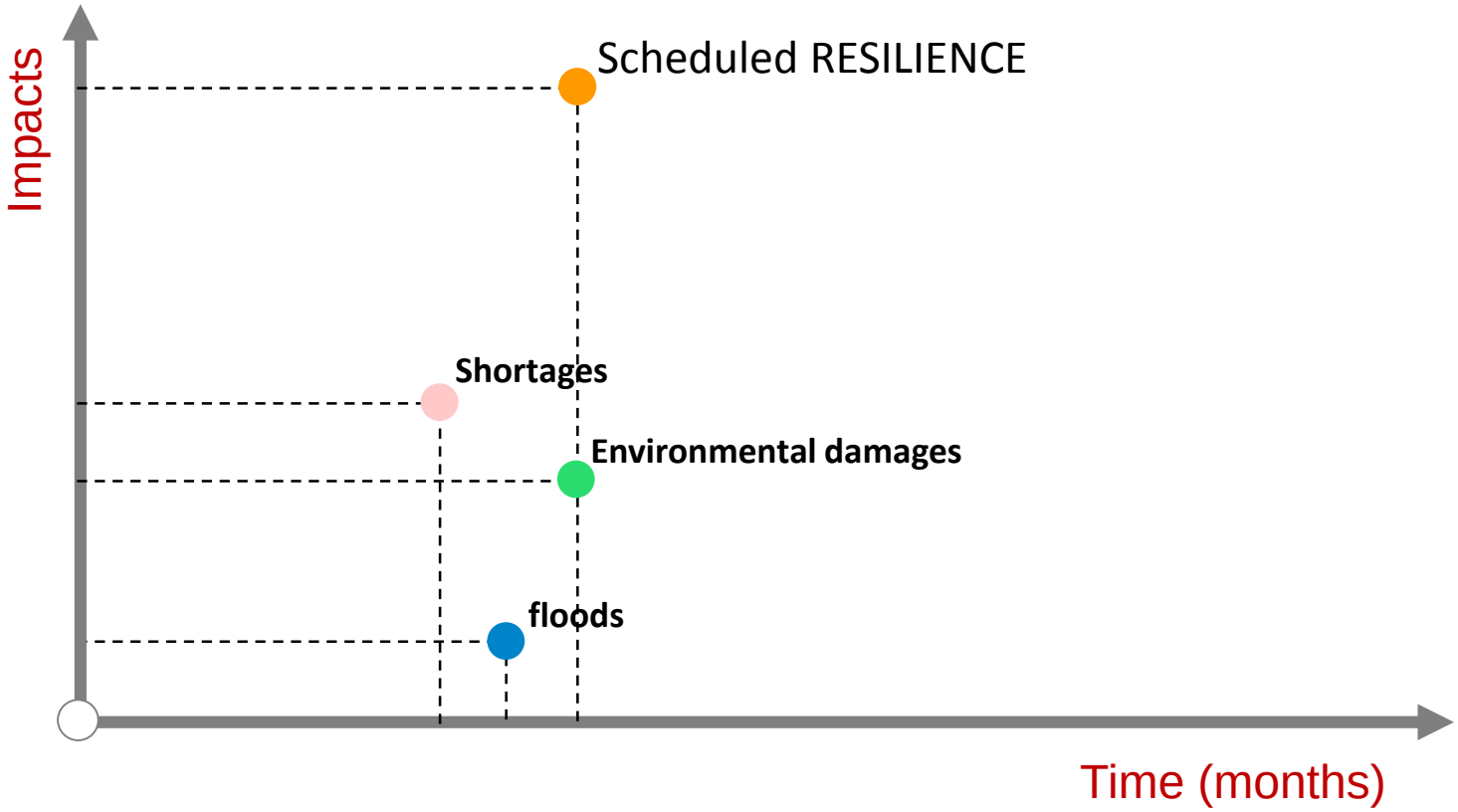


Resistance

Resilience



There is not only one resilience



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THRESHOLDS & TARGETS are NEEDED

RELIABILITY → **RESILIENCE**

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Then,

it is important to manage a **BASE LINE**
(diagnostic of current situation)

based on **RISK ASSESSMENT**

as an attribute of the **LEVEL OF SERVICE**
(and not only the compliance)

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CONCLUSIONS

- It is important to **quantify the current resilience to every type of threat**
- It is a must to **set a target (expectation) of risk** (likelihood and impacts)
- It is needed to **analyze feasible options**
- It is a must to **identify adaptive measures** to cope with the occurrence of scenarios before implementing solutions
- It is a must **planning contingency management**

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Some examples from

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Madrid, SPAIN

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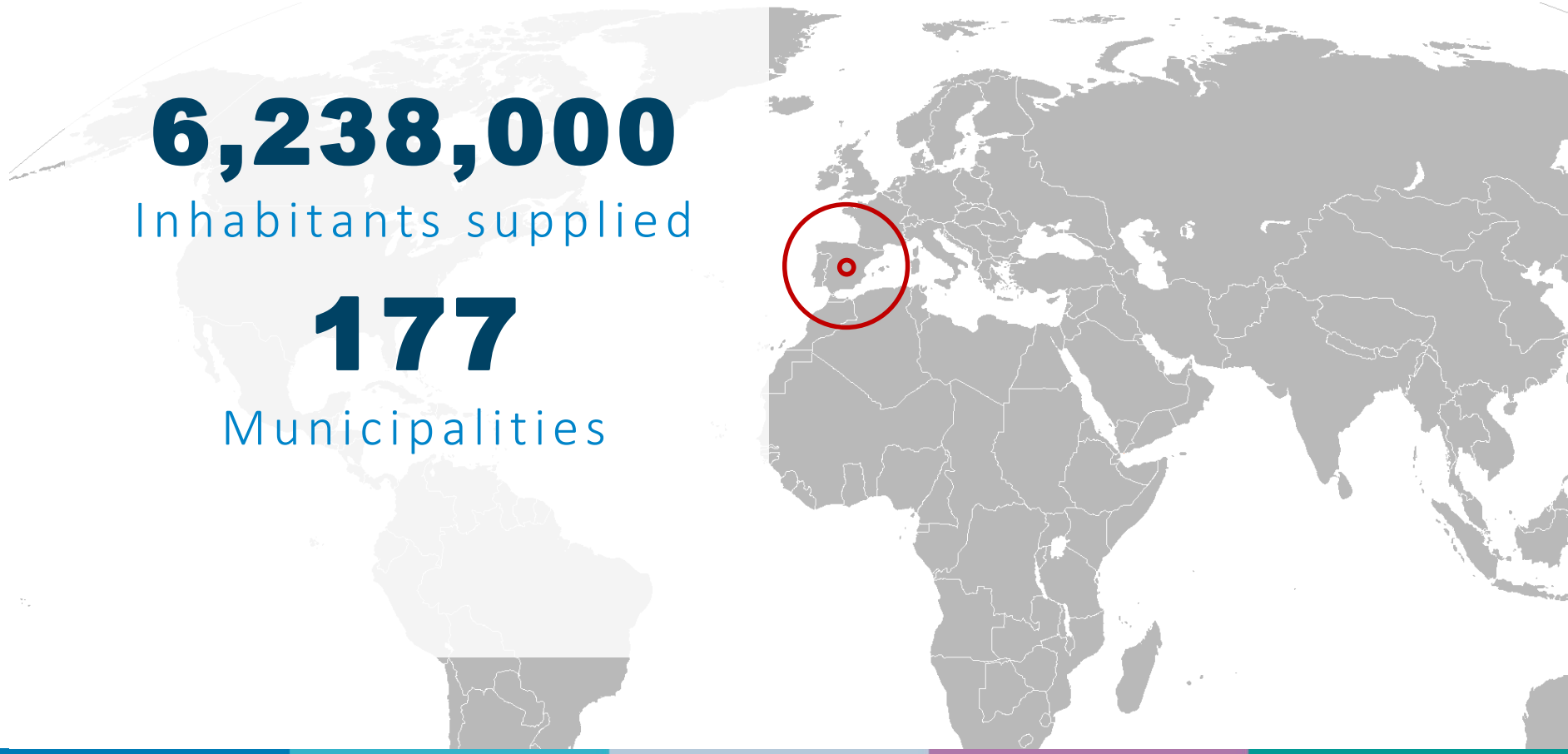
It is a public company responsible for managing the whole water cycle in the region of **Madrid** in Spain

6,238,000

Inhabitants supplied

177

Municipalities



UNDERSTANDING DEMANDS

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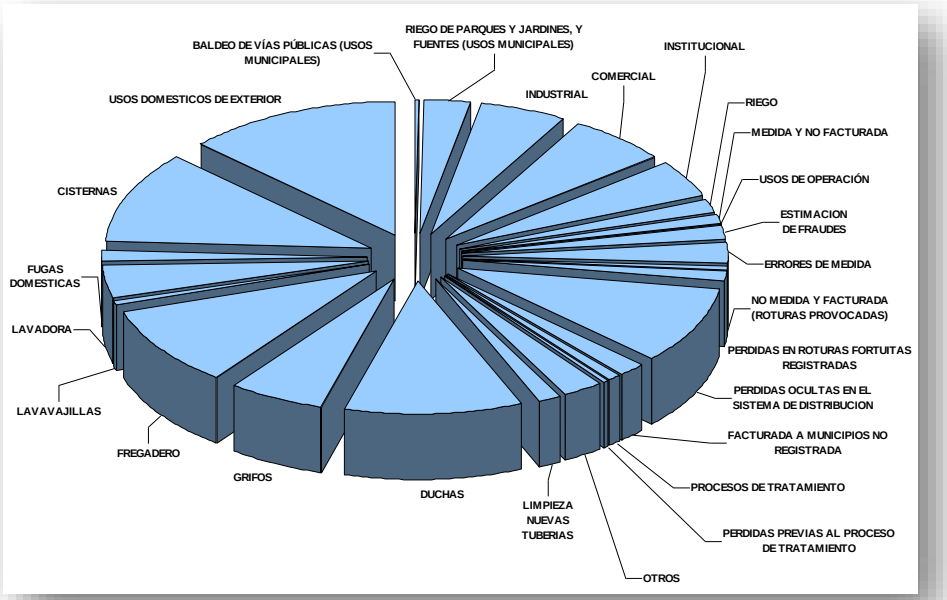

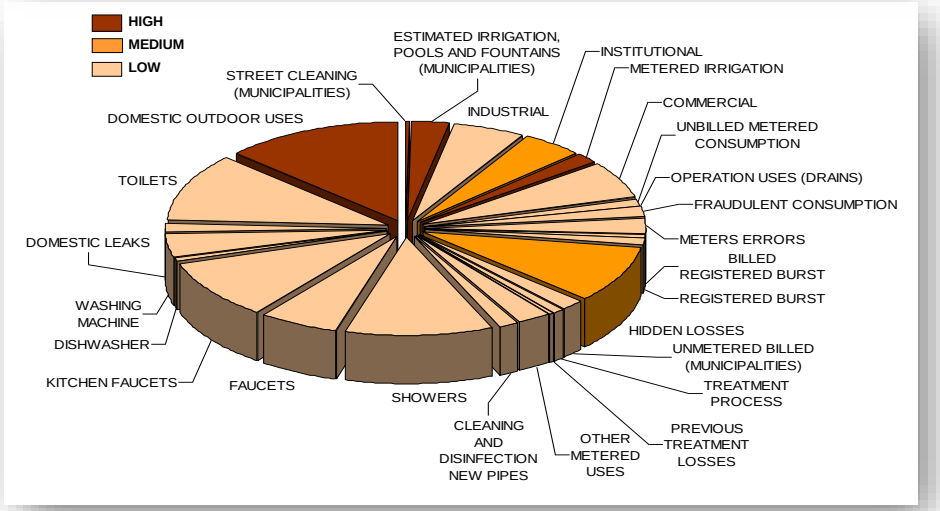

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Space-based remote sensing system for identification and quantification of **irregular consumption and outdoor water uses**

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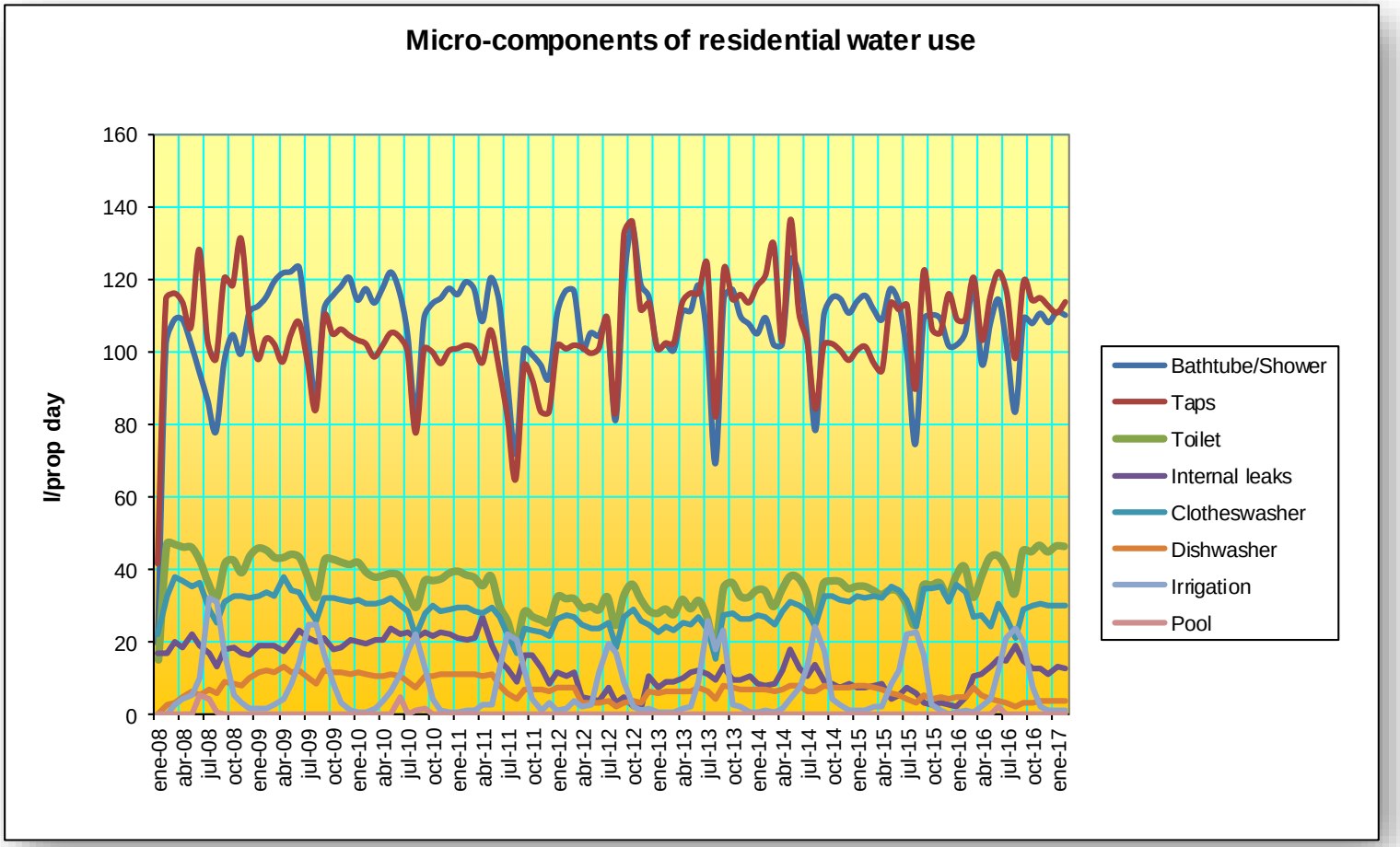
Microcomponents evolution based on permanent panel (300 viv.)



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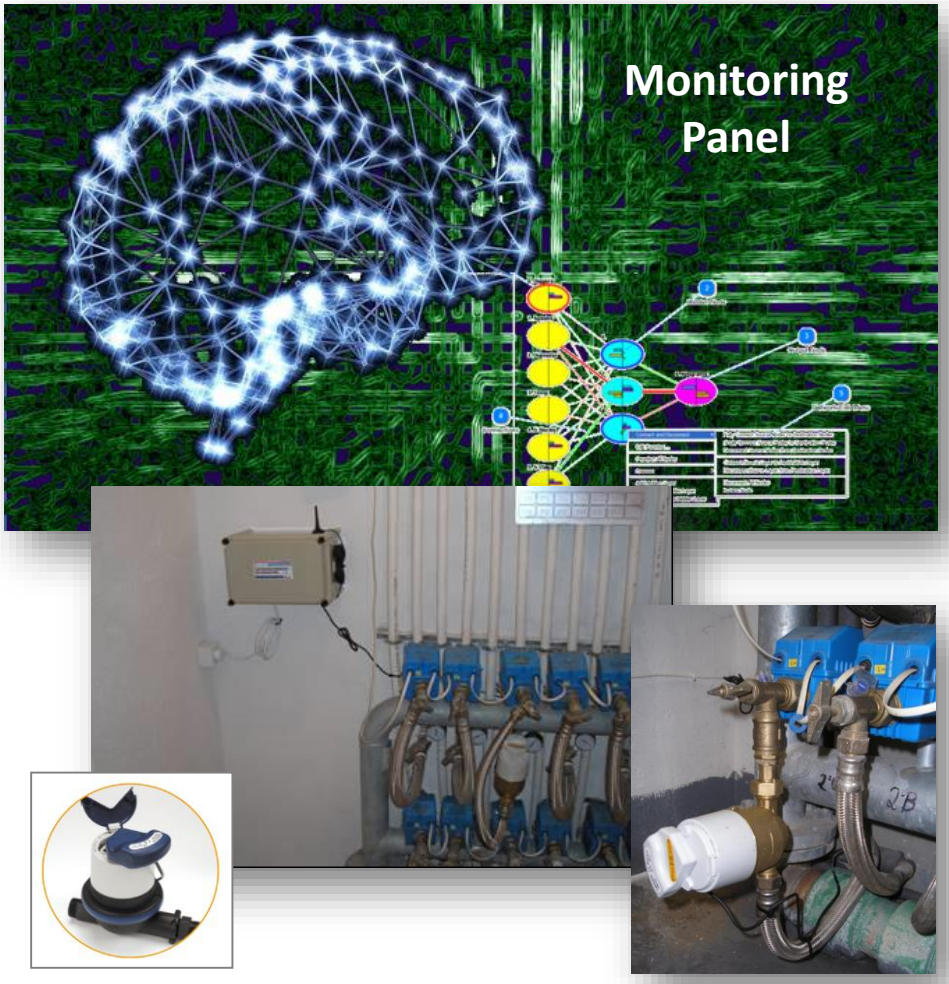
Pattern recognition for end uses identification - Intelligent system



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UNDERSTANDING EXTREME EVENTS

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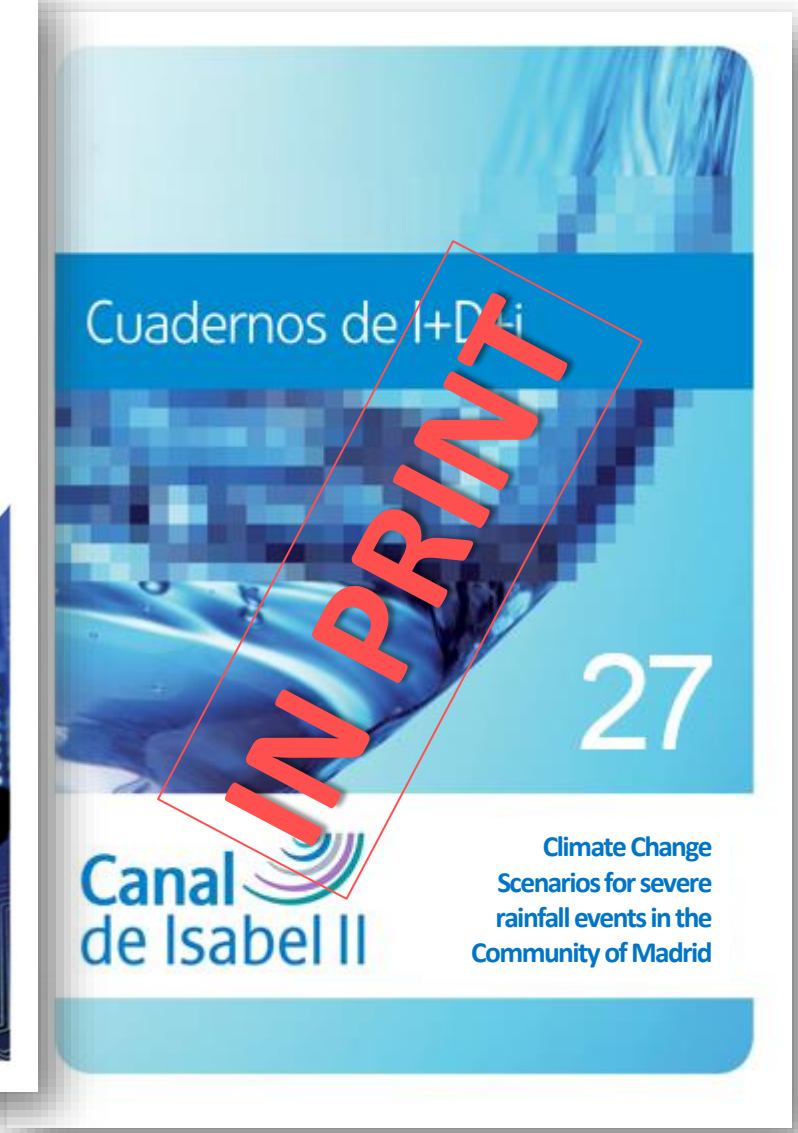

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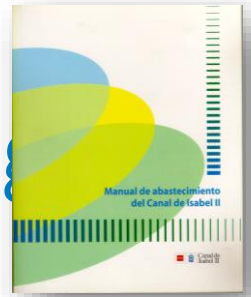
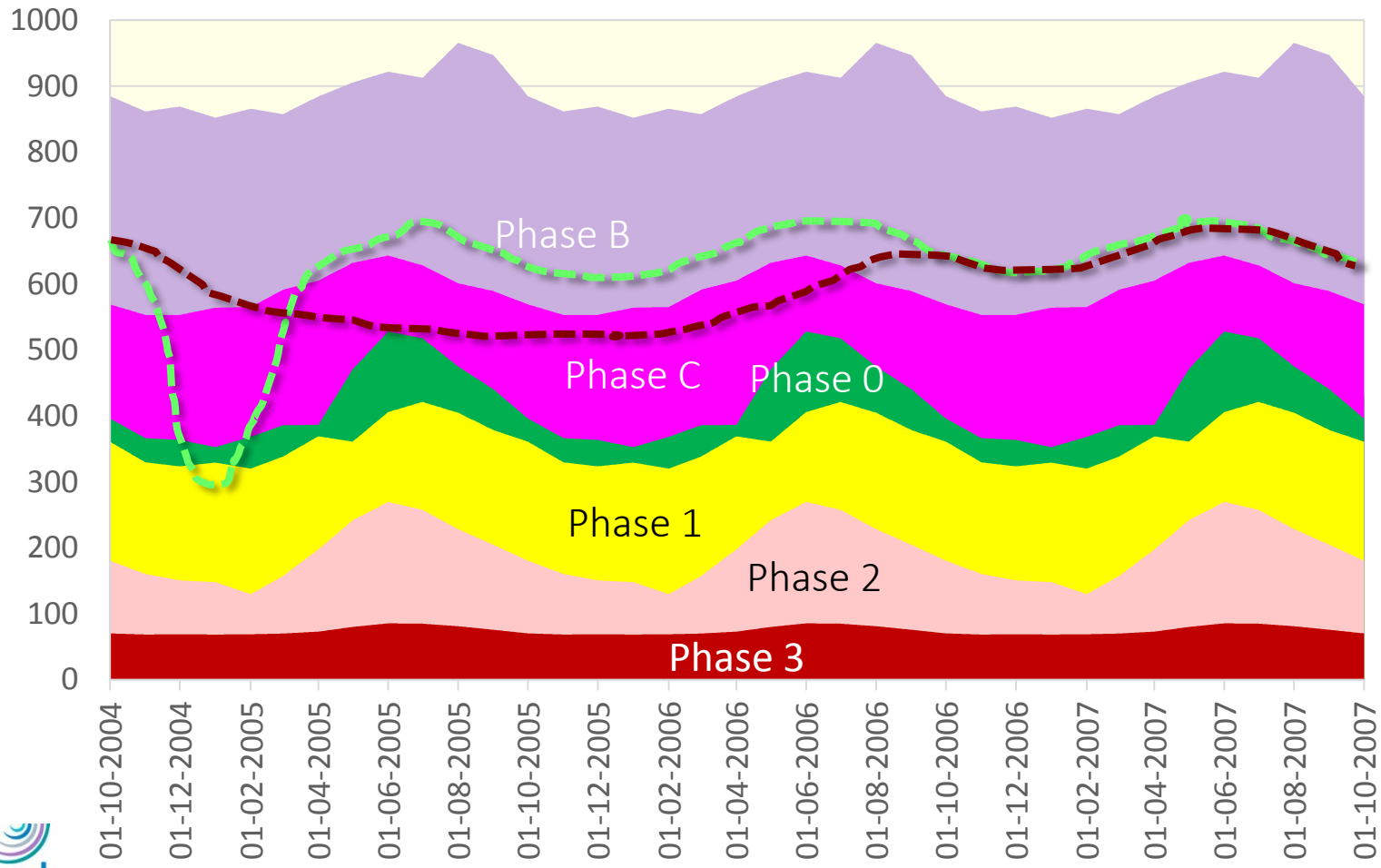
Drought Operational planning

PROTOCOLS





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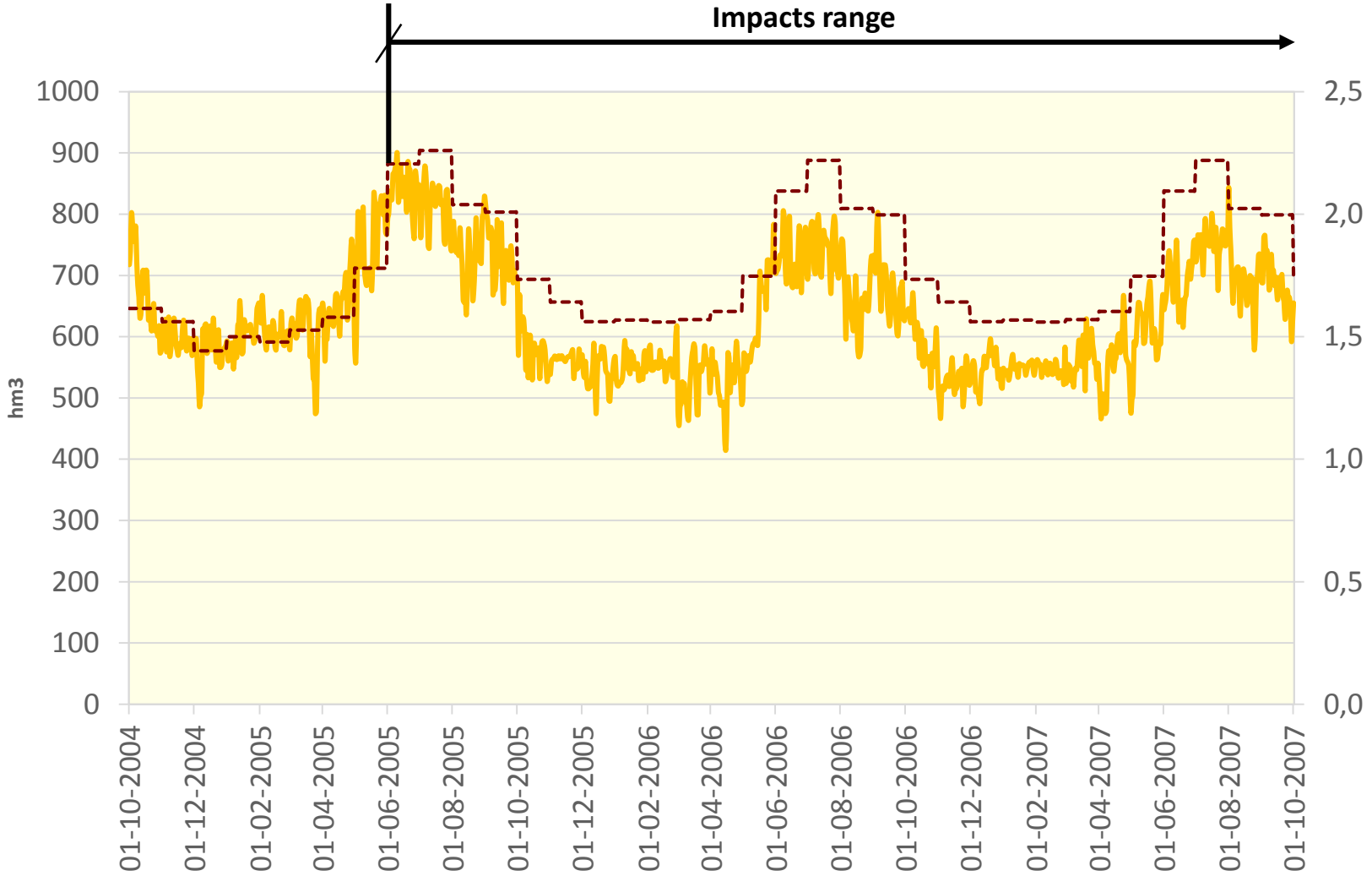
DEMANDS IMPACTS



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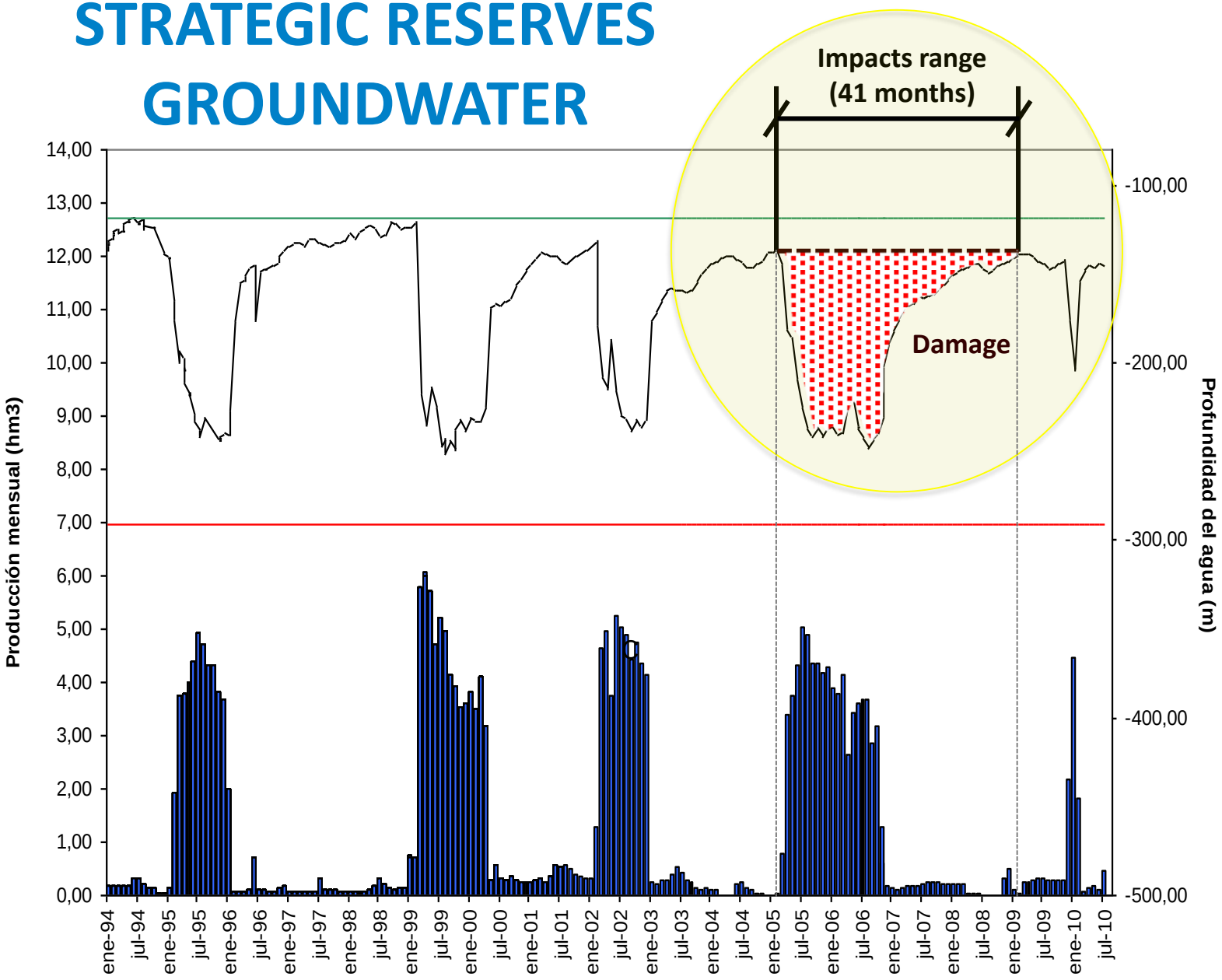
STRATEGIC RESERVES GROUNDWATER



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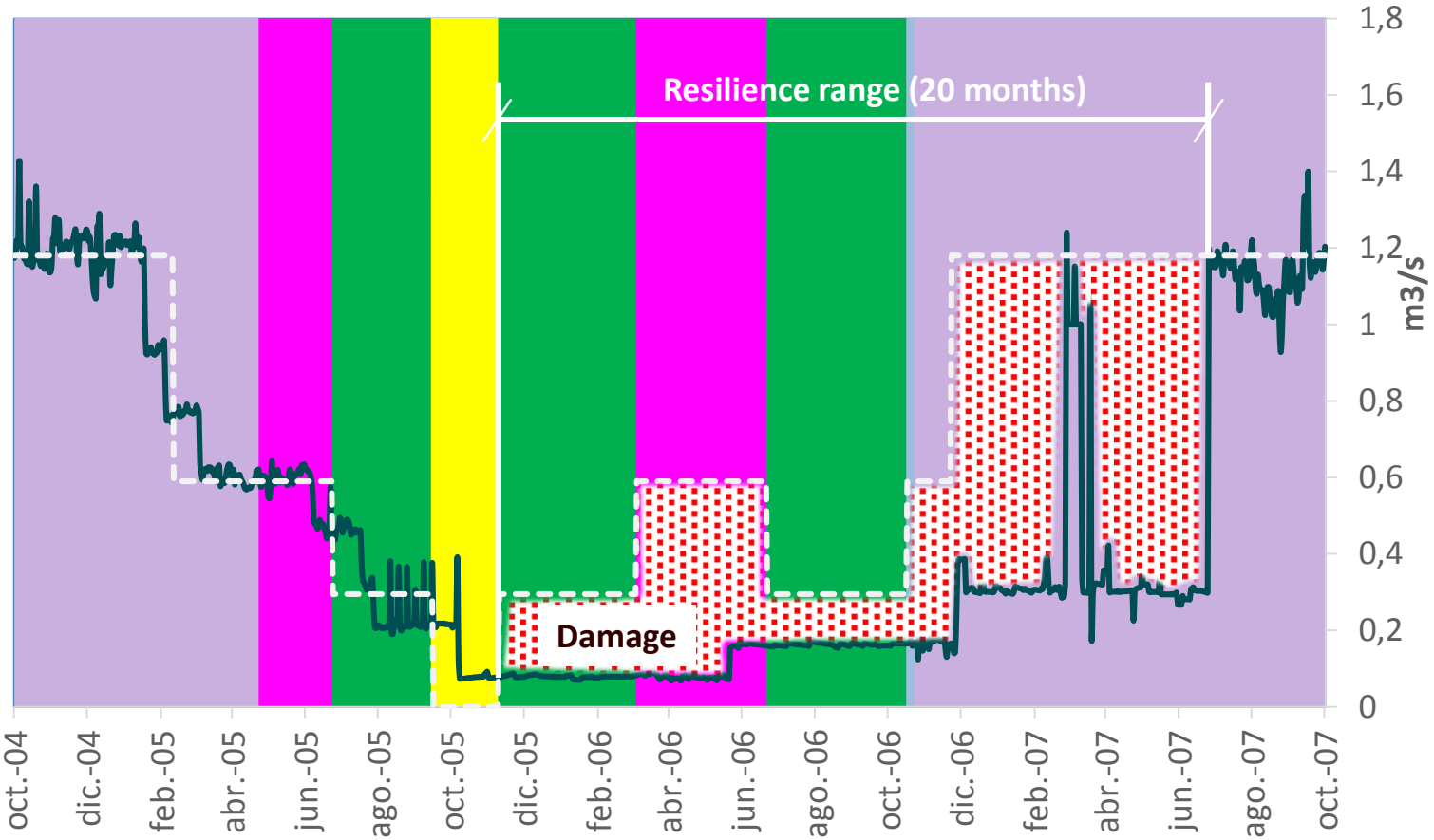
ENVIRONMENTAL FLOWS

Scheduled Resilience



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PLANNING CONTINGENCIES

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Contingency management resources and procedures

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ASSESSING RISKS & LEVEL OF SERVICE

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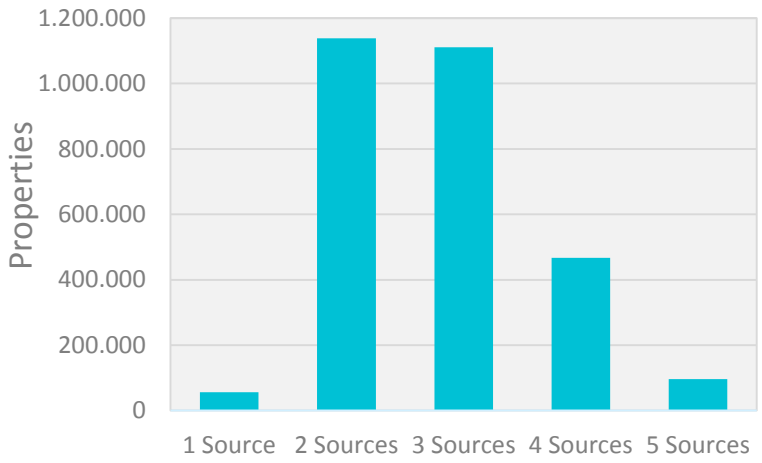
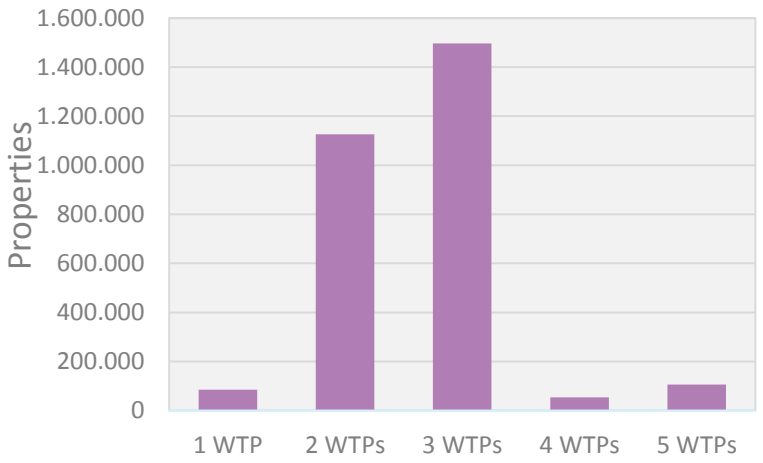
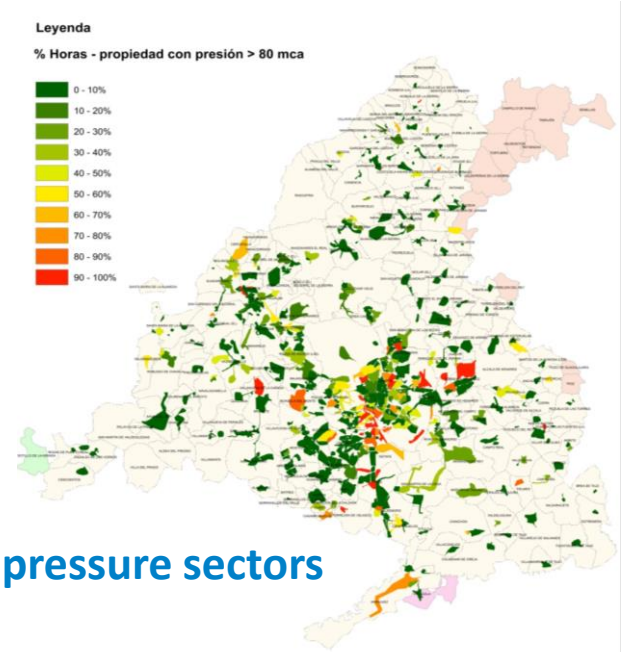
Sources. Availability



Treatment ability

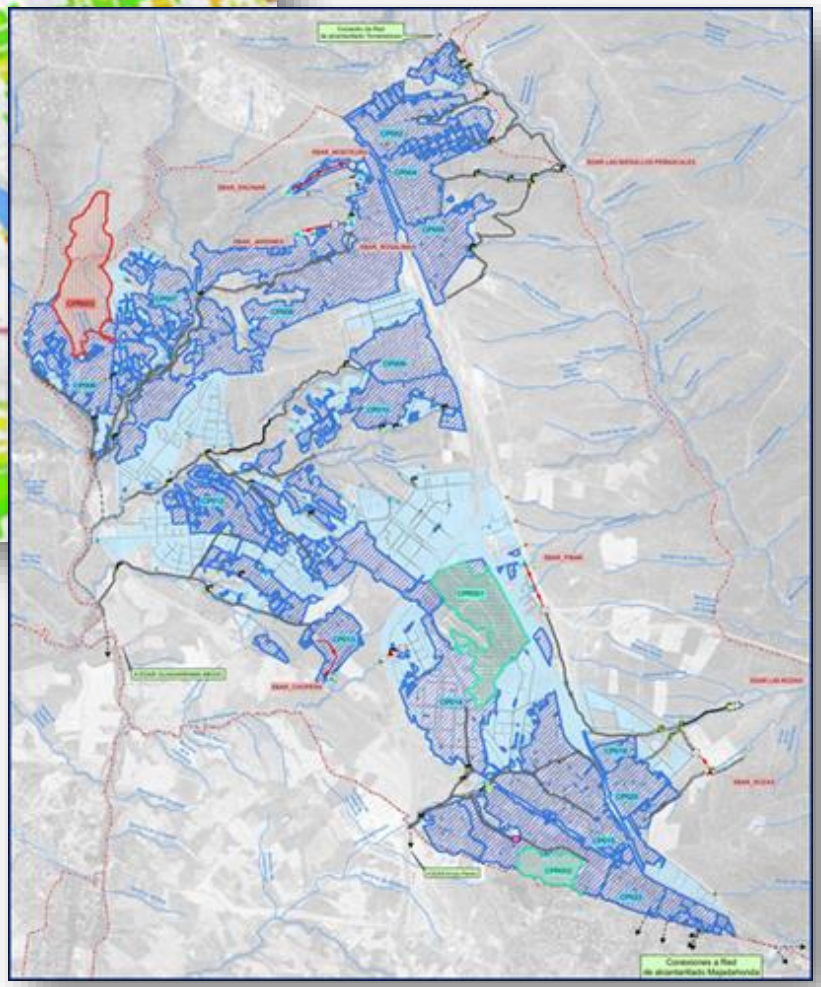




High pressure sectors

Risk assessment and management model

Discontinuity Risk 3,782,152 properties x hour / year



Flooded Properties x hour

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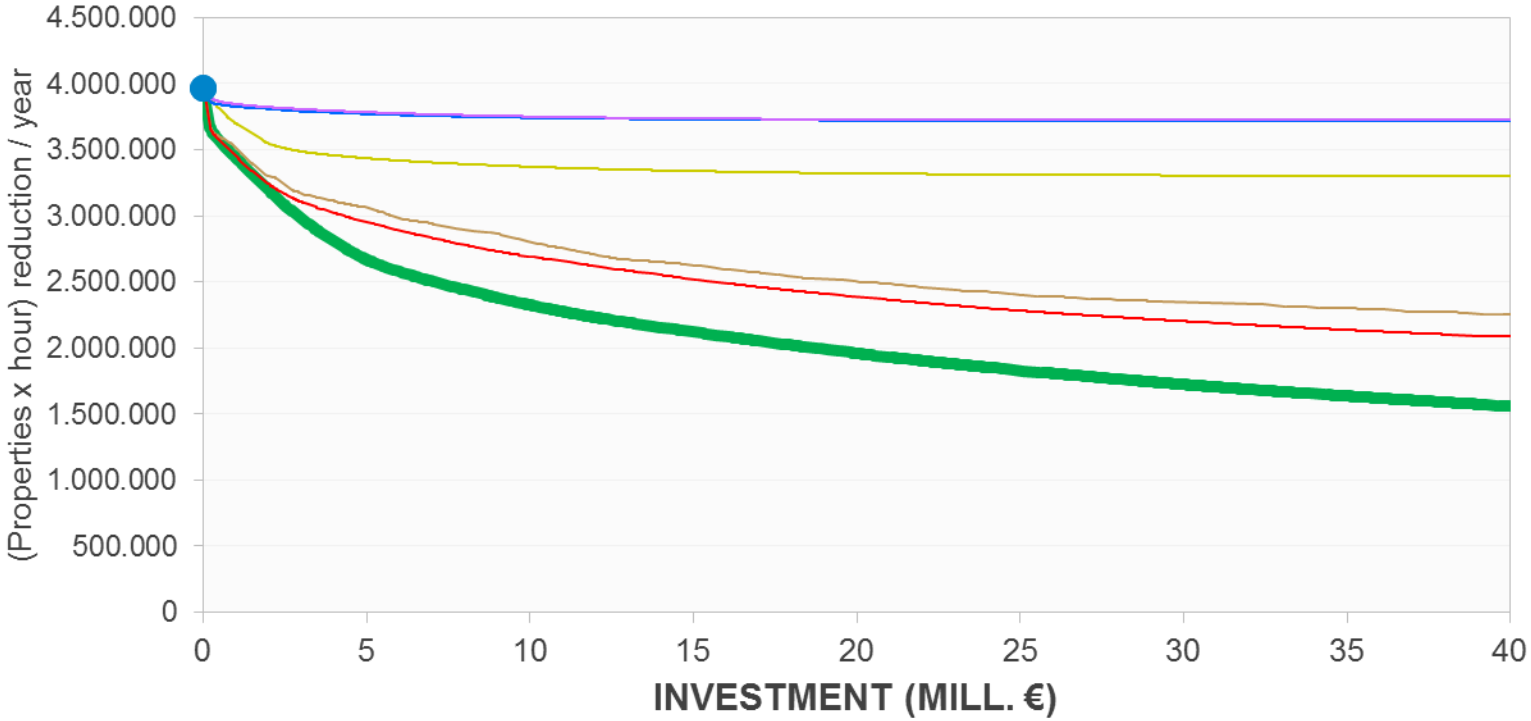
Discontinuity Impact. Improvement options



Likelihood of hour x property discontinuity

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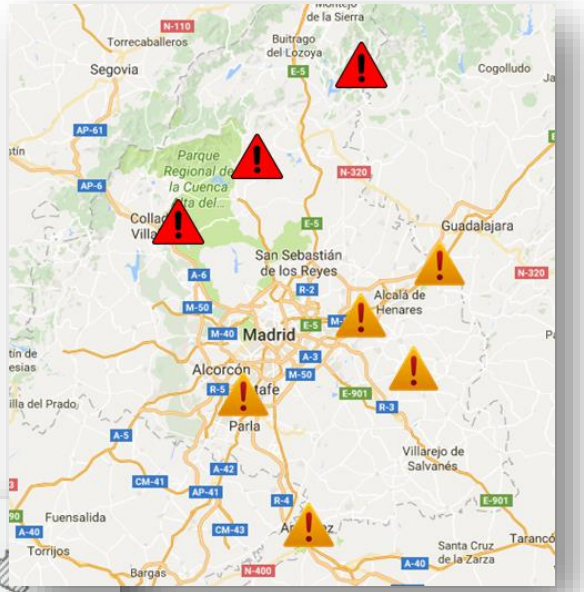
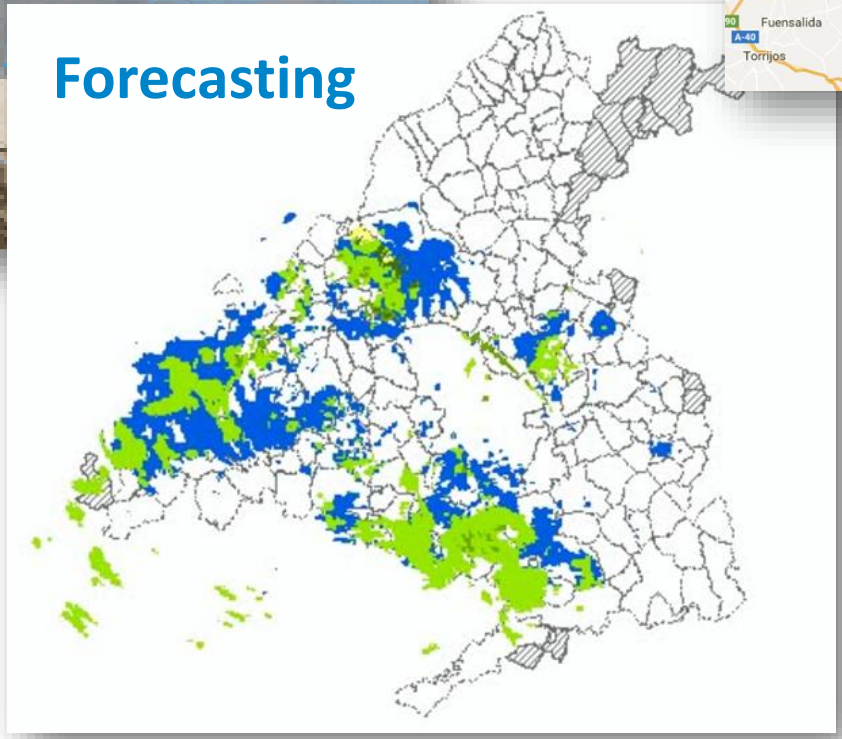


Alarm System



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