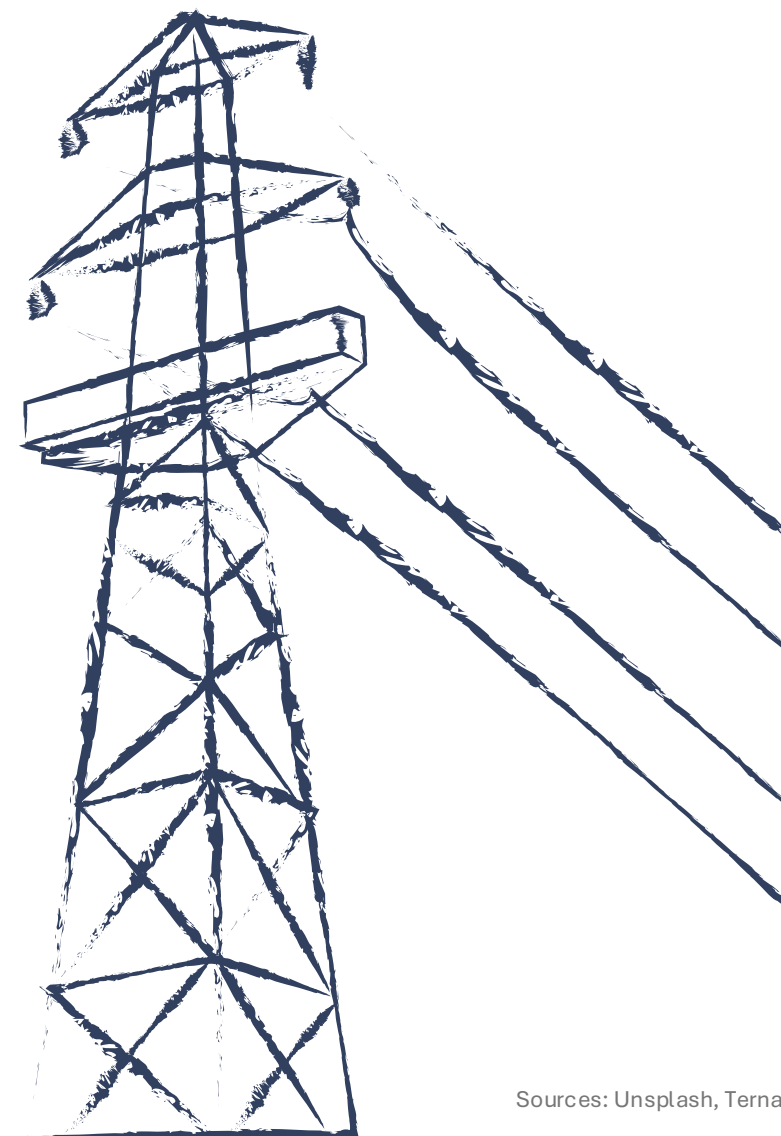


# RGI – ENTSO-E climate adaptation survey and database: relevant insights to the framework

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# Climate hazards and impacts on infrastructure:

## Knowledge gaps

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**Costs**



**What are the hazards / multiple-hazards?**



**What is the estimated damage?**

**Probabilities**



**What are the estimated measures before / during / after hazard(s) occurring?**



**Whether and how to assess inaction?**

# Database's elements and objectives



Mapping and structuring climate hazards and their impacts on electricity grid infrastructure across Europe



Providing potential corresponding adaptation and resilience measures



Initial assessment of costs (impacts & solutions), duration of hazards, rebuild time etc.



Collecting ideas/insights on assessing probabilities



Providing case studies and knowledge-base

An **internal** reference point for the development of the framework to guide the indicator

A **stand-alone, public** database for grid operators, energy system planners and other stakeholders to accompany the TYNDP process and beyond

# Developing a database: experts' survey & data search

- Duration: 28 July – 13 October 2025
- RGI & ENTSO-E Members, EU DSO Entity & E.DSO Members
- 14 replies: 12 TSOs (estimated), 2 DSOs (estimated)



6. What were / are the **driving factors** behind the adoption and implementation of these measures? Please assess the following considerations from "not applicable in my case" to "necessary".

|                                                             | Not applicable in my case        | Not important at all  | Partly important                 | Important                        | Very important                   | Necessary             |
|-------------------------------------------------------------|----------------------------------|-----------------------|----------------------------------|----------------------------------|----------------------------------|-----------------------|
| Costs of implementation                                     | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/>            | <input checked="" type="radio"/> | <input type="radio"/>            | <input type="radio"/> |
| Proven feasible / applicable in the past                    | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/>            | <input checked="" type="radio"/> | <input type="radio"/>            | <input type="radio"/> |
| Perceived feasible / applicable (e.g. in pilot solutions)   | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/>            | <input type="radio"/>            | <input type="radio"/>            | <input type="radio"/> |
| System security                                             | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/>            | <input type="radio"/>            | <input checked="" type="radio"/> | <input type="radio"/> |
| Easy access to technology / technological readiness         | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/>            | <input type="radio"/>            | <input checked="" type="radio"/> | <input type="radio"/> |
| Legal requirements                                          | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/>            | <input checked="" type="radio"/> | <input type="radio"/>            | <input type="radio"/> |
| Socio-political demands                                     | <input type="radio"/>            | <input type="radio"/> | <input checked="" type="radio"/> | <input type="radio"/>            | <input type="radio"/>            | <input type="radio"/> |
| Previous impact that revealed the need for certain measures | <input type="radio"/>            | <input type="radio"/> | <input type="radio"/>            | <input checked="" type="radio"/> | <input type="radio"/>            | <input type="radio"/> |
| Negative / successful experience in other organisations     | <input checked="" type="radio"/> | <input type="radio"/> | <input type="radio"/>            | <input type="radio"/>            | <input type="radio"/>            | <input type="radio"/> |



14/11/2025

# Survey results: initial qualitative assessment

\* Not all respondents replied to all questions in the form \*

## Type of adaptation measures (prevention, mitigation, restoration):

All 3 measures: 6

Prevent & mitigate: 2

Prevent & restore: 3

Mitigate: 1

Prevent: 1



## Using a consistent approach across hazards' type:

Yes: 10

No: 3

## Addressing multi-hazards:

Yes: 7

No: 6



## Level of assessment (asset vs. system):

Asset only: 1 (DSO)

Asset & system: 12 (TSOs + 1 DSO)

## Considerations of costs and /or impacts of inaction:

Yes: 9

No: 5



## Estimated rebuild time:

Highly dependent on type of hazard and infrastructure

## Assumptions about probability (outage after hazards + duration of rebuilding):

Emergency stock and/or backup power supply: 2

Rebuild time (also + ENS, energy not supplied): 2

Predicted frequency of extreme events: 2

Depending on the hazard: 4

Not part of the assessment: 1

## CAPEX/OPEX in calculation:

Capex + Opex: 7

Capex only: 3

Not sure: 3



# Database: examples & next steps

The screenshot displays a web-based database interface. On the left, a sidebar contains navigation elements: 'DATABASE PRACTICE', 'Topic: Climate Adaptation & Resilience', 'Workstream: Climate-Proof Grids', 'Tags: Coastal Flooding; Fluvial Flooding; Sea Level Rise', and 'Navigation' with buttons for 'Highlights' and 'Main Information'. The main content area is titled 'Main Information' and features two project cards. The top card, 'TENNET STRENGTHENS grid resilience in the Net', includes a description of adaptation measures for flooding and sea level rise. The bottom card, 'INTERBDL PROJECT Ulm Netze evaluates climate vulnerability of power infrastructure', is highlighted. Below the cards, a 'Highlights' section lists three key points: 01. Around 1,000 public substations assessed for vulnerability to heavy rainfall and surface water. 02. Conducted within the InterBDL project, focusing on the effects of climate change on local infrastructure. 03. Collaboration with the German Aerospace Center (DLR) and other research partners.

**TENNET STRENGTHENS grid resilience in the Net**

● DATABASE PRACTICE

Topic: Climate Adaptation & Resilience

Workstream: Climate-Proof Grids

Tags: Coastal Flooding; Fluvial Flooding; Sea Level Rise

**Main Information**

To accommodate fluvial and coastal flooding and sea level rise, TenneT's (NL) adaptation measures include elevating and, accordingly, re-designing mats and elevating critical components of substations above expected high-water levels, as

**INTERBDL PROJECT**

*Ulm Netze evaluates climate vulnerability of power infrastructure*

**Highlights**

- 01 Around 1,000 public substations assessed for vulnerability to heavy rainfall and surface water.
- 02 Conducted within the InterBDL project, focusing on the effects of climate change on local infrastructure.
- 03 Collaboration with the German Aerospace Center (DLR) and other research partners.

## What's next?

- Adjusting and updating existing cases
- Adding more cases from grid operators and other organisations

**Spread the word: we are looking for more best practices!**