



# Climate Resilience

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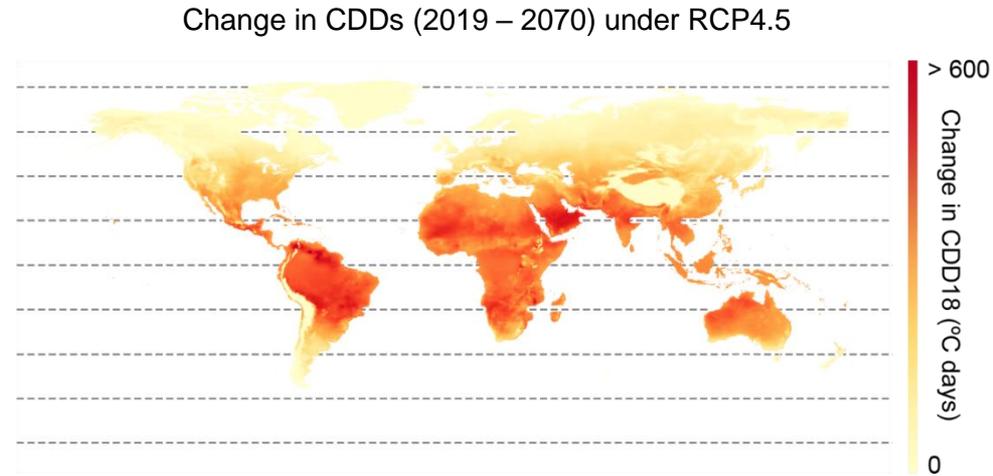
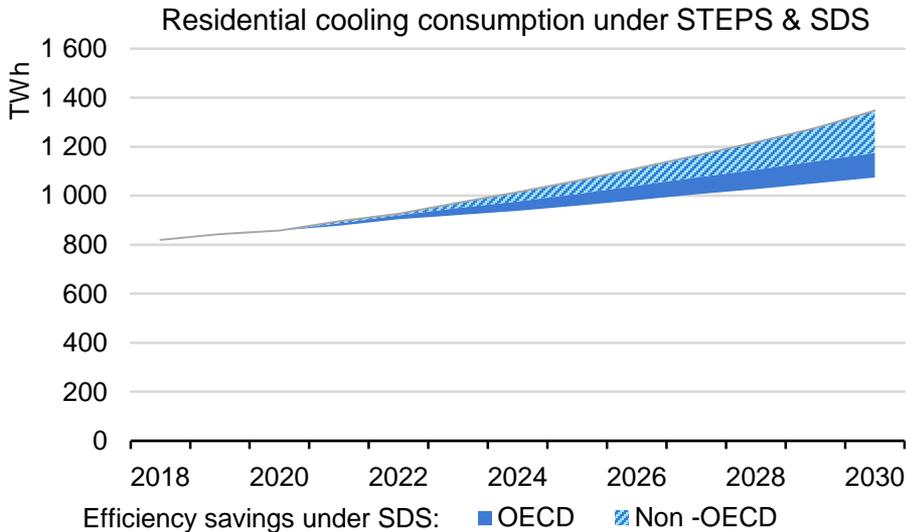
Paris, 12 April 2021

- The electricity system is witnessing increasing pressure from climate change
- **Climate change directly affects every segment of the electricity system**

Overview of main potential impacts on the electricity system due to climate change

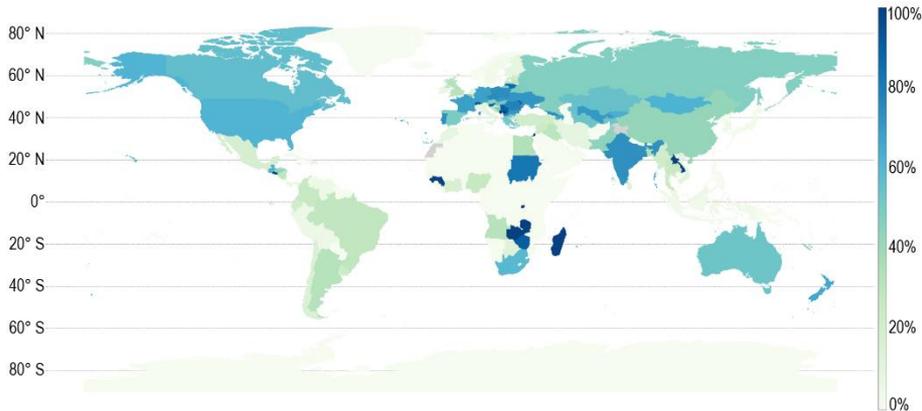
Climate impact	Generation	Transmission and distribution	Demand
<b>Rising global temperatures</b>	<ul style="list-style-type: none"> <li>• Efficiency</li> <li>• Cooling efficiency</li> <li>• Generation potential</li> <li>• Need for additional generation</li> </ul>	<ul style="list-style-type: none"> <li>• Efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Cooling and heating</li> </ul>
<b>Changing precipitation patterns</b>	<ul style="list-style-type: none"> <li>• Output and potential</li> <li>• Peak and variability</li> <li>• Technology application</li> </ul>	<ul style="list-style-type: none"> <li>• Physical risks</li> </ul>	<ul style="list-style-type: none"> <li>• Cooling</li> <li>• Water supply</li> </ul>
<b>Sea-level rise</b>	<ul style="list-style-type: none"> <li>• Output</li> <li>• Physical risks</li> <li>• New asset development</li> </ul>	<ul style="list-style-type: none"> <li>• Physical risks</li> <li>• New asset development</li> </ul>	<ul style="list-style-type: none"> <li>• Water supply</li> </ul>
<b>Extreme weather events</b>	<ul style="list-style-type: none"> <li>• Physical risks</li> <li>• Efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Physical risks</li> <li>• Efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Cooling</li> </ul>

- Increasing temperatures will have an impact on the entire electricity value chain, e.g.:
- **Generation:** decreased efficiency of plants, **T&D:** thermal derating of lines, transformers and other components, **Demand:** increased cooling and refrigeration demand

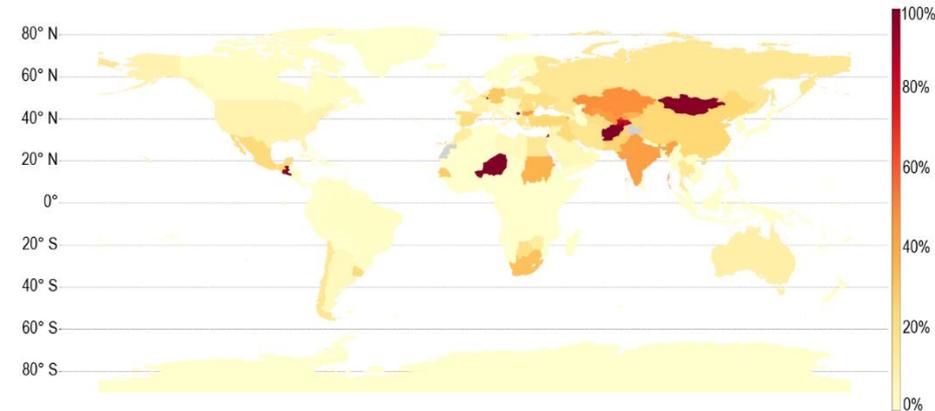


- Changing precipitation patterns will have an impact on water availability at both **seasonal** and **geographical** level
- Notable impact on hydropower and risks to security of supply from thermal plants

National share of thermal plants using freshwater cooling



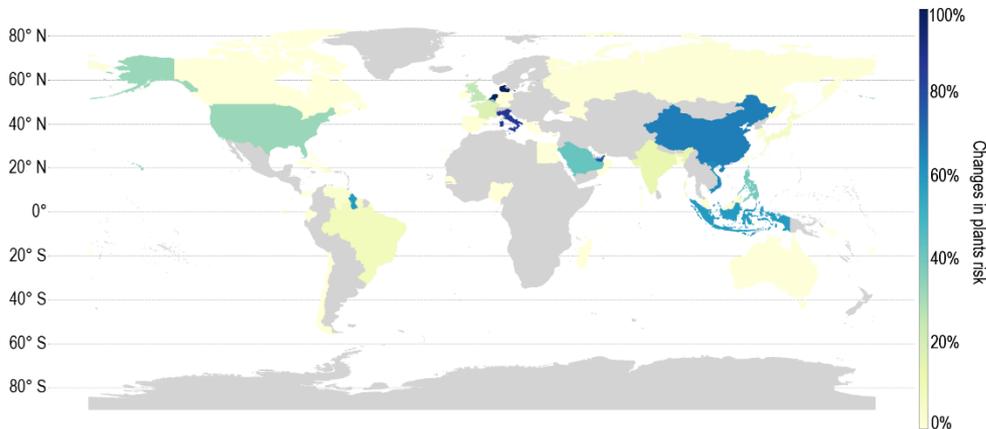
Share of existing thermal plants which use freshwater cooling and are in regions of high water stress



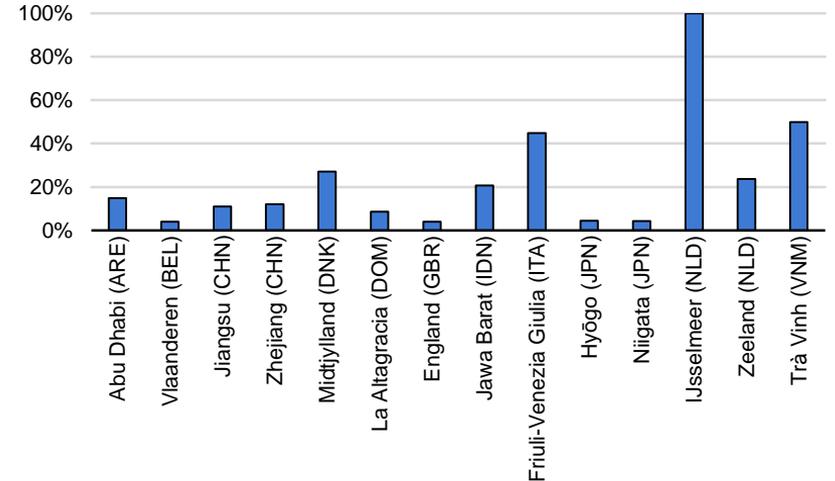
# Impacts on electricity systems: Sea level rise

- This affects generation assets, transmission and distribution lines and substations located near the coast.
- Analysis shows the risk of sea level rise is highly disparate, affecting only countries with particular geographies (coastal, low-lying).

Share of plants at risk of 1-in-100 year floods (1.1m SLR)

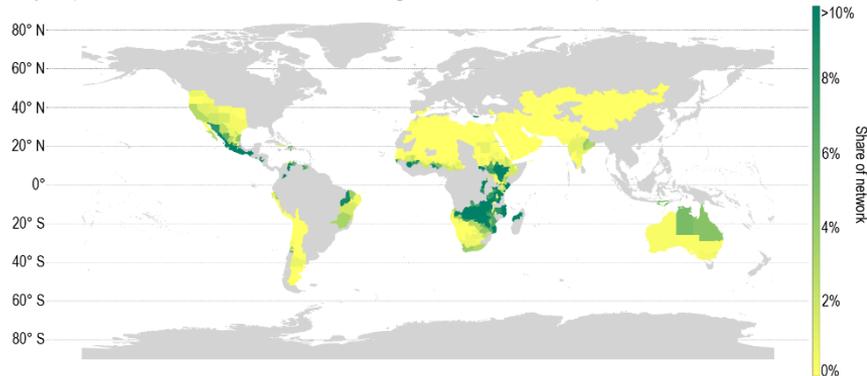


Regions with >1% generation capacity newly at risk (1.1m SLR)

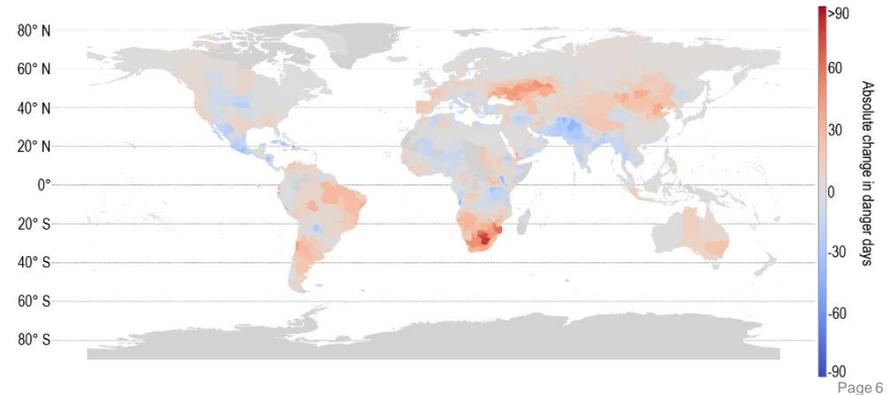


- Extreme weather events provide **immediate shocks** to the system with **multiple impacts over large geographies**
- Impacts can be severe and span the entire electricity value chain, e.g.:
  - Cold spells, heatwaves and droughts (increased demand, generation availability)
  - Cyclones and floods (damaged T&D equipment)
  - Wildfires (damaged T&D equipment, multiple simultaneous faults, de-energised lines)

Share of distribution networks in forested areas by subnational region that experience an annual average of six months or more of fire danger days (i.e. with fire weather index greater than 21.3)

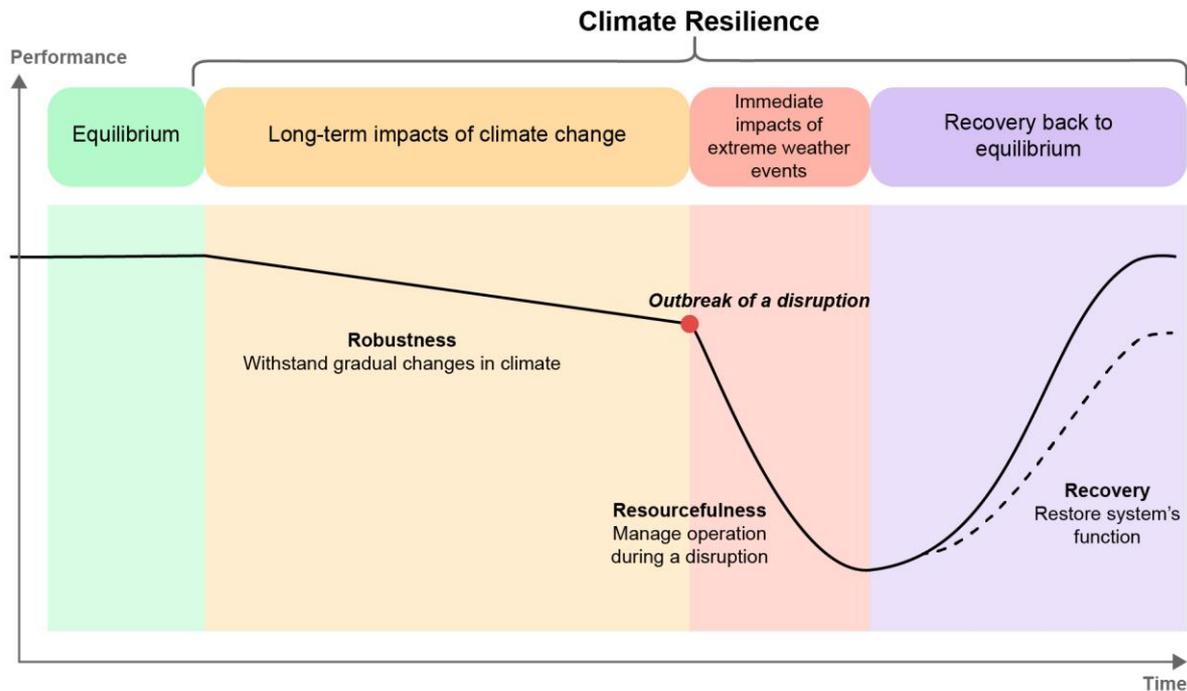


Absolute change in the distribution network-weighted average of fire danger days by subnational region from 1999-2004 to 2015-2019



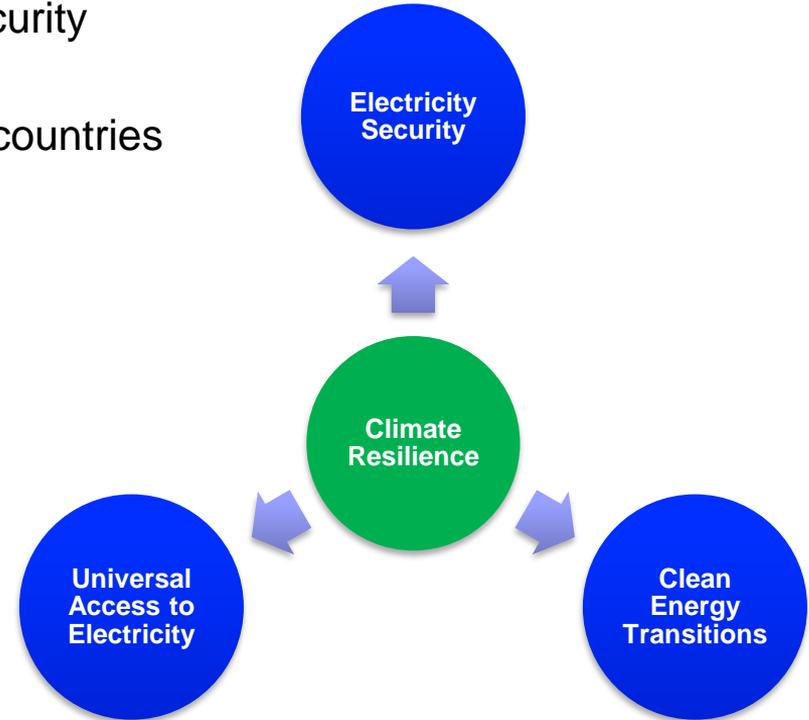
# Conceptual framework for climate resilience

## Conceptual framework for climate resilience of the electricity system

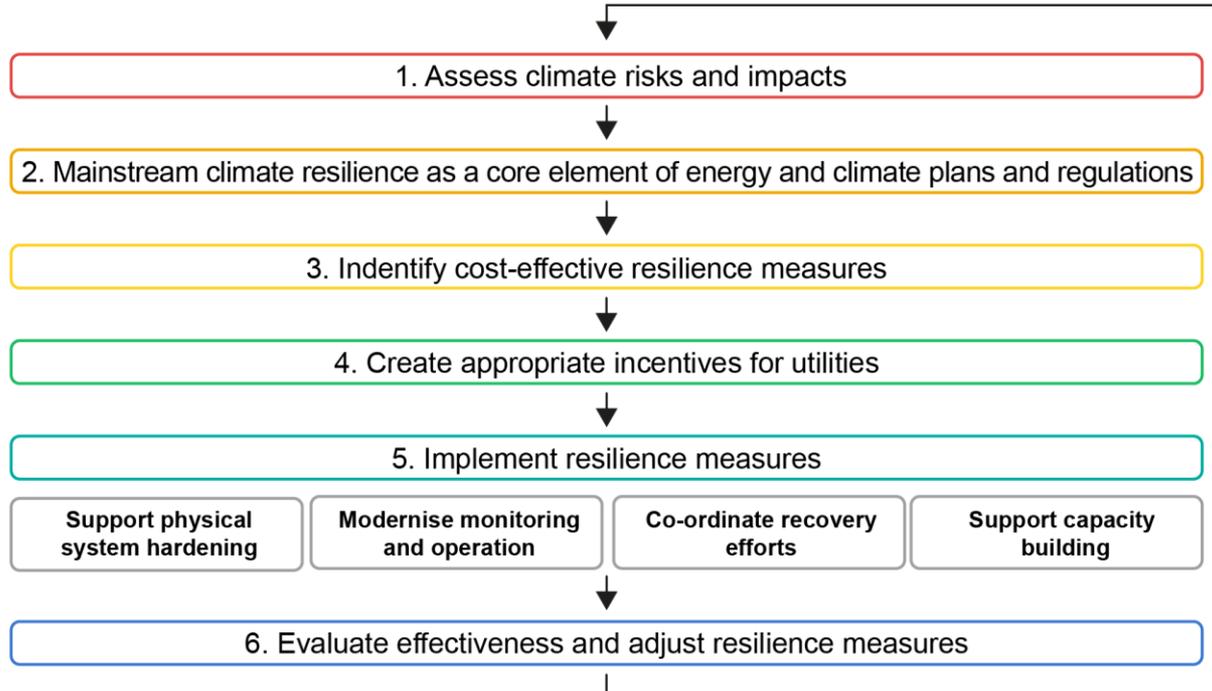


**Climate resilience is the ability to anticipate, absorb, accommodate and recover from adverse climate impacts.**

- Provide a cost-effective solution for electricity security
- Enable universal electricity access in vulnerable countries
- Support clean energy transitions

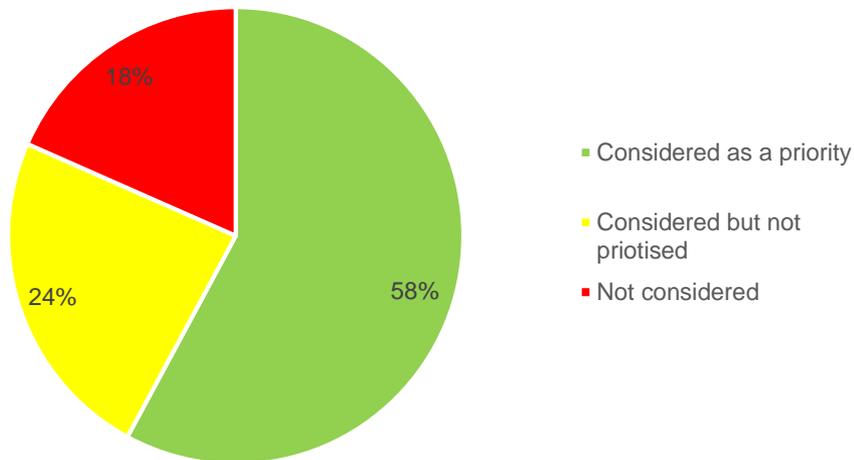


## Sequential application of measures for climate resilience

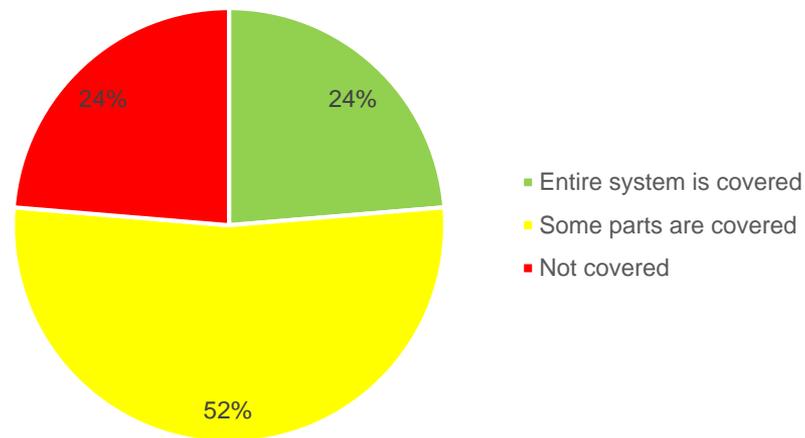


**Effective policy measures and co-ordinated action among key actors can build up climate resilience.**

## Energy sector in national adaptation strategies and plans



## Coverage of climate resilience of electricity systems



**National plans and strategies that explicitly include climate resilience as a core element send a strong signal to utilities and investors to strengthen the resilience of electricity systems.**

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