

Holistic Grid Resilience Assessment & Interventions



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The Need for Resilience Interventions

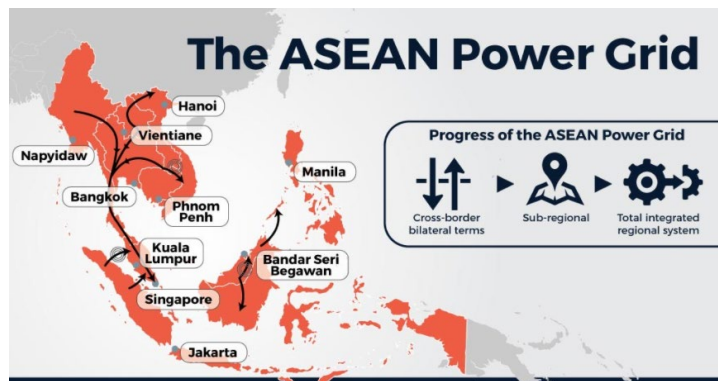
Climate threats to grid infrastructure



Increasing reliance on reliable electricity supply



Cross-border dependencies



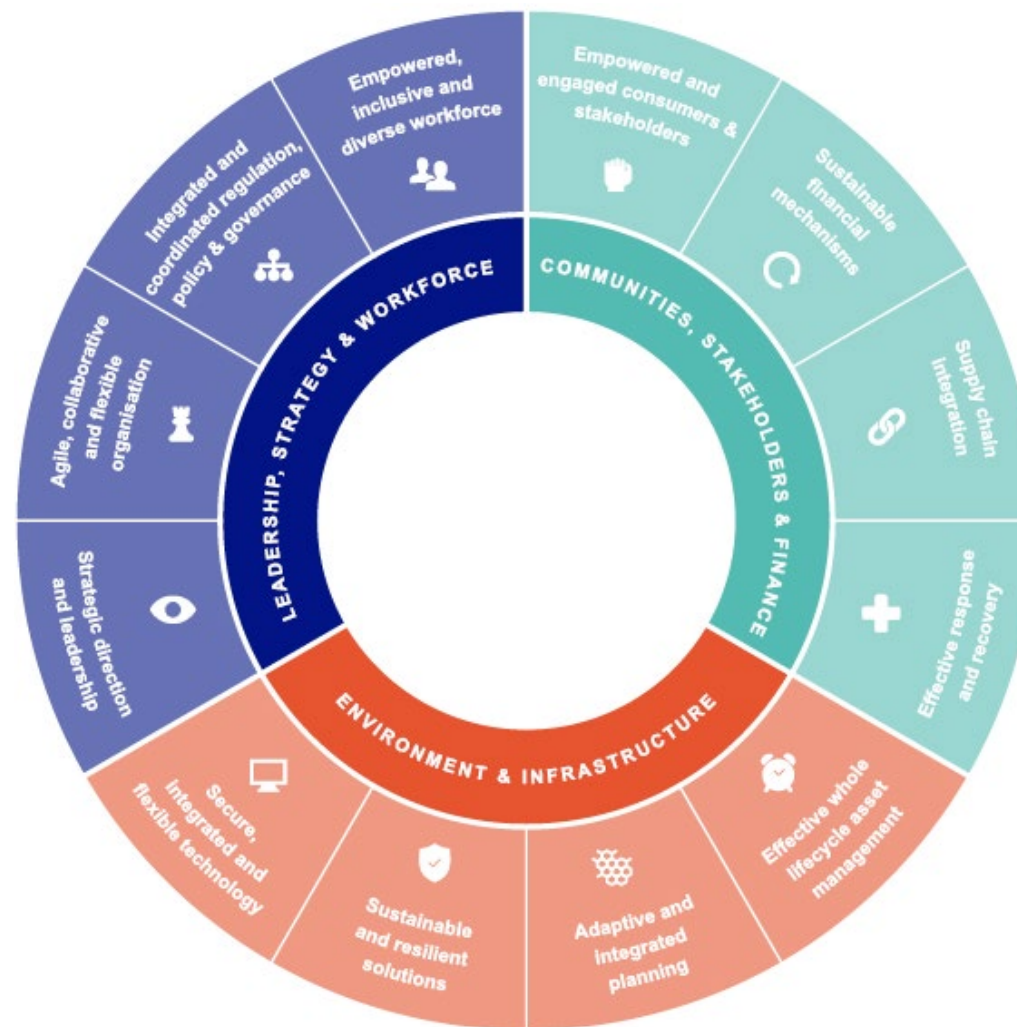
Rapid changes in the energy landscape



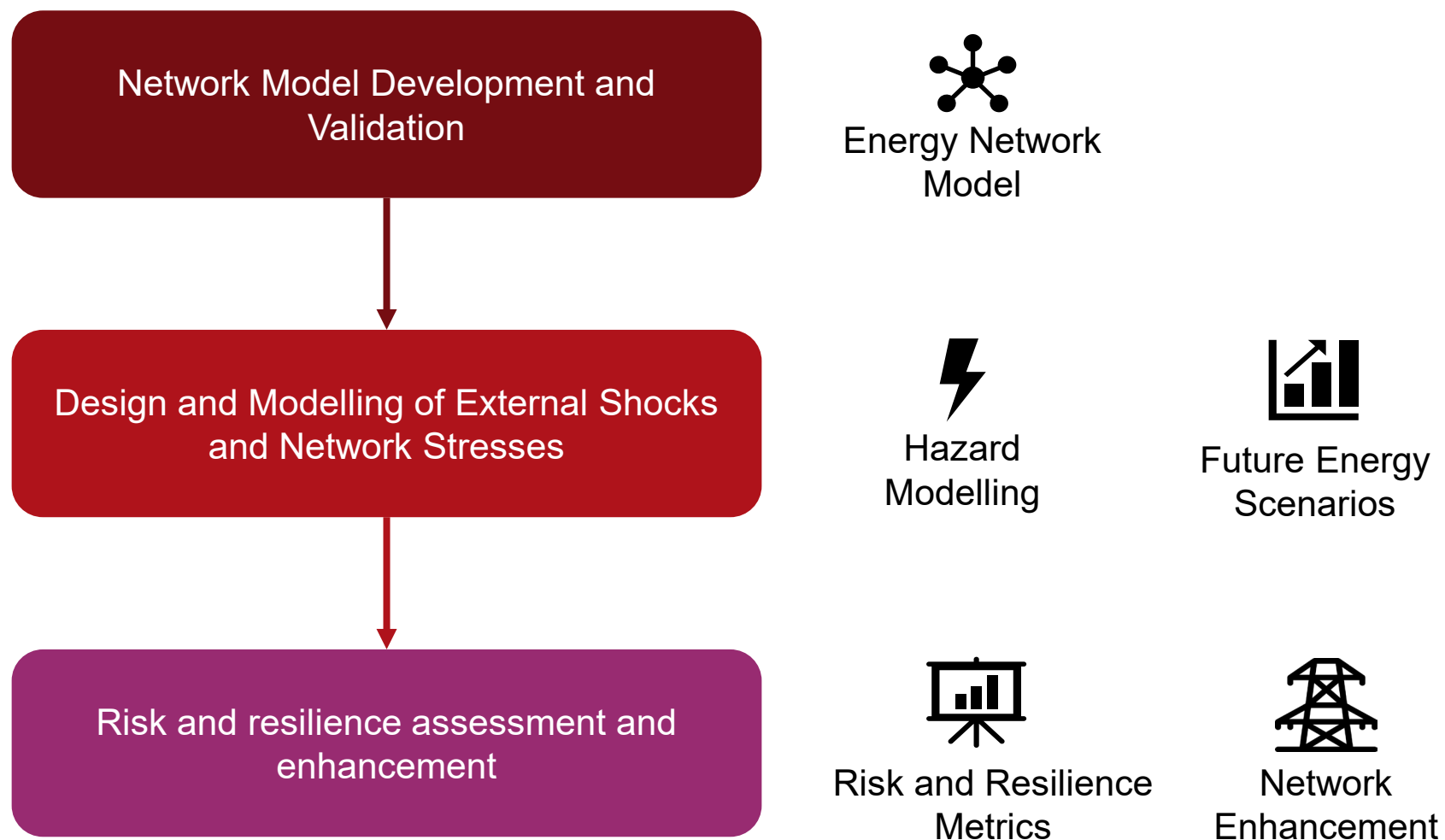
Resilience Assessment Framework

Identifying what is important for resilience

- Resilience is analysed through:
 - 3 dimensions
 - 12 goals
 - 43 indicators



Quantitative Resilience Assessment (QRA)



Highlights of QRA Tool

Spatial and Temporal Impact Assessment of Extreme Shocks and Future Energy Scenarios

Network stress-testing for the determination of its “breaking point”.

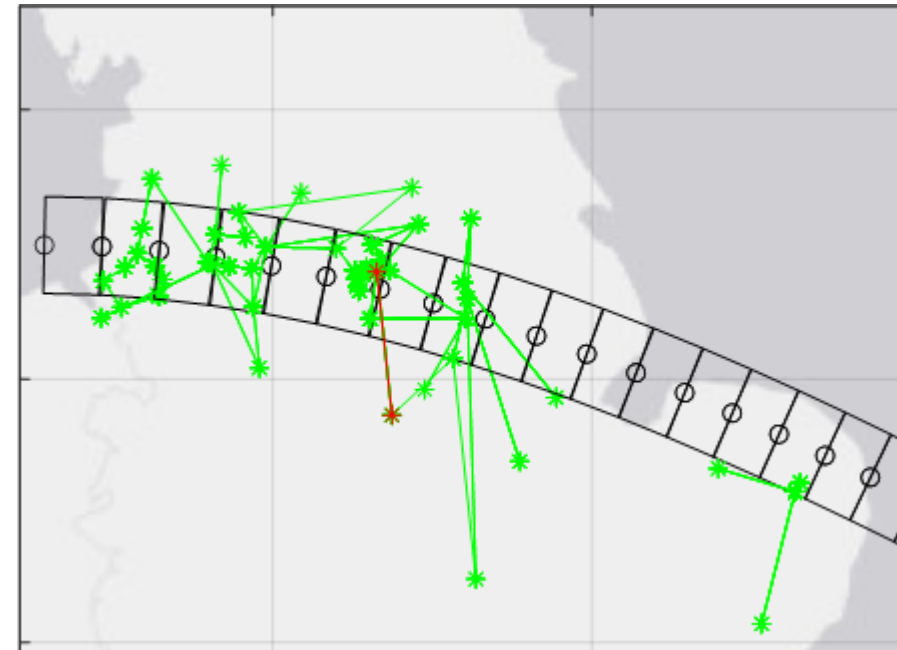
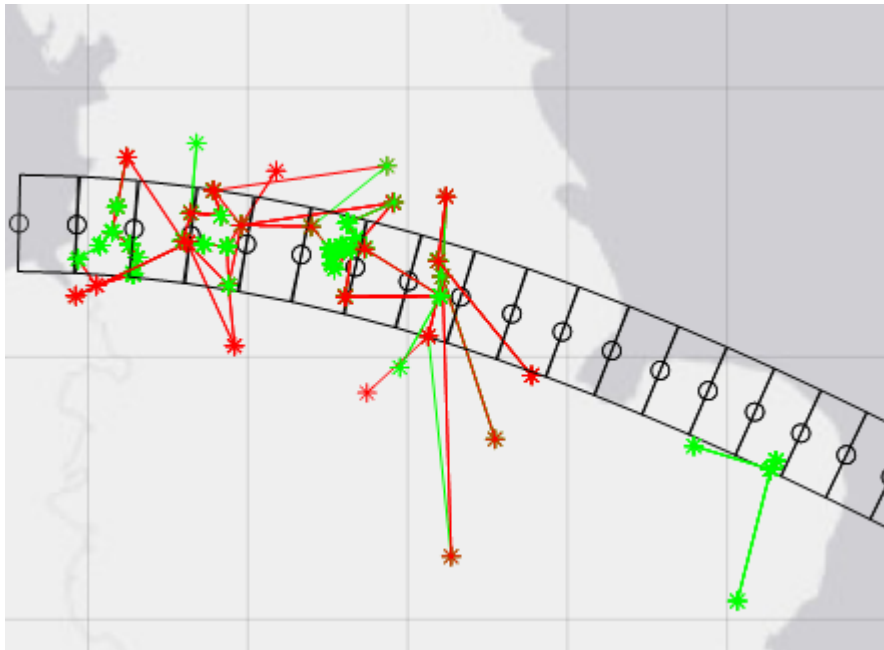
Design and application of holistic resilience metric systems

Advanced GIS-based visualization of network vulnerability and metrics.

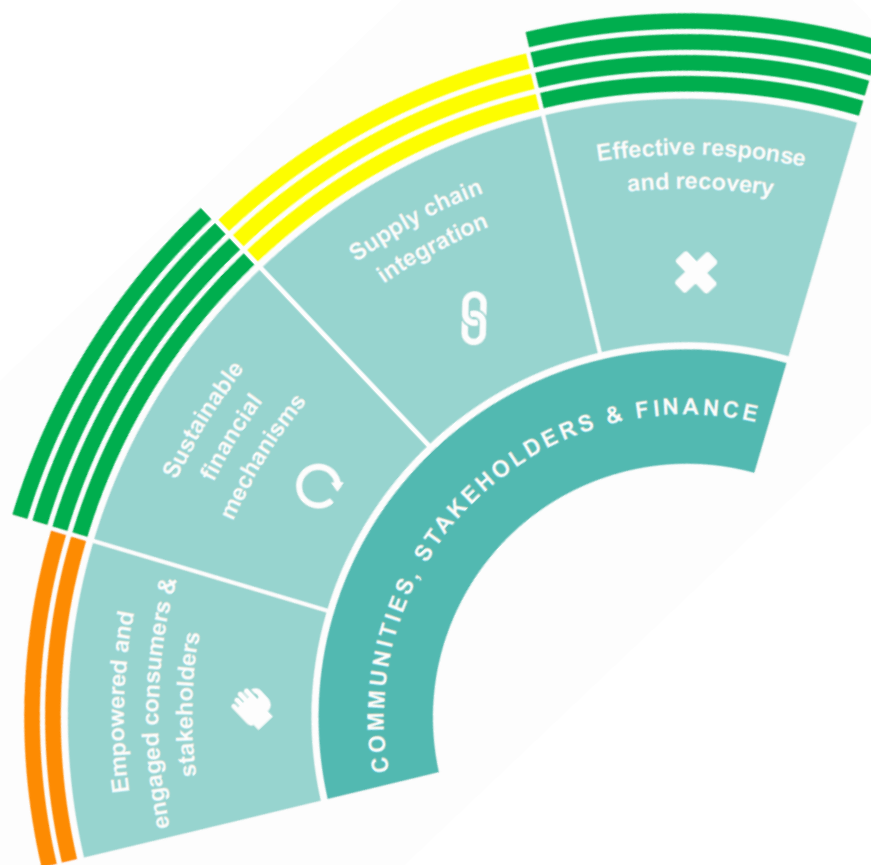
Risk-driven identification and multi-criteria assessment of network reinforcement options.



Windstorm Example

EENS (MWh per windstorm)	Probability of Interruption to Supply (%)	Breaking Point (m/s)
15,555	9.8	32.5
4,800	2.6	38.5

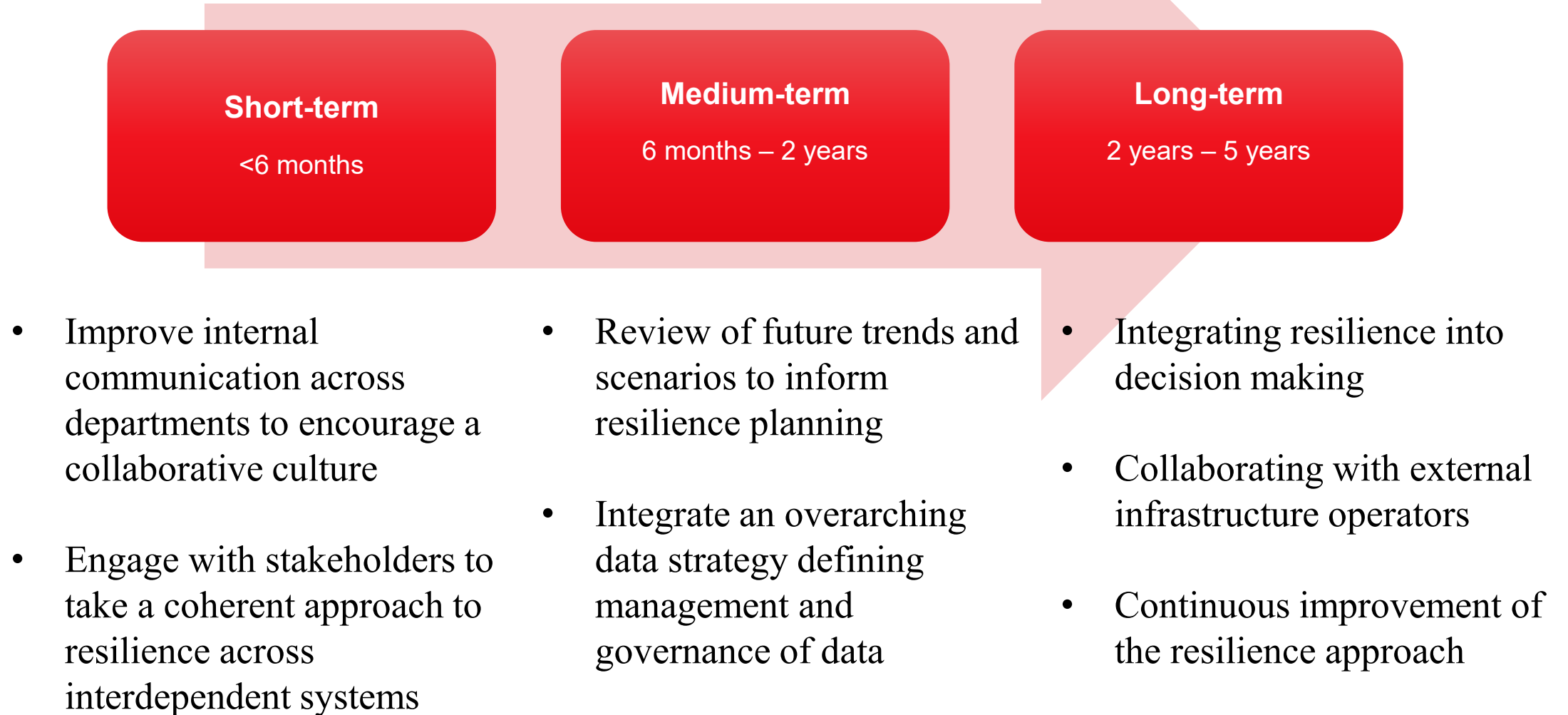


Resilience Maturity



Goal	Indicator	Maturity
 Supply chain integration	Accountable, ethical and sustainable supply chain	<div></div>
	Clear communication and collaboration across the existing supply chain	<div></div>
	Contingency plans for supply chain failure	<div></div>
	Understanding of supplier market risks and opportunities	<div></div>
 Effective response & recovery	Ensuring continuity of service to all	<div></div>
	Regular and comprehensive stress testing with defined roles and responsibilities	<div></div>

Intervention Pathway



ARUP