Infrastructure Impact Analysis Report

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Executive Summary

Failure Source:	Hospital (Hospital)
Failure Type:	Power Failure
Severity Level:	HIGH
Overall Risk:	MEDIUM
Affected Nodes:	4
Critical Impacts:	0
High Severity:	0
Estimated Affected Population:	~300 people
Estimated Recovery Time:	1-2 hours

Detailed Cascading Impact Analysis

The GNN-based predictive model has analyzed the failure propagation through the infrastructure network. A total of 4 connected nodes are predicted to experience cascading effects, with 0 nodes reaching critical impact levels and 0 nodes experiencing high severity impacts.

Affected Infrastructure Nodes (Detailed Analysis)

Each node's risk is evaluated across multiple dimensions. The table below shows the critical dimension (highest risk factor) for each affected node, using MAX-based aggregation to ensure no critical risks are hidden.

Node Name	Type	Severity	Impact %	Critical Dimension	Expected Effects
School	School	MEDIUM	22%	Service Availability	Grid stress detected near School. Power fluctuatio
Main-Pipe	Water Pipe	LOW	20%	Water Supply	Minor power variance at Main-Pipe. Systems oper
Pump-A	Water Pump	LOW	20%	Water Supply	Minor power variance at Pump-A. Systems operat
Main-Tank	Water Tank	LOW	16%	Water Supply	Minor power variance at Main-Tank. Systems oper

Node-by-Node Dimension Analysis

Below is the detailed risk breakdown for each critical node, showing all evaluated dimensions. The highlighted dimension represents the worst-case scenario for that node.

Analysis Methodology

This analysis was generated using a Graph Neural Network (GNN) trained on infrastructure cascade patterns. The model analyzes network topology, node criticality, and historical failure propagation patterns to predict the cascading effects of infrastructure failures.

Network Configuration: 5 nodes connected by 4 bidirectional edges. The analysis accounts for node health status, infrastructure type, connectivity, and failure mode characteristics.

MAX-Based Risk Aggregation: Impact scores use MAX aggregation across 12 risk dimensions (water supply, power, service availability, quality, etc.) instead of averaging. This prevents critical risks in specific dimensions from being diluted by low risks in other dimensions. Each node's severity is determined by its worst-case dimension.

Semantic Interpretation: Negative deltas downstream of service nodes (hospitals, schools, markets) are semantically interpreted as service outages rather than 'reduced load.' This ensures that when a critical service facility fails, the system correctly flags it as a crisis rather than showing 'less stress' on upstream infrastructure.

This report is generated by the Village Infrastructure Impact Predictor using AI-powered cascade analysis. Predictions should be validated with domain experts and real-time monitoring data.