

## Impact of Facility Disruptions on Demand Allocation Strategies in Reliable Facility Location Models

**Authors :** Abdulrahman R. Alenezi

**Abstract :** This research investigates the effects of facility disruptions on-demand allocation within the context of the Reliable Facility Location Problem (RFLP). We explore two distinct scenarios: one where primary and backup facilities can fail simultaneously and another where such simultaneous failures are not possible. The RFLP model is tailored to reflect these scenarios, incorporating different approaches to transportation cost calculations. Utilizing a Lagrange relaxation method, the model achieves high efficiency, yielding an average optimality gap of 0.1% within 12.2 seconds of CPU time. Findings indicate that primary facilities are typically sited closer to demand points than backup facilities. In cases where simultaneous failures are prohibited, demand points are predominantly assigned to the nearest available facility. Conversely, in scenarios permitting simultaneous failures, demand allocation may prioritize factors beyond mere proximity, such as failure rates. This study highlights the critical influence of facility reliability on strategic location decisions, providing insights for enhancing resilience in supply chain networks.

**Keywords :** reliable supply chain network, facility location problem, reliable facility location model, LaGrange relaxation

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