Introducing: Infrastructure systems have been designed using analysis of past events, putting vital infrastructure at risk of failure as future conditions change (Figs 1 and 2).

Challenge: Utilizing resilient infrastructure to maintain functioning communities.

Needs: The ability of infrastructure to prepare for, withstand, and recover from disruptions as well as adapt to changing conditions.

Solution: Implementing characteristics of resilient lifeline systems.

Objective: Use developed resilient characteristics and achievement indicators to identify gaps (Fig 3) in practice among water infrastructure agencies in the United States.

Introduction

Background: Infrastructure systems have been designed using analysis of past events, putting vital infrastructure at risk of failure as future conditions change (Figs 1 and 2).

Methods

15 characteristics of resilient lifeline systems act as goals

Corresponding achievement indicators identify resilient actions

Current status of 12 water agencies identified

43 question survey distributed to various water agencies

Fig (4): Procedure for identifying existing resilience

Steps were created to identify resilient practices (Fig 4).

Actions were scored based on implementation level (Table 1) and categorized into domains (Fig 5).

Resilience gaps were examined (Fig 6).

Target Resilience (Characteristics) - Existing Resilience = Resilience Gaps

Fig (8): Locational resilience by domain

Results

1. Overall Resilience

- Resilience achievement scores were calculated by domain for each location (Fig 8).

2. Characteristics

- Two agencies are working towards or meeting all goals set by the established resilient characteristics (Fig 9).

3. Resilience Gaps

- Relationships between the adoption of certain resilient characteristics and locations were specified (Fig 10).

Fig (9): Locations implementing best resilient practices

Fig (10): Identified resilience gaps

Fig (11): Characteristics lacking full implementation.

Conclusion

In order to improve the state of resilience it is important to first understand the current behaviors and actions common among water infrastructure agencies but contemporary research on resilient lifeline systems does not incorporate practices currently operationalized. The influencing factors of resilient behavior can be used in further research and as an aid in the implementation of resilience plans. Gaps in the implementation of resilient practices were found to be influenced by geographic stressors and correlations between the implementation of certain achievement indicators.

- This research belongs to Thrust B, Project B1-1: Urban Water Infrastructure Resilience focused on agency operations.

References


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Abstract

This research focused on benchmarking the characteristics of resilience that are most commonly practiced among water infrastructure agencies. A survey generated using previously identified achievement indicators was distributed. The current status of 13 water agencies were assessed and results were used to find gaps in the adoption of practices. The inclusion of various agency locations was important as hazards differ, requiring slightly adapted resilience programs.

Research Questions:

- What characteristics of resilience are currently being operationalized in water systems across the United States?
- What gaps are present between the current state of practice and target resilience?

Table 1: Corresponding response scores

<table>
<thead>
<tr>
<th>Possible Response</th>
<th>Corresponding Score</th>
</tr>
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<tbody>
<tr>
<td>Definitely Yes</td>
<td>3</td>
</tr>
<tr>
<td>Tends to Yes</td>
<td>2</td>
</tr>
<tr>
<td>Not Sure</td>
<td>1</td>
</tr>
<tr>
<td>Definitely No</td>
<td>0</td>
</tr>
</tbody>
</table>

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