Are Plans and Policies Integrated for Community Hazard Resilience? An **Evaluation for Indigenous Communities**

INTRODUCTION

The impacts of natural hazards are growing increasingly severe, particularly for historically marginalized communities, as is the case of many Indigenous communities in the US.

- A **plan network** (the collection of plans governing land use and physical development) that incorporates resilience goals and works coherently for that (i.e., **plan integration**) is instrumental in promoting community hazard resilience.
- However, plans oftentimes work against each other, thus instead weakening resilience.
- Yet, there has been no study on evaluating the extent of plan integration in Indigenous communities.

We expand and demonstrate an approach to evaluate plan integration in the context of Indigenous communities. More specifically, we address the following research questions: 1. Is the plan network integrated in promoting community resilience to flooding?

- 2. Is the network paying enough attention to the future flood risk?
- 3. Is the network paying enough attention to the Indian reservation?

<u>METHODS</u>

Study site: An Indian reservation bounded by Louisiana and its neighboring communities of Charenton, Baldwin, and Franklin, Louisiana.

Approach: The Plan Integration for Resilience ScorecardTM (PIRSTM) method, following the threestep approach conventional among existing PIRSTM studies and **adding to it extensions needed for** the context of Indian reservations.

Step 1 – Delineate planning districts and hazard zones



Figure 1. Delineation of district-hazard zones.

Baldwin. Charenton, and Franklin Miles 0 1 2 4

- Planning district: Based on Census Block Groups.
- Hazard zone: Current flood risks (100- and 500-year floodplains; FEMA, 2017) and future flood risk (5-feet sea-level rise; NOAA, 2017).

District-hazard zone: Intersected the planning districts and the hazard zones, generating the district-hazard zones (n = 48), our unit of analysis.

We also delineated the boundary of different types of lands within the Indian reservation (Esri Federal Data, 2025 for the trust and fee land boundary; Regrid, 2025 for fee land ownership):



Non-tribe-owned fee *land*: Land owned by non-tribal entities.

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- *Trust land*: Held by the Department of the Interior in trust for the tribe.
- *Tribe-owned fee land:* Land owned by the tribe or its members.

Step 2 – Determine vulnerability

We established the physical vulnerability and social vulnerability (using the CDC SVI) of each planning district.

Step 3 – Evaluate plan network

- First, we collected all planning documents available (6 state plans, 2 parish plans, and 1 tribal plan). Second, we selected relevant policies from each planning document.
- Third, we scored each policy in each district-hazard zone: • +1 if the policy can enhance resilience, and vice versa for -1; • 0 if the policy is unlikely to influence the resilience there.
- We considered the authority of each tier of government thus the spatial applicability of its **policies**. We determined the authority by synthesizing the existing law and government literature. Fourthly, we aggregated the scores from all policies for each district-hazard zone – this formed the
- proxy of the degree of plan integration there. Fifthly, we singled out the scores specific to the reservation.

RESULTS



Figure 3. Total policy scores in each district-hazard zone. The plan network is integrated toward and supports community flooding resilience given:

- The positive mean of +12.41
- Positive total scores in **all** 48 district-hazard zones

Attention to future flood risk



Figure 4. The mean policy scores for each type of flood risk.

The plan network does not pay enough attention to the future flood risk, in comparison to its attention to the current flood risks:

Mean scores for the current flood risks: 13.36 (100-year floodplain) and 12.55 (500-year floodplain). Yet, the score for the future flood risk is lower, at 10.04.

This material is based upon work supported by the National Science Foundations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.



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Attention to the Indian reservation

- The network is not paying enough attention to the reservation: its mean score is substantially lower in the reservation (3.81) than in the neighboring communities (11.92 -12.64) (Fig. 5)
- Yet, the more local the plans, the more attention they pay to the reservation (Fig. 6)
- The problem of insufficient attention to the reservation is more acute in the 100year floodplain (Fig. 7)





Figure 6. The mean scores in each community, by plan tiers.



Figure 7. Mean policy scores in each floodplain, by communities.

The plan network cannot pay enough attention to the reservation because:

- tribal sovereignty and (2) the *exclusive federal-tribal relationship*.

- risk is insufficient compared to that for the current flood risks. communities.
- Indian reservations..

Figure 5. Mean policy scores by community.

pays the least attention to the reservation in the 500-year floodplain, this problem **looms** larger in the 100year floodplain: • The scores in the

While the network

other three communities increase or stay roughly constant. • *Yet it falls further*

in the reservation

State and parish governments, in principle, have no authority in Indian reservations because of (1)

This principle has been diluted but is still largely stable in (1) trust lands and (2) tribe-owned fee lands, which constitute the vast majority of area of the reservation being studied (see Fig. 2). Thus, many positive state- and parish-level-plan policies cannot benefit the reservation.

CONCLUSIONS

The plan network is integrated for promoting resilience: on average and in each district-hazard zone. While it still contributes to greater resilience for the future flood risk, the network's attention to this

The network does not pay enough attention to the reservation, relative to its neighboring

The problem of insufficient attention is more acute for the once-in-100-year flood risk. The more local the plans, the more attention they pay to the reservation. The network under-benefits the reservation to the limited authority of the states and the parishes in