Hazard Mitigation and Disaster Recovery Planning Strategies for the 2025 Pacific Palisades and Eaton Fires in Los Angeles, California

By: Martin Garcia Fry

These strategies encompass data-driven research conducted by the author to develop an operational planning process for short- and long-term disaster recovery. The strategies described represent an ongoing effort to integrate climate change mitigation goals into disaster recovery plans.

1. Hazard Mitigation

1.1 Environmental Solutions:

- Define fire-prone land in urban boundary areas to detect high-risk fire paths.
- Evaluate the resistance of native, high-water intake vegetation with high levels of chlorophyll content to clarify which vegetation types deal with fire best, if any.
- These data-driven fire risk assessments can be used to:
    - Target (1): Establish a dry land belt/buffer area.
        - **Solution:** By estimating buffer width requirements through maximum fire leap distances and (ember) flying distances.
        - **Solution:** Promote wastewater treatment facilities for cropland irrigation and increased firefighting capability.
    - Target (2): Establish contingency measures for increased security, such as planting the least flammable native vegetation around buffer zones.
        - **Solution:** Possibility of fire-resistant vegetation to delay propagation except in areas sharing a side with roads, parcels, or buildings.
        - **Suggestion:** Continued irrigation programs and pruning maintenance.

Note: These solutions/policy recommendations elevate soil moisture, create fire-resistant micro-climates, increase firefighting capacity, and reduce wind-fueled fire extents.

1.2 Socioeconomic Solutions:

- Fire-resistant building codes should be endorsed to enhance resilience.
    - Target (1): Establish housing setbacks to gain distance from buffers by:
        - Estimating the relative distance between non-destroyed, set-backed homes and fires (e.g., during the Pacific Palisades and Eaton fires).
        - Building codes: Setbacks for high-risk administrative areas.
        - Given the heterogeneity of high-risk area distribution, one way forward is to instill new or updated peri-urban administrative areas, requiring setbacks, while allowing residential mixed-use development to alleviate economic burdens.

- **Suggestion:** Integrate green infrastructure investments with value propositions, such as evacuation facilities coupled with farmers' markets and leisure activities to attract visitors and boost disaster resilience.
- Evacuation sites require localized hazard mitigation approaches.
- **Solution:** Promote cropland for increased water retention, mitigating fires and promoting complementary home businesses.

Note: This solution/policy could increase food and water security as a dual hazard mitigation and economic development opportunity. Potential outcomes include: Fire mitigation, enhanced disaster preparedness, water and food resource development, community resilience, and increased firefighting capability.

2. Long-Term Disaster Recovery

- Rapidly growing peri-urban areas pose opportunities, and challenges, for urban safety and climate change.
- One way to deal with hazard risk is to promote urban growth management strategies, such as agronomic urban boundary (AUB) networks (Garcia-Fry, et al., 2022). AUB networks target sustainable development goals through rural labor, land cover, energy-efficient travel, and semi-urban development to:
  - (2-A) Reduce urban intensities and enclose that growth in city-wide areas,
  - (2-B) Allocate multi-hazard mitigation infrastructure,
  - (2-C) Locate households that will potentially venture home-businesses, and
  - (2-D) Allocate multi-modal mobility infrastructure enclosing agroforestry to enable adaptation and mitigation solutions that enhance rural livelihoods.

2.1 Environmental Solutions:

- Target (2-A): Reducing urban intensity to form a revitalization network that promotes preservation and creation of new agricultural areas by:
  - Identifying disaster recovery needs through a comprehensive survey of disaster-affected areas to include: Field questionnaire for displaced victims, land use data, and travel routine data.
  - Analyzing spatiotemporal urban growth rates using remote sensing-based land change dynamics to prioritize the location of large-scale investments.
  - Using mobility input data to simulate pre-disaster travel routines.
  - Acquiring 7 data sets to perform the Operational Land Use and Transport Microsimulation (OLUTM) Model (Garcia-Fry, et al., 2022).
  - Similar to loss-avoidance models, the OLUTM model utilizes pre-disaster data and survey questionnaire data to evaluate before and after development scenarios and quantify the effectiveness of proposed solutions to help formulate sustainable and resilient redevelopment plans.

        - **Solution:** The OLUTM Model finds street networks for AUB network adaptation, accounting for population, mobility, and land cover data to ensure environmental and socioeconomic returns.
    - Target (2-B): Using these results, hazard mitigation strategies can be proposed to sustain large-scale investments by:
        - Establishing which land/water carbon sinks require protection.
        - For example, Altadena and the Angeles National Forest share boundaries and both require human and climate hazards risk reduction.
        - **Solution:** Vegetation-free dry buffer areas to reduce urban vulnerability and propose policy-driven schemes of redevelopment.

2.2 Socioeconomic Solutions:

- Target (2-C): Understanding household location effects through:
    - A clustering sub-model of the OLUTM model to group people with travel attributes, location preferences, and diverse segmentations.
    - Groups are located using sociodemographic data to weigh the polarity of travel attributes on-site and define cluster locations.
    - A settlement module follows to locate each cluster in a settlement site.
    - **Solution:** Once cluster locations are defined, a land use change module evaluates the probability of home-business entrepreneurship as a factor of location, age, household composition, education, income, and risk-taking psychographic segments reflecting a choice of land use change.
- Target (2-D): Understanding household-specific needs through:
    - Community-driven recovery and evaluation framework, placing beneficiaries at the center to address (1) permanent housing, (2) post-disaster mental health, and (3) sustainability.
    - **Solution:** Assisted housing design and mutual-help reconstruction to reduce mental health effects and speed livelihood recovery.
    - **Suggestion:** Psychometric tools before, during, and after the reconstruction process to evaluate program effectiveness.
    - **Solution:** Customized design for home-business entrepreneurship.
    - **Solution:** Using Home-Kits as a hazard-resistant building guide for community-driven reconstruction (multiple local construction systems are adaptable), saving 30% in building costs.