Using NLP to Compare Resilience, Sustainability, and Adaptation Planning

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Background and motivation

“Resilience” is about capacity to absorb shocks

- Planning for resilience occurs alongside planning for other goals (e.g., sustainability; climate adaptation)
- Where does resilience fit in with other goals?
  - Similarities in planning process?
  - Similarities in actions?

Why NLP?

Similarities/differences between planning for X and Y (setting objectives)

- Streamline/standardize planning process for X and Y
- Assess adherence to guidelines

Similarities/differences between actions for X and Y (achieving objectives)

- Implementation: what actions available for X and Y?
- Investment: what is the cost?

The need for custom corpora

Planning documents (e.g., capital improvement plans, hazard mitigation plans, budgets) are long, messy, not standardized

- Domain expertise
  - Identifying objectives
  - Identifying actions and attaching to objectives
- Other challenges
  - Definitions (standard definitions vs “emergent” based on use)
  - Linking planning and budget documents

The value of those corpora

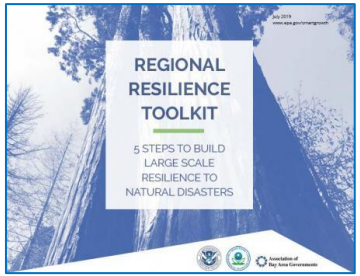
Assist communities with planning

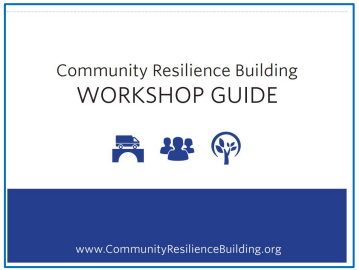
- Assess existing planning documents
- Assist in developing/revising planning documents
- Streamlining or combining processes where possible
- Adhere to guidelines required for funding
- Query available actions (what works for X **and** Y; what is the cost)

Case Study: Resilience, Climate Adaptation, and Sustainability ("RAS") Planning **Guidance** (1/2)

Goal: identify similarities and differences between community focused RAS planning processes - help improve communication, identify trade offs, and reduce redundancies

Published guidance documents assessed for methods described (data needs, analysis, and strategies suggested), goals, and outputs expected using *qualitative content analysis* (i.e. **annotations**).





Case Study: Resilience, Climate Adaptation, and Sustainability ("RAS") Planning **Guidance** (2/2)

- Annotated database of guidance documents serves as corpus for subsequent analysis
  - Two-independent coders, 26 documents = 2,681 coded segments ~ 3 mo
  - Existing planning document studies have similar annotated corpora
- Corpus developed for RAS planning guidance documents provides convenient demonstration case for NLP
  - May be unique application for examining corpora at intersection of urban planning, design, environmental management, & administration.
  - Explores feasibility to extend NLP methods to reexamine prior, similar efforts or new domains

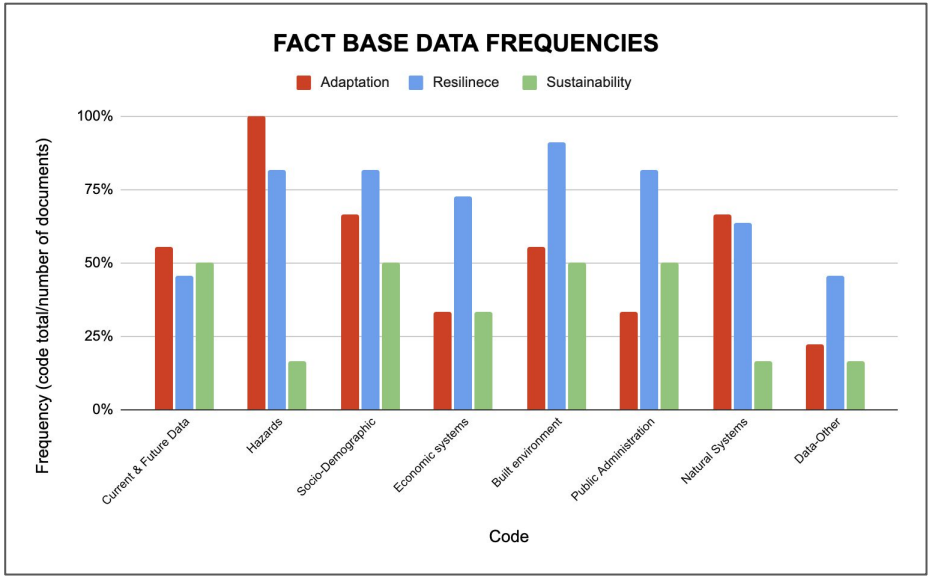


*Figure prepared by Samantha Wong, Binghamton University

Case study: (Cherry-picked) Example

"One common zoning incentive is an increased floor-to-area ratio (FAR), which regulates the density of development on a site. The City of Portland, Oregon offers increased FAR as an incentive for installing green roofs."

- Building Community **Resilience** with Nature-Based Solutions (FEMA 2020)

"Incentives can be financial, such as tax credits for protecting natural resources, or procedural, such as height or floor area bonuses for designs that are more resilient to hazards."

- Planning Framework for a **Climate-Resilient** Economy (EPA 2016) *Adaptation*

Next steps

- Complete data cleaning and analysis of case study documents
- Use case study data to test some NLP tasks (e.g., embeddings, classification, topic modeling, ...)
- Assess strengths/weaknesses of “off-the-shelf” methods

Thank you!

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