Analysis and Characterization of Community Projects for Resilience

Innovations in Climate Resilience

March 28th, 2023

Session B1

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Hello there!

Molly Jenkins

Jenkins.molly@epa.gov

Oak Ridge Institute for Science & Education Participant

Hosted at the United States Environmental Protection Agency

Office of Research and Development

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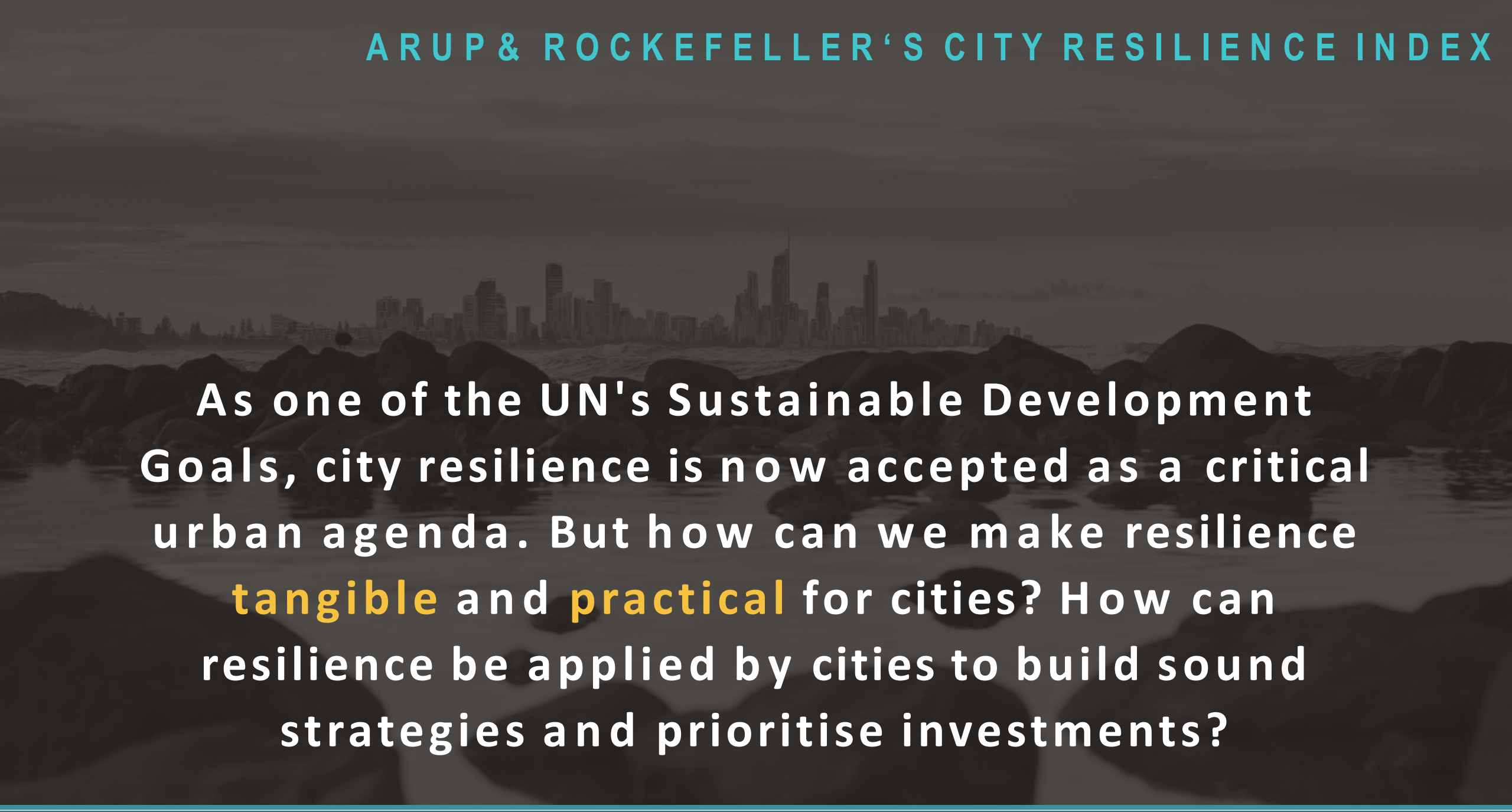
ARUP & ROCKEFELLER'S CITY RESILIENCE INDEX



As one of the UN's Sustainable Development Goals, city resilience is now accepted as a critical urban agenda. But how can we make resilience tangible and practical for cities? How can resilience be applied by cities to build sound strategies and prioritise investments?

Prevailing resilience literature and applications alike inadequately research what is otherwise standard practice in web application development: **understanding the audience.**

OUR OBJECTIVE: INFORM PRACTICAL RESILIENCE APPLICATION

Research underpinning public-facing storymap development

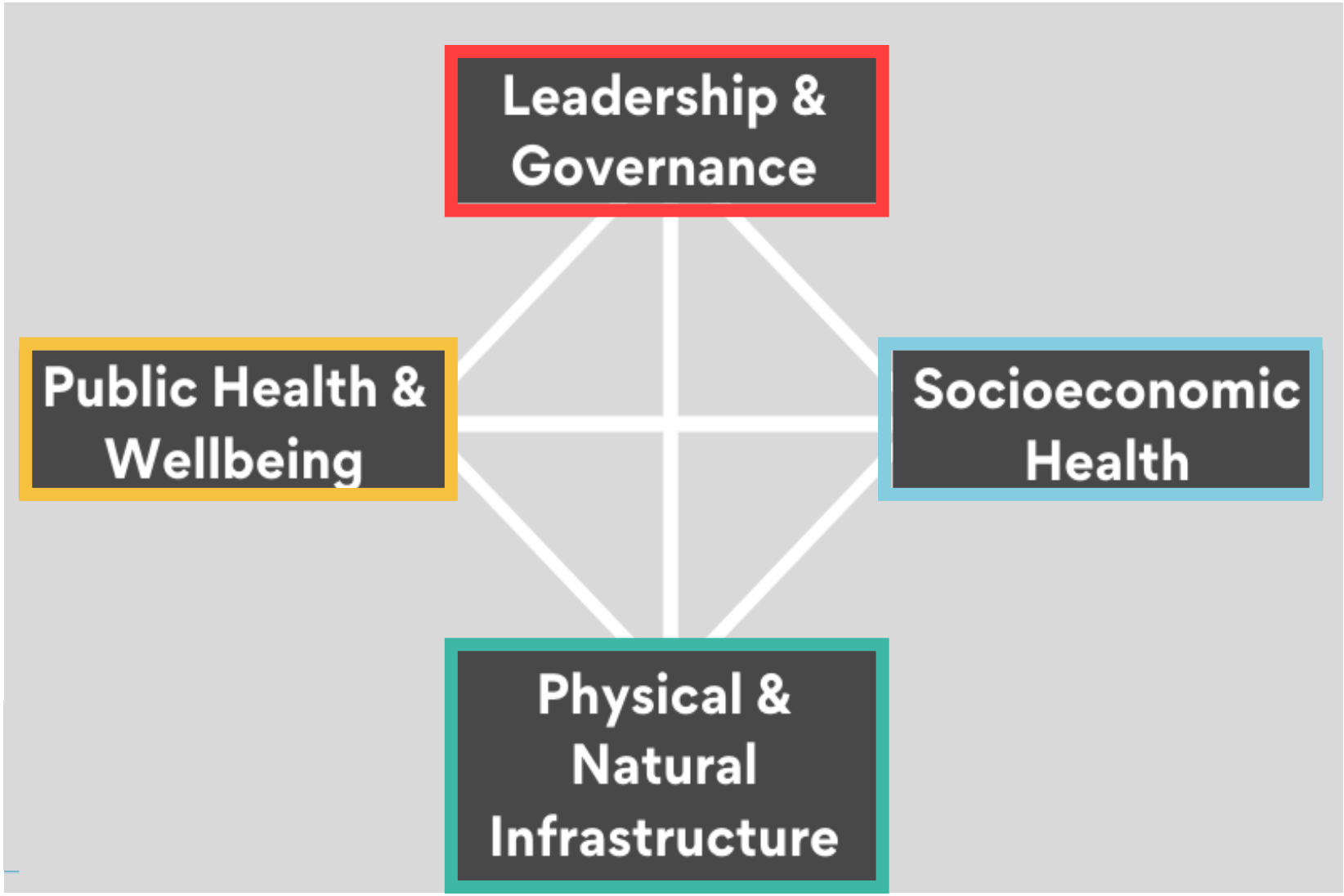
1) Develop resilience lexicon
   - Summarize academic-defined criteria

2) Develop community priority lexicon:
   - Synthesize community priorities
   - 1600+ real projects; 250+ cities

3) Evaluate overlap between resilience lexicon and community lexicon

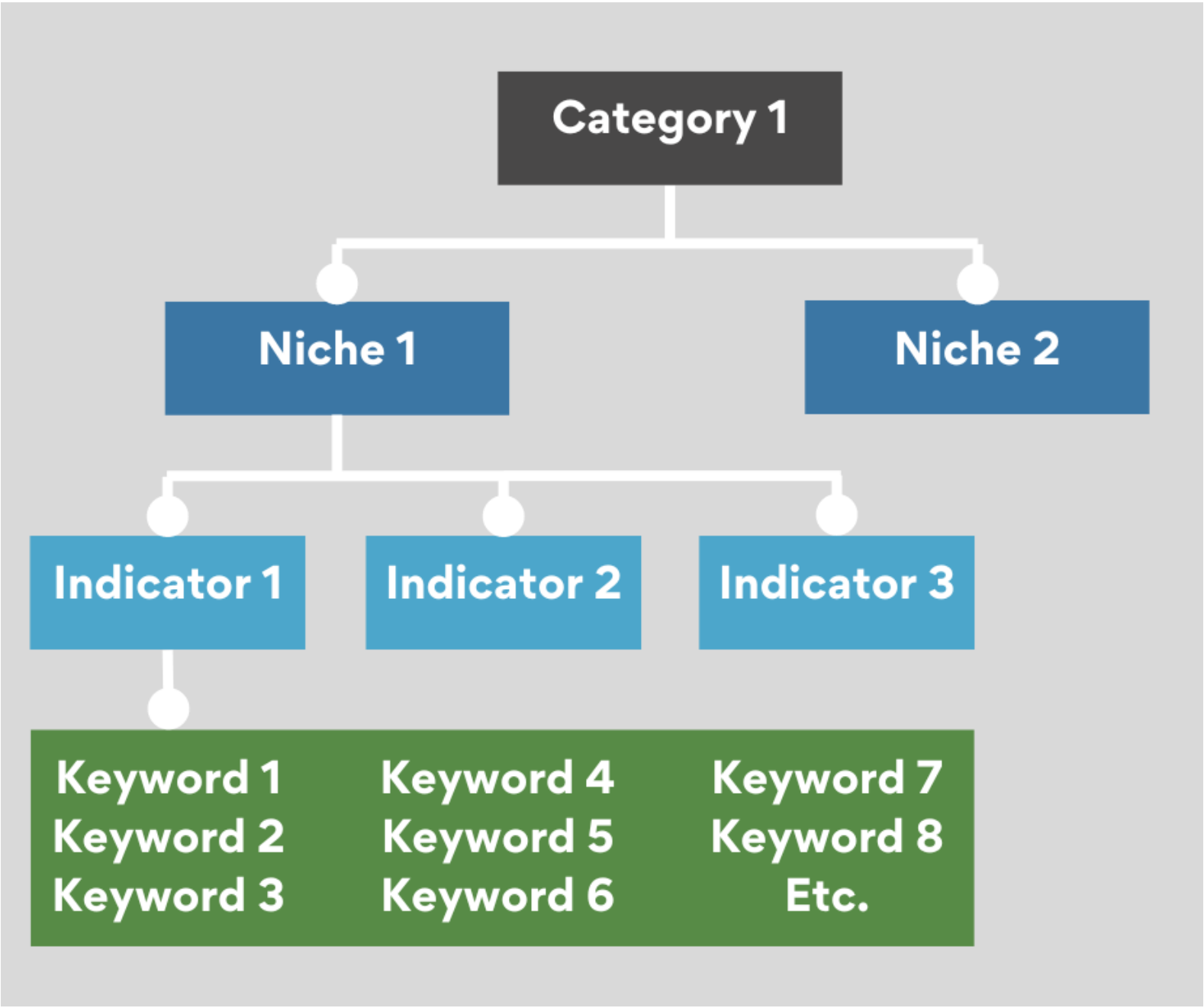
4) Results inform UX of future resilience storymap

Background & Methods



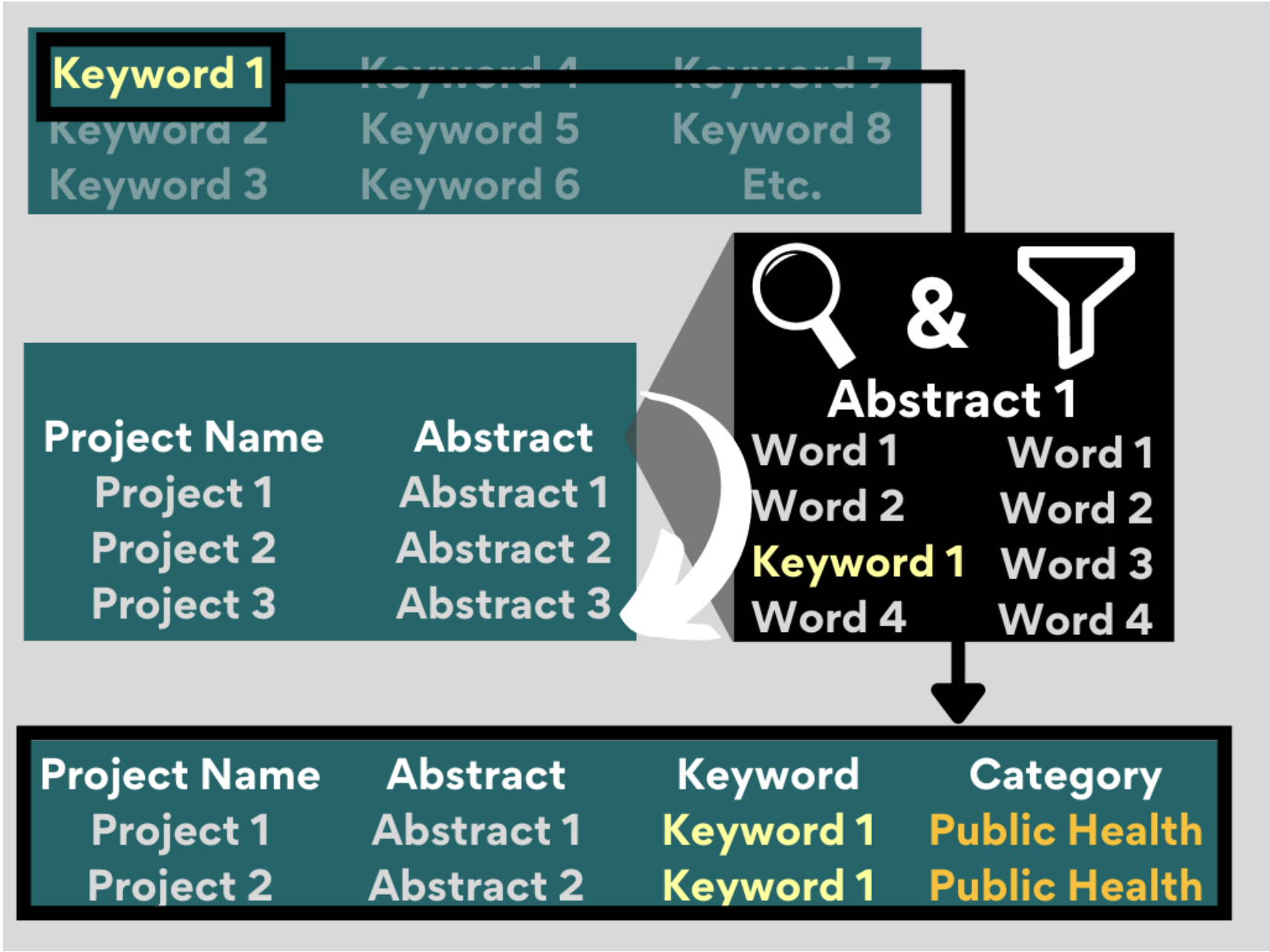
Identification of 4 common resilience categories

- Adapted from ARUP & Rockefeller Foundation's City Resilience Index
- Validated against other dominant resilience frameworks



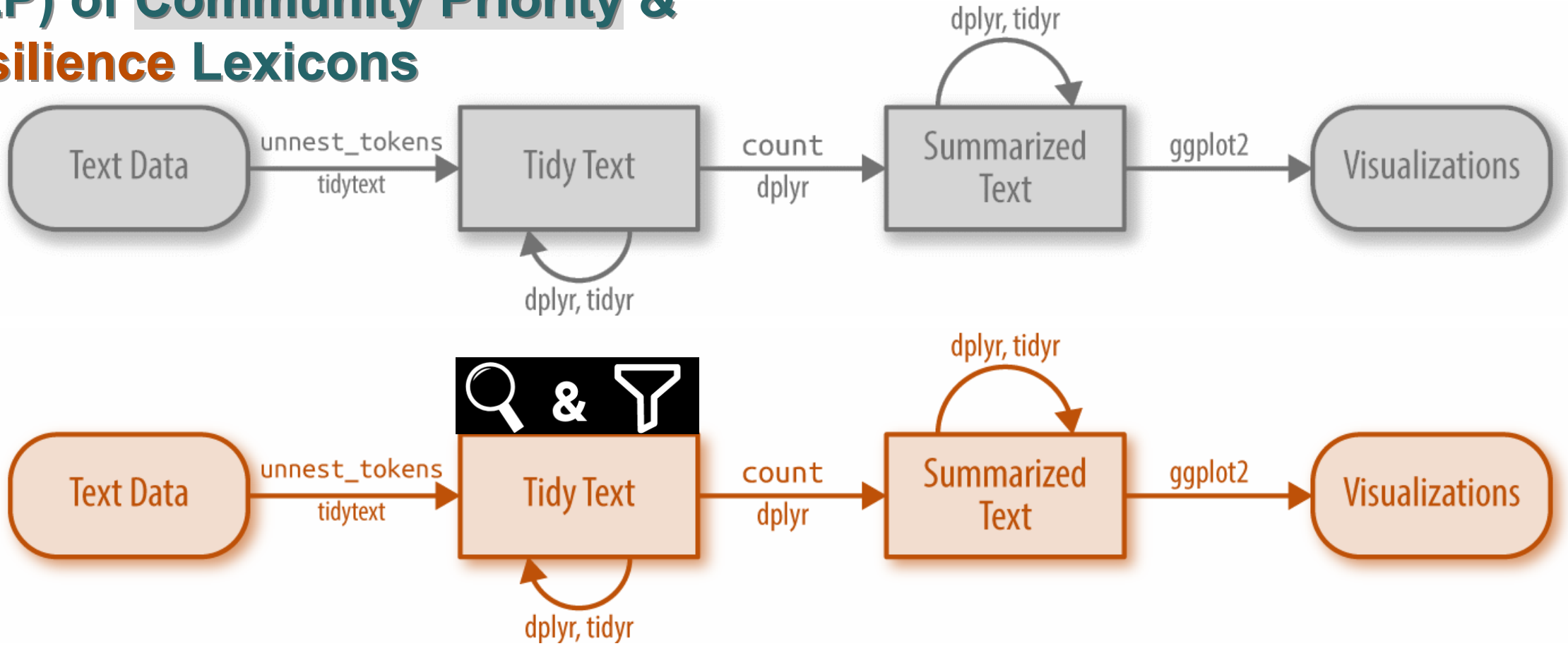
Methods Precedent: Elsevier Sustainable Development Goal Mapping Initiative

- Educational Partnerships for Innovation in Communities Network (EPIC-N)
  - 1,600+ unique projects; 250+ cities
- Similarities w/Elsevier initiative & data structure:
  - Large text database of project names and abstracts
  - keywords used as proxies for indicators



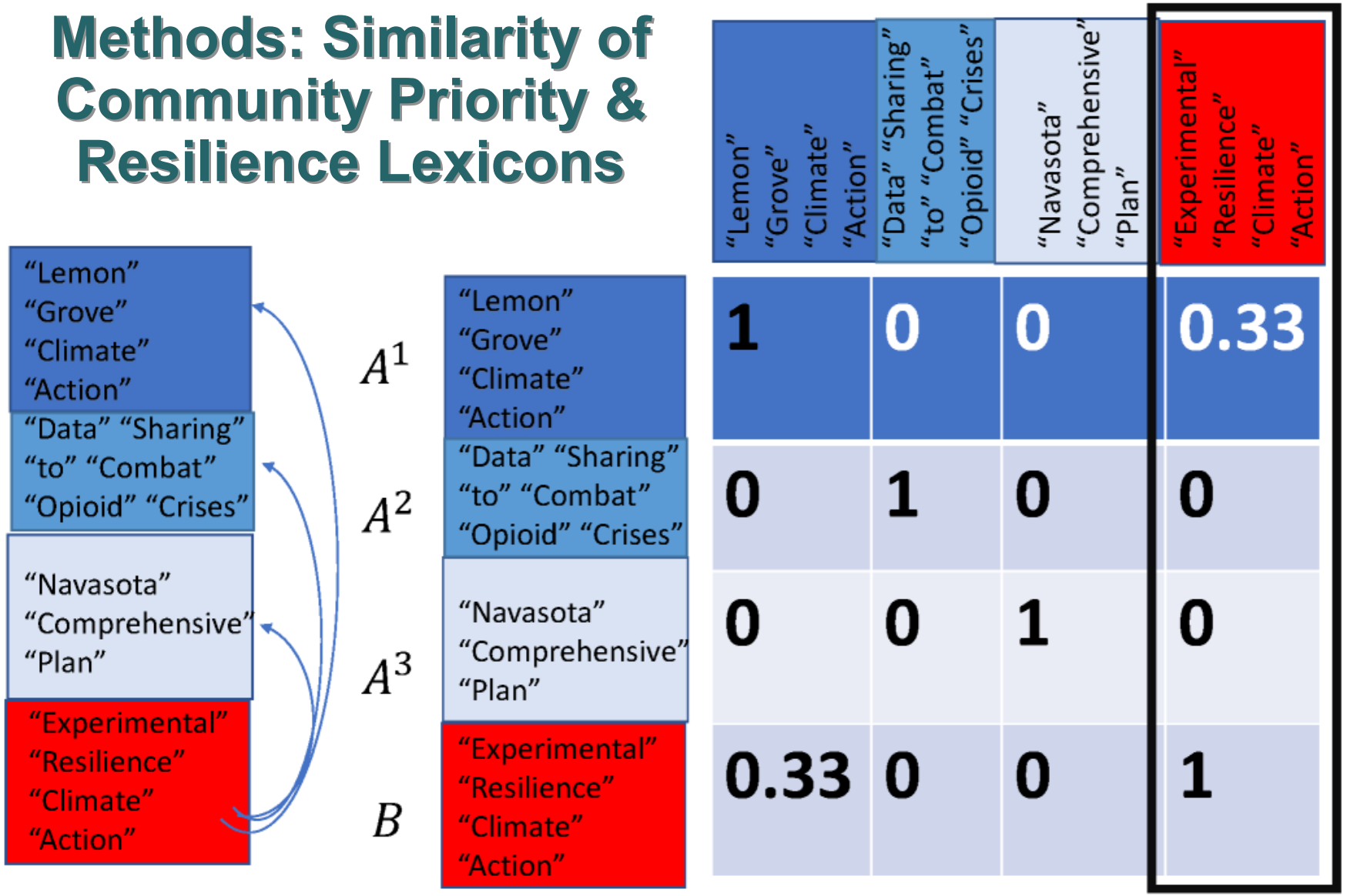
Methods: Resilience Lexicon & Community Resilience Profiling

Methods: Natural Language Processing (NLP) of Community Priority & Resilience Lexicons



- raw frequencies
- tf-idf rankings
- Markov chain visualization of bigrams (word pairs)

Methods: Similarity of Community Priority & Resilience Lexicons

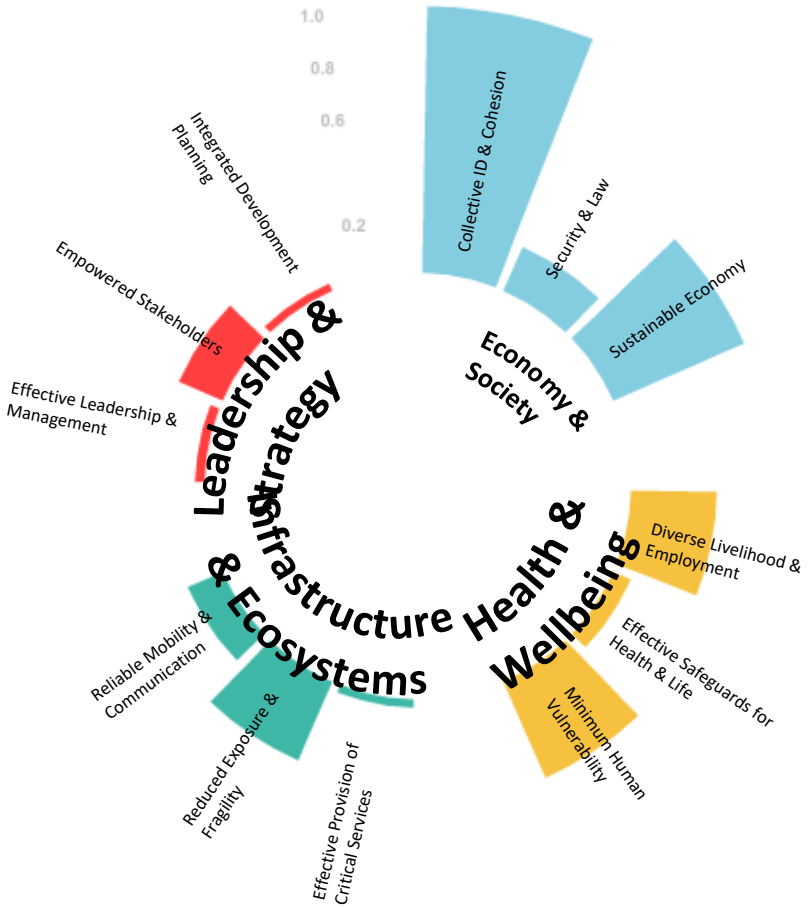


$$\frac{A^n \cap B}{A^n \cup B}$$

- Evaluation of Experimental vs Control Lexicons
  - Text similarity using Jaccard's similarity index
- Unsupervised topic models

Results: Resilience Lexicon

- 40 communities in particular stood out for a combination of:
  - High frequency of terms
  - Geographic and community diversity represented



Top Terms Overall

word	n	tf
public	538	0.049
development	517	0.047
water	318	0.029
planning	311	0.028
management	288	0.026
data	284	0.026
housing	276	0.025
transportation	243	0.022
local	238	0.022
information	230	0.021

Results: Resilience Lexicon NLP

Top Terms by Project

Project.Name	word	n	tf	idf	tf_idf
Improving Energy Efficiency at Juda School	energy	11	0.647	2.942	1.904
Chronic Illness: Promoting Healthy Lifestyles	chronic	9	0.333	5.460	1.820
Marketing 'Energy City'	energy	16	0.615	2.942	1.810
Eco-Greeen Business Park	green	9	0.600	2.926	1.756
Future growth of organic solar cells in the building integrated photovoltaic market	energy	8	0.571	2.942	1.681
Green Roof Design	green	16	0.571	2.926	1.672
National City Police Culture	police	12	0.387	4.073	1.577
Solar Panel Recommendations for Juda School District	energy	10	0.500	2.942	1.471
Air Quality and Noise Pollution in Lemon Grove	air	8	0.308	4.430	1.363
San Diego State University Mission Valley Policy Tools and Recommendations, Approaches to Affordable Housing	affordable	9	0.360	3.635	1.309

Top Terms by City

City	word	n	tf	idf	tf_idf
Eugene	mobility	21	0.276	2.133	0.589
Gonzales	policies	18	0.333	1.504	0.501
Liberty	planning	18	0.500	0.671	0.336
San Diego	housing	40	0.278	0.973	0.270
Ramsey City	resilient	29	0.073	3.519	0.258
Glendale	social	27	0.225	1.013	0.228
Navasota	resources	24	0.200	1.055	0.211
Portland	transit	79	0.120	1.686	0.203
State College	safety	19	0.116	1.727	0.200
Paoli	care	18	0.081	2.197	0.178

Results: Community Priority Lexicon NLP

Top Terms by City

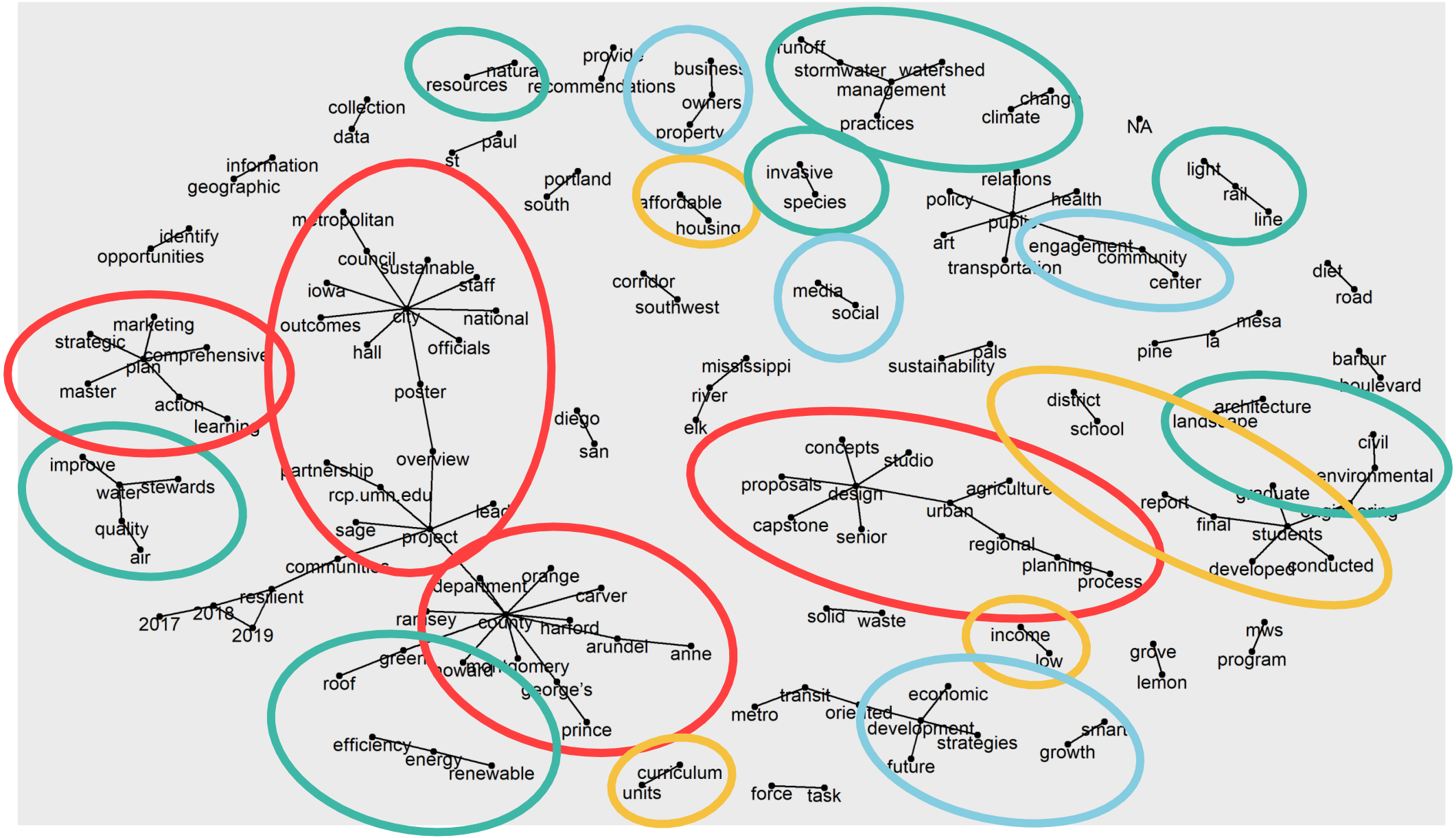
Top Terms Overall

word	n	tf
city	1920	0.021
students	1442	0.015
community	1018	0.011
project	945	0.010
plan	577	0.006
design	548	0.006
public	538	0.006
development	517	0.006
county	443	0.005
residents	425	0.005

Top Terms by Project

Project.Name	word	n	tf	idf	tf_idf
Developing Content for the University of St. Thomas Pollinator Path	pollinator	20	0.088	6.440	0.570
Decreasing Use of Plastic Shopping Bags	plastic	20	0.076	6.440	0.488
Evaluating Stormwater Management Graphics	mwmo	20	0.088	5.187	0.455
Developing Content for the University of St. Thomas Pollinator Path	path	20	0.088	4.648	0.411
Developing PR for Organics and Recycling	recycling	18	0.111	3.699	0.411
Green Roof Design	roof	18	0.071	5.342	0.379
Decreasing Use of Plastic Shopping Bags	bags	16	0.061	6.035	0.366
Wikiup Junction Community Advisory Council	pine	22	0.068	5.342	0.365
Inventorying Albany's Cultural Resources	cultural	20	0.087	3.668	0.319
Marketing 'Energy City'	energy	16	0.105	3.006	0.316

Results: Community Priority Lexicon NLP



Results: Similarity of Community Priority & Resilience Lexicons

- Jaccard's similarity index table: low/no similarity between community priority (control) and resilience (experiment) lexicons, both across terms individually and across groups
- Unsupervised topic models did not predict groupings consistently either

Jaccard's Similarity Matrix

OUR OBJECTIVE: INFORM PRACTICAL RESILIENCE APPLICATIONS

1) Clear mismatch between academic resilience lexicon and community priority lexicon
   - E.g. mismatch in communication between researchers and community practitioners?

2) Potential categorical overlap and latent emergence of governing topics
   - TOPICS == main resilience categories?
   - Unsupervised clustering methods & focus groups

OUR OBJECTIVE: INFORM PRACTICAL RESILIENCE APPLICATIONS

Research informs the practical application of a public Community Resilience Assessment and Planning Storymap, with paired case studies and corresponding national-extent standardized data.

Acknowledgements

Special thanks to Jessica Daniel, Jose Zambrana, Laura Bloch, Marshall Curry, and Federal Service interns as core members of the project team.

[Sustainable City Year Program]

City, State: Salem, Oregon
Community size: 175,535
Rurality Code: [2]
Community Summary: Salem, Oregon participated in EPIC-N program year 2014-2015. University of Oregon: Sustainable City Year Program.

Topics: Critical transit; affordable housing

Summary of what was done to address resilience: Salem EPIC-N projects highlighted the need for increased reliability of critical services, including transit in the event of crises requiring evacuation. Many projects also underscored the importance of affordable housing for the health and adaptability of city residents. External sites:
[Salem Webpage]
[EPIC-N Write up]

EnviroAtlas Community? No.

Relevant Sustainable Development Goals:

Community Resilience Profile

Case Study maps:

a. Population near major roadway with little to no tree buffer: [https://enviroatlas.epa.gov/enviroatlas/interactivemap/?eaLayer=eaLyrNum_228]
b. Estimated floodplains: [https://enviroatlas.epa.gov/enviroatlas/interactivemap/?eaLayer=eaLyrNum_361]
c. Residential address vacancy rate for 2014: [https://enviroatlas.epa.gov/enviroatlas/interactivemap/?eaLayer=eaLyrNum_761]

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