TOWARDS A VERMONT RESILIENCY MATRIX?

VERMONT CLIMATE COUNCIL

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Sources of today's content:

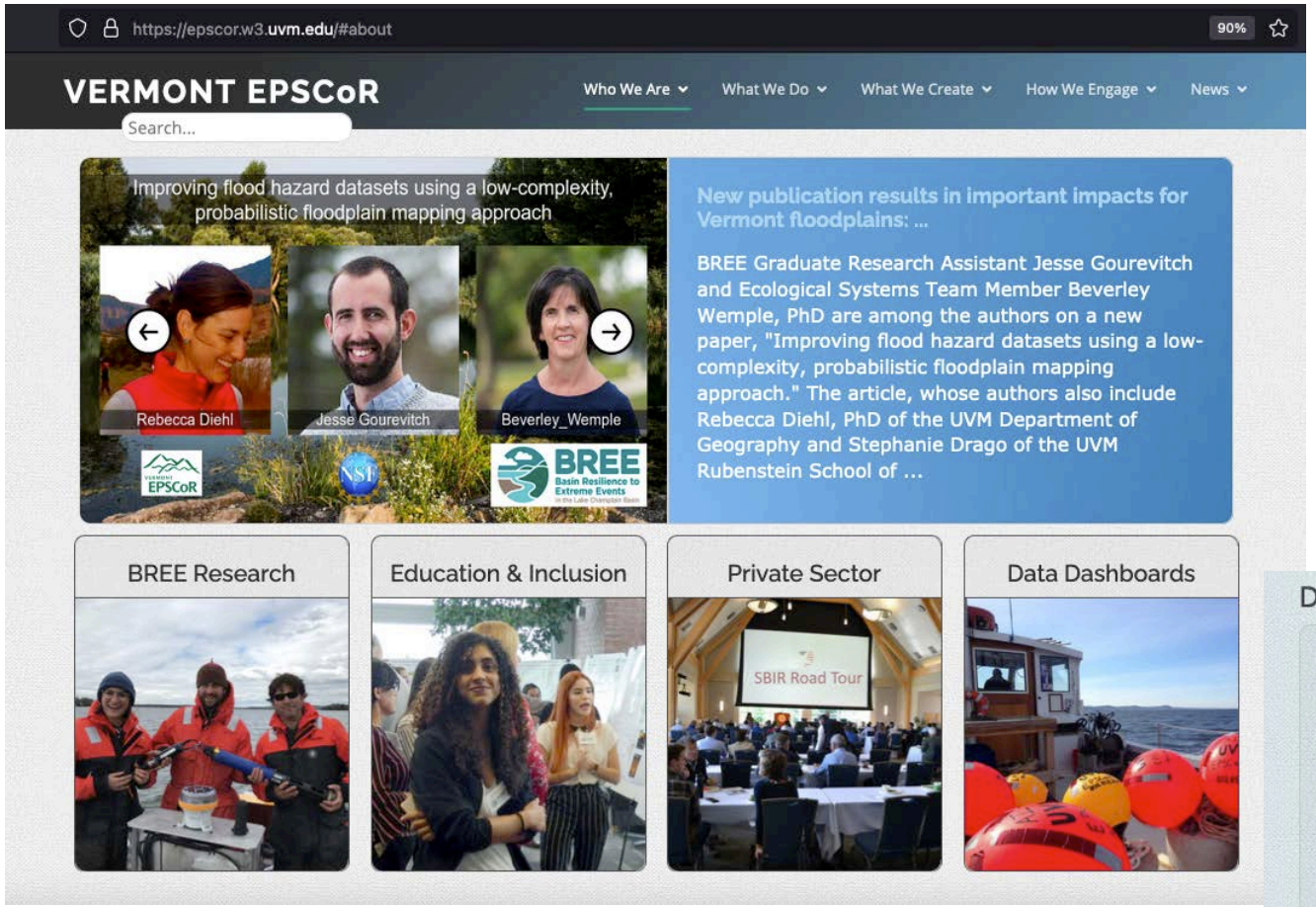
- VT EPSCoR's Research on Adaptation to Climate Change (RACC) and Basin Resilience to Extreme Events (BREE)
- PA 317 Systems Analysis for Community Resiliency / Certificate of Graduate Study in Community Resilience and Planning
- International Joint Commission (ICJ) Lake Champlain Richelieu River Flood Reference
- Economic Resilience Assessment Roundtables

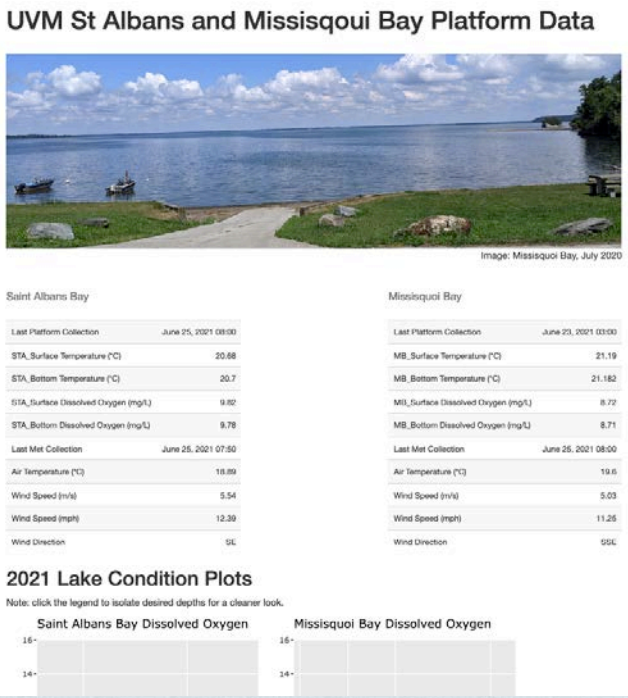
BREE Basin Resilience to Extreme Events in the Lake Champlain Basin

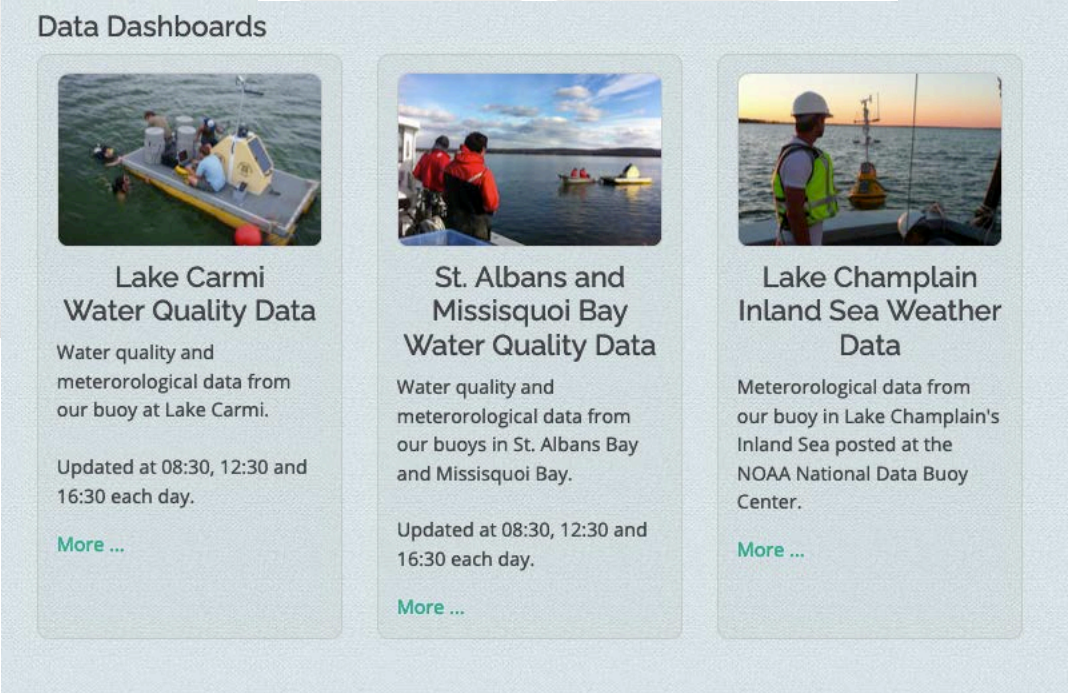
CDAE

INTERNATIONAL JOINT COMMISSION • COMMISSION MIXTE INTERNATIONALE

THE UNIVERSITY OF VERMONT OFFICE OF ENGAGEMENT







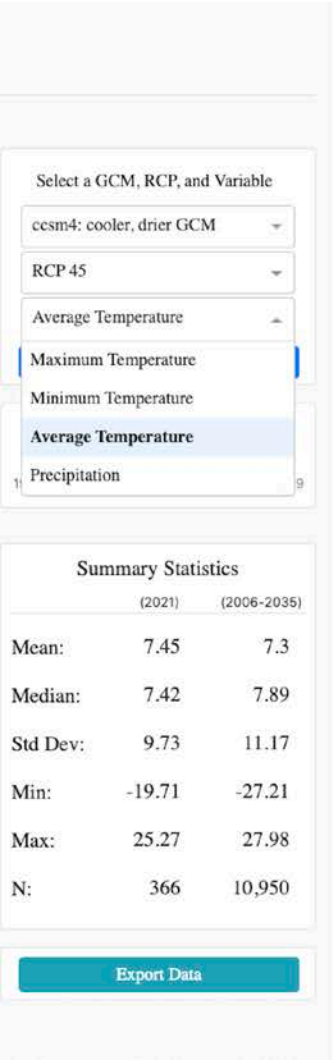
https://epscor.w3.uvm.edu/#data

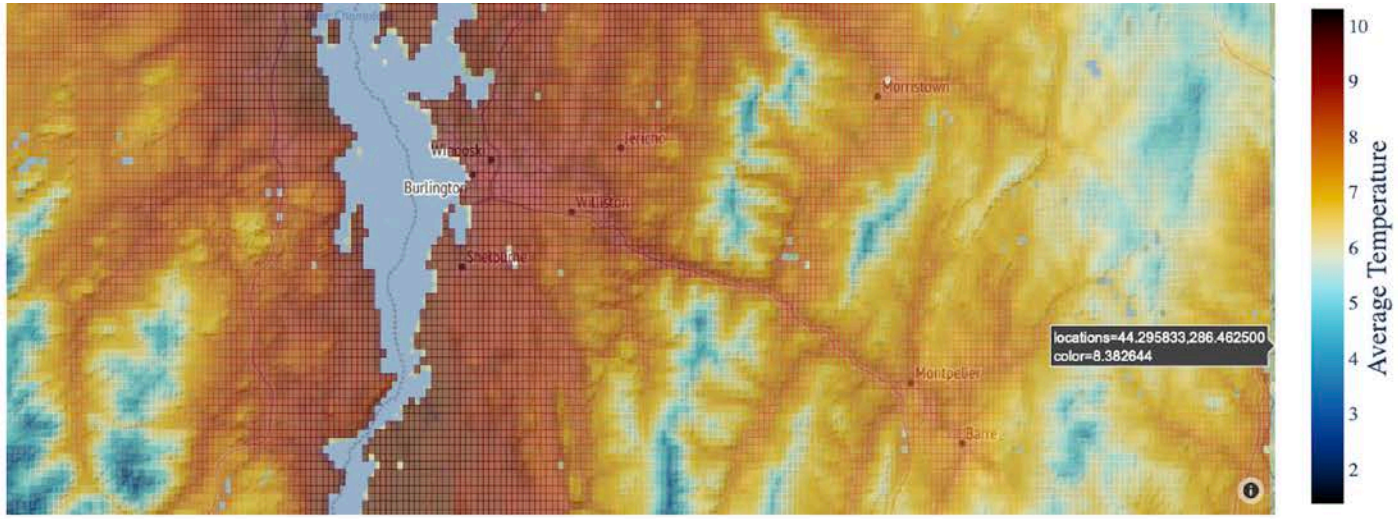
Regional Downscaled Climate Model Dashboard – under construction

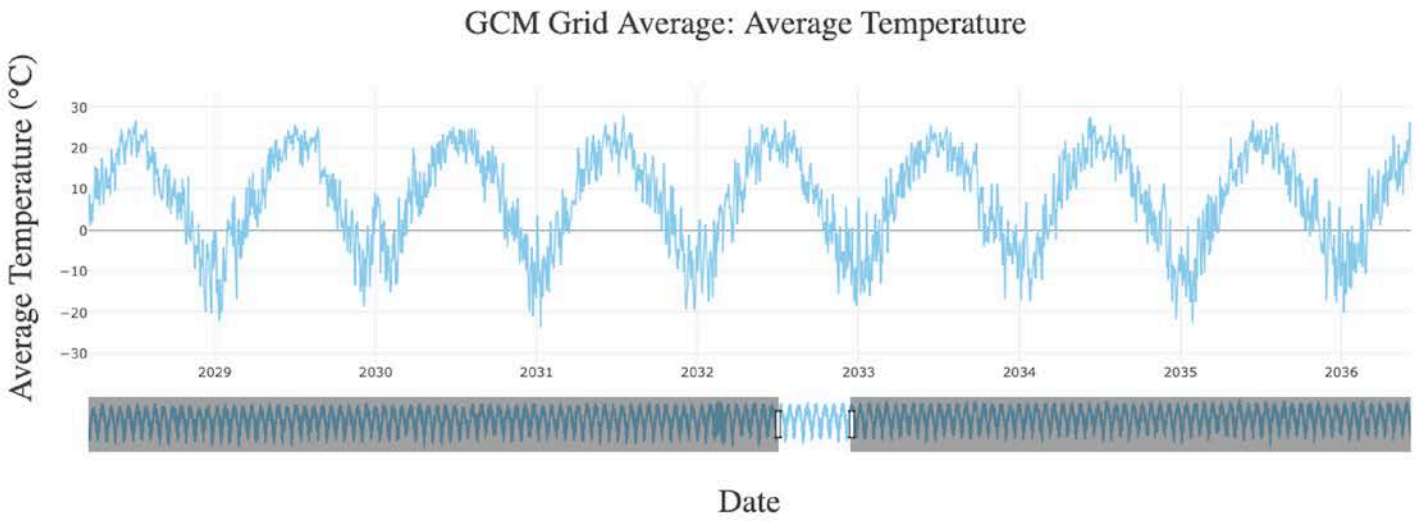
Sliders:

- GCMs
- RCPs

- Temperature
- Precipitation

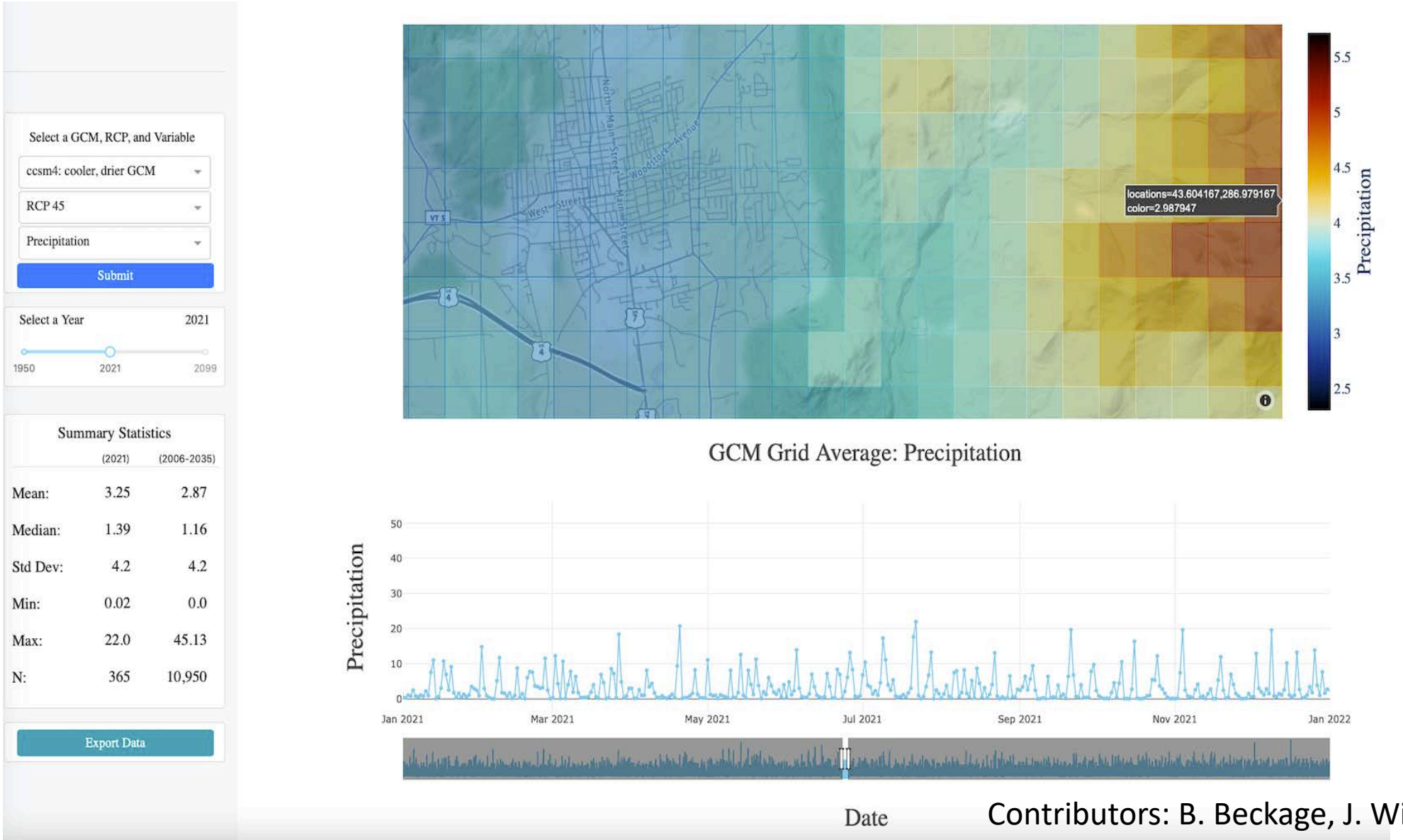






Contributors: B. Beckage, J. Winter, P.Clemins, E. Clark

Regional Downscaled Climate Model Dashboard – under construction



- Days above 90 degrees F
- First/last frost
- Drought indices

Contributors: B. Beckage, J. Winter, P.Clemins, E. Clark

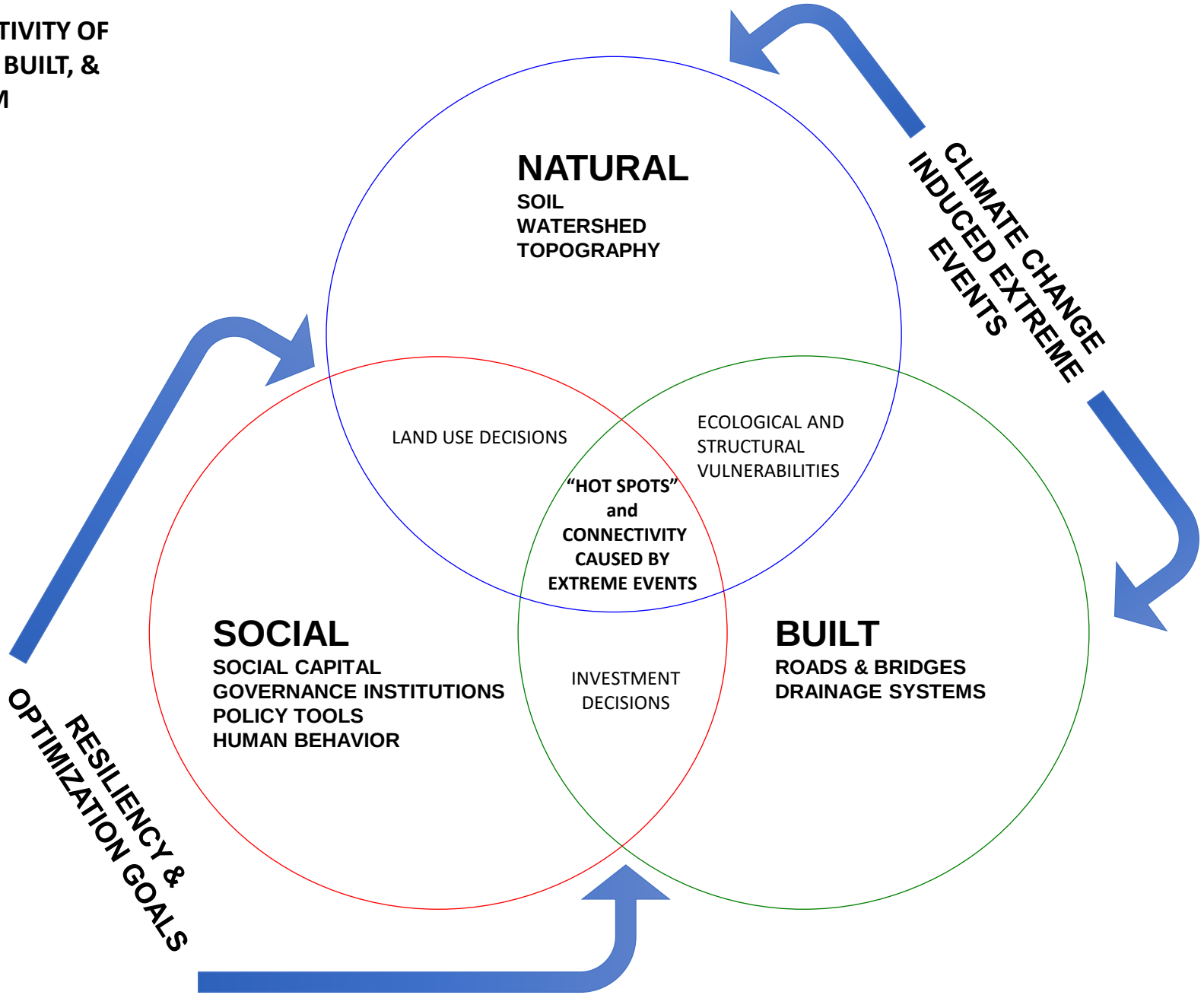
What is resilient?

- Resilient ecosystems

- Resilient people
- Resilient places (rural, urban, social ecological systems)
- Resilient things (infrastructure)

- Resilient organizations and institutions (governments, NGOs, businesses)
- <u>Resilient communities</u>

INTERCONNECTIVITY OF THE NATURAL, BUILT, & SOCIAL SYSTEM

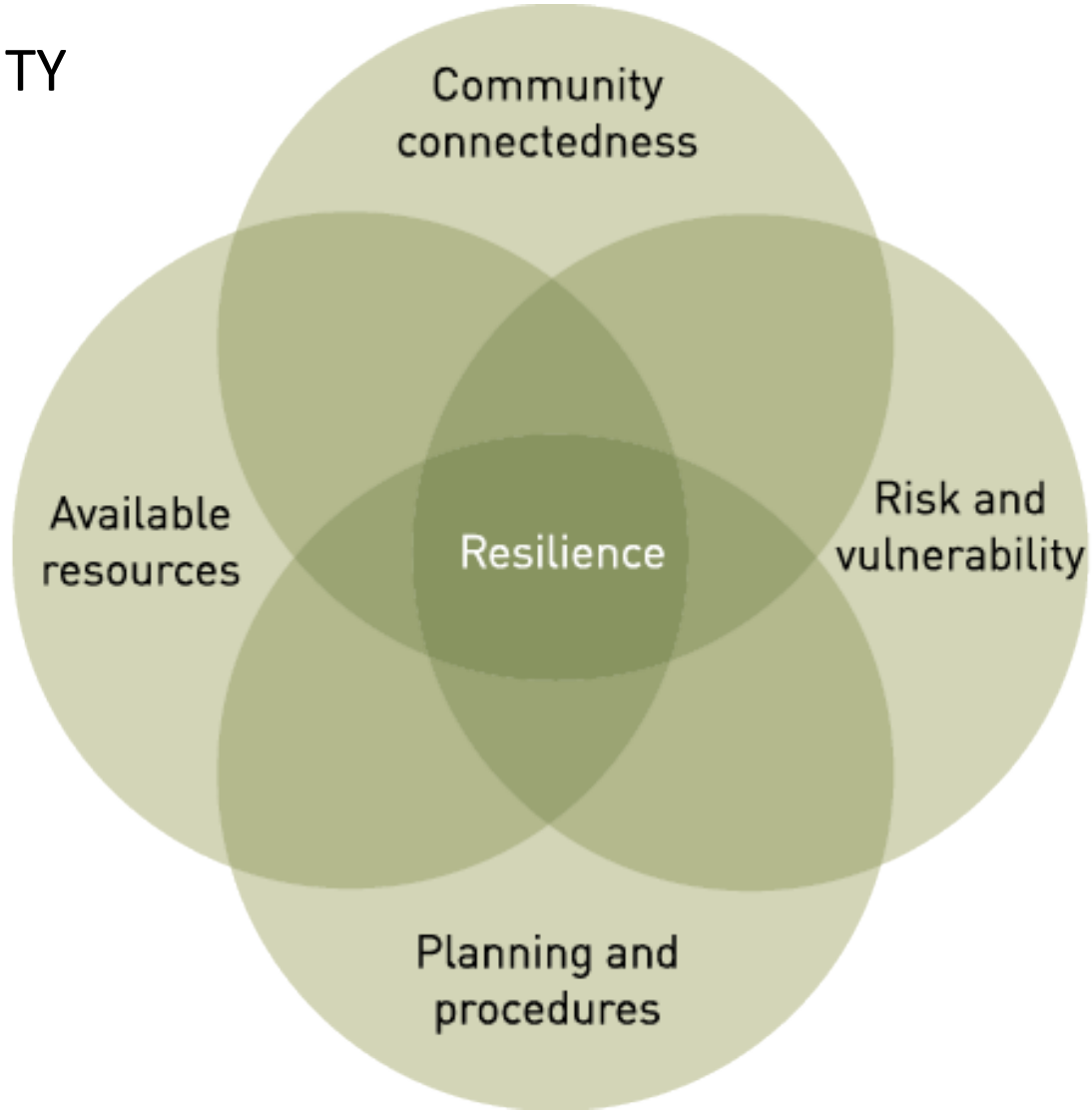


What does it mean to be resilient? (it's a tricky question)

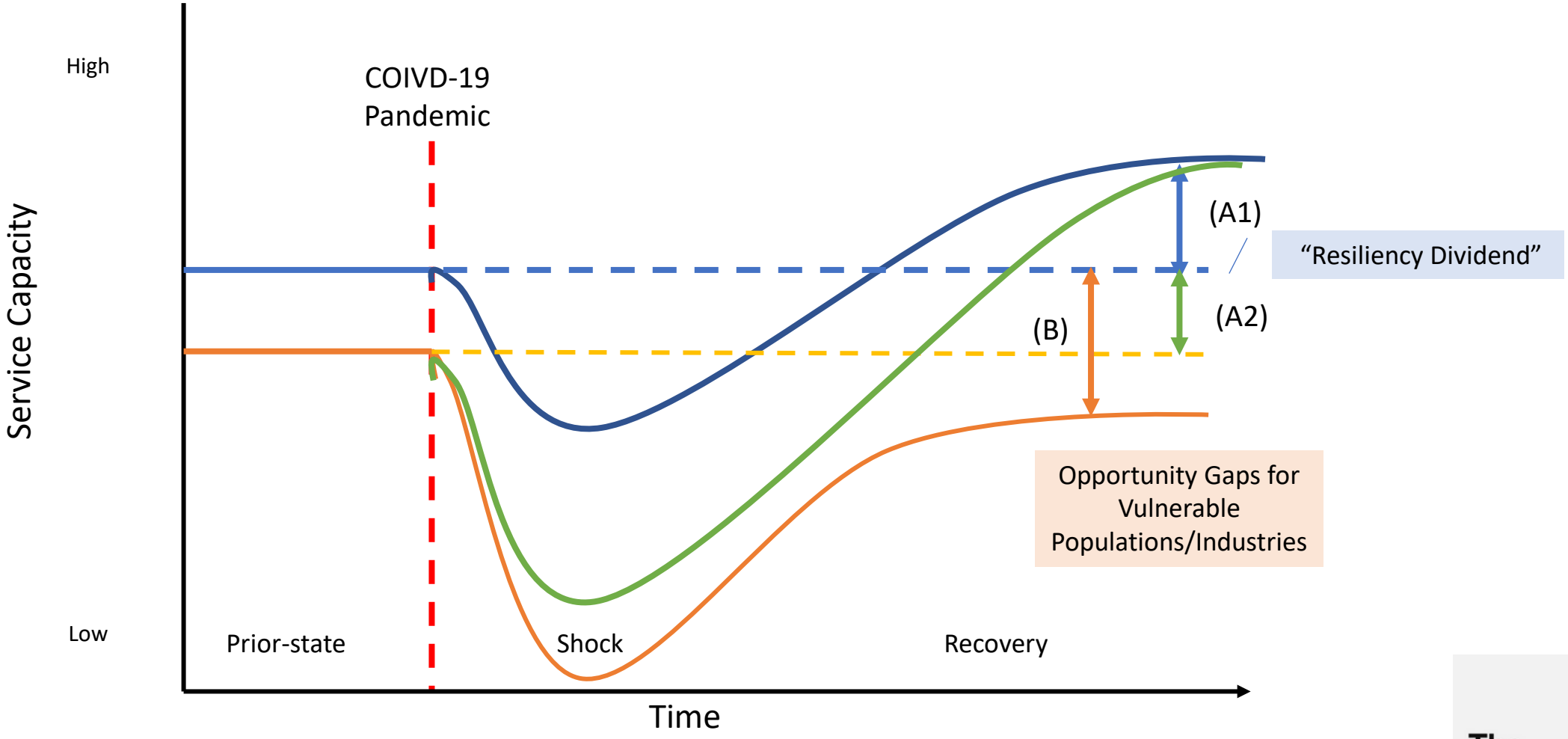
Ecological	• "… the capacity of a system to experience shocks while **retaining essentially the same function**, structure, feedbacks, and therefore identity"
Social-ecological	• "…the ability of a system to **cope** with a disturbance, **responding**, or **reorganizing** to anticipated or past events…"
Disaster	• "… the measure of a system's, or part of a system's, capacity to **absorb** and **recover** from the occurrence of a hazardous event"
Urban	• "… the ability of a city or urban system to **withstand** a wide array of shocks and stresses, and return to normal…"
Community	• "… the existence, development and engagement of community resources by community members to thrive in an environment characterized by change, **uncertainty**, unpredictability and **surprise**"

Davidson, J., C. Jacobson, A. Lyth, A. Dedekorkut-Howes, C. Baldwin, J. Ellison, N. Holbrook, M. Howes, S. Serrao-Neumann, L. Singh-Peterson, and T. Smith. 2016. Interrogating resilience: toward a typology to improve its operationalization. *Ecology and Society* 21 (2):27.

ELEMENTS OF RESILENCY CAPACITY BUILDING



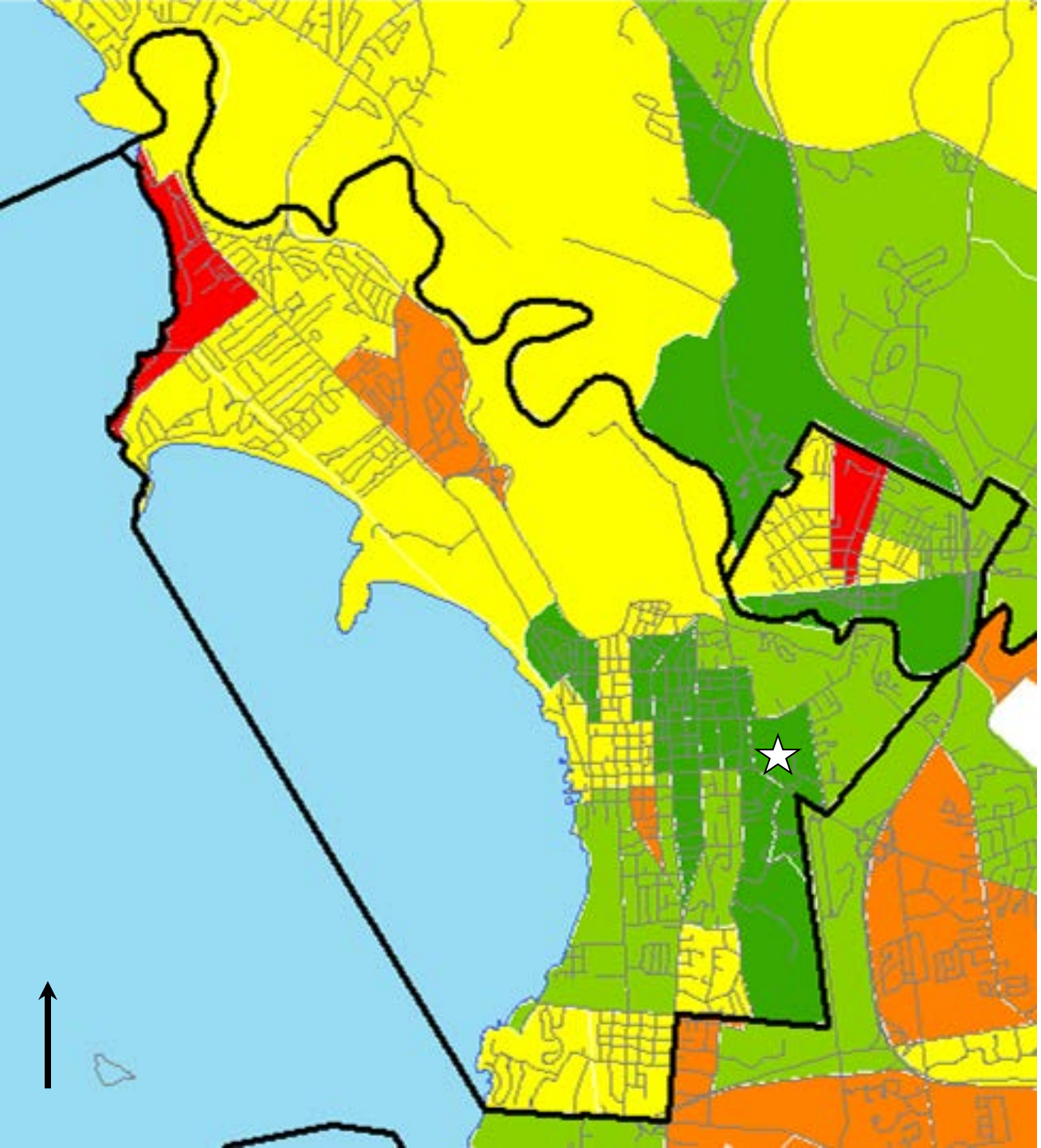
THE COMMUNITY RESILIENCY RECOVERY CURVE(S)



The K-Shaped Recovery

Social Vulnerability

- Part of understanding resilience/absorptive capacity of a community
  - Geospatial analysis of census data
- Helps to target resources to areas of greatest impact
- Social vulnerability indicators
  - Social Sensibility Score
    - Sensitive populations
    - Precarious situation
    - Limited Resources

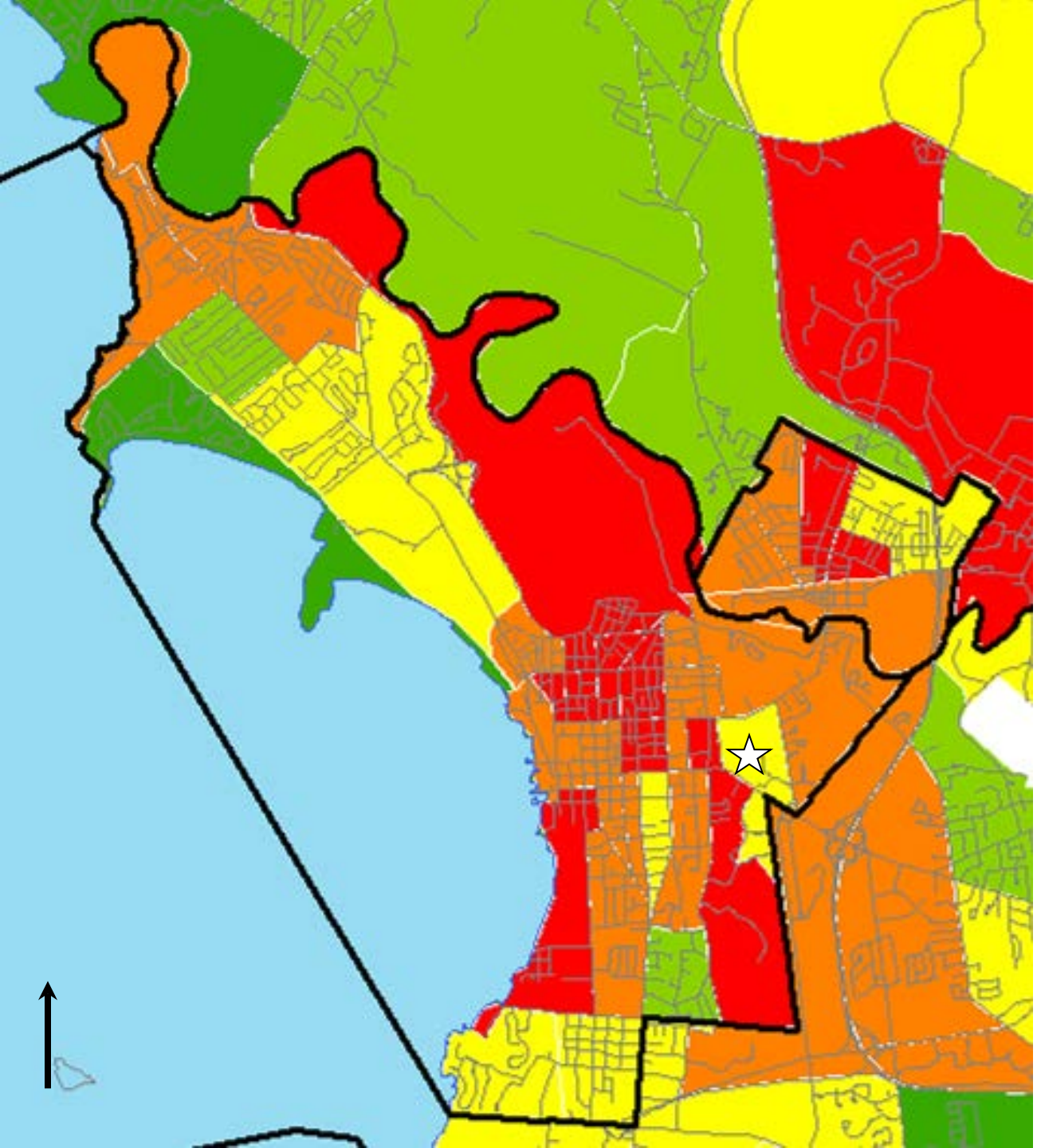


City of Burlington, VT

- Sensitive populations
  - Vulnerable age groups
  - Percentage of households that have children
  - Individuals inactive in labor market
  - Individuals living alone

- Useful for flood hazards
  - <u>In the response phase</u>

SOURCE: Thayer, 2020

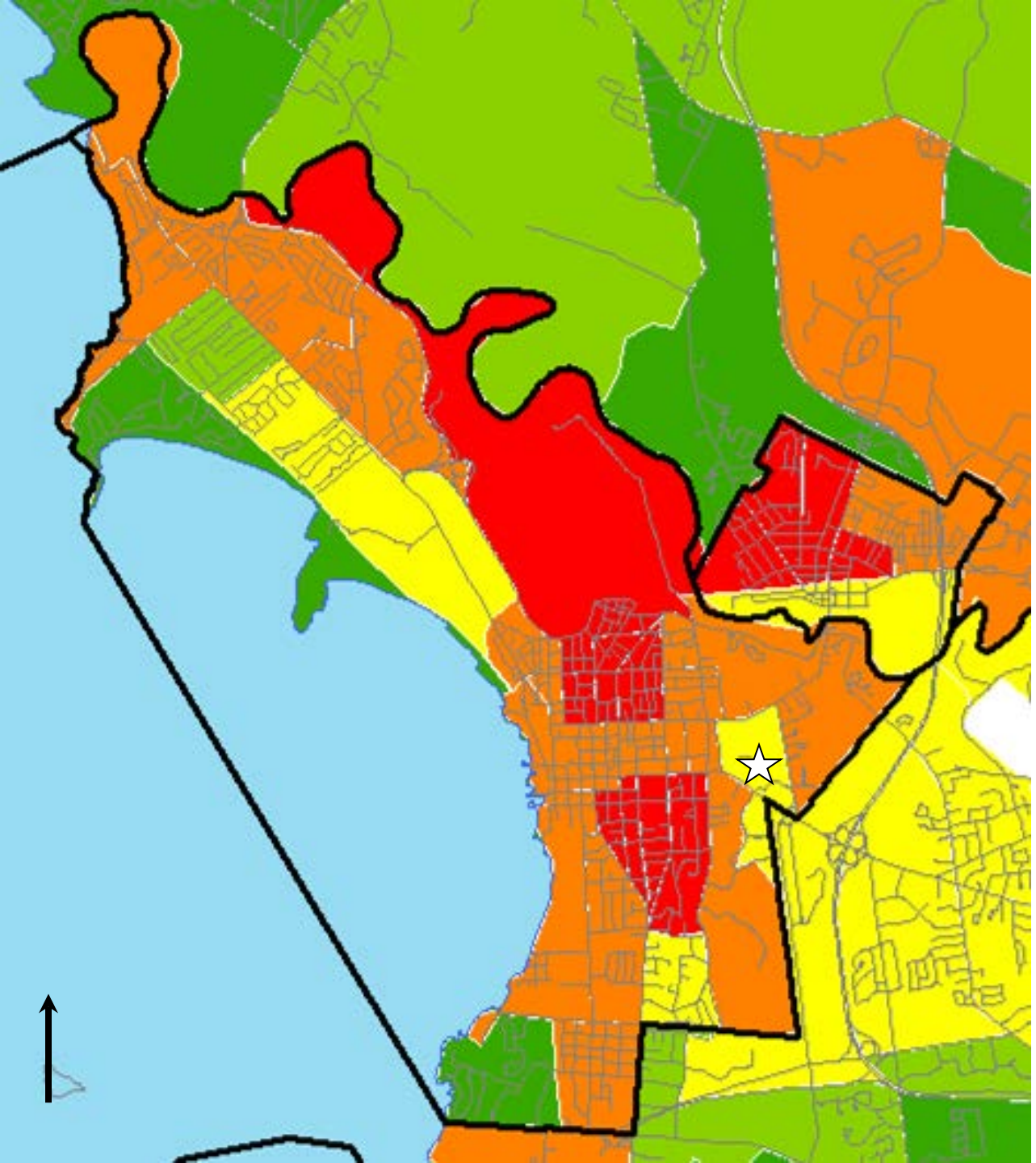


City of Burlington, VT

- Precarious situations
  - Single parent families
  - Rental/tenant status households
  - Households spending >30% of income on housing costs
  - Households with <$30,000 annual income
  - Unemployment rate

- Useful for flood hazards
  - <u>In the recovery phase</u>

SOURCE: Thayer, 2020



City of Burlington, VT

- Limited Resources
  - Houses built prior to 1960
  - Percentage of individuals 25+ without a high school diploma
  - Percentage of households receiving social assistance
  - Median value of housing
  - Median household income
- Useful for flood hazards
  - <u>In the mitigation phase</u>

SOURCE: Thayer, 2020

LCRR BASIN FLOOD HAZARD SOCIAL-ECOLOGICAL SYSTEM

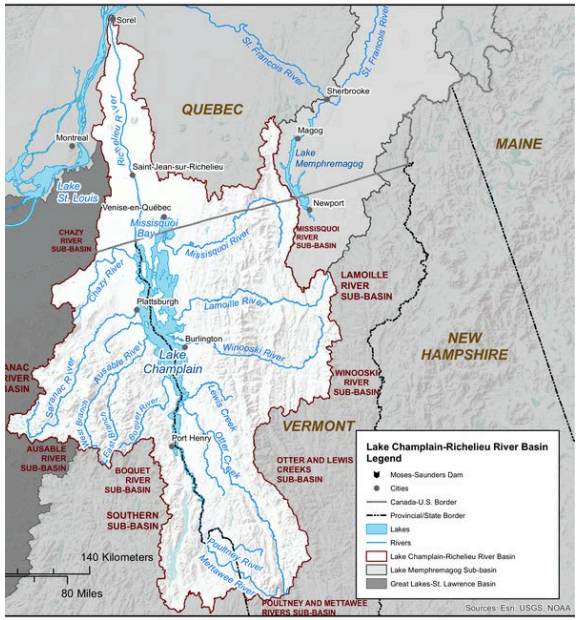
FLOOD MITIGATION

THEME 1: Structural

THEME 2: Wetland preservation

THEME 4: Policy tools (land use; insurance)

THEME 4: Flood Maps, Models and Simulations



HYDRO-ECOLOGICAL SYSTEM

THEME 3: Forecasts / Early Warning

THEME 3: Coordinated responses

FLOOD RESPONSE & RECOVERY

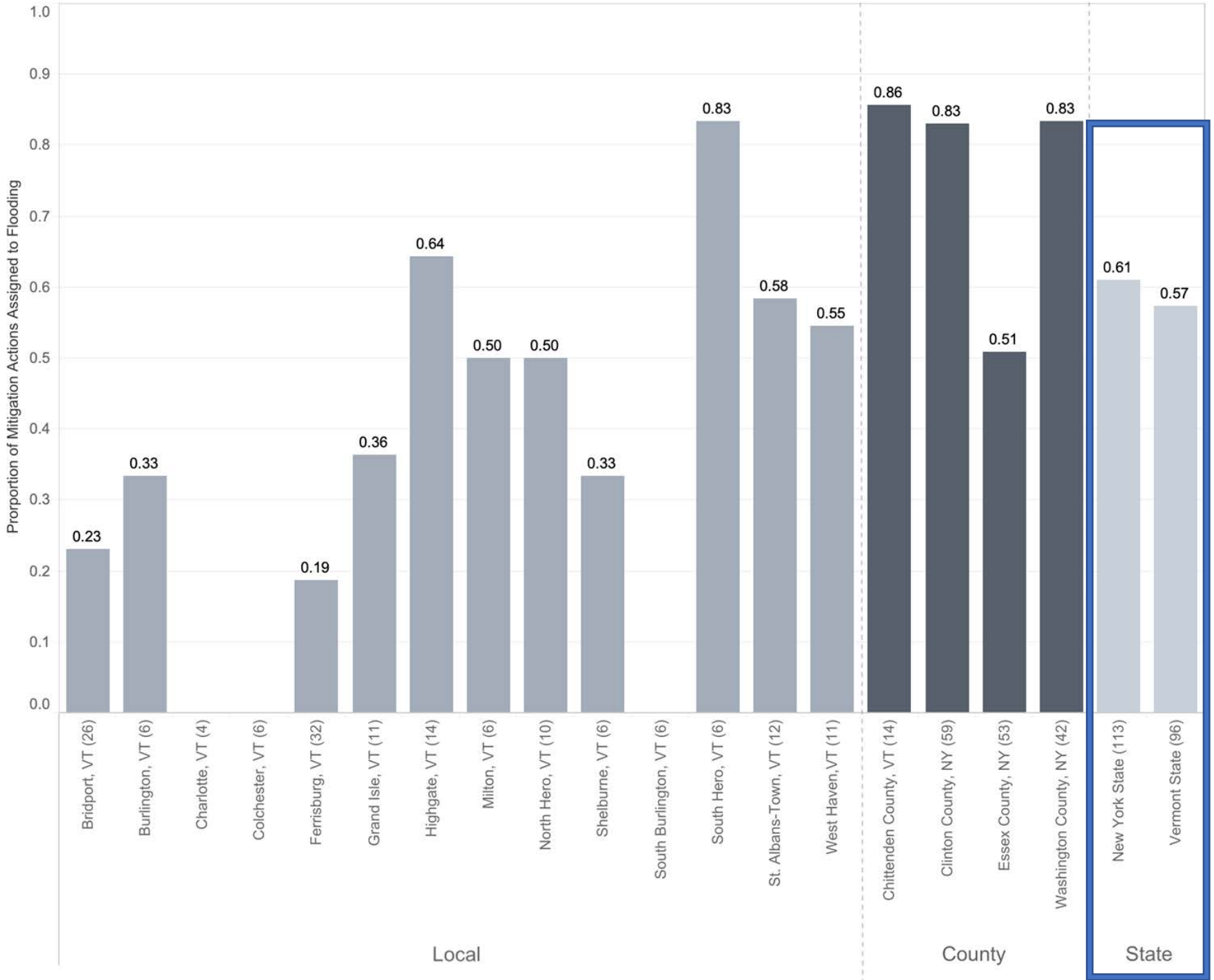
Individuals

Preferences: Decision Criteria

Institutions

Preferences: Decision Criteria

SOCIAL, POLITICAL & ECONOMIC SYSTEM



Frequency of Flood Hazard Mitigation Measures

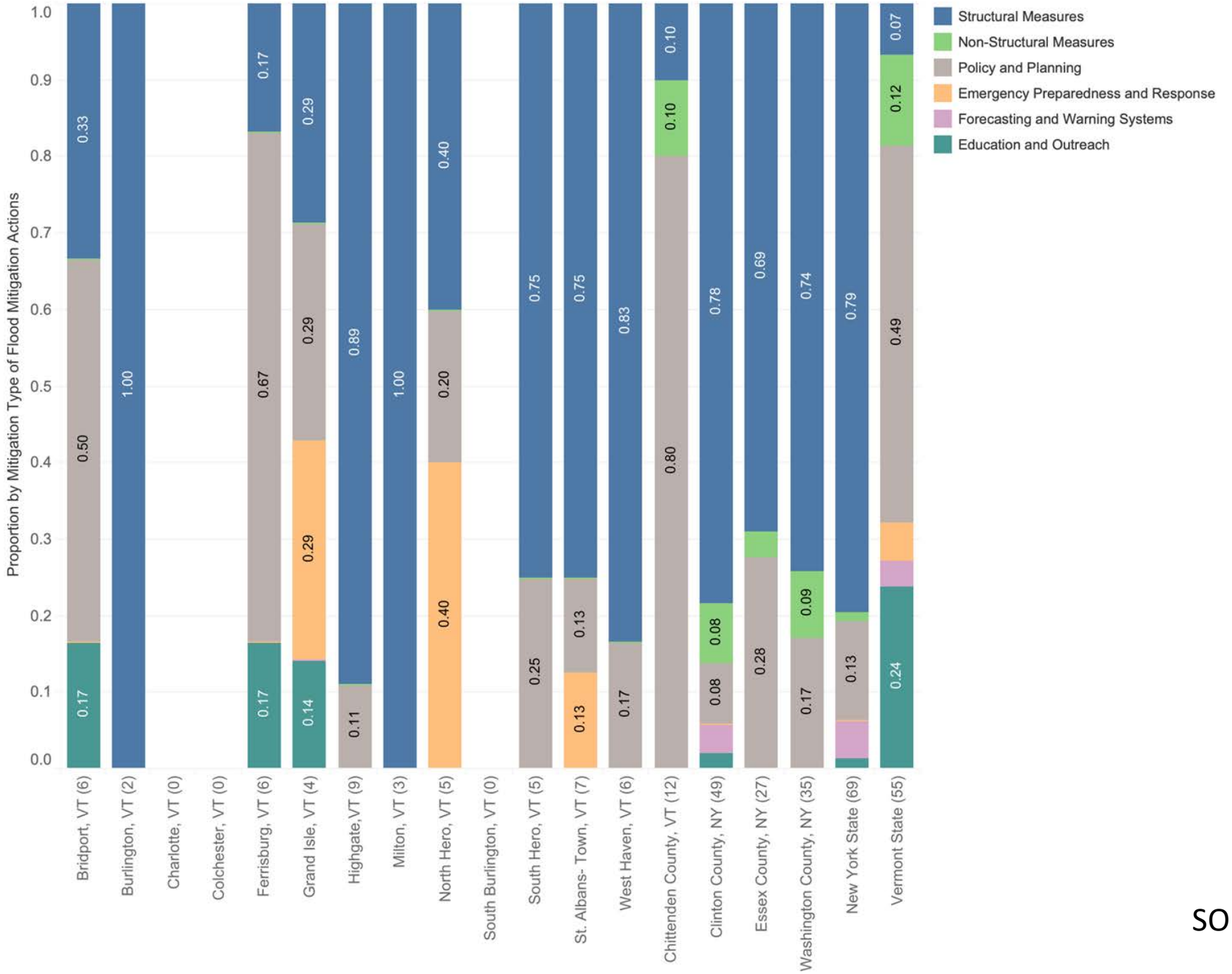
In VT and NY State Hazard Mitigation Plans

&

In Lake Champlain Adjacent VT Towns & NY Counties

SOURCE: Thayer, 2020

Type of Approach of Flood Mitigation Actions



SOURCE: Thayer, 2020

Why Resilient *Rural* Communities?

- We invest in rural America to protect and restore the environment.
- We invest in rural America to produce high-quality, de-commodified food and fiber.
- We invest in rural America as a laboratory of social innovation.
- We invest in rural America to produce healthy, well-educated future citizens.
- We invest in rural America to maintain population distribution and prevent urban overcrowding. (Stauber, 2001, P.60)

ECONOMIC RESILIENCY ROUNDTABLES

Sentiments of professionals working in organizations and sectors with a mission of enhancing economic and entrepreneurship development, workforce development, the interests of BIPOC Vermonters, public and private finance, arts & culture, government, social services, planning, arts and culture, or education and research.

Participants were recruited to a 90-minute meetings. N= 75 participants

Goals and Questions of Roundtables

1. Defining Success

Observation:

There is a "Vermont way" of defining successful community economic development.

Research Questions:

- What is the relationship between economic impact and other indicators of community health and well-being?
- What performance metrics should guide strategic investments?

1.2 Helping Vermont's rural economy compete in a post-pandemic world

Observation:

Vermont is one of the most rural states with regions that are struggling to build a thriving economy after the pandemic.

Research Questions:

- What are the highest priority post-pandemic economic and community development initiatives?
- How can rural Vermont innovate economic development efforts to accelerate recovery?
- How has the pandemic highlighted emerging needs and opportunities?

ROUNDTABLE RESULTS: Key Challenges

- *Lack of Adequate Workforce Leads to High Levels of Job Vacancies*
- *Lack of Social Equity, Cultural Diversity, and Inclusivity Stifles Economic Development and Innovation*
- *Low Levels of Public and Private Investment, Levels of Risk and Patient Capital within Rural Communities Challenges Innovation*
- *Poor Broadband Access Hinders Vermonters' Abilities to Work and Learn from Home, and Limits the Capacities of Small Rural Businesses*
- *Educational Systems are Not Sufficiently Designed for Preparing Young People to Find Meaningful and Well-Paying Career Pathways*
- *Cost of Universal Early Childcare and Preschool Places Burdens on Working Parents, and Provides Inequitable Starts for Young Vermonters*
- *The Emerging "Digital Economy" is Leaving Rural Communities Behind*
- *Chronically Poor Housing and Commercial Property Availability Limits Population Growth and Creates Inequitable Access to Affordable Housing*
- *Lacking and/or Aging Infrastructure for Town Centers Serves as a Limiting Factor for Sustainable Growth*
- *Threatened Working Landscapes and Waterways Compromises One of Vermont's Greatest Virtues*
- *Vermont's Aging Rural Population*
- *Lack of Access to Healthcare and Poor Health Outcomes for Rural Communities and Low-Income Households*
- *High Transportation Costs and Inadequate Public Transportation Infrastructure Hamper Vermont's Affordability*
- *High Economic and Environmental Costs of Heating and Cooling Hamper Vermont's Affordability*
- *Gaps in Coordination and Governance Built to Address Prior Conditions Are Not Well Suited to Address Existing Conditions*

ROUNDTABLE RESULTS: Key Opportunities

- Invest in a Skilled Workforce
- Focus on Racial Equity, and Building Inclusion and Belonging Communities
- Build Investments for Entrepreneurial Enterprises
- **Promote and Sustain a Remote Workforce While Maintaining Thriving Town Centers**
- Leverage Vermont's Quality of Life as a Critical Feature in Jobs Attraction
- Appreciate the Role of the Nonprofit Sector as a Critical Feature of the Vermont Economy
- Invest in Childcare, Preschool, and Education
- **Invest in Broadband, Housing, Transportation, Water, and Energy Infrastructure**
- **Pursue a Collective Impact Approach to Economic and Workforce Development Rooted in Social Equity**

Infrastructure visualizations/dashboards

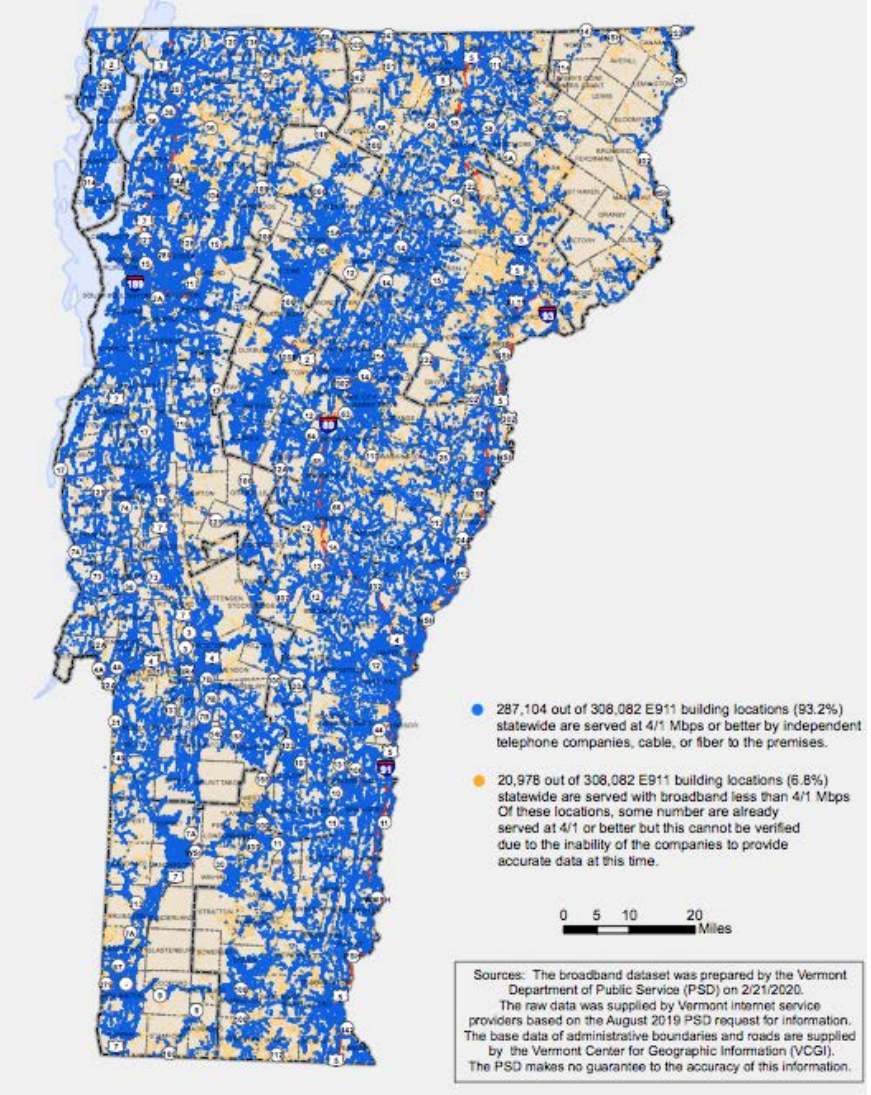
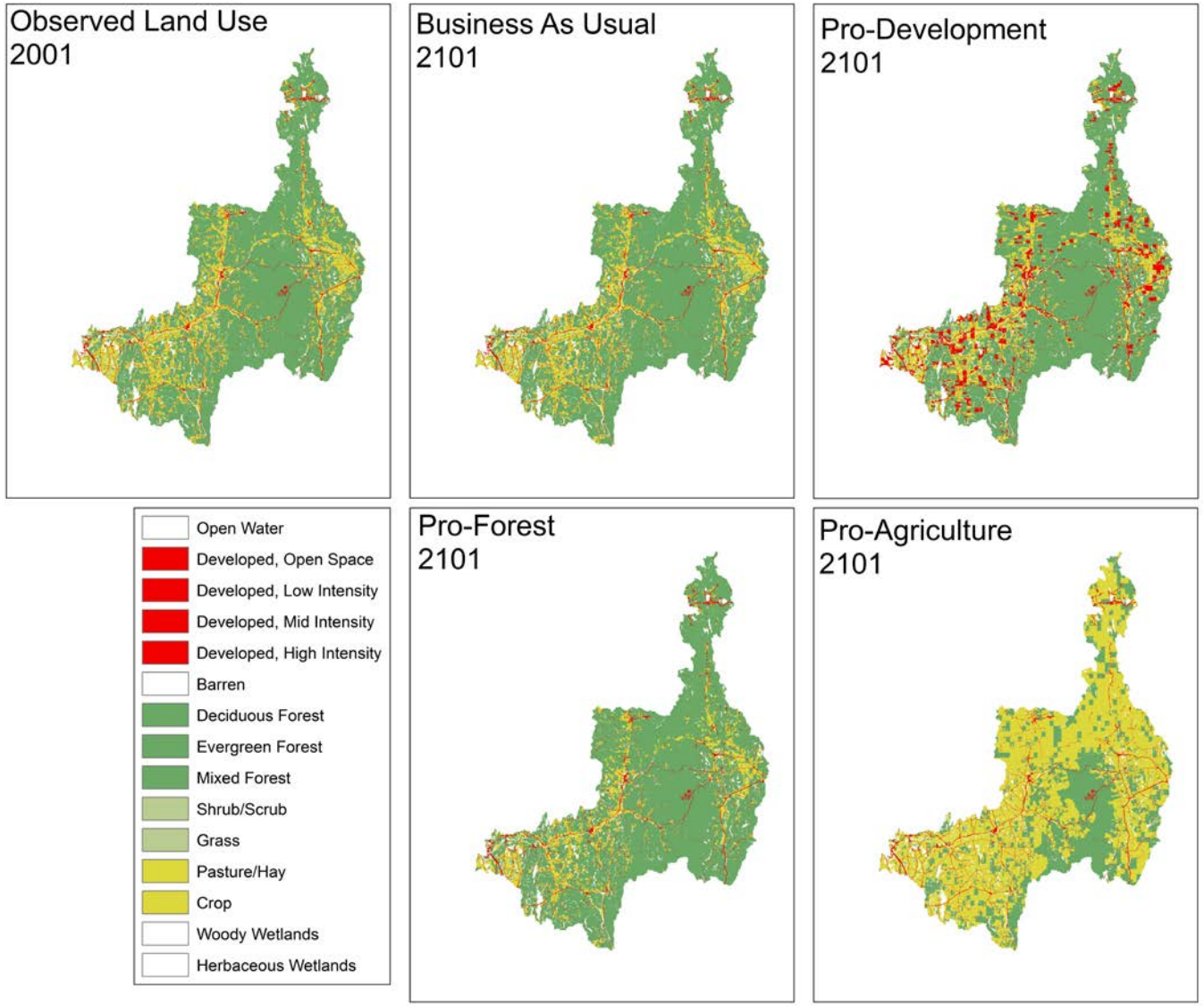


Figure 5. Broadband Availability by E911 Building. Retrieved from Vermont Department of Public Service.

Integrated Assessment Modeling: Projecting Land Use



(Source: Tsai et al., 2015)

Nebraska regions also are compared with peers on five indexes of economic conditions:

Demographic Growth & Renewal Index

Measures long-run population growth, dependency ratio, median age, millennial and Gen Z balance change and population diversity. See Table 4 on page 9 and Appendix 4 online.

Education & Skill Index

Measures high school, community college and 4-year college attainment, labor force participation and employment in knowledge-based occupations. See Table 5 on page 10 and Appendix 5 online.

Infrastructure & Cost of Doing Business Index

Measures access to broadband, interstate highways and 4-year colleges as well as wage rates, marginal income tax rates and the presence of opportunity zones. See Table 6 on page 10 and Appendix 6 online.

Quality of Life Index

Measures the appeal of living and working in a region including commute times, age of housing stock, relative wage rates, public safety, climate amenities, access to healthcare and national parks. See Table 7 on page 11 and Appendix 7 online.

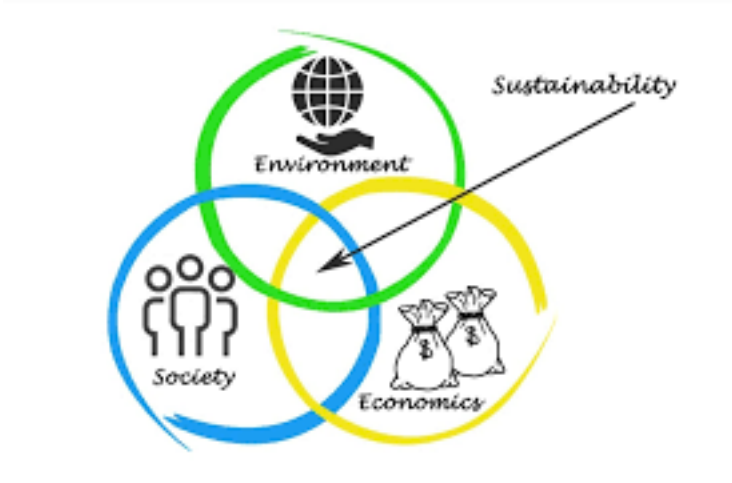
Social Capital Index

Measures involvement with volunteer organizations, programs to build the community environment, and voter participation. See Table 8 on page 11 and Appendix 8 online.

Table I Multifunctionality and global indicators (selection) of well- and poorly developed economic, social and environmental capital

		Strongly developed capital	*Weakly developed capital*
Multifunctionality of rural communities	Economic capital	• Economic well-being • Diversified income streams (e.g. pluriactivity) • Low dependency on external funds (e.g. agricultural subsidies) • Multifunctional businesses • Integration into global capitalist system (?) • Happiness (?) • etc.	• Poverty/debt • Over-dependency on agricultural production • Poor infrastructure • High dependency on external funding (e.g. subsidies; remittances from abroad) (?) • Communities as net importers of food • etc.
	Social capital	• Close interaction between rural people (tight-knit communities) • Availability of skills training and education • Good health and sanitation • Multifunctional services • Good communication between stakeholder groups • Female empowerment/empower ment of ethnic minorities in rural areas (?) • Open-minded communities (ability to accept change) • Good and transparent land owner ship regulations (control over means of production) • Rural stakeholders in control of development trajectories • Strong governance structures at multiple geographical scales (democratic participation) • etc.	• Outmigration of young people (greying of rural communities) • Service deserts • Lack of leadership • Lack of control over destiny of rural community • High death rates and low life expectancy • Poor communication between stake holder groups • Female dependency/gender- or ethnically-based lack of self-determination • Weak land ownership patterns (e.g. high levels of tenant/ dependent farmers) • General dissatisfaction with rural community pathways • Weak governance • etc.
	Environmental capital	• High levels of biodiversity • Good water quality and availability • Sustainable soil management • Predictable agricultural yields • Sustainable management of envi ronmental resources in rural community • Multifunctional environmental resources • etc.	• Soil degradation • Desertification • Salinization • Poor water quality and availability • Uncertainty over agricultural yields • etc.

Source: author; after Pretty (1995); Parnwell (2007); Van Huylenbroek *et al.* (2007); Noe *et al.* (2008); Chaskin (2008); Cutter *et al.* (2008); Rigg *et al.* (2008).



(Wilson, 2012)

Considerations:

Is there an interest/desire to develop a Vermont resiliency matrix?