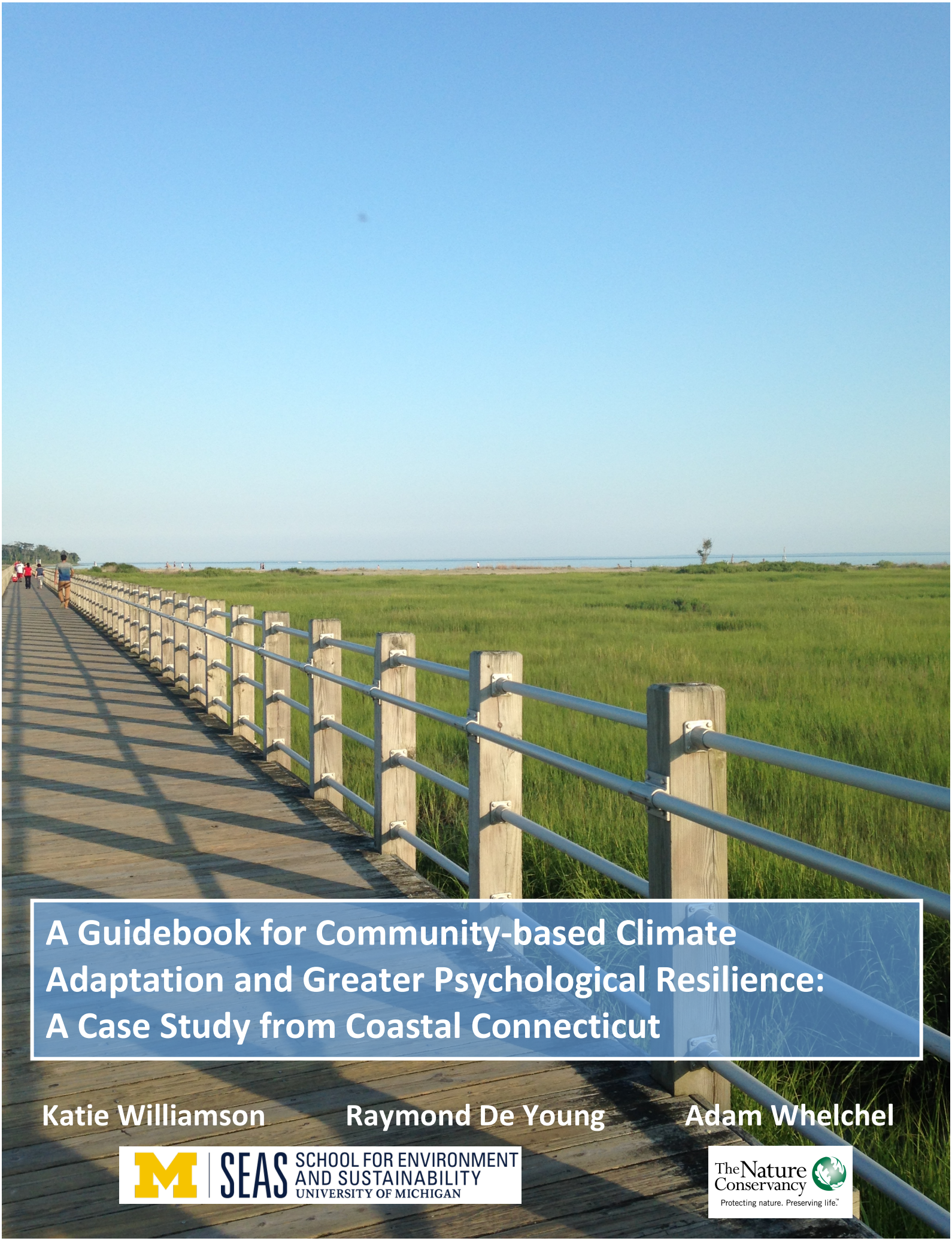

A Guidebook for Community-based Climate Adaptation and Greater Psychological Resilience: A Case Study from Coastal Connecticut

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Table of Contents

INTRODUCTION

Climate change presents immense risks to all communities, with each one facing unique challenges, vulnerabilities, and opportunities. Coastal communities around the globe — including the Northeast of the United States — are vulnerable to threats such as more frequent and intense storms as well as sea level rise. The outcomes of Tropical Storm Irene in 2011 and Hurricane Sandy in 2012 have been forcing Northeast communities to think critically about whether they are prepared for ongoing and future impacts of climate change and natural hazards as well as the local resources needed to support community resilience. This is a common tale from countless other communities worldwide that have experienced similar impacts. Common responses tend to invest in infrastructural solutions, but how can we also help people continually feel cognitively and emotionally prepared for future unknowns? This guidebook hopes to start a dialogue with some answers and strategies to address the psychological and social dimensions of climate adaptation. Our goal is for communities to have a broader suite of tools to prepare in advance of an event as well as cope with, and adapt effectively to, ensuing change.

This guidebook is the result of a collaborative research study conducted by the University of Michigan in partnership with The Nature Conservancy. Coastal Connecticut was selected as the target area due to the presence of a long-term community resilience-building program, high exposure to climate hazards, and applicability of findings to other communities. In the summer of 2017, participants from a number of cities and towns across coastal Connecticut shared their visions of community-based climate adaptation through a mental-mapping exercise. Individual participants further shared the priorities, challenges, learning opportunities, and skills that they would need to leverage during a transition to a more self-reliant community. They also shared how they felt emotionally about impending change and their ability to resond. The results of our research revealed a number of key insights about shared community features, assets, and needs, which helped to inform alternative strategies for climate adaptation moving forward.

The sections in the guidebook include the following:

- ***Guiding Framework***: This section provides the foundation of key concepts for environmental psychology and community-based climate adaptation that puts the results and methods in context and highlights supportive research from these fields.
- ***Results***: This section provides an overview of the findings from the research study, specifically the results of the individual mental maps and interviews.
- ***Tools & Strategies***: This section uses the results to develop actionable strategies for communities to use to plan for psychological resilience to natural hazards and environmental change.

- ***Appendix – Mental Mapping Methods Guide***: This section serves as a reference for anyone interested in using this methodology in their community and learning more about how it generated the results of the study.

We hope that what follows is a useful resource for community leaders and practitioners to take steps towards increasing the resilience and adaptive capacity of their communities through the use of an underused lens – psychology. Some of the guiding principles, results, and suggested strategies may be surprising at first; they focus on helping individuals build competencies in addition to creating supportive cognitive and social environments around them. We encourage readers to explore new ways of thinking about what can bring out the best in people in their community during a period of uncertainty, as this is what will allow people to thrive even in the face of future challenges.

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PART I: GUIDING FRAMEWORK

The Big Picture: Climate Change, Adaptive Capacity, and the Role of Psychology

Climate change presents an immense current and ongoing challenge to human health and well-being. Regardless of the numerous possible impacts, it is inevitable and necessary that communities strategize for adaptation.[1] Indeed, the International Panel on Climate Change (IPCC) defines the process of adaptation as the ways we plan, learn, and act to reduce vulnerability to current and future changes and impacts. The IPCC further describes adaptive capacity as the degree to which a community can respond to these impacts. While there will certainly be physical, social, political, and economic changes in communities from climate and resource threats, it is important that we also recognize the significant psychological impacts that will ensue over the immediate and long term.[2-5] The Center for Disease Control, National Wildlife Federation, Union of Concerned Scientists, Environmental Protection Agency, and the U.S. Global Change Research Program comprise just some of the stakeholders and practitioners who have identified and studied the psychological impacts of climate change.[6-10]

Moreover, evidence suggests that individuals may not be adequately prepared to respond to the uncertainty and severity of the many impacts of climate change over the long term. Instead, they may choose to ignore or reject beneficial lifestyle and behavioral changes without adequate psychological support.[11, 12] For example, mental health practitioners in the wake of Hurricane Katrina observed that a proactive approach to coping and preparation was helpful for individuals in managing their emotional and cognitive responses after the event.[13] A similar strategy would be important for a long-term series of changes brought about by climate change. The role of experts in this process may typically be seen as driving behavior or lifestyle changes in communities. Instead, our work advocates for experts to serve in more of a supporting role to create opportunities and environments for individuals to grow, thrive, and direct their own way forward.[14]

The present challenge then is for practitioners and community members alike to facilitate opportunities and situations in which people pursue the knowledge, skills, and behaviors that will help them and their communities to thrive even in an uncertain and unfamiliar world. Some common strategies in adaptation planning work have involved increasing or improving hard systems and barriers, ecosystem restoration, and emergency or early warning services.[15] While these are vital, fewer approaches emphasize the importance of individual and psychological capacity building.[16-18]

The following study serves to demonstrate the importance of considering an individual's ability to cope with unknown or dramatic change in their environment and how researchers and

practitioners can apply more psychological and behavioral lenses to climate adaptation at the community level. We applied theories from environmental and positive psychology, community-based climate adaptation, and behavioral science in order to explore individual insights about community-based visions of adaptation or self-reliance. In other words, what else might we need to consider in planning for adaptation that exists at the level of individuals? Our hypothesis was that capacity building for climate adaptation involves more than what we build around us but also requires what we build within us and between us as people.

The Community Context

Localization is a process of transitioning towards supportive behaviors, economies, social systems, industries, and natural resource stewardship and conservation at the scale of a community. It does not mandate or encourage isolation from a broader state, nation, or globe, but instead focuses individual attention on strengthening communities and living within natural resource limits.[19] Localization is similar to the process of community-based adaptation, where communities are managing the impacts of climate change based on their unique needs, knowledge, and capabilities.[1] Moreover, communities have demonstrated time and time again their capacity for immense change and innovation; they are in many ways the heart of climate adaptation and resilience, rather than state and national actors.[20] Therefore, through localization communities strive to achieve a state of self-reliance, where they are able to fully provide for the diverse needs of their citizens within their local or regional boundaries.[19] Such a goal leverages intentional resource stewardship, local expertise, inclusive and equitable social systems, as well as opportunities for learning, empowerment, and creativity.

In the process of community-based adaptation or localization, it is important to remember that no change happens in a vacuum. Instead, the social, economic, political, and cultural context in which a community is situated has a large effect on that community's capacity to adapt and the distribution of resulting impacts. Moreover, within a community, there are dimensions of inequality and inequity that influence individual adaptive capacities and behavioral trends.[21] We are interested in how community visions can lead to transformational forms of adaptation, which confront the power and political barriers that affect communities to create new, better systems instead of just improving current ones.[22, 23] It is further an imperative to recognize the many value systems that are implicated in climate adaptation and be sensitive and open to a diverse set of community responses.[24] In any case, participation, agency, and leadership from a wide representation of community members will be necessary, so that the resulting community can support a range of interests, needs, and goals.

The Cognitive and Behavioral Context

With this in mind, a core tenant of environmental psychology is exploring the ways individuals are similar, whether through their environmental sensitivity, shared values and responses, or the need for cognitively supportive environments.[14] Mental models, otherwise known as cognitive maps, are the unique neurological structures that shape and store each individual's knowledge of the world. Humans are innately inclined to find clarity in our surroundings and learn from them, so we seek environments that allow us to simultaneously improve our understanding and create opportunities for exploration and growth.[25, 26] Mental models become especially salient in the context of community-based adaptation, where the ability to observe and respond to changes in the environment requires a strong cognitive map of one's surroundings. Moreover, mental maps can reveal the ways that people conceptualize climate change and how they envision their behavioral responses to it. The process of envisioning encourages individuals to dream of a desired world and ideally set goals to achieve it. They expand their mental maps in ways that aid with coping and pursuing behaviors that are meaningful and promote well-being.[27, 28]

Cognitive maps further enable pre-familiarization, the process of preparing for something by becoming familiar with it before it occurs.[29-31] An everyday example of this concept is carrying out a fire drill; we execute routine drills in our buildings, so that individuals build familiarity of the steps they will need to take and therefore be more prepared and comfortable in an emergency. When thinking about climate adaptation, pre-familiarization is a helpful way to frame preparing individuals for alternative behaviors, lifestyles, and systems that may result due to the impacts of climate change and natural resource limitations. Behavior change can be traced to a preference for the familiar; therefore, pre-familiarization is an intervention to cope with anticipated change, as building familiarity also increases comfort with uncertainty.[26, 30, 31] An amazing feature of the human brain is the ability to develop a sense of knowing something even without direct experience — leveraging this ability will be invaluable in helping communities transition to an unknown future.[32, 33]

Some common strategies for effecting behavior change employ education and information, incentives, norms, and affect.[34] Alternatively, intrinsic values are some of the most motivating factors in determining our behavior, while also rooted in our identity and well-being.[2, 35, 36] Indeed the feeling of being internally rewarded for completing certain behaviors is more durable and reliable than external factors and universal across humans.[34] Intrinsic motivation can be elicited through participation, building competence, and frugality.[31] Participating in personal and community goal setting and action are important parts of mental health and relationship building.[37-39] The feeling of doing something meaningful that aligns with personal values further reinforces certain behaviors.[40] People also want to feel needed by their communities, especially in ways that promote self-efficacy and competence through growing individual skills and strengths.[38]

Frugality can be found through different actions when an individual seeks to be resourceful or practice conservation. Climate adaptation may elicit a sense of creativity, purpose, and action that contributes positively to one's own and others' lives.

Along with our values and meaningful contributions, positive emotions also influence behavior. Emotions such as happiness, hope, love, contentment, and interest allow an individual to expand the ways they approach and act on a problem. They also build physical, intellectual, and social resources, so they can address these problems effectively.[41-43] Additionally, positive emotions help individuals to respond in a resilient way to difficult situations and negative experiences.[44] Therefore, when considering how to encourage people to address climate change, it is important to create opportunities for individuals to experience positive emotions to enable feelings of competence and skill-building towards desired behaviors.

In Summary

- There are psychological impacts of climate change and implications for adaptive capacity;
- Local communities are major sources of inspiration and innovation, and working towards a state of self-reliance could help them adapt to long-term change;
- Climate change adaptation and resilience must occur with social, political, economic, and cultural factors in mind;
- Humans are constantly building mental models of the world around them, which we can leverage by helping people build maps of various scenarios to aid in the coping process;
- Intrinsic motivation, competence, and participation are all important factors in behavior change and overall well being, which will be useful during climate adaptation; and
- Positive emotions help to foster behavior change and skill building, so leaders and practitioners should explore ways to design joyful, engaging, and hopeful solutions to the challenges ahead.

PART II: RESULTS

For our research study, we had several guiding questions:

1) What are the common features of a thriving community undergoing a transition to community-based climate adaptation and resilience, based on individual mental models?
2) What are the priorities, challenges, learning opportunities, skills, and emotions that planners and community leaders will want to consider and address during a period of change?
3) How do participants value psychological and social dimensions of climate adaptation in comparison to natural and physical ones?

Place and Participants

Connecticut is a small state in the Northeast United States with its southern border situated on Long Island Sound in the Atlantic Ocean. Tropical Storm Irene in 2011 and Hurricane Sandy in 2012 both had devastating effects on the coast and caused many city governments to plan seriously for future climate-related hazards, especially due to prominent coastal development.[45] Financial resources vary by place to place, as towns and cities along the coast range in median household income. Three of Connecticut's largest cities also lie on the coastline: Stamford, Bridgeport, and New Haven.[46] Under the Connecticut Home Rule Act, each municipality has control over its actions apart from one another and the state. This carries implications for resource acquisition, distribution, and duplication between cities and towns as well as regional efforts.[47]

There were 66 people who participated in and completed research sessions for this study. We emailed community leaders and individuals working in city and town governments to ask for their participation in a mental mapping exercise on community resilience and self-reliance, most of whom responded and agreed. After each session, we asked individuals if there was anyone else in their community who would be interested in participating and then contacted anyone mentioned. We also tried to be mindful of the demographics of our sample for diverse representation but prioritized the distribution of locations along the coast. Again, the purpose of our research was to explore similar trends among individuals and communities rather than their differences.

The resulting sample of individuals was from 18 towns and cities spanning the entire coastline, where nearly half of them had lived in that place for more than 15 years. The gender of participants was almost equal between females and males, with slightly more female representation. The sample was predominantly White (of American or European origin), with approximately 13% of the sample being comprised of individuals who identified as Black, Hispanic, Native American, and/or Middle Eastern or North African. Annual household income among participants was high, with 46% of individuals claiming more than $150,000 annually, 32%

between $75,000 and $149,000, 17% between $50,000 and $74,000, and the remainder with less than $50,000. The age of individuals in the sample ranged from 25 to over 75 years and was evenly distributed, with the largest group being 34-44 years. The sample was also highly educated, with 72% having a graduate or professional degree and 90% having at least a 4-year degree.

The Mental Mapping Exercise

To collect data towards these questions, we had individuals complete a mental mapping exercise called Conceptual, Content, Cognitive Mapping (3CM; See Appendix for more details). Individuals made their maps based on the following prompt:

> *Imagine a scenario where natural resources and energy are limited, and your community is transitioning to be much more self-reliant for the long-term. This means there will likely be reduced imports and exports to and from your community, little to no federal support, and a need to depend on the natural and human resources in your area. Think about your personal and community strengths and vulnerabilities as you plan for helping yourself and community adapt to this new way of life. It could be an opportunity to do things differently and explore meaningful projects that didn't seem as urgent or important before. In such a scenario, what features would be necessary for you and your community to thrive? What kinds of goals would you want to set? What skills/knowledge would you prioritize? What issues would be important?*

After individuals read through this prompt, they began the 3CM exercise. Once they were finished, we interviewed them and recorded their responses to a series of follow up questions. These questions allowed us to learn more about the content and structure of each map, given the prompt and scenario provided. These questions asked them to identify areas of priority in their map; personal challenges they would face; personal learning opportunities; skills they possessed; and emotions they felt when considering their map as a whole and the community self-reliance scenario in the prompt. Finally, we asked individuals to complete a brief demographic survey, so we could analyze broader trends among individuals.

Common Features

To understand common features of communities transitioning to a state of self-reliance, we analyzed the most used items in individual mental maps of 66 individuals. Individuals selected on average 51 items and grouped them into an average of 7 categories. Examples of three different kinds of mental maps are shown in Figures 1, 2, and 3.

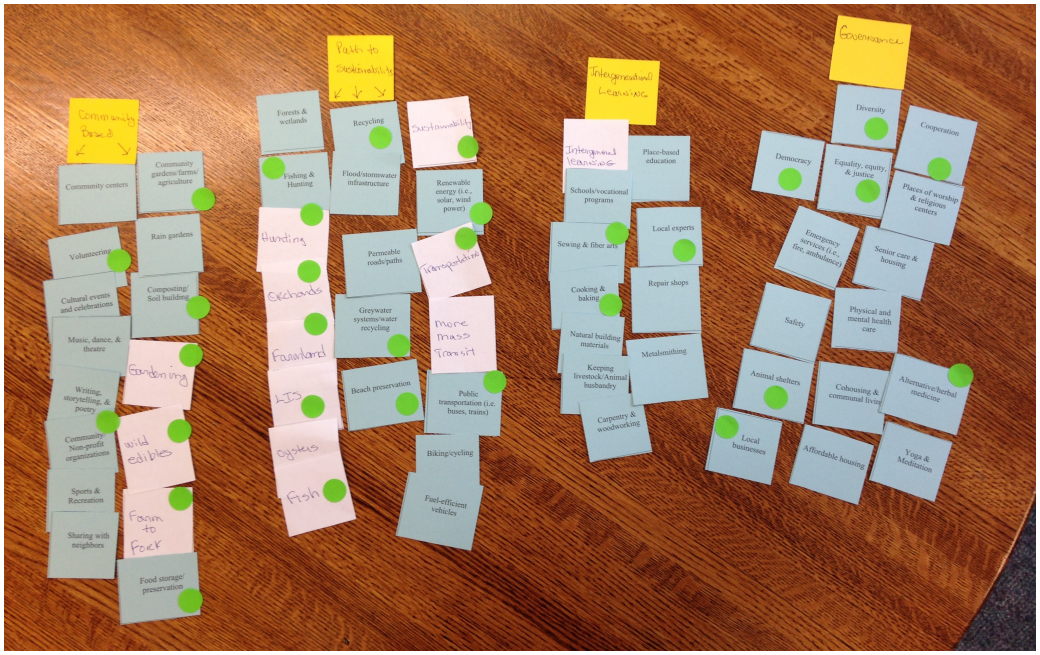

Figure 1. Mental map of a participant using 61 cards and 4 categories.

Figure 2. Mental map of a participant using 52 cards and 7 categories.

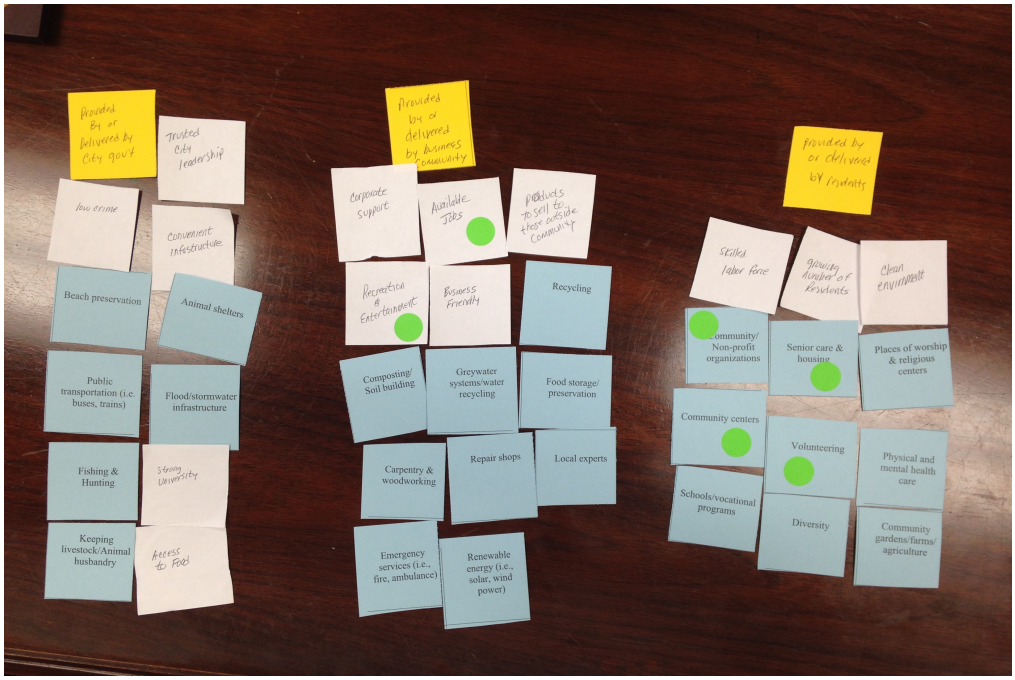

Figure 3. Mental map of a participant using 37 cards and 3 categories.

Out of the 88 total items that appeared in individuals' mental maps, there were 22 items that were the most highly endorsed, as listed in Table 1.

Table 1. The top quartile of items used in individual mental maps based on percent endorsement (n=66). The * indicates the 3 most endorsed items.

Food and water	**%**	**Community building**	**%**
Community agriculture and food production	98*	Volunteering	89
Water availability and quality	88	Cooperation	88
Food storage and preservation	83	Sharing with neighbors and resource knowledge	86
		Local experts	85
Health and safety		Community centers	83
Flood and stormwater infrastructure	85	Community organizations	85
Emergency services and operations	89		
Physical and mental health care	89	**Education**	
Senior care	85	Schools, vocational programs, and education	97*
Safety and security	83		
		Business and economy	
Governance		Local businesses and economy	91
Local governance	88		
Leadership	85	**Waste**	
Equality, equity, and justice	83	Recycling	86
Transportation and energy			
Renewable energy	91		
Public transportation	92*		

Through this set of items, we observed common themes of food and water, health and safety, governance, transportation and energy, community building, education, business and economy, and waste as being important. There was a wide range of total items that individuals could have included, such as those involving arts and culture as well as natural features, such as forests and beaches. These data suggest that certain items are likely to be important in all coastal communities, and that there are other features that may be more community-specific in the adaptation process.

Priorities, Challenges, Learning Opportunities, Skills, and Emotions

After participants completed their mental maps, we asked them several questions to elaborate on the content of their maps. These questions were the following:

1) How would you prioritize your categories or items in terms of community actions in this scenario?
2) What would be challenging to adapt to if you were living in this envisioned world?
3) What do you see as learning opportunities in this envisioned world?
4) If this envisioned world became your reality, how would you feel emotionally?
5) Can you tell us about individual skills you could contribute in this scenario?

Tables 2 and 3 display the results of the most commonly mentioned items for each question, in order of the most to least endorsed by individuals.

Table 2. Most common items for responses to interview questions about priorities, individual challenges, learning opportunities, and emotions.

Priorities	**%**
Governance	24
Food and food provisioning	15
Water	11
Housing and shelter	9
Community character	8
Economy and business	8
Leadership	8
Safety and emergency services	8
Knowledge and skill sharing	6
Natural resource protection	6
Communication	5
Community organizing	5
Diversity and social justice	5
Education	5
Health and nutrition	5
Setting goals and planning	5
Individual Learning Opportunities	
Farming and gardening	24
Energy	20
Carpentry	12
Bartering	11
Keeping livestock and animal husbandry	11
Greywater recycling	9
Natural resource conservation	6
Sewing	6
Alternative and herbal medicine	5
Composting	5
Education	5
Emergency services	5
Engineering and mechanics	5
Food systems	5
Flood infrastructure	5
Forests and wetlands	5
Housing	5
Mental health and well-being	5
New knowledge and skills	5
Public engagement	5
Rain gardens	5

Individual Challenges	**%**
Physical tasks and manual skills	14
Food provisioning	11
Governance and leadership	9
Transportation and mobility	9
Limitations (e.g. food options, travel, energy)	8
Sharing economy	8
Changing mindsets	6
Commitment from everyone	6
Missing the larger world, other places, people	6
Getting the resources and materials I need	5
Healthcare and medicine	5
Emotional responses	
Afraid	15
Excited	14
Open to engaging and doing more	9
Opportunistic	9
Worried	9
Good	8
Anxious	6
Nervous	6
Overwhelmed	6
Concerned	5
Cool	5
Frustrated	5
Fun to imagine	5
Hopeful	5
Interesting	5
Optimistic	5
Reevaluating what's important	5

Table 3. Most common responses for individual skills identified based on items in individual mental maps.

Individual Skills	**%**		**%**
Cooperation	59	Cooking and baking	21
Leadership	56	Greywater systems and water recycling	21
Volunteering	53	Public and multi-modal transportation	21
Community agriculture	48	Safety	21
Community and non-profit organizations	44	Physical and mental health care	20
Sharing with neighbors	44	Community centers	18
Local governance	41	Alternative currencies and barter systems	18
Flood and stormwater infrastructure	39	Fuel-efficient vehicles	17
Equality, equity, and justice	38	Places of worship and religious centers	17
Recycling	38	Education and training	15
Beach preservation	36	Schools and vocational programs	15
Composting and soil building	35	Sports and Recreation	15
Forests and wetlands	35	Affordable housing	14
Biking	32	Communication systems and media	14
Rain gardens	29	Fishing and Hunting	14
Renewable energy	29	Food storage and preservation	14
Local experts	29	Music, dance, and theatre	14
Water availability and quality	26	Place-based education	12
Permeable roads and paths	24	Writing, storytelling, and poetry	14
Cultural events and celebrations	23	Emergency services	12
Democracy	23	Keeping livestock and animal husbandry	12
Diversity	23	Yoga & meditation	12
Local businesses	21		

In general, individuals described having fewer existing manual skills than organizational skills. They also prioritized “basic needs,” such as food, water, and shelter, as well as governance. When asked about learning opportunities, individuals described only manual skills such as energy systems, agriculture, and carpentry. For challenges, individuals expressed both manual and organizational skills. More specifically, food provisioning of some sort emerged as an existing skill, a priority, a learning opportunity, and a challenge for individuals and received some of the highest endorsement in these areas. Similarly, leadership emerged as an existing skill, priority, and challenge. When asked about how individuals felt emotionally when completing this process of envisioning for self-reliance, individuals shared a range of emotions. Overall there were more positive emotions than negative ones, although excitement and fear received an equally high endorsement from participants. There were also some individuals who experienced both positive and negative emotions simultaneously.

Comparing Broader Community Dimensions

To understand more general categories of items included in the maps, I used a hierarchical cluster analysis.[48] There were several different findings of this process, based on the aggregate of all mental maps as well as those for subsets of participants. The subsets included: individuals who had a positive, negative, or mixed emotional response to the future world captured by their mental maps; whether a city in which an individual lived was medium-high income ($39,000-$97,000) or lower income ($21,000-$35,000) per capita; and whether a city was small (10,000-50,000 people) or medium (50,000-150,000 people). When we examined the categories of items as whole, the diagrams showed that participants included items from two main types of community dimensions: physical and natural dimensions and social, cultural, and psychological dimensions. Table 4 shows the results of the total sample of participants as well as subsets of participants in terms of how each endorsed items in the two types of dimensions. For most subgroups and all data, t-tests revealed a significantly greater endorsement ($p \leq .001$) for the social, cultural, and psychological dimension of items than the physical and natural dimension of items. For example, individuals from smaller and medium size cities both included significantly more psychological, social, and cultural items than physical and natural items in their maps.

Table 4. Endorsement of social-cultural-psychological and physical-natural dimensions of items by different subgroups in the sample.

Data subgroup	Dimension type	% Dimension Endorsement	p-value
Positive emotions	Psych-Soc-Cult	56	.000*
	Phys-Nat	44	
Negative emotions	Psych-Soc-Cult	54	.001*
	Phys-Nat	46	
Mixed emotions	Psych-Soc-Cult	50	.438
	Phys-Nat	50	
Medium-high income cities	Psych-Soc-Cult	51	.172
	Phys-Nat	49	
Lower income cities	Psych-Soc-Cult	67	.000*
	Phys-Nat	33	
Small size cities	Psych-Soc-Cult	54	.000*
	Phys-Nat	46	
Medium size cities	Psych-Soc-Cult	61	.000*
	Phys-Nat	39	
All data	Psych-Soc-Cult	53	.000*
	Phys-Nat	47	

*Marks significance at $p \leq .001$ level

Through these results, we learned about the common features individuals would want in a future community; the priorities, challenges, learning opportunities, skills, and emotions expected in that community; and the value of ensuring there are psychological, social, and cultural dimensions to

climate adaptation. The next section will detail ideas for how to use these results to further build adaptive capacity with psychology in mind.

PART III: TOOLS & STRATEGIES FOR COMMUNITY-BASED ADAPTATION AND PSYCHOLOGICAL RESILIENCE

Based on the research findings described in Part II, three main findings emerged that carry implications for community planners and leaders. The following ideas and strategies represent conversations with community members as well as best practices from climate-adaptation, emergency response plans, and resiliency plans in other cities and towns around the country. Exploring the communities of Baltimore, Maryland, Cambridge, Massachusetts, Seattle, Washington, and San Francisco, California can help to demonstrate the innovative ways that cities are stepping up to the challenge of diversifying their climate adaptation and resilience approaches. These initiatives are important not only in their ability to help communities cope and adapt to future uncertainty, but also because they have the potential to bring out the best in people and build greater psychological resilience during a period of long-term challenges. They also create ways for diverse members of the community to learn more about one another and to participate in the community planning process, so that their needs are reflected in community change.

Finding #1: Across a diverse subset of communities, there are many common features that individuals feel are important for a thriving community amid climate adaptation.

Strategic tool: Small Experiments

Based on the most common items in individual mental maps, there are key groups of features that appeared as important to community planning to increase its resilience and ability to thrive during a period of climate adaptation: food, governance, transportation, education, health and safety, community building, business and economy, and waste. Given these results, we can make sure that these elements are represented in community plans and also address their relationship to psychology and self-reliance. One way to approach this would be to consider each of these aspects as a smaller problem to be solved within the larger goal of adaptation. For example, psychologists Karl Weick and Rachel Kaplan advocate for behavior change through "small wins" and "small experiments" to help individuals learn from new behaviors through trial and error.[49, 50] The following questions could each therefore become smaller research efforts that individually address a different facet of achieving local self-reliance:

1. How can growing and providing **food** fulfill more than a daily biological need but also foster community relationships and individual well-being?
2. How can **governance** structures be designed to represent the diverse ideas, identities, and experiences of a community and allow for meaningful and deep participation?
3. How can a community create **transportation** systems that are low-carbon, efficient, affordable, and able to best connect people to one another and resources?

4. How might an **education** system better prepare its community for multiple future scenarios and empower individuals with the knowledge, skills, and experiences to take on a number of natural resource challenges and climate hazards?
5. How can communities ensure that the **health and safety** of our community extends beyond physical harm to include mental health and psychological well-being?
6. How can leaders leverage **community-building** initiatives to share skills and resources and build relationships among neighbors? Among communities and other towns?
7. How can a **local economy** support its community with all of the necessary resources and skills to thrive and how can individuals support local businesses to minimize external aid?
8. How can a community use its **waste stream** by harvesting key resources for building, manufacturing, and soil building to maintain local systems over the long term?

Such questions challenge us to apply a psycho-social lens to key community features, so they can have a stronger impact on the well-being of community members. They will require a continuous response and engagement from the community to ensure that solutions are equitable and enable individual and community growth and capacity building.

For example, in Seattle, Washington, the City's Department of Neighborhoods has created a **Community Resource Hub**. This is an online portal that provides resources for informing, engaging, and organizing community members to address different challenges and needs in their neighborhood.[51] One of these resources related to small experiments is the P-Patch program, a network of over 88 public community gardens overseen by the City and managed by individuals in order to build gardening skills, increase community cohesion, beautify neighborhood spaces, and grow food. Communities can apply for grants to create a garden in their community. This program has been a huge success across the City; there are currently many individuals who are on the waitlist for this program — a clear measure of its value and demand.

Finding #2. Psychological, social, and cultural elements are key elements of community visions and deserve equal attention to physical and natural elements of climate adaptation plans.

Strategic tool: Community visioning

This finding suggests that planners and practitioners would benefit from incorporating social science concerns into climate adaptation and resilience work. Preparing communities for climate and natural resource change will involve not just protecting them from physical harms or restoring resilient ecosystems, but also caring for their psychological, social, and cultural needs. Mainstreaming these elements into planning will only enhance adaptive capacity and is something that community members have expressed is an important part of community life no matter the circumstances.

For example, many cities in the nation have begun or completed visioning processes, which are helpful for building mental maps of the future and designing proactive responses. In Cambridge, Massachusetts the city has launched **Envision Cambridge**, a comprehensive community vision for six focus areas: housing, economy, climate and the environment, mobility, urban form, and community interaction.[52] Through direct community engagement, this three-year process will complement other initiatives in the city to help individuals better understand and shape what change looks like in their communities for them to be prepared for what lies ahead. San Francisco, California similarly started a campaign called **Look Ahead San Francisco**.[53] This initiative helps individuals visualize the impacts of sea level rise and take action towards its impacts. It is important to note that if a community chooses to conduct a visioning exercise, the framing is crucial; rather than asking about how to return to normal after a natural hazard strikes, communities would be best served by seeing how they can transition and transform their community to a more resilient and adapted place that can respond continuously to change over the long term.

Finding #3. Individuals' current skills tend to be organizational rather than manual, and individual learning opportunities indicate an interest in, and challenge from, pursuing these manual skills.

Strategic tool: Resiliency hubs and skill-sharing

Through comparing the aggregate results for current community skills, priorities, learning opportunities, and challenges that relate to climate adaptation and resiliency, there was a complementary relationship among them. For example, many individuals indicated strengths in organizational skills such as volunteering, cooperation, leadership, and sharing. At the same time, they saw both learning opportunities and challenges in more manual skills such as farming and gardening, energy systems, and carpentry. One participant well-described this trend when she said about projects in her community, "We're initiators, not maintainers, innovators, not implementors."

These findings suggest opportunities for community leaders to use current community strengths to fill gaps in the community skill base; for example, leveraging the power of community organizing, leadership, and a willingness to share in order to provide hands-on skill training. Indeed, the process of reskilling in skills like carpentry and gardening could also help more individuals to respond positively to change and contribute to the overall adaptive capacity of a community. Skill empowerment could further influence the emotional tone of resilience building, where individuals who feel more positively will also be more willing to adopt new behaviors and approach uncertainty as a chance to learn. Therefore, creating training and skill-sharing centers,

workshops, or other programs could be an incredibly effective way to build resilience in the face of climate and natural resource threats over the long term.

For example, the city of Baltimore, Maryland has been credited with piloting **Resiliency Hubs** for vulnerable populations to achieve this purpose.[54] These hubs involve a building, set of buildings, or gathering place that can provide emergency supplies, resources, and space to bring people together. They can serve as education and training centers for technical skills such as emergency response training (e.g. Community Emergency Response Team), weatherization, and solar installation, as well as a place to get to know neighbors. So far, the City has identified three out of four pilot locations and has begun purchasing supplies to stock these hubs when they open. These hubs need not be newly constructed buildings; instead they can be churches, libraries, schools, or community centers that provide easy access to as many individuals as possible.

Another resource in Seattle is **Seattle Community Emergency Hubs,** which are similar to Baltimore's Resilience Hubs as locally designated areas where individuals can gather in times of distress and access information and resources.[55] Seattle Emergency Communication Hubs are specific hubs with trained volunteers who can assist with community needs. In addition, the City offers free trainings and workshops to individuals, businesses, organizations, and community groups on topics such as developing an emergency supply kit and water purification. These efforts distribute knowledge and competence training, so that community members can be more independent of City services and take care of themselves. They serve as resources that allow people to adapt in place and work to strengthen their community rather than relocating to another community with more apparent resources. While not in their original design, Resilience Hubs also offer a place to teach other non-emergency skills such as carpentry, gardening, and home repairs, as well as host social events and foster deeper relationships. If nothing else, there is a major psychological benefit to knowing that there are ample human, funding, and physical resources for a community to draw upon during a period of uncertainty. Furthermore, if communities are able to make these hubs into popular centers with informational and enjoyable programming, there is a greater chance that they will provide a consistent service over the long term. Resiliency Hubs would be an asset in any community and could help individuals feel more effective in caring for themselves and/or their families.

In Summary: Action Strategies

1) Examine resiliency and climate adaptation plans with a psychological, social, and cultural lens. Launch small experiments to incorporate these aspects of adaptive capacity building in addition to increasing physical and technical infrastructure and improvements;
2) Lead a visioning exercise with community members where they envision short and long-term changes in the community as well as adaptation strategies that will become the new normal; and
3) Explore the option of designating current community centers as hubs or hotspots around the town or city that can help individuals easily identify and access resources, knowledge, skill-building opportunities, and most importantly, one another.

Conclusion

In conclusion, the mental maps of individual visions for community-based climate adaptation revealed a diverse set of features and the importance of addressing personal needs and goals to increase adaptive capacity. As community planners, designers, and leaders address impacts of climate and natural resource change, these data provide evidence for the inclusion of social, cultural, and psychological dimensions to enhance current initiatives. Tools like the ones shared here may enable a greater human ability to cope and even thrive in the uncertainty that lies ahead.

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APPENDIX: MENTAL MAPPING METHODS GUIDE

The methods used to create this guidebook involved a mental mapping tool and interviews. The mental mapping technique is called Conceptual Content Cognitive Mapping (3CM for short), and has been used by researchers across a number of disciplines, despite its origins in environmental psychology. 3CMs are not a test of knowledge but instead help to reveal the content and organization of a person's understanding of a given concept.[56, 57] For the research described here, the 3CM was used to better understand how individuals conceptualized a future scenario with limited resources and what would be needed for their community to thrive. A typical 3CM follows these steps:

1) First, participants receive a prompt related to the research question that helps frame the context of the mental mapping exercise;
2) Second, participants list items on paper or select from a pre-made deck of important words and phrases on small cards that relate to the prompt;
3) Third, participants organize their cards into categories based on what they feel goes together;
4) Fourth, participants label the categories of cards; and
5) Finally, participants explain to the researchers the process of selecting and organizing cards and the mental map as a whole.

How to Write a 3CM Prompt

An ideal prompt puts people in a creative frame of mind. To do this, the prompt should describe a specific scenario and lead people towards generating a list of concepts or things that can be written as single words or phrases.[58] This need not be more than a few sentences to set the scene as well as a couple prompting questions. The following opening lines can be particularly effective:

- Imagine if your community was experiencing X…
- Imagine if you were talking to your friend or family member about X…
- Consider a place you would describe as X. What does it look like?

Prompting questions might include:

- What are things you might include?
- What are things you might describe or tell this person?
- How would you organize your thoughts?

Remind your participants that there is no right or wrong answer to this prompt and try to provide them with at least 20-30 minutes to complete the steps above.

Materials Needed

In any of the 3CM styles described below, you can have individuals draw their maps on paper based on a list of items or you can have them sort and organize cards of pre-made items. For paper versions, it is helpful to have a handout for each person with the instructions, prompt, and space to draw, as well as a writing utensil. For card versions, you will need a handout with the instructions and prompt as well as a deck or stack of cards for the items and for category labels — it helps to have different colors. In both cases, it is important to have enough table or surface space for individuals to complete their maps, particularly if using the card version. The different styles are as follows:

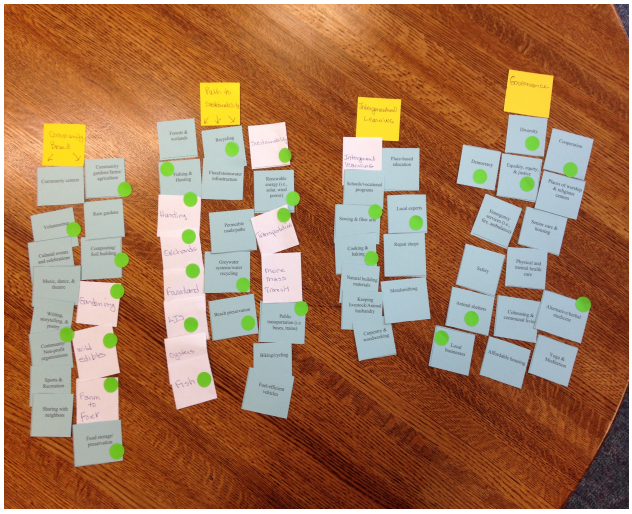
- Structured: In this style, you will need to create a list of items that you want all participants to consider in their maps to answer the prompt. It is recommended that you keep your number of items to approximately 50 or fewer in total. If using this style, be sure to inform your participants that they do not need to use all of the items you provide and can select as many or as few as they like to include.
- Semi-structured: In this style, you create a list of items that you want all participants to consider in their maps to answer the prompt as well as provide them with the ability to add their own items to the 3CM.
- Unstructured: In this style, you have participants generate all of their own items to include in their maps to answer the prompt.

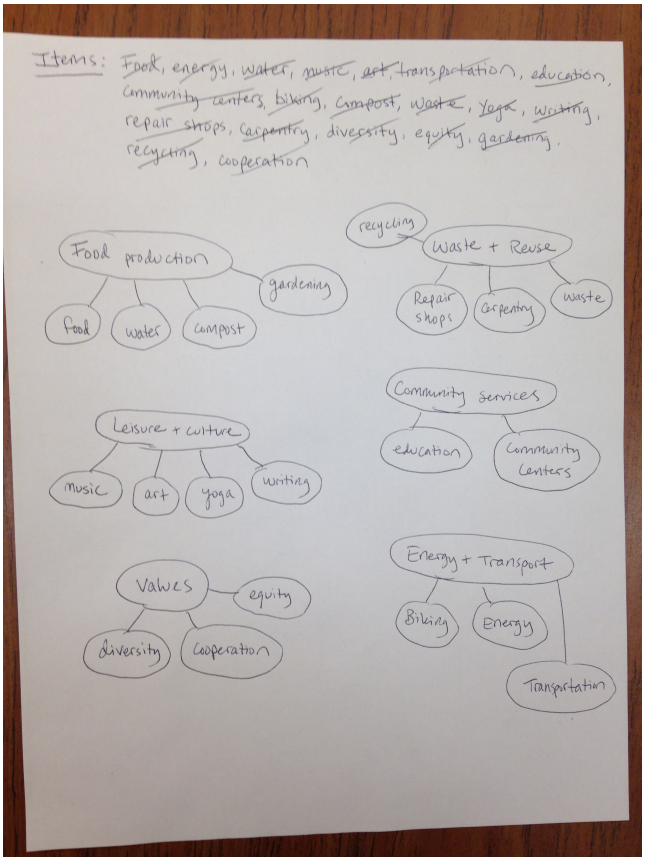
Here's an example of a full prompt and set of instructions for an unstructured 3CM completed on paper:

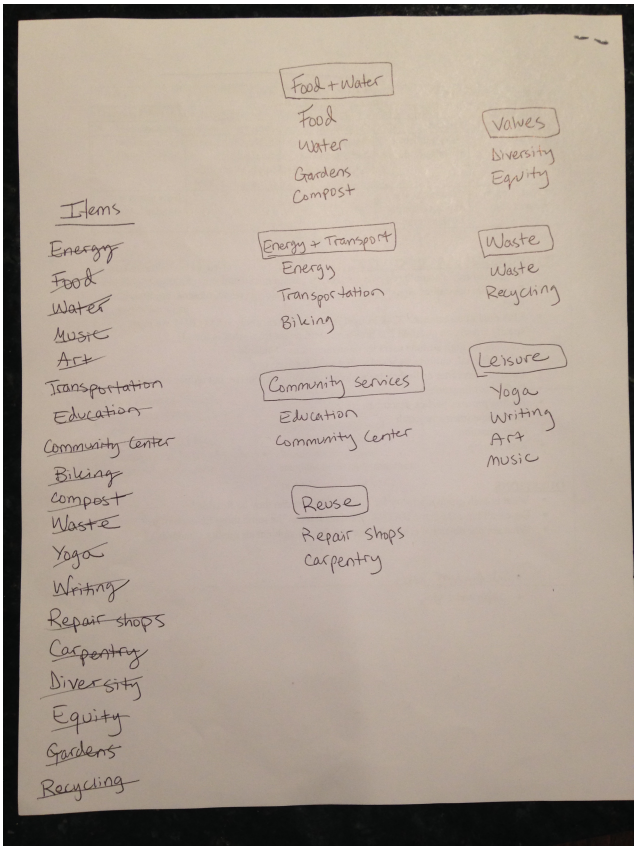
> Imagine you and your friend are talking about the word, "community." Your friend asks for how you might define it and values your perspective as an engaged member of the neighborhood. What are the **things** you would be most likely to mention when describing this concept? What **words or phrases** would you use? How would you **organize** your thoughts? Below, please **draw a model** of what you think is most important to discuss when thinking about "community."
>
> Instructions:
> 1) First, list out important words and phrases that come to mind.
> 2) Next, organize these items into categories based on what you feel goes together.
> 3) Finally, label each category.
>
> Please let me know when you are finished. Remember there is no right or wrong answer, and you may include as many or as few items as you like.

On the next page you will find some examples of completed 3CMs in the different styles. The top two maps use blue and white cards for the items and yellow cards as the category labels. The

green dots were an added layer and used to indicate individual skills related to those items. The bottom two maps show examples of completed 3CMs on paper.







Using the 3CM Data

Once you have completed the 3CM exercise, there are qualitative and/or quantitative options for using and translating the data:

1) Have individuals partner up and talk about their maps in terms of their similarities and differences and then have pairs report back their findings to the larger group;
2) Create a "gallery walk" of the maps where individuals take a tour around the room to take a glimpse of everyone's mental maps and then share what they noticed; and/or
3) Take pictures of the maps and then collect them to save for future analysis. These data can be shared with participants and also serve as data for participatory research.

In the case of the third option, you can use your images of the maps to record the findings and conduct further analysis. For example, you can enter the data into a table to better understand the frequency of items used as well as common categories. One way to format your data is shown in this example table below using Microsoft Excel or another data manipulation program.

	Participant number				**Total # endorsements per item**
Item/concept name	**Person 1**	**Person 2**	**Person 3**	**Person 4**	
Affordable housing	x		x		2
Composting	x	x		x	3
Leadership	x			x	2
Democracy		x	x	x	4
Safety	x			x	2
Education		x		x	2
Individual total # of items used	4	3	2	5	

Once you have these results, you can calculate descriptive statistics for individual items, categories, and even subsets of individuals. These findings serve as evidence for individual and group interests, understandings, and conceptualizations related to your prompt.

Overall, using a 3CM can be a great method for conducting informal or formal research on a topic of interest. They can be useful in community meetings, focus groups, interviews, and many other settings that involve understanding individual understandings and perspectives. For more detailed information on the 3CM process and examples, please refer to the following article: Kearney, A. R. (2015). 3CM: A tool for knowing "where they're at." *Fostering Reasonableness*, *20*(2003), 273–293.

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