The Nexus of Sustainability and Climate Resilience Planning: Embedding Climate Resilience Policies in Local Governments

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Abstract: A local government's approach to climate action planning varies based on the type of municipal leadership, financial resources available for resilience planning, and a community-level commitment to addressing the threats of climate change. Two cities in Michigan deployed climate change plans in their operations and at a community scale. While using different approaches, the intended outcomes of climate change plans in those cities are similar. The article reviews programs and policies to implementing climate resilience measures and how cities in Michigan approach climate change, either indirectly, by specific targets embedded in sustainability planning, or directly, through funding climate action planning in a city's operations. The key outcomes related to climate change action and resilience planning are transparency, accountability, measurements, reporting requirements, annual review, and progress report-related adjustments. The article reviews various approaches to implementing climate resilience measures and how cities approach climate change through specific targets embedded in sustainability planning or directly through funding climate action planning. The concepts of integrating resilience planning into sustainability plans are reviewed in part to provide a better appreciation of policies that lead to practical outcomes in resilience planning. Moreover, the review will provide insight as to how various types of governments may provide for continuity in planning in response to changes in elected and appointed leadership.

Keywords: Climate Preparedness, Sustainability, Resilience Planning, Local Governments, Cities, Urban Planning

Introduction and Literature Review

The notion of climate resilience at a local government level began to take shape in recent years. The concept of climate resilience was advanced with President Obama's impetus for climate preparedness and the ensuing creation of the State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience (Task Force 2014). Moreover, the 100 Resilient Cities grant opportunity enabled 100 cities around the world to hire Chief Resilience Officers (CROs) and to begin planning for climate resilience (100 Resilient Cities 2018). A related effort was conducted by the Resilient Communities for America (RC4A n.d.). Another more demanding activity to engage local governments in efforts to reduce impacts of climate change was seen through the network of the Compact of Mayors, with a set of stringent rules to meet the requirements set as part of the agreement (Compact of Mayors n.d.; Global Covenant of Mayors n.d.). With President Trump's decision to withdraw from the Paris Climate Accord, there is an increased level of attention at cities and local governments in the US, as they remain committed to climate change efforts (Alibašić 2018a; Compact of Mayors n.d.; Sengupta et al. 2017; The Telegraph Reporters 2017). Consequently, research attempting to define resilience and its application to and at local governments becomes all the more relevant.

In recent years, various theoretical and practical frameworks were deployed focusing on the public aspect and politics of addressing climate change at multiple levels of government (Jayawardena and van Roon 2016; Kuntsi-Reunanen 2010; Lyons 2017; Smith and Greenblatt 2016). Vock (2014) offered a brief overview of local governments as they prepared for regional climate effects. Likewise, Meerow, Newell, and Stults (2016) provided a comprehensive review of efforts to define urban resiliency. A wide array of studies and research offer various lenses explaining climate resilience and related initiatives, focusing on adaptation or climate

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The International Journal of Climate Change: Impacts and Responses
Volume 10, Issue 2, 2018, http://on-climate.com

ISSN: 1835-7156 (Print)
http://doi.org/10.18848/1835-7156/CGP/v10i01/21-33 (Article)

preparedness, or the climate action planning context (Boswell, Greve, and Seale 2012; Bristow 2010; Bulkeley 2013; Burch 2010; Brugmann 2012; Chamberlin 2009; Coyle 2011; Gleeson 2014; Larsen 2015; Meerow, Newell, and Stults 2016; Newman, Beatley, and Boyer 2009; O'Brien and O'Keefe 2014; Task Force 2014; Wamsler 2014). The threats of climate change are documented in detail, researched, and thoroughly understood (Archer and Rahmstorf 2010; Henson 2011; Peters 2012).

This article concentrates on climate resilience planning at the local government level, with an emphasis on sustainability plans as tools to promote and implement climate resilience plans. Brugmann (2012) analyzed the scales of climate adaptation strategies in urban settings, viewing the systems and assets as resilient through their ability to "provide predictable performance." A city's role is not simply to provide services, but also to prepare for unexpected circumstances and situations and use policy options that best fit the organizational and community framework. With an increased number of tools at a city's disposal, dispensing with resilience planning is a difficult conundrum for staff with limited capacity or lack of knowledge related to this nascent field of public administration to determine which approaches generate the best outcomes. The article will focus on a medium size, Midwestern city from Michigan, Grand Rapids, and its approach to sustainability planning, which includes climate resilience as its target. A review of the cities' approaches to climate change planning does not reveal any other city using similar tactics. This method of embedding climate resilience planning to its sustainability plan, unique in its complexion, is then contrasted against the city of Ann Arbor's methodology, which includes funding dedicated to climate action planning (City of Ann Arbor 2015; City of Grand Rapids 2016). The method of review consists of publically available reports and internal documents and information made available to the author.

Theoretical Framework of Climate Resilience at a Local Government Level

In their research, Shaw and Maythorne (2012, 62) as a first step, "generated data about the relevance of a resilient approach to local management within the current political and economic climate." Similarly, Alibašić (2018c), Birkeland (2014), Boswell, Greve, and Seale (2012), Fiksel (2006), and Coyle (2011) described the system's design and systemic approach to building resilience in organizations and communities. However, with all the research focusing either directly on scientific aspects of climate resilience and/or theories behind the resilience, there is no published research prominently accenting the use of sustainability planning in local governments seeking outcomes related to climate preparedness and resilience. The purpose of this article is to assess the possibilities and opportunities associated with using sustainability plans to embed climate resilience planning to guide better and provide for climate change action planning, further referred to as climate resilience in the rest of this article. The argument posited with this research is that sustainability plans may provide an opportunity for organizations for the alignment of budgetary outcomes with climate resilience planning and to enable continuity of the climate resilience planning, as those plans will remain in place for a more extended period.

Burch (2010) reviewed resilience efforts by Canadian cities and indicated differing results. In developing a model-based analysis for urban economic impact assessment and uncertainty scenarios, Hallegatte, Henriet, and Corfee-Morlot (2010) argued in favor of the implementation of climate adaptation and mitigation strategies at a local scale to enhance resilience. Bullock et al. (2015) assessed urban resilience using case studies of cities through a climate adaptation lens. In practical terms and theory, as discussed by Alibašić (2014 and 2017) and as shown in Figure 1, a city's approach to resilience planning takes into consideration climate change data, emergency preparedness, sustainable energy planning, community health, and safety issues of an organization and community. Furthermore, an argument must be made that resilience does not exclude mitigation efforts, as the ability of a system to recover does not depend on adaptation strategies alone. Similarly, to local sustainability efforts that necessitated from the need of local officials to address internal and external pressures, climate resilience planning requires the same

approach. In the words of Fiksel (2006, 20) "sustainable development in a changing global environment will require resilience at many levels."

When studying resilience, diverse theoretical frameworks are deployed, from Jabareen's (2013) conceptual framework (the Resilient City Planning Framework or RCPF) applied to urban settings and cities, Desouza and Flanery's (2013) conceptual framework, Ahern's (2011) resilience theory, and Fiksel's (2006) system theory approach. This article adopts resilience theories to better understand current climate resilience planning strategies in place in select Michigan cities. Moreover, resilience planning is utilized as an attempt by an organization to improve the organizational ability to recover from stresses and shocks (Alibašić 2018c).

Climate Resilience Targets Embedded within the Sustainability Plan

System changes are present within organizations engaged in sustainability with benefits to the society as a whole and emphasized and elevated through resiliency. The city of Grand Rapids, Michigan carried out a different process of accomplishing climate resilience goals. Rather than creating a separate plan for climate action-related issues, the city deployed climate resilience targets throughout the sustainability plan. The staff paired the plan with annual sustainability plan progress reports, which also include climate adaptation and mitigation targets. National organizations took notice with Goodwin (2012) and Geary (2011) reporting about the city's innovative budget, economic development and sustainability connections, and the National Wildlife Federation (NWF) (n.d.) summarizing the city's climate change efforts. Additionally, ICLEI reported about the Office of Energy and Sustainability's ability to integrate adaptation into sustainability plans and then to partner with the city to be a test site for climate adaptation toolkit (Guevarra 2010; Knapp 2011). Recently, the author of the American City & County described the success of the Grand Rapids energy efficiency efforts (Prall 2016). In 2012, Grand Rapids was recognized by the US Conference of Mayors for its climate change efforts, winning the Climate Change Award (McCarty 2012).

Sustainability Plan

Markedly, the city of Grand Rapids set forth a distinctive, multi-year sustainability plan with over 200 economic, environmental, social, and governance targets, entirely containing the city's most pressing resilience-planning priorities (City of Grand Rapids 2016). All of these sustainability efforts are measured, tracked, and reported annually, providing for transparency and accountability and enabling the city staff to meet sustainability targets. the sustainability plan and its implementation included numerous resilience-based facets, containing energy efficiency improvements in city buildings with a resulting 15 percent reduction in electricity consumption, rooftop solar panel placement on an existing LEED-certified building and purchasing renewable energy credits for its annual energy use, and installing geothermal projects at fire stations (City of Grand Rapids 2016). The city has an updated Stormwater Management Master Plan, includes green infrastructure in street planning, and has holistically been working to improve storm infrastructure (Alibašić 2014; City of Grand Rapids 2015; City of Grand Rapids 2016). The Sustainability Progress report served as a snapshot of the cumulative work performed over a period of five years from 2010–2015 of sustainability plan implementation (City of Grand Rapids 2015, 2016). Importantly, too, tying its sustainability plan directly to emergency planning, the city acted proactively to prepare for extreme weather and potential disasters (Alibašić 2014).

Resilience Targets within the Sustainability Plan

The targets in the Sustainability Plan FY17–FY21 were designed to prepare the city for, and in response to, future threats, challenges, and scenarios (City of Grand Rapids 2016). Grand Rapids recognized the need for community-wide resilience and preparedness by taking into

consideration disaster mitigation, energy issues, climate data, public health, and safety (Alibašić 2014). Among many indispensable targets, within its sustainability plan, Grand Rapids realized the need for energy reduction, easy access to public transit infrastructure, and reduction of waste by the reuse of resources, and has established targets in the sustainability plan to address those concerns (Alibašić 2017). Most notably, the city has made a goal to implement resilience-based improvements by installing efficiency improvements, including renewable energy in its power supply portfolio, geothermal projects at fire stations, update water management and infrastructure, and implement a community-wide active sustainability network involving over 200 private and public organizations (Alibašić 2017). All of these efforts are measured, tracked, and reported providing for transparency and accountability and to meet the targets to promote resiliency within the city (Alibašić 2017).

Private Sector and Community Support for Climate Resilience Planning

A critical component of an effective climate resilience plan lies in the level of community and private-sector involvement. On a national and an international stage, business leaders have been actively involved in promoting climate resilience (Alibašić 2018b). In 2005, Grand Rapids established the Community Sustainability Partnership (Alibašić 2017). This regional partnership has grown to over 280 local endorsing partners from all sectors (Grand Rapids Community Sustainability Partnership 2018). With resilience and sustainability work being at the forefront of many leaders in Grand Rapids, the city was named a full 2030 district in 2016 (2030 Districts n.d.). Furthermore, West Michigan Sustainable Business Forum was actively involved in research dealing with climate resilience (WMSBF 2016).

Regional Climate Resiliency Report

A notable aspect of climate resilience planning for Grand Rapids was its employees' ability to partner with environmental groups and academic institutions to seek climate action outcomes. Partnering with a local environmental group, universities, and regional institutions, and using a system-wide approach to understanding climate change, extreme weather events, and impacts on the region, the city of Grand Rapids and West Michigan Environmental Action Council (WMEAC) developed a Climate Resiliency Report. The report aimed to educate stakeholders, citizens, and partners of various local climate-related threats while providing recommendations for reinventing city operations to become more resilient to the impacts of climate change. The city saw these climate strategies as an extension of responsible governance and an essential investment in the future prosperity of the city (Alibašić, 2017). While the report deserves a separate analysis and an in-depth review of its usefulness as a tool for cities, a cursory summary of key findings is noteworthy for this study.

The report focused on localization of climate change impacts and placed precise recommendations for the city to build local community resilience and to strengthen emergency preparedness coupled with disaster recovery. Goals of the report included community engagement and further enhancement of projects, policies, programs, and planning actions, enabling Grand Rapids to mitigate the effects of climate change, to adapt to its impacts, and to utilize emerging sustainability opportunities (Alibašić 2017).

The WMEAC's Climate Resiliency Report noted the effects of climate change on each sector, viewing those impacts from a system-wide perspective, and suggesting building resilience requires an in-depth appreciation of the needs in the community and relationships between sectors (WMEAC 2013).

System Approach to Understanding Localization of Climate Change

Local expertise was utilized for in-depth assessment of the climate science data, and local officials involved in sustainability planning and development were interviewed. Interviewees represented the following perspectives: Academia, Regional Planning, Transportation, Food Systems, Emergency Preparedness, Sustainability, Environmental Services, Community Infrastructure, Forestry, Finance, Public Safety, Built Environment, Community Essential Needs, Engineering, and Energy (WMEAC 2013).

Localization of Climate Science and Climate Resilience Planning

The Model for the Assessment of Greenhouse-gas Induced Climate Change with the Regional Scenario Generator (MAGICC/SCENGEN) modeling software was used for the Grand Rapids Climate Resiliency Report (WMEAC 2013). Moreover, the "results produced for coordinates relating to the city of Grand Rapids and projected to an area of 2.5° by 2.5°" (WMEAC 2013, 9). The anticipated temperature and precipitation variables "through the years 2022 and 2042" coinciding with the city's master plan process for twenty years, and comparing the variables to a "baseline annual average and monthly average data from 1961–1990" (WMEAC 2013, 9).

As discussed in the report, average temperature and precipitation will increase by 1.1°C and 2.6 percent, respectively, by 2022, and further increase by 2.2°C and 8.5 percent, respectively, by 2042, while seasonally, the largest increases in temperature are projected to occur during the winter and the least in summer (WMEAC 2013). Likewise, the resiliency report indicated that the largest percent increase in precipitation is predicted to occur in the winter and spring months, while summer is the only season projected to become drier. Additionally, the report predicted the Great Lakes region can expect more variable and volatile and extreme weather, with heightened trends of "storms producing greater than one inch of rain in 24 hours, increased frequency of consecutive days above 90 degrees F and 90 percent humidity, and more freeze-thaw cycles in winter and spring" (WMEAC 2013, 88).

The Grand Rapids Climate Resiliency Report supplied conclusions and recommendations in the areas of process improvements, including suggestions for organizations to adopt a triple bottom line accounting in financing and implementation of projects (WMEAC 2013). Furthermore, under crime prevention, the report suggested the use of environmental design as crime prevention tools (WMEAC 2013). Finally, the report recommended the city invest in a distributed energy system, energy efficiency, and renewable energy.

As visually shown in Figure 1, connecting the relevant planning and implementation functionalities of local governments and partnering organizations at all levels is critical to ensuring longevity, continuity, and success of resilience planning. The key components include the review and utilization of climate data and the corresponding effects on resources and infrastructure.

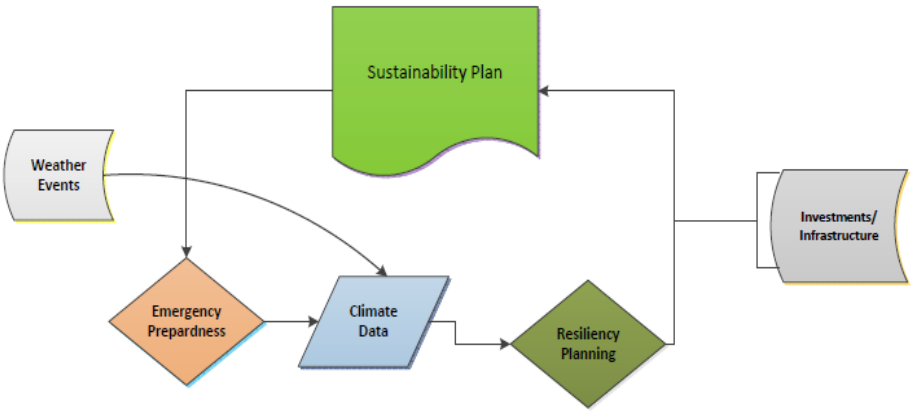

Figure 1: Combining Resilience Planning with Sustainability Plans and Emergency Preparedness
Source: Alibašić

Figure 2 offers an in-depth, system-wide visual explanation to resilience, using a city as an example where climate change work was integrated into the sustainability plan. The system-wide resilience strategy includes both climate adaptation and mitigation initiatives. For example, policies and programs that encourage energy efficiency are both fiscally and environmentally responsible and act as a method of both climate mitigation, which reduces pollution and greenhouse gas emission, and climate adaptation, which leads to reduced grid overload and potential grid failures by decreasing demand.

Applying Resilience Report to Sustainability Plan

The city extended direct linkages to the budget and tied it to the planning process. As shown in Figures 2 and 3, the Grand Rapids sustainability plan has specific targets, outcomes, and sustainability indicators, including climate resilience targets directly into sustainability planning.

The climate resilience report was used directly to bolster and to link various aspects and targets of the city's sustainability plan, as evidenced in Figure 3 and examined by Alibašić (2017). Likewise, sustainability planning with resilience-specific targets allowed a broader discussion on the regionality of climate change and regional effects of climate preparedness and resilience (Alibašić 2014). Moreover, Alibašić (2018a) inferred local climate change efforts in the context of resilience planning. By concentrating efforts toward resilience building, cities can better protect all residents, particularly low- to moderate-income populations and those living in poverty. Besides, in ensuring environmental stability and safeguarding the economy from the harmful effects of disasters, local governments utilize insights into the complexity of climate change about the existing economic, ecological, governance, and social conditions of communities and regions (Alibašić 2018d).

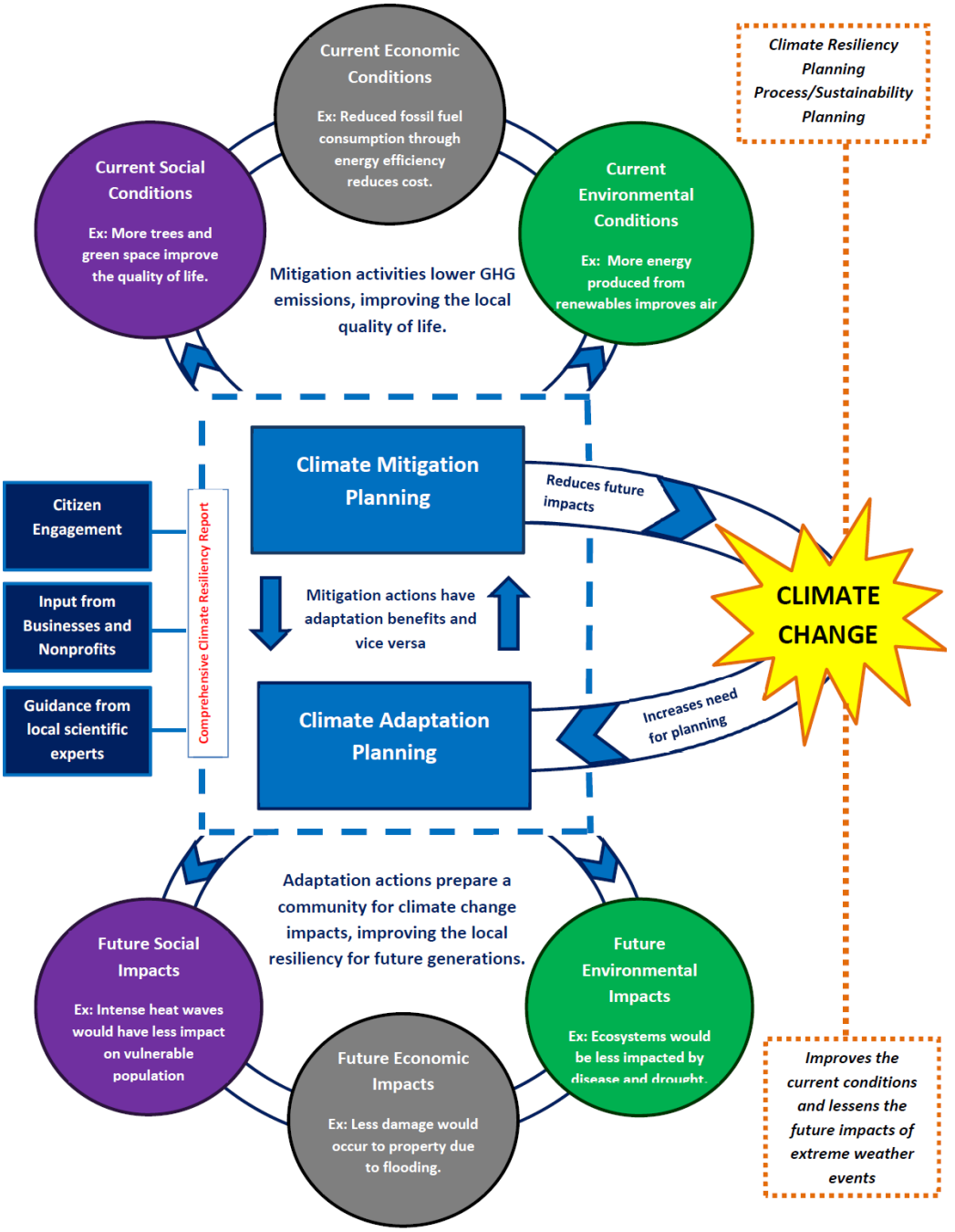

Figure 2: Resilience Planning through Climate Mitigation and Adaptation Strategies
Source: Alibašić

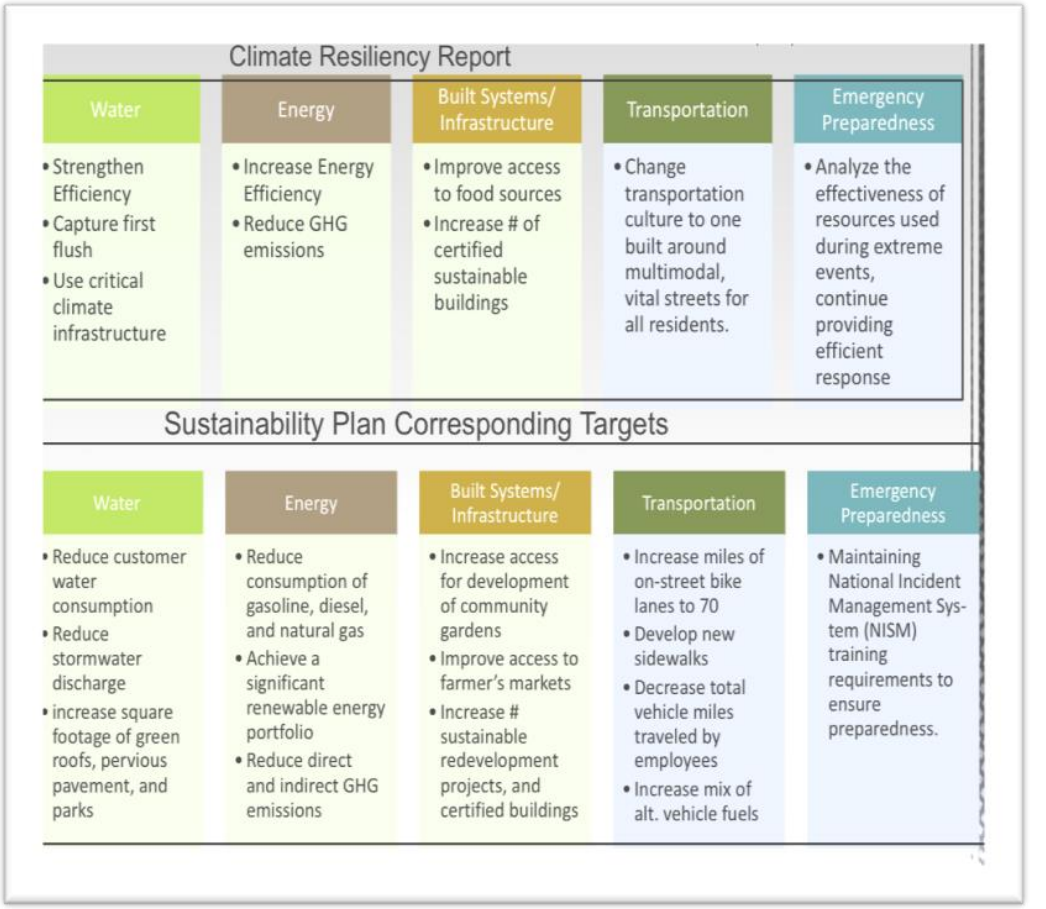

Figure 3: Converting Grand Rapids Resiliency Report Recommendations into Sustainability Targets
Source: Alibašić

City of Ann Arbor Approach to Climate Resilience

Contrasting Grand Rapids' approach to climate resilience to other local government methods, another Michigan city was chosen as a comparable model. Ann Arbor was purposely selected to contrast the efforts in Grand Rapids, due to its similarities with its focus on climate change using sustainability framework and policies. Comparable to Grand Rapids, Ann Arbor is mostly built out to its geographic boundary and had a noticeable decline in commercial/industrial activities that led to reductions in emissions during a period of economic stagnation. However, both cities invested its resources in rebranding and regenerating the local economies to withstand the pressures of global economic changes that occurred in the recent two decades. Both cities saw economic growth in past years, with upward trends predicted to continue into the future (Fulton and Hyman 2015).

A review of the existing documents from the city of Ann Arbor indicated significant commitment and resources poured into sustainability planning and climate action planning (City of Ann Arbor 2015; Powers 2015; Stanton 2015). While similar in its commitment to climate action planning and sustainability, the critical difference with Grand Rapids is that the city of Ann Arbor has both a sustainability plan and a climate action plan. In Ann Arbor, the indirect interchange between a sustainability plan and climate action, including climate adaptation and mitigation, is visible and evidenced in its Climate Action Plan. The Climate Action Plan contains

the greenhouse gas emissions inventory and climate action categories, including Energy and Buildings, Land Use and Access, Resource Management, and Community and Health categories (City of Ann Arbor 2012, 2013). As conveyed in the city of Ann Arbor's (2012, 3) report, which tracks emissions within the city limits, "total GHG emissions across the Ann Arbor community in 2010, were over 2.2 million metric tons of CO2," and it was "up slightly from 2.19 million metric tons in 2000." The concept of good governance is exhibited in the city of Ann Arbor's reporting of its carbon emission inventory and being fully transparent and accountable in providing information, acknowledging the increase of community-wide carbon emissions.

The Sustainability Action Plan has direct climate mitigation and adaptation implication as it includes climate and energy outcomes and goals (City of Ann Arbor 2015). While approaches to climate resilience planning by these two cities appear divergent, the end goals and results are very similar, and Ann Arbor's embedding of climate action plans is relevant in its sustainability action plan (City of Ann Arbor 2015). Its alignment of sustainability and climate action planning is interchanged throughout existing documents (City of Ann Arbor 2012, 2013, 2015).

Conclusion: Using Sustainability Planning to Further Climate Resilience

The concept of embedding resilience planning into a sustainability plan was reviewed in part to provide a meaningful appreciation of policies and initiatives that leads to practical outcomes in resilience planning. Moreover, the review was conducted to bestow better insight as to how various types of governments may provide for continuity in planning in response to changes in elected and appointed leadership. The research into these two cities in Michigan and their practical approach to addressing climate change reveals a set of far-reaching conclusions. First, the process of embedding climate change activities into sustainability plans is helpful insomuch as cities measure and benchmark results of climate action activities and efforts. The same conclusion can be applied to cities with climate change plans in place, with specific goals and objectives. Hence, in cases where cities install climate change plans or sustainability plans with particular climate change targets, the relevant results would be evident with measurable and definable outcomes. Second, what seems to be critical in most cases is the presence of reporting mechanisms. In these cases, where there are clear reports readily available for viewing by the public and with specifically defined outcomes, definitive climate actions plans are installed and implemented. Furthermore, measuring, tracking, and reporting outcomes are essential elements of sustainability and resilience planning (Alibašić 2017, 2018d).

Local governments' approach to climate action planning varies based on the type of municipal leadership, financial resources available for resilience planning, and community-level commitment to addressing the threats of climate change. While seemingly different approaches produce similar results, it is worth noting that both cities have dedicated staff that ensure that measurable and actionable outcomes are being implemented. The significant difference between the two cities is that Grand Rapids does not have a separate climate action plan. The key results related to climate resilience planning are transparency, accountability, measurements, reporting requirements, annual review, and progress reports.

The notion of sustainability plans being used to promote and implement climate change is relevant for both academics and practitioners. Climate resilience planning is an essential area of study, and the impact of theoretical frameworks of resilience needs further research and investigation. This article shows that climate resilience plans and actions are locale-specific and that on the level of local governments, administrators and elected officials define the steps needed to address climate-related threats. Further research is required to analyze the full impact of sustainability plans role in delivering climate action results. A more in-depth analysis is needed to offer a review of the full implications of the effectiveness of using a sustainability plan for climate resilience planning.

Accordingly, this article and future study will aid practitioners in reviewing current cities' plans and fill the gaps related to identifying types of approaches and targets needed to fulfill

climate action pledges. Embedding climate action plans into existing plans is an effective way of committing to the climate resilience action, as long as cities tie the planning to its budget process.

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