

Personal Behavior in the Northfield Climate Action Plan

Madeline Hagar and Hannah Kennicott

Spring 2018

Carleton College

## **Table of Contents**

I.	Executive Summary	1
II.	Introduction to Personal Behavior	2
III.	Urgency of Climate Change and Significance of Personal Behavior	4
IV.	Northfield's Current Efforts Regarding Personal Behavior	7
A.	Past Work	7
B.	Future Work	13
V.	Possible Actions Northfield Can Take to Address Personal Behavior	15
A.	Strategies of Similar Municipalities	15
B.	Effectiveness of Different Behavioral Options	18
C.	Most Promising Recommendations for Personal Behavior in the Northfield CAP	21
1.	Promote Weatherization	22
2.	Upgrade Home Appliances	24
3.	Upgrade HVAC Equipment	25
4.	Implement Car Sharing	27
5.	Implement Bike Sharing	28
6.	Promote More Awareness of Walking	30
7.	Expand Curbside Composting	31
9.	Develop Educational Materials and Programs	33
VI.	Project Design and Implementation Strategies for Personal Behavior Initiatives	34
A.	Key Policy Questions for Personal Behavior	34
B.	Design Principles for Initiatives Focused on Changing Behavior	35
VII.	Conclusion	38
	Bibliography	40
	Appendix	42

## **I. Executive Summary**

The purpose of this paper is to provide Northfield with an understanding of how the local municipality can utilize the psychology of climate change to enact policies that will act as a catalyst for change in individual and household behavior. Personal behavior, defined as individual and household day-to-day and long-term actions, is an important aspect to consider for any climate action plan because there are significant, measurable impacts of personal behavior on climate change. Given the overall collective impact caused by individual actions, identifying areas with high behavioral plasticity, the likelihood that behavior change is feasible, is critical in meeting the greenhouse gas (GHG) emission reductions needed to curb environmental consequences of climate change. The most effective and promising actions will combine the highest level of emission reductions, behavioral plasticity, and policy feasibility. The programs that show the most potential in the climate action plans of cities similar to Northfield have primarily focused on household equipment, residential building efficiency, and efficient transportation.

This paper identifies the following actions as the most promising in the context of Northfield: promote weatherization, upgrade home appliances, upgrade HVAC equipment, implement car sharing, implement bike sharing, promote more awareness of walking, expand Curbside Composting, continue to support and expand existing programs, and develop educational materials and programs. The proven benefits of these options include environmental impacts such as decreasing GHG emissions, social impacts like empowering disadvantaged communities, and economic benefits like cutting the costs of energy for individuals. This paper also analyzes the challenges that arise from funding these programs, addressing the specific needs of particular communities in Northfield, and the inherent difficulty of changing the

behavior of individuals. Lastly, this report does not cover businesses' role in the climate action plan because it focuses on individuals and households rather than corporate impacts on climate change. This report also focuses on recommendations for improving transportation that are directed to the broader Northfield community. Specifically, regarding walking, this paper focuses on increasing walking for residents, not school children, which is covered by the transportation paper authored by Caroline Harvey and Thu Nguyen.

## **II. Introduction to Personal Behavior**

The everyday choices of people can alter the world they inhabit over time. In the context of climate change, individuals and households play an important role in obtaining decarbonization goals. Community members can support policy changes and buy efficient technology, whether they are environmental activists or not. Conversely, people can choose to ignore environmental issues or actively campaign against environmental policies. Therefore, how and why people are making behavioral decisions matters greatly, especially when dealing with the long-term impacts associated with climate change.

In this paper, the role of personal behavior in climate action plans, hereby referred to as "CAPs," will be defined, evaluated, and discussed in the context of Northfield, Minnesota. For the purposes of this report, personal behavior will be defined as individual and household actions regarding day-to-day and long-term choices that people are making. Personal behavior matters when we think about climate change given that households account for 38% of national carbon emissions. This level of emissions is greater than any other country except China and larger than the entire U.S. industrial sector. Seeing as households account for a sizeable amount of national carbon emissions, personal behavior has the potential to create major change in decreasing

emissions, rather than negligible differences.<sup>1</sup> These changes can be incentivized by policies, which is where Northfield's CAP can be utilized. Behavioral plasticity, "the proportion of potential adoptions of particular target behaviors that is reasonably achievable,"<sup>2</sup> is key in developing personal behavior changes that will actually be effective. In other words, it is a measure of how likely an individual is to adopt a behavior. The primary focus for this report is the behavior of households and individuals, but the government and non-state actors deserve acknowledgement for their role and potential influence in developing and implementing future changes. Businesses have been omitted given that this report focuses on individuals and households rather than corporate impacts on climate change. Additionally, promising transportation recommendations focus on initiatives for the broader community, given that Thu Nguyen and Caroline Harvey cover transportation related to schools in their paper.

Moreover, the city council's 2018-2020 strategic plan outlined reduced net carbon emissions as a goal.<sup>3</sup> With this in mind, we focused our research on changes that would be both feasible as well as reduce carbon emissions given the stated goal of the city. Based on the strategies of similar municipalities, literature, and our understanding of Northfield, we recommend that Northfield adopt strategies primarily focused on the adoption of sustainable technology, household equipment, transportation, and waste management practices. We also recommend that they continue to support existing efforts and develop more education programs. These areas will result in large emission reductions and have demonstrated significant behavioral plasticity, the likelihood that a behavior change is feasible. These policies will face challenges with design and implementation, but ultimately provide Northfield with many social,

---

<sup>1</sup> Paul C. Stern Michael P. Vandenberg, "The Role of Individual and Household Behavior in Decarbonization," *Legal Studies Research Paper Series* 17 - 52 (2017).

<sup>2</sup> Ibid.

<sup>3</sup> Northfield, "Strategic Plan Summary 2018-2020."

environmental, and economic benefits. These challenges and advantages will be explored further later in the paper. This paper will begin by explaining the significance of personal behavior as well as the challenges Northfield will face due to climate change. From there, the paper will describe current personal behavior initiatives in Northfield and the city's plans for the future, which will provide the necessary context to understand the strategies outlined in the CAPs of similar municipalities and their effectiveness, as well as set the foundation for Northfield's own CAP and our specific recommendations for the City of Northfield. The paper will end with a discussion on program design and implementation, weighing the pros and cons of initiatives targeted at making behavioral changes.

### **III. Urgency of Climate Change and Significance of Personal Behavior**

Human activities have been progressively damaging the natural environment for decades, culminating in the effects of climate change people are experiencing today and prompting a call for change on an individual and household basis. The global effects of climate change include rising temperatures from GHG emissions, increasing numbers of natural disasters, decreasing biodiversity, and rising sea levels.<sup>4</sup> While this phenomenon affects the globe, its impacts are not spread uniformly. Emphasizing the local effects of climate change is crucial, especially in communicating the issue of climate change. While the local effects are often not included in the personal understanding of climate change, they are the most impactful influence upon personal and household behavior.<sup>5</sup>

In Minnesota specifically, the effects of climate change are already manifesting at the local level. According to the EPA, precipitation in the Midwest has increased 5-10% in the past

---

<sup>4</sup> United States Environmental Protection Agency, "Climate Impacts on Human Health."

<sup>5</sup> Leila Scannell. Robert Gifford, "Personally Relevant Climate Change: The Role of Place Attachment and Local Versus Global Message Framing in Engagement," (2013).

fifty years, and flooding has become a significant issue. “Some climate scientists find it telling that three of the mega-rains were extremely heavy - considered 1,000-year storms - and took place in pretty much the same area in southern Minnesota.”<sup>6</sup> These mega-rains increase flooding risk, especially in southern Minnesota communities such as Northfield that have already experienced severe flooding of the Cannon River in the past few years (see Figure 1 in the Appendix). On that same note, the quality of the water is expected to decline as climate change intensifies. Flooding can cause land pollutants to sweep across vast distances through the water. Additionally, increased temperatures can cause algae blooms, leading to a series of human health, ecosystem, and aesthetic problems.<sup>7</sup>

Directly water-related problems are not the only cause for concern. Incredibly complex ecosystems will shift or unravel, and native species populations will change.<sup>8</sup> It will also put pressure on the agricultural industry, of which Minnesota greatly relies on for its economy, seeing as it is ranked fourth for agricultural exports in the U.S.<sup>9</sup> There are also many specific threats to local human health, including a longer time window for Lyme Disease exposure, a higher occurrence of heat waves, and worsened allergy seasons.<sup>10</sup>

Since the impacts of climate change can occur subtly and slowly over the years, policies that are made today have a crucial role in determining the viability of the future. Even more generally, how people choose to live day-to-day matters immensely when considering the role humans play in contributing to climate change. Using national adjusted estimates for emissions that consider the location of electricity and other factors, it can be estimated that the major emission sources in the United States are households (31%), manufacturing (25%), and

---

<sup>6</sup> MPR, "Climate Change in Minnesota: 23 Signs."

<sup>7</sup> EPA, "What Climate Change Means for Minnesota."

<sup>8</sup> "Climate Impacts on Ecosystems."

<sup>9</sup> Su Ye, "Minnesota Agricultural Exports," *Minnesota Department of Agriculture* (2018).

<sup>10</sup> EPA, "What Climate Change Means for Minnesota".

transportation (15%). The minor contributors are, for instance, government (5%) and agriculture, forestry, fisheries, mining, and construction (6%).<sup>11</sup> This national data provides an indication of just how much could be achieved in Northfield if households change their behavior. In fact, if households change their selection and use of current household and vehicle technologies, they could reduce their energy consumption by nearly 30%, decreasing overall US consumption by 11%.<sup>12</sup>

If Northfield's CAP targets shifts in personal behavior, the quality of the environment would greatly improve, and many effects of climate change could be mitigated or avoided. By decreasing household GHG emissions, preventing and adapting to the effects of flooding, and adopting more sustainable waste management practices, Northfield can become more environmentally sustainable.

Additionally, the social implications of uniting individuals for a common goal through explicit changes in personal behavior would benefit the community, including students of both colleges and town residents. Through educational programs and outreach in Northfield, community members would become more empowered to make decisions that reflect their care of their environment, futures, and families. The spark of the CAP could ignite the fire for grassroots movements, further strengthening the community of Northfield. Finally, the potential for economic growth and personal financial gains are promising. On a national scale, many jobs are being created by investing in the development of technology that surpasses current available choices regarding efficiency and sustainability. In Northfield, investing in renewable energy sources could decrease long-term costs for consumers.<sup>13</sup> Moreover, investments in more energy

---

<sup>11</sup> Michael P. Vandenberg.

<sup>12</sup> Paul C Stern Gerald Gardener, "The Short List: The Most Effective Actions U.S. Households Can Take to Curb Climate Change," (2009).

<sup>13</sup> Union of Concerned Scientists, "Renewable Electricity Standards Deliver Economic Benefits."



efficient appliances, such as dishwashers and refrigerators, and HVAC systems would reduce GHG emissions and have cost saving advantages as well.<sup>14</sup> Lastly, the aesthetic benefits of keeping an environment clean and pollution-free ultimately lead to higher property values.<sup>15</sup> This would not only help a resident trying to sell his or her home, but it could also attract more people to the Northfield area. Over all, personal behavior plays a significant role in combating climate change given the demonstrated impact of human activities on the planet, as well as the potential for households to make a significant difference by changing their behavior.

#### **IV. Northfield's Current Efforts Regarding Personal Behavior**

It is crucial to consider the efforts that currently exist in Northfield regarding personal behavior. This provides a basis for understanding the programs that could be expanded upon, as well as an overview of current work being done in this specific area. By understanding current initiatives, future changes can be implemented more effectively. Additionally, those already involved in personal behavior and sustainability could be great resources in developing the CAP. In this paper, the focus is on efforts made by both colleges, businesses, and the city government.

##### *A. Past Work*

###### **1. St. Olaf College**

St. Olaf focuses its efforts on sustainable waste management, education, and community engagement. According to the school's sustainability website, the campus provides recycling bins in all student rooms and department offices. The college also composts "nearly 175 tons of food annually" and "100 percent of the compost that is generated is used on college-owned

---

<sup>14</sup> Michael P. Vandenberg.

<sup>15</sup> CHEJ, "Property Values Factpack," *Center for Health, Environment, and Justice* (2015).

land.”<sup>16</sup> Moreover, the college utilizes reusable bags for bag lunches, provides free water stations to encourage people to use reusable water bottles, and provides discounts to students purchasing coffee who bring their own cups. These programs are meant to incentivize and make it easy for students to adopt behavior that reduces their waste. St. Olaf has also invested a significant amount of resources into its science programs, many of which are actively involved in supporting research related to climate change and campus sustainability.<sup>17</sup> This active engagement of the student body cultivates awareness of an individual’s actions and engagement on climate-related issues globally and locally.

Lastly, community engagement is a key component of St. Olaf’s sustainability plan. Approximately “15 environmentally focused student organizations and clubs operate under the umbrella of the St. Olaf Environmental Coalition.” These clubs seek to educate their peers, build campus awareness, and promote public policy advocacy.<sup>18</sup> This campus cultivates an atmosphere of caring, in which all students are actively engaged in sustainability efforts. Whether they are immediately integrated upon arrival via the recycling program, incentivized through discounted coffee prices to use reusable cups, or actively engaged in research or a club, students, staff, and faculty are all involved in St. Olaf’s efforts to be sustainable and reduce its carbon footprint.<sup>19</sup>

## 2. Carleton College

Like St. Olaf, Carleton places a significant emphasis on appropriately sorting waste into landfill waste, recyclables, and compostable materials. Throughout campus, there are many three-unit waste boxes (those units being landfill waste, compost, and recyclables) with posted information on the sorting of common objects, like food scraps or cups. There are also many

---

<sup>16</sup> St. Olaf College, "Campus Sustainability."

<sup>17</sup> Ibid.

<sup>18</sup> Ibid.

<sup>19</sup> Ibid.

educational programs designed to encourage students to properly sort their waste. An event intended to reduce waste at Carleton is the No Impact Challenge. Teams register and compete against each other to produce the least amount of waste throughout Climate Action Week, a week in February dedicated to sharing sustainability information and tips to the campus as a whole.<sup>20</sup>

Sustainability education programs promote energy-saving practices during new student orientation each year. The Green Guide, a guide to sustainability at Carleton that is directed towards new students, is uploaded online. It categorizes the sustainable personal behaviors of Carleton students by location: in the classroom, dorm room, dining hall, etc. An effort called Take Back the Tap encourages the refilling of water bottles rather than the purchase, use, and disposal of plastic water bottles.<sup>21</sup> Water bottle fillers have been installed in many locations on campus, and they count how many disposable water bottles they save and display that number on the front of them. Other efficient technology has also been implemented throughout campus, including low-flow shower heads in all campus showers which was initiated through the Sustainability Revolving Fund, low-flush toilets, targeted irrigation to maintain turf in high traffic areas, and landscaping to minimize erosion and runoff.<sup>22</sup>

Carleton takes advantage of the transportation options provided by the city, but it also has several of its own transportation programs. The most recent addition to sustainable transportation at Carleton is the bike share program. Ten loanable bikes are borrowed for free by students and returned to designated racks.<sup>23</sup> It encourages non-car options for local transportation as well as exercise, which benefits the health of students. Carleton also collaborates with the car rental

---

<sup>20</sup> Ibid.

<sup>21</sup> "Sustainability." Carleton College Website.

<sup>22</sup> Ibid.

<sup>23</sup> Ibid.

company “Enterprise” to provide a car sharing program. Car sharing, hourly car rentals that are returned to an accessible location, allows students to travel off-campus without owning a car. To provide an idea of the cost, the hourly rate for students is \$7, and the annual membership is \$35.<sup>24</sup> In conclusion, Carleton’s sustainability efforts focus on educating students about alternative sustainable practices, implementing programs to make the overall college more environmentally friendly, and making the college community aware of the positive impact of their efforts.

### 3. Local Businesses

#### a) Dick’s Sanitation Inc.

The City of Northfield currently contracts with Dick’s Sanitation Inc. (DSI) to provide residential curbside garbage and recycling collection.<sup>25</sup> Rubbish bins come in various sizes, providing some financial incentive to minimize waste. The company participates in single sort recycling, meaning that all the recyclable materials are mixed together in the collection truck rather than separated by type of material. DSI also offers seasonal yard waste collection so it can be composted.<sup>26</sup> After residents subscribe to these services, they will receive their respective garbage and recycling bins. Garbage collection occurs weekly and recycling collection takes place every other week on the same day as garbage pickup.<sup>27</sup> In addition to DSI’s services, there is also the Rice County Recycling Center and Landfill located halfway between Northfield and Faribault off of Highway 3 and an organic compost/yard waste disposal site between Northfield

---

<sup>24</sup> Carleton, "Transportation: Enterprise Car Share."

<sup>25</sup> Northfield, "Solid Waste: Garbage and Recycling."

<sup>26</sup> Dick’s, "Yard Waste Hauling Services."

<sup>27</sup> Northfield, "Solid Waste: Garbage and Recycling".

and Dundas on Armstrong Road.<sup>28</sup> DSI's services enable residents to easily participate in waste management practices, promoting the practice of recycling and composting.

#### b) Northfield Curbside Composting

Northfield Curbside Composting aims to reduce waste and lower local GHG emissions. They achieve this by offering to collect and then compost household organic waste from local residents. After subscribing to their services, the household receives a 5-gallon bucket and compostable bag liners. Throughout each week, the household can fill the bucket with food scraps, soiled paper, and yard waste. Each week the waste will be collected before being composted and turned into soil by the company.<sup>29</sup> Northfield Curbside Composting currently provides services to 325 households (about 5% of the 6,000 households) in Northfield.<sup>30</sup> The company makes it easy for residents to engage in a sustainable behavior that reduces the amount of food waste in the Rice County Landfill. This is critical given that food waste releases methane, a harmful GHG, when it decomposes in landfills.<sup>31</sup>

### 4. Local Government Action

#### a. Safe Routes

The Safe Routes state program, whose main goal is to make walking and biking to school safer for kids, conducted a study of Northfield public schools in 2009. Since then, the city has made several infrastructural changes based on the findings and recommendations. To find out more information about Safe Routes, please see Thu Nguyen and Caroline Harvey's paper on transportation in the City of Northfield.

---

<sup>28</sup> "Compost/Yard Waste."

<sup>29</sup> "Curbside Composting."

<sup>30</sup> Bailey Shatz-Akin, May 2018.

<sup>31</sup> EPA, "Facts and Figures About Materials, Waste, and Recycling: Advancing Sustainable Materials Management: Facts and Figures."

### b. Rain Barrel Incentive Program

In 2012, the city of Northfield began providing financial incentives for property owners to participate in using rain barrels to reduce storm water runoff.<sup>32</sup> The Rain Barrel program is based on giving reimbursements to property owners after they have undergone an application and installation process. Rain barrels provide an easy way for residents to conserve water and reduce runoff by collecting water from roof downspouts. After capturing this water, it can be reused to water plants or gardens on the property. Each utility account can install up to 3 rain barrels. After installation, the account holder will receive a \$20 credit on their utility bill.<sup>33</sup>

A highlight of the program is that it is available to all holders of utility accounts in Northfield. To participate, a relatively short application needs to be completed, verifying that you have installed the rain barrel, in addition to a staff visit to verify installation.<sup>34</sup> This program is funded through Storm water Utility Fees.<sup>35</sup> Over all, this program provides a financial incentive for local Northfield residents to make a simple, easy adjustment that will enable residents to conserve water long term.

### c. Rain Garden Cost Share Incentive Program

Like the Rain Barrel program, the Rain Garden Cost Share program incentivizes local residents to reduce storm water pollution and localized flooding by installing a rain garden, a native plant garden intentionally designed and constructed to reroute storm water.<sup>36</sup> The program reduces the costs of installation by providing each participant with a 50% reimbursement on the cost of materials and equipment up to a \$250 maximum reimbursement. To apply, one can fill

---

<sup>32</sup> Northfield, "Rain Garden/Rail Barrels/Native Plant Rebate."

<sup>33</sup> Ibid.

<sup>34</sup> Northfield, "City of Northfield Rain Barrel Rebate Information."

<sup>35</sup> Ibid.

<sup>36</sup> Ibid.

out the form on the City of Northfield’s website.<sup>37</sup> More information on specific factors to consider for installing rain gardens can also be found on that site.

Rain gardens redirect storm water, moving it away from roof downspouts, driveways, and sidewalks, and towards areas with native plants instead. This reduces runoff into the street, thereby reducing the amount of storm water that enters the Cannon River through the local sewer system. By preventing the storm water runoff, residents protect the quality of lakes, rivers, and groundwater. Rain gardens also add natural beauty to a home and provide local wildlife habitat for beneficial birds and butterflies.<sup>38</sup>

#### d. Native Plant Rebate Program

The Native Plant Rebate Program “promotes the growth and development of native plant communities in Northfield.”<sup>39</sup> The program offers rebates to help cover the costs of construction of native plant gardens. Participants who qualify will receive a credit for 33% of the cost up to \$75. More information on the rebate program and the application can be found on the City of Northfield’s website. Benefits of these gardens include positive impacts on pollinator organisms like bees as well as less storm water pollution from runoff. Native plants establish deep root systems that prevent soil erosion and promote water infiltration, rather than runoff that can lead to the pollution of local water bodies like the Cannon River.

### B. *Future Work*

The GreenStep Cities Program is a Minnesota-based voluntary program that Northfield declared its commitment to in 2011. This program monitors the progress of every enrolled city. While the City has initiated several initiatives, according to the website, several tasks remain that

---

<sup>37</sup> Ibid.

<sup>38</sup> Ibid.

<sup>39</sup> Ibid.

Northfield has either yet to begin or complete. Seeing as Northfield is still publicly committed the program, the following are likely the future steps: new green buildings, building reuse, higher density of housing and commercial use, efficient and healthy development patterns, efficient highway-oriented development, and efficient city fleets amongst others.<sup>40</sup> However, there are no future steps explicitly listed that directly address personal behavior. This presents an opportunity for Northfield's CAP to cover this existing gap in the GreenStep Cities Program, enabling Northfield to further maximize the positive effects that can accompany changes in behavior, like GHG emission reductions and cost-savings.<sup>41</sup>

Additionally, the Greater Northfield Sustainability Collaborative (GNSC) has a website that serves as a hub for many resources, including information on efforts by local organizations and exemplary CAPs from other municipalities. Incorporating this website in the City's efforts can help publicize its programs given the organization's role as a central location for information sharing and collective action. According to a PowerPoint from the GNSC, planning for storm water and flooding is and will continue to be a city priority.<sup>42</sup> Northfield has experienced severe flooding of the Cannon River in recent years, so this specific local goal is one of the four initiatives alongside developing a CAP.<sup>43</sup> Maintaining and expanding existing programs that deal with storm water and potential flooding, such as the rain barrel and rain garden programs, will also fall under future work for the City of Northfield.

---

<sup>40</sup> Tim Behrendt, "Greenstep Cities Program," City of Northfield, Minnesota.

<sup>41</sup> Michael P. Vandenberg.

<sup>42</sup> "How Will Climate Change Affect Northfield?," Greater Northfield Sustainability Collaborative.

<sup>43</sup> Philip Weyhe, "City Board Will Help Develop Climate Action Plan," *Northfield News* 2018.



## V. Possible Actions Northfield Can Take to Address Personal Behavior

By comparing the initiatives and policies of similar municipalities, strategies can be identified that could be adapted to Northfield. The effectiveness of these policies can be analyzed to develop a list of the most promising actions for Northfield. Lastly, the social, economic, and environmental benefits of the strategies can be analyzed to see what the specific, estimated benefits will be to Northfield residents and households.

### A. *Strategies of Similar Municipalities*

In order to understand effective policy measures that could be taken in Northfield, it is important to first look at actions being taken by similar municipalities. This section analyzes the specific and general policies related to personal behavior that have been enacted by St. Louis Park, MN, Evanston, IL, Bedford, NY, Urbana, IL, and Dubuque, IL. These municipalities' CAPs are worth reviewing given that they are referenced by the GNSC as exemplary CAPs. These municipalities' strategies focused on education, financial incentives, restrictions and regulations, infrastructure changes, and surveys to address personal behavior's role in climate change. Examining the effectiveness of their actions being taken will help inform possible policy measures for Northfield.

One of the general strategies outlined in successful CAPs is education, especially for those who are low-income. St. Louis Park and Evanston provide low-income residents with information on weatherization programs for which they may be eligible.<sup>44</sup> <sup>45</sup> Bedford also extends this information to seniors.<sup>46</sup> The dissemination of information and education is also often found in the promotion of composting in a city. Dubuque focuses their compost education

---

<sup>44</sup> "St. Louis Park Climate Action Plan," The St. Louis Park Environment and Sustainability Commission.

<sup>45</sup> "Evanston Climate Action Plan," City of Evanston Website.

<sup>46</sup> "Town of Bedford Climate Action Plan," Town of Bedford.

outreach on children in schools because they internalize the benefits of composting quickly, can bring the information home to their parents, and advocate for adoption of composting activities by the family.<sup>47</sup> Evanston also suggests education in its CAP because learning of the financial benefits of upgrading to more efficient appliances encourages residents to make the switch on their own or via the appropriate programs, if eligible.<sup>48</sup>

Several municipalities proposed discounts and other economic incentives to change individuals' behavior. Urbana decided to implement tax incentives to increase the use of more energy efficient home appliances after they surveyed residents and found that these financial incentives would be effective.<sup>49</sup> Similarly, Dubuque planned to offer discounts or tax exemptions for energy efficient improvements, like HVAC upgrades that are Energy Star compliant.<sup>50</sup> Interestingly, Dubuque also brainstormed offering coupons and vouchers for commuters to walk to work.<sup>51</sup> Tax incentives and other financial incentives, like rebates and reimbursements, can apply to many different specific actions to decrease GHG emissions. However, it seems that these municipalities preferred to search for funding options through state or national programs whenever possible, rather than funding the incentives with local resources.

On the other hand, restrictions and regulations are also an option to deter poor personal behavior, rather than promote better behavior. Evanston requires Energy Star appliances in new development.<sup>52</sup> Urbana, in addition to proposing tax incentives, is making Energy Star appliances a requirement for homes as well.<sup>53</sup> Overall, these municipalities focus on the reinforcements that incentive rather than de-incentivize particular behaviors.

---

<sup>47</sup> Theodoros Giannakouros Jason Schatz, "Dubuque Community Climate Action and Resiliency Plan."

<sup>48</sup> "Evanston Climate Action Plan".

<sup>49</sup> "Urbana Climate Action Plan," City of Urbana, Illinois Website.

<sup>50</sup> Jason Schatz, Theodoros Giannakouros. "Dubuque Community Climate Action and Resiliency Plan."

<sup>51</sup> Ibid.

<sup>52</sup> "Evanston Climate Action Plan".

<sup>53</sup> "Urbana Climate Action Plan".

Another general strategy discussed in many CAPs is changes in infrastructure, mostly focused on promoting car sharing programs. St. Louis Park aimed to make general infrastructure changes to reduce the parking demand, but did not propose specific recommendations.<sup>54</sup> Similarly, Evanston wanted to make changes to expand designated parking for car share vehicles.<sup>55</sup> They outline how putting bike share stops in front of the most used buildings would increase use within their CAP. Dubuque planned to make parking for car share vehicles free or to give those vehicles priority parking spots.<sup>56</sup> Additionally, Urbana updated their city's infrastructure to make walking more accessible.<sup>57</sup>

In looking at the CAPs of other municipalities, it is apparent that each one has been tailored to the specific needs of the region. The implementation dates and timelines vary, and there are differences in the implementation strategies of each plan. In fact, several CAPs include public surveys to identify the needs of the people and inform decisions that maximize the impact of the specific municipality's CAP. For instance, Dubuque conducted a survey to determine where car sharing stations should be located.<sup>58</sup> Looking at other municipalities' CAPs is incredibly helpful, but there should not be a "one-size-fits-all" approach to developing Northfield's CAP. Surveys can help tailor general strategies for decreasing GHG emissions to what Northfield needs.

While there are many great ideas in these CAPs, there is also one recurring strategy that may not be particularly effective. Nearly every CAP had a recommendation to simply "encourage" a behavior (example: "encourage municipal composting"). While encouraging sustainable personal behavior is the ultimate goal, actions like sharing information, educating

---

<sup>54</sup> "St. Louis Park Climate Action Plan".

<sup>55</sup> "Evanston Climate Action Plan".

<sup>56</sup> Jason Schatz.

<sup>57</sup> "Urbana Climate Action Plan".

<sup>58</sup> Jason Schatz.

people, offering financial incentives, requiring equipment that is up to standards, and surveying the needs of the people should be explicitly listed in Northfield's CAP to create goals that are specific and attainable.

### *B. Effectiveness of Different Behavioral Options*

To begin, community engagement and education would be effective in Northfield when it comes to modifying personal behavior. Proactive education is crucial because “in the case of climate change, learning from experience is learning too late.”<sup>59</sup> However, some programs are more effective than others. In researching education related to climate change, several commonalities have been identified in effective programs. It has been shown that education programs implemented in schools have been effective, but the specific audience must be taken into consideration for material.<sup>60</sup> Students in kindergarten through grade 6 should primarily be exposed to environmental appreciation, environmental sensitivity, and ecological concepts, while issues, values, investigation, and action skills should become the major emphasis in students' later years (Grades 6-12).<sup>61</sup> Additionally, “focusing on personally relevant and meaningful information and using active and engaging teaching methods.”<sup>62</sup> When working with both children and adults, it is also important to avoid of negative emotions that can cause “distancing” by highlighting hopefulness and potential actions to mitigate the problem. Those implementing the education programs should be cognizant of the phenomenon known as “climate fatigue,”

---

<sup>59</sup> Juliette Rooney-Varga Tamara Shapiro Ledley, Frank Niepold, "Addressing Climate Change through Education," *Oxford Research Encyclopedias: Environmental Science* (2017).

<sup>60</sup> Richard R. Plate Martha C. Monroe, Annie Oxarart, Alison Bowers, Willandia A. Chaves, "Identifying Effective Climate Change Education Strategies: A Systematic Review of the Research," *Taylor and Francis Online* (2017).

<sup>61</sup> ACEE, "What Is Excellent Climate Change Education? A Guidebook Based on Peer-Reviewed Research and Practitioner Best Practice."

<sup>62</sup> Martha C. Monroe.

which is “an experience of feeling overwhelmed by the climate crisis,” so it can be avoided in education programs.<sup>63</sup>

Additionally, surveys can be an effective strategy because understanding public attitudes and behavior is essential when designing and implementing policies and programs to combat climate change. Differences in worldviews, perceptions of personal and social risks, understandings of efficacy, perceptions of personal responsibility, and social norms are examples of barriers to action.<sup>64</sup> Therefore, surveys can be an effective way to learn more about the community. To be effective, they should include a large, representative sample of the general population. Additionally, surveys are relatively easy and practical, making them an effective task to undertake given the simplicity of the action.<sup>65</sup> By collecting the responses of a wide range of community members, Northfield can better understand the needs and attitudes of its community. This enables the municipality to create more specific policies that account for any existing psychological barriers to action. Clearly, cultivating buy-in from individuals, households, and the Northfield community is essential for any policy to be effective.

Another strategy included in other CAPs are financial incentives, which can include a range of tax/fee rebates that support positive, sustainable actions and penalties that discourage bad behavior. For these types of policies to be effective, they need to be continuously evaluated and updated to align existing regulatory frameworks and reflect changes in the market and behavioral norms. When implemented effectively, subsidies and tax/fee rebates lower the financial market barriers to good behavior, for instance, funding energy efficient HVAC

---

<sup>63</sup> May Boeve.

<sup>64</sup> "Citizen Participation and Community Engagement in the Local Action Plan Process: A Guide for Municipal Governments," Centre for Sustainable Community Development, Partners for Climate Protection.

<sup>65</sup> Jon Krosnick Penny Visser, Paul Lavrakas, "Survey Research," *Stanford Communication Department*.

equipment purchases or shuttle fares.<sup>66</sup> In creating an economic instrument to create financial incentives (price signals), this strategy leverages market dynamics to effectively encourage a targeted action.<sup>67</sup> An advantage of this type of policy is economic efficiency; the ability to distribute the economic burden of reducing GHG emissions in this case.<sup>68</sup> However, the disadvantage is that these policies affect various socioeconomic groups differently as language, education, and financial barriers may still remain.

As previously discussed, governments can provide financial incentives for positive behavior, but they can also create regulations that set a specific standard, ensuring that a negative behavior will stop. In the context of the similar municipalities' CAPs, several cities suggested implementing a regulation that requires households to use Energy Star appliances, rather than providing discounts or rebates for those appliances. When looking at barriers to regulation, powerful interest groups are often identified as a challenge to getting this type of regulation passed.<sup>69</sup> However, on the municipal level, it is unclear whether there would likely be a major industry or player who would be opposing the requirement of Energy Star appliances, for instance. Additionally, there is not a lot of information on regulation on the municipal level. Historically, the EPA and state programs have taken on the task of regulations and restrictions. The effectiveness of regulation on a national scale has been repeatedly proven, but there is less certainty surrounding the impact of local regulation.

In addition to regulations, other municipalities focus on making physical infrastructure changes to primarily promote walking and car sharing programs. Research shows that effective increases in city walkability can be achieved by installing street furniture like benches and

---

<sup>66</sup> "Financial Incentives: Policy Overview and Good Practices."

<sup>67</sup> "Economic Incentives for Behavioural Change."

<sup>68</sup> ACEE, "Financial Incentives for Energy Efficiency."

<sup>69</sup> Andy Green, "Building More Effective Regulation."

prioritizing spaces that engage pedestrians and cyclists. To do so requires investments that provide active retail stores, street side cafes, and restaurants along key corridors, and reducing the negative impact of parking lots and traffic on the pedestrian experience. Investing in making amenities appealing and accessible is effective because it invites people to walk around and explore the area.<sup>70</sup> For car sharing, these changes include expanding designated priority parking for cars and possibly making parking for shared vehicles free. A study conducted on the effectiveness of car sharing found that the one-way, versus round trip, option is the most feasible to guarantee a large amount of participation from the community.<sup>71</sup> Another component of effectiveness for car sharing is whether or not the program is free floating or station-based. Free floating means that cars do not need to be returned to a specific location, whereas station-based dictates that the cars must be returned to designated areas. To be effective, the frequent destinations of city residents should be determined to decide whether free-floating or station-based is best.

### *C. Most Promising Recommendations for Personal Behavior in the Northfield CAP*

As previously stated, the household and transportation sectors are large contributors to climate change, so targeted behavior changes in these areas will provide Northfield with the opportunity to make a significant impact. However, specifically regarding personal behavior initiatives, effectiveness must go beyond the technical potential of a proposed program to result in emission reductions. The plasticity of the targeted behavior and policy feasibility also contribute to the effectiveness of a policy, program, or law. These are key factors to consider given that people can be resistant to change, and habits can be hard to break. Lastly, policies

---

<sup>70</sup> Alex Davies, "Easy, Proven Ways to Make Cities Better for Pedestrians."

<sup>71</sup> Sachin Govind William Tong, Ankit Agarwal, David Xu, "2016: Analysis of Effectiveness of Varying Car-Sharing Business Models," *Illinois Math and Science Academy Digital Commons* (2016).

aimed at small, relatively painless behavioral changes like turning off the lights can lead people to believe they are making enough of a change. In reality, they are simply curtailing the problem rather than directly combating the source of the issue. In conclusion, the most impactful, efficient strategies are those that capitalize on areas where behavior can easily be influenced while simultaneously achieving the CAP's goals.

We have developed a list of the most promising actions based on strategies from similar municipalities, existing literature, and our judgement based on our understanding of Northfield. These actions fall under the broad categories of technology upgrades, continued support and expansion of current initiatives, and community outreach. It is important to note that this list is not exhaustive, but merely a starting point from which Northfield can build in the future.

### 1. Promote Weatherization

Weatherization, modifying one's home to be better suited for the climate and therefore make it more energy efficient, is very promising in regard to decreasing the GHG emissions of houses in Northfield. In practice, this includes auditing homes to understand individuals' energy use, improving insulation to decrease the required heating/cooling, fixing air leaks, improving ventilation, controlling moisture levels, and other climate-specific changes.<sup>72</sup> In Northern Minnesota, the average low temperature in the coldest times of the year is 8° F, and the average high temperature in the warmest time is 83° F.<sup>73</sup> An average home uses a significant amount of energy for heating and cooling throughout the year to be livable and comfortable. Weatherization is also promising because weatherization has behavioral plasticity of 90%, which is very high and indicates that this action should be easily adopted by people.<sup>74</sup>

---

<sup>72</sup> "Weatherize," Energy.gov.

<sup>73</sup> "Climate Minnesota - Saint Paul," U.S. Climate Data.

<sup>74</sup> Michael P. Vandenbergh.



The environmental impacts of weatherization are enormous; 25.2 million tons of carbon emissions would be avoided with widespread adoption of this practice.<sup>75</sup> That being said, weatherization does not only reduce one's carbon footprint. Sulfur dioxide, nitrogen oxide, particulate matter, and volatile organic compound levels can also decrease. Economically, weatherization is advantageous because the heating and cooling bills of residents would decrease, saving households money long-term. The savings could then be directed towards other important or costly parts of life, like education.<sup>76</sup> Seeing as the poverty rate is over 10% in Northfield, this practice could greatly assist low-income families. Weatherization also makes homes generally more comfortable to live in.

There are also funding options available for weatherization. On the Minnesota Commerce Department website, the Rice County provider is the Three Rivers Community Action. Three Rivers provides weatherization for homes that qualify, prioritizing the elderly, disabled people, and households with children.<sup>77</sup> There is an application process, and we recommend that Northfield municipality host sessions with people, possibly volunteers, who are familiar with the application available to assist in filling out applications. Possible locations for these sessions are City Hall, the Northfield Public Library, or even a public park. Additionally, we recommend that the municipality educate the public on the benefits of weatherization by posting information on their website and posting public graphics in town with easily understandable information. Those who can afford the upgrades without subsidies should also be aware of the positive impacts, as they can still reap the benefits. The Center for Energy and Environment has resources for

---

<sup>75</sup> Ibid.

<sup>76</sup> "Town of Bedford Climate Action Plan".

<sup>77</sup> ThreeRivers, "Weatherization."

Minnesota residents who wish to take out loans to complete energy efficient projects like weatherization.<sup>78</sup> Additionally, Xcel offers home audits to assess for energy efficiency.<sup>79</sup>

## 2. Upgrade Home Appliances

When upgrading to more efficient versions of home appliances, many sources focus on refrigerators because they are the appliance that uses the greatest amount of energy in most households. Additionally, stoves, clothes washers and dryers, and dishwashers are large energy sinks and therefore effective in obtaining savings through upgrades.<sup>80</sup> However, it is worth noting that efficient technology can apply to several types of appliances. One potential action the municipality could take is to conduct an organized survey or audit to determine which appliances are the largest energy-wasters in the area. The use of more efficient appliances has been recognized to have a high behavioral plasticity of 80%, so it is worth pursuing.<sup>81</sup> The fact that this intervention requires a single action, the purchase of the new technology, rather than multiple daily ones increases its level of effectiveness given its lower task complexity.

An estimated 14.7 million tons of carbon would be conserved if efficient appliances were installed on a large scale.<sup>82</sup> It is also estimated that if every major home appliance in the United States increased its energy-efficiency by 10-30%, the demand for electricity would decrease by the equivalent of 25 large power plants.<sup>83</sup> The economic benefits for residents is also significant; households can save up to \$400 by switching to efficient appliances.<sup>84</sup>

---

<sup>78</sup> CEE, "Home Energy Loan Program."

<sup>79</sup> Xcel, "Programs and Rebates."

<sup>80</sup> EarthEasy, "Energy-Efficient Appliances."

<sup>81</sup> Michael P. Vandenbergh.

<sup>82</sup> Ibid.

<sup>83</sup> EarthEasy.

<sup>84</sup> Ibid.

There are various funding options available. Energy Star, a program managed by the EPA, identified several specific rebates and discount sources in Northfield, including a buy-down/discount for lightbulbs, a rebate program for water heaters, and another rebate program for boilers.<sup>85</sup> All of these are funded by Xcel Energy, which also lists many rebate opportunities on its website.<sup>86</sup> Given the existence of a wide range of funding options, the municipality should consider rebate application sessions as a potential action, as well as educational programs to inform the public about the benefits of switching to more efficient appliances. Once again, we believe that the city can make these resources more accessible and well-known to the public.

### 3. Upgrade HVAC Equipment

Another field that relates to residential heating and cooling is HVAC (heating, ventilation, and air conditioning) equipment. This is a big umbrella term, and it can encompass anything from water heaters to fan upgrades. Even if the equipment is up-to-date and theoretically efficient, homes still need to be examined to ensure that it is working properly. Like weatherization, upgrading HVAC equipment can help mitigate the effects of climate change on temperatures in the city. This action also has a behavioral plasticity of 80%, meaning it is very likely that households would adopt this change given the correct incentives.<sup>87</sup>

The audit, repair, replacement, and improvement of HVAC are popular in regard to decreasing emissions; the cities of Bedford, St. Louis Park, Urbana, and Dubuque all, in the very least, acknowledge HVAC equipment in their CAPs. The environmental impacts of installing efficient HVAC equipment are significant. 10.7 million tons of carbon would not be emitted if HVAC improvements were fully taken advantage of on a national scale, and an additional 3.7

---

<sup>85</sup> "Energy Star Rebate Finder: 55057 Zip Code."

<sup>86</sup> Xcel.

<sup>87</sup> Michael P. Vandenbergh.

million tons would be conserved nationally if the filters on HVAC equipment were changed regularly.<sup>88</sup> The economic benefits include reduced energy costs for residents.<sup>89</sup> Finally, human health could be improved with more efficient HVAC equipment. Perhaps this is not intuitive because air pollution, such as smog, is now widely-recognized as a problem, but indoor air contamination levels can be 25 times higher than outdoor air levels.<sup>90</sup> Air sealing, plugging leaks, has been noted as particularly promising for decreasing monthly energy bills.<sup>91</sup> Fixing leaks increases the comfort of a home while also lowering heating and cooling costs.

We recommend that the municipality educate the public through programs and pamphlets. Additionally, they can make resources for financial assistance more accessible and well-known in Northfield. Many of these funding opportunities require applications, so sessions that help people complete these applications could be promoted or combined with the weatherization sessions. Additionally, the municipality should partner with Streitz,<sup>92</sup> a local HVAC contractor and other house service companies during this process to help better understand the technology and navigate upgrades. These relationships will be quite useful in obtaining the goal of updating HVAC equipment. The Energy Assistance Program from the Minnesota Commerce Department allows for home heating system repair or replacement for low-income families. The Northfield provider is the same as the resource for weatherization assistance: Three Rivers Community Action. This application can be found in both English and Spanish, which is well-suited for Northfield because approximately 12% of residents speak Spanish.<sup>93</sup> The application period for 2018 is October 2017 through May 2018, so program scheduling for any given year should account for this timeframe. Similar to weatherization, the

---

<sup>88</sup> Ibid.

<sup>89</sup> Moran, "The Benefits of Energy Efficient Hvac."

<sup>90</sup> Ibid.

<sup>91</sup> Entek, "How to Save Money with Energy Efficient Hvac Systems."

<sup>92</sup> Streitz, "Streitz Heating and Cooling: 72 Degrees Air Conditioning and Heating."

<sup>93</sup> "Northfield, Mn."

Center for Energy and Environment has resources for Minnesota residents who want to take out loans to complete energy efficient projects, including heating systems and central air conditioning.<sup>94</sup>

#### 4. Implement Car Sharing

One opportunity to improve transportation is car sharing, a program of hourly car-rentals that are returned to an accessible location for other people to use. As explained in the “Past Work” section, Carleton currently participates in a car-sharing program with Enterprise.<sup>95</sup> The city should explore expanding this already-established program to the rest of the city in collaboration with Enterprise. If the city is looking for options beyond Enterprise, they may also investigate ZIPcar or car2go, two other hourly car rental companies. Urbana’s initial car share program was made to suit the needs of 500 participants given a total population of 42,000.<sup>96</sup> Therefore, Northfield’s initial program may need to accommodate an estimated 250 people since the population is approximately 20,000.<sup>97</sup> Additionally, Northfield would also have to promote these programs once they are established and provide educational materials to the public to ensure they are aware of the benefits of car-sharing. We also recommend that the city conduct surveys to determine high-traffic areas that would benefit most from a car-sharing stop. This program will be most effective if it can close the gap of coverage for transportation. Since Northfield is relatively rural, driving is the main mode of transportation for many. It will be critical to determine the driving patterns and needs of residents in order to decide on a free floating versus station-based program as well.

---

<sup>94</sup> CEE.

<sup>95</sup> Carleton.

<sup>96</sup> "Urbana Climate Action Plan".

<sup>97</sup> Data USA, "Northfield, Mn."

Transportation has been long-identified as a problem area for emissions. In fact, car emissions cause 75% of carbon monoxide emissions in the US.<sup>98</sup> With that in mind, car-sharing has many environmental benefits. For example, on average, Car2go users decreased their greenhouse gas emissions by 10%.<sup>99</sup> Additionally, it has been found that car-sharing also encourages walking and biking for users, bolstering the benefits of decreased emissions even further.<sup>100</sup> The economic benefits are also persuasive. For residents, these include increases in gas and oil savings as well as savings from less car maintenance. The city would have to pay for less parking infrastructure and fewer road expansions. There are even benefits for non-users because those who use shared cars eliminate the number of cars on the roads and in parking spaces.

Unfortunately, because this program would fall under the purview of the city rather than the individual residents like some of the other proposed actions, there are far fewer funding options available. This initiative may have to be realized primarily through government spending or in partnership with Carleton. However, intuitively, the overall cost could be lower if the city were to simply expand the Carleton program with Enterprise to add more cars and stops, rather than starting a new program from scratch with a new company.

## 5. Implement Bike Sharing

On a similar note, bike sharing could also be expanded from the current programs at Carleton and St. Olaf to the rest of the city. Carleton uses the company Zagster, and the first four hours of every ride are free.<sup>101</sup> Because Northfield is a relatively small town, we believe that most users would not go over that four-hour period to complete casual errands, exercise, or go

---

<sup>98</sup> Linda C. Brinson, "How Much Air Pollution Comes from Cars?."

<sup>99</sup> Katy Steinmetz, "Study: The Serious Environmental Potential of Car-Sharing."

<sup>100</sup> Irene Lane, "Environmental Benefits of Car Sharing."

<sup>101</sup> Carleton, "Sustainability," Carleton College.

out for meals. Carleton has two “parking” stations around campus. However, the city should investigate the feasibility of working in collaboration with Zagster to add more bikes to the program, as there are currently only 10 bikes, and additional stops in town where residents frequent.<sup>102</sup> If Zagster is not the preferred company of the city or they wish to begin their own separate program, they should investigate the logistics of working with another company or starting a new account with Zagster. We also recommend that the city conduct surveys to determine high-traffic areas that could benefit from having a bike-sharing stop.

As one would expect, bike-sharing programs decrease fuel consumption and therefore GHG emissions.<sup>103</sup> In cities that have bike sharing programs, there are often reports of better local air quality.<sup>104</sup> There are also several health benefits of biking, like improvements in cardiovascular health, stress levels, flexibility, and body fat.<sup>105</sup> The economic benefits, both on a small and larger scale, cannot be underestimated. Not only would the individual spend less money on cars, gas, and maintenance, but the local economy could flourish. A study conducted in local areas in Washington DC surrounding bike share stations “concluded that business owners and managers had a generally positive attitude toward public bike sharing. 70% reported a positive impact on neighborhoods due to greater access to these areas.” Moreover, 16% of respondents stated that they engaged in new spending at these neighborhood businesses because of the increased accessibility of the area provided by bike sharing.<sup>106</sup> This suggests that bike sharing can increase economic productivity in an area.

---

<sup>102</sup> Ibid.

<sup>103</sup> Alexandros Nikitas, "The Global Bike Sharing Boom- Why Cities Love a Cycling Scheme."

<sup>104</sup> Medium, "The Economic Benefits of Bike Sharing."

<sup>105</sup> BetterHealth, "Cycling- Health Benefits."

<sup>106</sup> Medium.

We run into the same predicament with this action in terms of funding as car-sharing; it may have to be incorporated into the city budget. However, once again, it may be more cost-effective to expand the Zagster program from Carleton rather than start a new program.

## 6. Promote More Awareness of Walking

When thinking about decreasing GHG emissions through changes in transportation modes, walking usually comes to mind. The environmental impacts of walking mostly come from avoiding the emissions from driving, which we have already discussed at length. The health benefits of walking are numerous; it helps individuals maintain healthy weights, manage high blood pressure, strengthen muscles, and improve mood.<sup>107</sup>

However, in a rural area such as Northfield, encouraging walking can be quite difficult. The tool Walk Score gives Northfield a score of 28 out of 100 for walkability, meaning that it is a largely car-dependent location.<sup>108</sup> Northfield has already done a lot of work to improve walkability through infrastructure changes as a result of the Safe Routes study, and several maps have been made to show walking routes. When looking for an action for the municipality to take to encourage more people to walk, it is important to consider that walking is unlikely to result in significant GHG emission reductions “unless [it is] adopted as temporary responses to emergencies or there are changes in social norms, lifestyles, or ideas of well-being, such as a more widespread belief that bicycling and walking have health benefits that compensate for time spent or are signs of a good community.”<sup>109</sup> We recommend that the city seek to change the culture around walking by distributing information in various forms, including mail flyers, posters, and other public information. This information can include the health benefits of

---

<sup>107</sup> Clinic Staff, "Walking: Trim Your Waistline, Improve Your Health."

<sup>108</sup> WalkScore, "Living in Northfield."

<sup>109</sup> Michael P. Vandenberg.



walking, as well as maps that have already been developed. The website Map My Walk lists over a dozen walking routes of various lengths in Northfield.<sup>110</sup> Additionally, the city of Northfield a map of approved parks and walking trails on its website.<sup>111</sup> Given that the existing resources are already available online, costs for this type of program should be low, encompassing time investments to share information and costs for educational materials.

## 7. Expand Curbside Composting

Another existing program that could be expanded to make a bigger impact is Northfield Curbside Composting. They currently have organic compost pickup for residents who are willing to pay for it, but that is only around 325 households.<sup>112</sup> Northfield has over 6,000 households, so there is a significant opportunity for expansion.<sup>113</sup> While in email communication with Curbside Composting, the company identified several roadblocks that they face trying to encourage people to regularly compost. To begin, many people do not have the knowledge needed to sort composting, and they can find the process intimidating. They also recognize the importance of teaching kids in schools about composting to cultivate this beneficial behavior from a young age. We suggest that Northfield collaborate with Curbside Composting and the local elementary, middle, and high schools to develop educational materials or short lesson plans that could be implemented at the schools. Additionally, they acknowledge that while their prices are quite low, cost is certainly a barrier to composting. Especially with the poverty rate of Northfield in mind, the annual up-front cost of around \$78 or the monthly price of \$6.50 can be infeasible.<sup>114</sup> The Northfield CAP should consider providing financial support to Curbside Composting, so their

---

<sup>110</sup> MapMyWalk, "Northfield Walking Trails."

<sup>111</sup> Northfield, "Northfield Parks, Open Space, and Trail System Plan (Map)."

<sup>112</sup> Shatz-Akin.

<sup>113</sup> USA.

<sup>114</sup> "Curbside Composting".

rates could decrease overall or provide discounts for specific groups of people in need of financial assistance.

Composting is an easy change to make that has a significant positive impact. Approximately 25% of Minnesota trash is comprised of food wastes and other materials that could be composted. This produces major increases in greenhouse gases, seeing as landfills are the single largest direct, human source of methane. Just a few of the environmental benefits of composting include enriching soil, reducing the need for chemical fertilizers, reducing methane production in landfills, and lowering carbon emissions. It also encourages the production of beneficial bacteria and fungi that break down organic matter to create humus, a rich nutrient-filled material.<sup>115</sup> Not only that, it has been shown that composting can help prevent storm water runoff. As mentioned earlier, Northfield has been extremely susceptible to flooding, and the CAP can address that by listing ways to encourage composting on a larger scale.<sup>116</sup>

#### 8. Continue to Support and Expand Existing Programs

As described above, there are currently many wonderful programs and organizations that already exist in the Northfield area. Not only would it be timelier and cost efficient to continue expanding these efforts rather than creating new ones with the development of Northfield's CAP, these are great resources for information and connections in the Northfield community. Based on the past work of Northfield, current initiatives like the aforementioned rebate programs for rain barrels, rain gardens, and native plants should be continued. In furthering current initiatives, we specifically recommend that the current programs first be evaluated on their effectiveness, then be adjusted as needed, and finally be expanded so these programs can reach their full potential. Expansion can be addressed in many ways, including additional outreach, development and

---

<sup>115</sup> EPA, "Composting at Home."

<sup>116</sup> Eureka, "Environmental Benefits of Recycling and Composting."

dissemination of educational materials to the public, and market-based initiatives undertaken by the municipality. Partnerships with local nonprofits and businesses can also be part of the expansion process, as they can provide expertise, stronger connections with the targeted audience, and more. For example, the CRWP is a local nonprofit “dedicated to engaging people in protecting and improving the water quality and natural systems of the Cannon River watershed.”<sup>117</sup> To accomplish this goal, the organization focuses on three main areas: community building in cities and towns, farmers and landowners, and wastewater management. Thus, this organization could prove useful when navigating the expansion of other existing storm water initiatives like the rain barrel and rain garden programs operated by the city.

#### 9. Develop Educational Materials and Programs

General education programs will be essential in altering the personal behavior of individuals. There are many communities that could be targeted as collectives. These materials and programs should focus on educating the community about the impact of individuals’ actions on climate change, sharing strategies for adapting to climate change, and cultivating a personal interest in and care for the environment and its inhabitants. See the “Effectiveness of Different Behavioral Options” section for more information on how to approach education. The elementary, middle, and high schools already bring together the entire youth of Northfield, and school-specific programming should be pursued by the city. Additionally, knowledge of the economic benefits of increased appliance and HVAC efficiency, and the various programs that exist, would empower the low-income families of Northfield to save on household expenses.<sup>118</sup> These materials should also be posted to the City of Northfield’s website where appropriate and

---

<sup>117</sup> "About Crwp," Cannon River Watershed Partnership.

<sup>118</sup> Martha C. Monroe.

perhaps the GNSC's website as well. As previously stated, we believe that the most effective changes in personal behavior combine policy changes that encourage environmentally friendly actions with community involvement and education.

## **VI. Project Design and Implementation Strategies for Personal Behavior Initiatives**

When developing specific policies and initiatives, it is important to note the nuances that come with dealing with personal behavioral changes. The following sections delve into the key reminders and difficulties for policy making regarding personal behavior. Section A focuses on concepts and questions to keep in mind when designing programs, whereas Section B identifies specific strategies or methods for effective policies, in addition to the pros and cons of these types of initiatives.

### *A. Key Policy Questions for Personal Behavior*

Given the nuanced and community-specific nature of developing laws targeted at changing personal behavior, there are several key ideas to keep in mind when designing policies and laws around this issue. First, a central concept for personal behavior policies is identifying and defining the target audience and behavior. Given that designing these policies requires understanding of the local context and individuals, it is imperative that policies pay attention to the desired audience when framing the programs and thinking about their implementation. Moreover, it is critical to consider the sorts of resources available to various segments of the population and whether individuals will have access to the program and resources that are critical to the policy's effectiveness. For example, if a policy targets public transportation by trying to increase car sharing, the pick-up and drop-off locations for rides need to be placed so that all community members can easily and readily access the cars, and times of service need to match

the differing needs of individuals. Additionally, policies should be flexible in the sense that they can be adapted to a world where the environment, technology, and behavior are changing. As aforementioned, effective policies rely on behavioral plasticity as well as technical potential. Low-impact solutions like the promotion of turning of the lights may appear to be an easier intervention and therefore more likely to achieve the desired GHG emission reduction, but high-impact areas where behavior can be modified must be the focus of future action. Moreover, technology is rapidly changing, so the best available tools should be regularly reviewed and implemented if possible and necessary. Not only should policies and programs maintain a degree of flexibility, but their marketing to people matters. The most successful interventions will occur when people are receiving information from trusted, reliable sources. These reliable individuals may look different to different audiences, so identifying these key figures in various segments of the Northfield community may assist the municipality in garnering the necessary buy-in and momentum required to drive a behavior change. However, this will take time, which is a limited commodity. Lastly, once a target behavior has been identified, a timeline for the program should be determined, noting that behavior can be resistant to change. By keeping these ideas in mind, policies will be better suited to address personal behavior's role in climate change in Northfield.

### *B. Design Principles for Initiatives Focused on Changing Behavior*

Again, the most promising programs have focused on household equipment, building efficiency, and motor vehicle efficiency.<sup>119</sup> To begin, we will discuss some key design principles of personal behavior policies, moving on to discuss the pros and cons of these principles. First, it is important to remember that there is no simple playbook to follow here. Policies must be carefully designed and tailored to the specific audience and behavior. A particular behavior and

---

<sup>119</sup> Michael P. Vandenbergh.

its key determinants should be identified prior to designing an intervention strategy.<sup>120</sup> In other words, understanding the existing attitudes, barriers to actions, and values that drive decision making need to be understood, in addition to the context of the situation. With this in mind, the first principle is that high-impact actions should be prioritized, meaning policies that will result in large GHG emission reductions. Next, laws and policies should “combine financial and social incentives with well-presented and easily accessible information from trusted sources at points of decision.”<sup>121</sup> Moreover, appealing to social norms can be an effective strategy. Cognitive costs also matter, meaning that habits can be very difficult to break, and people are more likely to pick their “default setting” if an alternative is not presented and supported. Another challenge with policies designed to influence personal behavior is when those policies require the use of unfamiliar technologies. Thus, quality assurance and training for the technology may be necessary. Lastly, behavioral changes will not result from policies, programs, or laws alone. The government must also work in conjunction with nongovernmental organizations, corporations, religious organizations, and education institutions. Examples of these include the Cannon River Watershed Partnership (CRWP), Growing Up Healthy (GUH), Xcel, Carleton College, St. Olaf College, and local public schools. The partners mentioned in the GNSC section of “Past Work” also reference potential contacts.

These design principles present Northfield with an opportunity to create targeted policies that can use the power of social and financial incentives to alter people’s behavior. In doing so, Northfield can curb the impact humans are having on climate change on a local level, which is critical. Personal behavior initiatives present a unique opportunity for policymakers to drive sustained change by incentivizing, teaching, and supporting the adoption of different behaviors.

---

<sup>120</sup> Christine Kormos Robert Gifford, Amanda McIntyre, "Behavioral Dimensions of Climate Change: Drivers, Responses, Barriers, and Interventions," *WIREs Clim Change* (2011).

<sup>121</sup> Michael P. Vandenbergh.

Unfortunately, there are also difficulties with personal behavior policy design and implementation. It requires a lot of time, energy, resources, and multilateral coordination. These policies cannot necessarily be quickly adapted from existing CAPs. Emphasis must be placed on understanding the needs, values, and thought processes of a wide range of individuals and households in Northfield. This will require time and research but will enable the local cohort of organizations and policymakers to make more informed decisions in the future. Regarding implementation, it may be difficult to get residents and households to deviate from their personal behavioral norm. Again, this is where behavioral plasticity matters, as policies focused on initiating change in areas of low plasticity will face many more psychological barriers to adoption. This is where development of labels, educational documents, and more will be essential because some of these changes will ask people to use new, unfamiliar technologies.

Lastly, how the impacts of climate change are distributed among a local population matter when developing effective initiatives. Northfield has a diverse population of residents, including college students, immigrants, and refugees. Communities of color, low income residents, and the elderly are especially vulnerable to climate health risks due to likelihood of exposure, low adaptive capacity, or a combination of factors. Given that many people living and working in Northfield belong to these marginalized communities, it is critical that any future CAPs consider how the effects of the plan will impact residents coming from different racial, ethnic, educational, religious, and socio-economic backgrounds. In fact, according to 2016 Census, the population of Northfield is 83.9% White, 7.7% Hispanic, and 3.87% Asian. Moreover, the poverty rate is 10.6%.<sup>122</sup> Due to the positionality of community members, some will be less capable of adapting to climate change given social and economic constraints than others, meaning that it then becomes the responsibility of the local government to create a plan

---

<sup>122</sup> United States Census Bureau, "Population and Housing Unit Estimates."

that is focused on ensuring the vitality and safety of all people living in Northfield. It also means that future actions taken by Northfield will need to be innovative and varied in approach given the different access and resources that various facets of people have. Regarding personal behavior, what makes one person change their behavior may not motivate someone else who has a different socio-economic status. By tailoring the CAP to specific groups of people, the city can create better targeted and effective policies.

## **VII. Conclusion**

Personal behavior, or the actions of individuals and households, must be a key part in the development of Northfield's CAP. Not only would it result in measurable decreases in carbon emissions and limit other detrimental environmental impacts, it would also provide economic benefits, empower local residents to engage in conversations about climate change, and decrease their vulnerability to its potential effects. It is necessary to prioritize the actions that have both the largest potential impact and the greatest likelihood of inducing behavior changes that can maintain a more sustainable future. Through the adoption of more energy efficient household and transportation technologies, expansion of existing programs, and development of educational materials we can re-shape the personal behavior of the Northfield community, perhaps creating a self-reinforcing set of behavior standards that can cultivate a new cultural context around the environment.

As with any environmental policy, there will be a set of challenges that should be anticipated. While there are many resources available and the return on investments will be beneficial, the initial cost of some of the most promising actions may appear as too large of a hurdle. Clear communication and accessible information about these programs and their benefits will be key tools to overcome potential apprehension related to initial costs. Northfield should



also focus its CAP on expanding existing programs that have proven to be effective and increasing awareness about the benefits of upgrading technology or implementing new programs. In addition, policies should try to focus on the behaviors that are less resistant to change in order to avoid psychological pitfalls or barriers to action.

Beyond program design and implementation, we must keep in mind the demographics of the communities in Northfield, tailoring the plan to the specific needs and behavior of those facets of people. Individuals and households who are more vulnerable will have various levels of access and ability to change their behaviors, which should be taken into account. On a similar note, a lot of inspiration can be taken from the CAPs of similar cities, but Northfield's specific climate, both cultural and environmental, should be considered, perhaps by surveying the needs of individuals before developing the plan. Overall, climate change is primarily a result of human action and inaction. Therefore, understanding existing behavioral patterns, as well as how to shift them through policy and other programming, is an important aspect of a CAP. This will only become more essential as time passes and the effects of climate change become more difficult to reverse.

## Bibliography

- "About Crwp." Cannon River Watershed Partnership.
- ACEE. "Financial Incentives for Energy Efficiency."
- . "What Is Excellent Climate Change Education? A Guidebook Based on Peer-Reviewed Research and Practitioner Best Practice."
- Agency, United States Environmental Protection. "Climate Impacts on Human Health."
- Behrendt, Tim. "Greenstep Cities Program." City of Northfield, Minnesota.
- BetterHealth. "Cycling- Health Benefits."
- Boeve, May. "Definition of Climate Fatigue." Lexicon of Food.
- Brinson, Linda C. "How Much Air Pollution Comes from Cars?".
- Bureau, United States Census. "Population and Housing Unit Estimates."
- Carleton. "Sustainability." Carleton College.
- . "Transportation: Enterprise Car Share."
- CEE. "Home Energy Loan Program."
- CHEJ. "Property Values Factpack." *Center for Health, Environment, and Justice* (2015).
- "Citizen Participation and Community Engagement in the Local Action Plan Process: A Guide for Municipal Governments." Centre for Sustainable Community Development, Partners for Climate Protection.
- "Climate Minnesota - Saint Paul." U.S. Climate Data.
- College, St. Olaf. "Campus Sustainability."
- "Curbside Composting."
- Davies, Alex. "Easy, Proven Ways to Make Cities Better for Pedestrians."
- Dick's. "Yard Waste Hauling Services."
- EarthEasy. "Energy-Efficient Appliances."
- "Economic Incentives for Behavioural Change."
- "Energy Star Rebate Finder: 55057 Zip Code."
- Entek. "How to Save Money with Energy Efficient Hvac Systems."
- EPA. "Climate Impacts on Ecosystems."
- . "Composting at Home."
- . "Facts and Figures About Materials, Waste, and Recycling: Advancing Sustainable Materials Management: Facts and Figures."
- . "What Climate Change Means for Minnesota."
- Eureka. "Environmental Benefits of Recycling and Composting."
- "Evanston Climate Action Plan." City of Evanston Website.
- "Financial Incentives: Policy Overview and Good Practices."
- Gerald Gardener, Paul C Stern. "The Short List: The Most Effective Actions U.S. Households Can Take to Curb Climate Change." (2009).
- Gifford, Leila Scannell. Robert. "Personally Relevant Climate Change: The Role of Place Attachment and Local Versus Global Message Framing in Engagement." (2013).
- Green, Andy. "Building More Effective Regulation."
- "How Will Climate Change Affect Northfield?". Greater Northfield Sustainability Collaborative.
- Jason Schatz, Theodoros Giannakouros. "Dubuque Community Climate Action and Resiliency Plan."
- Lane, Irene. "Environmental Benefits of Car Sharing."
- MapMyWalk. "Northfield Walking Trails."

- Martha C. Monroe, Richard R. Plate, Annie Oxarart, Alison Bowers, Willandia A. Chaves. "Identifying Effective Climate Change Education Strategies: A Systematic Review of the Research." *Taylor and Francis Online* (2017).
- Medium. "The Economic Benefits of Bike Sharing."
- Michael P. Vandenbergh, Paul C. Stern. "The Role of Individual and Household Behavior in Decarbonization." *Legal Studies Research Paper Series* 17 - 52 (2017).
- "Midwest."
- Moran. "The Benefits of Energy Efficient Hvac."
- MPR. "Climate Change in Minnesota: 23 Signs."
- Nikitas, Alexandros. "The Global Bike Sharing Boom- Why Cities Love a Cycling Scheme."
- Northfield. "City of Northfield Rain Barrel Rebate Information."
- . "Compost/Yard Waste."
- . "Northfield Parks, Open Space, and Trail System Plan (Map)."
- . "Rain Garden/Rail Barrels/Native Plant Rebate."
- . "Solid Waste: Garbage and Recycling."
- . "Strategic Plan Summary 2018-2020."
- "Northfield, Mn."
- Penny Visser, Jon Krosnick, Paul Lavrakas. "Survey Research." *Stanford Communication Department*.
- Robert Gifford, Christine Kormos, Amanda McIntyre. "Behavioral Dimensions of Climate Change: Drivers, Responses, Barriers, and Interventions." *WIREs Clim Change* (2011).
- Scientists, Union of Concerned. "Renewable Electricity Standards Deliver Economic Benefits." Shatz-Akin, Bailey. May 2018.
- "St. Louis Park Climate Action Plan." The St. Louis Park Environment and Sustainability Commission.
- Staff, Clinic. "Walking: Trim Your Waistline, Improve Your Health."
- Steinmetz, Katy. "Study: The Serious Environmental Potential of Car-Sharing."
- Streitz. "Streitz Heating and Cooling: 72 Degrees Air Conditioning and Heating."
- Tamara Shapiro Ledley, Juliette Rooney-Varga, Frank Niepold. "Addressing Climate Change through Education." *Oxford Research Encyclopedias: Environmental Science* (2017).
- ThreeRivers. "Weatherization."
- "Town of Bedford Climate Action Plan." Town of Bedford.
- "Urbana Climate Action Plan." City of Urbana, Illinois Website.
- USA, Data. "Northfield, Mn."
- WalkScore. "Living in Northfield."
- "Weatherize." Energy.gov.
- Weyhe, Philip. "City Board Will Help Develop Climate Action Plan." *Northfield News*, 2018.
- William Tong, Sachin Govind, Ankit Agarwal, David Xu. "2016: Analysis of Effectiveness of Varying Car-Sharing Business Models." *Illinois Math and Science Academy Digital Commons* (2016).
- Xcel. "Programs and Rebates."
- Ye, Su. "Minnesota Agricultural Exports." *Minnesota Department of Agriculture* (2018).

## Appendix

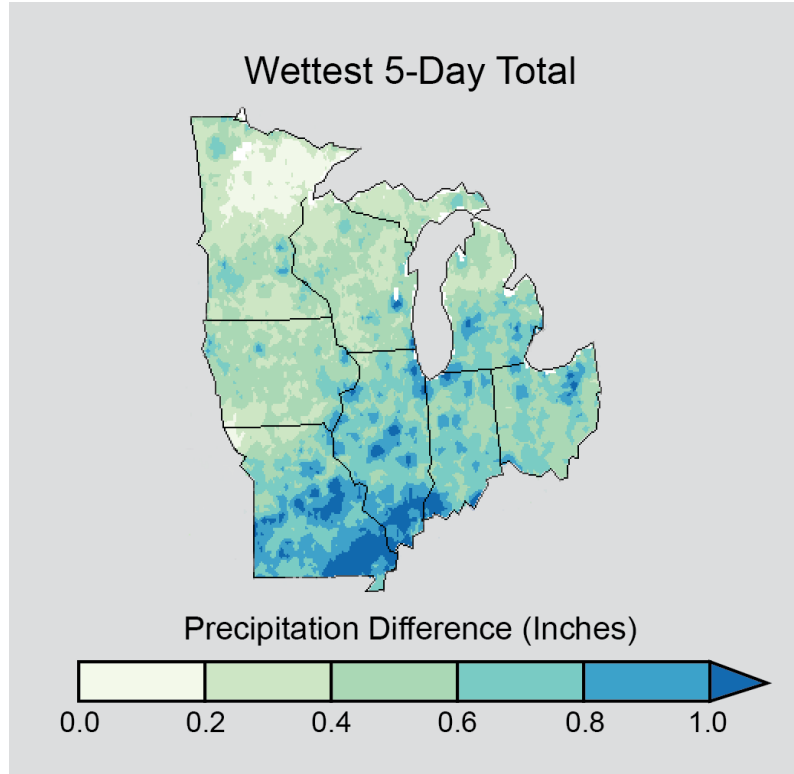


Figure 1: Increases in the amount of rain falling in the wettest 5-day period over a year, from the middle of the current century (2041-2070) relative to the end of the last century (1971-2000).<sup>123</sup>

---

<sup>123</sup> "Midwest."