Participation and the City

by
Minetta Van Strien

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Faculty advisors:
Associate Professor Thomas Princen, Chair
Assistant Professor Ming Xu

Abstract

The City of Ann Arbor is working on reducing its energy consumption and greenhouse gas emissions. Historically, it has focused on municipal operations but is now working on community-wide outreach. Currently the City's focus is on increasing home weatherization rates.

In this practicum I focused on creating an outreach and engagement model for the City. I chose "participation" as a core intervention strategy. Literature and case studies suggest that participation can be an effective intervention method, and one that could be used to address the City's constraints (e.g. financial, staff limitations). I suggested that the City could use participation to identify barriers preventing weatherization in the community, build relationships with the community, communicate the City's energy and greenhouse gas emission reduction targets, and engage and involve the community in finding local and applicable solutions. I argue that a participation strategy can be used to improve weatherization rates.

However, I also suggested that an engagement strategy making use of participatory methods would benefit from a broad focus on residential energy use, rather than a sole focus on weatherization, and would help achieve the City's goals of net greenhouse gas reductions.

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Background on the City of Ann Arbor's Energy Goals

In 2011, at the start of this practicum, the City of Ann Arbor Energy Office[1] had communicated to me the following energy and greenhouse gas (GHG) emission reduction goals (A. Brix, personal communication, February 2, 2011; N. Geisler, personal communication, October 12, 2011)[2]:

Municipal Operations:

- Carbon Neutrality by 2030
- 50% Reductions [GHG Emissions] by 2015 (Baseline 2000)
- 30% Renewable Energy by 2015

Community:

- 8% Reductions [GHG Emissions] by 2015 (Baseline 2000)
- 5% Renewable Energy by 2015

It had been determined by the City of Ann Arbor that greenhouse gas emissions would be used as the primary measure for accounting, as they capture a wide variety of concerns related to energy use by various City personnel (A. Brix, personal communication, April 21, 2011), such as energy security and climate change. The baseline year to measure the reductions against was 2000 (N. Geisler, personal communication, October 12, 2011). Historically the City had focused their attention on reducing energy use and improving energy efficiency in the municipal operations, but the City was now interested in expanding their focus community-wide (N. Geisler, personal communication, October 12, 2011). However, limitations to community-wide

[1] For the remainder of this paper, the *City of Ann Arbor Energy Office* is referred to as the "City." If the *City of Ann Arbor* (not the *Energy Office* unit) is what is intended, it is referred to as the *City of Ann Arbor*.

[2] The objectives, permissible areas of application, and data related to this practicum, as communicated to me by City staff (here I am not referring to my own personal objectives), took on many faces throughout the period of this practicum (February 2011 – April 2012). This was due to the number of City staff (and external City partners) taking part in the practicum at different periods, as well internally changing objectives and goals that happen in organizations with time. Although this gave me the opportunity to better understand organizational structures, it was a significant obstacle for communication and setting objectives in relation to the goals of this project. For the purpose of having some coherence in this document, I selected to communicate the broader trends and more prominent discussions that took place as a result of my practicum work with the City. In this paper I focus on integrating and applying academic literature and case studies to create an engagement model that reflects these trends and discussions. The engagement model, as explained in the body of the text, outlines the critical components I focused on when communicating with the City.

For the sake of clarity, I would like to note that this document does not represent an all-inclusive account of my work and experiences resulting from this practicum, nor does it account for what the City intended, did or intends to do with the information and experiences resulting from my work.

outreach by the City included limited funds and resources, staff hours, and expertise on best methods for implementing programs.

With the above overarching energy goals, the City identified residential insulation and air sealing (i.e. weatherization/envelope improvements) as an area to focus its residential energy outreach (W. Barrott & M. Naud, personal communication, June 29, 2011). Space heating constitutes the largest portion of residential energy use, and significant energy reductions can often be easily achieved with envelope improvements (Dietz, Gardner, Gilligan, Stern, & Vandenbergh, 2009; Gardner & Stern, 2009; U.S. Department of Energy, 2011).

The City wanted an intervention model that would be generalizable to different neighborhoods of single family owner-occupied homes (but not populations that only represented a limited demographic in Ann Arbor), and for it to be easily replicable by City staff (W. Barrott, N. Geisler, & M. Naud, personal communication, June 29 and July 1, 2011). In addition to financial and staff resources, the City also lacked information about its residential populations. It had no data about current and past insulation and air sealing rates, nor about current barriers to improvements in home weatherization (cognitive or structural barriers). For instance, insulation and air sealing rates can be limited by lack of local contractors, financial barriers, or simply lack of knowledge about the need for home weatherization. In addition, the City was most concerned about increasing weatherization rates. The above set the "intervention framework" and directed the intervention model I focused on during my work with the City.

Intervention Framework

The primary objective of my practicum was to create a generalizable and easily replicable outreach model for the City, one that focused on engaging the community in energy reductions through weatherization. The model needed to account for the above limitations (e.g. resources and staff). As a result of many discussions with the City, my core intervention strategy for my suggested engagement model focused on meeting reduction targets through "participation."

There is variation in the literature and in practice on what constitutes "participation" (Creighton, 2005; Depoe, Delicath, & Aepli Elsenbeer, 2004; Lucas & Hoskins, 2003; Sanoff, 2000; Wondolleck & Yaffee, 2000). The way the community is involved and participates can take different forms (e.g. surveys, public forums) or can be done for different purposes (e.g. to build support, garner information). For example, involving the community in the capacity of decision making would take a different form than involving them so to gain an understanding of local knowledge on an issue.

In this paper, I use "participation" to mean the involvement of the community in the process of increasing weatherization rates. Participation in this case would include delivering information from the City to the

community, but also would include the opportunity for the City to understand the community and gain local knowledge from the community (e.g. by asking questions, interacting), and create an opportunity for both the City and community to identify solutions and make decision on how to increase residential weatherization. The form of participation I chose for this model focused on personal/face-to-face interactions rather than faceless participatory methods (e.g. surveys). I selected personal participation as the "centerpiece of the model" because it created the forum needed for barrier identification; hearing the communities thoughts and feedback; finding innovative and local solutions; developing relationships and understanding to address weatherization within Ann Arbor; communicating the City's targets to the community; and addressing the limitations and outreach goals set by the City – among other benefits (these are discussed in detail in the section "Participation and the City"). There are significant literature and case studies that support this framework for the model, some of which I highlight in this paper.

One such example is ecoENERGY (in Canada), a program discussed in detail by McKenzie-Mohr, Lee, Schultz, & Kotler (2012). This was a $1.5 billion federally funded "home efficiency retrofits" program (with a significant focus on weatherization) (McKenzie-Mohr, Lee, Schultz, & Kotler, 2012, p. 99-100). The program was a relative success – with a large number of households participating, but a small portion of the targeted audience: Approximately 1% of (eligible) households (94,011) weatherized (McKenzie-Mohr, Lee, Schultz, & Kotler, 2012). McKenzie-Mohr et al. suggest incomplete engagement and outreach, and barriers created by the reimbursement schedule (or upfront costs) limited the success of the program. In spite of being a well-funded program focused on addressing a financial barrier to weatherizing, it still required or could have benefited from more effective engagement strategies, such as "in-person invitations from program staff to residents of older homes" (McKenzie-Mohr, Lee, Schultz, & Kotler, 2012, p. 101).

The ecoENERGY example suggests that if a barrier is preventing weatherization, it is not solely a financial barrier or a financial barrier that can be addressed with similar reimbursement schedules for all populations. In this respect, the ecoENERGY program highlights the importance of understanding the targeted population. For example, to run a similar program, the City would need to understand how populations differ in the form of financial resources they need or demand (e.g. whether or not funding is needed for upfront costs). But unlike the Canadian example, even if financial barriers were identified as the sole barrier preventing weatherization in the Ann Arbor neighborhoods, the City cannot currently fund a similar program.

Although there are other interventions or mediums (e.g. advertising, financial incentives) that could meet some of the City's objectives, participation as a core intervention strategy addresses the City's important constraints (e.g. lack of financial resources, staff resources, information about the populations that could inform the City's outreach). Mobilizing and using

the community's resources – in whatever form they are available (e.g. time, money) – is critical for the City's residential energy outreach program, as the City does not have significant resources to "give" to the community to weatherize.

In summary, the City needs help identifying specific ways to increase weatherization in the neighborhoods and resources to move those ideas forward. Therefore, I concluded one of the critical element needed to increase weatherization is a community that is engaged and willing to offer ideas, move the ideas forward, and creatively resolve barriers with the City. One of the benefits of participation is that it can be used for exactly these purposes: as an engagement strategy to solve and implement local solutions.

The remaining sections in this paper discuss the outreach model I focused on with the City: barriers that define interventions; participation (and complementary components) as an intervention strategy for engagement; and a brief discussion on using participation together with weatherization targets to meet the City's goals.

Barrier Identification

Barrier identification is critical for environmental outreach and program development because this step outlines the appropriate intervention needed to change the targeted behavior (McKenzie-Mohr, 2000; McKenzie-Mohr, 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012). Barriers can be cognitive or structural (Kaplan & Kaplan, 1982/1989; Kaplan & Kaplan, 2009; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012). Cognitive barriers, whether understood and/or considered to be valid by others or not, reflect an individual's current understanding of an issue, or their ability to take in information (Kaplan & Kaplan, 1982/1989; D. McKenzie-Mohr, personal communication, September 8, 2011). For example, if an individual believes that compact fluorescent lamps (CFLs) are dangerous for household use, a program targeting the *price* of CFLs will not increase their adoption, as the barrier preventing the adoption is one of perception, not financial limitations (see literature by McKenzie-Mohr and McKenzie-Mohr et al., listed in the references, for further discussion of barriers and similar examples). Another example of a cognitive barrier is one related to attention. Attention deficit/fatigue can prevent/diminish the ability of the individual(s) to take in new information (Kaplan, 1995). The distinction between the two examples is that one barrier is a result of current understanding (cognitive maps), and the other results from lack of capability (due to a number of possible reasons, such as overwork, fatiguing environments) to take in information. Structural barriers can range from financial restrictions to societal limitations (McKenzie-Mohr, Lee, Schultz, & Kotler, 2012), such as lack of local contractors or infrastructure to weatherize.

From an outsider's perspective, the "true" barrier(s) may not seem critical, relevant, or even a conceivable or plausible potential barrier

preventing action or behavior change (McKenzie-Mohr, 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012). What is an important barrier for some individuals/populations may not be relevant for others (McKenzie-Mohr, 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012). For example, funding envelope improvements may be difficult or impossible for some residents, but not a barrier at all for others. Depending on the perspective of the person(s) implementing the environmental intervention program, an understanding of the (true) barrier may or may not match that of the target population. In addition, for individuals/populations these barriers can change with time (e.g. a financial barrier preventing a behavior today may or may not exist in the future). For any individuals/populations, it is also possible that there are not any structural or cognitive barriers preventing the action (e.g. the population simply has not acted or is behaving in line with what is traditional, normal or seen as best practice). In this case, assuming there is a barrier can be just as harmful for a participation-focused program, as assuming the wrong barrier for a program design. As a general rule in designing environmental interventions, it is helpful to consciously set biases aside, otherwise critical design elements (e.g. targeting the message appropriately, solutions) may not be incorporated, possibly resulting in ineffective interventions (McKenzie-Mohr, 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012).

Barrier identification is valuable to the success of many intervention strategies (as it is about understanding the population and their environment); it is important to include this component in program design (McKenzie-Mohr, 2000; McKenzie-Mohr, 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012). If designed correctly, participatory methods can allow for barrier identification through interactions, observation, questions and feedback from the community (see McKenzie-Mohr, 2011 and McKenzie-Mohr, Lee, Schultz, & Kotler, 2012 for examples of how he/they incorporate barrier identificiation into interventions strategies). I suggested to the City that working with members of the community would create an environment to allow the City to understand if barriers exist, and where. Directly participating with the community (e.g. asking questions, getting feedback on potential solutions) could give the City an opportunity to understand the different neighborhoods, and therefore, how it could increase weatherization rates through effective and appropriately targeted community support or future programs.

Participation and the City

Identifying the barriers alone is not a complete intervention strategy, as it does nothing to change the behavior or solve the targeted problem. Getting at the "action component" or behavior change is the objective of many environmental engagement programs. One of the most-used strategies focuses on generating awareness and/or changing attitudes through information-based outreach (e.g. marketing, brochures, workshops) (De Young, 2011;

McKenzie-Mohr, 2000; McKenzie-Mohr, 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012). Unfortunately for environmental outreach, informational campaigns of the generic type, meant to change attitudes in hopes of changing behavior, have been found to have little positive results in the area of behavior change; research shows that the connections between knowledge of the problem, behavior, and behavior change is quite weak to nearly absent (Abrahamse, Steg, Vlek, & Rothengatter, 2005; De Young, 2011; McKenzie-Mohr, 2000; McKenzie-Mohr, 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012; Reynolds, 2010). Canada's One-Tonne Challenge to reduce greenhouse gas emissions is one such example (McKenzie-Mohr, Lee, Schultz, & Kotler, 2012). As discussed in detail by McKenzie-Mohr et al., the program was well-funded ($37 million for 3 years), implemented nationwide, and focused on distribution of information through media advertising, as well as some partnerships and a semi-personalized website for individuals (to make a pledge and calculate greenhouse gas emissions associated with individual behaviors). The outcome of the outreach was that most Canadians were aware of the issue and campaign, but had not changed their behavior (McKenzie-Mohr, Lee, Schultz, & Kotler, 2012).

Different from the One-Tonne Challenge or similar information-based strategies, participatory-centered engagement, in addition to creating opportunity for identifying and responding to barriers, would create opportunities for the City to:

- hear the community's own thoughts and suggestions on mitigating local and personal barriers;
- develop relationships with the community and ask for action on the task at hand;
- communicate their goals and to create an understanding of how weatherization can help meet them;
- build support around the issue, and create the opportunity for finding and implementing solutions.

These opportunities are discussed in the following paragraphs.

Being valued, respected and *listened to* are very important social feedbacks for people (Graybar & Leonard, 2005; S. Kaplan, personal communication, 2011; Kelley, 1998; Muzevich, 2001; Scott, 2010). Listening to people can communicate a sense of respect, be used to build relationships, fill in valuable information gaps missed in communications, and to find viable and individually-supported solutions. Because participation can allow for individuals to input their ideas and be heard, as well as understand the issue, participatory interventions can garner support around an issue as a result of individuals taking part in the discussion (Cairns, 2005; Kaplan & Kaplan, 1982/1989; Lucas, Brooks, Darnton, & Jones, 2008; Michigan Land Use Institute, 2004; The Grand Vision, 2012; Wondolleck & Yaffee, 2000).

Because barriers are specific to individuals, regions and actions, getting local feedback is not only valuable for solving environmental

problems, many times feedback presents simple, relevant and viable local solutions (Cairns, 2005; Kaplan & Kaplan, 1982/1989; McKenzie-Mohr, 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012; Michigan Land Use Institute, 2004). Individuals and populations are in a position to account for their local histories, personal or structural barriers, values and goals, other environmental behaviors they are already doing (and etcetera) – all of which, when taken into account, add valuable knowledge when trying to understand what solutions may work to solve a specific problem for a specific population (Cairns, 2005). Although an outsider may have some or all of this knowledge, getting the community's perspective may result in a different understanding of that knowledge (a different framing of the problem or potential solutions), which can be used to better address the issue (Bardwell, 1991).

The community of North Kenwood-Oakland/Bronzeville, a community within Chicago, is a good example: The North Kenwood-Oakland/Bronzeville was part of participatory action research projects, where the researchers were working to better understand how to effectively implement Chicago's Climate Action Plan (CCAP) in the diverse communities of Chicago (The Field Museum, 2010). As a result of the feedback from the residents of North Kenwood-Oakland/Bronzeville, the researchers'

> …report reveal[s] a myriad of connections among individual, household, and community priorities and the priorities of the CCAP [in areas of economic development, housing, public space, youth development – such as creating local food gardens and improving residential energy efficiency]. Each set of findings [in the report, resulting from the participatory project] concludes with recommendations for translating findings into engagement action programs that will help community leaders [and therefore help with the implementation of the CCAP] take ownership of climate action [through action-steps the community *already values*]. Communities that feel invested in the CCAP will not only implement its strategies, but also mobilize residents to devise their own creative solutions for achieving a sustainable city. (content in brackets added for clarity; The Field Museum, 2010)

The feedback from the North Kenwood-Oakland/Bronzeville community allowed for specific and relevant steps to address the goals of the CCAP to surface. Without this feedback, strategies to address climate change in the North Kenwood-Oakland/Bronzeville community could have varied from non-relevant solutions to maybe applicable options.

As noted, there may not be specific barriers to weatherizing residential homes in Ann Arbor – people simply may not have completed the task or are behaving according to their neighborhood's norms. In this case, an outreach method that allows for the City to simply request the community's help with increasing weatherization rates, while screening for and learning about any barriers, could be valuable to their weatherization efforts. A participatory method allows for this.

Research has shown that environmental interventions that use personal contact in the intervention methodology (e.g. to distribute information, follow up, ask for commitments, demonstrate the behavior) have better results than

strategies that focus solely on information distribution (through media such as pamphlets or prompts) (Aronson & O'Leary, 1982-1983; Hopper & McCarl Nielsen, 1991; McKenzie-Mohr, 2000). In addition, people tend to respond to request by people who have authority associated with their position (e.g. police officers, city staff), or individuals they have relationships with or view as similar to themselves (e.g. family, neighbors, friends, colleagues) (Cialdini, 2009). I suggested to the City that the participatory model used for weatherization outreach allow for human interaction in its design. The design should allow for face-to-face contact, time and interaction that could build relationships, and include a built-in opportunity for requesting help by the City staff, for weatherization solutions or improvements. I also suggested a participatory strategy partnered with community leaders would increase responses by the community as a result of the benefits of local and neighbor social influence (Axsen & Kurani, 2011; Hopper & McCarl Nielsen, 1991; UC Davis - Institute of Transportation Studies, 2011).

Another benefit of the participation strategy is that it also gives the City the opportunity to communicate their energy and climate goals. The City wants people to know about their goals, and needs their help in achieving them. A participation-based engagement strategy puts the City and their goals in view of the community. This communication also has other important implications: When presented with information on a topic, humans do enjoy *understanding* it (Kaplan & Kaplan, 2008; Kaplan & Kaplan, 1982/1989; Kaplan & Kaplan, 2003; Kaplan & Kaplan, 2009). More importantly, humans want and tend to avoid information that does not make sense or does not connect with their own cognitive maps (e.g. thoughts, experiences, understanding) (Kaplan & Kaplan, 2008; Kaplan & Kaplan, 1982/1989; Kaplan & Kaplan, 2003; Kaplan & Kaplan, 2009). Delivering relevant (tailored) information in environmental communications has been found to increase the success in a variety of interventions (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Lokhorst, van Dijk, Staats, van Dijk, & de Snoo, 2010; Nisbet, 2009).

Residential energy audits are an example of tailored information, as the outcome of the audit provides for specific recommendations for the household, rather than a laundry list of residential efficiency measures that may or may not be applicable (Abrahamse, Steg, Vlek, & Rothengatter, 2005). Abrahamse et al. review several cases of successful energy audits interventions (although they note that the success does vary). Because weatherizing is a personal activity, one that needs to be completed by the individual households, an outreach strategy that does not have mechanisms that check for poorly-received information and the resulting outcomes may not meet its objectives (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Nolan, Schultz, & Knowles, 2009; Reynolds, 2010).

A participatory approach would offer the City staff immediate feedback (either through verbal and other communication, or lack of response), and therefore the opportunity to adjust their framing of the information, and methods of communication, appropriately. This is not the

same as manipulating information in a deceitful way, but rather, being thoughtful of and responsive to the recipients of the information. Rather than assuming interest and/or understanding of the information delivered by the City, the City could be checking for both, and *would be in a position to do so* (in comparison to outreach strategies, such as informational campaigns, where feedback mechanisms are not immediate or nonexistent).

As noted earlier, the critical element needed to increase weatherization was an engaged and willing community. One of the benefits of participation is that it can do exactly this: help in building an invested and engaged community (Cairns, 2005; Kaplan & Kaplan, 1982/1989; Lucas & Hoskins, 2003; Lucas, Brooks, Darnton, & Jones, 2008; The Grand Vision, 2012; Wondolleck & Yaffee, 2000). As individuals and neighborhoods get involved (e.g. in the discussion, process and solutions), they become invested in the issue at hand. Previous cases show that as individuals spend their time and energy in the process, and gain an increased understanding of the problem (in this case, the goals set by the City), support of decisions or the potential solutions builds amongst those involved with the project. Participating in finding ways to increase weatherization rates – in combination with "being heard," the influence humans have on humans, the aid relationships can offer to requesting help, etcetera (all discussed above) – could increase support and investment from the participants in the City's goals, and could work to move the community to increase weatherization rates through the discussed solutions, and as a result of feeling a sense of ownership in the goals.

To illustrate some of the ideas above, the following are possible scenarios: Through a participatory intervention, if the City found that one neighborhood had hesitations with selecting a reliable and safe contractor and therefore had not weatherized because of this hesitation, the discussion of solutions could include mitigating this barriers by checking the qualifications of and endorsing local contractors (similar barrier mitigation efforts are discussed by McKenzie-Mohr, 2011). In conversations with community members during the participatory intervention, the City could get immediate feedback on such an option, and decide to move forward, or not, with the option – or seek out another. In the case of a financial barrier, the City could work with the neighborhoods to organize a fundraising event, or work directly with the local energy company to connect its current reimbursement programs with local neighborhoods and this particular barrier (e.g. DTE Energy, 2012).

The City would work to address the individual neighborhood barriers at the time they are identified, in contrast to trying to address citywide barriers as they may be changing (with time). This is a problem-solving approach that focuses on immediately increasing weatherization rates for the various and diverse populations. Because weatherization is (for the most part) a one-time individual household activity, addressing personal barriers in a timely manner (at the time they are a barrier) gets at the heart of solving problems surrounding weatherization (which is a problem not about societal technical know-how or feasibility, but rather about increasing implementation).

The above discussion focused on the core engagement strategy, participation, and directly connected intervention tools (e.g. relationships, relevant communication) or benefits – the primary focus of the strategy I recommended to the City. Below I briefly outline two complementary intervention tools that I recommended the City use as a part of my engagement model and its weatherization outreach.

Social modeling: If City staff were able to encourage a handful of individuals to move forward on weatherization efforts as a result of their interactions with them, these individuals could serve as models for encouraging further weatherization. Because humans depend heavily on observations and information they receive from others they trust and know, getting weatherization rates up could happen if a few people demonstrate the action within the different populations within Ann Arbor (Aronson & O'Leary, 1982-1983; Axsen & Kurani, 2011; Cialdini, 2009; McKenzie-Mohr, 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012; UC Davis - Institute of Transportation Studies, 2011). I suggested that this intervention tool could complement participation. It could be interwoven, but without additional resources.

Commitments: The use of "commitments" could be incorporated in a similar way. After identifying barriers and solutions with the different individuals/populations, City staff could indicate their follow-up plan and get a commitment from the community. By commitment, I mean some type of agreement from the individuals/population on what they would do, or next step they would take (coming from the list of solutions discussed during the participatory interaction and already "approved" by the community during the conversation). There is significant literature that supports the use of commitments as a successful intervention method (Cialdini, 2009; Lokhorst, van Dijk, Staats, van Dijk, & de Snoo, 2010; McKenzie-Mohr, 2000; McKenzie-Mohr, 2011; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012).

Participation and Weatherization

The above describes the participatory-focused engagement model, developed as a result of my practicum work with the City, and discussed for the application of residential weatherization improvements. But the participatory approach can be used for solving issues beyond weatherization. In my proposal to the City I suggested that the participatory strategy should remain flexible with a focus on all areas of residential energy (not just weatherization), as it would be more appropriate for meeting reduction targets (as well as long-term sustainability needs), but also would be more effective in engaging the community (and therefore more effective in supporting the City in reaching its energy targets). Although the reasons for the broader participatory approach were not a significant part of the communications I had with the City, here I briefly discuss some of the reasons I suggested this approach to the City.

As noted, the City identified weatherization as an area where significant energy efficiency improvements can be easily made and greenhouse gas emission reduction could be met (please see Appendix 1; Dietz, Gardner, Gilligan, Stern, & Vandenbergh, 2009; Gardner & Stern, 2009; U.S. Department of Energy, 2011). However, I felt that it would be a more effective strategy to couple a participatory model, as described above, with a "residential energy" focus. A weatherization-focused strategy is already proposing *where* residents should focus their attention (on weatherization); this is without knowing what the different populations view as important, where they could or would be willing to make reductions immediately, or what they have or are already doing in terms of environmental behaviors (including weatherizing). This strategy ignores the importance of personal history, barriers and relevance in reaching energy/greenhouse gas targets, which the literature and case studies suggest are important components for engagement (see above as well as Crompton & Kasser, 2009; The Field Museum, 2012; The Field Museum, 2010). In addition, focusing on weatherization during the participatory events highlights that this is what the City views as important, and does not communicate (highlight) the reason the City is addressing residential energy use in the first place – which is urgently needed greenhouse gas reductions, from anywhere.

Rebound effects occur when people increase their energy consumption in one area (e.g. turning up the thermostat, keeping more lights on) as a result of savings in another area (e.g. savings can be perceived, financial) (Maxwell, Owen, McAndrew, Muehmel, & Neubauer, 2011; UK Energy Research Centre, 2007). The realized savings from efficiency improvements are, in practice, often much lower than expected, and in cases have resulted in net increase of emissions as a result of rebound effects and increased consumption (Maxwell, Owen, McAndrew, Muehmel, & Neubauer, 2011; Wilkinson, Smith, Beevers, Tonne, & Oreszczyn, 2007). For instance, policy programs meant to increase insulation in the UK incorporate an automatic rebound effect of 15% into their calculations (15% of the expected savings does not occur, as a result of people increasing their residential temperatures after the retrofit activity) (Maxwell, Owen, McAndrew, Muehmel, & Neubauer, 2011). Increased consumption can occur across sectors; for example, under various hypothetical scenarios, in spite of residential weatherization improvements, net greenhouse gas emissions increased due to a rebound effect of increased electricity use (please refer to Appendix 2 for a scenario; Maxwell, Owen, McAndrew, Muehmel, & Neubauer, 2011). Mitigating rebound effects may be important for meeting the City's net greenhouse gas emission reduction objective. This may require communicating a clear objective of energy/greenhouse reductions to the community, as households cannot mitigate a rebound effect if they are not focused on reducing across uses (e.g. lighting, thermostat settings, vehicle miles traveled) (Maxwell, Owen, McAndrew, Muehmel, & Neubauer, 2011). In this respect, the need to communicate broader goals also speaks to the needs and benefits (discussed in

the paragraph above) of using participatory outreach to focus on reducing overall residential energy use, rather than focusing on one particular area.

The above paragraphs outline some of the reasons I felt a focus on overall residential energy use with the use of the participatory approach would be a better strategy to meet the City's reduction targets for greenhouse gas emissions.

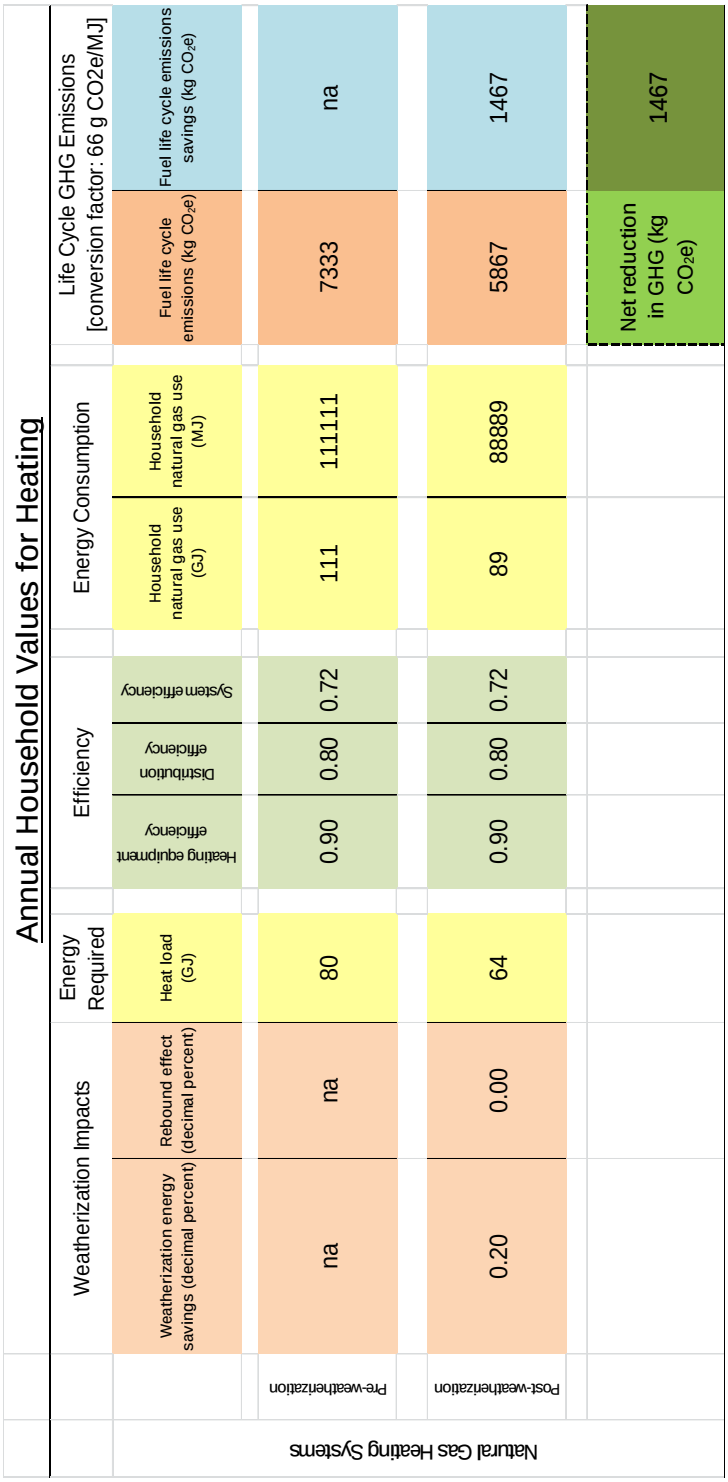
Conclusion

Due to constraints and goals set by the City, and based on current literature and case studies, I recommended an engagement model that focused on participation, but also integrated additional intervention tools, such as commitments and social modeling. Participation as an engagement strategy creates opportunities for the City to communicate its goals and build local understanding, gain an understanding of the community (and therefore barriers and potential solutions), and build relationships (which could be used in other environmental outreach efforts by City, such as reducing waste or water use).

Although weatherization is a smart target (high-impact area with minimal technical requirements), the CCAP case study (and the other noted literature) suggest that a participatory strategy may work best with a broader and more flexible focus: Effectively engaging the community may require taking into account personal histories, addressing local barriers, finding applicable solutions, and working to integrate information and issues so they are relevant to the community.

But more importantly, getting net greenhouse gas emission reductions may require an involved and engaged community working on reducing overall energy use. The boarder participatory approach may be required to engage the community and meet the City's net greenhouse gas emission reduction targets.

Appendix 1



Annual Household Values for Heating

		Weatherization Impacts		Energy Required	Efficiency			Energy Consumption		Life Cycle GHG Emissions [conversion factor: 66 g CO2e/MJ]	
		Weatherization energy savings (decimal percent)	Rebound effect (decimal percent)	Heat load (GJ)	Heating equipment efficiency	Distribution efficiency	System efficiency	Household natural gas use (GJ)	Household natural gas use (MJ)	Fuel life cycle emissions (kg CO_2e)	Fuel life cycle emissions savings (kg CO_2e)
Natural Gas Heating Systems	Pre-weatherization	na	na	80	0.90	0.80	0.72	111	111111	7333	na
	Post-weatherization	0.20	0.00	64	0.90	0.80	0.72	89	88889	5867	1467
										Net reduction in GHG (kg CO_2e)	1467

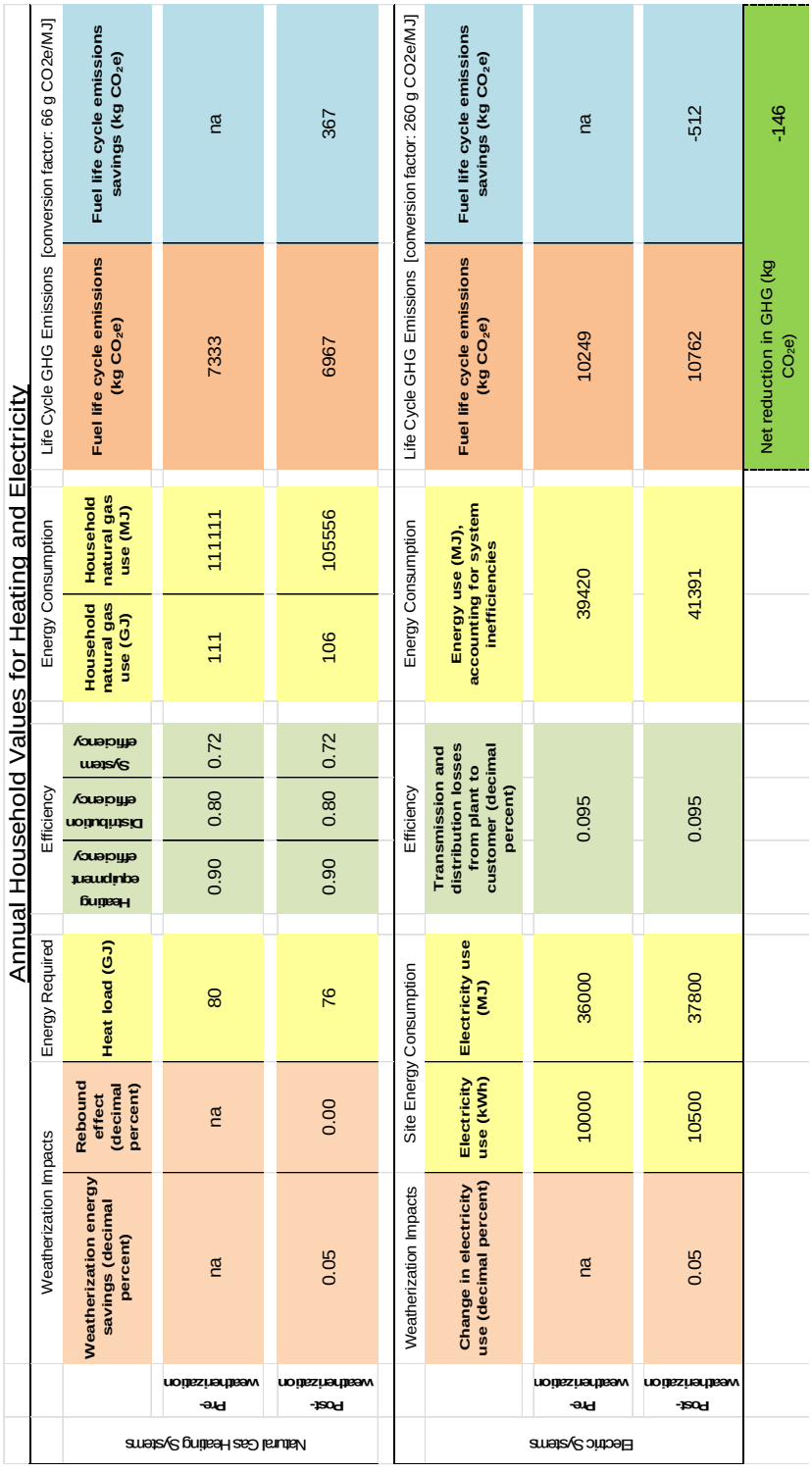
The above table is a potential greenhouse gas (GHG) reduction scenario, resulting from home insulation and air sealing efforts. The two rows represent annual household (a single hypothetical home) heating values, pre- and post-weatherization. Annual heat load was assumed to be 80 GJ (Hanova & Dowlatabadi, 2007). The overall residential heating system efficiency was assumed to be 72% (U.S. Department of Energy, 2011, February 9). (Household natural gas use was calculated from the system efficiency and required heat load values). For life cycle greenhouse gas emissions I used an emission factor of 66 g CO_2e/MJ, a value provided by Venkatesh, Jaramillo, Griffin, & Matthews (2011). The result of the scenario analysis shows that assuming 20% weatherization savings (Energy Star, n.d.), and no rebound effect, net reductions in GHG emissions would be approximately 1467 kg CO_2e.

Annual Household Values for Heating

		Weatherization Impacts		Energy Required	Efficiency			Energy Consumption		Life Cycle GHG Emissions [conversion factor: 66 g CO2e/MJ]	
		Weatherization energy savings (decimal percent)	Rebound effect (decimal percent)	Heat load (GJ)	Heating equipment efficiency	Distribution efficiency	Systemefficiency	Household natural gas use (GJ)	Household natural gas use (MJ)	Fuel life cycle emissions (kg CO_2e)	Fuel life cycle emissions savings (kg CO_2e)
Natural Gas Heating Systems	Pre-weatherization	na	na	80	0.80	0.75	0.60	133	133333	8800	na
	Post-weatherization	0.10	0.15	73	0.80	0.75	0.60	122	122000	8052	748
										Net reduction in GHG (kg CO_2e)	748

The above table is a potential greenhouse gas (GHG) reduction scenario, resulting from home insulation and air sealing efforts. The two rows represent annual household (a single hypothetical home) heating values, pre- and post-weatherization. Annual heat load was assumed to be 80 GJ (Hanova & Dowlatabadi, 2007). The overall residential heating system efficiency was assumed to be 60% (U.S. Department of Energy, 2011, February 9). (Household natural gas use was calculated from the system efficiency and required heat load values). For life cycle greenhouse gas emissions I used an emission factor of 66 g CO_2e/MJ, a value provided by Venkatesh, Jaramillo, Griffin, & Matthews (2011). The result of the scenario analysis shows that assuming 10% weatherization savings, and a 15% rebound effect (Maxwell, Owen, McAndrew, Muehmel, & Neubauer, 2011), net reductions in GHG emissions would be approximately 748 kg CO_2e.

Appendix 2



Annual Household Values for Heating and Electricity

		Weatherization Impacts		Energy Required	Efficiency			Energy Consumption		Life Cycle GHG Emissions [conversion factor: 66 g CO2e/MJ]	
		Weatherization energy savings (decimal percent)	Rebound effect (decimal percent)	Heat load (GJ)	Heating equipment efficiency	Distribution efficiency	System efficiency	Household natural gas use (GJ)	Household natural gas use (MJ)	Fuel life cycle emissions ($kg CO_2e$)	Fuel life cycle emissions savings ($kg CO_2e$)
Natural Gas Heating Systems	Pre-weatherization	na	na	80	0.90	0.80	0.72	111	111111	7333	na
	Post-weatherization	0.05	0.00	76	0.90	0.80	0.72	106	105556	6967	367

		Weatherization Impacts	Site Energy Consumption		Efficiency	Energy Consumption	Life Cycle GHG Emissions [conversion factor: 260 g CO2e/MJ]	
		Change in electricity use (decimal percent)	Electricity use (kWh)	Electricity use (MJ)	Transmission and distribution losses from plant to customer (decimal percent)	Energy use (MJ), accounting for system inefficiencies	Fuel life cycle emissions ($kg CO_2e$)	Fuel life cycle emissions savings ($kg CO_2e$)
Electric Systems	Pre-weatherization	na	10000	36000	0.095	39420	10249	na
	Post-weatherization	0.05	10500	37800	0.095	41391	10762	-512
							Net reduction in GHG ($kg CO_2e$)	-146

Under this hypothetical scenario, assuming 5% weatherization savings and a rebound effect of 5% in a different sector (electricity use), net GHG emissions could increase by 146 kg CO_2e. (Average electricity use taken from U.S. Energy Information Administration, 2011). Transmission and distribution losses, and life cycle GHG emissions for electricity generation in Michigan were based on an analysis by Kim and Dale (2005), and assumed a 100-year global warming potential (for methane and nitrous oxide).

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