Selecting Programs for Urban Transformations Towards Sustainability

by

Nigel Forrest

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved November 2015 by the
Graduate Supervisory Committee:

Arnim Wiek, Chair
Daniel Schugurensky
Robert Melnick

ARIZONA STATE UNIVERSITY

December 2015

ABSTRACT

Despite widespread acknowledgement of the need for transformation towards sustainability, the majority of cities appear stuck in incremental change instead of far-reaching, radical change. While there are numerous obstacles to transformational change, one critical aspect is the *process* of selecting impactful sustainability programs. The unique and complex nature of sustainability suggests a different approach is needed to program selection than is normal. But, to what extent are cities adapting selection processes in response to sustainability and what effect does this have on sustainable urban transformation? Could there be a more effective process to select programs with greater transformational potential? This dissertation investigates these questions using case studies and action research to add to the general knowledge of urban sustainability program selection and to develop practical knowledge (solutions) for more effective sustainable urban transformation.

The dissertation consists of three studies. Study 1 uses a case study approach to investigate existing sustainability program selection processes in three cities: Avondale, USA; Almere, the Netherlands; and Freiburg, Germany. These cities all express commitment to sustainability but have varying degrees of sustainable development experience, accomplishment, and recognition. Study 2 develops a program selection framework for urban sustainable transformation drawing extensively from the literature on sustainability assessment and related fields, and on participatory input from municipal practitioners in Avondale and Almere. Study 3 assesses the usefulness of the framework in a dual pilot study. Participatory workshops were conducted in which the framework was applied to real-world situations: (i) with the city's sustainability working group in Avondale; and (ii) with a local energy cooperative in Almere.

Overall, findings suggest cities are not significantly adapting program selection processes in response to the challenges of sustainability. Processes are often haphazard, opportunistic, driven elite actors, and weakly aligned with sustainability principles and goals, which results in selected programs being more incremental than transformational. The proposed framework appears effective at opening up the range of program options considered, stimulating constructive deliberation among participants, and promoting higher order learning. The framework has potential

for nudging program selection towards transformational outcomes and more deeply embedding

sustainability within institutional culture.

To Caroline and my mum.

ACKNOWLEDGMENTS

My first thanks are to Arnim Wiek, my advisor and mentor, without whom I sincerely doubt I would have completed my Ph.D. Arnim is an incredible supporter of his students in ways that go far beyond the immediate dissertation work. I consider myself very fortunate that Arnim took me on, and despite some rough times and hardships, his belief in me never faltered. His sound guidance, encouragement, enthusiasm, and practical help got me through to the end. Thank you, Arnim, for all that you have done.

I thank also Rob Melnick and Daniel Schugurensky, my other committee members, for their patience, their critical input, and their encouragement. I particularly appreciated their willingness to review drafts and provide feedback in short timescales, and to accommodate my changes in schedule. I am grateful to have had two such experienced and distinguished scholars behind me.

The research in this dissertation particularly depended on the cooperation of several key research partners. I am very thankful to Daniel Culotta and Drew Bryck (City of Avondale), Erwin Lindeijer and Anne Marie van Osch (Gemeente Almere), and Simone Pflaum (City of Freiburg). The research would have been impossible without their efforts. It was a particular privilege to work with Erwin, whose knowledge and experience on urban sustainability planning and practice are second to none. I am also very grateful to my colleagues Matt Cohen and Chris Kuzdas (ASU, School of Sustainability) and Beau Warbroek (University of Twente, Enschede) for their assistance in workshop preparation and facilitation.

There are many others who have helped me in the dissertation work as well as in the larger doctoral process but I can mention only a handful here. My colleagues in the Sustainability Transitions and Intervention Research Lab at the School of Sustainability have been a constant source of encouragement, advice, and help. Thank you to Matt Cohen, Michael Bernstein, Lauren Keeler (Withycombe), Rider Foley, Chris Kuzdas, John Harlow and John Quinn. A special mention, though, goes to Braden Kay, who has been particularly inspiration for me. Thanks also to Aurianne Koster for your friendship throughout the years.

I have been incredibly privileged to have been funded for most of my doctoral studies from several sources. I have received teaching positions and scholarships from the School of

Last, but not least, I thank my family for standing by me through this seemingly never ending part of my life. There have been many changes and difficulties in the years since I began. Thank you to my two biggest (only?) members of my fan club: my mum and Caroline, both of whom kept me going at times when I thought I couldn't. Thank you, too, Caroline, for the hours of proof reading and presentation practice! My sister and brother, Delia and Douglas, have also been sources of encouragement. Finally, thank you to my children, Gregor and Ellie, for standing by me in what has been a very difficult time in our family. I am sure better times are ahead.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

1. General Background

Sustainability has been described as "the issue of our age", and one in which cities have a central role to play and responsibility to act (Willis, 2006). While many cities are seen to be taking sustainability related action (McCormick, Anderberg, Coenen, & Neij, 2013; Svara, Watt, & Jang, 2013; Willis, 2006), the general impression is that the reality does not match the rhetoric and there is a lack of real progress (Betsill & Bulkeley, 2007; Hodson, Marvin, & Bulkeley, 2013; Wheeler, 2008; Cooper and Vargas (2004) in Conroy & Iqbal, 2009; Whitehead, 2012). Transforming cities to sustainability is widely recognized as requiring *radical* change to urban systems of production and consumption (McCormick et al., 2013; Nevens, Frantzeskaki, Gorissen, & Loorbach, 2013; Radywyl & Biggs, 2013; Whitehead, 2012), yet the action taken by cities is more often *incremental* than radical, making only slight adjustments without fundamentally changing the underlying systems (Albrechts, 2010; Betsill & Bulkeley, 2007; Conroy & Iqbal, 2009; Culotta, Wiek, & Forrest, 2015; Jensen & Elle, 2007; Krause, 2011; Saha & Paterson, 2008; Spath & Rohracher, 2011; Staley, 2006; Wheeler, 2008). If the urgent challenges of mitigating sustainability problems such as global warming, biodiversity loss, health epidemics, and inequality are to be met, then cities must begin to take action that goes beyond the boundaries of the dominant economic, social and political systems (Albrechts, 2010; Devolder & Block, 2015; Whitehead, 2012; Willis, 2012). How though, could cities move towards a more transformational approach to sustainability?

The lack of progress has been blamed on various factors, including political opposition and weak leadership, multi-level governance conflicts, institutional inertia and resistance, and insufficient resources and capacity (Aylett, 2013; Bulkeley, 2010; Bulkeley & Betsill, 2005; Krause, 2012; Wheeler, 2008). However, in this dissertation, the focus is on *process*, and in particular, the way that cities select sustainability programs. By *sustainability program* it is meant any policy implementation, service, project, or other action taken by a municipality, or in which it is significantly involved, for the purpose of improving the sustainability of the city. Program selection is critically important because it is the actions that cities choose to take that intervene in the functioning of the city and do, or do not, produce change towards sustainability. The selection process is therefore

1

also critical as it has a direct bearing on which programs get selected. Of course, all of the other factors – politics, institutions, and so forth – are also important and there are, no doubt, multiple combinations that can lead to transformational outcomes. However, it is suggested here that appropriate process, in combination with other positive factors, can strengthen outcomes, but also, may even improve outcomes in the absence of other positive factors.

There are few studies specifically investigating sustainability program selection processes reported in the literature although it is possible to glean some impressions from related studies. It would seem that cities' selection of sustainability programs often: is unplanned and uncoordinated (Aylett, 2013; Betsill & Bulkeley, 2007; Conroy & Iqbal, 2009; Culotta et al., 2015; Hodson et al., 2013; Wheeler, 2008); favors technical solutions (Aylett, 2013; Conroy, 2006; Culotta et al., 2015; Hodson et al., 2013; Lombardi, Porter, Barber, & Rogers, 2011; Staley, 2006; Vallance, Perkins, Bowring, & Dixon, 2012; Wheeler, 2008); lacks strategic orientation (Aylett, 2013; Culotta et al., 2015; Jaglin, 2013; Staley, 2006); is opportunistic (Bassett & Shandas, 2010; Betsill & Bulkeley, 2007; Conroy & Iqbal, 2009; Culotta et al., 2015); and is politically driven (Blühdorn, 2009; Brand, 2007; Kronsell, 2013; Lombardi et al., 2011; Whitehead, 2012). None of these characteristics would seem to enhance the possibilities for selecting transformational sustainability programs. One study of a climate change mitigation initiative in Sonoma County, California does specifically investigate selection processes and confirms this general impression (Culotta et al., 2015). In general, however, given its apparent importance, the literature is rather thin, particularly in empirical studies, when it comes to sustainability program selection processes.

The Culotta et al. (2015) article, of which I made a substantial contribution as a co-author, indicated directions for future research and became a precursor to this dissertation. It showed, albeit in a single case, that selection processes may not be conducive to urban sustainable transformation, and that a more systematic process may be helpful. While further empirical data on selection processes would be useful to understand more fully how current selection processes affect sustainability, there is already sufficient indication that there may be value in developing a tool as a practical solution to achieve more effective program selection. These, then, became the

core aims of this dissertation: understanding current program selection and providing a practical solution to its deficiencies in terms of achieving urban transformation towards sustainability.

2. Research Questions and Approach

The purpose of the research contained in this dissertation is to determine how cities could be enabled to improve their selection of programs with respect to the goal of urban transformation towards sustainability. The primary research questions pursued were:

1. How do cities currently select programs for sustainable urban transformation? While preliminary research, including Culotta et al. (2015), suggests current selection processes have some deficiencies, it is necessary to further validate this claim before proceeding with developing a solution. Answering this question elucidates the extent and severity of the problem and identifies barriers to and opportunities for improvement.

2. How could *cities select programs to achieve greater progress towards urban sustainability?* This question is contingent on the results of the first question confirming that current processes are not as effective as they could be (which, to a large extent, it did). This question prompts the research to produce practical answers that can be used by city practitioners for more effective program selection.

The questions are approached qualitatively using a combination of case study and action research. A multiple case study research strategy was chosen because: (1) case studies are well suited to answering "how or why" questions about contemporary phenomena in real-world settings; and (2) multiple case studies can produce more robust results than a single case (Yin, 2003). In action research, the level of participation goes beyond information extraction to co-creating solutions with research partners in a real-world setting, and therefore lends greater validity to results by combining theoretical and practical knowledge as well creating greater acceptance among research partners as intended users of the results (Small, 1995). Another feature of action research reflected in the research design is that it may adapt as the research unfolds (Small, 1995): as details of specific cases become known; as research partners begin to actively contribute; as situations arise; and as learning from the research occurs. Within this overall approach, three distinct studies were performed:

Study 1: How cities select sustainability programs – Insights from Avondale, Arizona, USA, Almere, the Netherlands, and Freiburg, Germany. In this study, the selection processes of a small sample of sustainability programs were investigated in each of three cities: Avondale, Almere, and Freiburg. Within each case city, data were collected by interview and document review. The selection process was descriptively analyzed, evaluated against an ideal process for selecting socially robust, sustainable, and transformational programs, and insights made into how sustainability affects, and is affected by, the selection process. Tentative generalizations were made across the three cities, particular issues discussed, and possible remedies suggested.

Study 2: A framework for selecting programs for effective urban sustainable transformation. In this study a practical framework for selecting programs is designed and described, and challenges to its use discussed. The framework design is based on a set of principles derived from sustainability, planning, and other related literature, and on input from practitioners in Avondale and Almere, continuing on from the research for Study 1 in these cities.

Study 3: How to best select sustainability programs for transformational change in cities – insights from two pilot studies. In this study, the framework developed in Study 2 is tested in two pilot studies: one in Avondale and the other in Almere. Both pilot studies were participatory workshops. In Avondale, the city's sustainability working group applied the framework to the selection of solutions towards the city's Climate and Energy goals. In Almere, a local energy cooperative, in conjunction with the city, used the framework to review options for achieving a climate and energy neutral district. The pilot studies revealed information on the feasibility of the framework through participant questionnaires and interviews.

Cities play a critical role as case studies / research partners in all three studies. In Study 1, three cities – Avondale, USA, Almere, the Netherlands, and Freiburg, Germany – are used as case studies. Two of these cities – Avondale and Almere – then continue as action research partners in Studies 2 and 3. In each city, a key participant with good knowledge of the organization and its sustainability activities provided background information for the research and facilitated access to people and resources.

4

Cases (cities) were selected based on consideration of several criteria (Table 1). Avondale is a small (population 75,000), rapidly growing city in Arizona, USA, on the edge of a medium sized metropolitan area (Phoenix). Almere is a medium sized (population 195,000), rapidly growing city on the edge of a medium sized metropolitan area (Amsterdam). Freiburg is a medium sized city (population 225,000) in southwest Germany. While all three cities have demonstrated a commitment to sustainability they vary in their sustainable development accomplishments, experience, and reputations. Whereas Avondale might be described as "aspirant", where sustainability has only relatively recently emerged, Freiburg is known worldwide as a leader in sustainability with a sustainability history going back to 1973, and Almere is somewhere between the two.

Table 1: Selection Criteria for Research Cases

Criterion	Ideal condition
Location	North America or Europe
Size	Small – medium (e.g. population 50,000 – 250,000)
Commitment	Demonstrated commitment to sustainable development and willingness to participate in the research
Capacity	Staff and other stakeholders can allocate time to participate and core staff have good sustainability knowledge
Activity	Are actively planning and implementing sustainability projects and have a recent history of activity

The research reported in this dissertation conforms to the ethical standards of, and was approved by, Arizona State University's Internal Review Board. Full permission was obtained from each of the participating municipalities and from individual participants, and the rights, values and desires of participants were respected at all times.

3. Dissertation Structure

The main substance of this dissertation (chapters 2, 3 and 4) consists of three discrete 'papers' representing a cumulative body of work. The papers correspond to Studies 1, 2 and 3 described above, and each is written as an integral article, capable of standing on its own as a publishable piece. This differs from the more conventional style in which the dissertation is written as a single, integrated body of work and each chapter depends on one or more of the others.

One advantage of this is that the reader who is interested in only one of the studies need only read a single chapter. A reader of the entire dissertation, however, will notice some repetitiveness in Chapters 2, 3 and 4, and Chapter 1, the introduction. The redundancy is limited to parts of each paper's introductory material, literature, and case background. There is no overlap in the methods sections, analysis, discussions, or conclusions.

STUDY 1: HOW CITIES SELECT SUSTAINABILITY PROGRAMS: INSIGHTS FROM

AVONDALE, ARIZONA, USA, ALMERE, THE NETHERLANDS, AND FREIBURG, GERMANY

Abstract

While many cities are taking sustainability related action, there is little evidence that they are making significant progress towards an urban sustainability transformation. While there are numerous reasons for this, one that has received little attention by practitioners or researchers is the *process* by which sustainability programs are being selected. The program selection process should adequately reflect the unique and complex nature of sustainability, yet it is not clear that cities are adapting their processes. The purpose of this article is to investigate *how* sustainability programs are currently selected in cities and what effect this might have on sustainability outcomes. In case studies of Avondale, Arizona, USA, Almere, the Netherlands, and Freiburg, Germany, a sample of sustainability programs are investigated to reveal insights into the selection processes. Findings show that program selection processes are often haphazard, opportunistic, driven by a small set of actors, and weakly aligned with sustainability principles and goals. Thus, sustainability appears to be having little effect on the program selection process. It does, however, appear to be affecting the programs that are selected by creating new demands and opportunities, though not always with sustainability as the priority. The result is that selected programs are often incremental rather than transformational and progress towards sustainable transformation is therefore unlikely. Suggestions are made as to how the selection process could be improved. The research also found significant exceptions in which programs with apparent transformational potential emerged from the selection process.

1. Introduction

Municipal sustainability programs are more or less *de rigueur* today. It is rare to find a city that does not mention sustainability on its website and hard to imagine a city that would claim that sustainability is not important. The extent of this adoption is indicated by over 2,700 European municipalities committing to the Aalborg Principles for sustainable development (www.sustainablecities.eu) or 74% of U.S. cities incorporating sustainability goals into their general plan (Saha & Paterson, 2008). Cities are taking action too, not just talking about it: almost every

U.S. municipality is taking some kind of sustainability action (Svara, 2011) whether planned or not. Indeed, good planning in general is claimed to be full of actions that may be construed as sustainable (Krueger & Agyeman, 2005; Saha & Paterson, 2008), and outside the direct purvue of government, urban sustainability "experiments" are proliferating globally (Bulkeley & Castán Broto, 2012). Thus, there is no shortage of action, and sustainability may never have had a higher profile in cities than it does now.

Despite the attention and activity, signs of significant progress are not obvious. Over 20 years since the Rio summit set the agenda for local action, the consumer capitalist society continues on its crash course with ecological and social limits (Blühdorn, 2009; Dahle, 2007; Raworth, 2012; Rockström et al., 2009). While there are numerous examples that are commonly considered as front-runners (Roorda et al., 2011; Wheeler & Beatley, 2009), there is no city that could credibly be described as close to sustainable. Even in frequently proclaimed front-runners such as Portland, Oregon and Freiburg, Germany progress has been lackluster (Aylett, 2013; Bailey, 2007; Spath & Rohracher, 2011; Staley, 2006). Meanwhile, scholars and practitioners are increasingly claiming that the magnitude and urgency of sustainability problems including, for example, climate change, biodiversity loss, obesity and social inequality, require *radical* change (Albrechts, 2010; Clark, 2000; Gibson, 2013; Hodson, Marvin, & Spath, 2015; Jordan, 2008; Markard, Raven, & Truffer, 2012; Steward, 2012). Yet, action taken in cities seems to be more *incremental* in nature than transformational (Albrechts, 2010; Betsill & Bulkeley, 2007; Conroy & Iqbal, 2009; Culotta et al., 2015; Jensen & Elle, 2007; Krause, 2011; Saha & Paterson, 2008; Spath & Rohracher, 2011; Staley, 2006; Wheeler, 2008).

Sustainable urban transformation and the similar concept of urban sustainability transition, means a radical change in the structure of urban systems of production and consumption (McCormick et al., 2013; Nevens et al., 2013). Such a transformation is not limited to technology but is essentially about fundamentally new ways of living (Westley et al., 2011). Sustainable cities therefore require not only radical change to infrastructure but also to economic, institutional, political, and cultural systems. But sustainability transformations will not happen on their own (Jordan, 2008; Loorbach & Rotmans, 2006): some form of pressure to push them along and

8

guidance to keep them in a desired direction is needed (Loorbach & Rotmans, 2006). Methods such as transformational sustainability research (Wiek & Lang, in press) and urban transition labs (Nevens et al., 2013) provide an overarching framework for "managing" such change.

Another important aspect of sustainable transformation is that it is a multi-level and generational process that cannot be accomplished by a single program, but requires a series of interventions over time (Rotmans & Loorbach, 2010). Here, the term "program" refers to a policy implementation, service, project, or other action taken by a municipality, or in which it is significantly involved. But, to overcome the inertia and countervailing forces of existing systems programs need to do more than incrementally tweak the system (Dahle, 2007). Incremental programs essentially do a little more, a little better, within the confines of the prevailing system (Kates, Travis, & Wilbanks, 2012; Kindler, 1979) whereas transformational programs are disruptive (Albrechts, 2010; Westley et al., 2011), involving "reconceptualization and discontinuity" (Kindler, 1979). The difference is one of degree, with most programs sitting somewhere on a continuum between incremental and transformational (Albrechts, 2010; Kindler, 1979; Lindblom, 1979). Incremental programs are not only inadequate for radical change but may also reinforce the existing system and further inhibit transformation (Rittel & Webber, 1973). While transformational programs may disrupt through direct, large scale impact (Kates et al., 2012), they may also employ more subtle means to set in motion changes that create foundations and opportunity for further change (Albrechts, 2010; Lindblom, 1979). Thus, the idea that programs have *transformational potential*, but for such potential to be realized, programs must build on each other to produce cumulative change (Rotmans & Loorbach, 2010), and seek out societal leverage points (Meadows, 1999).

Yet, the idea of guided transformation or "managed" transitions is not universally accepted as the only way towards a sustainable future. It is suggested that in "actually existing sustainabilities" many municipalities are taking sustainability action, though not explicitly recognizing it as such, and that planning (for sustainability) is not critically important (Krueger & Agyeman, 2005). Indeed, "good planning" in general supposedly produces "movement towards sustainability" (Saha & Paterson, 2008). Moreover, many cities globally are engaging in a variety of multi-stakeholder partnerships in a somewhat unplanned and opportunistic fashion to carry out

"climate change experiments" (Bulkeley & Castán Broto, 2012). While such an *anything goes* approach may eventually produce significant change, it is questionable that it can do so with the urgency needed or that it will be socially just. It raises the question of what counts as a sustainability program? The more extreme interpretation could be that anything can. However, anything goes is perhaps not only insufficient for transformation, but also unhelpful in that it creates a false sense of accomplishment and progress, and is open to cooptation. Transformation, then, requires a more strategic approach.

Given the importance of individual programs to the success of sustainable urban transformations, it follows that the *process* of selection is also important, yet it has received little attention in practice or research. Although few studies look at program selection directly (see Culotta, Wiek and Forrest's (2015) case study of a climate change mitigation initiative in Sonoma County, California for one), the literature suggests a number of deficiencies with respect to transformational outcomes. They include being:

- *Unplanned:* a lack of planning and coordination across programs (Aylett, 2013; Betsill & Bulkeley, 2007; Conroy & Iqbal, 2009; Culotta et al., 2015; Hodson et al., 2013; Wheeler, 2008);

- *Of Limited impact:* a propensity for narrow, technical fixes (Aylett, 2013; Conroy, 2006; Culotta et al., 2015; Hodson et al., 2013; Lombardi et al., 2011; Staley, 2006; Vallance et al., 2012; Wheeler, 2008);

- *Unguided:* a lack of commitment to, or alignment with, shared goals (Aylett, 2013; Culotta et al., 2015; Jaglin, 2013; Staley, 2006);

- *Opportunistic:* selecting primarily for reasons other sustainability, such as quick returns, visibility, co-benefits, or funding availability (Bassett & Shandas, 2010; Betsill & Bulkeley, 2007; Conroy & Iqbal, 2009; Culotta et al., 2015).

- *Politically Driven:* motivated by political, rather than sustainability goals ((Blühdorn, 2009; Brand, 2007; Kronsell, 2013; Lombardi et al., 2011; Whitehead, 2012)

The result is that programs tend to be fragmented, perhaps even conflicting, low in ambition, constrained by narrow social, economic and political boundaries, and, thus, more

incremental than transformational as they do little to change business-as-usual. Although some cities are showing commitment, setting goals, and developing plans for sustainability (Saha & Paterson, 2008; Svara, 2011), it is less clear that cities are adapting program selection processes to meet the unique challenges of sustainability. Moreover, although selection processes may not have changed, the context has: sustainability as a societal issue has given rise to new funding opportunities, new areas of competition, new pressures from external stakeholders, new popular demands, new technologies, and new legislation from higher levels of government. This new and changing context is a source of potential distractions and pitfalls that prevent progress towards urban sustainability transformation, and increases the need for appropriate program selection processes. In general, cities are still adjusting their core competencies to deal with the new landscape and challenges of sustainability (Betsill & Bulkeley, 2007; Willis, 2006).

Sustainability science makes it clear that progress in sustainability requires different approaches and processes (Culotta et al., 2015) due to the uniquely complex, dynamic, multi-level, contested, and urgent nature of sustainability problems (Funtowicz & Ravetz, 1993; Rittel & Webber, 1973). Sustainability problems have several distinguishing characteristics. They are: harmful to the integrity, viability, and vitality of societies in the long-term; require urgent attention to avoid crossing thresholds and causing long-term harm; have effects that are dispersed in space and time and societal sector (e.g. social, environmental and economic); have multiple causes which are also dispersed; and the problem and potential solutions are contested by stakeholders with different interests and perspectives (Wiek, Foley, & Guston, 2012).

In selecting programs for sustainability, Culotta et al. (2015) identify the need for certain prerequisites to the selection process (*inputs*), characteristics of how programs should be selected (*process*), and properties of the programs that should be selected by the process (*outputs*). Inputs should include an overarching sustainable development framework and intermediary organization; the process should be shared and consistent, participatory, and accountable; and outputs should be effective, systemic, integrated, and, of course, sustainable (Culotta et al., 2015). To this may be added, an explicit need to open up decision making to a wider, more radical range of possibilities and considerations if program selection is to break out from prevailing constraints and beyond

11

incremental impact (Stirling et al., 2007). If these criteria are met, it is suggested that the process is more likely to select socially robust, sustainable, and transformational programs. To what extent, then, are cities selecting programs for sustainability?

The purpose of this article is to empirically investigate the process of program selection in cities with respect to sustainable transformation. The guiding questions are:

1. *How are cities selecting programs for sustainability?*

2. *Are the general indications of the literature supported by empirical research?*

3. *What might the implications be for sustainable urban transformation?*

The research takes a qualitative case study approach in which a sample of sustainability programs are investigated from three cities to reveal insights into current selection processes. In addition to filling the gap in the sustainability literature about program selection, the article also creates local knowledge to serve as input into co-developing improvements to selection processes with participating cities.

In two cases, the City of Avondale, Arizona, and the Municipality of Almere, the Netherlands, the study provides a stepping-stone towards collaboratively designing a program selection framework. A third case, the City of Freiburg, Germany, is more limited and offers supporting insights. The three cities were chosen for both pragmatic and research design reasons. All of the cities are of small to medium sized. Cities of this size are, perhaps, easier to work with than large cities, but have capacity to engage in sustainability activities and research where smaller cities often may not. The cities are all active in sustainability but with different capability levels, length of commitment, accomplishments and image. Whereas Avondale's sustainability accomplishments are relatively modest, though its commitment is growing and it clearly aspires to more, Freiburg has a reputation as a worldwide leader with a long history of sustainability, and Almere is somewhere in between. It might be expected that cities with a more mature record of sustainable development have more sophisticated program selection processes.

The article continues in Section 2 with a description of the analytical framework and research methods used. In section 3 the results of the case studies are summarized which are then

synthesized and compared in Section 4. The article finishes with a discussion of program selection and its relation to sustainable urban transformation in Section 5 and conclusions in Section 6.

2. Research Design

Each city was approached as a separate case in which data were first collected and then analyzed to produce an understanding of the sustainability program selection process in that city. Results from all cases were then synthesized to arrive at findings about sustainability program selection in general.

Each case study followed the same method and was conducted with the assistance of a city staff member most familiar with sustainability efforts. Data were collected on a sample of programs (five to seven) identified by the city liaison as a program the city has been involved in that they consider a *sustainability* program. The sample was not intended to be representative of all programs but sufficient to provide a window into selection processes in that city. Programs were investigated through semi-structured interviews (one to three per program) and document review. Interviewees were identified for their knowledge and involvement in programs by the city liaison or other interviewees. Documents examined included city reports, meeting minutes, proposals, websites, and local press.

Analysis of each case included three steps.

1. *How are sustainability programs selected?* A descriptive analysis of key aspects of program selection including the nature of the selected program, issue(s) being addressed, general process, and program origins and assessment.

2. *Does program selection meet effectiveness criteria for sustainable transformation?* An evaluative analysis using criteria from Culotta et al. (2015) of whether processes are likely to select socially robust, sustainable and transformational programs (Table 2).

3. *How does sustainability affect, and how is it affected by, program selection?* Further discussion of the case to gain insights into the extent to which, and nature of how, sustainability influences the selection process and how the selection process impacts sustainable transformation. This includes considering if the city could claim to be explicitly selecting programs *for sustainability* or following an *anything goes* approach.

Table 2: Evaluative-Analytical Framework for Program Selection (Based on Culotta et al. (2015)).

Inputs, *should include:*	Process, *should:*	Output (programs), *should:*
An overarching sustainability framework An intermediary providing coordination, facilitation and drive	Interactively incorporate knowledge and views of all stakeholders Provide accountability through transparency and clear responsibilities Follow a shared, structured process Include consideration of a wide range of options Include assessment of options against broad criteria	Address the immediate issue and align with sustainability goals Be supported by evidence Target upstream drivers of the issue Adhere to balanced sustainability principles Integrate with other programs and span domains / sectors

Results from each case are synthesized to tentatively generalize program selection and to generally compare and contrast the cases.

3. Cases Study Results

3.1 Avondale

Avondale is a rapidly growing city, population approximately 80,000, on the west of the Phoenix, Arizona metropolitan area. It is a typical low-density, suburban, car-centric U.S. edge city, though it transitions southwards through poorer, older neighborhoods to a more agricultural and rural character. Sustainability has been emerging as a theme in the city for several years with the most recent sign of commitment being the appointment of an environmental program manager to plan and coordinate city sustainability efforts in 2013 and the approval of a municipal sustainability plan in 2014. The current scope of sustainability efforts is predominantly limited to municipal operations but many aspects of it touch on citizens and businesses of the wider city, too. The municipal sustainability plan includes several ambitious goals including net zero greenhouse gas, waste, and water, although non-binding and without dates or clear definitions (COA, 2014), and identifies 120 sustainability actions that the city is already taking.

3.1.1. Program Selection Process Description

Selection processes were investigated for seven programs (Table 3). The sample includes programs of internal and external reach, and types of economic development, community building, infrastructure efficiency, environmental impact and work practices. All programs aim at a particular issue, usually loosely linkable to general municipal goals, but address other issues, too. Note that all of the programs examined were selected before the sustainability plan was approved.

The selection process follows a general pattern (initiation, investigation, discussion, recommendation, and decision) but not a formal procedure. Initiation results from a problem (e.g. staff retention and recruitment, city code compliance), a council member's interests (community gardens, environmental impact, technology sector), a goal review (landfill diversion), or an operational review (IT systems). Process initiation is by city management or council members. Investigation, discussion, and recommendation is mostly performed by assigned staff, sometimes in groups, with consultation with departmental and city management, and occasionally involving wider internal input (Green IT, Green Friday). Most decisions are made by the council, but for some (such as block grant funding), a city manager or departmental head authority was sufficient. Two programs require approval by commissions (Small Loans, Plastic Bags).

Program ideas originate from internal brainstorming (Green Friday, Green IT), a focused search (Plastic Bags), individual knowledge (Community Garden, Gangplank), gradual iterative evolution (Small Loans), or external (commission) recommendation (Green Waste). Mostly, only a single program is generated and considered for implementation, although it may come through an earlier iteration (Small Loans, Plastic Bags). Alternatives are generated in only two projects (Green IT and Green Friday) and presented to decision makers in only one (Green IT). Programs are informally assessed through discussion, usually between staff and senior management, without clear criteria or procedures. Mostly, consideration is of operational aspects of the program, such as implementation / operational cost or impact on service. Typically, consideration of likely achievement of immediate outcomes (e.g. loans made, bags collected, energy saved) is given, often based on some degree of evidence from similar programs in other cities but never specific (e.g. how *many/much* loans, bags, energy). Nor is much attention given to the potential to achieve

broader outcomes (community impact, environmental impact) or long-term goals (e.g. net zero greenhouse gas and waste).

Table 3: Summary Description of Selection Processes of a Sample of Programs in Avondale

Program	Description	Issues to be addressed	Process	Origins
Green Friday	Change from 5 to 4 day work schedule for all non-emergency and continuous service employees allowing several large buildings to close on Fridays.	*Main:* Staff retention and recruitment / city competitiveness; *Other:* Costs; Energy use; Air quality (commuting); public convenience	Initiated by city management who created a committee to identify a solution to the main issue. Following discussion of recommended solution with the City Manager it was presented to and approved by the council.	The committee brainstormed numerous options. Options were assessed informally with narrow criteria that expanded as knowledge increased. A best option was identified supported by exemplar cases.
Community Garden	A local non-profit organization leases a centrally located 70 plot / 2 acre site from the city. Run entirely by members. $120 annual fee includes water and shared tools. Holds educational events and works with schools and women's shelter.	*Main:* Diversity and lack of community in the city; *Other:* Capacity to grow food; General health and nutrition	Initiated by a council member with personal interest who requested support for a garden from the council. Staff were assigned to develop a site, engage public, and create a non-profit org. Council approved the plan and small startup grant.	No alternatives were considered. Council imposed minimum criteria (no cost to city, must be well maintained). Other criteria were limited to site selection. Other local gardens informally cited in support. Sustainability potential undeveloped.

Program	Description	Issues to be addressed	Process	Origins
Community Workspace	Community workspace for technology entrepreneurs and business initiation. Entirely operated by a non-profit org. ("Gangplank") with free lease + $60K annual grant from city. Located in vacant public building in old town district, energy retrofitted at $162K cost largely from federal ARRA funds.	*Main:* Weak local economic base; *Other:* enhance city image; improve city assets; old town revitalization; community engagement; energy saving	Initiated by Economic Development Director looking to stimulate business startups. GP program was proposed by a council member personally interested in technology sector who promoted the program through informal discussions before final approval by the council.	A more conventional incubator solution was first considered. GP were already operating in another local city that was discovered by a council member. Assessment was informal with no clear criteria but wider community benefits were important. Supported by success of first GP center. Sustainability potential undeveloped.
Green Waste	Separate, monthly, curbside residential green waste collection. Material is sent to a local, commercial composter for $20 / ton (landfill is $25). Landfill diversion has increased 18%. Initial costs (equipment) of $100K. Created 2 new jobs and costs $100K / year to run.	*Main:* Environmental impact of landfill; Supporting residents' environmental behavior choices. *Other:* Green city image / local city competitiveness	Initiated by public works director and asst. manager due to stalled progress on increasing landfill diversion. Staff member assigned to develop a program for a pilot which was approved by council. Council approved permanent service after pilot successfully increased diversion.	Idea was generated by environment commission and remained on their priority list for 3 years without action. No alternatives were known to have been considered. Informal assessment using operationally-oriented criteria. Supported by reference to programs in other local cities.

Program	Description	Issues to be addressed	Process	Origins
Plastic Bags	Partnership with regional supermarkets to operate a statewide plastic bag recycling scheme in Avondale. City operated collection bins in City Hall and libraries feed into local supermarket stream. The City provides education and marketing support.	*Main:* Environmental impact of plastic bags; Supporting residents' environmental behavior choices. *Other:* Green city image; reduce cost (reduced regular recycling system fouling); increase landfill diversion;	Initiated by a council member whose request to the council to use ordinance was rejected but approval given to investigate voluntary measures. A staff member was assigned who developed a partnership with the regional scheme. First approved by the environment commission and then by the Council.	Two options were sequentially considered (1. ordinance targeting use, 2. voluntary recycling targeting disposal). Discovered by staff member researching voluntary solutions. No formal criteria or assessment. Supported by operational success of existing scheme.
Green IT	Nine projects to upgrade and transform IT infrastructure and practices including server room upgrade; virtualization; desktop inventory reduction; replace CRT with LED screens; Re-use old PCs in schools; paperless city; energy star purchasing;	*Main:* Need to overhaul IT operations / environmental impact of IT operations. *Other:* reduce costs; reduce energy use; enhance service;	Initiated by IT Director reviewing IT systems who saw opportunity to combine environmental and IT goals. A plan was developed with IT staff and discussed with City Manager. Parts were approved by IT manager or City Manager or Council;	Numerous options were brainstormed and researched by IT staff. Not all were included in the plan. Assessment included cost, operational impact, energy use, and e-waste reduction but was somewhat informal. Supported by industry and government best practices.

Program	Description	Issues to be addressed	Process	Origins
Small Business Loans	Provide accessible small loans ($1500 - $10K) to small businesses in old town district. Loans are made on a basis of personal relations, trust and community commitment for business improvement. Financing is by a local bank and underwritten by the city's Community Development Block Grant of $30K / year.	*Main:* strengthen local economy; Old town revitalization; *Other:* support private water connection improvements for city code compliance.	Initiated by Neighborhood & Family Services Director due to old town small businesses having a city water code compliance issue. Internal discussions widened the scope to general business improvement. Staff developed the program and found a partnering bank. It was approved by the N&FS commission and then by council	The idea to use community development funds arose from internal managerial discussion with awareness of other cities doing this. Variations on loan schemes were considered and a program developed to fit the local context. No formal criteria or assessment was done. Sustainability potential undeveloped.

3.1.2. Does program selection meet effectiveness criteria for sustainable transformation?

Criteria for selecting socially robust, sustainable, and transformational programs were only weakly met overall (Table 4). Inputs were weak or non-existent and the process was weak. Characteristics of outputs (selected programs) were slightly stronger in that they generally addressed immediate issues, though less so sustainability goals, were supported by a degree of evidence, and targeted upstream drivers. These moderate strengths, however, are somewhat moot as the application of sustainability principles in the selection process was weak or absent.

Table 4: Overall Assessment of Avondale's Program Selection

Inputs	Process	Output
Overarching framework – Weak. No framework existed. Selection was guided by individual issues and vague goals although usually falling under broad municipal (but not specifically sustainability) goals. ***Intermediary – None.*** Coordination was limited to within selection processes and not across. Not usually	***Participatory – Weak.*** Participants were mostly limited to assigned staff, senior management, and council members. ***Accountable – Weak.*** Moderately transparent as a public process but in reality much activity is private and not easily accessible. Responsibilities during the	***Alignment – Moderate.*** Most programs aligned with the immediate issue and general municipal goals ***Evidence – Moderate.*** Other cities or best practice used as evidence of effectiveness. ***Upstream Programs – Moderate.*** Some programs targeted midstream infrastructure but many

many stakeholders to be coordinated.	process and for selection are not always clear. ***Shared, structured process – None.*** Selection followed a general pattern but no formal process existed. ***Generate Options – Weak.*** In most cases only a single option was considered. ***Assess Options – Weak.*** Informal assessment (if any) using vague and narrowly focused criteria	aimed at upstream rules, motives, knowledge, and resources ***Sustainability principles – Weak.*** Most programs align with only one or two principles and often only superficially so. Most have undeveloped potential for sustainability. ***Integrated – Weak.*** Most programs did not link to other programs and were weak in spanning across sectors. Some involved working with external partners.

3.1.3. How does sustainability affect, and how is it affected by, program selection?

Overall, none of the programs appear to be clearly intended as sustainability programs, either as individual programs or when considered with other programs as part of a bigger plan. First, there is no integrated strategy for sustainability transition and programs are selected in isolation without much regard for existing, current, or planned programs. Second, when considered individually, although environmental impact is a priority in some programs (Green Waste, Plastic Bags, Green IT), a balanced and comprehensive view of sustainability is not a priority issue in initiating any program selection process. Neither are sustainability principles comprehensively applied in selection processes when considering and designing programs, although some programs do invoke select principles (e.g. *civic engagement* is built in to the Community Garden). And, the city's Environmental Commission might be expected to play a greater role in selection, but had input into only two of the programs examined. Thus, programs are typically selected as something other than a sustainability program or based on a limited (environmental) view of sustainability.

This is not to say that programs have no potential as sustainability programs. Indeed, sustainability appears underdeveloped or underemphasized in some programs (e.g. Community Garden). In others, sustainability aspects emerge as more is learned about the issue and solution(s). For example, energy saving was not initially important to Green Friday but became so

when potential programs were investigated, and in the Community Workspace program, energy saving became a co-benefit only when it was realized that the program created an opportunity to use already existing federal energy efficiency funds for building retrofitting.

Although sustainability may not be a dominant input to the city's program selection processes, it does appear to have influence in other ways:

- new programs were initiated that otherwise would not have been, even when at considerable cost to the city (the Green Waste program costs approximately $100,000 per year to operate).

- the emergence of a green city image in which environmental co-benefits are emphasized and, or, added to programs (Green IT, Community Workspace, Green Friday, Green Waste).

These influences appear to be for several reasons. One is a genuine effort to improve the city's sustainability. Another is to keep up with what other local cities are doing, and, taking this a step further, to elevate the city's visibility as an attractive place for business, residents, and visitors.

Overall, Avondale's approach is more *anything goes* than a clearly focused commitment to, and strategy for, advancing sustainable urban transformation or even a more limited goal of sustainable municipal operations.

3.2 Almere, the Netherlands

Almere is the newest city in the Netherlands. Founded in 1976 it now has a population of approximately 195,000 with plans to grow to 350,000, known as Almere 2.0 (Municipality of Almere, 2009). The city is relatively suburban by Dutch standards with predominantly low rise housing with a highly integrated public transport network scattered throughout a park-like setting of woodland, lakes and canals (Newman, 2009). Almere has an established commitment to sustainability including its "Almere Principles" and strategic vision for Almere 2.0 (Municipality of Almere, 2009). The city has been involved in numerous, mainly energy related and somewhat technical and top-down sustainability programs over the last 10 years (Roorda et al., 2011). It also recently set the (non-binding) goal of becoming an energy and carbon neutral city by 2022. The date is deliberately set to coincide with when the city will host the Floriade exhibition, a major horticultural international

event held every 10 years in the Netherlands, with the theme of "Growing Green Cities". The city does not have a centralized sustainability office or manager but has planners focusing on sustainability in areas such as energy, housing and transport.

3.2.1. Program Selection Process Description

Selection processes were investigated for five programs (Table 5). The sample programs are all external to municipal operations and include housing and building, mobility, energy, and innovation. Most programs clearly address city sustainability goals of energy neutrality, civic participation, or general sustainability.

There is no formal procedure for selecting sustainability programs and neither is there a clear pattern by which selection happens. Programs evolve in a manner that is difficult to trace. Initiation is by aldermen (politically appointed executives) (Energy Neutral Housing, Sustainability Shop) or external experts (Eco-building Materials, Charging Points) or community members (Energy Cooperative). Staff are assigned to investigate the issue and/or proposal, usually with an external party, and develop it towards a recommended solution. Whilst city staff have some freedom to proceed, significant decisions are usually made by an alderman.

Program ideas originated from an individual's knowledge (Energy Cooperative, Eco-building Materials), an earlier program (Sustainability Shop), predetermination by an external organization (Charging Points), or by professional collaboration (Energy Neutral Housing). Only in one process (Energy Neutral Housing) was more than one program option generated. All other processes were single option, two of which emerged out of a prior program (Sustainability Shop, Energy Cooperative). In only one process (Energy Neutral Housing) were program options formally assessed, including sustainability-oriented criteria as well as technical feasibility and performance. Some programs are supported by evidence of operation in other cities, though perhaps not directly transferrable due to their contextual nature (Energy Cooperative, Energy Neutral Housing), and others are very innovative with little evidence to go on (Sustainability Shop, Eco-building Materials).

Table 5: Summary Description of Selection Processes of a Sample of Programs in Imere

Program	Description	Issues	Process	Origins
De Groene Reus Energy Cooperative	Grassroots, volunteer run organization promoting renewable energy solutions to Almere residents. It provides knowledge, planning, providers, and low cost solutions to members for a small annual fee. The city provides technical support and guidance and may provide further funding of €20K. A well-known Alderman is a member. The coop holds public meetings including other energy stakeholders and demonstrates popular support for energy neutrality.	*Main:* Civic participation; energy neutrality by 2022.	Emerged out of two predecessor civic organizations – one focused on broad sustainability, the other on energy – that had approached the city for help and city's own efforts to plan energy neutrality and build a sustainability agenda. A strategic planner was assigned to work with the orgs. A public meeting, opened by alderman, showed broad support for an energy initiative and the cooperative was formed. The city is supporting the coop in a consultancy role and with funding.	The idea for an energy cooperative came from one of the initial civic organizations but fitted with the city's goals for civic participation and energy neutrality. The city had considered numerous energy projects, especially wind, but faced many barriers. Adding broad public support helps to overcome some barriers. No formal assessment was made before the city got involved. Supporting evidence comes from many examples of energy coops in the NLs and direct experience from one in a nearby city.

Program	Description	Issues	Process	Origins
The Sustainability Shop	A community center for supporting sustainability innovation. Providing resources, capacity, connections and so forth to help local entrepreneurs (social and commercial) develop and implement ideas. Founded on principles of openness and sharing, holds educational and networking events to inspire and stimulate. Funded 50/50 by the city and local environmental NGO but defunded after 18 months.	Main: sustainability; Other:	Initiated by an alderman looking to stimulate sustainability activity in the city. An approach was made to the director of a local environmental NGO to host and co-fund the program. The city was at the time developing a sustainability agenda. The NGO director researched and planned the idea and the shop opened 9 months later.	No other options were considered. The shop grew out of a more limited, internally focused 'sustainability lab' within the municipality that was not having much effect.

Program	Description	Issues	Process	Origins
Nobelhorst Energy Neutral Housing	Phase 1 of a large greenfield housing development (950 of 4300 homes) being constructed and managed by a social housing corporation. The new district is to be socially, environmentally, and economically sustainable and includes a diversity of dwellings (apartments, terraced, detached) and occupancies (private, social). This program focuses only on housing energy. Other programs focus on other aspects.	*Main:* Energy neutral district / city; Expansion of city by 160,000 people by 2030. *Other:* Energy independent; no added cost compared to 'regular' housing.	Initiated by an alderman who strongly believes in the "participatory city" – empowering residents, particularly lower income. The program was opened to competitive bids with 6 main requirements including energy neutrality and homeowner choice. The originally proposed energy solution was flawed so a new solution was needed. City planners, the developer and consultants cooperated to identify possible solutions through investigation, discussion, and negotiation.	Numerous options were generated by planners, consultants, and developer. Options were formally assessed against operational and performance criteria (cost, environmental impact, regulations, maintenance, etc.). Options are all supported by examples but not all are well established and proven.

Program	Description	Issues	Process	Origins
Electric Car Charging Points	A collaboration with national industry consortium, metro-area cities, energy companies, and charging network companies to install public access charging points around the city. 25 stations were funded by the consortium (€10K each) and a further 10 from national funds (economic development, air quality) and industry sponsors. There are an estimated 350 electric cars in Almere.	*Main:* (Perceived) Demand for charging points (10-20 public requests per year) *Other:* Regional air quality (mainly Amsterdam); city competitiveness / economic development; leader for electric car services industry (2 charging point companies are located in the city); gathering usage and technical data.	Initiated through membership in MRA (Amsterdam Metro Region) making pressure to improve Amsterdam air quality. Political decision also taken to meet (very low) demand for stations in Almere. Funding, technical, legal, and city code issues negotiated by staff with partners. Decisions to proceed with each phase made by city management.	Idea came from multiple sources (MRA, locally based companies). Part of general policy to support multiple mobility modes. No alternative options were generated on how to support Amsterdam air quality. Appraisal was based on operational criteria (location, cost / funding). Supported by (limited) experience in Amsterdam.
Growing Houses – Eco-building materials	A working demonstration of growing hemp as a construction material. A bio-based architectural practice is working with city staff to develop the program and obtain approval for building materials. A local farmer provides a field to grow the hemp. The hemp is then processed into a concrete like construction material.	*Main:* develop viable bio-based building for Floriade 2022 exhibition. *Other:*	Initiated by architect / innovator who approached the city about developing biobased construction for 2022 Floriade exhibition where buildings will be bio-based. First approach was through the sustainability shop which established contact with city staff. An alderman took an interest and supported the program.	The idea came from the architect. No other options were generated. No formal assessment was made. It was seen as an experimental program and, if successful, a building block towards the Floriade.

3.2.2. Does program selection meet effectiveness criteria for sustainable transformation?

Criteria for selecting socially robust, sustainable, and transformational programs were moderately well met overall (Table 6). Selection is relatively strong on inputs and on the

characteristics of outputs, but weak on the process itself. While the process is somewhat participatory, involving multiple stakeholders, though sometimes rather exclusively, it is weak in other respects of structure, accountability, generating options and assessment. However, two of the projects deserve closer examination with respect to this assessment.

The Energy Neutral Housing program is an exception that had a strong selection process. Multiple stakeholders (the City, a housing association, consultancies) worked cooperatively to generate eight solution options which were assessed against multiple criteria. Criteria included performance against climate neutrality and energy independence as well as housing costs and planning difficulty. To some extent, this may be considered an exemplary process in its generation of options and assessment that aligned with sustainability goals and principles.

Sometimes, it might not be appropriate to consider program selection at the individual program level. In the Energy Cooperative, program selection came about following a longer history of analysis and experimentation related to energy and carbon neutrality by the city. The city has good experience and knowledge of what it will take to achieve the goal and recognizes that the civic sector has an important role to play. Thus, although options were not generated when it came to working with the community groups and the selection process for the energy cooperative, many options had already been considered, explored and even tried.

Table 6: Overall Assessment of Almere's Program Selection

Inputs	Process	Output
Overarching framework – Moderate. Several components provide strong guidance to most of the programs: the Almere Principles; the Almere 2.0 Strategic vision; the 2022 Floriade exhibition and sustainability agenda developed around it; and the goal to attempt to achieve energy neutrality by 2022 ***Intermediary – Moderate.*** Planning staff play a very active role in working with a variety of stakeholders to advance the city goals.	***Participatory – Moderate.*** One program was strongly participatory whereas three engaged specialist stakeholders but were quite exclusive. ***Accountable – Weak.*** Decision processes and responsibilities are mostly murky and there is a lot of closed-door type discussion. ***Shared, structured process – None.*** No structured process exists. Selection evolves irregularly.	***Alignment – Moderate.*** Programs address immediate issues and mostly align with sustainability goals. ***Evidence – Weak.*** Most programs have precedents but support is weak due to contextual and experimental nature of programs. ***Upstream Programs – Moderate.*** Programs target upstream resources and capacity as well as midstream infrastructure. ***Sustainability principles – Moderate.*** Though not explicitly applied, most

	Generate Options – Weak. Only one process generated more than one option. **Assess Options – Weak.** Mostly informal assessment, loosely defined and narrowly focused criteria.	programs refer to the Almere Principles and consider social, environmental, and economic sustainability. **Integrated – Moderate.** All programs had some link with other possible or existing programs

3.2.3. How does sustainability affect, and how is it affected by, program selection?

Sustainability played a strong and primary role in the selection process of all programs bar one (Charging Points). Although informal and unstructured, processes were initiated in response to sustainability issues, were guided by the city's sustainability goals, and were influenced in design by sustainability principles. Programs either pursued sustainability goals directly or were taken as intermediary steps towards stimulating further programs with direct sustainability impact. The Charging Points program, however, seems less clearly a sustainability program. While it has an environmental goal of improving air quality in Amsterdam, the priorities seem more about serving the interests of the few electric car owners in Almere, promoting the economic base of Almere, and furthering the agenda of the electric car industry than balanced and comprehensive sustainability.

Although sustainability is an influence on program selection it has not as clearly influenced the actual selection process. In other words, Almere has not specifically changed the process of program selection in response to sustainability as a general issue. Indeed, Almere does not have a particular process for program selection. The process is fluid and adaptable which, along with a noticeable degree of latitude given to planners working on sustainability, seems to create space for ideas to emerge and be developed in the general direction of sustainability goals. Such a process, however, is subject to the whims of politics as seen, for example, in the withdrawal of funding for the Sustainability Shop.

3.3 Freiburg, Germany

Freiburg has a population of 220,000 and lies in the southwestern corner of Germany. It is a compact city, almost entirely rebuilt around the historic city center since the end of the Second World War. The city has a worldwide reputation as a sustainability leader based on a series of radical actions since the 1970s including rejecting nuclear power, pedestrianizing the city center,

building an extensive tram system and cycling network, and developing two large sustainable neighborhoods (City of Freiburg, 2011a). The city also has a thriving solar energy industry and sustainability service economic sector, and markets itself as *the* green city to attract visitors, inward investment, and economic growth (City of Freiburg, n.d.; Kronsell, 2013). Whilst the municipality has been a key player in these major developments, much of the impetus has come from a well-informed and active citizenry, non-governmental organizations, research institutions and business community but without any "overarching and integrative process" (Spath & Rohracher, 2011). Indeed, the city generally lagged behind these extra-governmental actors and progress towards targets of 25% below 1992 greenhouse gas emissions by 2010 and 10% of electricity from renewables by 2010 fell considerably short. Since 2006, however, the city reset its climate goal to 40% below 1992 levels by 2030 and there has been an effort to institutionalize municipal sustainable development and improve coordination with external stakeholders. A multi-stakeholder sustainability council was formed whose first accomplishment was to identify 60 sustainability goals across 12 policy areas, subsequently approved by the municipality in 2009. In 2010 a two-staff sustainability office was established to systematize the process of achieving these goals which began by taking stock (600 current sustainability activities were identified (City of Freiburg, 2011b)), setting targets, and working across the municipality towards achieving these targets.

3.3.1 Selected Programs

The Freiburg case was not developed to the same extent as Almere and Avondale but adds further insight from a city widely regarded as a sustainability front-runner. In addition to the city's general process for sustainable development, several programs were discussed with five interviewees including the city's sustainability manager and three Sustainability Council members.

- *Four Leaf Clover Sustainability Education.* With €60000 per year from the city, a non-profit ecology center (Ökostation) coordinates and partially funds organizations to implement sustainability education projects to students from kindergarten to high school. In each project, a group of four organizations is formed and each delivers a different aspect of an issue (ecological, economic, social, or cultural – the four leafs of

the clover). Dozens of diverse city organizations participate in the program. Funding is part of the larger LEIF (Lifelong Learning) federal grant to the city.

- *Powering light-rail by renewable energy.* The municipally owned light-rail company (VAG) powers the light-rail through 100% renewable energy since 2009 through an agreement with the municipally owned electricity company (badenova). Having a guaranteed customer for the power enables badenova to secure the required supply of 13 GWh per year.

- *Tourist Fee.* A 5% bed tax on the city's 1.4 million tourist-nights per year. Imposed in 2014 by the city's agency for Economy, Tourism, and Trade Fairs (FWTM), the tax is estimated to provide €1.5 million of revenue to the city. Business visitors are exempt. This was not a '*sustainability program'* but is included here because it is perhaps informative about the city's program selection and sustainability priority in general.

- *Immigrant Sustainability Education.* A federally funded program to educate immigrant families about sustainability issues such as energy efficiency and recycling.

- *Robert Bosch United World College.* The city supported the establishment of a new United World College (UWC) international boarding school with a strong sustainability focus. Jointly funded by the Robert Bosch and UWC Foundations, 200 high school students attend from around the world on scholarships. The city secured an unused heritage building and provided planning and construction support and a 5 year lease.

3.3.2. Does program selection meet effectiveness criteria for sustainable transformation?

Program Selection Inputs. To some extent program selection was guided by the city's sustainability goals which, although not an overarching, comprehensive sustainable development framework, are a clear statement of direction. Most programs clearly aligned with policy areas of education, mobility, and climate protection but the Tourist Fee program was purely driven by revenue generation considerations. Selection processes were initiated by city management or politicians, in association with external partners such as municipally owned companies (VAG and badenova) or non-profits (Ökostation, Aeforia, UWC/Bosch). Initiation was in response to funding opportunities (federal education funding), revenue opportunities (growth in city visitors), ongoing

discourse among stakeholders around sustainability goals (the municipality, VAG and badenova), or external requests (UWC/Bosch). There was no intermediary providing coordination across, or continuity between, these and other programs: programs were generally selected in isolation. However, there was coordination of stakeholders within projects (the Four Leaf Clover program has 60 partnering organizations) and there did seem to be awareness among stakeholders of each other, of common goals, and of programs in the city, and a willingness to work together.

Program Selection Process. There is no shared procedure for selecting programs and neither is there a pattern to selection processes. The selection of each program followed its own path. Program options appear to have been generated only in the case of the Tourist Fee program when an alternative green fee was proposed by city hoteliers (it was rejected, apparently based primarily on the lesser revenue generated). Program ideas originated from creative discourse between stakeholders in the Four Leaf Clover and Light-rail Power programs or from knowledge of practices in other cities in the case of the Tourist Fee program. In participation, the Four Leaf Clover program was strong in developing the program through a broad, open, multi-stakeholder process. In contrast, the Tourist Fee appeared to have been weak in participation, where program generation and development was conducted within the FWTM with little open discourse with stakeholders or willingness to consider alternatives such as that proposed by hoteliers. Participation in the light-rail energy program was limited to the major operational parties (VAG and badenova) and city politicians.

Program Selection Outputs. Program selection appeared to consider effectiveness as far as operational outputs and immediate outcomes go (meeting the electricity demand, a strong pool of participating organizations, expected revenue, etc.) but perhaps less so for more distal outcomes such as the effect of educational programs on sustainability behaviors, or the effect of price rises on tourist visits. Some programs were aimed at upstream influences in that the Four Leaf Clover program targets student knowledge and the bed tax, changes formal rules. The bed tax, however, is not intended to change individual behavior (visiting the city) whereas the educational program is. The light-rail energy program aims at midstream infrastructure. Sustainability principles were strongly applied in the Four Leaf Clover program selection but not at all in the bed tax program.

31

The Light-rail energy program is a good example of integration between programs with benefits to both VAG and badenova. The other programs were more isolated.

3.3.3. How does sustainability affect, and how is it affected by, program selection?

Freiburg's program selection has long been influenced by sustainability through its well-informed and active citizenry and large number of sustainably-oriented organizations. These groups provide some degree of scrutiny and hold politicians electorally accountable over sustainability issues. More recently, partly in response to the failure to meet climate and energy targets, the city has established the Sustainability Council, formalized sustainability goals and policy, set a new greenhouse gas reduction target, and instigated a sustainability management office. Thus, sustainability is now having an effect on the city's institutions after its laissez faire approach, although, as yet, there is no indication that this is changing the program selection process.

Sustainability is not always the overriding priority when selecting programs. The Four Leaf Clover program struggled to get the city to honor its funding obligations despite the important part this program played in the city being awarded the federal LEIF funding. In the Tourist Fee program, the city's FWTM agency would not openly consider an alternative "green fee" proposal that would have dedicated the revenue, albeit lower, for sustainability programs. More generally, the sustainability Council, despite consisting of 30 very knowledgeable and creative thinkers on sustainability from across the city, does not seem to be engaged in program generation or selection, but is instead kept busy on "unimportant questions" (Sustainability Council Member, 9 May, 2014). Thus, there is some suggestion that the city sometimes uses sustainability as an opportunity to further other aims, and at other times may dismiss it outright. There is also some feeling that the city's projection of its Green City image lacks substance in its actions and is more oriented towards economic growth. The siting of the new UWC in Freiburg, for example, may add to the city's prestige and image as a center of excellence in sustainability learning and innovation, but it is less likely to have a direct impact on the actually sustainability of the city.

Overall, the city's approach to sustainability program selection appears somewhat *anything goes*. The city is not (yet) providing the coordination between departments and external

stakeholders needed to produce integrated programs (the Light-rail Power program is a significant exception). It is not drawing on the potential of the Sustainability Council as a source of innovative programming. Although the city has a comprehensive set of sustainability policy areas and detailed sustainability goals, many of the 600 programs identified by the city in the Sustainability Status Report indicate a very liberal interpretation of what qualifies as a sustainability program.

4. Case Comparison and Synthesis

4.1 Program selection process

The main commonalities, while not universal but observed to some extent in all three cities, allow some tentative generalizations about program selection processes.

1. The process is irregular and largely informal

2. Participation, including process initiation and program origination, is dominated by appointed staff, senior management, and elected officials

3. Frequently, only a single option is considered; alternatives are rarely generated.

4. Sometimes, the single option is arrived at through a dynamic development process, but other cases are solution-led, where a program is identified first and the process follows on.

5. Many programs are not clearly selected as sustainability programs, lacking alignment with sustainability goals, having other priorities, or not applying sustainability principles.

6. There is usually only limited and informal assessment of options.

7. Program selection is usually supported by at least some evidence from other cities or best practices, or is of more novel programs without strong precedent.

4.2 Comparing approaches between cases

Comparing overall processes, Almere appears to be more transformational than Avondale. Avondale meets few of the criteria for selecting socially robust, sustainable, and transformational programs, and is at its strongest when it comes to considering the effectiveness / evidence of options and in selecting moderately upstream programs. Avondale does not place a high priority on comprehensive, balanced sustainability in the selection process, and it is not always clear that selecting sustainability programs is the intention, or it only becomes so as an afterthought.

Avondale, then, appears to have an *anything goes* approach. Almere's process is more transformational because there is moderately strong guidance and adherence to sustainability goals and principles, and a more coherent and integrated approach in which the city plays a role of intermediary. Freiburg is perhaps somewhere in between: quite strongly guided through sustainability goals but less coherent and integrated, and driven more by opportunity than purposive pursuit of goals and targets. Freiburg also has somewhat of an *anything goes* approach.

One outcome seen in Almere is the selection of three programs with significant transformational potential. The Energy Neutral Housing program is transformational by virtue of scale, whereas the Energy Cooperative and Sustainability Shop programs are transformational as intermediate steps intended to catalyze further direct-impact sustainability programs. These programs perhaps demonstrate that transformational outcomes may be produced by (at least) two different paths: (i) generating and comparing options; and (ii) experimenting and evolving.

The differences between Almere and Avondale is partly explained by Almere having: sustainability more deeply embedded into its administration; highly knowledgeable and motivated planners more actively pursuing sustainability and engaging and coordinating with a more expansive group of external stakeholders; more latitude for these planners to operate as change agents; and more committed political leadership. This is not to say Avondale does not have any of this but that it is behind Almere in its development with, for example, the Municipal Sustainability Plan and sustainability manager having been only recently established. Politically, strong opposition to sustainability exists in Almere just as it does in Avondale. However, there are perhaps other, more institutional explanations for why this is less of a barrier than it might be in Avondale including the relatively powerful position of aldermen to take action, and a democratic model which produces coalition governments with clear agenda setting and power to act. In addition, there is a more active and sustainability-motivated citizenry in Almere that applies pressure on the city to act and also creates opportunities for collaborative programs with the city.

Freiburg, however, has similar ingredients to Almere, including an even more active and sustainability-oriented citizenry, yet the city's program selection appears less transformational. There is perhaps, more of a reluctance for the city to take on the role of intermediary and, instead,

to (still) rely on external parties to drive program development and implementation. There also seems to be more 'departmentalism' within the city with, for example, the interests of the FWTM, a powerful agency whose remit is to market and develop the city's economy, conflicting at times with the interests of other parties and sustainability in general. Neither does the city appear ready to engage stakeholders in a strongly participatory approach.

4.3 Support for general indications of the literature

The findings from the case studies provide mixed support for the assertions of the literature. Almere, in particular, provides evidence to the contrary.

Regarding the lack of planning and coordination, the Energy Neutral Housing program in Almere involved integrated planning with other programs; the Energy Cooperative process has been one of coordinating multiple stakeholders and multiple developments; and the Eco-Building Materials program shows future coordination with possible programs of the 2022 Floriade. If we consider at broader scale, however, none of the cities has an integrated sustainability plan although Almere has begun to develop a sustainability agenda.

The propensity for narrow, technical fixes noted in the literature is not widely supported by the cases. Although the many of the selected programs may fit this description there are also many examples across all cases that do not.

The assertion that there is a lack of commitment to, or alignment with, shared goals.is partially confirmed. In Avondale, many programs were selected as something other than sustainability programs due to a lack of priority for sustainability and lack of application of sustainability principles. Almere, again, demonstrated stronger adherence to sustainability, although not universal.

There is some support for the claim that programs are primarily selected for reasons other than sustainability. Examples where selection was more for visibility, co-benefits, or funding availability, occur in all cases.

5. Discussion

5.1 Participation and creative input

Most selection processes considered and selected only a single program. While in a few of these, there was an evolutionary process by which the program idea came into being and was developed, more often, a program was identified and accepted without much apparent sustainability related deliberation. To some extent, then, the selection process could sometimes be described as "solution-led" in which the process is oriented around a predetermined, and often the only considered, solution (May, Page, & Hull, 2008). This likely ensures that radical options will never even be considered, let alone selected, and therefore precludes the possibilities for transformation.

This limiting of choice may be partly attributed to the concentration of creative control and decision making in experts, senior management, and political leaders that was seen in all cases. Such circumstances create professional and institutional resistance to change (Aylett, 2013) that naturally limits choice to within well-known and tolerated boundaries. Overcoming this barrier is possible by decentralizing control of the selection process through empowering a much wider group of stakeholders in the selection process (Aylett, 2013). While this is possible within departments, it becomes more powerful when executed at organizational level, or better still through engaging with civic and other external stakeholders. Diverse, creative input is important for generating a wide range of program options and for adapting options to maximize their sustainability potential.

In Avondale and Freiburg sources of creative input exist but are not used to their full potential. In Avondale, the Energy and Natural Resources Commission, and in Freiburg, the Sustainability Council could be much more engaged in program selection.

5.2 Making the most of sustainability

Commitment to sustainability goals and application of sustainability principles was suggested as a key factor in the assessment of Almere being more advanced in sustainability program selection than Avondale. This difference may not only lead to unsustainable programs being selected but to missed opportunities as well. Several programs in Avondale are potentially underdeveloped with respect to sustainability. The Community Garden, for example, underplays

ecological and economic possibilities (e.g. being organic, cost savings to low income families), and the Collaborative Workspace program could have used the energy retrofit of the building housing the program as a focus and developed more emphasis on sustainability-oriented initiatives coming out of the program.

The application of sustainability principles can not only indicate whether a program option is desirable or not, but can also be used as design criteria to adapt the option. Combining this with more *creative input* into option design can maximize its sustainability potential.

5.3 Transformation, delusion, or greenwash

The corollary to underdevelopment of sustainability in options is, perhaps, overemphasis, where the sustainability benefits of an option are overplayed.

One enabling factor of this is that the *anything goes* approach lowers the bar to the point where almost anything can be labelled as sustainable or "green". Another is that vague assessment criteria and procedures mean that programs can be selected based on an assumed capability to achieve some unquantified immediate outcome without putting this in the context of existing impacts or long-term goals. For example, a program may be claimed to reduce energy use but not *how much* in relation to current energy use or future energy use targets. This can give the illusion of doing something even though it may have negligible contribution to what really needs to be done. Such creating of a "false sense of achievement" not only fails to make progress, but may prevent critical analysis and further action (Aylett, 2013, p. 1399).

The use of the "green" label has become a common tactic among cities striving to be economically competitive through promotion of an enterprise culture and creating a image of a "green" city (Brand, 2007). Economic growth is the main driver but there may be quality of life benefits for (some) residents too. However, such changes are incremental and transformational progress is marginal. In Avondale, "visibility", or the enhancement of the city's image to those outside was identified as a goal in several projects (Gangplank, Green Waste, Plastic Bags) as was promotion of an enterprise culture (Gangplank). In Almere, the Electric Car Charging Station program has dubious sustainability qualifications where, instead, the underlying motives may be more about economic growth and projecting a green image.

Program selection that includes assessment against robust sustainability criteria, substantiates performance claims with evidence, and puts estimated performance in the context of transformational sustainability goals, can help to reduce the possibility of delusion or greenwashing.

6. Conclusions

Case studies of three cities (Avondale, U.S.; Almere, the Netherlands; Freiburg, Germany) have revealed knowledge and insight into the selection processes of a sample of sustainability programs. The findings suggest selection processes are often haphazard, dominated by experts, managers, and politicians, are solution-led without considering alternatives, and include limited assessment of programs. Program selection for sustainability is often no different from selection for other purposes and only weakly meets criteria for selecting socially robust, sustainable and transformational programs: selection processes have not clearly been adapted to meet the unique challenges of sustainability. It seems, also, to varying degrees, that cities are prepared to take an *anything goes* approach, labelling all kinds of programs as 'sustainability programs'. The implications are that programs selected tend to be fragmented and of limited impact and, thus, more incremental than transformational. Exceptions are noted, particularly in Almere, where the selection process has produced some programs that appear to have transformational potential.

Interpretation of findings suggests that although selection processes are not clearly affecting sustainability, and sustainability has not clearly affected selection processes, sustainability is influencing which programs get selected in a more indirect way. Sustainability has given rise to new 'best practice' programs, new funding opportunities, new competitive fronts, and new opportunities for city branding and image building. While these may result in some advance in sustainability, albeit in a fragmented and limited way, it would appear that sustainability is also being used to advance economic growth and political positions.

Some further insights into selection processes suggest how processes can be improved to produce more transformational outcomes. These include: broadening participation in the selection process to provide more creative input; applying robust sustainability principles to improve the design of program options and maximize sustainability potential; and including pragmatic,

38

evidence-supported program assessment to highlight the sustainability and transformational potential of options and avoid unsupported claims.

While somewhat consistent with the limited literature on the subject, these findings are tentative due to research limitations. The findings are based on only three cities, and the sample of programs investigated in each case was small and not representative of all programs selected in that city. For example, Freiburg has certainly selected strongly transformational programs in the past such as its tram system or housing district developments. Furthermore, the scope of the research did not extend to an assessment of the effectiveness of programs to achieve sustainable and transformational outcomes but was limited to an assessment of the selection process and the likelihood that it would select effective programs based on a set of assumptions about how this should be done. While these assumptions are based on sustainability science and other related literature, further empirical research on their validity is needed.

Despite the limitations, the article makes a valuable contribution to a gap in the sustainability literature and provides useful knowledge for the design of more effective sustainability program selection processes.

STUDY 2: A FRAMEWORK FOR SELECTING PROGRAMS FOR EFFECTIVE URBAN

SUSTAINABLE TRANSFORMATION

Abstract

The selection of sustainability programs in municipal sustainability initiatives is critical to the progress of sustainable urban transformations. Yet, despite the unique challenges of sustainability problems, cities do not appear to be adapting program selection processes which, along with other factors, is suggested to result in selected programs being more incremental than transformational. One possible solution is to pay greater attention to how programs are selected through a more systematic process that addresses common deficiencies in current selection processes. The purpose of this article is to present a framework that guides the selection of programs towards long-term sustainability based on the best available evidence while recognizing multiple views and interests. Its design draws on the sustainability literature and inputs from municipal practitioners in Avondale, Arizona, and Almere, the Netherlands. The framework is suggested to support greater progress to sustainable cities as both a direct tool that promotes selection of more transformational sustainability programs, and as a learning tool that increases stakeholder and organizational capacity for transformational sustainable development. It is not, however, a panacea. Also needed are sustainable visions and goals, effective program implementations, and formative program evaluations – but above all, municipal decision makers must fully commit to prioritizing sustainability goals and open up to the full range of possible sustainability programs.

1. Introduction

Sustainable urban transformation is urgently needed to tackle problems such as climate change, inequality, and epidemics that threaten societal viability and integrity (Clark, 2000; Hodson et al., 2015; McCormick et al., 2013; Whitehead, 2012; Willis, 2012). While cities commonly acknowledge the need for action and many are taking action, most programs implemented are of marginal impact and there is little evidence of significant progress towards urban sustainability (Betsill & Bulkeley, 2007; Hodson et al., 2013; Wheeler, 2008; Cooper and Vargas (2004) in Conroy & Iqbal, 2009). One reason offered for this is that cities have not yet developed the institutional

capacity to deal with the new and unique challenges of sustainability problems (Bulkeley, 2010; Svara et al., 2013). While there are other reasons that block progress, not least those of political economy (Bulkeley, 2010), there is a need to close the gap between what cities say, or at face-value appear to intend, and their capacity to achieve it.

Sustainable urban transformation, taken here to be a broadly similar concept to urban sustainability transition, refers to a purposive, fundamental change in the way cities function to a sustainable state over a generational timescale (Markard et al., 2012; McCormick et al., 2013). By "sustainability program", it is meant a coordinated policy, project, or other action taken to address a sustainability problem. In general, urban sustainability programs aim to change the systems and practices of urban production, distribution, and consumption to be more sustainable, i.e., supporting the viability and integrity of urban society and the regions affected by it.

Sustainability problems have unique, complex characteristics which differentiate them from "normal" problems (Funtowicz & Ravetz, 1993), and present cities with new challenges in program selection. Sustainability problems are: harmful to societies in the long-term; require urgent attention; have impacts that are dispersed in space and time and societal sector (e.g. social, environmental and economic); have complex causes; and are contested (Wiek, Foley, et al., 2012). Sustainability problems, then, are "networked cause-effect chains" (Wiek, Foley, et al., 2012) that cut across and through entire societies. As a result, there are many potential solutions of differing types (sectors) to sustainability problems, with multiple intervention points (Wiek, Foley, et al., 2012), and a wide assortment of stakeholders. Solutions, too, are complex, necessarily comprising manifold systemic interventions dispersed in space and time and sectors, and requiring integration, cooperation, and adherence to sustainability principles. The urgency of sustainability problems also dictates that incremental, gradual, change will not suffice and radical, transformational action is required. How could a city select programs to deal with such problems?

The scale and complexity of change required for sustainable urban transformation is much greater than any single sustainability program can cause. Multiple programs that build on and interact with each other in a way that moves towards long-term sustainability visions and goals are needed (Rotmans & Loorbach, 2010). It follows that the choice of program is critical, and therefore

the selection process is too. However, programs often emerge haphazardly with little consideration of alternatives or contribution to overall transformation (Forrest & Wiek, unpublished-b). Indeed, they are frequently implemented in the absence of any transformational or integrative context (Conroy & Iqbal, 2009; Culotta et al., 2015; Hodson & Marvin, 2010; McCormick et al., 2013; Wheeler, 2008).

Transformational sustainability research frameworks (Wiek & Lang, in press), such as urban transition labs (Nevens et al., 2013) , provide this type of context as systematic, strategic, overarching approaches to urban sustainability transition, yet they are largely silent about the nitty-gritty of program selection. For example, participants in urban transition labs appear to be left to their own devices in deciding what to do after agreeing on a vision and goals (Nevens & Roorda, 2014). More generally, "there are only a few examples where transformative change has been adequately connected to sustainability goals to realise strategic potentials" (McCormick et al., 2013). Thus, while transformational sustainability frameworks provide the overarching direction and strategy, there is need for more guidance on selecting programs within them.

Sustainability assessment could help with this endeavor. Having evolved from a method narrowly focused on avoiding environmental harm, it has become more strategic and comprehensive (Hacking & Guthrie, 2008; Pintér, Hardi, Martinuzzi, & Hall, 2012). Backed by commitment to explicit *sustainability imperatives,* this more progressive sustainability assessment has potential to select more effective programs (Bond, Morrison-Saunders, & Stoeglehner, 2013; Gibson, 2013). But, while sustainability assessment focuses on program selection to an extent that other methods do not, it still needs to be combined with other methods, such as visioning, current state analysis, and program design, to achieve the continuity, integration, and direction needed for sustainability transformation (Wiek & Lang, in press).

Research prior to this study identified particular deficiencies commonly found in cities' selection processes with respect to sustainable urban transformation (Forrest & Wiek, unpublished-b), including:

- *opportunism*, where selection is influenced by extraneous parties and events (e.g. funding opportunities) rather than strategic goals. While such programs may be

42

sustainably oriented, they may lack the integration and coordination needed to tackle the complexity of sustainability programs, and generally deflect from the desired trajectory;

- *elitism*, where selection is controlled by a narrow group of powerful actors (experts, managers, and politicians), thereby limiting the creativity and diversity needed to create transformational programs and missing the interest and commitment needed for programs to be successful;

- *misalignment*, where selection is guided by principles and goals other than sustainability (e.g. free markets, economic growth), demoting sustainability to a co-benefit or afterthought, perhaps even conflicting with it, and diminishing commitment and impact;

- *incrementalism*, where programs selected are of marginal impact and incapable of providing the magnitude of change quickly enough as required by the urgency of sustainability problems;

The result is that programs are weak and fragmented, and therefore unlikely to provide the cumulative effect needed to transform urban systems. It is posited that a systematic selection process could help to address these, and other, issues.

The purpose of this article is to present a framework that guides the selection of sustainability programs towards sustainable urban transformation, based on the best available evidence, while recognizing multiple views and interests. The framework design draws from the literature on sustainability assessment and, using an action research approach (Small, 1995), from collaborative input of practitioners from the municipalities of Avondale, Arizona, U.S.A. and Almere, the Netherlands. Practitioners have a critical role to play in designing a product that is useful in practice and not just theory. The framework, consisting of procedure and structure, is aimed at being a useful and usable tool for municipal sustainability practitioners, while the article also contributes to the literature on sustainable urban transformation and sustainability assessment.

Almere and Avondale, populations 195,000 and 80,000, are rapidly growing cities on the edge of Amsterdam and Phoenix metropolitan areas, respectively. Both cities participated in an

earlier phase of this research (Forrest & Wiek, unpublished-b) and were selected for their urban similarities, appropriate size for participating in research, and having existing sustainability initiatives, capabilities, and commitment.

The article proceeds with Section 2 in which the research methods used to develop the framework are explained. Then, framework design guidelines, derived from the literature and research partner inputs, are presented in Section 3. An operationalized framework is described in Section 4 and its usefulness and limitations are discussed in Section 5. Section 6 concludes the article.

2. Research Steps and Methods

An initial version of the framework was derived through a synthesis of literature on sustainability assessment and other frameworks related to sustainability program selection. Articles on conceptual models, general guidelines, or procedural descriptions were sought until little or no new information was gained from additional articles. Articles were analyzed to inductively construct a list of features of sustainability assessment processes. The list contained conflicts between articles over particular features, and conflicts between features. Conflicts were resolved by referring to the broader literature and, or discussing with practitioners, and eliminating the offending features. Of the remaining features, some were eliminated if deemed to be of marginal importance, and the others were consolidated as much as possible, without losing critical information.

A framework, consisting of steps, activities, and schemata was then constructed to comply with the guidelines and modified in response to review meetings with practitioners in Avondale and Almere. In Avondale this consisted of several informal discussions with the sustainability manager and other planners. In Almere it consisted of two three hour review meetings with two senior sustainability planners followed by comments on discussion documents. The working version of the framework was further explored by using data from an Almere program as an example.

3. Design Guidelines for a Sustainability Program Selection Framework

Guidelines were distilled from 36 features of sustainability assessment processes extracted from 19 articles. In addition, they were supplemented with input from practitioners in

Almere and Avondale and from other literature. Similar to the selection process criteria of Culotta et al. (2015), they are organized into:

(i) *Context:* what are the inputs to, or constraints on, the process?

(ii) *Process*: a) what activities should be done; and b) how should they be done?

(iii) *Output*: what qualities should selected programs have?

The guidelines, therefore, represent what the sustainability literature, and in particular, that of sustainability assessment and transformational sustainable research says is relevant to how programs should be selected to be socially robust, sustainable and transformational. Many of the guidelines, however, especially when considered in isolation, are applicable to selecting any type of goal-oriented program; there is nothing particularly peculiar to sustainability about them. This is a subject that is returned to in the discussion section.

3.1 Context

Operate within an overarching sustainable development framework

Sustainable urban transformation is a long-term, multi-program, strategic process (Forrest & Wiek, unpublished-b), and individual programs need to cumulatively contribute to this. Program selection, then, should be guided by long-term sustainability goals for the city or a sustainable future vision of the city (Devuyst, 1999; Hacking & Guthrie, 2008; Ramaswami et al., 2011), and should preferably occur within an encompassing transformational sustainable development framework (Culotta et al., 2015; Walton et al., 2005). This provides programs with the continuity, integration, and direction needed for transformation.

Support decision makers

Sustainability problems and solutions are contentious and political, and as such, the framework should aim to support decision makers and not try to make decisions for them (Devuyst, 1999; Hacking & Guthrie, 2008; Stirling, 1999; Stirling & Mayer, 2001; Waas et al., 2014; Walton et al., 2005). As confirmed by analysts in Almere, the notion that the prescriptive output of an analytical framework will be accepted by decision makers is wide of the mark; no matter how valid the results, it will always be seen as advocacy (Kørnøv & Thissen, 2000; Nykvist & Nilsson, 2009), and therefore as an encroachment on decision making responsibility. Decision making takes place

within the administrative and democratic machinery of the municipality, and typically, a clear line separates the analytical environment of the framework from the political environment of decision making. Thus, the framework should inform decision makers as fully as possible on the choices open to them, but should not attempt to identify a "best option" or otherwise make decisions for them (Devuyst, 1999; Pintér et al., 2012; Waas et al., 2014; Walton et al., 2005).

Engage with decision making

Arriving at sustainability solutions is often a dynamic process due to the inherent uncertainty of sustainability problems, the need for input from multiple stakeholders, and the learning that takes place as stakeholders work towards a solution. While analysis and decision making are often separate, the interface between them need not be linear and one-way but could instead entail multiple interactions. Involving decision makers interactively throughout the process can lead to more informed decisions and promote learning. Engaging decision makers in the analytical process can avoid missed opportunities or dismissal of options due to lack of understanding or buy-in, but it also risks politicization and derailment of the process (van Eeten, 2001).

3.2 Procedural guidelines – What activities should be performed?

Set boundaries and frame the issue positively with stakeholders

Sustainability problems are dispersed in space and time, cut across sectors and domains, and affect a wide variety of stakeholders. Boundary setting and framing can significantly change the nature of the problem and is, therefore, a critical part of the process. Setting basic parameters, such as identifying the problem, setting goals, and defining the intended scope of the solution are commonly accepted parts of the program selection process (Andersson-Sköld, Suer, Bergman, & Helgesson, 2014; Hacking & Guthrie, 2008). However, the process should go further to also incorporate target community priorities (Hacking & Guthrie, 2008; Pintér et al., 2012) and define program assessment criteria (Culotta, 2012; Pintér et al., 2012; Stirling & Mayer, 2001) through stakeholder participation (Gamboa & Munda, 2007; Ramaswami et al., 2011). Moreover, for transformation, the process should be framed positively as one of finding sustainable solutions, as

opposed to the least unsustainable solutions (Bond et al., 2013; Hacking & Guthrie, 2008), and be explicitly linked to established sustainability goals.

Generate a range of options

Transformation requires decision-making be opened up to a much wider choice of programs than usually allowed by institutional limits (Andersson-Sköld et al., 2014; Hacking & Guthrie, 2008; Hurley, Ashley, & Mounce, 2008; Stirling, 1999, 2008), yet often, the only choice is between a single program of marginal impact and the status quo (Forrest & Wiek, unpublished-b). The selection process should therefore include multiple options of various types (Andersson-Sköld et al., 2014; Hacking & Guthrie, 2008; Hurley et al., 2008; Stirling, 1999; Stirling et al., 2007). Options should not be limited by what is conventionally considered as realistic (Andersson-Sköld et al., 2014) and at least some should promise radical outcomes.

Deliberate over the options and issues

Participatory governance involving stakeholder dialog around real issues has transformational potential in urban planning practice (Fung & Wright, 2001; Innes & Booher, 2004). Deliberation is identified in the sustainability assessment literature as a strategy for overcoming issues such as stakeholder empowerment, gaps between expert and local knowledge, tradeoffs, and polarization, as well as leading to higher order learning (Andersson-Sköld et al., 2014; Hurley et al., 2008; Pope & Morrison-Saunders, 2013; Ramaswami et al., 2011). Deliberation, then, in which suitably-informed, structured discussion of program options takes place, allowing stakeholders to share and examine viewpoints in a constructive manner, should be part of the selection process.

Assess options against multiple criteria but go no further

Selecting a program requires due consideration of its merits, yet this is often a weak aspect of practice (Forrest & Wiek, unpublished-b). Multi-criteria assessment is a common method in sustainability assessment (Gamboa & Munda, 2007; Hurley et al., 2008; Ramaswami et al., 2011; Walton et al., 2005) which, in extreme, distills a wide range of incommensurate data into a single index. While it produces seductive results from a managerial point of view (Waas et al., 2014) it has a number of shortcomings. It projects an "illusory impression" of precision and certainty

although it is frequently subjective and contains large error (Hurley et al., 2008; Stirling, 1999). It is a black box: opaque and difficult to understand (Hurley et al., 2008; Walton et al., 2005), relying on complex mathematical methods and proprietary computational tools (Huang, Keisler, & Linkov, 2011; Stirling, 1999). It selects a 'best option' (Andersson-Sköld et al., 2014; Culotta, 2012; Stoeglehner & Neugebauer, 2013) which will frequently be seen unfavorably by decision makers as making a decision for them (Kørnøv & Thissen, 2000; Nykvist & Nilsson, 2009). Thus, it runs counter to other guidelines including transparency, ease-of-use, and supporting decision making. This was confirmed by analysts in Almere.

Despite the unsuitability of multi-criteria assessment, some form of option assessment against comprehensive criteria should be still part of the selection process (Stirling, 1999), but without any attempt to aggregate, weight, compute, or otherwise pre-empt program selection. Presenting assessment results in an option-criteria matrix is a dense and rich presentation format that allows comparison of options (Andersson-Sköld et al., 2014; Gamboa & Munda, 2007). Relative comparison alone, however, is uninformative about whether an option is "sustainable enough" and so options should also be compared against a reference (Pope & Morrison-Saunders, 2013) which, for transformational results, should directly relate to overarching sustainability goals (Devuyst, 1999).

3.2 Procedural Guidelines – How should activities be performed?

Lower the barriers to use

The framework should be easy to use to overcome barriers of cost and capacity (Hurley et al., 2008; Jensen & Elle, 2007; Ramaswami et al., 2011; Walton et al., 2005). Accessibility is decreased, for example, by depending on the use of specialized tools, membership of organizations, or consultancy services, which all affect who can use the framework. Low accessibility also reduces the participatory and transparent qualities of the process. The framework, then, should use readily available tools and resources (Ramaswami et al., 2011; Walton et al., 2005). A need for reasonable levels of skills is, however, unavoidable.

Another practical barrier to tool use is they are often time consuming (Jensen & Elle, 2007; Walton et al., 2005). The framework, then, should be as efficient as possible (Andersson-Sköld et

al., 2014; Bond et al., 2013; Hurley et al., 2008; Ramaswami et al., 2011; Walton et al., 2005) allowing, for example, professional staff to perform time consuming research and prepare results for other participants in order to optimize everyone's time (Hurley et al., 2008).

Transparent

Due to the contentious nature of sustainability problems and solutions it is important to build trust among stakeholders, and therefore, to be open. But, for other reasons, such as accountability, learning, repeatability, and reuse, the framework should also be transparent (Andersson-Sköld et al., 2014; Culotta et al., 2015; Devuyst, 1999; Gamboa & Munda, 2007; Hurley et al., 2008; Pintér et al., 2012; Stirling, 1999; Waas et al., 2014; Walton et al., 2005). It should be possible to trace steps, data, participation, and decisions (Andersson-Sköld et al., 2014; Pintér et al., 2012; Walton et al., 2005). Transparency promotes accountability by highlighting where decisions appear to go against the evidence. Transparency also means there should be no "black box" procedures that impede understanding of how inputs become outputs. Black box approaches are an issue of technical procedure, but also of closed-door decision making ,that may result in the rejection of results, and of the framework in general, by some stakeholders (Hurley et al., 2008; Walton et al., 2005). Transparency may be increased by having a respected, independent expert audit the process.

Recognize uncertainty and be evidence supported

Uncertainty is intrinsic to sustainability assessment (Stirling, 1999). Selection processes should therefore highlight gaps in data, unknowns, contested outcomes and so forth (Andersson-Sköld et al., 2014; Stirling, 1999; Waas et al., 2014), and use this to stimulate discussion among stakeholders (Stirling, 1999), and not as an excuse for weak or no action. Thus, there should be no pretense of certainty where there is none. Program selection should also, as far as possible, be supported by evidence of what works (Culotta et al., 2015). Where possible, this means drawing on experiences and lessons from the great many (successful) sustainability solutions that already exist in cities around the world; there is no need to continually invent new solutions. However, sustainability solutions are often sensitive to local context and it may be necessary to create novel programs for which there are no clear precedents and therefore little direct evidence. Such

experimental type programs should be clearly presented as weak on direct evidence but should be supported by a credible theory of change and indirect evidence.

Adaptable

Uncertainty, plurality, and context specificity make sustainable development unpredictable and dynamic. The need for adaptability, then, is widely recognized in the literature (Andersson-Sköld et al., 2014; Bond et al., 2013; Gamboa & Munda, 2007; Hacking & Guthrie, 2008; Hurley et al., 2008; Pintér et al., 2012; Stirling et al., 2007). There are three aspects to this. First, the framework should be applicable to the variety of situations and scales found within urban municipalities. Second, the framework itself should be modifiable, such as allowing criterion to be added in response to changing circumstances or knowledge. And third, the framework should recognize the non-linearity of the analytical and decision making process and allow for iteration (Andersson-Sköld et al., 2014; Hacking & Guthrie, 2008). In general, the framework should reflect a dynamic process.

Participatory

Almost universally, the literature supports a participatory selection process that incorporates multiple perspectives into analysis and decision making through interaction with stakeholders (Andersson-Sköld et al., 2014; Gamboa & Munda, 2007; Hurley et al., 2008; Pintér et al., 2012; Ramaswami et al., 2011; Stirling, 1999; Stirling et al., 2007; Stoeglehner & Neugebauer, 2013). Participatory planning in general involves those affected by decisions in the process to bridge gaps between expert and local knowledge, and results in more creative and robust solutions (Fung & Wright, 2001; Innes & Booher, 2004; Ramaswami et al., 2011). Participation therefore supports the sustainability principle of justice while, at the same time, increases the possibility for generating transformational program options. However, participatory assessment processes can be slow and time consuming (Andersson-Sköld et al., 2014; Ramaswami et al., 2011). The framework should therefore pragmatically engage stakeholders throughout the process.

3.3 Output – what to look for in programs

Broad assessment of options

The framework should induce comprehensive consideration of program options with respect to the overall goal – to identify effective programs for urban sustainable transformation. Consideration of options in the literature is commonly achieved through use of assessment criteria, but there is little guidance on what should be assessed or how criteria should be structured.

The first aspect that must be considered is if program options result in sustainable outcomes. Despite the seemingly obvious need for this, cities appear to make only a weak assessment of the expected sustainability of a program (Forrest & Wiek, unpublished-b). Typically, criteria mentioned in the literature are limited to varying combinations of environmental, social, and economic aspects of a program's sustainability-related outcomes, with a tendency towards the environmental (Andersson-Sköld et al., 2014; Hacking & Guthrie, 2008; Hurley et al., 2008). The "three pillars" structure has the advantage of simplicity but there are other more sophisticated schema that could be used, such as Gibson's sustainability assessment criteria which encourage a more integrative approach (2006). Structured sustainability criteria, preferably of suitable sophistication, are an essential part of assessing program options, however, there are two other important parts to assessment: transformational potential and feasibility.

The transformational potential of a program is critical to achieving long-term sustainability goals: programs may in themselves be sustainable but be of marginal impact, changing little. Transformational potential refers to the degree that a program disrupts or differs from established systems and results in significantly different ways of doing things (Forrest & Wiek, unpublished-b). Programs may achieve this directly through, for example, large scale impact, or indirectly, by creating conditions which enable further programs with direct impact (Forrest & Wiek, unpublished-b). Criteria for assessing how transformational a program is are not well established, but may include considerations of scale (Kates et al., 2012), systemic intervention, integration and synergy with other programs, avoidance of trade-offs, and reversal (not just reducing) of unsustainabilities (Culotta et al., 2015; Gibson, 2013). But it is also important to consider the extent to which programs go beyond and seek to transform dominant economic, political, and social paradigms, to produce

new social norms, alternative models of enterprise, more empowering modes of democracy, and so forth (Albrechts, 2010; Devolder & Block, 2015; Radywyl & Biggs, 2013; Wright, 2010), i.e., does the program offer a radically different solution? Finally, to make continued progress in a strategic direction, transformational programs should align with the established sustainability goals.

Feasibility is the most commonly assessed aspect in program selection, though little mentioned in the sustainability assessment literature. Feasibility assessment is often limited to financial or operational considerations (Forrest & Wiek, unpublished-b; Hurley et al., 2008) but should go beyond this to include technical, cultural, political and other aspects (Cooper & Vargas, 2004). While feasibility cannot be ignored, it may run counter to sustainability and transformational potential, i.e. strongly sustainable and transformational programs may be less feasible, largely due to programs being more feasible when they conform to established systems.

To summarize, the framework should consider three aspects of program effectiveness: is it feasible, sustainable, and transformational? These aspects roughly relate, in order, to outcomes of increasing societal scope and, or, timescale. This is illustrated against a logical model of a program in Figure 1.
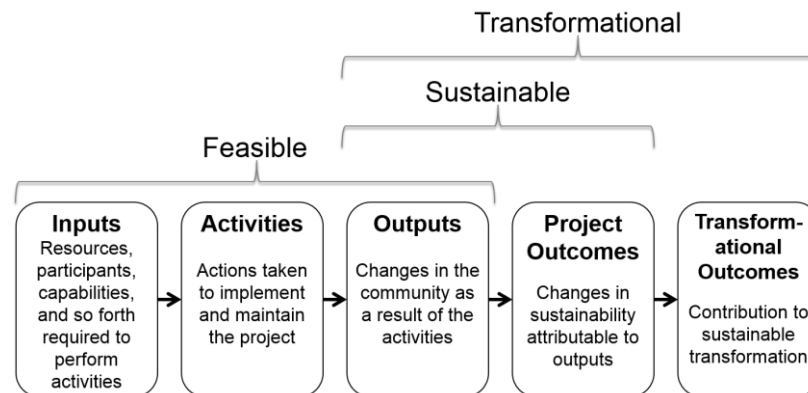
Figure 1: Sustainability Program Assessment Model Linking Assessment Criteria Sets to Program Logic (after Forrest and Wiek (2014)).

Define local criteria through stakeholder participation

The framework should provide a structure within which criteria are defined, as opposed to providing pre-defined criteria. This ensures that the three aspects of effective programs described above are covered (feasible, sustainable and transformational), but the assessment will reflect the

specific nature and context of the issue for which a program is being selected. Criteria should preferably be defined through a participatory process to reflect the interests of stakeholders (Gamboa & Munda, 2007; Ramaswami et al., 2011; Waas et al., 2014).

4. Framework for Selecting Sustainability Programs

4.1 Framework Overview

The function of the framework is to guide the generation and assessment of program options. It does this in response to an initiating condition (a problem, opportunity, or proposal) that raises an issue to be addressed. The framework's output (an assessment of the options) provides information that supports making a decision on which option to implement. The framework, then, is the middle stage of a three-stage process (Figure 2), where Stage I is the emergence of the initiating condition, Stage II is the framework, and Stage III is the decision making. While the overall process is sequential, beginning with a situation requiring action and ending with the selection of a program to implement, there may be some iteration between the framework and decision making. Within the framework there are three steps: (1) framing the issue, (2) generating program options, and (3) assessing program options, which are also generally sequential, but with some iteration possible.
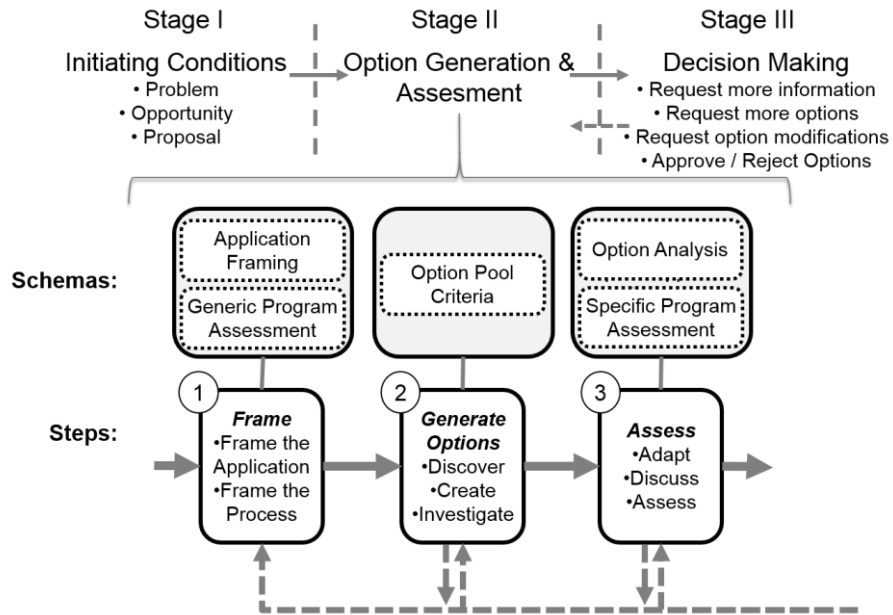
Figure 2: The Three-step Framework within the Overall Program Selection Process.

Stage I – Initiating Conditions

Initiating conditions include problems, opportunities, requests, and so forth.

- *Problems* include failing, or potentially failing, to provide adequate levels of service, or having to provide new services. For example, in Avondale, failing to meet expected progress on increasing landfill diversion prompted a green waste program.

- *Opportunities* are possibilities to enhance or expand existing services, perhaps in anticipation of future requirements, or to pursue a goal, because a particular factor or combination of factors present themselves at a particular time. In Almere, for example, a program to install electric car charging points was an opportunity presented when several factors combined, including: a working relationship with other municipalities; funding being available from a national source; and an existing commercial partnership.

- *Requests* are proposals for a specific development within an existing program, often with discretionary funding or other resources available. For example, in Almere, a program to grow hemp for building materials resulted from a request from a bio-based architectural practice.

Stage II – Framework Application

The framework consists of three steps (described in more detail below): (1) frame the issue, define parameters, and set the scope of the solution; (2) generate and research program options; and (3) assess the options against each other and against transformational sustainability goals, and communicate the results to decision makers.

Various participants have roles in the application of the framework. Although continuity of participants throughout the process is important, so is efficient use of their time. Thus, not all participants need be involved in every step. The main roles are:

- Administrators – coordinate and manage the process, participants, and information; ensure the link between the application and overarching sustainability goals.

- Facilitators – assist with participatory processes.

- Analysts – conduct research, analysis, and prepare information.

- Participants - stakeholders who participate in various parts of the process.

Most likely the framework would be administered by municipal staff who have operational responsibility for sustainable development; this might be a dedicated sustainability office or might fall within the planning department, among other possibilities. The important point is that it is a shared and centralized process and not one that departments or city organizations implement in isolation.

Stage III – Decision Making

Decision making takes place within the executive and democratic machinery of the municipality and typically includes professional staff, appointed executives, and elected officials. The framework's output provides decision makers with the information they need to make informed decisions. Decision makers should be encouraged to request more information about options, modifications to options, and additional options before finally rejecting or approving options. Depending on local circumstances, decision makers may be invited to participate more in the framework process but with due care not politicize it.

4.1 Framework Steps

Step 1 – Define Scope & Parameters

In the first step, the issue to be addressed is described and the parameters and criteria that will apply to the process defined.

1. Administrators first prepare initial definitions (Table 7) from relevant documents, talking to appropriate people, sustainability plans, and so forth.

2. The initial definitions are then reviewed by invited participants. This includes reviewing who the participants are for each step.

3. Participants then review the screening criteria for the option pool that will be used in step 2 (Generate Options).

4. Finally, participants review the program assessment criteria and define the specific indicators that will be used to assess them in Step 3 (Assess Options). Indicator definitions should cover: i) what is to be measured, including constituent parts of aggregate criteria; ii) how it should be measured; iii) a sustainable target level so measurement shows distance-to-target; iv) a uniform, numeric scale and how it should be interpreted.

Table 7: Application Framing Schema for Capturing the Scope of the Situation / Program

Situation	Describes the general nature and background of the situation to be addressed. Often this is a problem to be solved but may be an opportunity or desire to do something new.
Framing	States the objective of the framework application as a positive sustainability challenge rather than a negative problem. For example: "which housing solutions can support sustainable living" instead of "which residential heating system has the lowest greenhouse gas emissions".
Goals	Specifies the desired program level outcomes and transformational goals to which it should contribute. There may be multiple objectives of different types and of different timeframes.
Scope	Specifies the spatial and temporal extent of the action to be taken and any specific 'targets' (e.g. people or houses) to be reached.
Stakeholders	Identifies the direct and indirect stakeholders of the action, their characteristics, interests, and how they will be affected. Should specifically identify: (1) stakeholders who stand to gain; (2) vulnerable groups who may be harmed; and (3) the primary target population.
Participants	Identifies who will be engaged in the process, in what steps, and in what role.
Constraints	Specifies limiting parameters (resource, regulatory, administrative, timing, etc.) to the selection process and solution

Rules	Specifies procedural details, such as how decisions to include programs in the option pool will be made

Step 2 – Generate Program Options

The purpose of this step is to create a broad and balanced pool of program options. This entails creativity, research, and reflection. While research may be mainly performed by analysts, the other activities involve facilitated stakeholder participation.

1. Identify existing programs that appear to produce the desired outcomes, are not fantasy, and do not produce obvious unsustainabilities.

2. Create new options when the range of existing options is too limited.

3. Preliminarily investigate the effectiveness of program options and the conditions under which they work.

4. Generate option variants as appropriate. For example, some solutions (e.g. wind energy sites) vary significantly depending on location so each possible location may be made an option.

5. Adapt options to the local context as needed. For example, if an energy conservation campaign is being targeted at a community with high number of immigrants then language and culture differences may be significant.

6. Assess the pool of options against the option pool criteria (Table 8) and rework the pool as needed.

Table 8: Criteria for Screening the Pool of Options

Criterion	*Only include options that appear to:*
Sustainable	not produce obvious unsustainabilities
Proven	have been successful if tried before
Feasible	not be complete fantasy
	Ensure the pool:
Diverse	is technically, socially and economically diverse
Radical	includes options that are fundamentally different from the current systems
Quantity	has a minimum number of options appropriate to the application

Step 3 – Assess Program Options

In this final step, program options in the option pool are researched, discussed, and assessed. Research is primarily conducted by analysts while discussion and assessment is more broadly participatory.

1. Research options and gather data needed to assess each of the indicators.

2. Prepare data on each option into consistent, concise, easily assimilated information sets.

3. Review and discuss options.

4. Assess each indicator using indicator definitions, the prepared option information, and specific rules defined for assessment (each indicator falls under one of the generic program assessment criteria (Table 9)).

5. Construct an option-criteria matrix that concisely and graphically represents the assessment of all the options

Table 9: Schema for Program Assessment. Based on: feasibility (Cooper & Vargas, 2004); Sustainability (Gibson, 2006); Transformational potential (Culotta et al., 2015; Gibson, 2013; Loorbach, 2007).

Is it feasible?
Financial – Can adequate funding can be obtained and sustained?
Technical – Does the knowledge and technology for the program to work exist?
Cultural – Is it acceptable to those affected and providing it?
Operational – Do the resources and capacity for operation and maintenance exist?
Institutional – Does it conform to legal, administrative, managerial, and other formal and informal rules?
Political – Does the will and power to act exist?
Is it sustainable?
Environment – Does it improve long-term socio-ecological integrity and preserve non-renewable resources?
Well-being – Does it improve everyone's means for a meaningful life and opportunities to improve?
Justice – Are sufficiency and opportunity gaps small and tolerable, and the interests of future generations protected?
Livelihoods – Are opportunities for diverse, meaningful, living-wage livelihoods accessible to all?
Citizenship – Does it engage citizens in open, democratic governance with sustainability as a core value?

Is it transformational?
Transformational - Does it break from dominant paradigms, create space for change, and reverse unsustainabilities?
Precautionary – Does it avoid lock-in to unsustainable or uncertain solutions and mitigate known risks?
Alignment – Does it strategically align with local and city level sustainability goals?
Systemic – Does it address systemic causes of unsustainability?
Integrated – Does it work across sectors and levels and with other programs?
Impact – does it have significant impact?

5. Discussion

A number of challenges to the adoption of the framework into practice are discussed below with some brief recommendations made on how they might be overcome. But, before doing so, the issue raised earlier about the applicability of many of the guidelines to sustainability is returned to. Indeed, this issue also pertains to the challenges discussed below and the framework in general: much of what is presented in this article is of a very general nature and could apply to numerous urban problems, such as housing, health, or transport, so *what makes the framework relevant to sustainability*? There are several points to be made about this.

The first point is that the strength of the framework with respect to sustainability comes from the sum of its parts: taken alone, individual framework elements are unlikely to improve program selection. The framework is a particular arrangement of existing ideas, methods, and practices, with some novel features added with the overall aim of making transformational progress on urban sustainability. Many of the individual elements of the framework do actually address particular aspects of sustainability, such as it is contested, has dispersed impacts, and is intrinsically uncertain. Framework elements also address the shortcomings that exist in typical program selection processes that result in poor progress towards urban sustainability, including opportunism, isolation, elitism, and incrementalism. If, after this, the framework can be applied with success to other types of urban problems (non-sustainability), then this is an added benefit

The second point is that tools and methods for tackling sustainability problems are commonly derived from those that have been developed in other fields or for other purposes. Participatory processes, for example, have long been proposed as a means of empowering citizens

59

to have a say in the issues that affect them (Arnstein, 1969; Fung & Wright, 2001) and is particularly well suited to deal with contentious issues (Innes & Booher, 2004) which sustainability problems invariably are. It has, thus, naturally been adopted as an important tool for tackling sustainability problems. Visioning is another method that is integral, but not unique, to sustainability problem solving having application also in organizational change, community planning, and other fields (Wiek & Iwaniec, 2013). A key feature of visioning for sustainability, however, that distinguishes it from other uses, is the appliance of sustainability criteria (Wiek & Iwaniec, 2013). Another well-established method in sustainability is transition management, a prescriptive framework for guiding long-term transitions of socio-technical systems to sustainability (Loorbach, 2007) which could equally well be applied to any future goal, except for the normative requirement that it aims for a sustainable future. The framework presented here is no exception: without its explicit and normative sustainability aims, it could be a general purpose tool applicable, for example, to a problem such as the transforming a city's housing to provide quality, affordable housing for all.

The third and most significant point is that urban issues, such as housing, transport and public health, when viewed through a sustainability problem lens, are not just urban problems but are sustainability problems (Foley & Wiek, 2013). Housing is not only about construction quality and affordability but has far-reaching social, economic, and environmental impacts. Childhood obesity, a problem of epidemic proportions, is frequently framed as a health problem solvable by diet and exercise, yet it is caused by the urban environment and deep rooted, societal drivers (Foley & Wiek, 2013; Robinson, 2010). The framework should be applied to such problems as sustainability issues, and as part of a wider transformation of the city to sustainability. Taking this a step further, however, suggests that most of what cities do, if not everything, is relevant to sustainability, and perhaps the ultimate aim should be to embed the framework, in some shape or form, in all city decision making.

The Political Challenge.

Whilst the framework avoids encroaching on existing decision making, it does, through transparency, provide a means to hold decision makers more accountable. This transparency will make it clear to all the degree to which decisions are supported by the evidence. Many politicians

may see this as potentially undermining their authority and maneuverability, but there are significant advantages that using the Framework provides them. Firstly, the framework provides the politicians with greater latitude in their decision making. Indeed, the clarity and consistence of information provided by frameworks is generally beneficial to decision making (Hacking & Guthrie, 2008; Hajkowicz, 2007; Stirling, 1999). Secondly, extended use of the framework can have longer-term learning outcomes as decision makers become more aware of a wider range of options, and familiar with considering them more broadly (Hurley et al., 2008; Walton et al., 2005). Such an effect is not likely to be immediate, but it can plant seeds of ideas that come up again and develop greater roots (Hall, 1993; Smith, 2013). Thirdly, the participatory aspect of the information presented to decision makers, especially when supported by a respected external auditor, provides greater credibility to this information and might assist them in making the hard choices needed to effect transformational changes.

Recommendation – push for evidence-supported, participatory policy making that opens up decision making choices.

The Administrative Challenge.

Municipalities frequently find frameworks too complex and opaque to support analysis and decision making (Hacking & Guthrie, 2008; Hurley et al., 2008; Jensen & Elle, 2007; Walton et al., 2005), and that encroachment on decision making (through 'best option' approaches) is counter-productive (Stirling, 1999). Moreover, the cost, time, and training required for tools are also prohibitive (Hurley et al., 2008; Jensen & Elle, 2007; Walton et al., 2005). To overcome some of these barriers the framework presented here is designed to be simple, clear and accessible. In addition, adopting the framework should, itself, be approached as a transition. The initial priority in adoption is simply to use the framework without much attention to whether selected programs are more transformational. From here, institutional learning, adaptation of the framework, and developing individual competencies may push its use towards more transformational outcomes.

The bottom line, however, is that it will still be more effort to use the framework than not. The alternative, however, is not to take on such additional burdens and continue to "muddle through" with incremental change and no real progress (Hurley et al., 2008). The paradox is, that

adopting frameworks such as presented here is very challenging given the inertia of municipalities to transform their institutional capacity for sustainable development, yet the use of these frameworks is essential for transformational change (Ravetz, 2000, p. 31).

Recommendation – use the framework's potential to inspire real impact and overcome incremental bureaucratic mentality.

The Evidence Challenge.

Due to the novelty of transformational programs there is less evidence to support them and, therefore, if taking an evidence-supported approach, transformational programs would lose out to commonly implemented, well-proven, but incremental options. However, in addition to the strength of the evidence, it is also important to consider what the evidence actually supports, given the goal of transformation. Clearly, strong evidence for strong transformation is most preferable, and weak evidence for weak transformation (incremental outcomes) is the least preferable. But, in between these, weak evidence of strong transformation should trump strong evidence of weak transformation. It may even be argued that incremental options should not be selected, regardless of the evidence.

Two other cases relating to evidence exist. One is the absence of evidence, or null case, where an option is researched but no evidence found. The other is the unknown case, where the option is not researched and, therefore, it is not known if there is any evidence or not. Null evidence should not rule out an option, indeed, these options are essential for transformation in the absence of well-proven options (see below for more on this), but they should be supported by a convincing theory of change. In the unknown case, there may be evidence that the option does not work and therefore the option should not be implemented.

Recommendation – transformational program options should be favored over incremental, even when the evidence for them is not as strong.

The Progress Challenge.

Related to the evidence challenge, is there a conflict between the evidence-supported approach and the innovation driven approach of urban transition management? Urban transition labs emphasize innovation and experimentation, and, to some extent, an anything-goes approach,

albeit within a transition agenda (Nevens et al., 2013). But when should experimentation give over to 'development' - the implementation of concrete, proven solutions? When should cities be less concerned about learning and more with doing? There is no shortage of already existing, tried and tested (to some extent) programs out there in other cities to 'do'. Rarely, do the municipalities have the resources, time, or remit to be dabbling in experiments. They have prescribed responsibilities and are accountable for outcomes. Perhaps, then urban transition approaches need more direction on discovering and adapting existing solutions and less emphasis on creating novel solutions.

Recommendation – the framework does not preclude experimental programs when needed but it should favor proven, established transformational programs.

The Buy-in Challenge.

Participation may occur throughout the framework steps but it stops short of participants actually choosing a "best option". Participants, though, will quickly tire of participating in what they see as a pointless exercise if decision makers select options that go against those suggested by the framework appraisal. Participation, however, is still highly meaningful to the output of the process. It helps to ensure that a diverse range of options are considered using broad criteria deemed relevant to those directly affected, as opposed to a limited set of incremental options assessed by experts, using a narrow set of cost and efficiency dominated criteria. It also provides more weight to the assessment in the eyes of decision makers. This may not, however, be enough to convince participants to keep participating.

Recommendation – empower participants with at least some decision making responsibility. For example, use the framework for participatory budgeting in which discretionary municipal funding is made available for allocation on sustainability programs.

6. Conclusion

If cities are to make real progress towards a sustainable future then it is imperative that they move beyond incremental change to transformational action. The framework presented here is suggested as a solution that can help with this in two ways: as a direct tool that guides program selection; and as a learning tool that supports organizational change.

As a direct influence on program selection, the framework accounts for the unique nature of sustainability problems and addresses several impediments to the selection of transformational sustainability programs in existing municipal program selection processes. Key features of the framework include:

- open to stakeholder participation reducing elitism, increasing diversity and creativity in programs, increasing ownership and acceptance of programs;

- generating and screening a wide range of program options to help overcome incrementalism by including radical options in the discourse;

- transparently assessing the extent to which program options are feasible, sustainable, and transformational, to find the most effective solutions, increase accountability, and reduce the possibility for misalignment;

- complementing overarching transformational sustainability methods to reduce opportunism, increase integration and cooperation, and maintain strategic direction;

Perhaps, however, the greater contribution of the framework is its potential for developing transformational sustainability thinking within stakeholders and encouraging organizational change. It does this by proving an open and transparent platform for structured discourse that broadens the debate beyond institutional and political constraints. As a first step to sustainable urban transformation, it is critical that ideas and solutions outside the dominant socio-economic-political paradigm at least get on the agenda. Through using the framework, it is possible that stakeholders, including decision makers, will improve their sustainability knowledge and develop greater perspective on what needs to be done to make real progress.

The framework certainly is not a panacea. There are other major factors critical to sustainable urban transformation, including, of course, political leadership and commitment. Institutionally, it is important that sustainability be embedded into the very fabric of the municipality and urban governance. It is also critical that cities put in place and maintain the key components of overarching transformational methods, including a sustainable future vision of the city, sustainability goals, strategies for moving towards the vision, effective implementation of sustainability programs, and formative evaluation of programs.

While the framework design is based on transformational sustainability research and sustainability assessment literatures, and includes input from municipal sustainability practitioners, it is still tried and untested. The most important next step, therefore, is to test the feasibility of the framework in realistic settings, and beyond that, to test the effectiveness of the framework for selecting transformational sustainability programs.

STUDY 3: HOW TO BEST SELECT SUSTAINABILITY PROGRAMS FOR

TRANSFORMATIONAL CHANGE IN CITIES: INSIGHTS FROM TWO PILOT STUDIES

Abstract

Despite widespread calls for transformations towards sustainability, the majority of cities worldwide appear stuck in making incremental changes. While there are numerous obstacles to transformational change, one critical issue lies in the process of selecting impactful sustainability programs. Such programs often emerge haphazardly and opportunistically with little attention paid to evidence of how effective they are. In this article, two pilot studies of a framework designed to improve the process of selecting sustainability programs are presented. Applying the framework starts with generating a diverse pool of program options, followed by assessing the options against a comprehensive set of criteria, comparing the options based on the assessment, and selecting the most prominent one(s). Results of the pilot studies suggest the framework is effective at opening up the range of options considered, broadening the range of relevant assessment criteria, and enhancing deliberation among stakeholders. It also appears to be useful to decision-makers and helps to promote higher-order sustainability learning. In conclusion, if cities are to make significant progress towards sustainability, such a framework seems to be a useful tool to move beyond incremental changes.

1. Introduction

The need for transformational change towards sustainability in urban areas, where the majority of the earth's population live, is widely acknowledged by scholars and practitioners (Clark, 2000; Hodson et al., 2015; McCormick et al., 2013; Whitehead, 2012; Willis, 2012). This means implementing sustainability programs that address 'wicked' problems such as climate change, social inequality, violent conflicts, and epidemics by *radically* changing production, distribution, consumption, governance and other processes that operate in cities (Clark, 2000; McCormick et al., 2013; Radywyl & Biggs, 2013; Rickards, 2013; Rohracher & Späth, 2013). Yet, actions taken by urban decision-makers to date tend to be incremental, not transformational (Betsill & Bulkeley, 2007; Conroy & Iqbal, 2009; Culotta et al., in press; Jensen & Elle, 2007; Krause, 2011; Saha & Paterson, 2008; Spath & Rohracher, 2011; Wheeler, 2008). The challenge, then, is how to nudge

and support urban decision-makers in selecting and implementing sustainability programs that yield transformational results. Whilst there are many barriers to transformational change – the dominant schemes of economy, governance, institutions, and politics –, here the focus is on institutional capacity and the process of program selection.

Program selection processes typically appear to be haphazard, narrowly focused, lacking guidance, and driven by political priorities other than sustainability (Forrest & Wiek, unpublished-b). The programs selected, then, are often fragmented and produce only weak sustainability outcomes (Forrest & Wiek, unpublished-b). Despite its seemingly obvious importance, little attention has been paid to the process of selecting sustainability programs in research or practice. There are no well-known tools, principles, or best practices readily available; instead, the assumption prevails that program selection will take care of itself. Yet, much can go awry from the strategic heights of long-term transformation planning to the nitty-gritty of choosing and implementing actual programs of change. Based on previous work undertaken by Culotta et al. (2015), Forrest and Wiek (unpublished-a) designed a procedural framework to overcome the shortcomings of usual selection processes. However, while this framework design is derived from both theoretical (scholarly literature) and practical inputs (practitioner collaboration), it has not yet been tested.

In this article, the results of two pilot studies are presented in which this program selection framework has been tested in real-world settings. The studies took an action research approach (Small, 1995) to investigate the feasibility and perceived usefulness of the framework in partnership with the City of Avondale, Arizona, and the Municipality of Almere, the Netherlands. The aim of the studies were twofold: first, to benefit the municipal partners through specific insights on how to best select sustainability programs in these two cities; and second, to further develop the selection framework to be of general use to other cities. Both studies employed the same design: identifying an issue to be addressed, applying the framework in a participatory workshop, and evaluating the workshop through participant questionnaires and follow-up interviews. Findings from both studies were then synthesized and, to some extent, generalized, and modifications to the framework suggested.

67

The pilot studies continued prior research with these cities in which selection processes had been investigated and the framework collaboratively developed (Forrest & Wiek, unpublished-a, unpublished-b). Using two cases provides more robust and generalizable results than a single case (Yin, 2003). The cities were selected for their track record, interest, and capacity to carry out sustainability programs and participate in the research. Both cities aspire to greater sustainability as seen in words and actions. They are also similar in that they are both medium sized, rapidly growing, and on the edge of metropolitan areas (Phoenix and Amsterdam) with challenges of high commuting rates, weak economic base, housing expansion, and weak social identity.

2. Research Design

As pilot studies, the emphasis is on understanding the practicalities of implementing the framework (*feasibility*) (Sidani & Braden, 2011). However, the studies were also designed to obtain information on the perceived usefulness of the framework (*perceived value*) but *not* to what extent the framework actually helps select the apparently more effective programs (*efficacy*). To test the framework's efficacy, a considerably more sophisticated research design would be required (and greater time, resources, and effort entailed).

2.1 Framework for Selecting Sustainability Programs

The framework being tested is intended to guide urban sustainability practitioners to select transformational programs towards sustainability (Forrest & Wiek, unpublished-a). It incorporates two simple principles to this effect. The first is that the process should be opened up to a diverse pool of options, and the second is that a comprehensive view on what makes an option effective should be taken. A diverse option pool means generating a broad range of options of different types (technical, behavioral, social, economic, etc.) for consideration, even if they initially appear unlikely solutions. This overcomes common problems of solution-led decisions (starting with a solution rather than an issue, or taking the first idea that comes up), being limited to obvious and well-known solutions, and not thinking beyond the knowledge of few individuals or units. Taking a comprehensive view on what makes an option effective recognizes that there are multiple aspects that need to be considered and not just one or two, such as outcomes generated and cost.

Criteria for what makes an option effective fall under three categories. First, is the option *sustainable*? The option should improve social, ecological, and economic outcomes in a balanced way. Second, is the option *feasible*? The option should be possible to achieve. This does not mean it should be easy, but that it is not fantasy. And third, is the option *transformational*? The option should have potential for *significantly* changing the target system, either directly or indirectly, in a way that leads towards sustainability. Many criteria could be used to try to answer these broad questions, but for pragmatic reasons in the pilot studies only three are used within each category.

Procedurally, the framework consists of three steps:

1. Define the program context – Describe the situation to be addressed, identify goals, and define criteria on which selection should be based.

2. Generate a program option pool – Discover existing or create new program options, research the options and adapt them to the local context. Option profiles – brief, uniform descriptions – are produced that allow participants to quickly understand the options. Information is concisely and uniformly described under sections of: (i) the problem or opportunity afforded by this option; (ii) the current state of this option in the municipality; (iii) the objectives (estimated targets) of the option and which sustainability goals it aims at; (iv) how the option achieves its objectives / goals; and (v) supporting evidence that the option is effective (example in Figure 3).
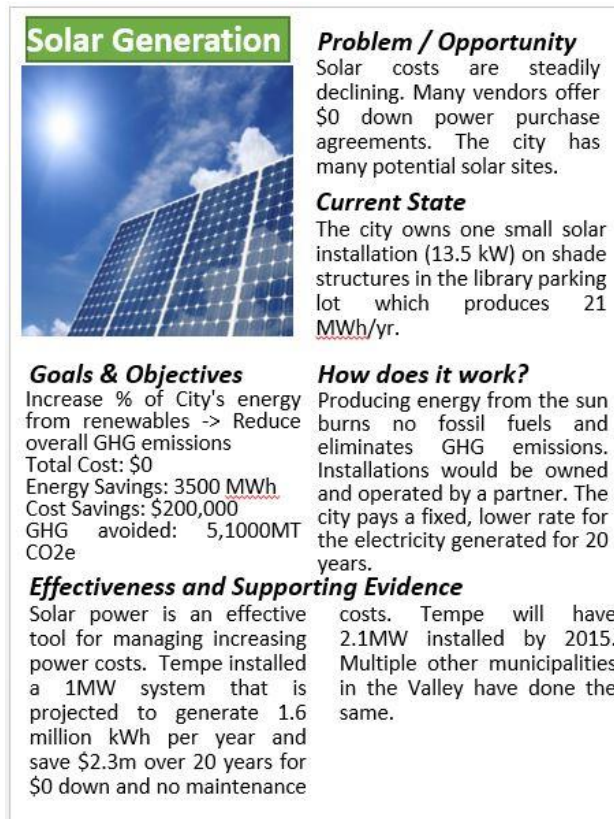
Figure 3: Exemplary Program Profile for One of the Options in the Avondale Option Pool

3. Assess program options – Review program option profiles, discuss options, assess against the criteria, produce an assessment chart, and rank the options. The assessment chart is a graphical representation of the assessment of all program options (example in Figure 4).
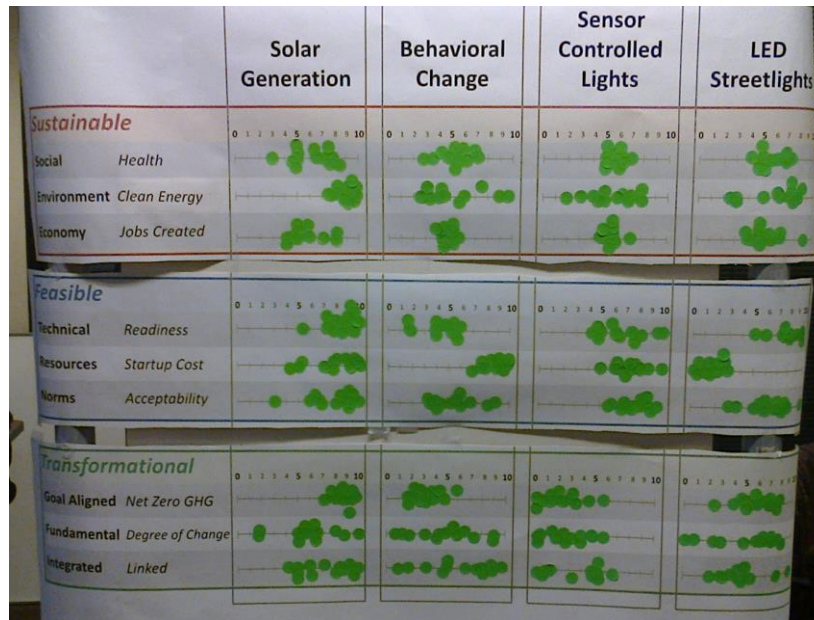
Figure 4: Exemplary Assessment Chart Created in the Avondale Workshop

The performance of steps should be as participatory as possible. Overall, the process is not intended to make a decision on which program(s) to pursue, but to provide information in the form of an assessment chart that supports decision makers in *their* decision making. The assessment chart allows program options to be visually compared across all assessment criteria.

2.2. Evaluation of the Framework

The feasibility of the framework was evaluated using post-workshop participant questionnaires and interviews with selected participants, non-participating decision-makers, and planners. Questionnaires were short and focused on how usable the framework was, what perceived value was gained from using it, and barriers to its future use. Interviews were semi-structured and probed participants on the same questions as the questionnaire but more deeply. Interviews with decision-makers focused on the output of the workshop (the assessment chart), its likely impact on decision making, and whether they would like to see the framework being used. Interviews with planners focused on the perceived value of the framework, how it might be used in future, and what improvements are needed.

2.3. Participatory Procedures in the Pilot Studies

Both pilot studies followed a similar procedure (Table 10). Due to limited time, participant availability, and resources, application of some aspects of the framework were curtailed. In

particular, only Step 3 (assessment) was fully participatory, and Steps 1 and 2 (defining the scope and generating the pool of options) were primarily performed by the research team. The assessment step was performed as a structured workshop of 3-4 hours, with 6-13 participants representing the stakeholders in the situation and facilitated by the research team.

Table 10: Outline of the Participatory Procedures in the Pilot Studies.

	Avondale Pilot Study	Almere Pilot Study
1. Define the program context	Lead researcher (N.F.), city sustainability manager, with input from other city planners	Lead researcher (N.F.), city planner, with input from community group members
2. Generate a program option pool	Lead researcher (N.F.), city sustainability manager, with inputs from across the city administration	Lead researcher (N.F.), city planner, with input from community group members
3. Assess program options	Sustainability working group (13 staff members) in a workshop (3 hours) with four facilitators including team leader (N.F.) and the sustainability manager. Option ranking by participants was performed three times: (1) after individual digestion of option profiles; (2) after facilitated group discussion of options; (3) after facilitated assessment of options	Community group (5 members) and city staff (2) participants in a workshop (4 hours) with 3 facilitators including lead researcher and city planner. Option ranking was performed three times: (1) after individual digestion of option profiles; (2) after facilitated group discussion of options and introduction of further information related to assessment categories; (3) after facilitated assessment of options
4. Evaluation of the framework	Participant questionnaires were completed online within 1 week of the workshop (n=11 out of 13). Follow-up interviews were completed with two participants, two non-participant decision makers (director and vice-mayor), and the sustainability manager.	Paper participant questionnaires were completed immediately after the workshop (n=6 out of 7). Follow-up interviews were completed with the city planner.

The workshop procedure was designed to encourage exploration of the options through deliberative discussion, leading to an informed assessment. Following facilitated discussion about options and criteria, participants scored options against criteria on a scale of 0 – 10 (0 is very ineffective or even damaging; 5 is weakly effective or neutral; and 10 is very effective) using sticky dots and a large poster. The process was transparent (participants could see what each other were scoring) and encouraged discussion as participants score options individually, building up an aggregated assessment. The spread of dots for each assessment indicated the degree of agreement among participants.

The workshop also included ranking of options at different points in the process. Ranking, or selecting a 'best' option, is not actually part of the framework but was included for two reasons: firstly, as an indicator of how participants' view of options was changed as they were exposed to more information and other viewpoints; and secondly, as an activity that breaks up the workshop physically, whilst stimulating participants to think about options in a holistic and relative fashion. Ranking used a 'dot survey' method where each participant had a fixed number of dots to freely allocate across options.

3. Avondale Pilot Study

3.1 Background

Avondale is a typical suburban city on the west of the Phoenix metropolitan area. The population of approximately 80,000 more than doubled from 2000 to 2010 though growth has since slowed. The city is growing in commitment to sustainability, most recently by appointing a sustainability manager in 2013, and approving a sustainability plan in 2014. The plan is primarily concerned with municipal operations, although many aspects have wider reach, and includes goals of becoming net zero in greenhouse gas, waste and water. The city counts some 120 actions towards sustainability it is already taking.

Following approval of the sustainability plan the city recently initiated a cross-departmental sustainability working group. The group will meet regularly to select solutions, evaluate progress, and adapt the plan, and was therefore identified as an ideal group of participants to test the framework. The choice of application of the framework was aimed at Energy and Climate, one of the 11 impact areas identified in the plan, which most directly relates to the net zero greenhouse gas emissions goal. The purpose would be to ask: *what energy and climate actions should be undertaken to move towards sustainability goals*? While the question is real and the setting authentic, the pilot study was being used by the city as a trial rather than to support any impending decision. So there was no immediate plan to present workshop output to city decision-makers. However, when the occasion for such decision making arises then the output may be used.

3.2 Workshop Results

3.2.1. Program context

- Framing: What actions should the city take to move towards its energy and climate goals?

- Main goal: Net zero greenhouse gas emissions

- Other goals: Fiscal responsibility; Example to residents and businesses; Promote continuous learning and innovation

- Stakeholders: City administration staff and citizens

3.2.2. Program option pool

Options were identified by the research team based on programs already identified by the city in the Municipal Sustainability Plan.

- Option 1. Large-scale Solar: install large solar generation array using a 3rd party power purchase agreement

- Option 2. Behavioral change: empower employees to find ways to reduce electricity use

- Option 3. Light motion sensors: install motion sensor light controls in all common areas

- Option 4. LED Streetlights: upgrade all streetlights to LED

3.2.3. Assessment Criteria

The criteria set was created by the research team.

Sustainable

- *Social:* Does the option improve health?

- *Environmental:* Does the option reduce harmful electricity sources?

- *Economic:* Does the option enhance local employment?

Feasible

- *Evidence supported:* Is the option tried and tested?

- *Cost effective:* Is the option affordable?

- *Acceptability:* Is the option culturally and politically acceptable?

Transformational

- *Alignment:* Does the option make progress towards the main goal?

- *Significant change:* Does the option fundamentally change the system?

- *Integrated:* Does the option link with other programs?

3.2.4 Assessment results

See Figure 4 for the overall Avondale assessment.

3.4 Evaluation results

Feasibility

Participants found the framework easy to understand and use, although the need for more time to complete activities, and clearer labeling and instructions were minor criticisms. Other suggestions included adding more criteria, more technical analysis of assessment data (e.g. weighting), and improving the quality of program profile data, while it was also noted that more use of the framework for different applications would increase familiarity and usefulness.

Perceived Value

Participants quite strongly believed the framework would help the city select more transformational programs. Several participants commented that the framework helped them to understand the options and the views of others better, however, some participants did not think the framework led them to more transformational thinking because they already leaned this way. Some participants commented that the framework was useful as a discussion tool. It was also noted to have potential value in involving decision makers in the assessment process or opening it up to public participation.

Decision makers believed the option assessment chart would help them make better decisions.

Efficacy

There is no evidence that use of the framework favored selection of transformational programs. There was a slight indication that it might have significantly influenced participants' opinions of options as seen by a shift in support for large scale solar (Figure 5). There was no

change in overall rankings over the three ranking activities, and the option with the highest assessed transformational potential was the highest ranked option.
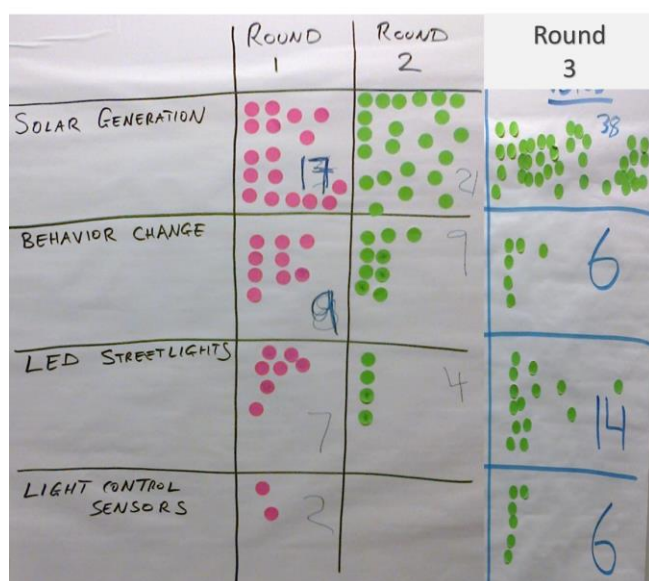
Figure 5: Option Ranking Over Three Rounds of Deliberation in the Avondale Workshop. Round 1=after individual reading of option profile; 2=after group discussion; 3=after assessment. Each particpant had 5 dots per round. There were 7 participants in round 1 and 2, and 13 in round 3.

4. Almere Pilot Study

4.1 Background

Almere is a "new town" to the southeast of Amsterdam, created in 1976 as part of a national strategy to relieve housing pressure. It has a population of 195,000 and is generally more suburban than other Dutch cities. The original plan for Almere highly valued its park-like setting, integrating development into the existing woodland and water. The plan for "Almere 2.0" released in 2008 outlines how the city will grow to 350,000 inhabitants whilst maintaining this approach and further emphasizing sustainability. The city has been involved in numerous large sustainability, mostly energy related, programs, and recently the city has committed to becoming energy and climate neutral by 2022.

The pilot study was conducted in close collaboration with a senior energy planner in the city. Three possible applications for the framework were considered, all of which were energy related and involved collaboration with different community groups. The Filmwijk Energy

76

Cooperative was chosen as their needs were clearly known, program options were already identified and relatively straightforward to research, and they were willing and able to participate.

The Filmwijk is a district in central Almere of around 4,000 homes and 11,000 people. The housing was constructed in the 1990s and includes a range of types from suburban villas to townhomes to high-rise apartment blocks. Platform Filmwijk is a residents' association representing the whole district. In 2013, the platform set a goal of becoming an energy and climate neutral district and initiated a volunteer Energy Working Group. The group has been in discussion with city planners, local energy cooperatives, and entrepreneurs about how to achieve the goal, and decided to initially focus on electricity production and consumption. The city supports such community programs, including modest funding, as a means to its Growing Green energy and climate neutral goals. The question now facing the cooperative is: what action should be taken?

4.2 Workshop Outputs

4.2.1. Program context

- Framing: what should we do if we receive €20.000 from the Municipality?

- Main goal: Energy and climate neutral district

- Other goals: Community engagement

- Constraints: Focus on household electricity; Use funding to implement a startup program within the next year;

- Stakeholders: Filmwijk residents; City administration; collaborating organizations

3.2.2. Program option pool

Initial options were identified by the research team and reviewed by Energy Group members. Inclusion of options was based on whether they: (1) appear capable of a significant contribution towards district energy and climate neutrality; (2) have been successful in other places; (3) were already identified by the Filmwijk;

- Option 1. Household Solar.

- Option 2. Collective Solar in district.

- Option 3. Collective solar in city.

- Option 4. Collective wind in city.

- Option 5. Collective wind in region.

- Option 6. Household energy saving.

Program profiles provided a basic background to each option – what goals are contributed to, how it works, and evidence and data about expected performance (Figure 6). They also described the expected impact of the option under each of the assessment categories (sustainable, feasible, transformational) to help participants align their thoughts with the assessment.

Figure 6: Program Option Profile Example (in Dutch) from Almere Workshop

3.2.3. Assessment Criteria

An initial criteria set was created by the research team and reviewed by the energy group members.

Sustainable.

- *Social:* Does the option improve the social structure and allow all residents a fair opportunity to benefit?

- *Environmental:* Does the option contribute to a fossil-free energy system?

- *Economic:* Does the option enhance the local economy and employment?

Feasible

- *Capacity:* Is the option possible with the available resources or can sufficient extra resources be obtained?

- *Cost Effective:* Is the option affordable, related to the effect?

- *Acceptable:* Is the option likely to be behaviorally acceptable?

Transformational

- *Awareness:* Does the option engage and mobilize citizens and local partners?

- *Fundamental Change:* Does the option directly or indirectly produce fundamental change towards Almere as Growing Green City?

- *Integrated:* Does the option link and synergize with other programs and activities?

3.2.3. Assessment Results

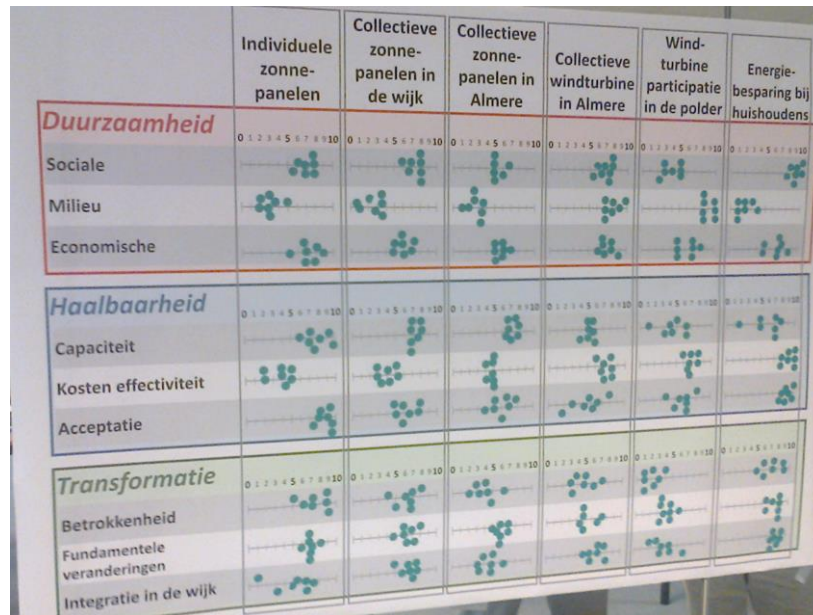Assessment results are shown in Figure 7.

Figure 7: Option Assessment Chart Produced in Almere Workshop

3.3 Evaluation results

Feasibility

Overall, participants found the framework was easily understood and easy to use with about the right number of options and criteria. A common criticism was that criteria were not clear and specific enough. Other points were that there was insufficient time to complete the various activities and that some of the discussion needed more structuring.

Perceived Value

Participants gained a little more knowledge of how options work, though some already knew a lot. They also gained a better understanding of the views of others and much better knowedge of option impacts. Thus, the workshop seemed to broaden participants' views of options beyond technical knowledge. There was a quite strong consensus that the workshop helped the group towards a decision and a similar exercise should be repeated.

The city gained a tool and initiated a potential 'catalog' of (energy) program options that could be used to support other community groups in similar exercises.

To the relief of the energy group leader, the workshop consolidated the existing preference for an Energy Saving program (Figure 8). It also shifted Household Solar from a little favored to quite strongly favored option. There was a significant shift in preferences between round 1

(individual understanding) and round 2 (group discussion) but little further change in round 3 (assessment). Thus, discussing options in a structured, facilitated fashion may have had more effect than going through the assessment process and seeing the overall assessment picture.

Figure 8: Option ranking over three rounds of deliberation in the Almere workshop. Round 1=after individual reading of basic profile; 2=after group discussion, reading of assessment oriented profile information; 3=after criteria by criteria discussion and assessment. Each particpant had 10 dots per round. There were 6 participants in round 1 and seven in round 2 and 3.

5. Discussion

Perceived Value of the framework

As a learning tool, the framework aids participants' learning about the options and how they work, understanding of other perspectives, learning about sustainability, and what is required to achieve long-term goals and transformation. In Avondale, support for large scale solar increased slightly as participants understood more about its feasibility, helped by strong supporting evidence from a neighboring city and the substantial step it would make towards to the net zero carbon goal.

As a means of arriving at consensus, structured discussion opens up the discourse to cover ground not usually covered, and facilitated discussion allows everyone's opinions to be voiced therefore leveling the playing field for all participants. This was seen in Almere where slight fears that previous polarization of views would derail the exercise did not materialize. Instead, there appeared to be an increase in cohesion within the group and even some change in opinions.

As a decision support tool, the output of the workshops (assessment chart) communicates a lot of information concisely and simply. Not arriving at a 'best option', i.e. producing open, unweighted results allows discussion and assessment to stay more open, and does not pre-empt decision makers. This open presentation of the information was positively viewed by decision makers in Avondale as something that could help them make decisions. However, perhaps more useful to decision makers would be to actually participate in the workshop, as happened in Almere.

Efficacy of the framework

There are slight indications from both workshops that the process produced a shift in participants' opinions of options. In Avondale there was a small increase in support for large scale solar in round 2 (post group discussion). In Almere, Individual Solar gained slightly in round 2 (post group discussion), although, this could have been entirely due to one extra participant joining in that round. No further change appeared to happen after round 3 (assessment). Thus, a very tentative conclusion might be that the group discussion activity has an effect but the assessment activity does not.

While this indicates the framework might have some effect on participants' opinions of options, it does not necessarily mean that the framework is effective at encouraging selection of more transformational programs which is the ultimate goal. While there is nothing about the results that suggest this is not so the limits of the research design do not make it possible to evaluate this outcome. For example, there was no control group, participant numbers were small, participants varied between rounds, and so forth. Further studies are suggested focusing on option generation, the effect of the framework on assessment, the effect of framework output on decision making, and whether the framework improves the likelihood of more transformational programs being selected.

Usability of the framework

Generally, the framework was considered easy to understand and use by participants. It was also engaging and held participants' attention – an important feature for over three hours of intense discussion. However, several usability issues emerged out of the studies of which three are discussed here.

In Almere, it appears that assessment step may not have been necessary. It may be enough to just use criteria for structured discussion, as there was little change between round 2 (structured discussion) and round 3 (assessment), i.e. assessment had no further influence on participants' views. Going through the assessment step, criteria by criteria, is a trying exercise due to subjectivity, ambiguity, insufficient data, and so forth. So, it may not be worth the trouble if it does not add any value to the whole exercise. This might have been so in the Almere workshop where participants were also decision makers, but in other situations, a primary purpose of the workshop is to produce an assessment chart for decision makers who, it is assumed, would not generally attend such events. The assessment step also serves other purposes within the workshop of breaking up the discussion, keeping the workshop interesting, and producing an overall picture for participants to refer to. Thus, depending on the circumstances, and if particularly limited for time, it might be acceptable to drop the assessment step.

The number of criteria, at nine, may still be too many even though some participants commented that there were not enough. However, what is lost in detail and comprehensive coverage is gained in having more time to discuss each criteria and therefore have a richer discussion. It is time consuming to talk about all criteria and nine seemed at the limit. At nine criteria, given the huge range of what is to be covered, they are already very aggregated, so reducing the number of criteria, perhaps to five, might not make a great deal of difference, whereas adding more criteria would demand even more time and limit valuable discussion.

Quality of information on program options and criteria is critical. Clear, simple and concise information is needed, presented consistently in an easy to follow structure. The program profiles in Almere (full page) were too much, whereas in Avondale (quarter page) they were perhaps too

sparse. Criteria in both workshops were criticized for being unclear and unspecific which makes assessment difficult.

Capacity to use the framework is a significant issue. It takes considerable time for planning, research, and preparation, and requires somewhat skilled researchers and access to research resources. This is probably beyond what many municipalities are prepared to commit and much more than most voluntary community groups can take on. However, municipalities using the framework will build up their option pool and it can be reused in different applications as Almere plan to do. A pool of criteria that can be similarly reused is also possible, and the burden of using the framework will reduce. Workshops are also time consuming and difficult to get participants to attend. Also, as familiarity with the framework is gained by participants and facilitators it will become easier to use. Ultimately, though, doing such work takes additional resources and capacity. The alternative is to not do research and not hold workshops and, as pointed out by Stirling (2001), this will almost certainly guarantee nothing changes.

In Almere, there was agreement that the framework was useful for creating a program option pool and for developing capacity to work with community groups, but it was not seen as something that would fit within general municipal operations. As found in earlier research in Almere (Forrest & Wiek, unpublished-b), the selection process is often irregular and evolves over time, and there is not always a clear opportunity for looking at a range of options. In this case, the framework could still be used to compare a single option against business-as-usual. In Avondale the response from staff, facilitators, and decision makers was that it would be a useful tool, especially for the sustainability working group and no particular obstacles were identified why it would not be helpful?. Yet, without a strong commitment from a department director, city manager or elected official, and a plan to implement the framework, it is unlikely to be taken up. General use of tools for sustainable development does not have a strong history (Jensen & Elle, 2007).

6. Conclusions

In this article, a participatory framework that encourages selection of transformational sustainability programs was tested in two pilot studies. The studies found the framework to be particularly useful in two respects: first, as a deliberative discussion tool that helps participants to

understand the issue, the potential solutions, and the perspectives of other stakeholders; and second, as decision support tool that opens up the range of choices to decision makers. There is a slight indication that the framework does have some effect on participants' opinions but whether it leads to shifts towards selecting more transformational sustainability programs is not known from this research. It is suggested, however, that continued use of the framework will result in social learning that produces movement in this direction.

Limitations of the studies prevent conclusions on important aspects of the framework. The studies did not include strong, participatory option generation and criteria setting which are critical to producing a diverse range of options and broad assessment criteria. Neither did they include control groups or other quasi-experimental design by which to evaluate whether the framework does nudge participants towards transformational options. These are areas for further research.

Sustainable urban transformation requires those involved in selecting sustainability programs to move beyond the incremental to the radical. The framework presented here is a promising tool that can help this happen.

CONCLUSION

1. Summary of the Research and Findings

This dissertation examines the process of how cities select sustainability programs and offers a practical solution that may accelerate progress towards sustainable urban transformation. How programs are selected is critical to what gets done, and ultimately, to the progress made towards a sustainable city, yet it is an issue that receives little attention in research or practice. Clearly, if selection processes do not produce programs that are sustainable and transformational then progress is highly unlikely, but could be improved by a more effective process. This dissertation then, poses the general research question of *how do cities currently select programs for sustainable urban transformation and how could they select programs to achieve greater progress*, and in attempting to answer it, aims to create general knowledge about program selection processes and their intersection with sustainability, and practical knowledge that can help cities accelerate sustainable urban transformation. Three studies were carried out to this end.

The first study addresses the first part of the main research question regarding how cities *currently* select sustainability programs. It does so by considering more broadly how sustainability affects and is affected by the project selection process through case studies of Avondale, USA, Almere, the Netherlands, and Freiburg, Germany. Generally, the case studies reflect the indications from the literature that cities are not adapting program selection processes in response to the unique challenges of sustainability and that this often leads to programs being selected (and implemented) that that are incremental as opposed to transformational. Consequently, progress towards sustainable urban transformation is unlikely. Particular issues in selection processes include: opportunism which detracts from long-term strategies; elitism which reduces diversity and creativity, and denies justice to all stakeholders; and misalignment which relegates sustainability to a lower priority. Thus, sustainability is having little effect on the selection process, and the selection process is having little effect on sustainability. In a more general sense, however, the study found that cities may sometimes use sustainability to influence program selection in order to promote economic and urban development goals. Although the findings are generally negative, they are not universal and positive aspects in sustainability program selection were found in all three cities.

The second study picks up where the first study left off to tackle the second part of the main research question: how *could* cities select programs for more effective sustainable urban transformation? Beginning with the findings from the first study, this study uses extensive literature review and practitioner input from planners in Avondale and Almere to design a framework that guides program selection towards sustainable and transformational outcomes. Key features of the framework (stakeholder engagement; a diverse pool of program options; broad and structured assessment of program option feasibility, sustainability, and transformational potential; and working within overarching sustainability goals and strategy) take into account characteristics of sustainability problems and address the identified shortcomings in current selection processes. The framework is suggested to have potential for improving city program selection in two ways: directly guiding program selection in the desired direction through use of procedures and criteria; and, in the longer term, developing stakeholder and organizational capacity for transformational sustainability thinking. The critical aim of the framework is to expose stakeholders to, and stimulate constructive deliberation of, a much wider range of program options that go beyond the constraints of the prevailing socio-economic-political system.

The third study further addresses the question of how cities *could* select programs for more effective sustainable urban transformation by pilot testing the framework developed in Study 2. Separate pilot studies tested the feasibility and perceived value of the framework using participatory workshops in Avondale and Almere. The framework was generally found to be simple to understand and easy to use though research and preparation is time consuming. The framework appeared to have value as a learning tool that increased participants' understanding of the issue at hand, program options, other stakeholders' perspectives, and sustainability in general. The most positive aspect appeared to be its stimulation of deliberation through structured, facilitated discussion. While there was some indication that deliberation may produce a shift in participants' opinions, testing limitations prevent any conclusions about whether the framework encourages participants' to favor programs with greater potential for sustainable transformation. Overall, the framework has potential for fulfilling its purpose but further research is needed to evaluate critical aspects.

2. Some Limitations and Challenges of the Research

2.1 Delimitations

The focus of the research was the selection process for sustainability projects, yet progress towards sustainable urban transformation is affected by many factors of which program selection is only one. It is readily acknowledged, then, that the external validity of the research is limited. Furthermore, delimitation of actual processes and sustainability programs in the field is somewhat fuzzy – in reality, these are messy phenomena/entities that make them difficult to investigate, analyze, and compare.

2.2 Generalization

Generalization of results is limited in several ways. Although three cities were included in Study 1 and two cities in Studies 2 and 3 allowing more robust generalization than a single case city, generalization from case studies is of limited validity. In addition, while the sample of programs investigated in Study 1 was of adequate size, the selection of programs (primarily by city research partners) was open to bias, and therefore, conclusions drawn are not necessarily representative of all programs in that city.

Case (city) selection further limits generalization of results. Using cities that have that have already demonstrated a commitment to sustainability, as opposed to cities with no particular commitment but that still may choose sustainability programs, may be a significant difference. The cities studied are all similar populations (80,000, 195,000 and 225,000) but would similar results be found in small (e.g. < 50,000) or large (e.g. > 500,000) cities? Although including cities from three different countries (USA, the Netherlands and Germany) and two different broad political-economic environments (USA and E.U.) did not show vast differences in results, it is reasonable to expect different results would be found from cities in other countries and environments.

2.3 Solution-oriented Research

This dissertation is falls largely under the solution-oriented research paradigm (Robinson & Sirard, 2005) in that the overall aim is to develop a practical solution (an intervention) that can improve performance of municipalities with respect to sustainable urban transformation. In solution-oriented research, evaluation is a critical part in the development of interventions (Fraser, Richman,

Galinsky, & Day, 2009), yet testing an intervention into complex, real-world situations with societal impacts, such as the program selection framework, is notoriously difficult (Patton, 2011). The time, resources, and collaborative commitment required for undertaking extensive and rigorous evaluation of the framework are much greater than was available in this dissertation research. Thus, testing of the effect of the framework on program choice or on the effectiveness of selected programs for sustainable transformation, and so forth, were beyond the scope of this research, and evaluation was necessarily limited to preliminary testing of feasibility and perceived value, particularly of the assessment step.

Another substantial part of intervention development is its initial adoption into practice and translation into wider use (Fraser et al., 2009) which were also beyond the scope of this research. This highlights a general problem: that the time and resources and collaborative commitment that can be mustered in much dissertation-based research is insufficient for full lifecycle intervention development, which is especially true in sustainability where outcomes can be on generational scales. The same goes for solution-oriented research in general. Despite these limitations in evaluation and translation, dissertation research should not avoid taking on intervention development and solution-oriented research; indeed, this is a critical direction for sustainability science (Wiek, Ness, Schweizer-Ries, Brand, & Farioli, 2012). But to avoid fragmentation and to develop solutions with real impact there is a need for degree awarding institutions and units within them to support continuity of the research over multiple dissertations as has been done, to some extent, by the Sustainability Transitions and Intervention Research Lab in the Arizona State University School of Sustainability.

2.4 Collaborative Research with Cities

Collaborative research depends on substantial participation of research partners, in this case city staff and other stakeholders in the city. Getting cities to agree to participate in this type of research, which asks for greater commitment and resources from the city than more usual 'extractive' research, is difficult in the first place, especially when the benefits to the city may not be immediately tangible. And once they do agree, it can be equally as difficult to maintain progress due to availability, capabilities and other factors that may reduce the level of engagement,

contribution made, interest and other aspects of participation quality. There is significant dependence on the city's current and near-term activities and events such as planning cycles, concurrent projects, personnel changes and elections.

Another difficulty is that city staff can be very wary and therefore controlling of any attempt to engage politicians or other senior decision makers in the research for fear of opening a can of worms. To a lesser extent, this may even extend to including external partners in the research. While, as a researcher, it is legitimate, ethical, and of value to include these parties in research, it is difficult to do so when trying to work collaboratively with city staff. Thus, there can be a trade-off between building a productive working relationship with city staff, and conducting probing research.

2.5 Participatory Processes

The research included participatory workshops with Avondale and Almere. While these were successful events, difficulties in scheduling, communication, language, and so forth led to preparations being rushed and left room for improvement.

3. Suggested Further Research

The framework presented in this dissertation shows potential as a means of selecting more effective programs for sustainable urban transformation. Some further research is suggested to evaluate its effectiveness and further develop the framework, including:

- - how could a diverse option pool be generated?
- - how effective is the framework on decision making when performed as part of the assessment or externally to the assessment?
- - how does the socio-demographic composition of the participants affects results?
- - in what situations is the use of the framework feasible and how should it be adapted to fit different situations?
- - what are the barriers to city's adopting the use of the framework and how can they be overcome?

Neither city that participated in the development and testing of the framework in this research have committed to use the framework. To further develop the framework it would be

important to re-engage with these cities or engage with other cities in a second phase of solution-oriented research.

4. Contribution

Sustainability practitioners need more solutions that can enhance their capacity for effective practice. This dissertation contributes one such solution, albeit in an early stage of development, for use by urban sustainability practitioners. In developing this solution collaboratively, the research also contributed to the efforts in Avondale and Almere to make these cities more sustainable places. Additionally, the dissertation has empirically created new knowledge about current program selection for sustainability in cities that contributes to the rather thin, existing literature on the subject.

5. Final Conclusion

Urban sustainable development has been an issue for cities for over 20 years, since at least the Rio Convention in 1992, yet this dissertation, on top of other research (Bulkeley & Castán Broto, 2012; Wheeler, 2008), shows the inertia of cities in adapting their practices to the challenges of sustainability. This, most likely, plays a part in the generally acknowledged lack of progress towards urban sustainability. As shown in Study 1, cities have not adapted program selection processes and as such, there are shortcomings that inhibit transformational change towards a sustainable city. A remedy to the shortcomings, in the form of a framework that guides program selection towards sustainable urban transformation, is proposed in Study 2. The key aim of the framework is to open up choice in program selection for broad-based stakeholder deliberation of a wide range of radical program options: if cities are to make real progress towards sustainability then a critical first step is that the agenda is freed from the prevailing institutional and political constraints. This dissertation contributes to this goal.

REFERENCES

Albrechts, L. (2010). More of the same is not enough! How could strategic spatial planning be instrumental in dealing with the challenges ahead? *Environment & Planning B: Planning & Design*, *37*(6), 1115–1127. http://doi.org/10.1068/b36068

Andersson-Sköld, Y., Suer, P., Bergman, R., & Helgesson, H. (2014). Sustainable decisions on the agenda – a decision support tool and its application on climate-change adaptation. *Local Environment*, *0*(0), 1–20. http://doi.org/10.1080/13549839.2014.922531

Arnstein, S. (1969). A Ladder Of Citizen Participation. *Journal of the American Planning Association*, *35*(4), 216–224. http://doi.org/10.1080/01944366908977225

Aylett, A. (2013). The Socio-institutional Dynamics of Urban Climate Governance: A Comparative Analysis of Innovation and Change in Durban (KZN, South Africa) and Portland (OR, USA). *Urban Studies*, *50*(7), 1386–1402. http://doi.org/10.1177/0042098013480968

Bailey, J. (2007). *Lessons from the Pioneers: Tackling Global Warming at the Local Level*. Minneapolis: Institute for Local Self-Reliance. Retrieved from http://www.ilsr.org/lessons-pioneers-tackling-global-warming-local-level/

Bassett, E., & Shandas, V. (2010). Innovation and Climate Action Planning. *Journal of the American Planning Association*, *76*(4), 435–450. http://doi.org/10.1080/01944363.2010.509703

Betsill, M. M., & Bulkeley, H. (2007). Looking Back and Thinking Ahead: A Decade of Cities and Climate Change Research. *Local Environment*, *12*(5), 447–456. http://doi.org/10.1080/13549830701659683

Blühdorn, I. (2009). Locked into the Politics of Unsustainability. *Eurozine, Http://www. Eurozine. com/articles/2009-10-23-Bluehdorn-En. Html*, *3*, 2009.

Bond, A. J., Morrison-Saunders, A., & Stoeglehner, G. (2013). Designing a sustainability assessment process. In A. J. Bond, A. Morrison-Saunders, & R. Howitt (Eds.), *Sustainability assessment pluralism, practice and progress* (pp. 231–244). New York: Routledge.

Brand, P. (2007). Green Subjection: The Politics of Neoliberal Urban Environmental Management. *International Journal of Urban and Regional Research*, *31*(3), 616–632. http://doi.org/10.1111/j.1468-2427.2007.00748.x

Bulkeley, H. (2010). Cities and the Governing of Climate Change. *Annual Review of Environment and Resources*, *35*(1), 229–253. http://doi.org/10.1146/annurev-environ-072809-101747

Bulkeley, H., & Betsill, M. M. (2005). Rethinking Sustainable Cities: Multilevel Governance and the "Urban" Politics of Climate Change. *Environmental Politics*, *14*(1), 42–63. http://doi.org/10.1080/0964401042000310178

Bulkeley, H., & Castán Broto, V. (2012). Government by experiment? Global cities and the governing of climate change. *Transactions of the Institute of British Geographers*, no–no. http://doi.org/10.1111/j.1475-5661.2012.00535.x

City of Freiburg. (2011a). *Environmental Policy in Freiburg*. Freiburg. Retrieved from http://www.freiburg.de/pb/,Lde/232045.html

City of Freiburg. (2011b). *Statusberecht Kommunaler Nachhaltigkeitsaktivitaten 2009-2012*. Freiburg. Retrieved from http://www.freiburg.de/pb/site/Freiburg/get/354874/statusbericht.pdf

City of Freiburg. (n.d.). *Green City Freiburg. Approaches to Sustainability.* Freiburg. Retrieved from http://www.freiburg.de/pb/,Lde/232045.html

Clark, W. C. (2000). Transition toward Sustainability, A. *Ecology Law Quarterly*, *27*, 1021.

Conroy, M. M. (2006). Moving the Middle Ahead Challenges and Opportunities of Sustainability in Indiana, Kentucky, and Ohio. *Journal of Planning Education and Research*, *26*(1), 18–27. http://doi.org/10.1177/0739456X06289664

Conroy, M. M., & Iqbal, A.-A. (2009). Adoption of sustainability initiatives in Indiana, Kentucky, and Ohio. *Local Environment*, *14*(2), 109–125. http://doi.org/10.1080/13549830802521428

Cooper, P. J., & Vargas, C. M. (2004). *Implementing sustainable development: from global policy to local action*. Lanham, Md: Rowman & Littlefield Publishers.

Culotta, D. S. (2012). *From Reactive to Proactive: Creating a Governance System for Negotiating Local and Regional Climate Change Mitigation Interventions* (M.A.). Arizona State University, United States -- Arizona. Retrieved from http://search.proquest.com.ezproxy1.lib.asu.edu/pqdtft/docview/1013441621/abstract/13 E0FE590E525250EFF/1?accountid=4485

Culotta, D. S., Wiek, A., & Forrest, N. (2015). Selecting and coordinating local and regional climate change interventions. *Environment and Planning C: Government and Policy*, *0*(0), 1–26.

Dahle, K. (2007). When do transformative initiatives really transform? A typology of different paths for transition to a sustainable society. *Futures*, *39*(5), 487–504. http://doi.org/10.1016/j.futures.2006.10.007

Devolder, S., & Block, T. (2015). Transition Thinking Incorporated: Towards a New Discussion Framework on Sustainable Urban Projects. *Sustainability*, *7*(3), 3269–3289. http://doi.org/10.3390/su7033269

Devuyst, D. (1999). Sustainability Assessment: the application of a methodological framework. *Journal of Environmental Assessment Policy and Management*, *01*(04), 459–487. http://doi.org/10.1142/S1464333299000351

Foley, R. W., & Wiek, A. (2013). Patterns of nanotechnology innovation and governance within a metropolitan area. *Technology in Society*, *35*(4), 233–247. http://doi.org/10.1016/j.techsoc.2013.10.004

Forrest, N., & Wiek, A. (unpublished-a). Advancing sustainable urban transformations – a framework for selecting sustainability projects.

Forrest, N., & Wiek, A. (unpublished-b). Do cities select sustainability interventions for sustainable urban transformation: insights from Almere (Netherlands) and Avondale (AZ, USA)?

Forrest, N., & Wiek, A. (2014). Learning from success—Toward evidence-informed sustainability transitions in communities. *Environmental Innovation and Societal Transitions*, *12*, 66–88. http://doi.org/10.1016/j.eist.2014.01.003

Fraser, M. W., Richman, J. M., Galinsky, M. J., & Day, S. H. (2009). *Intervention Research: Developing Social Programs* (1st ed.). Oxford University Press, USA.

Fung, A., & Wright, E. O. (2001). Deepening democracy: innovations in empowered participatory governance. *Politics and Society*, *29*(1), 5–42.

Funtowicz, S. O., & Ravetz, J. R. (1993). Science for the post-normal age. *Futures*, *25*(7), 739–755. http://doi.org/10.1016/0016-3287(93)90022-L

Gamboa, G., & Munda, G. (2007). The problem of windfarm location: A social multi-criteria evaluation framework. *Energy Policy*, *35*(3), 1564–1583. http://doi.org/10.1016/j.enpol.2006.04.021

Gibson, R. (2006). Sustainability assessment: basic components of a practical approach. *Impact Assessment and Project Appraisal*, *24*(3), 170.

Gibson, R. (2013). Why sustainability assessment? In A. J. Bond, A. Morrison-Saunders, & R. Howitt (Eds.), *Sustainability assessment pluralism, practice and progress* (pp. 3–17). New York: Routledge.

Hacking, T., & Guthrie, P. (2008). A framework for clarifying the meaning of Triple Bottom-Line, Integrated, and Sustainability Assessment. *Environmental Impact Assessment Review*, *28*(2–3), 73–89. http://doi.org/10.1016/j.eiar.2007.03.002

Hajkowicz, S. (2007). A comparison of multiple criteria analysis and unaided approaches to environmental decision making. *Environmental Science & Policy*, *10*(3), 177–184. http://doi.org/10.1016/j.envsci.2006.09.003

Hall, P. A. (1993). Policy Paradigms, Social Learning, and the State: The Case of Economic Policymaking in Britain. *Comparative Politics*, *25*(3), 275–296. http://doi.org/10.2307/422246

Hodson, M., & Marvin, S. (2010). Can cities shape socio-technical transitions and how would we know if they were? *Research Policy*, *39*(4), 477–485.

Hodson, M., Marvin, S., & Bulkeley, H. (2013). The Intermediary Organisation of Low Carbon Cities: A Comparative Analysis of Transitions in Greater London and Greater Manchester. *Urban Studies*, *50*(7), 1403–1422. http://doi.org/10.1177/0042098013480967

Hodson, M., Marvin, S., & Spath, P. (2015). Subnational Inter-scalar Dynamics: The Differentiated Geographies of Governing Low Carbon Transitions—With Examples from the UK. In *Handbook on sustainability...* Springer.

Huang, I. B., Keisler, J., & Linkov, I. (2011). Multi-criteria decision analysis in environmental sciences: Ten years of applications and trends. *Science of The Total Environment*, *409*(19), 3578–3594. http://doi.org/10.1016/j.scitotenv.2011.06.022

Hurley, L., Ashley, R., & Mounce, S. (2008). Addressing practical problems in sustainability assessment frameworks. *Proceedings of the ICE - Engineering Sustainability*, *161*(1), 23–30. http://doi.org/10.1680/ensu.2008.161.1.23

Innes, J. E., & Booher, D. E. (2004). Reframing public participation: strategies for the 21st century. *Planning Theory & Practice*, *5*(4), 419–436.

Jaglin, S. (2013). Urban Energy Policies and the Governance of Multilevel Issues in Cape Town. *Urban Studies*. http://doi.org/10.1177/0042098013500091

Jensen, J. O., & Elle, M. (2007). Exploring the Use of Tools for Urban Sustainability in European Cities. *Indoor and Built Environment*, *16*(3), 235–247. http://doi.org/10.1177/1420326X07079341

Jordan, A. (2008). The governance of sustainable development: taking stock and looking forwards. *Environment and Planning C: Government and Policy*, *26*(1), 17–33. http://doi.org/10.1068/cav6

Kates, R. W., Travis, W. R., & Wilbanks, T. J. (2012). Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences*, *109*(19), 7156–7161. http://doi.org/10.1073/pnas.1115521109

Kindler, H. S. (1979). Two Planning Strategies: Incremental Change and Transformational Change. *Group & Organization Management*, *4*(4), 476–484. http://doi.org/10.1177/105960117900400409

Kørnøv, L., & Thissen, W. A. H. (2000). Rationality in decision- and policy-making: implications for strategic environmental assessment. *Impact Assessment and Project Appraisal*, *18*(3), 191–200. http://doi.org/10.3152/147154600781767402

Krause, R. M. (2011). An assessment of the greenhouse gas reducing activities being implemented in US cities. *Local Environment*, *16*(2), 193–211. http://doi.org/10.1080/13549839.2011.562491

Krause, R. M. (2012). Political Decision-making and the Local Provision of Public Goods: The Case of Municipal Climate Protection in the US. *Urban Studies*, *49*(11), 2399–2417. http://doi.org/10.1177/0042098011427183

Kronsell, A. (2013). Legitimacy for climate policies: politics and participation in the Green City of Freiburg. *Local Environment*, *18*(8), 965–982.

Krueger, R., & Agyeman, J. (2005). Sustainability schizophrenia or "actually existing sustainabilities?" toward a broader understanding of the politics and promise of local sustainability in the US. *Geoforum*, *36*(4), 410–417. http://doi.org/10.1016/j.geoforum.2004.07.005

Lindblom, C. E. (1979). Still Muddling, Not Yet Through. *Public Administration Review*, *39*(6), 517–526. http://doi.org/10.2307/976178

Lombardi, D. R., Porter, L., Barber, A., & Rogers, C. D. F. (2011). Conceptualising Sustainability in UK Urban Regeneration: a Discursive Formation. *Urban Studies*, *48*(2), 273–296. http://doi.org/10.1177/0042098009360690

Loorbach, D. (2007). *Transition Management: New Mode of Governance for Sustainable Development*. International Books.

Loorbach, D., & Rotmans, J. (2006). Managing transitions for sustainable development. In X. Olshoorn & A. J. Wieczorek (Eds.), *Understanding Industrial Transformation: views from different disciplines* (pp. 187–206). Dordrecht: Springer.

Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy*, *41*(6), 955–967. http://doi.org/10.1016/j.respol.2012.02.013

May, A. D., Page, M., & Hull, A. (2008). Developing a set of decision-support tools for sustainable urban transport in the UK. *Transport Policy*, *15*(6), 328–340. http://doi.org/10.1016/j.tranpol.2008.12.010

McCormick, K., Anderberg, S., Coenen, L., & Neij, L. (2013). Advancing sustainable urban transformation. *Journal of Cleaner Production*, *50*, 1–11. http://doi.org/10.1016/j.jclepro.2013.01.003

Meadows, D. (1999). *Leverage Points: Places to intervene in a system*. Vermont: The Sustainability Institute.

Municipality of Almere. (2009). *Summary, Draft Structural Vision Almere 2.0*. Almere, NL: Municipality of Almere. Retrieved from http://english.almere.nl/fileadmin/files/almere/subsites/english/Draft_strategic_vision_Almere_2.0.pdf

Nevens, F., Frantzeskaki, N., Gorissen, L., & Loorbach, D. (2013). Urban Transition Labs: co-creating transformative action for sustainable cities. *Journal of Cleaner Production*, *50*, 111–122. http://doi.org/10.1016/j.jclepro.2012.12.001

Nevens, F., & Roorda, C. (2014). A climate of change: A transition approach for climate neutrality in the city of Ghent (Belgium). *Sustainable Cities and Society*, *10*, 112–121. http://doi.org/10.1016/j.scs.2013.06.001

Newman, M. (2009). Almere New City: Sustainable City, Ideal City? An Urban Morphological Analysis of the Newest Dutch City. *Sustain*, (21), 13–21.

Nykvist, B., & Nilsson, M. (2009). Are impact assessment procedures actually promoting sustainable development? Institutional perspectives on barriers and opportunities found in the Swedish committee system. *Environmental Impact Assessment Review*, *29*(1), 15–24. http://doi.org/10.1016/j.eiar.2008.04.002

Patton, M. Q. (2011). *Essentials of Utilization-Focused Evaluation*. Sage Publications, Inc.

Pintér, L., Hardi, P., Martinuzzi, A., & Hall, J. (2012). Bellagio STAMP: Principles for sustainability assessment and measurement. *Ecological Indicators*, *17*(0), 20–28. http://doi.org/10.1016/j.ecolind.2011.07.001

Pope, J., & Morrison-Saunders, A. (2013). Pluralism in practice. In A. J. Bond, A. Morrison-Saunders, & R. Howitt (Eds.), *Sustainability assessment pluralism, practice and progress* (pp. 100–114). New York: Routledge.

Radywyl, N., & Biggs, C. (2013). Reclaiming the commons for urban transformation. *Journal of Cleaner Production*, *50*, 159–170. http://doi.org/10.1016/j.jclepro.2012.12.020

Ramaswami, A., Main, D., Bernard, M., Chavez, A., Davis, A., Thomas, G., & Schnoor, K. (2011). Planning for low-carbon communities in US cities: a participatory process model between academic institutions, local governments and communities in Colorado. *Carbon Management*, *2*(4), 397–411. http://doi.org/10.4155/cmt.11.34

Ravetz, J. (2000). Integrated assessment for sustainability appraisal in cities and regions. *Environmental Impact Assessment Review*, *20*(1), 31–64. http://doi.org/10.1016/S0195-9255(99)00037-2

Raworth, K. (2012). A Safe and Just Space for Humanity: Can we live within the doughnut. *Oxfam Policy and Practice: Climate Change and Resilience*, *8*(1), 1–26.

Rickards, L. (2013). Transformation is adaptation. *Nature Climate Change*, *3*(8), 690–690. http://doi.org/10.1038/nclimate1933

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences*, *4*(2), 155–169.

Robinson, T. N. (2010). Save the World, Prevent Obesity: Piggybacking on Existing Social and Ideological Movements. *Obesity*, *18*(S1), S17–S22. http://doi.org/10.1038/oby.2009.427

Robinson, T. N., & Sirard, J. R. (2005). Preventing childhood obesity: A solution-oriented research paradigm. *American Journal of Preventive Medicine*, *28*(2, Supplement 2), 194–201. http://doi.org/10.1016/j.amepre.2004.10.030

Rockström, J., Steffen, W., Noone, K., Persson, \AA, Chapin, F. S., Lambin, E. F., … others. (2009). A safe operating space for humanity. *Nature*, *461*(7263), 472–475.

Rohracher, H., & Späth, P. (2013). The Interplay of Urban Energy Policy and Socio-technical Transitions: The Eco-cities of Graz and Freiburg in Retrospect. *Urban Studies*, [online]. http://doi.org/10.1177/0042098013500360

Roorda, C., Buiter, M., Rotmans, J., Bentvelzen, M., Tillie, N., & Keeton, R. (2011). Urban Development: the State of the Sustainable Art – An International Benchmark of Sustainable Urban Development. Dutch Research Institute for Transitions (DRIFT), Erasmus University Rotterdam, Netherlands.

Rotmans, J., & Loorbach, D. (2010). Towards a better understanding of transitions and their governance. A systemic and reflexive approach. In J. Grin, J. Rotmans, & J. Schot, *Transitions to Sustainable Development: New Directions in the Study of Long Term Transformative Change* (1st ed., pp. 103–220). New York: Routledge.

Saha, D., & Paterson, R. G. (2008). Local Government Efforts to Promote the "Three Es" of Sustainable Development Survey in Medium to Large Cities in the United States. *Journal of Planning Education and Research*, *28*(1), 21–37. http://doi.org/10.1177/0739456X08321803

Sidani, S., & Braden, C. J. (2011). Testing the acceptability and feasibility of interventions. In *Design, Evaluation, and Translation of Nursing Interventions* (1st ed., pp. 163–196). Wiley-Blackwell.

Small, S. A. (1995). Action-oriented research: Models and methods. *Journal of Marriage and the Family*, 941–955.

Smith, K. (2013). *Beyond evidence based policy in public health: the interplay of ideas*. Basingstoke, U.K.: Palgrave Macmillan.

Spath, P., & Rohracher, H. (2011). The "eco-cities" Freiburg and Graz. The social dynamics of pioneering urban energy and climate governance. In H. Bulkeley, V. Castán Broto, M.

Hodson, & S. Marvin (Eds.), *Cities and low carbon transitions* (pp. 88–106). Abingdon, Oxon ; New York, NY: Routledge.

Staley, S. (2006). Sustainable development in American planning: A critical appraisal. *Town Planning Review*, *77*(1), 99–126. http://doi.org/10.3828/tpr.77.1.6

Steward, F. (2012). Transformative innovation policy to meet the challenge of climate change: sociotechnical networks aligned with consumption and end-use as new transition arenas for a low-carbon society or green economy. *Technology Analysis & Strategic Management*, *24*(4), 331–343.

Stirling, A. (1999). The appraisal of sustainability: Some problems and possible responses. *Local Environment*, *4*(2), 111–135.

Stirling, A. (2008). "Opening Up" and "Closing Down" Power, Participation, and Pluralism in the Social Appraisal of Technology. *Science, Technology & Human Values*, *33*(2), 262–294. http://doi.org/10.1177/0162243907311265

Stirling, A., Leach, M., Mehta, L., Scoones, I., Smith, A., Stagl, S., & Thompson, J. (2007). *Empowering Designs: towards more progressive appraisal of sustainability*. STEPS Working Paper 3, Brighton: STEPS Centre. Retrieved from http://mobile.opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/2473/Empoweri ng%20Designs.pdf?sequence=1

Stirling, A., & Mayer, S. (2001). A novel approach to the appraisal of technological risk: a multicriteria mapping study of a genetically modified crop. *Environment and Planning C: Government and Policy*, *19*(4), 529 – 555. http://doi.org/10.1068/c8s

Stoeglehner, G., & Neugebauer, G. (2013). Integrating sustainability assessment into planning: benefits and challenges. In A. J. Bond, A. Morrison-Saunders, & R. Howitt (Eds.), *Sustainability assessment pluralism, practice and progress* (pp. 245–262). New York: Routledge.

Svara, J. H. (2011). The Early Stage of Local Government Action to Promote Sustainability. In International City/County Management Association, *The Municipal Year Book 2011* (pp. 43–60). Washington D.C.: International City/County Management Association.

Svara, J. H., Watt, T. C., & Jang, H. S. (2013). How Are U.S. Cities Doing Sustainability? Who Is Getting on the Sustainability Train, and Why? *Cityscape*, *15*(1), 9–44.

Vallance, S., Perkins, H. C., Bowring, J., & Dixon, J. E. (2012). Almost Invisible: Glimpsing the City and its Residents in the Urban Sustainability Discourse. *Urban Studies*, *49*(8), 1695–1710. http://doi.org/10.1177/0042098011417903

van Eeten, M. (2001). The challenge ahead for deliberative democracy: In reply to Weale. *Science and Public Policy*, *28*(6), 423–426. http://doi.org/10.3152/147154301781781200

Waas, T., Hugé, J., Block, T., Wright, T., Benitez-Capistros, F., & Verbruggen, A. (2014). Sustainability Assessment and Indicators: Tools in a Decision-Making Strategy for Sustainable Development. *Sustainability*, *6*(9), 5512–5534. http://doi.org/10.3390/su6095512

Walton, J. S., El-Haram, M., Castillo, N. H., Horner, R. M. W., Price, A. D. F., & Hardcastle, C. (2005). Integrated assessment of urban sustainability. *Proceedings of the ICE - Engineering Sustainability*, *158*(2), 57–65. http://doi.org/10.1680/ensu.2005.158.2.57

Westley, F., Olsson, P., Folke, C., Homer-Dixon, T., Vredenburg, H., Loorbach, D., … Leeuw, S. (2011). Tipping Toward Sustainability: Emerging Pathways of Transformation. *AMBIO*, *40*, 762–780. http://doi.org/10.1007/s13280-011-0186-9

Wheeler, S. M. (2008). State and Municipal Climate Change Plans: The First Generation. *Journal of the American Planning Association*, *74*(4), 481–496. http://doi.org/10.1080/01944360802377973

Wheeler, S. M., & Beatley, T. (2009). Urban sustainabiity at the city and regional scale. In S. M. Wheeler & T. Beatley (Eds.), *The sustainable urban development reader* (2nd ed., pp. 427–456). New York: Routledge.

Whitehead, M. (2012). The sustainable city: an obituary? On the future form and prospects of sustainable urbanism. In J. Flint & M. Raco (Eds.), *The Future of Sustainable Cities: Critical Reflections* (pp. 29–46). Bristol, U.K.: Policy Press.

Wiek, A., Foley, R. W., & Guston, D. H. (2012). Nanotechnology for sustainability: what does nanotechnology offer to address complex sustainability problems? *Journal of Nanoparticle Research*, *14*(9). http://doi.org/10.1007/s11051-012-1093-0

Wiek, A., & Iwaniec, D. (2013). Quality criteria for visions and visioning in sustainability science. *Sustainability Science*, *9*(4), 497–512. http://doi.org/10.1007/s11625-013-0208-6

Wiek, A., & Lang, D. J. (in press). Transformational sustainability research methodology. In H. Heinrichs, P. Martens, G. Michelson, & A. Wiek (Eds.), *Sustainability Science – An Introduction*. Berlin, New York: Springer.

Wiek, A., Ness, B., Schweizer-Ries, P., Brand, F., & Farioli, F. (2012). From complex systems analysis to transformational change: a comparative appraisal of sustainability science projects. *Sustainability Science*, *7*(0), 5–24. http://doi.org/10.1007/s11625-011-0148-y

Willis, M. (2006). Sustainability: the issue of our age, and a concern for local government. *PM Magazine*, *88*(7). Retrieved from http://webapps.icma.org/pm/8807/public/cover.cfm?author=Michael%20Willis&title=Sustainability%20The%20Issue%20of%20Our%20Age%20and%20a%20Concern%20for%20Local%20Government

Willis, M. (2012). Sustainability: The Leadership Difference We Must Provide. *PM Magazine*, *94*(5). Retrieved from http://webapps.icma.org/pm/8807/public/cover.cfm?author=Michael%20Willis&title=Sustainability%3A%20The%20Issue%20of%20Our%20Age%2C%20and%20a%20Concern%20for%20Local%20Government

Wright, E. O. (2010). *Envisioning Real Utopias*. London ; New York: Verso.

Yin, R. K. (2003). *Case Study Research: Design and Methods* (3rd ed). Thousand Oaks, Calif: Sage Publications.

APPENDIX A

IRB APPROVAL OF RESEARCH

ASU Knowledge Enterprise Development

EXEMPTION GRANTED

Arnim Wiek
Sustainability, School of
480/965-2387
Arnim.Wiek@asu.edu

Dear Arnim Wiek:

On 1/3/2014 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Urban Sustainability Transitions through Evidence-based Intervention Practices
Investigator:	Arnim Wiek
IRB ID:	STUDY00000453
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• IRB CONSENT Workshop.pdf, Category: Consent Form; • IRB CONSENT Expert.pdf, Category: Consent Form; • IRB CONSENT Interview453.pdf, Category: Consent Form; • IRB Protocol.docx, Category: IRB Protocol; • Recruitment Script - Expert Panel.pdf, Category: Recruitment Materials; • Recruitment Script - Generic.pdf, Category: Recruitment Materials;

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 1/3/2014.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

cc: Nigel Forrest
         Nigel Forrest