A Method for Sustainability Appraisal of Urban Visions

by

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ABSTRACT

Over the last two decades programs and mandates to encourage and foster sustainable urban development have arisen throughout the world, as cities have emerged as key opportunity sites for sustainable development due to the compactness and localization of services and resources. In order to recognize this potential, scholars and practitioners have turned to the practice of visioning as a way to motivate actions and decision making toward a sustainable future. A "vision" is defined as desirable state in the future and scholars believe that the creation of a shared, motivational vision is the best starting point to catalyze positive and sustainable change. However, recent studies on city visions indicate that they do not offer substantive sustainability content, and methods or processes to evaluate the sustainability content of the resulting vision (sustainability appraisal or assessment) are often absent from the visioning process. Thus, this paper explores methods for sustainability appraisal and their potential contributions to (and in) visioning. The goal is to uncover the elements of a robust sustainability appraisal and integrate them into the visioning process. I propose an integrated sustainability appraisal procedure based on sustainability criteria, indicators, and targets as part of a visioning methodology that was developed by a team of researchers at Arizona State University (ASU) of which I was a part. I demonstrate the applicability of the appraisal method in a case study of visioning in Phoenix, Arizona. The proposed method allows for early and frequent consideration and evaluation of sustainability objectives for urban development throughout the visioning process and will result in more sustainability-oriented visions. Further, it can allow for better measurement and monitoring of progress towards sustainability goals, which can make the goals more tangible and lead to more

accountability for making progress towards the development of more sustainable cities in the future.

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1. Introduction

In 2010, more than half of the world's population lived in cities, and this number is projected to increase to 70 percent by the year 2050 (UN-Habitat/WHO, 2010). On average, urban residents tend to have greater opportunities "to increase income, to benefit from good quality housing and living conditions, and to access services such as education and health care (UN-Habitat/WHO, 2010, p. X). The compactness and localization of services that characterize urban areas create opportunities to foster sustainable development (Newman & Jennings, 2008; Bai, 2008; Wheeler, 2000; Rees, 1996). For example, New York City's subway system shows how cities can foster sustainable mobility through a comprehensive and efficient public transit system, which helps reduce emissions from automobiles and works to create a more equitable society where everyone has equal access to goods and services. One can look at Portland, Oregon as an example of sustainable land use, highlighting the growth boundary that limits the continuous outward expansion of the city, which is essential in order to develop an efficient public transportation system and also helps to develop and maintain a local economy and strong sense of place amongst residents. Further, cities have the advantages of density, where resources such as water can be used more efficiently. To serve residents in dense cities, water is pumped into a much smaller area than in the suburbs where pipes are spread out over many miles in order to deliver water to residents. Further, Speir and Stephenson (2002) found that increasing the distance of a development from 0.25 miles to 4 miles from the service center resulted in a 30% increase in delivery costs. Overall, the policies,

urban forms, and other drivers that only exist in cities can allow urban areas to be a driving force towards global sustainability and livability.

Interestingly, cities are currently a major factor in the decline and degradation of human health and wellbeing, as well as the health and vitality of the surrounding natural environment on which cities depend. While I have just discussed some of the economic and social advantages to the development of cities, large urban areas also pose major threats to the long-term sustainability of our planet (Tanguay, 2010; UN-Habitat/WHO, 2010; Newman & Jennings, 2008; Rees, 1996). Cities emit about 70% of global carbon emissions and consume 60-80% of the world's energy (IEA/OECD, 2008) while only hosting about half of its population. This leads to negative health effects such as poor air quality, and the emissions also contribute to global climate change and its associated effects. Cities are prone to urban heat island, which leads to negative health effects from extreme heat and alters the weather patterns (precipitation, wind, humidity) (Stone & Rodgers, 2001). Cities in many developing counties lack clean water and sanitation systems (UN-Habitat/WHO, 2010), which has clear health implications for residents, but it also highlights social equity issues that are common. Due to compact development and land scarcity, it is expensive to live in cities, and this leads to issues of segregation and inequality. People with lower incomes are often forced to live in less desirable (and often less healthy) areas, such as apartments next to factories or houses next to the local dump (Liu, 1997; Brown, 1995; Greenberg, 1993). Further, these lower income residents often lack access to goods and services such as efficient transportation, healthy food, or high quality education (Brulle & Pellow, 2006; Moser, 1998). Since these urban areas are shown to have such potential for increasing sustainability and livability for residents, it is

becoming increasingly important to address these issues and redirect the future of urban areas towards the more positive prospects.

With this realization, programs and mandates to encourage and foster sustainable urban development have arisen throughout the world over the last two decades. The United States Department of Housing and Urban Development's (HUD), for example, established their Sustainable Communities Program in 2010, which supports locally-led collaborative efforts to foster sustainable, long-term development and reinvestment in cities throughout the United States. Yet, most of the tangible policy change and action is driven by the cities themselves or other independent organizations. For example, the C40 Cities Climate Leadership Group is a network of megacities throughout the world who have committed to addressing climate change both individually and collaboratively through initiatives to reduce in greenhouse gas emission and climate risks. Some examples of these initiatives are comprehensive bike plans in Bogotá, Columbia or car-free days in Seoul, Korea. Another example of a progressive organization is the Institute for Transportation and Development Policy, who works with cities worldwide to bring about sustainable transport solutions that cut greenhouse gas emissions, reduce poverty, and improve the quality of urban life [https://go.itdp.org/display/live/Home]. One of their projects in Buenos Aires worked to improve pedestrian safety in the city's busiest transportation hub by clearing and widening sidewalks and crosswalks, enhancing signage, installing bike parking, and planting trees. These projects exemplify commitment to achieving more a desirable future, even at times where there is a lack of national and international action towards sustainable and livable development.

In order to realize a city's potential in the progress toward sustainability, scholars and practitioners recommend that planning and decision making be informed by visions and visioning processes (Wiek & Iwaniec, in press; Newman & Jennings, 2008; Swart et al, 2004; Wheeler, 2000; Constanza, 2000; Olson, 1995). A vision for a city is a desirable future state (Shipley & Newkirk, 1998) and should be the end goal that guides decisions on future policies and development of that city. There has been literature about the role of visions in future development. Constanza (2000) argues, "creating a shared vision is the most effective engine for change in the desired direction" (online); similarly, Newman and Jennings (2008) assure that "a long-term vision is the starting point for catalyzing positive change, leading to sustainability" (p.8). A good vision should inspire individuals to take action to bring about visible, desirable change (Wheeler, 2000) and should help align communities, governments, businesses and others around a common purpose (Newman & Jennings, 2008). Wiek & Iwaniec (2012; in press) describe a vision as a 'pull factor', encouraging people to move forward towards a desirable state; this is in contrast to 'push factors', which denote what we *should* be doing and usually consist of abstract principles and guidelines (Shipley & Michela, 2006). In summary, a good vision should function as a "light at the end of the tunnel" or a motivational goal that brings a community together and helps them to make decisions and take actions that will get them closer to their desired future.

To make progress towards a *sustainable* future, however, the vision itself must be sustainable. But what is sustainability or a sustainable city? A sustainable city is one "where achievements in social, economic, and physical development are made to last. [It] has a lasting supply of the natural resources on which its development depends…[and]

maintains a lasting security from environmental hazards which may threaten development achievement…" (UNCHS/UNEP, 2000, p.2). As for a definition of sustainability, one of the most well-known and referenced sustainability principles is found in the Brundtland Report stating that sustainability "development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987, online). There have been scholars who have put forth criteria and principles for sustainability such as the need for socio-ecological system integrity and livelihood sufficiency and opportunity (amongst others) (Gibson, 2006), and others have proposed normative reference points, such as needs and identity (Newman & Jennings, 2008), by which sustainable visions should comply. Visions that consider and comply with these types of sustainability principles and criteria are needed so that we can ensure that progress of cities is towards a state of greater social equity, environmental conservation, and economic stability. 'Business as usual' has lead to cities that are plagued with issues such as homelessness, urban sprawl, and weather volatility. We can no longer afford to continue on this trajectory and must change the way that cities plan and make decisions in order to create more livable and sustainable societies. Since visions are mechanisms for motivating and creating desirable change, visioning processes that have an explicit focus on sustainability need to be completed in order to encourage future urban development towards sustainable outcomes and practices.

Recent studies on city visions indicate, however, that they often do not offer substantive sustainability content (John, 2012). City visions are also often fragmented and fail to bring together all of the necessary elements needed to create a sustainability vision (Newman & Jennings, 2008; Weaver & Rotmans, 2006; Wheeler, 2000). These

failures may be the result of a lack of knowledge around sustainability principles, a lack of capacity to understand and undertake sophisticated and cutting-edge visioning processes, or the lack of citizen and political will to accept changes in the status quo. Weaver & Rotmans (2006) suggest that we may be falling short in the creation of sustainability visions because we have a way of "locking-in the prevailing (unsustainable) development paradigm and locking-out strategic solutions that involve reframing" (p.285). These shortcomings in current visions and visioning practices reduce the likelihood that future plans and decisions for cities will be made with a propensity toward sustainability.

Over the past 10 years, significant progress has been made on general visioning methodology (Wiek & Iwaniec, in press; Minowitz & Wiek, 2013 (working paper); Shipley and Michela, 2006; Gaffikin, 2006; Shipley, 2000; Okubo, 2000; Helling, 1998). The work of Robert Shipley (Shipley & Michela, 2006; Shipley et al., 2004; Shipley, 2002; Shipley, 2000; Shipley & Newkirk, 1998) provides one of the first, and most comprehensive syntheses of the theory and practice of visioning. His research explores the origin and history of visions and visioning in urban planning practice, provides a critical analysis of the practice and motivating theory behind it, and questions whether current practices have a sound theoretical base and methodology (Shipley and Michela, 2006; Shipley, 2000; Shipley and Newkirk, 1998). In their article "Evaluating Municipal Visioning", Shipley et al. (2004) examines and critically evaluates several visioning undertakings that occurred between 1990 and 2001 in order to "uncover general lessons that practitioners can use to conduct more effective visioning exercises" (p.196), and this study was a significant contribution in the area of qualitative and quantitative evaluation

of visioning processes. Much of the evaluation work was based on the foundations of Helling (1998) and the evaluation of Atlanta's Vision 2020, which was shown to be less impressive than originally intended. Helling (1998) found that the visioning process yielded few significant or immediate results from its list of action initiatives, produced no realistic plan to attain the vision, and required excessive sums of money and resources. Other analyses and evaluations of visioning processes and results have further confirmed that many of them lack a visionary component (Gaffikin, 2006) or lack a level of comprehensiveness in order for the vision to have a realistic foundation (Newman & Jennings, 2008). Okubo (2000) and the National Civic League have created a community visioning and strategic planning handbook, which has become a well-known and highly utilized step-by-step guide for communities who want to undertake community-wide visioning and planning. While these studies have made major contributions to the field, most of this work has focused on traditional visioning and its application in cities with the goal of understanding what residents and community members desire for the future. There are very few examples of literature that discusses sustainability as it pertains to visions, and there are even fewer studies that exemplify sustainability visioning in practice.

Wiek and Iwaniec (in press) have recently synthesized the visioning literature with a particular focus on creating and crafting *sustainability* visions. Based on this review, they propose a list of quality criteria for creating sustainability visions. This work supports explicitly *sustainability-oriented* visioning, as it gives practitioners both the characteristics of a quality vision (as defined by Weik & Iwaniec), and key methods to help craft one.

Another stream of literature that is relevant here are contributions to sustainability assessment methodology in general (Gibson, 2006) as well as in the context of visioning (John, 2012; McDowell, 2007; Weaver and Rotmans, 2006). Sustainability assessment is defined as a tool measure and evaluate the sustainability of developments within a system of interest and how development of the system might be influenced by forces and policies, which might lead to deterioration or improvement in sustainability (Weaver & Rotmans, 2006). I use the term 'appraisal' here to mean a rough form of assessment, or what may be defined as a 'rough appraisal'. This appraisal will give researchers an initial sense of the vision's sustainability, whereas a more sophisticated assessment would include a full set of operationalized criteria and quantitative measures. Gibson (2006) has been fundamental in the development of sustainability assessment, synthesizing a set of generic criteria for sustainability. This is essential for providing a common reference scheme and improving consistency in the application of sustainability assessment processes. Although not directly developed for sustainability appraisal in visioning, the set of criteria could be used for visioning by operationalizing what each criteria means for the vision. For example, the principle of "intergeneration equity" can be appraised in a vision by examining in how far the vision accounts for the needs of both the current population and the future, unborn population who will inhabit the vision in the future.

More directly linked to visioning, McDowall (2007) presents a method for appraising the relative sustainability of different futures ("scenarios") based on a participatory and multi-criteria appraisal. This study highlights the value of including multiple, varying perspectives in the appraisal. Most studies attempt to appraise the relative sustainability of different futures based on a limited set of criteria such as carbon

emissions, cost, and air pollutants (McDowell, 2007). Including a greater diversity of perspectives in the compilation of sustainability criteria increases the variety of criteria through which a possible future may be appraised. This, in turn, ensures that a broad definition of sustainability is used, and this can include metrics that might be harder to measure but that are equally as important to create a sustainable future. One such criterion may be a measure of social sustainability, such as preserving cultural and/or community identity. A vision that reduces costs or number of air pollutant while uprooting social structures or community identities is not a sustainable future for which to strive.

Weaver and Rotmans (2006) present a progressive method for sustainability assessment called integrated sustainability assessment (ISA), which seeks to redefine sustainability assessment through a "re-conceptualization of assessment…to search for integrated solutions rather than be used simply to identify and evaluate trade-offs between objectives" (Weaver & Rotmans, 2006, p.289). The authors highlight how sustainability assessment is currently applied "in order to filter policies that have emerged under traditional paradigms, rather than to help change these paradigms" (Weaver & Rotmans, 2006, p.299); thus their ISA methodology provides a continuous and iterative assessment process with the goal of creating integrated, sustainability policies (sustainability-oriented governance) that are based on sustainability criteria and values. As part of a 4-stage process, ISA includes a robust systems analysis and problem identification, the creation of a sustainable vision and targets for the system, and the use of tools and methods to test the visions and policies in terms of sustainability, consistency, adequacy, robustness and feasibility. This iterative and integrated method is

an example of progressive research and experimentation on assessment methods that look to recreate sustainability assessment as a tool for making change, rather than a superficial checking procedure.

Most recently, John (2012) conducted a comparative evaluation of nine empirical visioning processes with special attention paid to the sustainability substance incorporated in the resulting visions. Through a criteria-based analysis, the study indicates that current, urban visions lack comprehensive and substantial sustainability thinking (John, 2012). This work contributes a set of 16 sustainability criteria and urban sustainability principles by which visions may be appraised. It also helps uncover the characteristics of visions and visioning methods that may facilitate or obstruct the inclusion of sustainability principles within urban visions.

Despite the progress made in these fields of study, sustainability appraisal has not yet been fully developed as an integrated part of visioning processes. There is still limited guidance for scholars, professionals (e.g., planners), and decision makers (e.g., corporations and government leaders) on how to rigorously incorporate sustainability into urban visions, or how to evaluate the sustainability substance of urban visions. This article sets out to address some of the aforementioned gaps and answers the following question: What is a robust sustainability appraisal method that can be used to create or evaluate the sustainability substance of urban visions?

Using recent design guidelines for sustainability visioning, I worked among a team of researchers at Arizona State University (ASU) to develop a method for undertaking sustainability appraisal in visioning. Based on this work, I present a set of criteria for urban sustainability, based on a broad literature review. Second, I spell out a

standardized procedure for how to appraise the sustainability substance of urban visions. Finally, I demonstrate the applicability of the proposed methodology through a case study on sustainable urban development in Phoenix, Arizona. The case study exemplifies the sustainability appraisal methodology developed by our ASU team that is designed to be an integral part of a visioning methodology created for Reinvent Phoenix, a project funded by a US Department of Housing and Urban Development (HUD) Sustainable Communities Regional Planning grant [http://portal.hud.gov/hudportal/HUD?src=/program_offices/sustainable_housing_communities/sustainable_communities_regional_planning_grants]. While the goal was to work with community members and key stakeholders to craft a vision for the Phoenix light rail corridor in the year 2040, the nature of the Sustainable Communities grant included an explicit mandate that the vision comply with principles of sustainability and livability; and thus our assessment procedure was developed as a way to ensure that this mandate was explicitly addressed in all facets of the project.

Until recently, visioning had not been a method that considered sustainability, and this is apparent in the lack of sustainability content that exists in urban visions. However, we have shifted into a new age where the importance of sustainability has been realized and is often required when considering the future. Thus, research and practice requires a comprehensive method to assess and monitor the sustainability content of a vision as well as the progress that various plans, policies, and decisions make towards achieving the sustainable future. This research proposes one such method and opens to door to further research and innovation behind sustainability assessment and appraisal as part of visioning and future development.

2. Criteria for Urban Sustainability

In order to undertake a sustainability assessment, it is necessary to compile sustainability criteria by which to appraise against. There is a variety of literature, scattered throughout many journals, where researchers identify characteristics of sustainability for all facets of urban life. For example, the livability principles, jointly developed by the HUD, the Environmental Protection Agency (EPA), and the US Department of Transportation (DOT) outlines six livability principles that guide US federal policies and decisions for sustainable development in areas such as housing, transportation, land use, and community development[1]. Similarly, the core, generic criteria for sustainability set forth by Gibson (2006) is another example of foundational work on defining what is considered sustainable for different characteristics of an environment.

These foundational criteria, along with a variety of other expert-based and peer-reviewed sources (Luederitz et al., 2013; Duany et al., 2010; ICLEI, 2010; UN-Habitat, 2009; Hack et al., 2009) were used in order to establish a set of sustainability objectives that would define the sustainable state by which future visions may be appraised. It should be noted that we did not undertake a systematic review of all available literature in order to synthesize these criteria. We chose to focus on the above key sources and undertook an iterative process of shaping and reshaping the objectives based on each source's insights in order to create a unified perspective. Here I provide an example of

[1] The six livability principles include: Provide more transportation choices; promote equitable, affordable housing; enhance economic competitiveness; support existing communities; coordinate policies and leverage investment; and value communities and neighborhoods [Retrieved from: http://portal.hud.gov/hudportal/HUD?src=/program_offices/sustainable_housing_communities/Six_Livability_Principles]

this iterative process for the housing objectives. Hack et al. (2009) states that sustainable housing should have "affordable, well-located, and energy-efficient housing" (p. 114). ICLEI identifies "promoting the preservation and reuse of historic resources to reinforce[e] community character and conserve[e] material resources" (p.14) as important for sustainability. The EPA encourages "housing that is compact in nature, green in design and construction, and transit-rich in options" (US EPA, 2012) as part of sustainable and smart growth policies. I synthesized these three statement to come up with a principle that sustainable housing should 'efficiently utilize resources by preserving and reusing old, buildings, choosing green, local materials and means of construction, and using energy and water efficient appliances, and limiting unit size'. This principle was then further refined during a final iteration, which resulted in two of the housing objectives that can be found in Table 1: Conserve natural resources in homes; and Maintain valuable cultural and historical character. This process was completed for six core areas of urban development that would be important for the future; these areas included housing, mobility, economic development, health, green systems, and land use. For each planning element, the team complied a list of 3-6 objectives, all of which have been sited as necessary in order to achieve a sustainable state for that element. This integrated set of criteria can be found below in Table 1.

Table 1: Sustainability objectives of six planning elements for urban development (for Reinvent Phoenix)

Housing	**Mobility**	**Land Use**
Meet demand with adequate housing options	Safe mobility	Ensure all basic services are accessible in the neighborhood
Provide sufficient quality housing and promote healthy housing conditions	Diverse mobility	Foster strong community ties and vibrant neighborhoods
Conserve natural resources in homes	Affordable mobility	Reduce transportation and infrastructure costs
Maintain valuable cultural and historical character	Time-efficient mobility	Eliminate adverse health effects from contaminated land
	Clean mobility	Eliminate adverse health effects from traffic or public infrastructure (roads, canals, utilities)
	Foster walkable and bikeable neighborhoods	Ensure sufficient amount of open space
	Avoid congestion	
Green Systems	**Health**	**Economic Development**
Reduce storm water loads and harvest water on-site	Equitable access to healthy food	Access to diverse employment and training opportunities
Reduce potable water consumption	Access to recreation	Economic vitality through strong, local economies
Reduce daytime temperatures	Abundant shade	Economy provides all residents with opportunities for a decent standard to living
Improve the social and economic benefits of green systems for health, mobility, and biodiversity	Social connectivity and integrity	
	Safety in public spaces	
	Enjoy high environmental quality	
	Access to social support network	
	Access to affordable preventative and curative healthcare	

This set of objectives is diverse and includes principles that are easily quantifiable and measured (secure housing affordability) and principles that are more abstract and not as easily quantified (foster strong community ties and vibrant neighborhoods). However, it is important to include all facets of sustainability for each of these elements, including environmental, financial, and social sustainability. These objectives make up the foundation of our visioning process and are the cornerstone to our appraisal methodology.

3. Sustainability Assessment Methods in Comparison

Sustainability criteria need to be embedded in a procedure that allows researchers and practitioners to measure how far a scenario complies with or deviates from these criteria, i.e., its sustainability. A variety of methods have been proposed and applied to achieve this, including the following, well known methods:

- Environmental Impact Assessment (EIA) (Bond, 2010; Pope, 2004; Glasson, Therivel, and Chadwick, 1999)
- Strategic Environmental Assessment (SEA) (Bond, 2010; Therivel, 2004; Pope, 2004; Arce, 2000)
- Multi-criteria Assessment (MCA) (Department for Communities and Local Government, 2009; Sheppard, 2005; UNFCCC, 2003) and mapping (Mcdowell, 2007)
- Integrated Assessment (IA)/Integrated Sustainability Assessment (ISA) (Weaver and Rotmans, 2006; Ravetz, 2000; Schlumpf, 1999)

Below, I describe and compare the key procedural steps of each of these prominent methods. This creates a 'pool of inspiration' the team draws from to propose a sustainability appraisal method for creating and evaluating urban visions (Section 5).

Environmental Impact Assessment (EIA)

EIAs emerged in the United States after the enactment of the National Environmental Policy Act (NEPA) of 1969; the purpose of an EA is to determine if a proposed action, or its alternatives, has potentially significant environmental effects. Key steps for EIA (from Glasson, Therivel, and Chadwick, 1999):

1) Scoping: Identify all possible impacts of all alternatives (including the 'no action' alternative)
2) Describing the project/development action: Clarify the purpose and rationale of the project and an understanding of its various characteristics, such as stages of development, location, and processes
3) Describing the environmental baseline: Establish both the present and future state of the environment in the absence of the project, taking into account changes resulting from natural events and from other human activities
4) Bring the previous two steps together to ensure all potentially significant environmental impacts (adverse and beneficial) are identified and taken into account
5) Identifying the main impacts: Assess the relative significance of the predicted impacts to allow a focus on the main adverse impacts

One shortcoming of EIA that was suggested by Pope (2004) was that, the "suggestion that EIA itself contributes to sustainability reflects the view that environmental impacts are at the core of sustainability concerns" (p.598) without really acknowledging the social and economic 'spheres' of the traditional, triple-bottom-line view of sustainability. It is also argued that an EIA's usefulness is hindered by being undertaken too late in the decision making process, which limits its ability to evaluate alternative options and limits the actual impact it can have on decisions (Pope, 2004).

Strategic Environmental Assessment (SEA)

SEA is a "systemic, ongoing process for evaluating the environmental quality and consequences of alternative visions and development intentions, ensuring full integration of relevant biophysical, economic, social, and political considerations" (Arce, 2000, p.394). Similarly to EIA, it is a tool used to support more effective decision-making and improved governance by forcing decision makers to identify the consequences of projects, plans, and proposals.

Key steps for SEA (from Therivel, 2004):

1) Identify environmental and sustainability objectives, indicators, and targets to test the plan options and statement against
2) Describe environmental baseline, including future trends; identify environmental issues and problems
3) Identify links to other relevant strategic actions (i.e. what other actions influence the strategic action in question and how?)

4) Identify sustainable alternatives for dealing with the problems and implementing the strategic action objective
5) Predict and evaluate the impact of alternatives/statements; compare alternatives
6) Monitor the environmental/sustainability impacts of the strategic decision

One benefit of SEA is that it is implemented earlier in the process, which gives it two, main advantages over traditional EIA: first, it can be used to evaluate alternatives in order to chose the 'best' option; and second, it can detect potential negative impacts at an early stage and address the sources, rather than the symptoms of these impacts (Arce, 2000).

Two types of SEA are identified: EIA-driven SEA and Objectives-led SEA (Pope, 2004). EIA-driven SEA involves undergoing an EIA but at the scale of a specific project, plan, or policy rather than an entire system. It is the similar reactive, ex-post process that evaluates impacts of a policy, plan or program against a baseline level, in order to evaluate the acceptability of the impacts and identify possible areas that need improvement with respect to environmental outcomes (Pope, 2004). Objectives-led SEA, on the other hand, is a system that assesses the potential impacts of a proposal against a series of aspirational environmental objectives, rather than against a baseline (Pope 2004). Some advantages that were cited for objectives-led SEA include the fact that it is proactive and can be part of developing programs and policies, rather than simply evaluating them. It promotes a comprehensive analysis of alternatives with sustainability as an explicit goal, or a series of goals, and it has a direct to target characteristic, where the position of the sustainable state is known and identified (Pope, 2004).

Multi-criteria Assessment (MCA)

MCA is a decision making tool that evaluates programs, policies, or visions based on multiple objectives and criteria and their perceived importance. The objectives are identified by the decision making body and are linked to measurable criteria in order to assess the extent to which the objectives have been achieved in each policy, program or vision (Department for Communities and Local Government, 2009). Participants don't have to agree on the relative importance for each of the criteria or the rankings of the alternatives; the method allows each participant to contribute their own thoughts, which are synthesized into a final 'score' and joint conclusion.

Key steps for MCA (from Department for Communities and Local Government, 2009):

1) Establish decision context: what are the aims of the MCA and who are the decision makers and other key players
2) Identify the options
3) Identify the objectives and criteria that reflect the value associated with the consequence of each option
4) Describe the expected performance of each option against the criteria
5) Assign weights for each of the criteria to reflect their relative importance to the decision
6) Combine the weights and scores for each option to derive their overall value

One of the benefits of this method is that it provides a "structured, collaborative process for combining multi-disciplinary expert evaluations and stakeholder input" that can be incorporated into the appraisal (Sheppard, 2005, p.174). Another benefit of MCA

is that a full range of criteria can be included and evaluated, including the environmental and social criteria that cannot be assigned an explicit, monetary value (UNFCCC, 2003). This is especially important when considering sustainable systems, since they are multi-faceted and cannot be reduced to a single-criterion. Finally, MCA does not work to prescribe a particular 'best choice," but instead "aims to explore the way in which different pictures of strategic choices may change depending on the view that is taken"(Stirling, 2005, p.5). This allows the assessment to be adaptable, which is important when considering the range of situations where sustainability appraisals are used.

Integrated (Sustainability) Assessment (ISA)

ISA is a tool that works to create system models that identify the interlinkages between drivers, pressures, states, outcomes and responses (Weaver and Rotmans, 2006; Ratvez, 2000) and helps developed a shared interpretation among participants of what sustainability means for that system. From there, participants can evaluate alternatives based on level of correspondence with the sustainable state.

Key steps (From Weaver & Rotmans, 2006):

1) Scoping: Identify sustainability problem, perform system analysis (identification of underlying drivers, boundaries, ect.), develop a conceptual model, and identify and select key stakeholders
2) Envisioning: Establish a sustainability vision for that system that is grounded in underlying principles and involves all the stakeholders; formulate policy options and assess the beneficial and adverse impacts of that policy

3) Experimenting: Choose a mix of quantitative and qualitative tools that could help reach the vision (by creating transition pathways); assess each pathway based on the previously established sustainability vision and principles; explore tradeoffs of different pathways and find most 'promising' route
4) Learning, evaluating and monitoring: Discuss lessons learned with participants; monitor the ISA process by formulating indicators that can indicate completion of ISA stages; reframe perceptions based on ISA process and then adjust sustainability vision, pathways and assessments

The major benefit of this process is that the holistic, system-level thinking can highlight the sustainability interventions that will have the greatest, positive impact within the larger system, rather than only focusing on one intervention point or one proposed solution. It can uncover a more comprehensive suite of projects, programs, and policies that would address sustainability, and it also exposes unavoidable tradeoffs that will have to be considered (Pope, 2004).

A key insight from this review of assessment procedures is regarding the use of criteria and objectives. All of the procedures, except for EIAs require the creation of a set of (sustainability) criteria or objectives on which the assessment is based. None of them offer a specific set of criteria to use, and all include an explicit step within the procedure where the assessors collaboratively synthesize the set of criteria or indicators that will be relevant for their purposes. There are both benefits and disadvantages to this. The benefit is that the set of criteria or objectives will be very context specific and tailored for that specific project. These will likely lead to assessments that are more grounded in reality

and can provide more actionable and meaningful results. However, the process of synthesizing criteria for each project can lead to a duplication of efforts and reduces the ability for quality control. If a standard set of widely accepted sustainability criteria or objectives were used in all assessments, it would not only ensure that the assessments were using empirically justified principles of sustainability, but it would also allow for easier comparison between assessments and projects. In the following section (Section 4), I synthesize the insights (benefits, impairments, and recommendations) from the method analyses above and develop a set of design guidelines for sustainability assessments and appraisals that, if followed, should help practitioners to design assessments and appraisals that are influential for decision making processes for the future.

4. Design Guidelines for Sustainability Assessment and Appraisal

As final step of preparation for the method proposal below (Section 5), I have compiled and synthesized a list of design guidelines for sustainability appraisal, in particular in the context of visioning.

First, for sustainability assessment or appraisal methods, the situation being appraised, whether a vision, a series of scenarios or a current state, must have something to be appraised *against*. In many situations, this comes in the form of a set of baseline measurements, such as "reducing GHG emissions by 10% from last year's levels," or "increasing amount of affordable housing to the level found in a neighboring town". However, assessing against this baseline may say very little about how sustainable the system is, since a level 10% less than last year may still be within an unsustainable level. Instead, the standard should be to assess the sustainability of a system with respect to

empirically justified targets or critical threshold values (CTV) (Nijkamp, 2000), where the sustainable state is known with high confidence. Then, a distance between the current state and the target (distance to target) can be calculated (Ravetz, 2000; Pope, 2004). Currently, there are a limited number of these justified, sustainability targets and critical thresholds, since research on thresholds and tipping points is still growing and there are an exhaustive number of indicators that could need targets. However, whenever possible, researchers should be diving into literature and best practices in order to find these kinds of targets.

The second important characteristic of high-quality assessments is undertaking the assessment early in the process where there is an explicit link between the appraisal results and the decisions made for the final outcome, be it a vision, plan, policy, ect. It has been found that many sustainability assessment methods occur late in projects and are not fully integrated into the decision-making framework from the beginning (Gibson, 2006; Pope, 2004; Arce, 2000). This creates a situation where the results of the assessment can be taken as advisory, and it can lead to unsustainable outcomes that could have been avoided. As one of the his four major components of sustainability assessment, Gibson (2006) identifies that assessments "must force decision makers to give serious, primary attention to sustainability requirements", which further speaks to the importance of making the assessment portion of the project explicit and upfront, so that sustainability is considered at the onset of the project and that all decisions, from the beginning, are guided by sustainability principles and targets.

A third characteristic of robust sustainability assessments is the use of holistic and long-term thinking. Gibson (2006) writes that a 'basic insight to consider' for

assessments is that they "need to be comprehensive, including socio-economic and biophysical matters and their interrelations and interdependencies over the long and short term" (p.172). Only through a systems perspective can the root causes of sustainability problems and the most effective intervention points to address the problem be uncovered. Otherwise, the assessment will not lead to system-wide sustainability and may produce unintended consequences that lead to further issues. For example Bond (2010) writes about appraisals that "will lead to beneficial social and economic effects through implementation of the appraised plan, but [will have] negative environmental effects" (p.4), and is therefore not a sustainable plan. Consideration of this guideline should make researchers and practitioners reflect on whether the selected targets and indicators sufficiently address the relevant sustainability objective in the long term. Objectives themselves cannot be directly changed since they are merely results of upstream drivers. Unless those drivers are properly identified and formulated as indicators, the assessment will not create outcomes that lead to greater long-term sustainability of the system. Thus, when designing a sustainability assessment, a causal map of the system should be considered in order to identify the most important indicators and work to avoid unintended consequences that can arise without a comprehensive view.

To summarize, there are three key characteristics of sustainability appraisals and assessments that emerge from the literature: one, setting explicit and empirically justified targets; two, having early and direct integration between the assessment results and the preparation of the final outcome or vision; and three, including both system-wide and long-term considerations into appraisal procedures.

5. Sustainability Appraisal Method for Visioning

To address the shortcomings of sustainability-oriented visions for urban areas, mainly the lack of sustainability content existing in visions as well as the failure to integrate sustainability appraisal methods into visioning methodologies, our ASU team has developed a sustainability appraisal technique for crafting sustainable urban visions. Here the insights and the material from the previous three sections are integrated. The set of compiled sustainability criteria (Section 2) is embedded into a standardized appraisal procedure that uses elements from current assessment procedures (Section 3) in a way that all relevant design guidelines for quality assessments (Section 4) are fulfilled.

There are various challenges that are apparent to sustainability-oriented researchers and planners. For any sustainability appraisal to be undertaken, there must be general support for this kind of work in the relevant community. This process will not be relevant to cities or communities that are not invested in sustainability or creating plans to harness sustainable development in the future. While the appraisal can be undertaken for visions without orientation to sustainability, the results will have little significance, since the sustainability objectives that are fundamental to the process may not be supported. Thus, this method should be used in communities who have committed to pursuing sustainable development. Further, there is constant capacity building that has to occur in order for the appraisal to be successful and influential. The visioning process is a vehicle for building sustainability capacity, and it is a great way to reveal what level of sustainability people are willing to accept for their future. Many communities will have predefined perceptions and understandings of sustainability objectives and will have varying levels of commitment to achieving it. Since this process is heavily objective-

driven, there must be a level of understanding and commitment to the objectives, and this requires the planner to work with participants to understand each objective and why it is important or relevant to them. The idea behind the appraisal should also be made clear, since the appraisal is not there to tell anyone that there vision is bad, but is instead a tool to show us how well we are doing towards achieving sustainability. The more that participants can internalize and identify with the objectives, the more productive the visioning process will be and the more motivated participants will be to achieve sustainable futures.

There are two, key phases of our sustainability appraisal method, both of which are directly integrated into a larger, visioning methodology. The first step of phase one involves the development of urban sustainability objective such as those found in Section 2. This involves the identification of core sustainability principles and best practices for urban development found in peer-reviewed and gray literature. For this project, the team chose to organize these principles around key planning elements. Each element should be connected to 3-6 sustainability objectives that, when taken together, characterize a sustainable state for that element (such as those found in Table 1). The second step, linking objectives, indicators, targets, and vision options, creates the foundation for the integrated appraisal technique. Each objective from step 1 should be linked with 1 or 2 relevant, measurable indicators that can be used to quantitatively measure the progress the vision makes towards the objective. The identification of indicators is essential for robust, sustainability appraisals of visions, since the identification of real data in association with the vision creates great relevance and tangibility. The identification of indicators can also be a tricky task, since the practitioner should focus on indicators that

directly measure progress towards the desired sustainability objective. Each indicator must then be associated with an empirically justified, sustainable target that designates the desired, sustainable state of the indicator. As one of the key design guidelines to sustainability assessment identified Section 4, it is necessary to have something to appraise against when undergoing a sustainability appraisal, and in order to undergo robust appraisals, it is important to have a justified and specified target indicating a sustainable level rather than of baseline or a "better than last year" goal.

The final step in the first phase involves identifying what we have termed 'vision options' for each sustainability objective. Vision options are examples of existing best practices, policies, organizations or ideas that, if implemented, have been shown to help a city make progress towards a particular sustainability objective. For example, the vision option cool pavement is an example of a vision option help achieve the Green Systems objective "Reducing daytime temperatures". This vision option was identified from literature and was shown to be successful, innovative solutions to reducing temperatures in a city (see Figure 1).

Planning Element: Green Systems

Objective: Reduce daytime temperatures

Vision Option: Cool Pavement

Example: http://emeraldcoolpavements.com/
Parking lot at Thomas and 1st street in Downtown Phoenix

Description:
Paving materials that are created to reflect more solar energy, enhance water evaporation, or have been otherwise modified to remain cooler than conventional pavements. Cool pavements can be created with existing paving technologies (such as asphalt and concrete) as well as newer approaches such as the use of coatings or grass paving. They are found to reduce surface heat temperature of asphalt by 20 to 40ºF and help reduce CO2 emissions during peak heat hours.

Figure 1: Example of a vision option (Cool pavement) for Green Systems planning element

The identification of a suite of visions options is a key step in the sustainability appraisal method, as it allows for the 'pre-screening' of vision components to ensure they align with sustainability principles. It allows practitioners to present stakeholders/participants with multiple, sustainable options that may be included in the vision, and the participants can decide which options they prefer or feel are the most feasible or desirable for their future vision for the area. The innovation of sustainable vision options as key inputs into vision process allows for an *ex-ante* sustainability appraisal, where sustainability is integrated in the beginning of the process, rather than simply evaluated at the end.

The first phase of the appraisal method is summarized below (Figure 2):

1. Compile sustainability objectives for urban areas (see Section 2)

2. Link each objective with a set of relevant indicators and identify a sustainable target (from empirical literature!) for each
3. Identify a suite of vision options that correspond with each objective

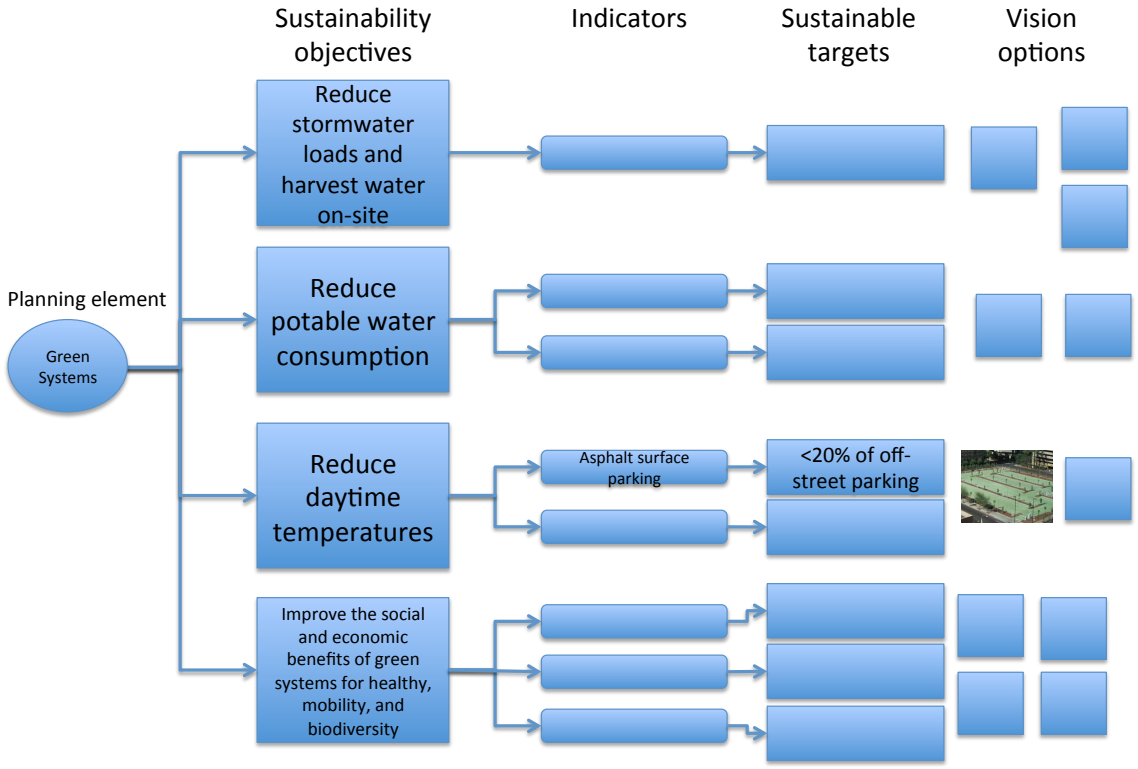

Figure 2: Phase 1 of proposed appraisal methodology with cool pavement example

The second phase of the method occurs after a final vision is drafted and the resulting vision is formally appraised for sustainability. In this part of the appraisal, the sustainability of the vision as a whole should be considered; this is in contrast to the first phase where the individual components of the vision were evaluated. A system-level appraisal is necessary because cities are systems where all components interact with and influence each other. For this phase, the appraisers should read through the whole vision and highlight phrases or components that align with sustainability principles. For principles that are addressed in the vision, the evaluators should also consider in-how-far

they are actually addressed, or in other words, where all the important indicators for that objective addressed? An appraiser may find an objective is not holistically addressed because only some of the indicators were considered while others were left out, and this can create conflicts or gaps for the sustainability of the vision. The appraiser should also highlight any principles that are not addressed in the vision, and all of this information should be written up in an appraisal.

The second step is to aggregate the results of all of the objectives to decide if the vision, in its current form, is a sustainable vision. This may include giving a 'final score' based on the appraisal and will reveal if the vision has adequately addressed the suite of objectives, or if there are too many gaps and conflicts for the vision to be considered sustainable. The final step in phase two involves taking the results of the appraisal and presenting it to the original stakeholders who crafted the vision. The stakeholders should be shown where there might be gaps or sustainability conflicts within their vision, and a process of negotiating conflicts and filling gaps should be facilitated. The vision should then be revised according to the decision made during this negotiating phase.

The second phase of the appraisal method is summarized below:

1. Ex-post appraisal of the vision draft
    a. Ensure that all relevant objectives are addressed, and highlight those that are not
    b. Consider to what extent each objective is addressed (i.e. are all relevant indicators attended to in order to holistically address the objective)
2. Aggregate the results from the appraisal to obtain an overall consensus about the sustainability of the vision (i.e. in its current form, is the vision sustainable?)

3. Revise the vision
    a. Negotiate and reconcile conflicts and/or gaps that were identified in the appraisal with the original participants and revise the vision accordingly

This appraisal method allows researchers and practitioners to perform an integrated sustainability appraisal within a visioning process. It allows for *ex-ante* appraisal to offer sustainable options into the visioning process, and it then re-evaluates the sustainability of the vision as an integrated system in the *ex-post* appraisal. Given that, one benefit of this methodology is that it has the flexibility to be used as an integrated part of the visioning process, but it can also be used to appraise visions that were not created using the integrated process. To undertake only ex-post appraisal using this method, objectives, indicators and targets must still be developed, but this process would be disconnected from the visioning process. This means that the objectives, indicators and targets will have to be previously standardized or agreed upon by the participants so that the appraisal can be both valid and useful. After the relevant set of objectives, indicators and targets are developed, the second phase of the appraisal can be undertaken to complete the appraisal and report the results on any vision that is presented.

In the next section (Section 6), I offer a case study in which this appraisal methodology was used as part of a community visioning process in Phoenix, Arizona.

6. Case Study – Sustainability Appraisal of a Vision for Communities Along the Light Rail Corridor In Phoenix, Arizona

The above sustainability appraisal method is part of a comprehensive visioning methodology that was developed for the participatory visioning component of Reinvent

Phoenix. As described in Section 1, Reinvent Phoenix is a collaborative project funded by a U.S. Department of Housing and Urban Development (HUD) Sustainable Communities Grant, which is awarded to cities and partnering organizations to undertake locally-led long-term planning, sustainable development and reinvestment in cities. In partnership with the City of Phoenix, St. Luke's Health Initiative, and other Phoenix-based organizations, our team of researchers from ASU has executed extensive participatory visioning with residents, business owners, developers, and other key players throughout the City of Phoenix, Arizona [http://phoenix.gov/pdd/reinventphx.html]. Through a series of visioning activities that included interviews, surveys, participatory mapping activities, focus groups, and visioning workshops, we have worked with these stakeholders to develop visions for their communities for the year 2040 that are based on principles of transit-oriented development (TOD) and sustainability.

As explicitly stated in the title of the grant, principles of sustainability and livability were the central focus of this visioning work and guided the process from its onset. Using the method described in Section 5, our ASU team formulated a comprehensive set of criteria, indicators, and targets for each of the six 'planning elements', through which the research was organized. For each of these elements, the team created an 'element matrix' (see Table 2, below). The first column of the matrix included a set of objectives. The second column contained the associated indicators, and the third column indicated targets for each objective.

Table 2: Indicators and targets for housing objective #2: Provide sufficient housing quality and health

Indicator	Definition	Targets
Basic amenities	Percentage of units with no electricity or other energy supply	<0.1%
Fitness	Average fitness (1—5) Percentage of units with <2.01 fitness	4.5 <0.1%
Indoor air quality	Percentage of units exceeding one or more indoor air quality thresholds	<0.1%
Water quality	Percentage of units exceeding one or more water quality thresholds	<0.1%
Noise	Percentage of units exceeding thresholds for noise	<0.1%
Landscape quality	Average outdoor summer water use	>50 gals/day/HH

Lastly, a set 'vision options' was identified for each objective. For example, one sustainability objective associated with the Green Systems element is "Reduce daytime temperatures," and an associated vision option to help achieve that objective is the use of cool pavement technologies to reduce the amount of heat absorption by asphalt in a city (see Figure 1). This vision option was identified from literature and was shown to be successful, innovative solution to reducing temperatures in a city. This process was completed for each sustainability objective identified in Table 1.

This suite of vision options was presented as part of various activities during our community visioning workshops. With the data from these workshops, which included preference, acceptability and feasibility data for various vision options, an overall vision for each district was developed. This vision was composed of different, sustainable vision options that people felt were most preferred, acceptable, and feasible for the future of their area.

The system-level sustainability appraisal was then undertaken to explore in how far each of the sustainability objectives were addressed within the resulting vision. This task was undertaken by members of the ASU team and required a familiarity with both

the resulting vision and the qualitative and quantitative data that went into the vision. The sustainability of the vision was appraised on two levels and written up into a formal document. The first level involved identifying the sustainability objectives that were addressed in the vision and the objectives that were absent or minimally addressed. The second level involved examining if all relevant indicators were addressed for each objective in the vision and if there were any sustainability conflicts that arose within the vision. An example found in Figure 3 highlights one such conflict in a vision where a community wanted to address the objective of 'fostering economic vitality through strong local businesses', but did not consider all relevant indicators. In their vision, there were many references to increasing the number of local businesses through programs that increased mixed-use development and the establishment of businesses incubators in their area. While these vision elements are important for addressing the 'economic vitality' objective, there was no mention of programs to help support the existing local businesses, which is an essential indicator for the long-term success of the objective. Interestingly, one of the main economic issues in this area was that businesses were frequently going out of businesses and there was high business turnover. Thus, the 'economic vitality' objective could not be holistically addressed without greater emphasis on supporting existing businesses. This is an example of a conflict that would need to be reconciled in step 3.

Economic Vitality: During visioning activities people expressed the importance of increasing their stock of small, locally owned, and independent businesses. They also stated their desire to have an influx of unique, higher-end restaurants, similar to Federal Pizza or Postinos (SE2; SE3; SE4; IN). Residents felt this development would create a "nice area for the community" (SE3), and participants liked how these local businesses were "dynamic", "good community gathering places" (SE4), and could "draw people in" from across the region (IN). All of these views were further solidified in the workshop activities, where participants preferred businesses in mixed use and business incubators, noting that they "match the organic feel of the neighborhood around it" (W2, VESC). While this support for local businesses aligns with the objective, there was one shortcoming of this discussion. While there was a lot of talk about incubating new local businesses in the area, there was less discussion about the options of supporting existing small businesses through small business support organizations. One issue the Uptown has faced is in maintaining existing businesses, and putting all efforts into cultivating new businesses without strategically thinking about ways to support these businesses does not holistically address the "economic vitality" objective.

Figure 3: Example of sustainability appraisal from Reinvent Phoenix

Due to constraints of time and capacity, this case study does not illustrate steps 2 and 3 of phase 2, aggregating the results and revising the vision. Ideally, we would have taken the results of the appraisal (how well was each objective addressed?) and aggregated them to decide if the vision was a sustainable vision. If the vision was not sustainable, than the conflicts that we identified in the appraisal would have been discussed with participants so they could see where conflicts and gaps exist and have the chance to fill and reconcile them to make their vision more sustainable. At a minimum, it would allow for capacity building amongst the participants, since it the sustainability conflicts would be highlighted and explained so that all stakeholders and decision makers would be aware that they exist. While we were unable to follow through with these steps in our case study, we did made sure that the appraisals were incorporated into resulting policy documents for Reinvent Phoenix, so that the people capable of implementing policies and plans for the vision are aware of sustainability successes and conflicts within the vision and can make decisions accordingly.

7. Discussion

The proposed sustainability appraisal process was designed to meet all of the design guidelines presented in Section 4. The first design guideline, ensuring that the appraisal includes sustainability targets by which the vision can be appraised against, was addressed in the first phase of the appraisal process when element matrices with sustainability objectives, indicators and targets were created. Further, wherever possible, these targets were taken from literature where the threshold was justified as the sustainable target.

The next design guideline, which calls for early and frequent application of the appraisal process and a clear link between the appraisal and the decision making process, was an explicit goal of the proposed method. This was partially accomplished by the process of identifying vision elements, which was the first application of the appraisal, and it helped ensure that decisions made regarding the vision would have an orientation towards sustainability. This design guideline was also addressed in the second phase of the appraisal methodology, where any gaps or deficiencies in the sustainability of the vision draft were identified and presented to the stakeholders for consideration. By bringing these issues back to the participants who have the most stake in and influence over the vision, there is greater ownership of the final product and a greater propensity to follow through with the decisions in the form of future plans, policies and projects.

Finally, the appraisal process involves holistic and long-term thinking (the third design guideline) in two respects. First, the appraisal process was embedded in a visioning process, which is inherently a long-term thinking exercise. Next, the second phase of the appraisal has an explicit goal of appraising the vision as a system, rather than

of individual components. Even though all vision elements are 'pre-approved' to be sustainable, combination of elements may not lead to a sustainable whole. For example, the inclusion of increased bike lanes and sidewalks into a vision addresses the principle "creating walkable and bikeable neighborhoods"; however, if there is not a subsequent vision of increasing the number and accessibility of goods and services available to pedestrians, than the vision of walking and biking is rendered insignificant, and the vision is not addressing all sustainability principles. Thus, long-term and systemic thinking are integral when undergoing this appraisal method.

The proposed method distinguishes itself from some of the well-know methods introduced in Section 3 in a couple of ways. First, it is an integrated method that it is directly built into a visioning methodology. This makes it easier for practitioners to use the method, since it is not an additional process that must be incorporated and learned. Unlike the other, prominent methods, this method does not compare different alternatives to see which is the most sustainable; it facilitates the creation of one, sustainable future and eliminates the need to even consider unsustainable alternatives. Finally, with the creation of indicators and targets, the appraisal can (and should) be undertaken long after the visioning process is complete. It makes evaluation of progress easier and more consistent, since the same principles are used throughout. In all, this method sets itself apart by its functionality within visioning processes and its commitment pushing sustainability to the forefront of all activities and decisions throughout and after the process.

8. Conclusions

There are multiple takeaways from this study on sustainability appraisal and its role in visioning. First, visioning is and will continue to be an important tool in order to help communities, cities, and nations move towards a more sustainable and livable state. However, it is evident that very few city visions contain sustainability substance, and it is clear that a stronger and more widely used process is needed to ensure that visions imply sustainable states (as defined in empirical literature) and to evaluate and monitor progress towards the vision. There are a handful of well-known assessment methods that exist and can provide some of the important qualities needed to assess visions, such as the inclusion of sustainability principles, the use of systems-thinking, and the use of a participatory process; however, at this point, none of these methods have an distinct role in visioning. Given this last point, I propose an integrated sustainability appraisal method for use explicitly within a visioning process. This method allows for early and frequent appraisal of a vision's sustainability-orientation, and can produce sustainability visions that can help cities and communities achieve a sustainable future.

While this methodology is a step in the direction for creating sustainable, urban visions, there still are areas for improvement and for further research. First, there is an important line of research that deals with negotiating conflicts that arise from the vision appraisals, which was recommended but not clearly defined in the proposed appraisal method. While we have recommended that these conflicts get presented to the stakeholders to be resolved, it would be helpful to have a defined method or guidelines for reconciling sustainability tradeoffs. Gibson (2006) presents a list of "Basic Sustainability Assessment Trade-off Rules," which are meant to help practitioners think

about tradeoffs between sustainability objectives. These rules include principles such as striving for 'maximum net gains' and 'avoidance of significant adverse effects'. Another useful concept for negotiating sustainability trade-offs is the Sustainable Solutions Space that is presented by Machler & Golub (2012), which identifies a bounded solution space where sustainability negotiations and trade-offs can occur in order to develop sustainable visions. The insights from these methods and others that deal with negotiating conflicts and trade-offs should be incorporated into the proposed method in the "revising" stage of phase 2. This will strengthen the method and provide ways to consider the conflicts that may arise and provide a participatory way to reconcile them.

Second, visioning methods in general, and the methodology presented here in particular, have to be tailored to be very place-specific. From the suite of objectives and indicators that are identified in the matrix, not all will be relevant to the area or to the stakeholders within that area. For example, the health principle of "Access to healthy food" may not be relevant to an area that has multiple grocery stores and markets that are highly accessible and utilized. Thus, it may be useful to have a systematic way of narrowing down the objectives and the associated vision options based on the current conditions of the area. Even without a specific algorithm, visioning practitioners should ensure that they present relevant objectives, indicators, and visions types based on the participants, location, and context of the engagement, and this selection process should be an explicit part of the methodology.

Next, as mentioned in Section 2, the ASU team did not undertake a systematic review of sustainability literature when compiling the list of sustainability objectives. For pragmatic reasons, we chose to focus on key sources of sustainability and urban planning

literature to get the best and most comprehensive overview that we could, given a limited timeline. However, a more systematic and in-depth review could be undertaken to further justify the sustainability objectives that were presented in this article, and this could include a large body of literature and more methodical review and synthesis.

Finally, an area for further research, as mentioned in the discussion of quality criteria, is the need to uncover these empirically justified sustainability targets for all objectives. As a sustainability community, we are at the early stages of this endeavor and are beginning to realize the importance of this kind of research. For example, Rockström et al.'s (2009) publication in *Nature* has received international attention, as the authors present a table of boundaries or tipping points for various indicators such as "ocean acidification" or "change in land use" (Rockström, 2009). We should encourage an increase in this type of research as a way to quantify and specify the sustainable targets and goals as we move forward in both visioning and urban planning in general.

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