SEARCHING FOR SPATIAL SUSTAINABILITY: ONE GOAL, MULTIPLE PATHS

Daniel E. Orenstein[1], Dalit Shach-Pinsly[2]

[1]Faculty of Architecture and Town Planning, Technion Israel Institute of Technology, DanielO@ar.technion.ac.il

[2]Faculty of Architecture and Town Planning, Technion Israel Institute of Technology, dalitsp@tx.technion.ac.il

Keywords: regional development, spatial planning models, sustainability

Abstract

Sustainability has been a prominent goal in environmental planning over t
especially in rural regions. Planning scholars and practitioners have contributed to this trend by proposing, developing and implementing frameworks for spatial development that aim to facilitate human economic and social development, while mitigating or even reversing the environmental damage associated to development. A broad diversity of frameworks has been developed, and they have both unique and overlapping features.

This work explores the myriad ways in which planners understand sustainability and how they implement it at various spatial scales. Drawing from the theoretical and professional literature and from case studies around the world, we develop a classification system for spatial sustainability frameworks based on three scales of aggregation: typologies (the most general category), models and individual case studies. We develop five axes that define the prominent differences in characteristics of spatial sustainability framework typologies. These are: *bottom-*up axis, defining who initiates and maintains the initiative; 2) the economic axis, defining the disciplinary approach that *determines relative importan* various priorities; 3) the subject-*specific* holistic axis, defining the fo *initiative;* 4) the local regional axis, defining the spatial scale of the initi *open space orientation.*

We suggest that the axes of comparison can assist communities to define and implement their spatial planning goals, while addressing diverse and sometimes competing interests, and conclude by discussing implications for planners. In particular, sustainability planning can be tailored according to the particularities of the socio-ecological system.

1. Introduction

For the past half century, one of the prominent trends in global environmental planning and policy has been the quest for sustainability at the local, regional and global scales. It has been widely posited that exponentially growing populations, rapid loss of open spaces, habitat fragmentation and destruction, sprawling human settlement and associated infrastructures all pose growing social, economic and ecological challenges that threaten the long-term wellbeing of human society. Growing recognition of these challenges culminated in such events in the 1980s and 1990s as the publication of the Bruntdland Report and the Stockholm Earth Summit (Conca and Dabelko, 1998). Simultaneously, local communities began experimenting with policy and planning to realize

comprehensive sustainability principles and goals. Planning scholars and practitioners joined the global effort to address these societal challenges proposing, developing and implementing frameworks for spatial development that strive to achieve sustainability development can continue, while the environmental damage is mitigated and even reversed (Jabareen, 2006). Multiple and diverse frameworks have been developed with both unique and overlapping features.

In this paper, we explore the diverse ways in which communities, policy makers and land use managers understand sustainability and how they implement sustainability at the regional sca With such a broad diversity of understanding, interpretation and implementation, we are also interested in finding commonalities between sundry approaches. We review, characterize and categorize a broad range of frameworks for sustainable regional spatial planning. We begin with a literature review of documents pertaining to regional sustainable development from the past decade. We characterize sustainability frameworks using common themes across planning frameworks. Next, we identify the critical differences between the frameworks, and define the underlying values and disciplinary biases that influence each model and define their differences. We conclude by offering lessons for planners and communities embarking on sustainability initiatives at the regional scale.

What is sustainability in the regional development literature?

Sustainable development has been a common, though oft maligned, development catchphrase since popularized by the Bruntland Report (Our Common Future ; World Commission on Environment and Development, 1987), which defined the term as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Inherent in the definition is the assumption that the earth s capac resources and to absorb waste is limited (Meadows et al., 1972). The combined pressures of increased human population growth and material consumption are considered unsustainable in that they lower the resilience of the planet and its ability to provide resources and absorb waste, thus threatening future generations. Rising from these assumptions, the first definitions and applications of sustainable development were focused on environmental issues, such as sustainable resource use.

While the report and the definition itself have been criticized from multiple perspectives (Wall, 1997; Miller, 2014), the term and the idea it represents have not only endured, but they have promulgated into every discipline and profession that deals with environment, resources and land use. The concept definition has been refined and various frameworks for assessing and monitoring sustainability have been proposed, most focusing on three aspects (or pillars) of human development: social, economic and environmental. The underlying assumption is that only if all three realms of human wellbeing are addressed can true sustainability be achieved. So, while sustainable resource use was and remains a common starting point for sustainability initiatives, the emphasis has shifted from purely environmental reasons to communities that rely on the resource for their social, cultural and economic well-being (Kearney et al., 2007). Weaver (2005) recounts that early definitions of sustainability (with regard to ecotourism) were particularly environment-focused, but this was superseded by the inclusion of social, cultural and economic sustainability considerations.

The literature on sustainable regional development analyzes and advocates the application of the concept via land use planning at the regional scale. Most of this work recognizes the three pillars of sustainability (Wiber et al., 2004; Weaver, 2005; Kearney et al., 2007; Donald, 2008; Wheeler,

2009; Schädler et al., 2011; Reyer et al., 2012), which have also been canonized in government policy documents such as Agenda 21 (United Nations, 1992; Council of the European Union, 2006; Organization for Economic Cooperation and Development, 2006). This three pillars definition has been challenged by some, such as Miller (2014), who suggests that such categorization locks the users into a limited discourse of compromise between the three components. He suggests replacing the paradigmatic definition with a pursuit of quality of life and sustainable livelihoods suggested by others, e.g. Stoll-Kleemann and O'Riordan, 2002; Horlings and Padt, 2013). Wall (1997) simultaneously touts the potentially beneficial definitions and goals of sustainable development while dismissing it alternatively as a political slogan or an imprecise catch phrase (which may also act as a catalyst for community discussion).

Table 1 summarizes the definitions of sustainable development applied in various works on the topic over the past decade.

Source	Research focus	Definition of sustainable development
Wiber et al., 2004	Community-based fishery management	Referred to in **ecological and economic** terms; **sustainable livelihoods** .
Weaver, 2005	Ecotourism	Contentious term, impossibility of knowing that a partic course of action is indeed sustainable This owes to the **subjectivity and malleability** of this [concept], wherein there is no consensus as to what exactly should be sustained. Sug a continuum of criteria for sustainability from status qu enhancement of the local environment.
Donald, 2008	Food systems	reducing a region s **ecological footprint**, addressing issues of **hunger**, and providing **more local jobs**; thus ultimately moving toward a more sustainable region in keeping with the **three classic pillars** of sustainabilit
Fitzsimons and Wescott, 2008	Multi-tenure reserve networks	Noted primarily in terms of **natural resource use** and **ecological** sustainability
Kearney et al., 2008	Participatory governance	Reference to the **three components**, but which cannot exist without **community wellbeing**; Emphasis should thus lie in maintaining or enhancing the **economic and sociocultural well-being, overall cohesiveness, and long-term health of the relevant human systems**
Wheeler, 2009	Sustainability challenges posed by megaregions	**long-term** time horizon **holistic** approaches between goals (**environment, economy and equity**) the concept of **limits** the importance of local and r **sense** of place
Hirschi, 2010	Network governance	integrating rural **economic development** objectives and **environmental and landscape protection** goals
Loible and Walz, 2010	Participatory processes in planning	strategies should promote **economic and social progress** while **preserving the environment** that should not be seen just as a resource and service provider but rather as a treasure of biodiversity and beaut
Schädler et al., 2011	Brownfield development	**reduction of land consumption and urban sprawl**
Reyer et al., 2012	Regional adaptation strategies in the face of global climate change	**ecological and (dependent) social systems** shift to new operating points without dramatically and abruptly changing functionality and characteristics
Horlings and Padt, 2013	Rural Areas	a **normative concept** referring to the responsibility to make short term decisions from a lon term perspective takin the

		effects on **future generations and a range of geographical scales** into account, and applies no longer only to **pollution control, the availability of natural resources and protecting species and their ecosystems**, but also to **human and social development, including human rights, good governance and solidarity. Qualities of life .**
Miller, 2014	Reframing the term sustainable development	**a conflicted encounter between economy, society and environment.** Suggests an alternative framework, quality of life

Table 1: Definitions of sustainability and sustainable development

In this work, we review the research on and application of sustainable regional development . Our research goal was triggered by a local non-governmental land-holding organization (NGO), whose staff desired to initiate a comprehensive regional sustainability initiative with local communities. The organization s interest was prompted by an ecological study of their conclusions that long-term survival of multiple species on the site could not be assured through management of the site alone. Rather, species survival was dependent on connectivity between the site and other habitats in the region and therefore, dependent on regional development. While the concept of biospheres has been adopted in Israel as one prominent model of regional sustainable development, the organization wanted to answer the following questions: 1) What models exist for regional sustainability initiatives? 2) What is the most suitable model for the NGO to adopt for the region, and 3) What would be the most productive role the NGO can play vis-à-vis setting the agenda and facilitating the process of a sustainability initiative? Our effort to answer these questions expanded into the current research, which consists of a comprehensive review, categorization and analysis of regional sustainable development initiatives.

2. Research Methods

The first stage of research relied on a literature and internet search for generalized concepts such as sustainable regional development and sustainable spatial planning. We reviewed the available literature (primary and grey) and analyzed the data in order to identify prominent themes that ran throughout the work. We then supplemented the initial with additional information on recurring themes from the literature, including terms such as ecotourism, sustainable agricultural landscapes, sustainable urbanism and landscape urbanism and others.

After reviewing the collected work, we developed a classification system based on four typologies of sustainability initiatives based on focal object of management, philosophical approach, disciplinary approach or other commonalities (Jabareen, 2006). Our typologies are 1) natural resource and ecology based initiatives, 2) urbanism initiatives, 3) issue-based initiatives, and 4) governance, participation and science-based approaches to sustainability. Particular models exemplify how the typologies are implemented on the ground. Models have specific managerial, planning or policy guidelines. For each typology and their associated models and case studies, we analyzed the following characteristics:

- Scope: At what spatial scale does the approach apply? National, regional and/or local? Who is involved?
- Fields of action and activities: Is the approach holistic or does it focus on a particular topic, resource or environmental characteristic? What specific actions characterize the approach?

- Successes and challenges: What has been the experience of implementation of the approach and what have been the challenges in meeting stated goals?

Finally, we present a set of thematic axes by which to understand each typology and associated models. We emphasize that no single sustainability initiative falls neatly into a single typology. To the contrary, we found common themes running through most of the reviewed papers. The typological classifications are meant to highlight themes and their relative dominance within particular initiatives. Along with the thematic axes, they are meant to assist the reader in defining the strengths and weaknesses of their own initiative and to tailor initiative in their own region.

3. Case studies of sustainability: Typologies and models

We identified four typologies for regional sustainability initiatives. We present each of the typologies with models that fall within each typology. For each model, we summarize salient details regarding scope, field(s) of action and activities, and successes and challenges.

Typology one: Natural resource and ecology based initiatives

The underlying primary foci of typology one initiatives are the natural resources and ecological integrity of a region and their core motivating goal is to protect biodiversity or prevent ecological degradation. Some are holistic on their approach, adopting region-wide sustainable land use planning that considers natural resources, biodiversity and ecosystem services (Fürst et al., 2013), and others focus on sustainable use of a focal resource. A prominent objective is landscape connectivity to assure viable habitats for a particular species or set of species (Fitzsimons and Wescott, 2008; Fitzsimons et al., 2013). Due to growing evidence that ecological conservation cannot succeed in the absence of human wellbeing (Dietz et al., 2003; Adams and Hutton, 2007), local community/stakeholder integration plays an increasingly prominent role in natural resource and ecology based initiatives. Nonetheless, sustainability is primarily indicated by ecological factors.

The typology is divided into two sub-categories, including multi-tenure reserve networks and community-based natural systems management. Multi-tenure reserve networks are areas of land owned and/or managed by diverse stakeholders that, for reasons of ecological integrity and desire to connect habitats, are integrated into a coordinated management regime (Fitzsimons and Wescott, 2008; Fitzsimons et al., 2013). A primary goal of multi-tenure reserve networks are protection of biodiversity. Models include biosphere reserves, biolink zones, wildlife corridors, conservation management networks, and ecoregions (Fitzsimons et al., 2013). Most of the models classified as multi-tenure reserve networks also have evolved to incorporate community-based management, as with biosphere reserves (Stoll-Kleemann and Welp, 2008).

Community-based management, a popular form of participatory governance for natural resource management (Kearney et al., 2007), is designed to address both ecological and socioeconomic goals by balancing exploitation of a natural resource with its long-term conservation. While it is generally focused on a particular natural resource, it internalizes the axiom that sustainable resource use should be determined by the communities that are dependent on the resources. The mechanism for initiating sustainability is through participatory governance. It addresses issues related to the access and control over commons resources by local and nonlocal actors based on the assumption that communities connected to natural resources are most likely to foster sustainable use. As such, it advocates devolution of decision-making power and authority to communities and community-

based organizations (Kellert et al., 2000; Wiber et al., 2004). Models for community-based management include social and community forestry, community wildlife management, buffer zone management and others (Kellert et al., 2000).

Scope: Multi-tenure reserve approaches are large scale, coinciding with habitats and their connectivity over the range of a species (Fitzsimons et al., 2013). Community-based management operates at scales according to the resource or biodiversity in question.

Fields of action and activities: Implementation of the approaches involves definition of the target species, resource or habitat, scientific research to define conservation needs, and then an identification of stakeholders. These can be forests, marine and wetland resources, grazing lands and fisheries, nature reserves and cultivated areas. Planning and management objectives include the devolution of authority, implementation of adaptive leadership, and encouragement of participatory governance. Initiatives encourage development of a scientific knowledge-base, strengthened communication and information dissemination, ecological/environmental monitoring, formation of learning communities, and clearly defining land rights. Partners include local communities, governmental agencies, non-governmental organizations, and experts in variety of disciplines.

Successes and Challenges: Success can be measured by the conservation status of the habitat, species or resource in question, or in terms of process (e.g. creation of multi-level community dialogues or engaged communities). Concrete objectives include revenues from resources, effective long term resource management and restoration of degraded ecosystems. Governance, leadership, and social and economic networks are all cited as elements of successful implementation.

Some challenges in implementing this approach are directly related to the size of the area and the wide variety of stakeholders within. This demands a high degree of coordination between stakeholders and governance structures (Fitzsimons et al., 2013), and initiators cite lack of trust between local communities, scientists and policy makers. Pre-existing conflicts between stakeholders that are left unresolved may demand attention and arbitration. Other challenges include failure to stimulate interest within local communities, failure to adopt truly participatory approach, lack of harmonization and coordination in actions of various partners and lack of enforcement of policies (Kellert et al., 2000; Stoll-Kleemann and O'Riordan, 2002). Lack of funding is also a common impediment to successful implementation and maintenance of the initiative (Kearney et al., 2007; Stoll-Kleemann and Welp, 2008; Fitzsimons et al., 2013). While the devolution of decision-making authority is encouraged, it also should be implemented with caution, as local communities may not have the social networks and governance structures needed to make, implement and enforce decisions (Wiber et al., 2004). This emphasizes the need and responsibility of government authorities to develop and foster the capacity of local communities to take an active role in decision making (Stoll-Kleemann and Welp, 2008).

Typology two: Urbanism

While urban areas are often touted as both inevitable and the prototype for settlement patterns in an increasingly populated world, they are also viewed as particularly challenging for sustainability (Wheeler, 2009). Many sustainability frameworks for urban regions have been developed to address environmental and socio-economic challenges (Jabareen, 2006). In contrast to the previous typology, urbanism typologies focus on the environmental and social aspects of urban development, with ecology taking a relatively minor role until recently.

The typology is divided into three sub-categories: new urbanism, landscape urbanism, and eco-urbanism. New Urbanists advocate design-based strategies based on traditional urban form goals of addressing suburban sprawl and inner-city decline (Bohl, 2000). Objectives, according to the Charter of the New Urbanism, include restoration of urban centers and town within coherent metropolitan regions, the reconfiguration of sprawling suburbs into communities of real neighborhoods and diverse districts, conservation of natural environments and the preservation of our built legacy (Congress for the New Urbanism, 2001). Within the New Urbanism sub-category there are several models that include neo-traditional town planning, the pedestrian pocket, transit-oriented development, Quartiers approach, and smart growth.

The second sub-category is Landscape Urbanism. Its main focus is organizing cities through the design of their landscape, rather than organizing them through their buildings. The concept offers a framework in which to consider complex urban conditions and the reciprocal implications of the city in the landscape (Mostafavi and Najle, 2003) and a sense that landscape can be used as a model and basis for urban initiatives, and a lens through which to examine cities (Grey, 2011). Models for landscape urbanism include the Machinic Landscape (Mostafavi and Najle, 2003), the field operations (Corner, 1999), infrastructural urbanism, Mat urbanism, and the Foreign Office Architect s phylogenesis.

The third subcategory is Ecological Urbanism, which is a successor and critique of landscape urbanism. It argues for a more holistic approach to design and management of cities, drawing lessons from ecology. Curiously, just as ecological typologies were becoming increasing human-centered, urbanism as witnessed by the development of ecological urbanism was becoming more ecologically centered. Ecological urbanism calls for city planning that is both multi-scalar and multi-disciplinary and proscribes that design exploit ecological knowledge to produce environmentally sustainable urbanism (Mostafavi and Doherty, 2010). Influenced by new ecological paradigms of dynamic and unpredictable nature and ecosystems theory (Pulliam and Johnson, 2002), Ecological Urbanists suggest that the modern challenge of landscape planning is leading the sciences, humanities, and design culture toward a more rigorous, robust and relevant engagement across the domains of ecology and design (Reed and Lister, 2014).

Scope: New urbanism is applied at various scales from the individual building to entire cities and regions. In the regional context, new urbanism considers a diversity of urban settings, from village, town, districts, and neighborhoods to cities and regions, and include their surrounding landscape (Bohl, 2000), which can range from local to regional scale. Since ecological urbanism aims to wed the theory and practice of city design and planning with the insights of ecology, it focuses on multiple scales from local to regional, often corresponding to ecological scales. The implementation of new urbanist, landscape urbanist and ecological urbanist initiatives depend on collaboration with and between government agencies at multiple levels, designers, urban planners, architects, private clients and local residents representatives. Ecological urbanism also incorporates the expertise ecologists and other natural scientists and land use managers.

Fields of action and activities: New urbanism acts mainly in the field of architecture and planning at multiple scales. Some of its activities include crafting flexible zoning standards, developing public parks and gathering spaces, promoting historic preservation, designing pedestrian and bicycle friendly neighborhoods, retrofitting of public housing projects, brownfield redevelopment and urban infill projects, transit-oriented development, and advocacy. Landscape urbanism incorporates expansive green space with urban areas, and designs spaces for infrastructure, water management, biodiversity, and human social and economic activities. Ecological urbanism acts in

the field of urban design and planning emphasizing reduction of urban footprints, design and planning for urban and local food production, developing productive urban environments and local energy sources, regulation of climate, disease, flood and drought and support for nutrient cycles and habitat for native plant and animal species.

Successes and Challenges: Advocates suggest success for these initiatives in influencing urban development. New urbanism-influenced initiatives have resulted in denser neighborhoods with improved internal connectivity and increased walkability. Landscape urbanism notes success due to its influence on raising environmental awareness and changing planning paradigms, with increased consideration of landscape integration. However, these approaches also face diverse challenges and criticism. New urbanism is often perceived as riskier than typical urban planning, due to its multiple-use goals and its strategies are sometimes viewed as exclusionary (e.g. a product of NIMBY). Both landscape and ecological urbanism raise issues regarding the question of the human presence in nature. In addition, urbanist initiatives are criticized as being based on loosely defined concepts and relying on ostentatious projects to promote the concept. Other critics challenge whether the typologies represent an honest integration of landscape architecture with principles of urban ecology.

Typology three: Issue-based initiatives

The general assumption of issue-based approaches is that by realizing sustainability in a given economic or social sphere, the impact will have impact on sustainability in all spheres. Donald (2008) emphasizes the potential, for example, of sustainability changes within food systems to have much wider ramifications of social, economic and ecological sustainability. Other initiatives focus on an economic or cultural mainstay of the region, for example salmon in the case of the Salmon River Watershed Roundtable in British Columbia (Day and Cantwell, 1998). The sub-categories of issue-based initiatives include ecotourism, eco-agriculture, and food-systems approach.

Agriculture and tourism are two prominent foci for issue-based sustainability initiatives at the regional scale. For many rural regions, agriculture and nature and landscape-based tourism are cornerstones of the local economy (Loibl and Walz, 2010). Both are considered to be ineluctably tied to environmental quality. Ecotourism is tourism that focuses on a component of nature and which should satisfy ecological, economic and socio-cultural sustainability (Wall, 1997; Weaver and Lawton, 2007) and encourage active learning provide transformative experiences (Weaver, 2005; Weaver and Lawton, 2007). Community empowerment has become a prominent feature in ecotourism initiatives (Weaver, 2005).

Donald (2008) advocates placing food systems at the center of regional sustainability issues: "Sustainable food production aims to involve nature's goods and services bet process, while at the same time minimizing the use of non-renewable inputs. In recent years, th focus has shifted from sustainable food production to a sustainable food syste beyond the farm to include the rest of the food chain, from organic fertilizers, fuel, food processors, food markets, eaters and waste management, as well as all the associated regulatory institutions and activities" (Donald, 2008, p.1253). He justifies the focus on food systems as a catalyst towards broader sustainability due to its impact and dependence on ecological, social and political systems.

Scope: As noted above, the scope of issue-based initiatives is consistent with the selected issue and can be local or regional depending on the issue and the goals of the initiator. For instance, an

agricultural initiative can occur at the site scale or can be part of a comprehensive regional (or national) policy. Salmon-based initiatives are by definition, conducted at the scale of the watershed.

Fields of action and activities: Fields of action are determined by the scope of the initiate and the particular issue in question.

Successes and Challenges: Donald (2008) suggests that success is measured by community collaboration. According to Weaver and Lawton (2007), ecotourism research suggests that it was unclear as to whether ecotourism in general was meeting ecological or economic goals. Wall (1997) is significantly more critical, drawing a sharp distinction between sustainable tourism (implying a holistic improvement in both human and environmental conditions) and ecotourism (an instigator of often unwanted change at the tourism destination). Rather, he prefers to consider tourism within the broader rubric of sustainable development.

Typology four: Governance, participation and science-based approaches

Agenda 21 states forthright that public participation in decision making is a prerequisite for realizing sustainable development (UNCD, 1992). The common feature of typology four is the underlying assumption that political and planning processes are the most crucial ingredient in the production of sustainable outcome. Various forms of community engagement have become cornerstones of sustainable planning and management in diverse fields of planning, landscape design, natural resource management, and environmental policy, and recent research suggests that new and innovative forms of community-based leadership are developing to meet sustainability challenges at the regional scale (Wiber et al., 2004; Horlings and Padt, 2013). Thus, much of the literature focuses either on systems of governance to maximize participation of relevant stakeholders or on the process of stakeholder integration into planning processes (Kearney et al., 2007; Loibl and Walz, 2010; Fitzsimons et al., 2013). This component of sustainability is considered so central that much of the literature treats participatory processes and governance as an indicator of sustainability in and of itself.

The literature on governance and participation in sustainability initiatives is diverse, but some examples can serve to illustrate the diversity. Loibl and Walz (2010) recount a science-informed stakeholder deliberation process in the Austrian Alps, where stakeholders were prompted to discussion with lectures about climate change and local socio-economic trends. Stakeholders provided their reactions, perceptions and knowledge of development dynamics in their region, and this information was used to generate scenarios and visual data to help the same stakeholders suggest sustainable development priorities and policies for the region s colleagues (2007) emphasize the need to build cross-scale horizontal and vertical interactions between various agencies and stakeholders to catalyze cooperation and avoid fragmentation of decision making. National parks in Switzerland combine bottom-up and top-down approaches to policy making, where local actors formulate policy that is then sent up the government hierarchy for approval. If approved, the federal government then supports the policy initiative financially and logistically (Hirschi, 2010).

Leadership is a recurring theme as an ingredient for success on initiatives. At the local level, leadership plays a central role in sustainability initiatives according to Horlings and Padt (2013). They explore regional development initiatives in rural Netherlands and conclude that leadership is crucial in the transition from the old economic path to more sustainable regio Others concur in noting that leadership is crucial for successful implementation and coordination of

multi-tenure reserves (Stoll-Kleemann and O'Riordan, 2002; Fitzsimons et al., 2013). Fitzsimons and colleagues (2013) warn that too much dependence on individuals is not sustainable over the long-term.

Scope: Diverse and a function of the target area and population. Primary emphasis is on including all of the relevant stakeholders.

Fields of action and activities: Diverse and a function of the selected target area and population.

Successes and Challenges: The case studies are generally portrayed by their authors as successful examples of governance and participation. But there are also examples of insufficient community participation (Kellert et al., 2000; Kearney et al., 2007). The primary challenge is to create a process that truly integrates community input, raising the community from an advisory capacity to one with a bona fide role in decision making (Kearney et al., 2007). Kearney and colleagues (2007) note three crucial shifts in thinking that must take place to create ideal community-based management, including 1) integrating the broad range of diverse stakeholders; 2) holding regulators and governments accountable and transparent to their public, and 3) allowing communities to take the lead in governance. Further, these empowering shifts must be officially recognized and codified (legally and politically). Kellert and colleagues (2000) report that according to their social and environmental indicators, community-based management in developing countries failed to result in equitable distribution of power and benefits, reduced conflict, or increased appreciation of local knowledge, biodiversity protection or sustainable resource use. The role of stakeholder engagement and participatory planning in regional sustainability is particularly challenging in megaregions, which are suggested to be inherently difficult to govern sustainably (Wheeler, 2009).

Also included in this typology is the science-based approach, which posits that research for sustainability must be local and, in part, stake-holder driven. An exemplary science-based sustainability initiative is the Long-term Socio-Ecological Research (LTSER) platform. LTSER platforms were conceived and implemented by the International Long-Term Ecological Research (ILTER) network over the past decade (Singh et al., 2013). The LTSER platform is a spatially-defined foundation for place-based, sustainability research, whose agenda is determined in collaboration between scientists and local stakeholders. The scope of LTSER is regional, although the size of LTSER platforms varies from several square kilometers to one-third of the area of Finland. Its focus is policy-relevant research, defining the scientific agenda in a way that suits the goals of regional sustainability. Collaborative meetings between policy makers, local residents and other stakeholders afford the opportunity to exchange scientific and local knowledge and to facilitate community-level planning. Partners include scientists, local/regional decision makers, land owners, local residents and other stakeholders. The LTSER network cites among their interim successes 1) a reorientation of scientific research agendas to be better aligned with regional socio-ecological challenges, 2) creation of collaboration between researchers, policy and management agencies and the general public, and 3) establishing an infrastructure for the collection of long-term socio-ecological data. Its challenges include lack of reliable funding mechanisms, a narrow scientific research agenda, and a socio-ecological focus that detracts from important pure-science research.

4. Thematic axes and discussion

This survey of spatial sustainability initiatives is a hopeful testament to the multiple ways which local communities, the scientific community, and policy makers are addressing contemporary

sustainability challenges. Sustainability the effort to secure socio-economic wellbeing while preserving ecological integrity, thereby assuring human wellbeing is a goal in regional management in thousands of projects across the globe. While this drive to address global development issues is encouraging, the efforts have often had limited success, measured at the regional scale (Wheeler, 2009) and at the aggregate global scale .

There is broad diversity in sustainability approaches, foci, management structures, implementation tools, and leadership. We derive from this analysis five axes with which to analyze both nascent initiatives and the overall conditions facing potential initiators of regional sustainability projects and to help clarify the potential strengths and weaknesses of an initiative based on sustainability planning theory and aggregate international experience. The axes are to be thought of as a continuum, and since initiatives are dynamic, their places on the axes are not static.

Axis one: top-down versus bottom-up initiative (Who initiated the effort, national government or international organizations or was the effort a local initiative by local residents?). Some initiatives are top-down, meaning that a specific tier within the governance structure, or other relatively influential groups (like academics, NGOs, or land owners), initiate, set goals and implement the project. While these initiatives may have well-defined and clear goals, they often neglect the aspect of community participation, even when explicitly part of the initiative. Biosphere reserves, when initiated by government agencies rather than by the communities themselves, can be hindered by neglect of community participation. But top-down initiatives benefit from institutional guidance and support. Bottom-up initiatives, catalyzed by community members themselves, can suffer from lack of focus, organization, and stability. They depend on the stamina, charisma and commitment of community members to implement projects. However, theoretical and practical data suggest that bottom-up initiatives are the most durable in terms of community support.

There are very clear roles for both governmental and community-based participation in sustainability projects. Without commitment of both participant groups, there is less potential for success. While stakeholder participation and empowerment should be self-evident, the role of government agencies, which includes financial support, capacity-building and facilitation, provision of information and expertise, guidance and connection to broader-scale (e.g. national and continental) policies should not be underestimated.

Axis two: ecological versus socio-economic focus (Did the effort focus on ecological priorities or did it begin with an emphasis on social or economic concerns?). While all sustainability definitions integrate and pre-suppose a balance between ecological and socio-economic considerations, in practice projects often reflect the priorities of their initiators. Biosphere reserves, for example, often reflect an inherent bias towards biodiversity conservation at the expense of socio-economic wellbeing. Stoll-Kleeman and O Riordan (2002) found that although they observed a paradigmatic change in the way biodiversity protection (e.g. in biosphere reserves) was discussed, towards an integrative socio-ecological approach with community participation, in practice the shift had yet to be actualized. Stoll-Kleeman and Welp (2008) suggest that, in order to fulfill biosphere goals, greater effort must be made to engage in interdisciplinary (rather than solely ecological) research as a path towards greater integration of communities and greater understanding of the socio-cultural and economic challenges. The evolution of the biosphere idea shows a growing attention to human well-being than early implementations of the model.

In contrast, while urban-based sustainability initiatives often place emphasis on open spaces, clean air and water, and clean transportation systems, they do not always reflect an understanding of

habitat conservation, ecological integrity and biodiversity. But overall, there seems to be a general convergence on full consideration of concerns on both ends of this spectrum.

Axis three: subject-specific versus holistic systems approach (Does the initiative focus on a single topic or target or does it take a holistic approach?). Both approaches on this axis have unique advantages for sustainability planning. The subject-specific approach (e.g. the Salmon River Watershed Roundtable) capitalizes on a culturally and/or economically meaningful component of the natural environment. Yet, even from the individual species or resource perspective, sustainable management will demand a more holistic approach to regional planning to assure long-term viability of the resource. Holistic approaches, such as multi-tenure connectivity initiatives, take the broad (ecological) view of a region and work to secure habitat protection for all biodiversity within.

The case studies show that both approaches can be effective, though they both face challenges. Some approaches may be too narrow to allow for a broader look at the ecological or societal impacts of a project (for instance, in ecotourism). On the other hand, holistic approaches, while inherently more appropriate for sustainability, can be too broad or vague to be effective. Further, holistic approaches are more revolutionary in their approach and may demand too much of various stakeholders, thus engendering opposition.

Axis four: geographic scale of approach (regional or local scale of resolution). Deciding on a spatial scale for the initiative is always a logical first step in a sustainability initiative. Scale will vary according to natural and political boundaries, social networks, specific sustainability approach (e.g. ecological or socio-economic; subject-specific or holistic), and administrative-political-economic considerations. The success of a project is contingent on proper definition of initiative boundaries (physical and social). The improper definition of boundaries will have an negative impact on a range of issues from ecological integrity to stakeholder engagement. All regions, regardless of size, are also subject to external factors beyond the boundaries of the initiative, and so exogenous change must also be considered within the sustainability initiative.

Axis five: Urban or open space orientation. This axis is closely tied to the ecological / socio-economic axis, as projects focusing on urban areas tend to also focus on human systems, while projects focusing on open space tend to more heavily emphasize ecological issues.

In conclusion, while specific characteristics of sustainability initiatives must be tailored for local conditions and priorities, we note a nearly universal convergence regarding key components of a successful sustainability initiative, including the importance of participatory governance and full collaboration and trust between agencies and stakeholders, a focus on local communities and their quality of life , and increasing linking of ecological and socio-economic wellbeing. Mechanisms and structures must be put in place to accommodate small-scale, community-oriented initiatives that receive crucial support from government agencies. Information systems must be reliable, timely and accessible. The target communities must be interested and willing to participate and initiative goals must be determined through a sensitive, though crucial, alignment of interests among stakeholders, who must formulate a common, dynamic vision for sustainable development (Kearney et al., 2007; Fitzsimons et al., 2013).

5. Bibliography

- Adams, W. and Hutton, J., 2007. People, Parks and Poverty: Political Ecology and Biodiversity Conservation. *Conservation and Society,* 5(2), pp.147-183.
- Bohl, C. C., 2000. New urbanism and the city: Potential applications and implications for distressed inner city neighborhoods. *Housing Policy Debate,* 11(4), pp.761-801.
- Conca, K. and Dabelko, G. D., 1998. Introduction. *In:* CONCA, K. & DABELKO, G. D. (eds.) *Green Planet Blues.* Boulder, CO: Westview Press.
- Congress for the New Urbanism. 2001. *Charter of the New Urbanism* [Online]. CNU. Available: http://www.cnu.org/charter [Accessed 15 May 2015].
- Corner, J., 1999. Field Operations. *In:* CRUZ, T. & BODDINGTON, A. (eds.) *Architecture of the Borderlands.* New York: Wiley.
- Council of the European Union, 2006. Renewed EU Sustainable Development Strategy. *In:* SECRETARIAT, G. (ed.). Brussels: European Union.
- Day, J. C. and Cantwell, M., 1998. Citizen initiated river basin planning: the Salmon watershed example [Salmon River Watershed Round Table]. *Environments,* 25(2/3 ,) pp.80.
- Dietz, T., Ostrom, E. and Stern, P. C., 2003. The Struggle to Govern the Commons. *Science,* 302(5652), pp.1907-1912.
- Donald, B., 2008. Food Systems Planning and Sustainable Cities and Regions: The Role of the Firm in Sustainable Food Capitalism. *Regional Studies,* 42(9), pp.1251-1262.
- Fitzsimons, J. A., Pulsford, I. and Wescott, G., 2013. Lessons from Large-Scale Conservation Networks in Australia. *Parks,* 19(1), pp.115-125.
- Fitzsimons, J. A. and Wescott, G., 2008. The role of multi-tenure reserve networks in improving reserve design and connectivity. *Landscape and Urban Planning,* 85(3 4), pp.163-173.
- Fürst, C., Helming, K., Lorz, C., Müller, F. and Verburg, P. H., 2013. Integrated land use and regional resource management A cross-disciplinary dialogue on future perspectives for a sustainable development of regional resources. *Journal of Environmental Management,* 127, Supplement(0), pp.S1-S5.
- Grey, C. 2011. Landscape Urbanism: Definitions & Trajectory. *Scenario Journal* [Online], Fall 2011. Available: http://scenariojournal.com/article/christopher-gray/ [Accessed 15 May 2015].
- Hirschi, C., 2010. Strengthening Regional Cohesion: Collaborative Networks and Sustainable Development in Swiss Rural Areas. *Ecology and Society,* 15(4.)
- Horlings, I. and Padt ,F., 2013. Leadership for Sustainable Regional Development in Rural Areas: Bridging Personal and Institutional Aspects. *Sustainable Development,* 21(6), pp.413-424.
- Jabareen, Y. R., 2006. Sustainable Urban Forms: Their Typologies, Models, and Concepts. *Journal of Planning Education and Research,* 26(1), pp.38-52.
- Kearney, J., Berkes, F., Charles, A., Pinkerton, E. and Wiber, M., 2007. The Role of Participatory Governance and Community-Based Management in Integrated Coastal and Ocean Management in Canada. *Coastal Management,* 35(1), pp.79-104.
- Kellert, S. R., Mehta, J. N., Ebbin, S. A. and Lichtenfeld, L. L., 2000. Community Natural Resource Management: Promise, Rhetoric, and Reality. *Society & Natural Resources,* 13(8), pp.705-715.
- Loibl, W. and Walz, A., 20 1.0 Generic Regional Development Strategies from Local Stakeholde Scenarios - an Alpine Village Experience. *Ecology and Society,* 15(3.)
- Meadows, D. H., Meadows, D. L., Randers, J. and Behrens, W. W., 1972. *The Limits to Growth,* Washington D.C., Potomac Associates.
- Miller, E., 2014. Economization and beyond: (re)composing livelihoods in Maine, USA. *Environment and Planning A,* 46(11), pp.2735-2751.
- Mostafavi, M. and Doherty, G. (eds.) 2010. *Ecological Urbanism,* Zürich: Lars Müller Publishers.
- Mostafavi ,M. and Najle, C. (eds.) 2003. *Landscape Urbanism: A Manual for the Machinic Landscape,* London: AA Publications.
- Organization for Economic Cooperation and Development, 2006. Good Practices in the National Sustainable Development Strategies of OECD Countries. Paris: OECD.

- Pulliam, H. R. and Johnson, B. R., 2002. Ecology's New Paradigm: What Does It Offer Designers and Planners? *In:* JOHNSON, B. R. & HILL, K. (eds.) *Ecology and Design: Frameworks for Learning.* Washington: Island Press.
- Reed, C. and Lister, N .M. 2014. Ecology and Design: Parallel Genealogies. *Places Journal* [Online], April 2014. Available: https://placesjournal.org/article/ecology-and-design-parallel-genealogies/ [Accessed 15 May 2015].
- Reyer, C., Bachinger, J., Bloch, R., Hattermann, F., Ibisch, P., Kreft, S., Lasch, P., Lucht, W., Nowicki, C., Spathelf, P., Stock, M. and Welp, M., 2012. Climate change adaptation and sustainable regional development: a case study for the Federal State of Brandenburg, Germany. *Regional Environmental Change,* 1 ,3 pp.523-542.
- Schädler, S., Morio, M., Bartke, S., Rohr-Zänker, R. and Finkel, M., 2011. Designing sustainable and economically attractive brownfield revitalization options using an integrated assessment model. *Journal of Environmental Management,* 92 ,3 pp.827-837.
- Singh, S. J., Haberl, H., Chertow, M., Mirtl, M. and Schmid, M. (eds.) 2013. *Long Term Socio-Ecological Research,* Dordrecht: Springer.
- Stoll-Kleemann, S. and O'riordan, T., 2002. From Participation to Partnership in Biodiversity Protection : Experience from Germany and South Africa. *Society & Natural Resources,* 15(2), pp.161-177.
- Stoll-Kleemann, S. and Welp, M., 2008. Participatory and Integrated Management of Biosphere Reserves: Lessons from Case Studies and a Global Survey. *GAIA - Ecological Perspectives for Science and Society,* 17(1), pp.161-168.
- United Nations, 1992. United Nations Conference on Environment and Development: Agenda 21. United Nations Division for Sustainable Development.
- Wall, G., 1997. FORUM: Is Ecotourism Sustainable ?*Environmental Management,* 21(4), pp.483-491.
- Weaver, D. B., 2005. Comprehensive and minimalist dimensions of ecotourism. *Annals of Tourism Research,* 32(2), pp.439-455.
- Weaver, D. B. and Lawton, L. J., 2007. Twenty years on: The state of contemporary ecotourism research. *Tourism Management,* 28(5), pp.1168-1179.
- Wheeler, S., 2009. Regions, Megaregions, and Sustainability. *Regional Studies,* 43(6), pp.863-876.
- Wiber, M., Berkes, F., Charles, A. and Kearney, J., 2004. Participatory research supporting community-based fishery management. *Marine Policy,* 28(6), pp.459-468.
- World Commission on Environment and Development, 1987. *Our Common Future,* Oxford, Oxford University Press.