

Urban Sustainability via Urban Productivity? A conceptual review and framework proposal

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Abstract

This paper offers conceptual and operational insights for more effective and forward-looking local sustainability decision-making through the emerging framework of holistic and regenerative urban productivity. We explore the concept, principles, and practices of urban productivity and look at how they can help address urban sustainability planning, implementation, and assessment, plus contribute to the achievement of the UN Sustainable Development Goals. We also present examples of related initiatives from cities around the world and we introduce a conceptual framework for urban productivity. This holistic framework encompasses a set of principles and goals to tackle complex urban processes for effective, inclusive, and forward-looking decision-making. It seeks to act as an overarching framework to help operationalise sustainability by empowering urban co-producers to pursue balanced and synergistic maximisation of all community elements. A productive city embraces economic resilience with shifts in employment patterns and habits; innovative, socially just, and environmentally responsible technologies; compact and nature-enhancing land use planning; strong social connections and affordable housing; and green, light,

and smart infrastructure. Urban productivity principles can lead the transformation of cities into well-functioning and sustainable systems.

Keywords: urban sustainability; urban productivity; sustainable cities; urban systems thinking; regenerative sustainability; sustainability frameworks

3.1. Introduction

Sustainable development (SD) emerged as a field of study after the Brundtland Commission described the connection between human activities and environmental degradation (WCED 1987). SD is generally understood as the integration of environmental, social, and economic concerns in the development of a dynamic system (Berke and Conroy 2000). International fora such as the 2012 Earth Summit, the 2015 Sustainable Development Summit, and the 2017 UN Habitat sent a clear message: the world must get on the path to a more sustainable future now and this calls for coordinated, multi-level collaboration (Connelly, Markey, and Roseland 2013; Kanuri et al. 2016).

In this paper we focus on sustainability at the urban community level and seek to advance the theory and practice of sustainable community development (SCD). SCD, influenced by many theoretical traditions and movements, integrates social, environmental, and economic considerations into the dynamic and complex community processes for the sustainable development of current and future generations (Roseland 2012; Berke and Conroy 2000).

Urban areas will host more than two thirds of global population by 2050 (UN DESA 2018). Today cities occupy 3-4% of the world's land surface, use 80% of global resources, account for one third of global energy and material consumption, and

generate most global waste (Elmqvist et al. 2019; Girardet 2015; World Economic Forum 2018). A city is “characterized – ecologically, economically, politically and culturally – by a significant infrastructural base; a high density of population, whether it be as denizens, working people, or transitory visitors; and what is perceived to be a large proportion of constructed surface area relative to the rest of the region” (James, 2015, p.26).

Cities are often considered as a component of the problem but they also offer opportunities and solutions for local and global socio-ecological systemic issues (Elmqvist et al. 2018). Their significance in achieving sustainability was expressed already in the 1970s when governments started perceiving the ramifications of rapid urbanisation. The Rio+20 conference encouraged local sustainability assessment while the UN Global Agenda for 2030 brought the urgency for urban sustainability to the foreground by including a goal for inclusive, safe, resilient, and sustainable cities (Spiliotopoulou and Roseland 2020).

Cities have enormous economic, social, and ecological productivity potential for long-term well-being but sustainable urban development requires concerted action and collaborative approaches (Bibri and Krogstie 2017). This paper aspires to offer conceptual and operational insights for more effective and forward-looking local sustainability decision-making processes. Our meta-question is: how can the concept, principles, and practices of holistic urban productivity help address local sustainability planning, implementation, and assessment, plus contribute to the achievement of the UN Sustainable Development Goals (SDGs)?

3.2. Research methods and paper outline

To explore this question, we studied prominent academic articles and also consulted

non-academic sources; all references were evaluated for credibility and soundness, in terms of author, publication venue, content, and methodology. The analysis synthesises theoretical roots, conceptual influences, major debates, limitations, and opportunities in sustainability and productivity theory and practice, and demonstrates the interdisciplinary influences.

In search of conceptual feedback and breadth of views, we also interviewed internationally recognised experts in urban sustainability and sustainable community development. Acclaimed scholars and practitioners provided added value to this research by offering comments on the concept and practice of urban sustainability and insights on local challenges in planning for and evaluating sustainability.

This paper starts with an overview of the literature and practice of SD/SCD and urban sustainability (section 3) and then examines the interdisciplinary conceptual foundations of urban productivity and regenerative development and presents examples of related initiatives from cities around the world (section 4). In section 5 we introduce a conceptual framework for urban productivity and then discuss the potential of this concept to help address urban sustainability processes and outcomes.

3.3. Overview of urban sustainability conceptually and operationally

3.3.1. Urban sustainability conceptually

Sustainability as a body of knowledge can historically be traced to environmental and social justice discourses of the 18th and 19th centuries – if not to ancient civilisations (Dernbach and Cheever 2015). SD is usually conceptualised as a three-legged stool, a three-pillar edifice, or as three circles depicted either in a Venn diagram or in a nested concentric way (Purvis, Mao, and Robinson 2019; Bayulken and Huisingsh 2015; Garren

and Brinkmann 2018). While the interdependent and mutually reinforcing character of the three pillars was highlighted in the UN World Summit on SD in 2002, in practice the pillars are still largely applied separately from each other (Garren and Brinkmann 2018).

The contemporary SD framework emerged following milestones such as Rachel Carson's influential *Silent Spring*, the Club of Rome seminal report on the necessity for limits to economic growth, and the 1972 UN Conference on Human Environment. SD gradually took its current shape after the 1987 Brundtland Commission report, the 2000 UN Millennium Development Goals, and the 2002 Johannesburg Summit. Despite criticism about favouring economic growth over socio-ecological concerns, the Brundtland definition for SD remains the starting point for related discussions: "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs" (WCED 1987).

The concept became more widespread after the universal agreement on global SD goals (the SDGs) in 2015; the 17 SDGs and 169 targets were a significant step forward and a turning point for global sustainability. They apply to all nations and are grounded in a holistic view of sustainability that calls for multi-scale action – an approach also reflected in the Paris Climate Agreement and the New Urban Agenda (Woodbridge 2015; ICSU and ISSC 2015; United Nations 2015; United Nations 2017). The SDGs offer an integrated vision and plan through at least 2030 and the full set is also applicable at the local level.

For some scholars SD is a decision-making framework, for others a societal thinking paradigm, but most agree that the concept is normative and value-laden, encourages systemic analysis, acknowledges the dynamic nature of systems, and supports the precautionary and polluter-pays principles (Garren and Brinkmann 2018;

Robinson 2004; Roseland 2012; Williams and Millington 2004; Dernbach and Cheever 2015; Bibri and Krogstie 2017; Harrington 2016; Kates, Parris, and Leiserowitz 2005; Neuman 2005).

SCD and urban sustainability have been influenced both by broader SD theories and debates and by intellectual traditions of the last two centuries. Although there is not a specific and widely endorsed set of theoretical foundations for SCD in the literature, some of the key elements are (Spiliotopoulou and Roseland 2020):

- *Weaker-to-stronger sustainability*: a debate between those who seek to change the supply side of resources and those who seek to change the demand side; a continuum between a utilitarian approach to resource management and a more spiritual approach that considers resource constraints. SCD implementation depends highly on the actors' position in this spectrum (Williams and Millington 2004; Dernbach and Cheever 2015; Roseland 2012).
- *Urban systems thinking*: viewing a human settlement as a complex, adaptive, and networked system that involves interdisciplinary study across spatial and temporal scales. Systemic thinking entails analysis of urban stocks and flows, nestedness, feedback loops, interdependence and connection between components, and adaptive capacity (Ellen MacArthur Foundation 2013; Meadows 2008; Uphoff 2014; Meerow, Newell, and Stults 2016; Girardet 2015).
- *Ecological modernisation*: seeks to address environmental problems and advance economic growth through technology and design improvements and resource efficiency. It has manifested through the privatisation and technological modernisation of urban utility networks, but the persistence on efficiency reveals the absence of integrative approaches to urban issues requiring deeper social

change (Bayulken and Huisingh 2015; De Jong et al. 2015; Hodson and Marvin 2014).

- *Environmental justice*: one of the foundations of social sustainability, seeking a more equitable distribution of resources, services, facilities, and environmental impact between and within generations. A step forward, “just” sustainability advocates for the inclusion of social equity and indigenous justice in sustainability (Agyeman 2013; Agyeman, Bullard, and Evans 2002; Hassan and Lee 2015).
- *Social economy (SE), Community Economic Development (CED), bioregionalism, eco-localism*: such initiatives emerged as a community response to negative impacts of socio-economic restructuring. SE builds on collective action and individual entrepreneurship; CED emphasises local knowledge and community-led action; and bioregionalism, eco-localism, and self-reliance encourage local diversification, community-place connection, and social equity (Ferguson (Hernandez) 2015; Connelly, Markey, and Roseland 2013; Curtis 2003; Roseland 2012).
- *Urban resilience*: popular approach in urban planning, as 90% of cities are situated on coastlines meaning increased vulnerability for most of the global population (Childers et al. 2014; Elmqvist et al. 2019). A resilient urban system is able to maintain or rapidly return to desired functions after a disturbance (a sudden shock or a continuous stress), adapt to change, and quickly transform components that limit its adaptive capacity (Meerow, Newell, and Stults 2016; Walker et al. 2004).
- *Circular economy (CE)*: builds upon the perception of a city as an ecosystem and is influenced by approaches such as cradle-to-cradle, regenerative design,

and biomimicry. Despite its narrower focus on optimisation that does not necessarily integrate social concerns, CE can contribute to a degrowth path by limiting resource waste and leakage (Geissdoerfer et al. 2017; Ellen MacArthur Foundation 2017; Ghisellini, Cialani, and Ulgiati 2014).

3.3.2. Urban sustainability operationally

These theories and concepts are operationalised through a broad range of urban agendas, with that of the sustainable city being the most frequently occurring; others include ecocity, smart city, resilient city, knowledge city, low-carbon city, ubiquitous city, green city, compact city, and livable city (De Jong et al. 2015). A sustainable city can be described as a complex and dynamic community that maximises socio-economic net benefits within environmental constraints while empowering current and future citizens (Roseland 2012; Kanuri et al. 2016).

Most agendas do not always integrate the three pillars or may use climate action as a sustainability proxy while pursuing economic growth, leading to siloed implementation and sustained inequity (Garren and Brinkmann 2018; Joss et al. 2015; Dernbach and Cheever 2015). Sustainability for many is a “buzzword” that lacks interdisciplinary thinking and inclusive processes (Garren and Brinkmann 2018). As sustainability educator and whole systems consultant Daniel Christian Wahl says, “it’s dangerous to put these things into silos” (D. C. Wahl, personal communication, January 21, 2019).

Scholarly literature observes that sustainability weaknesses result from application rather than meaning or definition. Urban agendas may not embrace whole-system tools and are often implemented within mainstream planning, investment, and operations (Dernbach and Cheever 2015). Choosing an agenda may also be impaired by issues such as NIMBYism, lack of sufficient resources and political will (e.g. due to

short-termism), community fragmentation, inter-city competition, interests that promote innovation and technology as panacea, and climate change impact (Berke 2002; De Jong et al. 2015).

Other obstacles to implementation include lack of stakeholder coordination, corruption in local politics, greenwashing or ‘cosmetic environmentalism’, and inadequate mandate and financing of local governments (De Flander 2014; Robinson 2004). In addition, collecting data has become an end in itself, but it is not clear if or how all this monitoring and reporting improves decision-making and encourages community change (Kaika 2017). Such issues can lead to lost opportunities, lack of credibility, and increased public scepticism (Roseland 2012; Cairns et al. 2015).

Despite the debates and weaknesses, however, SCD could represent a new way of thinking about and planning for long-term development. The SDGs, the New Urban Agenda, the abundance of urban agendas and networks, and the growing calls for climate action offer a window of opportunity for new methodological tools to help communities achieve their sustainability goals (Kaika 2017; Spiliotopoulou and Roseland 2020). In practice, SCD has in recent years embraced advancements in social and circular economy, just and collective action, local resilience, and self-reliance (Jackson and Victor 2011; Connelly, Markey, and Roseland 2013; Folke 2006; Meerow, Newell, and Stults 2016; Robinson and Cole 2015; Agyeman 2008).

The sustainable community is “an illusion in many ways, but it's a journey that we have to travel, and the combination of journey and destination [...] makes it exciting” (Julian Agyeman, Professor of Urban and Environmental Policy and Planning at Tufts University, personal communication, December 17, 2018). Managing the urban commons requires more dissent movements, bottom-up initiatives, alternative policies, and new narratives that transcend the false dichotomies of growth/degrowth and

continuity/disruption (Kaika 2017; Hamman 2017). The concept of urban productivity aspires to help achieve the fundamental changes needed to stop sustaining an ill-functioning system, in favor of maximised environmental and community well-being (Roseland and Spiliotopoulou 2017; Neuman 2005).

3.4. Urban productivity conceptually and operationally

3.4.1. Urban productivity conceptually

Shifting community development from a negative individualistic logic (reducing impact) to a positive systemic one (regeneration within a network of systems) is a transition that has emerged lately in the SCD literature. Urban areas may not be indefinitely sustainable if they continue to be solely extractive and not holistically productive. For long-term sustainability a transformation is proposed, to disrupt the current path so that the system we ‘sustain’ thereafter is a well-functioning one (Brugmann 2015; Girardet 2015; Spiliotopoulou and Roseland 2020; Wolfram 2016).

Urban or community productivity incorporates theories and practices from various disciplines and backgrounds, including traditional forms of knowledge that have been left out of the sustainability discourse in the past. Conceptually, it is multi-dimensional, grounded in strong sustainability principles and seeks to move past the notion of balancing priorities towards maximizing and regenerating urban tangible and intangible assets and components, beyond the triple-bottom line of SCD. Although traditional economic growth advises cities to increase economic output through technology, capital, and labour, holistic urban productivity addresses all city dimensions and components, and is therefore distinguished from the typical view of urban

productivity in the economic literature (Roseland 2012; Spiliotopoulou and Roseland 2020).

Economic and labour productivity

The concept of productivity is historically associated with economic and other resources. Economic and labour productivity have been thoroughly researched and are well developed concepts in economics, both in general and in the urban context. A central concept in neoclassical economics, productivity can be defined as the ratio of given output per given input, the value of output obtained with one unit of input, or the rate at which goods or services are produced (Jackson and Victor 2011; Bleischwitz 2001). Labour productivity is a standard measure of economic productivity and in this case the input is the time workers spend in employed labour (Behrens, Duranton, and Robert-Nicoud 2015; Jackson and Victor 2013).

The neoclassical, economic understanding of productivity gradually evolved toward multi-factor or multi-capital framings of productivity. These analyses considered factors such as human capital, services, information, and infrastructure, but did not usually involve environmental or ecological concerns (Bleischwitz 2001). Taking theory a step further, Total Factor Productivity (TFP), which emerged in the 1980s, is based on the existence of a residual, i.e. a “significant” percentage of output which could not be attributed to the neoclassical labour and capital inputs (Burkett 2006). By the mid-1990s, TFP theory included the input of natural resources, policies, knowledge sharing, collaboration, and expertise, and informed local and regional economic development strategies, along with other concepts such as ecological modernisation, circular economy, and innovation (Brugmann 2015).

Influenced by the above, urban productivity in the literature has been typically connected to local economic development and assets such as infrastructure, labour, trade, and financial investment (Sachs 2013; Brown and Rigby 2013; Diez 2017; Benjamin 1993). It has been well documented that cities, especially those with higher density, attract agglomeration economies and high-skilled employees and enjoy higher labour productivity, in developed and developing countries alike (Behrens, Duranton, and Robert-Nicoud 2015; Glaeser and Xiong 2017; Abel, Dey, and Gabe 2012; Fallah, Partridge, and Olfert 2011). Higher labour productivity of course need not mean ever-expanding working hours and exhaustion that reduce happiness and well-being for individuals and communities. Well-being is positively connected to time affluence and negatively connected to sprawled, unsustainable cities (Knight, Rosa, and Schor 2013; Fallah, Partridge, and Olfert 2011).

Resource productivity and circularity

Economically productive cities benefit from high labour productivity and production circularity to become as self-reliant and resilient as possible, given local and global resource constraints. Resource productivity can be defined as the net balance of resource production relative to resource extraction or the quantity of a good or service as outcome per unit of resource use. This traditional understanding is similar to that of economic productivity (output of economic growth per unit of resource used), with efficiencies in resource allocation and management (OECD 2015). Contemporary documents such as the New Urban Agenda's report "The City We Need 2.0" echo this as it focuses on resource efficiency and regeneration and infrastructure resilience (UN-Habitat 2016).

Urban circular economy models encourage product redesign for extended life and repair, material and resource regeneration, and overall closing of technical and

biological cycles in production and consumption (Ellen MacArthur Foundation 2017; World Economic Forum 2018). In a productive city, this approach can help move beyond efficiency to full resource circularity by extending the productive life of urban resources for as long as possible. The city would achieve resource extraction at a lower rate than that of resource regeneration, nature recovery and restoration, and improved community well-being (Geissdoerfer et al. 2017; McDonough and Braungart 2013).

The concept of urban metabolism is also adopted to analyse the urban ecosystem by studying resource flows and promoting effective policies for a cradle-to-cradle approach (Ellen MacArthur Foundation 2013; McDonough and Braungart 2013; Beloin-Saint-Pierre et al. 2017). A circular city is still a concept under development but it would help cities learn from nature's low-entropy metabolic processes to decrease resource input from "distant elsewhere" and optimise urban resource flows (Wackernagel and Rees 1996; Girardet 2015; Thomson and Newman 2018).

Productivity and circularity of urban resources, combined with holistic and long-term thinking, can contribute to increased self-reliance and resilience. While recognizing the benefits of economic globalisation, Wahl highlights the importance of re-localisation and re-regionalisation: "any investment in education and local capacity building, any investment in local food sovereignty, local energy sovereignty [will] bring the essentials closer to the city or closer to the regional than they are right now" (D. C. Wahl, personal communication, January 21, 2019).

Ecological productivity

Sustainable ecological productivity is a key requirement for a holistically productive city. Ecological productivity is defined as the rate at which energy is converted to organic substances, i.e. the total amount of energy fixed by plants adjusted for energy losses during plant respiration (Lerner and Lerner 2014). The concept of urban

ecological productivity is grounded in urban ecology which sees cities as part of living ecosystems and therefore deals with ecological processes within the complex and dynamic system of a city (Childers et al. 2014; Lieber 2018; Roseland 2012).

Although green infrastructure initiatives such as green roofs, living walls, urban parks, and bioswales cannot entirely replace untouched ecosystems, restoring and enhancing urban ecological processes has great potential (Roseland 2012; Condon 2019). A sustainable production and flow of urban ecosystem services, planned with contextual and systemic thinking, contributes to increased well-being and a balanced relationship of urban dwellers with their natural environment (Kabisch et al. 2018). Restoring and strengthening ecological productivity in cities adds value to their bioregions and could gradually make up for damage done in the Anthropocene (Mang and Reed 2015; Wahl 2016).

Regenerative design, also rooted in ecology and living systems theory, is another important concept for urban productivity, so far extensively implemented in agriculture and architecture (Robinson and Cole 2015). It seeks to enhance and regenerate local and regional socio-ecological systems based on wisdom from ecosystems and local history. It endorses and moves beyond biophilia and biomimicry toward the use of organic, natural design to restore urban ecosystems and create net-positive urban spaces (Condon 2019; Mang and Reed 2019).

The ecological worldview of regenerative design is upheld by Indigenous people but contrasted with the dominant mechanistic worldview (Du Plessis and Brandon 2015). Learning from nature means that solutions design must embrace indigenous wisdom such as Traditional Ecological Knowledge and engage in co-evolutionary processes based on an “experiential understanding” of how the world works (Du Plessis and Brandon 2015; Wahl 2016). Wahl defines it as “elegant solutions carefully adapted

to the biocultural uniqueness of place” (D. C. Wahl, personal communication, January 21, 2019).

Applications of regenerative design in farming consists of closed-loop systems that help improve soil quality, increase local biodiversity, and sequester carbon dioxide (Rodale Institute 2014; LaCanne and Lundgren 2018). In landscape architecture and urban planning, regenerative design can optimise – or even transform – the urban fabric to enhance walkability, reduce energy use, restore urban spaces of ecological significance, and ultimately reduce the city’s ecological footprint (Thomson and Newman 2018). In built environments, it is expressed through applications of net-zero and net-positive design, which are promising approaches despite being sometimes implemented with a technical and mostly anthropocentric focus (Mang and Reed 2015).

Socio-cultural and human productivity

Urban and suburban communities tend to experience social capital erosion (Putnam 1995) and current productivity approaches do not yet seem to adequately encompass socio-cultural aspects that holistic urban productivity embraces. While 20th century economic literature sees social productivity simply as the output per person in the labour force, discourse today has begun including social and institutional trust, engagement, equity, inclusion, connection, education, happiness, and health (Burgess and Heap 2012; Sharpe 2002; Stiglitz, Sen, and Fitoussi 2009).

Social capacity for urban transformation entails development of the human, intellectual, socio-cultural, and political community assets (Wolfram 2016). John Robinson, Professor and Presidential Advisor on the Environment, Climate Change and Sustainability at the University of Toronto, alludes to the need to perceive human productivity holistically and to reinforce human (professional and institutional) capacity (J. Robinson, personal communication, December 5, 2018). In addition, the “doughnut

economics” framework urges us to address social boundaries (basic needs) along with global ecosystem boundaries to ensure holistic well-being for all humanity (Raworth 2017).

Cultivating a sense of place is another fundamental component of productive cities. The significance of place-making is sometimes overlooked due to the almost exclusive focus on global processes and connecting – yet individualising – technologies (Sassen 2005; Putnam 1995). Indigenous communities in Canada and elsewhere, for instance, have demonstrated how the sense of belonging can enhance resilience, self-reliance, public health, and local nature (Vodden, Hunt, and Bell 2016). Looking at the world through the lens of place promotes a sense of responsibility for and a sense of unity with the natural environment (Mang, Haggard, and Regenesis 2016; Orr 2013).

Reclaiming and co-producing the urban commons are paramount. Urban researchers and practitioners “ascribe meaning to space and allocate rights to space, often unknowingly” while inclusive conversations about belonging to and becoming the city are needed (J. Agyeman, personal communication December 17, 2018). Ideas of co-production and “just sharing” are common in contemporary literature on urban future visions; for example:

- For Elmqvist et al., achieving a resilient city is contingent on transformations that need to be collectively explored and collaboratively developed, as a requirement for the “urban century”. They advocate for co-production of knowledge, co-management and sharing of the urban commons, and experimenting on plurality and redundancy through innovative bottom-up solutions in various spaces, scales, and sectors (Elmqvist et al. 2019).
- Landry argues that quality city-making requires creative, collaborative, forward thinking, open-minded, and inventive problem-solving for social innovation and

blossoming of human potential (Landry 2008). Along the same lines: Luger showed that cultural productivity should include grassroots cultural producers (Luger 2017); Smithsimon advocates for creative planning and architecture to make open spaces intentionally inviting (Smithsimon 2008); and Amin and Thrift's "emancipatory city" encourages creativity for freedom in the city (Amin and Thrift 2004).

- McLaren and Agyeman explain that popular sharing economy practices, often developed without wide societal consultation, do not automatically encompass social equity and justice. Their "sharing city" vision relies on the potential of urban space to facilitate sharing of socio-cultural, economic, physical, ecological, or other assets and to fulfill the right to the city for people and biodiversity (McLaren and Agyeman 2017; McLaren and Agyeman 2015). There is a need to change the narrative from "less is more" and "buy local" to more inclusive place-making (J. Agyeman, personal conversation, December 17, 2018).

By seeing the city as an ever-evolving organism and by making the city commons (built or natural) more open and creative, urban space can be accessible, inclusive, and inviting to "produce" relationships (Wahl 2016; Smithsimon 2008; Landry 2008). After all, urban planning, design, and architecture can only go so far in developing urban form; the users and their socio-cultural, educational, political, and ecological processes collectively give the material form meaning and purpose (Gismondi et al. 2016; Burden 2014; McLaren and Agyeman 2015).

Whole-systems approach

Urban productivity concepts are inextricably intertwined under the umbrella of whole-systems thinking for long-term well-being (Wahl 2016). The transformation to productivity requires viewing the city as a complex system in which urban dwellers and their natural and physical environment are involved in a co-evolutionary process in pursuit of balance and harmony in their bioregion (Neuman 2005; Condon 2019; Wahl 2016). Applying urban systems theory, a city would analyse systems and networks to which it belongs and sub-systems of which it is composed, while exploring perspectives from many disciplines (Uphoff 2014; Meadows 2008). Such thinking is not new: indigenous traditions have always honored the relationships and connections between all elements of the “community of life”, human and natural alike (Du Plessis and Brandon 2015).

Systemic thinking is at the core of regenerative design, regenerative development, and regenerative sustainability. Regenerative development seeks alignment and synergies with the natural environment for the restoration and regeneration of ecological resources (Robinson and Cole 2015; Mang, Haggard, and Regeneration 2016; Mang and Reed 2012; De Jong et al. 2015; Woo et al. 2014). Inspired by eminent scholars such as David Orr, Fritjof Capra, and John Tillman Lyle, Mang and Reed argue that holistic regenerative development can confront and address the linear processes and fragmented approaches of the current degenerative path (Mang and Reed 2019; Reed 2007).

Regenerative sustainability is a more recent concept built on constructivist social theory, which emphasizes the need for collaborative planning and participatory backcasting to ensure that all perspectives are considered, including nature’s intrinsic value (Robinson and Cole 2015; De Jong et al. 2015). It advocates goal-setting for

strong and healthy socio-ecological systems achieved through living-systems, holistic design (Gibbons et al. 2018). Wahl additionally urges the creation of “regenerative cultures” and invites us to question our assumptions and honor transdisciplinarity (Wahl 2016).

Despite their diverse theoretical roots, regenerative sustainability, regenerative development, and regenerative cultures are in practice similar in that they all pursue meaningful engagement of citizens and a whole-systems perspective in co-producing healthy and inclusive urban space. Urban productivity is informed by (and attempts to converge) these approaches. Figure 1 features key points of this paper and reflects the stages of a holistic urban productivity path.

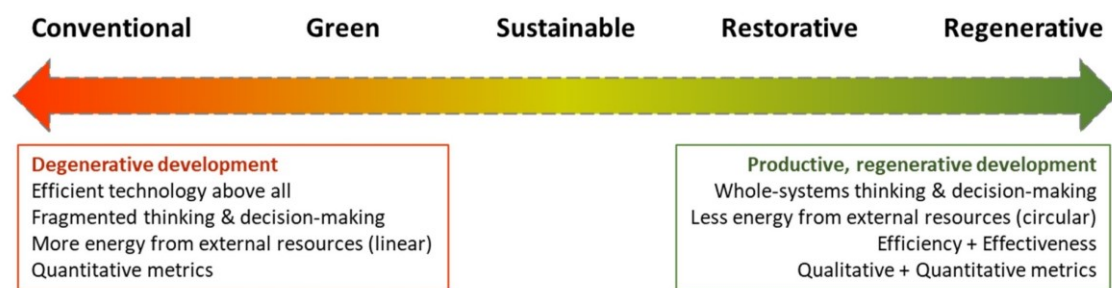


Figure 1. From conventional, degenerative development to productive, regenerative development. Adapted from: Mang & Reed, 2019; Reed, 2007.

3.4.2. *Urban productivity operationally*

In our research we discovered numerous initiatives worldwide that demonstrate how the above concepts have already been put into practice. Many are context-specific projects developed and implemented locally, whereas others are practices adopted in broader sectors. Some initiatives belong to both categories: following sectoral approaches while being locally developed. We compiled a range of practices but did not classify them by dimension of urban productivity because, despite the narrow scope, they are not siloed;

each one's positive impact extends across multiple community dimensions and stakeholders. "A lot of the solutions require collaborating across silos and boundaries." (Coro Strandberg, business sustainability strategist and thought leader, personal communication, December 17, 2018).

Table 1. Examples of urban productivity in practice. Sources: (Urban Innovation Community 2015; Girardet 2015; WA Contents 2018; Wahl 2016; Razavi 2017; Razavi 2018; Hunt and de Laurentis 2015; Roseland and Spiliotopoulou 2017; Scharmer 2018; LaCanne and Lundgren 2018; Du Plessis and Brandon 2015; Gibbons et al. 2018; McLaren and Agyeman 2015; Boeri Studio; Woo et al. 2014; UNEP 2018; Roussopoulos 2017; SIMS Municipal Recycling).

To reiterate, while none of these individual examples were developed with the explicit intent of illustrating urban productivity conceptually and in an integrated manner, when viewed as a set they begin to outline some aspects of how urban productivity may be operationalised in practice.

3.5. Introducing a framework for Urban Productivity

Following a brief discussion on sustainability decision-support tools, we propose a conceptual and inclusive illustration of urban productivity through a holistic framework that encompasses a set of principles and a set of urban productivity goals.

3.5.1. Decision-support tools for urban sustainability

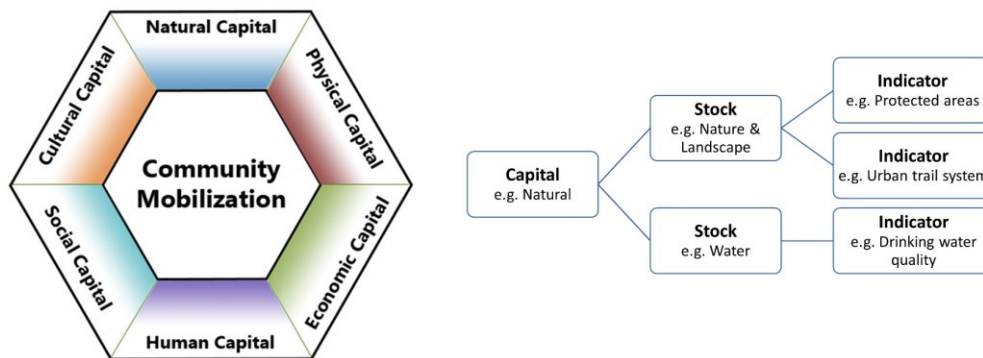
Planning for and implementing urban sustainability processes requires tackling complex

goal-setting and navigating local interests, with democratic methods and holistic, long-term thinking (Caprotti et al. 2017). Cities develop their plans often aided by one of many available tools and frameworks for local sustainability decision-making (De Jong et al. 2015; Tanguay et al. 2010; Joss et al. 2015).

One framework that provided inspiration for this research is the Community Capital Framework (CCF), a versatile and scalable instrument designed to support decision-making at all stages (Roseland 2012). It recommends the balanced and concurrent improvement of six community capitals with a whole-systems perspective: each capital is a sub-system of the larger whole-community system. The six forms of community capital are natural, physical, economic, human, social, and cultural (figure 2) (Roseland 2012; Roseland and Spiliotopoulou 2017).

The Community Capital Tool (CCT), which operationalises the CCF, was developed by the Centre for Sustainable Development, Simon Fraser University, Canada, and Telos, the Brabant Center for Sustainable Development, Tilburg University, Netherlands (Roseland 2012). The CCT is composed of the Scan, a planning tool to evaluate the impact of policies and initiatives on overall community health, and the Balance Sheet, a monitoring and reporting tool that also aligns with the three-level structure of the SDGs (goals, targets, and indicators). CCT results are presented as comprehensible graphics for progress measurement with sections incorporating citizens input and priorities.

The Community Capital Framework & Tool



- The Scan: supporting decision-making processes
- The Balance Sheet: measuring progress & reporting

Figure 2. Community Capital: A Framework and Tool for Sustainable Community Development. Adapted from: Roseland, 2012.

The CCT is one of many urban sustainability tools: we also consulted several others that helped shape the foundations of the Urban Productivity framework. Some may present conceptual similarities, but most come from various theoretical backgrounds and may address different issues or emphasise different goals (Tanguay et al. 2010; Joss et al. 2015). These are (in no particular order):

- The UN Sustainable Development Goals
- LEED v4.1 Cities and Communities (former STAR Communities and US Green Building Council’s LEED for Cities program)
- Global Resilient Cities Network (former 100 Resilient Cities)
- ISO37120 Sustainable cities and communities – Indicators for city services and quality of life
- Community Well-Being Index (Canada)
- Community Foundations of Canada Vital Signs

- EU Reference Framework for Sustainable Cities
- Living Community Challenge for connected and regenerative communities
- International Eco-City Standards and framework for an ecologically-restorative human civilisation
- The Natural Step's Framework for Strategic Sustainable Development
- The Green City Index
- The Foundation for Sustainable Area Development method
- One Planet Living & One Planet Communities
- Eco² Cities: Ecological Cities as Economic Cities

Not all frameworks are well equipped to address complex urban challenges with a systemic approach and attention to collective action, social inclusion, and equity (Du Plessis 2012; Newman and Jennings 2008; Joss et al. 2015; McLaren and Agyeman 2015). The Urban Productivity Framework aspires to help address such shortcomings as siloed thinking, planning, and implementation. Coro Strandberg highlights the persistence of short-termism in local government decision-making and proposes enhanced training for planners, engineers, and other professionals to overcome siloed thinking and plan for long-term goals and impact (Coro Strandberg, personal communication, December 17, 2018).

3.5.2. A framework for Urban Productivity

In the 30-year update of their seminal 1972 book “Limits to Growth”, Meadows et al. explain that there are three ways to respond to current pressures on planetary boundaries and to the urgency to transition to sustainable societies: 1) denial; 2) technological efficiency or economic measures; and 3) facing the underlying causes and restructuring

the system (Meadows, Randers, and Meadows 2004). The concept of urban productivity is clearly a response that corresponds to the third way of addressing current pressures; a way that aligns with the authors' vision for a well-functioning and sustainable society.

The Urban Productivity Framework aims to help cities tackle procedural, institutional, and other challenges in a transformative and systemic manner; the latter is what distinguishes this framework from the typical – economic and efficiency-based – view of productivity. While it is clear that such transformation will not be achieved in one day, cities need guidance toward sustainable, meaningful, and synergistic decision-making. To our knowledge there are not yet comprehensive agendas or decision-support tools with integrated urban productivity principles in mind.

This holistic framework advocates for balanced maximisation of all forms of productivity in a community – socio-cultural, natural, economic, physical, and human. Combining the concepts and approaches of section 3.3. under the umbrella of urban productivity can inform community visions, help shape long-term goals, and guide implementation and progress evaluation. We propose a set of four principles that should underpin efforts of holistic urban productivity:

- **Systemic, long-term thinking:** Through entrenched systems thinking, urban productivity can help design and implement agendas that seek regeneration of current urban systems in harmony with the socioecological systems within, above, or around them. The focus is not on the problem but on striving to achieve a desired state that can be sustained; the process of urban productivity then becomes systemic- and future-oriented.
- **Equity and justice:** Urban place-making centred on equity and justice can help achieve economic, social, and environmental transformation. The focus is on initiatives such as local solidarity economies that promote inclusiveness and

affordability; sharing networks that turn products and services into social connection and well-being; food system transitions that respect local resources and cultural diversity; and collective climate mitigation efforts that address issues of displacement and disproportionate impact.

- **Urban co-production and governance:** Through effective and inclusive governance, urban co-creation processes embrace local and traditional forms of knowledge, and people are valued and acknowledged as change agents. They co-produce and co-manage urban assets, increasing their value and transformative potential in a balanced way. The focus is on the function of assets and places and how these intersect for human and ecosystem well-being.
- **(Re)generation:** The maximisation of all forms of community capital requires a living systems perspective and a recognition of and respect for resource limits. The focus is on little non-renewable resource extraction and enhanced circular processes, from material and product design to production, procurement, consumption, and recovery. Urban tangible and intangible assets can then be produced and regenerated within a transformation towards well-functioning, resilient, and adaptive urban systems that can be sustained.

As Saskia Sassen has stated, “the real city is complex and incomplete” (Guadalupe 2013). Although whole-systems thinking is the foundational principle, all four principles need to be intertwined for cities on the path to restoration and maximisation of urban assets and resources. Agendas guiding productive urban development must embrace transdisciplinary and creative solutions, collective action, and progress measurability (De Flander 2014). Citizens, their governments, and other stakeholders will be able to use an agenda that integrates objective (quantitative, data-

driven) and subjective (qualitative, survey-based) information to help evaluate collective and individual progress against net-positive targets.

Focusing too much on quantifiable indicators however may result in missing part of the sustainability picture, particularly the socio-cultural and quality-of-life aspects (Stiglitz et al., 2009; J. Robinson, personal communication, December 5, 2018). The worldviews, ideas, perceptions, and storytelling are “actually the upstream influencing part that then affects how we deal with economic, social, and ecological issues” (D. C. Wahl, personal communication, January 21, 2019).

Cities therefore need to also welcome participatory but non-quantifiable tools such as visioning, networking, truth-telling, learning, and caring, for successful productive development within what Meadows et al. called “a third revolution” (Meadows, Randers, and Meadows 2004). These tools reflect the spirit of urban productivity: connection and relationship building, future-oriented co-production of the city, and compassion – wholeness qualities inspired in part by scholars advocating for transformation toward regenerative and sharing communities (McLaren and Agyeman 2015; Wahl 2016; Webb et al. 2018).

How would the four principles of the framework translate into urban productivity goals or parts of a city’s vision? Enhancing and sustaining urban productivity entails investment by, ideally, all community actors to first build and then implement a vision that includes productivity goals such as these shown alongside the framework (figure 3).

The Urban Productivity framework

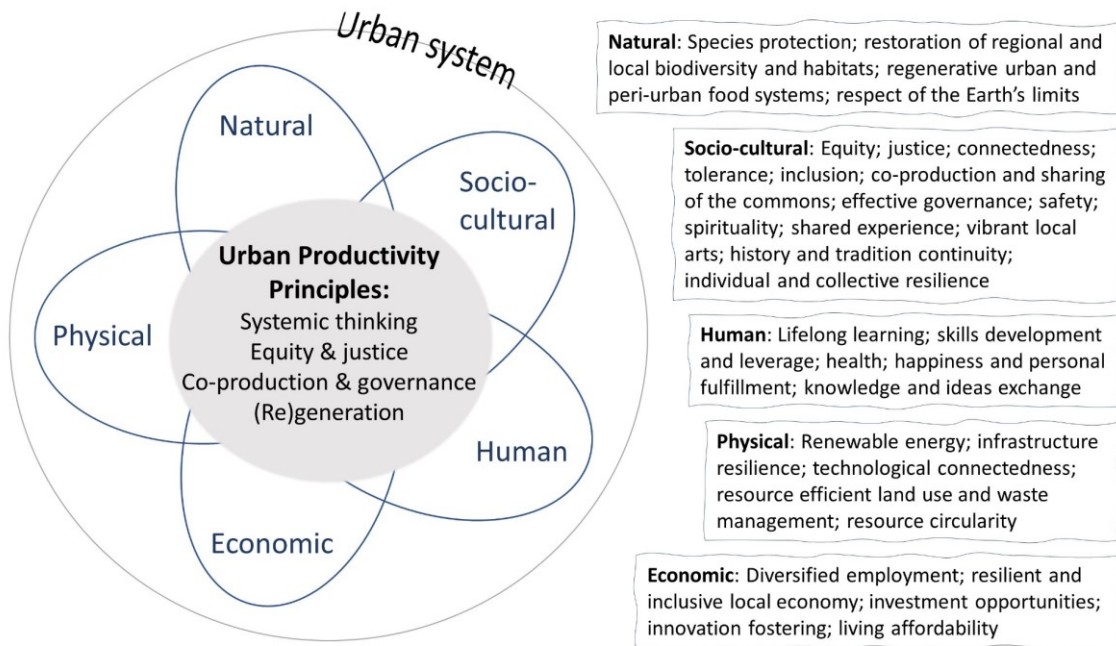


Figure 3. A framework for Urban Productivity. Illustration of the Urban Productivity framework, the underpinning principles, and the proposed generic goals for urban productivity. Original graph by the authors.

Context matters when planning for and implementing urban productivity strategies and actions. Political and other priorities and goals differ, and so do the issues and the decision-making processes, while best practices may not be transferable or readily implemented in every community (Roseland and Spiliotopoulou 2017). Trade-offs may be unavoidable to some extent, but contextual analysis and broad societal collaboration can make synergies visible so that operationalisation of urban productivity through goals and action becomes specific, inclusive, and adaptive.

3.6. Discussion

Aspiring to offer conceptual and operational insights for effective and forward-looking urban sustainability processes, we examined the concept, principles, and practices of urban productivity as a way to address local sustainability planning, implementation, and assessment. In this paper we have argued that increased multi-factor productivity in an urban community can result in the transition to a sustainable city and we have introduced a conceptual framework for urban productivity.

The efficiencies-focused approach adopted so far in local sustainability practice is impaired mostly by the lack of interdisciplinary thinking and inclusive processes, political short-termism, and community fragmentation. SCD operationalisation through urban agendas and frameworks often fails to embrace a systemic outlook throughout the process and does not always incorporate solutions for addressing the underlying causes of urban challenges (Benson and Craig 2014; Dernbach and Cheever 2015).

However, the full potential of the sustainability paradigm has not been reached yet as it still receives extensive criticism about promoting economic growth targets, embracing ecological modernisation principles, and using a traditional data-driven and reporting-centred approach. At a time when action is needed the most, the points raised offer constructive directions for SD and SCD by demonstrating the limitations of the concept without disproving it. In a gradual shift, a growing number of scholars have been offering insights not only on current limitations but above all on new approaches that can help communities transform into well-functioning systems (Elmqvist et al. 2019; Kaika 2017; Childers et al. 2014; Wolfram 2016).

Although the inherent vagueness of SD is partly the cause of communities (and the planet) not achieving sustainability yet, this flexibility can also be an advantage if combined with principles such as whole-systems thinking, equity and governance, and

resource regeneration. SCD shouldn't be used as an excuse for "greenwashing" but rather as a holistic compass to address environmental, social, and economic considerations (Garren and Brinkmann 2018; Connelly, Markey, and Roseland 2013). There is clearly a need for decision-making that embraces systemic thinking, seeks to maximise all dimensions of community capital, and results in net gain (Dernbach and Cheever 2015; Spiliotopoulou and Roseland 2020).

The sustainable city agenda is suitable to help "dramatically shift the practice of local participation from dominance by narrow special interests toward a more holistic and inclusive view" (Berke, 2002, p. 34). Perhaps what is required is not to adopt a narrow-focused agenda as commonly suggested, but rather system-wide coordinated policies for the transition to a well-functioning, sustainable system. Incorporating a resilience perspective additionally urges the city to consider the system's components, functions, and interactions, and embraces multi-level governance, flexibility, and continuous social learning (Elmqvist et al. 2019; Meerow and Newell 2016; Folke 2006). It is then that the challenged city can harness the co-production of knowledge and regeneration of urban assets.

The proposed Urban Productivity framework seeks to address many of the above issues and act as an overarching framework to help operationalise sustainability holistically and lead the process of transformation. The emerging concept of urban productivity is grounded in theories from multiple disciplines and acknowledges the interdependence of systemic components and enablers of individual and community well-being. It can empower urban co-producers to pursue balanced and synergistic maximisation of community elements (economic, physical, ecological, socio-cultural, and human).

In practice, the urban productivity concept has potential for great uptake by communities given its relevance to everyday life and resonance with people. The crucial first step is to “park [their] interpretation, [their] experience of this word, and then get creative” (C. Strandberg, personal communication, December 17, 2018).

Operationalised through digital tools and collaborative techniques, the Urban Productivity framework can be valuable for communities: from a systemic-thinking-focused training platform for urban designers and planning professionals to holistic productivity tools for visualisation, planning, implementation, and evaluation to benefit municipal councils, citizens, professionals, and other stakeholders.

The principles of the urban productivity framework aspire to tackle problems in SCD planning and implementation through systemic and long-term thinking, equity and justice, urban co-production and governance, and regeneration of urban resources. Asked how he conceives the productive city, Agyeman replied, “I would see it as the city that releases human potential” (J. Agyeman, personal communication, December 17, 2018).

A holistically productive city, in a nutshell, embraces: economic resilience with shifts in employment patterns and habits; innovative, socially just, and environmentally responsible technologies; compact and nature-enhancing land use planning; strong social connections and affordable housing; and green, light, and smart infrastructure (Wahl 2016; Girardet 2015; Condon 2019; Spiliotopoulou and Roseland 2020; Brugmann 2015).

3.7. Conclusion

SCD researchers and practitioners increasingly acknowledge the importance of developing – not just growing – urban assets, as cities continue to expand and extract

resources from “distant elsewhere” (Wackernagel and Rees 1996). In the face of mounting social, economic, and ecological challenges, the traditional approach of urban growth, based on weak sustainability principles, is no longer a viable option for current and future generations. The limits to growth are not only biophysical but also social, political, and institutional (Robinson 2004). The 2020 pandemic and the natural disasters of the last few years drive the point home: it is now undeniably urgent to develop local solutions to global issues.

Urban development must be guided by strong sustainability values and whole-systems thinking and co-produced in an equitable and regenerative way, i.e. following the principles of the Urban Productivity framework. This can then lead to increases in human, resource, and process productivity, improved urban assets performance and systemic interactions, ecological function regeneration, and ecologically wise use of resources (Girardet 2015; Brugmann 2015).

Future research on SCD and productive urban development should focus on human productivity strengthening, effective and inclusive decision-making processes, co-production of urban space, urban asset performance enhancement, and regeneration of local resources. Case studies to test and refine the Urban Productivity framework would be valuable to ensure its scalability and applicability. Wider application in various cities globally would help promote the concept’s holistic perspective with the aim of attaining the shared understanding that has been missing from the sustainability discourse.

Cities have enormous productivity potential not only in terms of economic and labour productivity (diverse and inclusive economy, fostering innovation), but also of social productivity (hubs of research, learning, and sharing) and ecological productivity (ecological function regeneration and efficient use of resources) (Roseland and

Spiliotopoulou 2017). The urban productivity path can achieve positive results locally, contribute to the success of national and international goals (such as the SDGs), and become the new normal to be sustained. After all, “the productive city, the sustainable, resilient, smart, the sharing city, are all works in progress. They are all experiments. There is no conclusion.” (J. Agyeman, personal communication, December 17, 2018).

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