NORDISK ARKITEKTURFORSKNING
NORDIC JOURNAL OF ARCHITECTURAL RESEARCH

2

ISSUE 2 2013

NORDISK ARKITEKTURFORSKNING
Nordic Journal of Architectural Research

2–2013

THEME ISSUE
GREEN INFRASTRUCTURE: FROM GLOBAL TO LOCAL

Nordic Journal of Architectural Research
ISSN: 1893–5281

Submitted manuscripts
Manuscripts are to be sent to Madeleine Granvik (Madeleine.Granvik@slu.se), Claus Bech-Danielsen (cbd@sbi.aau.dk) and Anni Vartola (anni.vartola@aalto.fi) as a text file in Word, using Times New Roman font. Submitted papers should not exceed 8 000 words exclusive abstract, references and figures. The recommended length of contributions is 5 000–8 000 words. Deviations from this must be agreed with the editors in chief. See Author's Guideline for further information.

Subscription
Students/graduate students
Prize: 250 SEK, 205 DKK, 225 NOK, 27.5 Euro
Individuals (teachers, researchers, employees, professionals)
Prize: 350 SEK, 290 DKK, 320 NOK, 38.5 Euro
Institutions (libraries, companies, universities)
Prize: 3 500 SEK, 2900, DKK, 3200 NOK, 385 Euro

Students and individual subscribers must inform about their e-mail address in order to get access to the journal. After payment, send the e-mail address to Trond Haug, trond.haug@sintef.no

Institutional subscribers must inform about their IP-address/IP-range in order to get access to the journal. After payment, send the IP-address/IP-range to Trond Haug, trond.haug@sintef.no

Payment
Sweden, pay to: postgirokonto 419 03 25-3
Denmark, pay to: Danske Bank 1-678-0995
Finland, pay to: Sampo Bank 800013-70633795
Norway, pay to: Den Norske Bank 7877.08.13769

Outside the Nordic countries pay in SEK to SWIFT-address:
PGS ISESS Account no: 4190325-3, Postgirot Bank Sweden, SE 105 06 Stockholm

Published by SINTEF Academic Press
P O Box 124 Blindern, NO-0314 Oslo, Norway

CONTENTS

Picture on the front cover. Photo: Gunnar Britse

NORDISK ARKITEKTURFORSKNING
NORDIC JOURNAL OF ARCHITECTURAL RESEARCH

GREEN-BLUE INFRASTRUCTURE IN URBAN-RURAL LANDSCAPES – INTRODUCING RESILIENT CITYLANDS

PER G BERG, MARIA IGNATIEVA, MADELEINE GRANVIK AND PER HEDFORS

Abstract

With the *global change* crisis pushing – and new knowledge about sustainability in socio-ecological systems pulling – there presently is a window of opportunity to further our understanding about resilient landscapes. In this paper we focus on *Green-blue infrastructure* as a key component of human settlements. Our main focus is theoretical and conceptual but we also illustrate its values and functions to deliver recreation, preserve biodiversity, create urban structure, support cultural identity, provide ecosystems services and maintain primary production/recycling. We further elaborate on the potential for new interactions between *green-blue-* and *built* structures, discussing international cases of both practical and theoretical relevance. *Resilient Citylands* is proposed as a new concept useful for *e.g.* landscape architecture and planning. It represents a new reciprocal co-evolution for different scales: of urban and rural areas; of human settlements and natural ecosystems[1], and of constructed and green-blue areas and elements within urban settings. We investigate how functionally dense, mixed-use, vibrant, intersensory and contemporary *urban areas* could be combined with cutting edge, lean and efficient *rural areas*.

Key words:
Green-blue infrastructure, Urban-rural interaction, Landscape planning, Landscape architecture, Resilient Citylands, Urban design

Introduction

As the global change crisis and its link to anthropogenic processes unfold (Syvitsky, 2012), it seems urgent and rational to target urban development (Fragkias and Seto, 2012) and its physical resource consumption (Haberl, 2012). An exponentially growing consumption rate in Asian, South-American, Eastern European and selected African Cities, will soon surpass the existing consumption rate in Western global cities in the US, Europe and Australia (Brown, 2009). Global urbanization, in its current state, may be the greatest deciding factor for aggravated hydrospheric and atmospheric perturbations, for adverse effects on the biosphere and for significant geochemical changes (IPCC, 2013; IGBP, 2004). At the same time, a massive depopulation in Western countries' *rural areas* and a deteriorating of rural livelihoods in developing countries are taking place (Brown, 2009). Other trends are severe nutrient loss and soil erosion in global agro-ecosystems (Baskin, et al., 2012; Brown, 2009). All these trends add to severe planetary reverberations: more frequent droughts, floods, changes in atmospheric concentrations of gases and greater variations in temperature, winds and moisture on a global scale (Gaffney and Höppe, 2012). Today, on a *macro-regional scale*, life-supporting areas (ecosystems appropriation) of human habitats add up to an unsustainable amount, up to 1000 times the surface of urban areas in *i.a.* the 29 largest cities in the Baltic Sea Region (Folke, et al., 1997). On *a local scale*, free mobility- and settling patterns lead to excessively resource dependent and sprawling cities (Thwaites, et al., 2007). Other effects are loss of valuable green-blue infrastructure (Berg and Rydén, 2012; UNEP, 2005; Florgård, 2004) and the formation of *edge cities* (Garreau, 1992).

New climate change mitigating knowledge and practices

Over the past decades, an exponential growth of *renewable energy investments* and energy conservation practices have resulted in building expansion in hundreds of global cities (Bokalders and Block, 2010; Wheeler and Beatley, 2008). Similarly, *low-impact and mixed-use* urban planning, design and transformation have been implemented – with green and lean bicycle-pedestrian and public transport infrastructure – in *e.g.* European and South-American Cities (Gehl 2010; Gaffron, Huismanns and Skala, 2005; Wright and Montezuma, 2004). The key role of households' *consumption and lifestyles* for OECD countries is also clarified (Brown, 2009; Åkerman, 2011; Carlsson Kanyama, 1999). International trends in *rural livelihoods* also encompass new development trends, which may contribute to *less resource consumption*, an improved *recycling of nutrients* and *healthier lifestyles* (Karlsson and Rydén, 2012). Efforts are increasing to establish *sustainable agriculture* in *i.a.* the Baltic Sea Region and in the North-American Great Lakes Region (Jacobsson, 2012). International global change researchers and environmental policy teams have started to forward another, potentially even more efficient, supplementary strategic process for mitigating climate change. It concerns there-localization[1] of producer-consumer markets and a call for local and regional as well as urban and rural interaction (Seitzinger, et al., 2012; Granvik, 2012; Berg and Rydén, 2012; Granvik, et al., 2012). The inability to address urgent resources- and environmental problems in urban areas, deteriorating production in rural lands and waters and polluting production methods across the globe, calls for a new strategy: a strategy that thoroughly investigates the potential of uniting urban and rural landscapes and functions.

The potential roles of *Green-blue Infrastructure*, seen from a separate urban *or* rural perspective, are seemingly rational and straight-forward. However, we also foresee problems or challenges with such a separate approach to urban *or* rural development. How can urban and rural dwellers, companies and other stakeholders instead become aware of each other's potential green-blue infrastructure values, functions and resources? How can urban *and* rural recreation, biodiversity, structuring potential, cultural values, ecosystems services and recycling capacities be optimized? How can urban *and* rural perspectives of green-blue infrastructure values be better harmonized (=to create common goals and utilize their mutual strengths)?

This paper elaborates on strengths and possible weaknesses of geographically interacting urban and rural landscapes. Our main objective is to present a theoretical approach and reasons for a modern unification of urban and rural structures, functions and processes based on current technology, landscape planning knowledge and actual best practices. We suggest a new concept – *Resilient Citylands* – and provide site- and situation dependent (contextual) examples and the under laying rationale. Our main research question is: How can a modern co-evolution of urban and rural and of built and green-blue landscapes support more resilient human habitats?

The paper is structured in a logical order, beginning with a historic perspective of green-blue infrastructure and urban-rural systems with special emphasis on landscape architecture theory. This is followed by our own contribution to theory building: identification of six green-blue structure values; definition of the concepts *Green-blue Infrastructure (GI)* and *Resilient Citylands (RCL)*. These topics are addressed by elaborating on different approaches to urban-rural interactions. In the final part we discuss contemporary implementation and visions of *Green-blue Infrastructure* in urban-rural systems by displaying selected global best practices. The paper ends with reflections on the risks and potential weaknesses of the concept *Resilient Citylands* and a final discussion.

1 Re-localization (an antonym of globalization) in the context of this paper means transformation processes for shortening the geographic distances (= i.a. less transport) between different society functions or stake-holders: from global to macro-regional, (i.a. the Baltic Sea Region) to micro-regional, (i.a. the Mälarvalley region around Stockholm) to local, (City) and to local community scale levels.

A historic perspective of Green-blue Infrastructure and urban-rural interactions

During the 7000 years of history of human urban settlements, these areas were often tightly integrated with adjacent food-, fuel-, water- and fiber producing rural landscapes (Sinclair, et al., 2010; Hyams, 1976). Ever since the alleged first urban settlements in the green crescent of Mesopotamia and through out the agrarian and industrial revolutions, rural functions were seldom considered the antithesis of townscape: On the contrary, they were considered a compulsory urban function (*ibid.*).

As industrialization started to replace the predominantly rural societies of the world, cities expanded initially along railways and main roads. They grew to create urban star rays reaching out into the surrounding landscape (Berg, 2010; Geddes, 1904). In the opposite direction, fiber- and energy yielding forest-, productive farmland and fish-rich water landscapes stretched towards the center of cities in the form of green-blue wedges or green ways, forming highly versatile network pathings[2]. The green-blue structures and networks were instrumental for the development of industrial towns. The historic urban and rural interlaced structures, -areas, -energy production, -flows of people, ideas and inventions were *co-evolving* all the way until the beginning of the 1930-ies in central Europe and until the 1950-ies in the Nordic countries (Berg and Rydén, 2012; Saifi and Drake, 2007). A similar development could be found across the globe – and in *developing* countries the urban-rural connection started to break only during the past 30 years. Still almost half the world's population is firmly tied to its connected productive lands and waters.

When the cities grew, their hinterlands were successively exploited, hence they spread across the countryside in all directions. An interesting paradox about the mechanism behind the loss of green spaces was disclosed by Joel Garreau in his book *Edge city* (1992). He showed that while a growing car-dependent population was searching new habitation – preferably in the zone *between settlements and wilderness* – the *green spaces* were successively consumed. The *pattern* of intertwined built and green wedges was successively lost: First in sprawling American subdivisions and later in most cities of the world. Having lost contact with nature, resourceful US citizens ultimately sought new frontiers. This time targeting the far periphery: the *edge* between the city and wilderness. The *co-evolution* of urban and rural (Saifi and Drake, 2007) was breached only during the last 60 years, stimulated by new global mobility-, production- and consumption patterns (Brown, 2009).

Realigning green-blue with built structures

During the past century gardeners, biologists, landscape architects, geographers, psychologists and planners have recurrently forwarded values of green-blue environments as a public interest for human welfare and well-being in cities. Already in the beginning of the 20th Century,

2 In this paper we use the term network pathing (Murphy, pers. comm. June 2013) tentatively to denote systems with alternative connected pathways (green corridors) and nodes (i.a. parks) with vegetated and water ecosystems (c.f. rhizome). Pathing could also refer to i.a. highly versatile built-, traffic-, communications-, technical- and service structure in communities. Pathing originates from computer science where it represents the design of alternative network pathways and nodes for securing a robust flow and storage of data.

first attempts were made in England to extract the magic atmosphere, the rich labor markets and the cultural excellence from the overcrowded, unhealthy and coal smoke-stricken cities. The perceived best parts of the contemporary cities were then combined with the healthy, productive but job-deficient and sparsely populated countryside as seen in Ebenezer Howard's *Garden City movement* (Miller, 1989). At the start of the last century, the Scottish biologist and planner Patrick Geddes (1904), and later American planner and architecture critic Lewis Mumford (1961), argued for an integrated built-green approach. This influenced planners world-wide during almost half a century. As traffic jams and resource demanding sub-divisions started to plague Western cities in the 1960-ies and 70-ies, Christopher Alexander (Alexander, Ishikawa and Silverstein, 1977) and Ian McHarg (1969) exhorted world planners and politicians to once again adapt human settlements to their green-blue environments. Unfortunately, the urban sprawl mechanisms are still active and have now spread to new ambitious economies, like *e.g.* China, India and Brazil (Brown, 2009).

In spite of the, admittedly, positive effects of *globalization* on human welfare, a developing resources scarcity crisis (*ibid.*) with increasing prices of *e.g.* oil, minerals and land, may induce a relative re-*localization* of markets. This has already manifested as a relative displacement from longer to successively shorter distances between producers and consumers (Granvik, 2012). Stream-lined urban landscapes, loss of biodiversity and local cultural identity are other negative effects of globalization, which may further trigger re-localization (Ignatieva and Ahrné, 2013).

Built and green interactions throughout Landscape Architecture history

The enlargement of towns in the early years of industrialization was typically related to the development of necessary public green structures. These were firstly designed in English cities in the middle of the 19th century – *i.a.* the Birkenhead Park by Joseph Paxton. Frederick Law Olmsted, in the middle and the last decades of the 19th century, planned a vast number of city parks (*e.g.* Central Park in New York). Within the limits of several cities, he had a pronounced intent to create strong links between everyday park nature and human settlements (Beveridge and Rocheleau, 1998). One positive outcome of Ebenezer Howard's Garden City movement was the concept of *planned* green areas and *connectivity* between the urban, rural and natural landscapes (Miller, 1989). The earlier mentioned planner and biologist Patrick Geddes (1904) created a foundation for a theory in landscape architecture about the dual need of human beings to have access to natural ecosystems[3] as well as to vibrant human culture in the cities. Another founder of landscape architecture theory, Ian McHarg, developed his eco-centric approach to urban-rural interaction (settlement development adapted mainly to ecosystems health and function) in his seminal book *Design with Nature* (McHarg,

3 Here natural ecosystems (stabilized by climate- and edaphic conditions) refer to a macro-regional typology, i.a. tundra, taiga or temperate grasslands – or a micro-regional typology i.a. forests, fields or streams.

1969). McHarg's work was further developed in Anne Whiston Spirn's *The Granite Garden* (1984). Spirn saw the *urban landscape* as an arena for both humans and natural ecosystems. According to Spirn, integrative approaches were first developed in landscape- and urban planning, where both had their roots in landscape architecture. The landscape architecture discipline emanated, in turn, from Olmsted Senior's work and Olmsted Junior's foundation of the world's first school of Landscape Architecture at Harvard University (Spirn, 1996).

Two recent decades of theories on green-built interactions

For more than a century, landscape architecture has carried the torch of built-green interaction theory, research, practice, planning, design and maintenance, with a particularly vivid development during the last 20 years. Ian Thompson's seminal work *Ecology, Community and Delight* (2000) was a strong statement of a modern co-evolution of urban and rural principles with the ultimate goal to create attractive human habitats. Hough (2004) had a closely related approach in *Cities and Natural Process, i.a.* discussing the role of city farming. Lövrie defined green structure and objects as *identity creating town planning elements* (Lövrie, 2003 – see also Qviström, 2008). Ottosson (2007) and Cooper Marcus (1997) investigated the *recreational and healing power of nature* and how to make it accessible for inhabitants in cities and communities. The functions of *rural landscapes* for sustainable livelihoods, heritage and natural resource management, were compiled in the landscape architecture anthology *Landscape and Sustainability* edited by Benson and Roe (2005).

The significance of Place and new theories on Green-blue Infrastructure values

The significance of *context* in the design of well-integrated green-built spaces was outlined in *Site Matters* by Kahn and Burns (2005) and further developed in a critical study of the modernistic city by Thwaites, et al. (2007) called *Urban Sustainability through Environmental Design – Approaches to Time-People-Place Responsive Urban Spaces*. The significance of place for green-built design was also a main issue in Rowe and Humphries' (2012) *educational landscapes*. Modern attempts to formulate a landscape architecture grand theory, typically elaborate on the contextual interactions of buildings, city life and urban activity on the one hand and an overall defining *Green-blue Infrastructure* on the other (see e.g. Murphy, 2005; Deming and Swaffield, 2011). This has in turn influenced a conceptual discussion about a Landscape Architecture City Theory (LandACT) (Hedfors and Florgård 2012; Hedfors and Granvik, 2008). Attempts to define a range of qualities and scales of green infrastructure for the benefit of urban dwellers have been outlined for different contexts with international city examples across the globe. See for instance examples from different continents (The Landscape Architecture Foundation, 2013), from China (Yu, 2012); from Brasil (Herzog, 2013); from the Middle

East (Egoz, et al., 2011); from the European Union – (EC, 2010) and US Cities (Tzoulas, et al., 2007); from Greater Stockholm (Stockholm County Council, 2009); from other Swedish cities (Lundgren Alm, 2001); and from Nordic cities (Florgård and Berg, 1997).

Development of theory and concepts

We will now present our own view of the concepts *Green-blue infrastructure* and *Resilient Citylands*. The definition of *Green-blue Infrastructure* draws on the work already done internationally in order to capture its contemporary essence. After that follows our definition of the new concept *Resilient Citylands*, which is later elaborated and exemplified.

Elaboration on the concept Green-blue Infrastructure

Green (soil-plant systems) or green-blue (soil-water-plant systems) infrastructure are poorly defined in the emerging theoretical literature within the field of landscape architecture. For practice organizations like IFLA (International Federation of Landscape Architects) and IFLA Europe(earlier EFLA) the concept is – however – more and more discussed. An official EU definition was given during a European Commission conference (EC, 2010):

> *Green Infrastructure serves the interests of both people and nature. It can be defined as a strategically planned network of high quality green spaces and other environmental features. It should be designed and managed as a multifunctional resource capable of delivering a wide range of benefits and services. Green Infrastructure includes natural and semi-natural areas, features and green spaces in rural and urban, terrestrial, freshwater, coastal and marine areas.*

In the US, Green Infrastructure (Tzoulas, et al., 2007) has been seen as:

> *A combination of all natural, semi-natural and artificial networks of multi-functional ecological systems within, around and between urban areas, at all spatial scales.*

The European Commission's *DG environment* emphasizes the *spatial structures of natural and semi-natural areas* and environmental features, *which enable citizens to benefit from its multiple services* (EGCA, 2013a). According to the EC, the concept is sorted under «nature and biodiversity», which may seem reasonable as the latter are quite broad concepts. In the following section we suggest, however, that the conceptual hierarchy should be seen as the other way around. In this way, *i.a.* biodiversity is seen as one function among many of green-blue infrastructure. Our definition includes both green (vegetation and its soil system) and blue (its waters and organisms) components. It is based on the Swedish Planning and Housing Authority (Boverket, 2013) and on Sandström and Hedfors (2009) – but also draws on Tzoulas, et al., (2007) and EC (EU, 2013; EC, 2010) definitions and examples. We here suggest a *structural, functional* and *process* aspect (Murphy and Hedfors, 2011) of *Green-blue Infrastructure*: The *structure* of GI defines its components and relationships; the *function* defines the outcomes or products of the GI; and the *process* defines the activities in which the GI is engaged:

> *Structure: Green(-blue) Infrastructure is a system of vegetated and water connections forming a controlled and flexible system (a versatile network pathing – see a tentative definition above) composed by predominantly plant-soil-water green-blue elements, patches/lakes, corridors/rivers, pathways/streams, wedges/bays, streaks/flows, co-defining the morphological matrix of human settlements in urban and rural settings in a range of scales.*

> *Function: Green (-blue) Infrastructure can be characterized by six main functions: (1) offering citizens restoration, health and well-being; (2) securing functional biodiversity in and near human settlements; (3) constituting a fundamental matrix for human settlements' morphologies; (4) co-defining cultural identity and open spaces as public social arenas; (5) providing ecosystems micro-climate regulating services for urban and rural human- and nature habitats; and (6) representing significant life-support and nutrient recycling areas for primary production of food, fodder, fiber and bioenergy.*

> *Process: Green (-blue) Infrastructure is engaged in a dynamic and continuous change of structure and function, which signify living and vital landscapes. GI comprise geological, hydrological and biological processes that operate over various time-intervals ranging from millions of years to instantaneous reactions. Typically such processes are flows, vegetation growth, plant dynamism and habitat succession. Flows include transportation and movement of plants and seeds, animals and fry, microorganisms, soil (as erosion), minerals, nutrients and water (evaporation, transpiration or meandering).*

Resilient Citylands definitions

The concept *Resilience* was originally used in physics and engineering to describe the ability of a material to absorb energy while deforming elastically and releasing that energy when regaining its original shape. It was more widely introduced in the 1970-ies, for describing properties of ecosystems that could be subjected to (climatic or bio-physical) disturbances (changes), resist or adjust to the changing event and after some time interval, regain its original structure and functions (Hollings, 1973). *Resilience* in this work is used in a socio-ecological system context, where such systems are assumed to possess a given *adaptive capacity* to perturbations. These can also be mitigated by humans through environmental observation, learning and altering their interactions within the system in a desirable way (Murphy, 2005).

We suggest that the concept *Citylands* can be understood as human ecosystems including two components. First, a *City* component referring to modern urban landscapes with dense human settlements and second, a *land* component representing (1) modern rural landscapes enclosing and including sparsely populated settlements *and/or* (2) within the dense city, including green-blue infrastructure interacting with urban settlements. *Citylands,* therefore, denote specific socio-ecological combination systems where settlements are *reciprocally and functionally integrated* with green-blue areas and elements. *Citylands* are also conceived in a range of *scales,* from whole regions to single houses with gardens. Our definitions of *Resilience, Citylands* and *Resilient Citylands* are thus:

> *Resilience = The ability of a living (socio-ecological) system to cope with pressure or disturbances through resistance and adaptation over time and – (for human systems) with the help of observation, learning and creative alteration – regenerate and even further develop its former structure and function.*

> *Citylands = Reciprocally and functionally interlaced urban and rural landscapes, ranging from large-scale regional systems to small-scale built-green-blue combined elements.*

> *Resilient Citylands = Resistant, adaptive and regenerative modern socio-ecological systems/landscapes, for which human observation, learning and creativity can be used for coping with disturbances. Resilient Citylands are reciprocally and functionally interlaced urban and rural landscapes, ranging from large-scale regional green infrastructure systems to small-scale built green-blue elements.*

Resilient Citylands taking landscape architecture towards the future

The Resilient Citylands concept emphasizes the *co-evolution of built- and green-blue infrastructures* in future planning of urban or rural human habitats. In order to supply sufficient resources and restorative environments to a majority of urban dwellers anywhere in the world, cities may have to expand their path networks (trails, threads, rays, stripes or streaks), along with and interacting with green-blue wedges, corridors and patches. This can be described as a system of alternative and versatile connections – *network pathing* (see our definition of this term above) *within the landscapes that carry both urban and rural characteristics* – of both green-blue and built elements (*e.g.* Murphy, 2013 *pers. comm;* see also Berg, 2010 and Ahern, 2007). We suggest that the Resilient Citylands concept is useful *e.g.* for landscape architecture research and practice and for explaining a diversity of values in a range of scales of green patterns, -structures, -matrix, -corridors, -patches and -spaces within *urban landscapes*. We also suggest that the *Resilient Citylands* concept can support the development and maintenance of *rural landscapes* both pre-dominantly affected (cultural) or pre-dominantly un-affected through human intervention (natural) landscapes. But even if urban-rural approaches to landscape architecture already exist, they may still have a typical urban or a typical rural focus (see table 1). Below we, therefore, further elaborate on possible differences between urban and rural conceptions of urban-rural interactions.

An urban perspective of urban-rural interactions

An emerging urban perspective of urban-rural interactions has been fuelled by peak oil and similar events, and represents the end of the non-renewable resources era (Brown, 2009). The end of fossil fuel may lead to increased land values and relatively higher prices for locally (and globally) produced food, fodder, fiber, energy and minerals. Increased land values also affect *any* land use issues, for instance how *engineers can erect constructions in the landscape* while *conserving global land and water resources* (see *e.g.* Carpenter, 2011). At the same time, strong world economies are purchasing land in other countries for securing life support for their own growing urban populations (Borras and Franco, 2012). Financial unrest and turbulent markets also trigger demands for *food, water and resources security* in southern hemisphere cities.

Consumers in northern hemisphere urban areas (*e.g.* OECD-countries) increasingly favour*local production of food*. Allegedly a number of reasons for this exist: *i.a.* better control and higher quality; support of the local market; food security; access to fresh food and less distribution costs (Granvik 2012; Queiroz, 2009; Hinrichs, 2003; Halweil, 2002). With currently only a few percent of the local food supporting the larger Western cities (Berg, 2007), cities start to investigate if food and other materials can be produced inside the city, in the urban periphery or in the region where the city is embedded (Queiroz, 2009; Halweil, 2002). An urban perspective of urban-rural interactions thus includes feasibility studies on increasing *rural food and bioenergy production* through an increased co-ordination in new regional and local *urban-rural* markets. In continental Western Europe another trend is to increase the *green areas inside cities*. To some extent this trend aims at increasing urban farming or utility gardens but also aims at increasing park areas for recreation and a range of other purposes (Egnor, Ishikawa and Silverstein, 2009; Florgård and Berg, 1997). Another such classic example is to secure free land between urban agglomerations in order to create identifiable neighbourhoods and green districts (Berg, 2010; Alexander, 1977). The trend to *increase* green areas is partly counteracted by the simultaneous *densification* trend (Berg, Granvik and Hedfors, 2012). In South-American cities like Bogota and Curitiba, a general *upgrading of public spaces* and functions has furthermore led to an increased number of citizens having contact with urban parks and other green areas – which has shown to strengthen both *recreation* and *social cohesion* (Wright and Montezuma, 2004). A particular example of low-impact design of integrated urban and rural functions is highlighted in studies about establishment and maintenance of *lawns* as an ecological and cultural phenomenon (Ignatieva and Ahrné, 2013).

A rural perspective of rural-urban interactions

A rural perspective of rural-urban interactions is also slowly emerging internationally but with diverse starting points (Artmann, et al., 2012). A large share of primary production, rural livelihoods and other rural functions of the world is still based on small family businesses trading within local consumer markets (see *e.g.* Graziano Da Silva, 2013). This is, however, quickly diminishing as large domestic or multi-national companies take over the control of primary production lands and waters. Using mainly centralized manufacturing and refinement utilities, products are sold on global markets (*ibid.*). Slowly rural researchers, authorities, practitioners and to some extent rural dwellers are realizing that arable land prices have already, due to peaking resources, increased over the last five years. This has partly caused local production and local markets to be stimulated (Granvik, et al., 2012).

In the EU's *Leader* projects, rural livelihoods are well defined and developed (Leader Regions, 2000; SOU 2005), but are rarely involved or even interested in urban issues. In the light of coming resource scarcity, rural stakeholders, however, foresee increased urban demand of *rural products and services* from multi-functional agriculture with increased income from *rural tourism* and rural services for urban dwellers (Granvik, et al., 2012; Karlsson and Rydén, 2012; Berg and Rydén, 2012). In the northern hemisphere, *rural recreation activities* (*i.a.* hiking and horse-riding) are offered as a part of rural production (*ibid.*). Another rural perspective of urban-rural interaction is local primary producers arranging *farmers' markets* in adjacent cities. A supplement to other such green jobs in farming, forestry and fisheries would be assisting in the urban maintenance of green areas, winter clearing of snow, sanding, bulldozing in new dwelling areas, pipe constructions, electrical systems installations etc. (*see i.a.* LRF, 2009). Beside primary production, protection of *nature reserves* and conservation of heritage pastoral *landscapes* is another subsidized activity of rural enterprises (Karlsson and Rydén 2012; Artman, et al., 2012). In the rural-urban perspective there is also an expectation and aspiration that the extraction of natural resources (mines, forest products, peat, hydropower) will be better reimbursed by urban consumers and enterprises in the future (*ibid.*).

A strategic boundary zone between urban and rural areas

One potential new feature of *Resilient Citylands* is the development of a new built-green-blue *boundary zone* between predominantly urban and predominantly rural areas (*see i.a.* Ahern, 2007; Moffat, 2003). Due to green/built wedges city morphology, Nordic cities have had markedly long green/blue interface *edge* between settlements on the one hand and glades, meadows, forests, parks, agricultural land, lakes, seas and

Table 1
Contemporary urban or rural perspectives of the values/functions of green-blue infrastructure (GI) (adapted from Boverket[4] (2013) and from Sandström and Hedfors (2009) including potential challenges for its interaction (harmonization) (Seitzinger, et al., 2012; Berg and Rydén, 2012).

Green-blue infrastructure *values and functions*	Urban perspective	Rural Perspective	Questions and challenges for a potential interaction (harmonization) of urban and rural perspectives on GI
1. **Recreation, Health & Social Interactions**	Urban parks and residential green areas are valuable for urban dwellers' recreation	Recreation landscapes (forests fields and waters) valuable for urban and rural dwellers	– How can urban dwellers become aware of and guided to rural recreation and rural dwellers be invited to urban green? How can green social arenas be designed/marketed?
2. **Biodiversity protection and development**	Urban species richness and simple biodiversity[5] in parks, gardens and brownfield areas	Nature reserves with high functional biodiversity[5] embedded in production landscapes	– How can urban and rural ecosystems and biotopes be better connected? How can stable functional biodiverse urban GI systems be established?
3. **Human Habitat structure and function**	GI is one of several urban structuring components and networks. Built structures dominate	GI is the main rural structuring component (nature, productive, recreation landscapes and nature reserves)	– How can urban and rural infrasystems (green-blue-, transport-, settlements- and service infrastructure) be harmonized? How can urban green be connected with public transit? How can GI network pathings be created?
4. **Cultural Identity**	Characteristic GI (*e.g.* parks) embeds historic urbanand to some extent new sub-urban centers	Open *often small-scale* agricultural landscapes, forests and waters including landscape parks are preserved[6]	– How can green heritage values (in urban parks and pastoral landscapes) programs be co-ordinated between cities, towns and rural communities?
5. **Ecosystem services** (e.g. environmental regulation and climate change mitigation)	Temperature-, wind-, moisture-, water flows-, water retention-, shadow- and air quality regulatory functions in public parks, green areas and waters	Water-, air-, soil cleaning-, recycling- dissipation- and en-richment capacity inplant-soil systems – in rural open landscapes, forests, lakes, streams and oceans	– How can rural regions provide its urban areas with efficient climate change protection and adaptation? How can urban and sub-urban GI be optimized to regulate micro-climate, buffer water flows and clean the air which will also affect surrounding rural hinterlands?
6. **Primary production and Ecotechnology**[7]	Urban agriculture, home gardening, collection & use of compost and municipal sewage treatment	Agriculture, forestry and fishing. Waste water- and other urban effluent nutrients recipient	– How can urban and rural supplementary food- and nutrient production-consumption (complete and *clean* recycling) be created and co-ordinated?

4 The Swedish National Board of Housing Building and Planning
5 Simple Biodiversity characterize ecosystems with many or few unrelated species. Functional Biodiversity characterize mature ecosystems with mutually interdependent and adapted species (Odum, 1989).
6 See e.g. the European Landscape Convention (ELC, 2000).
7 In The Swedish National Board of Housing, Building and Planning – the definition mainly targets recycling of nutrients, with little emphasis on e.g. rural or other food production for local urban consumption. In our understanding of this green structure value, recycling includes: primary production lands and waters outside the city; large scale green wedges adjacent to the built-up areas; local city districts and neighbourhoods.

rivers on the other (Berg, 2010; 1993; Odum, 1989). Widening the edge to a broad *boundary zone* or *spatial corridor*[8] could give room for intermediary green areas suitable for neighbourhood recreation (district parks, play grounds, sports grounds, orchards and domestic animal stables). Other potential functions of this zone are peri-urban agriculture with green houses and community gardens (Queiroz, 2009). This fringe is furthermore an interesting strategic zone for a range of other new functions (Berg, 2010; Bokalders and Block, 2010; Gaffron, Huismans and Skala, 2005). These include clean technology production; combined industries including production of food, fodder, fuel and fiber; recycling of waste linked to bioenergy production; other renewable energy production (wind-, photovoltaic-, hydro- and wave power) and energy storage. The urban-rural regional interface could be termed the *outer boundary zone,* whereas the local interfaces inside the city (urban settlements turning towards parks and community forests, fields and waters) could be termed the *inner boundary zone* (Berg and Rydén, 2012).

8 If a city or town could be described as an island, the interface line or spatial corridor would correspond to the shore.

Contemporary green-blue infrastructure practice in urban-rural landscapes

Co-Evolution towards green cities

In Europe, practices of intertwining built and green-blue structures are gradually degrading in Nordic cities – but they are instead developing in central European cities. Stockholm's *green wedges* (Florgård, 2004) and Copenhagen's *green finger plan* (Berg, 1993) are now inspiring Paris, London, Berlin, Rome and Barcelona on how to find a new interaction between urban and rural interfaces, *i.a.* for the *health* and *recreation* of its citizens (Mitchell and Popham, 2008; Stigsdotter and Grahn, 2003) for improving the *ecosystems services* (Elmqvist, et al., 2013; UNEP, 2005) and even increasingly for expanding the *primary production* in, near and across the free land areas surrounding and penetrating the city (Bokalders and Block, 2010; Ebbersten and Bodin, 1997). Below a selection of cases of urban-rural co-evolution systems are presented and discussed.

Urban-rural interactions in practice

A growing number of unique and good practices may illustrate a dawning interest among planning researchers and planning practitioners around the world for contemporary interaction and co-evolution (Saifi and Drake, 2007) of *urban and rural structures, functions* and *processes*. In some practices the contextual focus is on the geographic proximity of urban consumption and its adjacent green belt's rural primary production (table 2). During a world city planning competition hosted by the University of Tokyo 2003 (Itoh, 2003, pp. 198–226), Indian architect Aromar Revi and his India 2100-delegation was granted an honorary award for their 100-year plan of new human settlements in the west-coast Goa-province. In the proposition a «*rurban» sustainable urban development* principle was outlined with full interaction between urban and rural landscapes – mainly for the purpose of sustainable local food and water provision and of nutrient- and water cycling. An original idea of the *Caofeidian (Tangshan Bay) Eco-city project in China* was to link adjacent agriculture primary food production with the new settlement dwellers consumption – and via a *Recycling Management Centre* refine and feed back some of the nutrients from the waste-water and organic waste to local agriculture and aquaculture (Zhang, 2010). In the Baltic Sea Region (BSR – defined by the special watershed area of 14 countries), a series of three (2003 – 2013) Interreg funded projects *(Baltic Ecological Recycling and Agriculture – BERAS I, II and III)* investigated the preconditions for sustainable local food production systems intended for adjacent urban markets (Kahiluoto, et al., 2006). In another BSR – *Ecosystems Health and Agriculture* (EHSA) (Jacobsson, 2012) – Sustainable Agriculture for Local-Regional Consumption was investigated both in a BSR context and in the North-American *Great Lakes Region* (*ibid.*). Also, in one of three Sustainable Urban Development projects in the BSR – *Baltic University Urban Forum (BUUF)* – the share of local (adjacent to cities) food to total food consumed was investigated. Western Cities were found to typically have less than 1–2 % local food consumption (up to 10 % for smaller rural towns), whereas Eastern Baltic Cities still had a high share of local life support (up to 60 % local food for the largest cities) (See Berg 2007 and Ebbersten and Bodin, 1997). In a recent national survey in Sweden, it was established that a *re-localization* of food production is supported by many Swedish municipalities and by a majority of consumers in nationwide polls (Granvik, 2012). An international contemporary vital exponent of this growing interest for urban-rural interactions and local food, is the development of *Continuous Productive Urban Landscapes* (CPULs) – where research and practice of urban agriculture design for a number of unique sustainable cities' projects was developed (see *e.g.* Viljoen and Howe, 2006). A development of this idea can also be seen in the newly launched series of *Global Urban Agriculture Summits* (2011, 2013 and next 2014), arranged by the international enterprise Plantagon, asking: how could UN- and national research level practice, -industry and -politics support a crash program for the development of (sustainable) urban agriculture for the life-support of world cities in the future (GUA, 2013)?

Green-blue-built interaction in practice

Urban-rural interactions within the more limited realm of city planning, is mainly expressed as an interaction of urban built- and urban green-blue structures (see table 2). Such interaction is only to a small extent about urban and peri-urban primary production and nutrient recycling. It also represents a range of other GI values such as recreation, biodiversity, ecosystems services, cultural identity and a structural element in the city – see table 1. In the evaluation criteria for the EU Commission's Green Capital Award, three aspects were highlighted (EGCA, 2013a): citizens' access to green recreation areas, green structure share of total urban land-use (as a measure of ecosystems services potential) and the protection of biodiversity and valuable nature areas (Natura 2000 areas). At the same time, neither local primary production for urban use nor urban agriculture inside cities and peri-urban areas constituted, as yet, a main criterion for evaluating candidate cities.

In a comprehensive report for the Institute of Behavioral Sciences and the 22nd International Gas Conference in Tokyo, the role of green-blue infrastructure for future sustainable cities was elaborately presented. The report (*Proposals for the International Competition of Sustainable Urban Systems Design)* described future images for 11 global cities: Vologda – Russia, San Diego and Tijuana – USA and Mexico, Vancouver – Canada, Lin Jing Shen and Tong Ming team – China, Numazno-Mishama and Tokyo – Japan, Goa – India, Berlin – Germany, Buenos Aires – Argentina). Each of the 8 national teams presented a 100-year plan for their contemporary cities' transformation into sustainable cities (Itoh, 2003). The Goa scenario (see also above) was the only case where *urban and rural integration in a micro-regional* perspective was the main focus. In the Vancouver proposal (see table 2), *both Urban-rural* and *green-blue-built* interaction were main features of their 100-year plan. For all other participating cities, green-blue infrastructure was a key ingredient in their scenarios, typically confined to the *urban areas* themselves. International examples of new green-blue infrastructure planning, mainly targeting urban ecosystems services, biodiversity and recreation, have been suggested for Rio de Janeiro (Herzog, 2013), for Middle Eastern cities (Egoz, Pungetti and Makhzoumi, 2011) and are already implemented as new greenways and upgraded park systems in Bogota (Wright and Montezuma, 2004). The *Cheonggyeche stream* in downtown Seoul is a remarkable case where a 6 km linear riverside park was created when the overarching motorway was removed in the beginning of the new millennium (Landscape Architecture Foundation, 2013). Among the evaluated effects were a dramatic 50 % decrease in traffic-generated air particles, a 5 degrees lower heat island effect and – above all – a re-creational and multi-sensory experience for the 62000 Seoul-residents and 1400 tourists visiting the park everyday.

Urban-rural and Green-blue-Built interactions

A number of contemporary practices (table 2 and examples below) illustrate a more comprehensive view on urban-rural and built-green interactions. Some of the cases are close to our definition of *Citylands*. Green values were highlighted in the winning Vancouver proposal in the above mentioned world competition *Proposals for the International Competition of Sustainable Urban Systems*. Both urban-rural interactions on the *micro-regional* scale *and* green-blue-built structures interaction in different *local* scales within the city realm were mentioned (Moffat, 2003). The European Ecocities project featured seven scenarios of new sustain-

Table 2
Selected International Cases where urban-rural or green-blue-built interactions represented a conscious planning strategy for rendering human habitats more sustainable. Note that some projects have focused on regional (city-countryside) interactions and some more on local (cities and towns) green-blue-built infrastructures. A few cases describe both urban-rural and built-green interaction scales.

Case	Urban-rural (mainly regional)	Built-Green (mainly local)	Reference
Goa 100-year plan in India	A 100-year plan for a strong physical connection between settlement and production lands and waters		Itoh (2003), pp. 198–226)
World Urban Futures		Strategic Longitudinal Sustainability Scenarios for 11 world cities – most with green & built interlaced structures	Itoh (2003)
Vancouver Greater Region Cities[PLUS] 100-year plan in Canada	An award-winning plan for closing nutrient cycles and increasing local production in the whole region	The 100-year urban plan also targeted green and blue elements and structures in the city for multiple purposes	Moffat (2003)
EU Ecocities projects. Plans for seven European City districts.		Strong highlighting of green structure for recreation, ecosystems services and biodiversity	Gaffron, Huismans and Skala (2005)
Vauban district in Freiburg in Germany	Interface between urban settlement and surrounding fields and forests with orchards, edible gardens, streams and stables	Interaction of four scales of green within the settlement: entrance-, courtyard-, district- and wilderness green	Bokalders and Block (2010), p. 581
The Cheonggyecheon river restoration project in South-Korean Seoul		Former downtown river-branch covered with motorway – since 2003 transformed to a 6 km linear river park.	Landscape Architecture Foundation (2013)
Nantes Green Plan In France	Traditional and contemporary support of local Loire-valley farmers	Advanced Green infrastructure planning for recreation, ecosystems services and biodiversity	EGCA (2011b)
Bogota Ciclovia		Bicycle and Pedestrian Network with 25 km greenways through parks and along the river	Wright and Montezuma (2004)
Clichy Batignolles & Jardin Partage, Paris, France		Northern Paris Central Park for recreation, ecosystems services (health) and biodiversity. 100 urban pocket gardens for small-scaleurban food production	Egnor (2009)
Eco Quartier Pfaffenhofen München Germany	Regional Eco-cycling with urban fertile clean soil production – linked to adjacent rural food and fibre- and fuel production	Multi-scale green-blue-built infrastructure integration in mixed-use community	Casselman (2007); EQ Pfaffenhofen (2013)
Nyalenda peri-urban slum in Kisumu, Kenya		Plans for New Green-blue In-frastructure in Suburban Live-lihoods – focusing on water management and temperature regulation with local trees	Brunsell (2003)
Turenscape Houtan Park in Shanghai, China		Landscape Park transforming polluted and degraded landscapes and waters to attractive recreation and purification landscapes	Landscape Architecture Foundation (2013); Yu (2012)

ability districts in seven European Cities – from Tampere in Finland to Barcelona in Spain (Gaffron, Huismans and Skala, 2005). Most of the cities highlighted mainly the recreational and biodiversity rationale of the proposed eco-city green-blue spaces, however, the common goals for greening of the new city districts were more encompassing than that. Four of the goals for ecocities were characteristic of both urban-rural interactions and of green-blue-built interaction: *City in balance with nature, City with integrated green areas, City of bioclimatic comfort, City integrated into the surrounding region* – but also *City with closed water cycles*.

Green Infrastructure values were furthermore emphasized on a regional level as actual *green wedges* in Nantes (EGCA, 2013b). GI values for recreation, ecosystems services and biodiversity were highlighted just as much as the value of preserving traditional Loire-valley agricultural practices for urban dwellers' use. Other EGCA Award winning cities (Stockholm, 2010 and Copenhagen, 2014) have emphasized both urban-rural regional interactions together with city integrated green-blue infrastructure values (*e.g.* recreational and ecosystems services values).

All the aforementioned cases still, more or less, possess an *urban approach* to urban-rural interaction. A fully and mutually informed co-evolution of urban and rural – and of green-blue and built areas – is still largely missing. And it is a reciprocal dependence, where the full potential of urban and rural structures, functions and processes is utilized, that we define as *Resilient Citylands*. In table 3 green-blue infrastructure values and functions were listed and selected and tentative *Resilient Citylands*' goals described. Some of our research questions were also added to illustrate the new concept and the common denominator as a *connected urban and rural approach*. Table 3, therefore, also represents a list of global challenges for landscape architecture. But *Resilient Citylands* structure and function can be exemplified also beyond more obvious green-blue infrastructure values.

Resilient Citylands in a wider perspective

The earlier described cases/examples in table 2 highlight a selection of *green-blue-built* and *urban-rural* integration cases in different scales and table 3 outlines some characteristics for *RCL* solutions – all related to green-blue infrastructure values. The following international (mostly European) cases are implicating a wider perspective of *Resilient Citylands* illustrating selected and characteristic RCL solutions for *e.g.* energy, transport and building:

1. In Japan, USA, Denmark and Germany experiments have been carried out to co-ordinate different distributed renewable energy production systems (Blaabjerg, et al., 2006). The challenge is i.a. to synchronize urban PV electricity and waste incineration heat production with rural wind power, hydropower and bioenergy heat production.

2. In Karlsruhe, Germany, a *Duo-tram* system connects urban public transport with rural regional transit – a system that combine the dual need of rural-urban commuting and intra-urban mobility (Bokalders and Block, 2010).
3. One European Green Capital award-winning feature for Copenhagen (2014 winner of the Award), was the interlinked urban and regional bicycle network, facilitating a zero-emission mobility target in the Greater Copenhagen Region (EGCA, 2013c).
4. Several of Joachim Eble Architects' award-winning sustainability plans for European urban district projects, encompass a *cityland approach* with interaction of green-blue elements in the architecture as well as plans for urban-rural co-evolution (*see e.g.* Eble (2013) about Culemborg, the Netherlands (built), Vauban in Freiburg (built), Altstadt in Tübingen (built), Ostia in Rome (plans), Tianin in Taiwan (plans)).

One of the most advanced building projects under construction with a – in principle – complete *resilient citylands* plan can be found in the new suburban district *Pfaffenhofen* north of München (EQ Pfaffenhofen, 2013). This case contains an urban-rural settlement plan under construction including an eco-housing area, a primary food production area and a local business area. The built area as a whole and its constructed elements are fully integrated with production- and recreation landscapes on four scale levels.

A full *Resilient Cityland approach* was also used for the development of a model district – *Hågaby* in Uppsala Sweden – built according to the UN Habitat agenda (UNCHS, 1996). This settlement features urban *and* rural solutions for seven main resource categories: physical, economic, biological, organizational, social, cultural and aesthetic resources (Berg, 2004; Berg, 2002).

Table 3
A Resilient Citylands approach to six listed key green-blue infrastructure (GI) values/functions (Boverket, 2013; Sandström and Hedfors, 2009). All RCL potential solutions were interpreted to be of *mutual value* for both urban and rural areas, from both a green-blue- and built infrastructure perspective. All suggested RCL goals and solutions are tentative and linked to selected key literature or on-going research (in brackets).

Green Infrastructure Values and Functions	Potential Resilient Citylands(RCL) goals and practice solutions – *with selected Research Questions and references*
1. **Recreation, Health & Social Interactions** (Berg and Rydén, 2012; Berg 2010; Thompson, 2000)	Recreation, healthy environments and social interactions are commonly sought by all citizens in *both* urban parks *and* rural landscapes. *How can urban parks and rural city-near restorative forests, fields and waters be planned and designed to connect in the urban-rural fringe zone? How can such fringe zones be developed for a majority of urban and rural dwellers in several RCL scales (region, city, community – see 3 below)? How can active RCL guidance[9] of citizens be carried out for both urban and rural dwellers' recreation?*
2. **Biodiversity protection and development** (Ignatieva and Ahrné, 2013; Hedfors and Florgård, 2012)	Biologically valuable ecosystems are protected and displayed for citizensin urban parks *as well as* in rural natural and cultural landscapes. *How can RCL green-blue areas and its network pathing– ranging from dense urban centers to sparsely populated rural areas – better be integrated and represented? How can connected species richness and functional diversity be described for urban and rural dwellers, i.e. as highly versatile maps over multi-functional, connected green-blue spaces?*
3. **Human Habitat Structure and Function** (Seitzinger, et al., 2012; Berg, 2010; Bokalders and Block, 2010)	Attractive and functional infrasystems are interlaced and co-planned: built-, green-, transport-, technical- and service infrastructures. *How can an appropriate and efficient reciprocal green-blue-built matrix be realized in Human habitats? How could a transition –* **from** *peripheral green belt –* **to** *radial green-blue wedges structure in future urban areas – be put into practice? How can systems of green-blue wedges reaching in towards urban centers and built wedges reaching out into surrounding rural landscapes be co-ordinated?*
4. **Cultural Identity** (Ignatieva and Stewart, 2009; Ignatieva and Ahrné, 2013)	Well-defined urban and rural heritage values are made available for all citizens. *How can historic city centers´ buildings and parks be easy accessible and pedagogically displayed for urban-, sub-urban- and rural dwellers? How can valuable heritage-, culturally molded and natural rural landscapesbe rendered easily accessible and pedagogically displayed for all citizens? How can heritage park- and garden design and future sustainability planning be reconciled?*
5. **Ecosystems Services** (environmental regulation and climate change mitigation) (Elmqvist, et al., 2013) (UNEP, 2005)	Urban and rural environments are co-ordinated, in order to make full use of appropriate regulatory ecosystems services. *How can urban and rural green-blue infrastructure help creating more resilient and comfortable human habitats? How can cities, districts and local communities benefit from the temperature-, moisture-, sun protective- wind-, water flows- and air quality regulating capacity of forests, parks, green courtyards-, alleys-, trees-, shrubs-, and soil microbial ecosystems? How can cities, towns and rural communities be adapted for future climatic and environmental conditions?*
6. **Primary Production and Ecotechnology** (Granvik, et al., 2012; Berg, 2010; Casselman, 2007)	A complementary primary production and recycling system is created by combining urban and rural food-, fodder-, fiber- and fuel production capacities. *How can a supplementary system of urban high-value food- (leaf vegetables and fruit) and rural bulk production of (i.a. grain and root vegetables) be created? What is the long-term role of re-localization of food, materials and water recycling? How can urban waste obtain a quality sufficient for fertilizing food crops? How can clean and fertile soil be created from urban organic waste and charcoal – for use in green urban areas and rural primary production? How can a transformation from water- to soil recipients for sewage effluents be achieved? What are the comprehensive roles of urban agriculture in the global food system?*

9 Guidance refer to i.a. signature design of tram-stops and sign-posts, IT-screens and mobile apps guiding urban and rural dwellers to urban and rural recreation.

Risks and potential weaknesses with RCL

This paper suggests that *Resilient Citylands* may be a useful concept for describing a modern version of harmonized and mutually supportive urban-rural landscapes. In general this concept is about production, dwelling, culture, transport and energy and, in particular, for a mutually beneficial utilization of the functions and values of green-blue infrastructure. In this paper we see *re-localization of markets* as an important driver for the formation of *Resilient Citylands*. But as for all innovative conceptions, the new approach may in practice backfire, be misinterpreted or just generate unexpected problems and even threats – see *e.g.* Peter North's elaboration on the geo-political critique of localization as a strategy for abating climate change (North, 2010). Re-localization of *markets* may for instance lead to *higher prices* and a more limited *range of commodities* than what can be offered on a (ideally speaking) perfect competitive market. If RCL mean smaller and more geographically confined local production markets, their *vulnerability* may be greater compared to larger regional or global markets. Local markets can also be seen in a perspective of *protectionism* and may potentially adoptan *authoritarian* local governance (*ibid.)*.

Trying to inform and attract citizens about urban *and* rural recreation or heritage values in the landscape (see table 3), may furthermore not be in line with public preferences. Some people may actually be more or less urban *or* rural. Assuming there is a risk that municipal planners or politicians adopt a static or *universal* view on *Resilient Citylands*' ideal structure and function, may furthermore overlook the *contextual* reality in cities, towns and local communities. This may result in an inefficient use of resources. In some areas, it may for instance be appropriate to develop a 10 % local food production or local labour market, in other locations it is more justified to produce 30 % of the local food and 50 % of the workplaces within the micro-regional context (Berg, 2007). The meaning of *local* is also relative. Sometimes it is reasonable to refer to the *community level*, in other circumstances the *macro-region is the appropriate local market* for urban – rural interactions (North, 2010). *Resilient Citylands* is not always suggesting geographic proximity – but is sometimes represented rather by a consciousness among planners about urban-rural connections.

Discussion

In this paper we have elaborated on, and with actual cases tried to demonstrate, how a modern integration of urban and rural areas and of built and green-blue infrastructures may transform human habitats to a state we call *Resilient Citylands*. With increasing global resources scarcity and an aggravated environmental crisis as drivers (IPCC, 2013), we suggest that *Resilient Citylands* may constitute a partly new sustainability focus for landscape architecture. This involves a modern geographic structural, functional and processes urban-rural integration (Seitzinger, et al., 2011) and co-evolution (Saifi and Drake, 2007). A fundamental idea of the *Resilient Citylands* concept is that urban and rural activities can supplement each other in more elaborate, efficient and profitable ways than they do today. We have tried to show that such *Resilient Citylands* interactions can occur on *larger regional scales*, *city scales* or on *local community scales* within towns, city districts or local neighbourhoods. A transformation towards *Resilient Citylands* can be enhanced by*re-localization* of markets – *i.e.* a relative displacement of primary production-recycling systems – from global to macro-regional (*i.a.* the Mediterranean or Baltic Sea macro-regions), to micro-regional (*i.a.* European Union NUTS regions), to city levels and to local community levels.

We have offered a preliminary definition of the structural, functional and process properties of *Green-blue Infrastructure* and we have defined *Resilient Citylands*. We have tried to clarify that Landscape architecture has throughout its history emphasized the strong link between urban and rural functions as well as the reciprocal interdependence and values of built- and of green-blue infrastructure values. Our examples demonstrate a growing international and municipal interest of urban and rural interactions and of green-blue-built infrastructure for a number of reasons: for recreation, to preserve biodiversity, to develop and maintain a functionally efficient and aesthetically attractive human habitat structure, to protect heritage values, to release ecosystems services and to secure a resilient primary production and recycling.

We propose the *Resilient Cityland* concept as a tentative working hypothesis for integrated and more sustainable urban-rural and built-green-blue systems, with its potential *strengths and weaknesses*. Our ambition is to continue our current research and provide nuanced cases, which may enrich and rectify our new preliminary green-blue-built infrastructure concept. We hereby also invite a scientific discussion and an emergent collection of examples which may support, criticize and develop our understanding of what can create truly sustainable human habitats.

We have also with our cases tried to show that *Resilient Citylands* cannot be expected to be universal but probably have a *contextual expression*. Landscape architecture is particularly suited to criticize and elaborate on the *Resilient Cityland* concept, for its utilisation in city-, rural- and community planning as well as for the purpose of design and implementation. Chinese landscape planner Kongjie Yu has over the past decades started to transform the concept of progress in China – from «small-foot» (as in traditionally tied Chinese girl feet) to «big foot» approaches, where landscapes are liberated to invite natural flows and processes – landscapes that are built for settlements that can resiliently master expected climate change induced perturbations and regain their function over and over again (Yu, 2012). Yu has had a notable impact, while introducing these aspects in current Chinese planning, much like Frederick Law Olmsted had in the United States 150 years ago. Yu, renowned also in the global Landscape architecture community for combining Architecture and Ecological infrastructure in Landscape architecture, has a motto for planning resilient human habitats: «Begin with the ecological (green-blue) infrastructure».

Acknowledgement

The research discussed in this paper was financed by The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning (Formas) and the Swedish Institute.

Ahern, J., 2007. Green infrastructure for cities – the spatial dimension. In: Novotny V. and Brown P.R., eds. *Cities of the future – towards integrated water and landscape management.* Proceedings of an International Workshop in July 12–14, 2006 in Wingspread Conference Center, Racine. London: WI.IWO publishers.

Alexander, C., Ishikawa S. and Silverstein, M., 1977. *A Pattern Language – Towns, buildings, construction.* Oxford: Oxford University Press.

Artmann, J., Huttenloher, C., Kawka, R. and Sholze, J., 2012. *Partnership for rural-urban development – existing evidences.* Desk study for the European Parliament and DGRegio conference Sustainable Urban Rural Partnerships in Warsaw, Poland 23–25 April 2013. Retrieved at http://ec.europa.eu/regional_policy/conferences/rurban/2013/index_en.cfm

Baskin, Y., Reynaldo, V., Banwart, S., Black, H., Ingram, J., Joosten, H., Milne, E., and Noellemeyer, E., 2012. *The Benefit of Soil Carbon UNEP Year Book – Emerging Issues in our Global Environment* 2012. Nairobi: United Nations Environmental Program. pp. 19–33.

Benson, J.F. and Roe, M., eds., 2005. *Landscape and Sustainability*. London: Spon press.

Berg P.G., 2010. *Timeless Cityland – an Interdisciplinary Approach to finding the Sustainable Human Habitat.* Uppsala: Baltic University Press and Department of Urban and Rural Development, SLU University. 350 pp.

Berg, P.G., 2007. The Urban-Rural Connection. In: P.G. Berg, ed. *Urban-Rural Co-operation.* Baltic University Urban Forum (BUUF). Urban Management Guidebook VIII. European Regional Development Fund: BSR INTERREG IIIB Neighbourhood Programme. Baltic University Press. Uppsala: pp. 15–19.

Berg, P.G., 2004. Sustainability Resources in Swedish Townscape Neighbourhoods – Results from the Model Project Hågaby and Comparisons with Three Common Residential Areas. *Landscape and Urban Planning,* 68, pp. 29–50.

Berg, P.G., 2002. The City as a Sustainable Living System (Chapter 4 – pp. 24–33); Demonstrating Sustainability in Human Habitats (Chapter 5 – pp. 34–38); Developing Sustainability in Hågaby Village (Chapter 6 – pp. 39–56). In: L. Rydén, ed. *Basic Patterns of Sustainability. Case Studies I. Reports from the SUPERBS (Sustainable Urban Patterns around the Baltic Sea) project*. Uppsala: Baltic University Press.

Berg, P.G., 1993. *Biologi och Bosättning – Naturanpassning i samhällsbyggandet (Biology and Settlement – Nature adaptation in Community Construction – in Swedish).* Stockholm: Natur och Kultur.

Berg, P.G. and Ignatieva, M., 2012. Resilient Citylands – Launching a new Research Program for Sustainable Human Habitats in the Baltic Sea Region. In: L. Kannunikova. *Green Infrastructure,* VI[th] ICON-LA EFLA conference at SLU University in Uppsala and FTA University, StPetersburg. Proceedings. p. 8.

Berg, P.G. and Rydén, L., 2012. Urbanisation and Urban-Rural Co-operation. In: I. Karlsson and L. Rydén, eds. *Rural Development and Land Use.* Ecosystems Health and Sustainable Agriculture 3. Centre for SD, SLU and Uppsala Universities. pp. 141–154.

Berg, P.G., Granvik M. and Hedfors P., 2012. Functional Density – A Conceptual Framework in a Townscape Areas Context. *Nordic Journal of Architectural Research.* 2: pp. 29–46.

Berg, P.G., Eriksson, T. and Granvik, M., 2010. Micro-comprehensive Planning in Baltic Sea Urban Local Areas. *Engineering Sustainability* – an ICE Journal, –163 (ES4), pp. 219–232.

Beveridge, C.E and Rocheleau, P., 1998. *Frederick Law Olmsted: Designing the American Landscape*. New York: Universe Publishing.

Blaabjerg, F., Lov, F., Teodorescu, R. and Chen, Z., 2006. *Power Electronics in Renewable Energy Systems*. The 12[th] Power Electronics and Motion Control EPE-PEMC Conference in Pororož Slovenia 30 August – 1 September. The European Power Electronics and Drives Association (EPE), Brussels, and Institute of Electrical and Electronics Engineers. New York: Proceedings, pp. 1–17.

Bokalders, V. and Block, M., 2010. *The Whole Building Handbook – How to Design Healthy, Efficient and Sustainable Buildings.* London: Earth Scan and RIBA publishing, 450 pp.

Borras, S. Jr. and Franco, J., 2012. Global land grabbing and trajectories of agrarian change: a preliminary analysis. *Journal of Agrarian Change,* 12 (1).

Boverket, 2013. *Grönstruktur* (Green structure). http://www.boverket.se/Planera/planeringsfragor/Gronstruktur/

Brown, L., 2009. *Plan B 4.0. Mobilizing to save Civilization.* Washington D.C.: Earth Policy Institute.

Brunsell, L., 2003. *Small-Scale Drain-*

age Solutions in Nyalenda Slum Kisumu, Kenya. Uppsala: Minor Field study, SLU University.

Carlsson Kanyama, A., 1999. *Consumption patterns and climate change: consequences of eating and travelling in Sweden.* Stockholm University Dissertation. Summary in English. *AFR report,* p. 242.

Carpenter, T.T. 2011. *Construction in the Landscape* – A Handbook for Civil Engineering to Conserve Global Land Resources: Earthscan from Routledge.

Casselman, A. 2007. Special report: Inspired by Ancient Amazonians, a Plan to Convert Trash into Environmental Treasure. *Scientific American,* 15 May.

Cooper Marcus, C. 1997. Nature as Healer: Therapeutic Benefits in Outdoor Places. *Nordisk arkitekturforskning* ,10 (1): pp. 8–20.

Deming, E. and Swaffield, S., 2011. *Landscape Architecture Research – Inquiry, Strategy.* Wiley Publishers.

Ebbersten, S. and Bodin, B., 1997. A sustainable Baltic Sea Region. Booklet 4 *Food and fibres – sustainable agriculture, forestry and fishery*. Uppsala: Baltic University Press.

Eble, J., 2013. *Eble Architektur:* http://www.eble-architektur.de/index_deu.html (In German)

EC, 2010. *Green Infrastructure Implementation*. Proceedings of the European Commission Conference 19 November 2010, Brussels, Belgium. Available at: http://ec.europa.eu/environment/nature/ecosystems/docs/Green_Infrastructure_Conference_Proceedings191110.pdf

EGCA, 2013a. European Green Capital Award. *Expert Panel technical report* Award cycle, 2015, 54–56.

EGCA 2013b European Green Capital Award – Environmental *Best practice Report* Award Cycle 2013:27–28.

EGCA, 2013c. European Green Capital Award. *Expert Panel Report* Award Cycle, 2014, 27–28.

Egnor. T., 2009. *Ett grönt Paris? – Om den hållbara staden och förändringar i stadslandskapet* (A green Paris? – In Swedish with English Summary). Master Thesis at the Department of Urban and Rural Development – Unit of Landscape Architecture. SLU Uppsala.

Egoz, S., Pungetti, G. and Makhzoumi, J., 2011. *The Right to Landscape – Contesting Landscape and Human Rights.* Farnham Surrey: Ashgate.

ELC, 2000. *European Landscape Convention.* Council of Europe. European Treaty Series 176.

Elmqvist, T., Redman C.L., Barthel S. and Costanza, R., eds., 2013. *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities: A Global Assessment. Berlin:* Springer Verlag.

EQ Pfaffenhofen, 2013. EcoQuartier-Pfaffenhofen. *See* http://www.ecoquartier.de/

EU, 2013. *Green Infrastructure concept*. DG Environment (Nature and Biodiversity). Available at: http://ec.europa.eu/environment/nature/ecosystems/

Florgård, C., 2004. *Stockholm's greenblue infrastructure.* Case study in Working group 2 of COST ACTION 8 – Sustainable Urban Infrastructure. See Welsh School of Architecture on http://www.cardiff.ac.uk/archi/programmes/cost8/

Florgård, C. and Berg, P.G., 1997. The Function of Urban Green Structure in Sustainable Urban Development. In: S. Guldager and K. Nilsson, eds. 1997. *Ressource husholdning i kommunernes planlæggningog forvaltning af fri arealer.* Proceedings på baggrund af nordisk workshop marts 1996. Hørsholm, Denmark: Miljø och Energiministeriet, Forskningscentret for skov och landskab.

Folke, C., Jansson, Å., Larsson J. and Costanza, R., 1997. Ecosystem Appropriation by Cities. *Ambio,* 26, pp. 167–172.

Fragkias, M. and Seto, K., 2012. The rise and rise of urban expansion. *Global change,* 78, pp. 16–19.

Gaffney, O. and Höppe, P., 2012. Risky Business – on economic insurance company losses due to global natural disasters 2011. *Global Change,* 78, pp. 24–27.

Gaffron, P., Huismans, G. and Skala F., eds., 2005. *Ecocity. Book I – A better place to live.* EU Commission project. Urban development towards Appropriate Structures for Sustainable Transport. Hamburg Univ. of Technology, SenterNovem, Dutch Agency for Sustainability and Innovation and Department of Ecological Economics and Management, Vienna University of Economics and Business Administration.

Garreau, J., 1992. *Edge city – Life on the new frontier.* New York: Anchor Books.

Geddes, P., 1904. *City development – a study of Parks, Gardens and Culture Institutions*. A Carnegie Trust report, London.

Gehl, J., 2010. *Cities for People*. Washington: Island Press.

Granvik, M., 2012. The Localisation of Food Systems – An Emerging Issue for Swedish Municipal Authorities. *International Planning Studies*, 17 (2), pp. 113–124.

Granvik, M., Lindberg, G., Stigzelius, K-A., Fahlbeck, E. and Surry, Y., 2012. Prospects of multifunctional agriculture as a facilitator of sustainable Rural Development: Swedish experience of Pillar 2 of the Common Agricultural Policy (CAP). *Norwegian Journal of Geography*, 66 (3), pp. 155–166.

Graziano Da Silva, J., 2013. *Toward small-scale local food production – sustainability depends on the way food is produced and consumed*. University of Gastronomic Sciences, Bra Italy. At: http://www.fao.org/

GUA, 2013. Global Urban Agriculture Summits. Linköping: Plantagon.

Haberl, H., 2012. Addicted to Resources. *Global Change,* 78, pp. 20–23.

Halweil, B., 2002. *Home grown: The case for local food in a global market*. Worldwatch Paper 163. Washington DC: Worldwatch Institute.

Hedfors, P. and Granvik, M., 2008. *Landscape Architecture Theory: A Source for Interdisciplinary Sustainable Design.* In: L.M.F. Fabris, ed. Proceedings of the *Environscape: A Manifesto,* 2nd blu+verdeIntnl Congress, Milan: Politecnico di Milano, Faculty of Architecture, Department BEST, 23–24 October, pp. 327–336.

Hedfors, P. and Florgård C., 2012. Design with nature – the Gardener's view. In: M. Luccarelli, ed. *Green Oslo: visions, planning and discourse*. Ashgate.

Herzog, C. 2013. A multifunctional green infrastructure design to protect and improve native biodiversity in Rio de Janeiro. *Landscape and Ecological Engineering*, 31 (October), pp. 1–10.

Hinrichs C., 2003. The practice and politics of food system localization. *Journal of Rural Studies,* 19 (1), pp. 33–45.

Hollings, C.S. 1973. Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*. Vol, 4, pp. 1–23.

Hough, M., 2004. *Cities and Natural Process – A Basis for Sustainability*. 2nd Edition. Routledge.

Hyams E., 1976. *Soil and Civilisation*. London: John Murray.

IGBP, 2004. *Global Change – a Planet under Pressure*. International Geosphere Biosphere Program. Stockholm: The Royal Swedish Academy of Science.

Ignatieva, M. and Ahrné, K., 2013. Biodiverse Green Infrastructure for the 21st Century: from «the Green Desert» of Lawns to Biophilic Cities. *Journal of Architecture and Urbanism*. 371, pp. 1–9.

Ignatieva M. and Stewart G., 2009. Homogeneity of urban biotopes and similarity of landscape design language in former colonial cities. pp. 399–421. In: M.J. McDonnell, A. Hahs, and J. Breuste, eds. *Comparative Ecology of Cities and Towns.* Cambridge University Press.

IPCC, 2013. Intergovernmental Panel on Climate Change Working Group 1, Summary for Policy Makers. UNEP

Itoh, S., ed., 2003. *Proposals for the International Competition of Sustainable Urban Systems Design – Report of the International Gas Union Special Project*. Tokyo: The Institute of Behavioural Science, pp. 198–226.

Jacobsson, C., ed., 2012. *Ecosystem Health & Sustainable Agriculture, Book 1*. Uppsala: The Baltic University Programme.

Kahiluoto, H., Berg P.G., Granstedt A., Thomsson O. and Fischer, H., 2006. *The Power of Local – sustainable food systems around the Baltic Sea*. Interdisciplinary synthesis of the Interreg III B project Baltic Ecological Recycling Agriculture and Society (BERAS) *Report No 7*.

Kahn, A. and Burns, C.J., 2005. Introduction to Site Matters. In: C.J. Burns and A. Kahn, eds. *Site matters: design concepts, histories and strategies*. London: Routledge.

Karlsson, I. and Rydén L., 2012. *Rural Development and Land Use*. Uppsala: Baltic University Press.

Landscape and Ecological Engineering (in press).

Landscape Architecture Foundation 2013. Cheonggyecheon Restoration Project. LAF Case study briefs.
Available at: http://www.lafoundation.org/research/landscape-performance-series/case-studies/?benefit=select_all&project_type=select_all&location=country_South+Korea

Leader Regions, 2000. http://c.europa.eu/agriculture/rur/leaderplus/index_en.htm

LRF, 2009. Sveriges Gröna näringar – Fakta 2009 (Sweden's green industry – Facts). Lantbrukarnas riksförbund.

Lundgren, Alm E., 2001. *Stadslandskapets obrukade resurs*. (The Undeveloped Resource of the City Landscape). Dissertation (in Swedish). Göteborg: Chalmers Technical University.

Lövrie, K., 2003. *Det gröna som identitetsskapandestadsbyggnadselement – objekt, concept och struktur.* (Green Areas as an Identity Creating Town planning Element – object, concept and structure. Dissertation Swedish University of Agricultural Sciences, Alnarp. *Agraria* 423.

McHarg, I., 1969. *Design with Nature*. New York: Natural History Press.

Miller, M., 1989. *Letchworth – The First Garden City*. Chichester: Phillimore.

Mitchell, R. and Popham, F., 2008. Effect of Exposure to Natural Environment on Health Inequalities: an Observational Population Study. *The Lancet,* 372 (9650), pp. 1655–1660.

Moffat, S., 2003. CitiesPLUS. In: S. Itoh, ed. Proposals for the International Competition of Sustainable Urban Systems Design – *Report of the International Gas Union Special Project*. Tokyo: The Institute of Behavioural Science.

Mumford, L., 1961. *The City in History.* San Diego: Hardcourt Inc.

Murphy, M., 2005. *Landscape Architecture Theory – An Evolving Body of Thought*. Illinois: Waveland Press.

Murphy, M. and Hedfors, P., 2011. Systems theory and Landscape Architecture. In: R. Berney, ed. *Urban Nature,* CELA. Los Angeles, USA. 30 March–2 April 2011.

North, P., 2010. Eco-localization as a progressive response to Peak Oil and Climate Change – a Sympathetic Critique. *Geoforum* 41: pp. 585–594.

Odum, E.P., 1989. *Ecology – and our endangered life-support systems.* Massachusetts: Sinauer.

Ottosson, J., 2007. The Importance of Nature in Coping. Alnarp: Dissertation Landscape architecture department.

Queiroz, M., 2009. *Urban agriculture/ Agricultural urbanity: om stadsodling, urban och peri-urban agrikultur, för en mindre klimatbelastande och energikrävande matproduktion*. MasterThesis. Landscape Architecture Unit SOL. Department Uppsala. (in Swedish) University of Agricultural Sciences (Uppsala).

Qviström, M., 2008. Nordiska studier av stadsnära landskap (Nordic Studies of City-close Landscapes – in Swedish). Alnarp: LTJ-fakulteten.

Rowe, S. and Humphries, S., 2012. *The Coombes Approach – Learning through an Experiential and Outdoor Curriculum. London:* Continuum International Publishing Grou.

Saifi, B. and Drake, L., 2007. A coevolutionary model for promoting agricultural sustainability. *Ecological Economics,* 65, pp. 24–34.

Sandström, U.G. and Hedfors, P., 2009. Mångsidiggrönska vs. Grånandeförtätning: Planerings- och gestaltningsmotiv för stadens blågröna infrastruktur (On Green-blue city Infrastructure – in Swedish). In: P. Hedfors, ed. *Urban naturmark i landskapet* (Urban Nature in the Landscape), pp. 320–337. SLU, Dept. of Urban and Rural Development, Division of Landscape architecture, Rapporter, No. 3. Available online 15 Aug 2013 at: http://pub.epsilon.slu.se/9431/

Seitzinger, S.P., Svedin, U., Crumley C.L., Steffen, W., Arif Abdullah, S., Alfsen, C., Broadgate, W.J., Biermann, F., Bondre, N.R., Dearing, J.A., Deutch, L., Dhakal, S., Elmqvist, T., Farahbakhshazad, M., Gaffney, O., Haberl, H., Lavorel, S., Mbow, C., McMichael, A.J., deMorais, J.M.F., Olsson, P., Fernanda Pinho, P., Seto, K.C., Sinclair, P., Stafford Smith ,M. and Sugar, L., 2011. Planetary Stewardship in an Urbanizing World: Beyond City Limits. *Ambio,* September.

Sinclair, P.J.J., Nordquist, G., Herschend, F. and Isendahl, C., eds., 2010. *The urban mind: cultural and environmental dynamics*. Uppsala: African and Comparative Archaeology, Department of Archaeology and Ancient History. Uppsala University.

SOU, 2005. En Hållbar landsbygdsutveckling – Del betänkande av Landsbygdskommittén (A sustainable rural development – in Swedish – Swedish Public Investigation) (Stockholm).

Spirn, A.W., 1996. Constructing Nature – The Legacy of Frederick Law Olmsted. In: W. Cronon, ed. *Common Ground – Rethinking the Human Place in Nature.* New York: Norton & Co.

Spirn, A.W., 1984. *The Granite Garden: Urban Nature and Human Design*. New York: Basic Books.

Stigsdotter, U. and Grahn, P., 2003. Experiencing a Garden: A Healing Garden for People Suffering from Burnout Diseases. *Journal of Therapeutic Horticulture*, 14, pp. 38–48.

Stockholm County Council, 2009. *Regional Utvecklingsplan* för *Stor-Stockholm* (A Regional Development Plan for Greater Stockholm – Swedish) (RUFS, 2010). Stockholms Läns Landsting (Stockholm County Council).

Syvitsky, J., 2012. Anthropocene – An epoch of our making. *Global Change,* 78, March, pp. 12–15.

Thompson, I., 2000. *Ecology, Community and Delight – Sources of value in Landscape Architecture. London:* Spon Press.

Thwaites, K., Porta S., Ombretta, R. and Greaves, M., 2007. *Urban Sustainability through Environmental Design – Approaches to Time-People-Place Sensitive Urban Space*. Routledge.

Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kazmierczak, A., Niemela, J. and James, P., 2007. Promoting ecosystem and human health in urban areas using green infrastructure: a literature review. *Landscape and Urban Planning,* 81, pp. 167–178.

UNCHS, 1996. The Habitat Agenda and the Istanbul Declaration. *UN Conference on Human Settlements*. Nairobi: UN Habitat.

UNEP, 2005. Millenium Ecosystem Assessment: Living Beyond our Needs: *Natural Assets and Human Wellbeing: Statement of the Board.* New York: United Nations Environmental Program.

Viljoen, A. and Howe, J., 2006. *Continuous Productive Urban Landscapes* Oxford: Architectural Press.

Wheeler, S.M. and Beatley, T., 2008. *Sustainable Urban Development Reader*. New York: Routledge.

Wright, L. and Montezuma, R., 2004. Reclaiming public space: The economic, environmental and social impacts of Bogotá's transformation. University College London. Open access eprint. Retreive at: http://eprints.ucl.ac.uk/110/1/Wright_and_Montezuma,_Walk21_V,_Copenhagen,_Jun_2004.pdf

Yu, K., 2012. The Beautiful Bigfoot – Toward a New Landscape Aesthetic. *Arcade, 30.2*. Available at: http://arcadenw.org/article/the-beautiful-bigfoot

Zhang, Y., 2010. *Caofeidian Eco-city – A Specialised Analysis of the Chinese Future Metropolis*. Master Thesis within the Advanced level program Sustainable Development. Uppsala University and Swedish University of Agricultural Sciences.

Åkerman, J., 2011. *Transport Systems Meeting Climate Targets*. Dissertation. Stockholm KTH: Architecture.

Biographical information

Per G. Berg
Professor in Landscape
Planning
Department of Urban and Rural
Development, Swedish University
of Agricultural Sciences
Address: P.O. Box 7012
SE-750 07 Uppsala, SWEDEN
Telephone number: +46 18 67 25 13
E-mail: per.berg@slu.se

Professor in Landscape Architecture with a special focus on Sustainable Community Development in Urban and Rural settings. He is working at the Department of Urban and Rural Development, Unit of Landscape Architecture, Swedish University of Agricultural Sciences. Expert in the European Commission's European Green Capital Award Committee. His latest FORMAS funded research project is «Functional Density – A critical study on densification as a sustainability strategy in ordinary local Swedish urban townscape areas». The Swedish Institute has financed a pre-study on «Resilient Citylands».

Biographical information

Madeleine Granvik
Researcher and Theme leader in Sustainable Development and Management of Urban-Rural Interactions
Department of Urban and Rural Development, Swedish University of Agricultural Sciences
Address: P.O. Box 7012
SE-750 07 Uppsala, SWEDEN
Telephone number: +46 18 67 19 50
E-mail: Madeleine.Granvik@slu.se

Human geographer from Uppsala University. She holds a PhD in Landscape Planning and is currently a researcher in Sustainable Development and Management of Urban-Rural Interactions at the Department of Urban and Rural Development, Unit of Landscape Architecture, Swedish University of Agricultural Sciences. She is a theme leader in SLU´s Future Research Programme: Future Urban Sustainable Environment (FUSE) in the field System landscapes – from region to urban districts. Her latest FORMAS funded research project is «Functional Density – A critical study on densification as a sustainability strategy in ordinary local Swedish urban townscape areas». The Swedish Institute has financed a pre-study on «Resilient Citylands».

Biographical information

Per Hedfors
Researcher in Landscape Architecture Theory
Department of Urban and Rural Development, Swedish University of Agricultural Sciences
Address: P.O. Box 7012
SE-750 07 Uppsala, SWEDEN
Telephone number: +46 18 67 25 28
E-mail: Per.Hedfors@slu.se

Landscape Architect, Swedish University of Agricultural Sciences (SLU). He holds a PhD in Landscape Architecture and is currently a researcher in Landscape Architecture, with focus on theory, at the Department of Urban and Rural Development, Unit of Landscape Architecture, Swedish University of Agricultural Sciences. He is presently a partner in the FORMAS funded research project «Functional Density – A critical study on densification as a sustainability strategy in ordinary local Swedish urban townscape areas». The Swedish Institute has also financed a pre-study on «Resilient Citylands».

Biographical information

Maria Ignatieva
Faculty Professor in Landscape Architecture
Department of Urban and Rural Development, Swedish University of Agricultural Sciences
Address: P.O. Box 7012
SE-750 07 Uppsala, SWEDEN
Telephone number: +46 18 67 25 08
E-mail: maria.ignatieva@slu.se

Professor in Landscape Architecture, Department of Urban and Rural Development, Unit of Landscape Architecture, Swedish University of Agricultural Sciences. Honorary doctor of St. Petersburg State Forest Technical University, Russia. She did her Master in Landscape Architecture in St. Petersburg and PhD in botany and urban ecology in Moscow State University. In Russia, then in the USA, New Zealand and now in Sweden Maria continued working on the investigation of different urban ecosystems and developing principles of ecological design. Her latest FORMAS funded research project is «Lawns as ecological and cultural phenomenon: searching for sustainable lawns in Sweden». The Swedish Institute has financed a pre-study on «Resilient Citylands».