

Healthy urban planning –new approaches for strategic land use planning in the North

Emilia Rönkkö

Oulu School of Architecture, University of Oulu. e-mail: emilia.ronkko@oulu.fi

Abstract: This article outlines a theoretical framework and a strategic support scheme for healthy urban planning, which integrates the socio-spatial aspects of environment with the patterns of human-environment interaction. A multidisciplinary discussion of prior research and the rationale for the theoretical and methodological framework is shortly presented. The paper aims at reframing community-scale planning focus towards the multiple dimensions of human-environment interaction patterns that may positively affect human health and well-being in (sub)arctic climatic conditions. Pointing that relatively little has been said so far of the topic in the scale on small and medium sized rural communities, further discussions and research is needed how to benefit the practice of land use planning and community public health promotion in the north. In order to refrain the premises of healthy urban planning, an empirical case study was carried out in 2015 in Sodankylä, a small municipality with ca. 9000 inhabitants located in Northern Finland. Based mainly on qualitative data sets, the case study included contextual site analysis of the perceived qualities of the case area. This was followed by profiling and scenario drafting phase, where alternative futures for Sodankylä were framed, and their expected impacts on the environmental quality and well-being of the residents were evaluated together with the locals. As an outcome, a strategic land use plan for healthier future in 2040 was presented for Sodankylä. Based on the outcome and findings of this pilot case study, it can be concluded that understanding the interactions between individuals and their environment is critical for community planning which is beneficial to the long-term development of living environment quality and human health in the north.

Key words: Strategic land use planning, northern regions, environmental quality, community health.



Introduction

In the 21st century the global pandemics of noncommutable diseases, such as urban diabetes and obesity, have urged the professions of urban planning and public health to reconnect again (Corburn 2004). In academic research, growing number of studies have emphasized the importance of the urban conditions for the health and well-being of urban dwellers,

and a growing body of evidence has demonstrated the important role that context plays in health behavior and health outcomes (Dannenberg *et al.* 2011; Burke & Albert 2014). Consequently, the concept of healthy urban planning has emerged, and cities have begun to integrate urban health agendas into their comprehensive plans. Reflecting the WHO's broad definition of health, it intends to focus on the positive impacts that urban planning can have

on human health, wellbeing and quality of life (Barton & Tsourou 2000). Up to now, much of this work is conducted in a very different climatic context, mainly in USA. This has resulted in a series of healthy urban planning guidelines and manuals, which are not directly applicable in our climatic circumstances. Yet, in the boldest visions, the northern hemisphere would be urbanized rapidly within the next fifty years (e.g. Smith 2011). According to the estimations, by the year 2050 the percentage of people living in cities will be over 70 % worldwide, while in Europe it will reach over 80 %. Rapid urbanization means that rural, peripheral areas continue to lose their population, in absolute and relative terms as the city regions continue to grow. This tendency, which has clear consequences to the future generations in the northern regions, highlights even more the significance of directing attention to the quality of the living environments in these areas. Up to now, the focus on the interconnections between health and spatial factors has concerned primarily metropolitan areas or large cities (Stewart *et al.* 2016), even though the notion of socio-cultural sustainability and qualitative aspects of well-being such as restorative nature, slower pace of life and social capital, are often related to small and medium sized rural communities (Bukonya *et al.* 2003).

On a conceptual level, I regard the general nature of healthy urban planning principles somewhat problematic, since healthy urban planning will not be achieved just by adding the word “healthy” to planning documents nor it cannot be a universal manual for planners. It should be noted, that healthy urban planning has strong

linkages to the concepts of strategic urban planning and evidence-informed urban planning. A central issue is how scientific knowledge on community health could accompany the practice-based and intrinsic knowledge of planners (see Davoudi 2015). Addressing this challenge, University of Oulu is currently conducting a survey for Finnish urban planning professionals to assess their level of knowledge and use of health-related information in daily practice of urban design and planning. The hypothesis is that health promotion is not an explicit theme in Finnish comprehensive plans, since the focus of environmental health and impact assessment is typically more regarding environmental risks and preventive tactics.

The objective of this article, though, is to focus on the concept of healthy urban planning on a theoretical level. The paper will focus on the theory-development of the interconnections between spatial and socio-cultural patterns and characteristics that may promote human health and wellbeing in the northern regions. The aim is to understand whether certain socio-spatial frameworks increase the quality of life of a community, and if the mechanisms creating this quality can be identified with patterns of movement, cognition, references and culture. This view further raises the question, how planning can promote or enable, protect or create barriers for physically and socially active citizenship in (sub) arctic living environments.

Several conceptual frameworks of environmental quality and quality of life have been presented in previous research and investigated from multiple disciplinary viewpoints. Insight to the relationships

between these various concepts, as well as their respective theoretical bases, are well presented in a literature study by van Kemp *et al.* (2003). In the field of urban planning, theorists, such as Christopher Alexander, Kevin Lynch, Donald Appleyard and Jan Gehl, have provided their share of the discussion, and offered various definitions of the physical characteristics that contribute to good living environments (see Smith *et al.* 1997). Even though there is ambiguity which conceptual framework should be employed and a broad variety of conceptual definitions, the construction of a uniform, multidisciplinary conceptual framework would be important for the accumulation of scientific knowledge. As van Kemp *et al.* (2003) point out, “[c]onstruction of a multidisciplinary conceptual framework of environmental quality and quality of life is required to advance the field of urban development, environmental quality and human well-being. Such a framework would allow for a more theory-based choice of indicators and for the development of tools to evaluate multidimensional aspects of urban environmental quality.”

To a certain extent, there seems to be a consensus regarding the general attributes and elements that an urban environment should fulfil, such as livability, sustainability and urban quality. It has to be noted though, that quality is not an attribute inherent in the environment but a behavior-related function of the interaction between environmental characteristics and personal characteristics (Pacione 1990). It seems also rather accepted, that in order to understand the complex nature of the human–environment relationship, both objectively measured quality characteristics and also subjectively

perceived measures of environmental quality and quality of life have to be considered (Pacione 2003; Wissen Hayeka *et al.* 2015). Concurrently, there is support to the notion that noneconomic variables are as important for quality of life and health as are income and economic factors (e.g. Bukenya *et al.* 2003; Pacione 2003; Laaksonen & Silventoinen 2011). A recent study by Blessi *et al.* (2016) suggests that culture, interaction and relationships between individuals, is likely to replace absolute income and employment as the major driving force affecting well-being in relatively well-developed socio-economic contexts. Culture-driven well-being and the interconnections between health and socio-spatial factors are thus an intriguing field of multidisciplinary research. The puzzling question is, what creates and maintains health both in the level of the individual and society. Likely, the factors explaining the successes or failures of communities and psychosocial coping of individuals are a joint function of a subjective component, the individual well-being, and an objective component, the physical environment. If the perceived environment is outside the individual’s optimal range, overload of stressors impede coping. If the coping strategies are successful, adaptation occurs (Pacione 1990, 2003; Antonovsky 1996). Urban planning research must therefore address the question whether built environment can increase the resistance capacity of the community, and whether the mechanisms creating this capacity could be identified and reshaped within planning.

Theoretical framework for integrated environmental analysis

An integrative, strategic support scheme for health-oriented urban planning is needed to address a variety of aspects of environmental quality. Since 2012, the author has been developing an integrative framework for environmental analysis and strategic land use planning under a working title TRIM (from its Finnish initials, Toiminta, Rakenne, Ilmiasu, Merkitykset). (Rönkkö 2012, 2014, 2016; Hentilä &

Rönkkö 2015.) It addresses the functional, structural, sensed and experienced qualities of the environment as a behavior-related function between environment and patterns of human interaction (Figure 1).

An environment, which provides opportunities for active lifestyle for people of all ages can be considered as a precondition for healthy living. This entails positive affordances (Gibson 1977), i.e. perceived action possibilities latent in the environment, which are relevant in terms of encouraging people for physically and socially active lifestyle. However, there

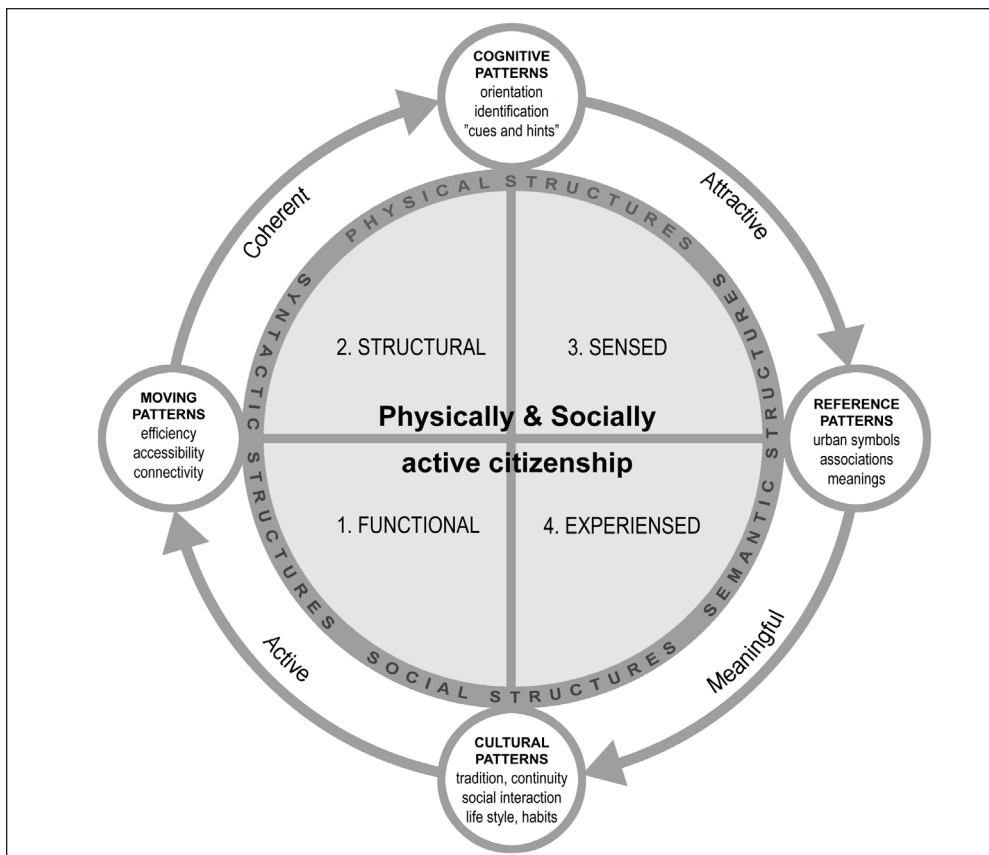


Figure 1. The functional, structural, sensed and experienced dimensions of the environment and the patterns of human-environment interaction.

are particular challenges (and unique possibilities) in the northern regions, where seasonal variation and dark and cold seasons have major effect in psychosocial coping and activity of the residents (Thompson Coon *et al.* 2011). People spend 90% of their lives within buildings and during the winter the percentage is even higher (Mäkinen 2007). Sedentary lifestyle is in turn associated with life style diseases related to urbanization (Kohl *et al.* 2012). Interestingly, inactivity seems to have different forms depending on the community size and regional typology. Small town residents walk less for utilitarian purposes but more for recreational purposes (Stewart *et al.* 2016.) As a behavior-related function between functionality and physical form, *patterns of movement* are a fundamental components of interaction, even to the extent that people practicing mobility constitute the city (Jensen 2009). Fighting the global pandemics of noncommunicable diseases denotes emphasizing also individual responsibility for health. At the local grass root level, the public must be convinced that walking and bicycling is time well spent. Moreover, increasing the level of active transport has a direct connection to the reduction of ecological footprint. In order to design healthy (and sustainable) environments, planners must consider not only the ecological impact of the physical structure itself, but also how it will affect the behavior of the people (Bay 2010.)

In terms of the physical structure, a coherent built fabric enables more frequent encounters with other people and encourage walking. Even though health inequalities are formed in a complex way, several studies indicate that urban sprawl affects negatively

to people's bodyweight, which urges health-based planning of residential areas (e.g. Handy *et al.* 2002; Näyhä *et al.* 2013). Despite the fact that the negative effects of sprawl are often highlighted, suburban areas or small-scale, low-density settlement patterns can also entail healthy affordances. In contrast to many US examples, a typical Finnish suburban type, the forestry suburb, can offer surprisingly versatile exercising possibilities both during winter and summer time. Furthermore, studies have indicated that urban green spaces are also important to both physiological and psychological well-being, as buffers against stress in urban environments (Grahn & Stigsdotter 2010). These areas can also produce more urban ecosystem services such as air filtration, micro climate regulation and noise reduction, even though occupying a larger amount of land (Bolund & Hunhammar 1999).

Considered from the viewpoint of psychological side of the city, the shape and figure play an important role in the cognitive reactions of individuals. Visual landmarks, nodes or edges (Lynch 1960) and psychophysical interaction with the environment are important both for our orientation and identification. The cognitive “cues and hints” (Tuan 1974) and locations with identifiable characteristics are influential in how our cognitive schemata and representations of the environment are perceived and how *cognitive patterns* are individually formed. This behavior-related function between form and senses is noteworthy, while the visual characteristics of destinations seem to be significant predictors of walking behavior (Vale *et al.* 2016). Especially in the northern

hemisphere, the sensed environmental qualities are constantly changing in terms of seasonal variation of light, temperature and wind. The visual appearance of the built environment and landscapes also change over time, as different functions become spatially explicit and the environment adapts to changing demands.

Living environment encountered through the senses is also loaded with symbolic meanings, associations and connotations. Urban places with cultural or political meaning, sites of personal associations or simply interaction with regulatory signs form *reference patterns*, as a behavior-related function between sensed and experienced. Meanings that people give to reference entities within a particular culture, are fundamental for place attachment, identity and engagement. This cultural context has an important role in affecting the behavior of the individual (see Stedman 2002). Behavior-related function between meanings, values and action, *cultural patterns*, may be defined as a way of life typical of a group, habits or meanings collectively transmitted through symbolic codes. They form on habitual and routine-like interaction with the everyday urban environment emphasizing the relations between the material world and embodied practices, and lay the foundation for instance on the general attitude towards healthy behavior. To conclude, culture has an important role as a set of adaptive strategies for communities' survival, as opposite to universalism and forced adaptation, which highlights the importance of designing culturally responsive environments (Rapoport 1987).

Case Sodankylä: a planning strategy for healthier future

Above described theoretical premises represented hypothetical relations between concepts, whereas empirical cases attempt to represent factual relations between the different concepts (van Kemp *et al.* 2003). For several years, Oulu School of Architecture has made experimental planning projects in small and medium sized communities of Eastern and Northern Finland to test and develop methods for strategic, integrative and participatory planning. In 2015, Sodankylä municipality with ca. 9000 inhabitants located in Northern Finland offered us the possibility for piloting the TRIM-framework together with master level students of architecture and geography and local residents (Rönkkö & Oikarinen 2016). Our aim was to test the health-oriented planning concept in a community-scale, and for this reason, the term 'healthy community planning' is used instead of healthy urban planning in this context. Having the second largest surface area of all municipalities in Finland and very sparse population, Sodankylä has faced typical challenges of rural areas in the north, such as a shrinking and aging population and far-reaching changes in the sources of livelihood. Basic public educational possibilities, health care and social services exist, but most of the young people tend to move away. The population was declining until 2011, when the new mining activities in Kevitsa nickel mine attracted new work force along with the existing Pahtavaara gold mine. Additional prospects of vast ore deposits have been

found beneath a protected marshland area. In this respect, large-scale projects, especially related to mineral resources, can have a significant role for the community's present state and future as well. If realized, the planned Sakatti mine would be the largest mining discovery of this millennium in Europe, having major indications for the future of Sodankylä. Other scenarios to be considered included the possible opening of the Northeast Passage, which would put Sodankylä in a very different strategic location in the world map. Yet another megatrend is related to life style preferences. According to Statistics Finland (Majoitustilasto 2016), overnight stays by Chinese tourists is increasing by 20% per year in Lapland due to growing amount of middle-class Asians seeking fresh air and nature. Simultaneously, a growing life style trend in the western world favors healthy and slower pace of life, and movements like LOHAS (Lifestyle of Health and Sustainability) are gaining popularity.

Methodology: Mapping environmental quality across a range of information inputs

Cooperation with local residents, municipality authorities, entrepreneurs and associations of Sodankylä had a significant role in our project. In terms of knowledge production, community-based participatory research (e.g. Burke & Albert 2014) and research by design -approach (e.g. Sevaldson 2010) were emphasized in our research design. They both highlight insider perspectives and tacit knowledge, aiming to reach established mind sets

or latent objectives of different interest groups, which would have been difficult to achieve with other kind of methods. Major emphasis was put on the early stages of participation, where stakeholder involvement is not limited only to the assessment of ready-made proposals, but it reaches to the inclusion of lay expertise in goal setting. Strategic scenario drafting was an integral part of this process.

In addition to shared knowledge production, we highlighted the role of empirical fieldwork in building up the knowledge base for healthy community planning. Data was collected and categorized with the help of TRIM tool and its four pre-defined thematic areas, i.e. the functional, structural, sensed and experienced dimensions of the environment. Thematic analyses conducted by the students formed holistic understanding of the environmental quality as well as the local community as integral part of the planning. The contextual site analysis was conducted with a combination of multiple methods, such as multisensory observation, interviews, qualitative field notes and photographic documentation. Data based on the perceived environmental qualities was then complemented with statistical data of the community structure, buildings and infrastructure, service network, population and work places. Additionally, we examined the statistical health information available from National Institute for Health and Welfare in order to valorize the spatial nature of community well-being. Data included indicators such as life expectancy, morbidity, the education level, employment and income. Furthermore, our analysis

was preceded by a study on the historical transformation processes in Sodankylä, which was a combination of statistical, archive and cartographic analysis.

Concurrently, a residential questionnaire was conducted in order to map the views and opinions locals had on the quality of the environment where they live and work in Sodankylä. The questionnaire was performed electronically and in paper form. The main themes of the questionnaire followed the four thematic areas of the TRIM-framework, meaning that it included questions concerning physical activity and functional environment, built environment, sensescape and social environment. The answers valorised especially the syntactic side of the human-environment interaction. In order to examine more closely the movement patterns in the town center, we arranged a workshop with high school students. They were asked to draw their daily routes on a map and also identify important or meaningful places for social activity. Results indicated, that even though the residents are very committed to outdoor activities in their leisure time, which are wide-ranging in Sodankylä, this does not project to their routines with utilitarian trips. In most cases even very short trips within the community centre (e.g. between home and work) were made with private car. Yet less than half of the respondents considered the municipality centre well-functioning in terms of traffic.

We also conducted ethnographic fieldwork in the form of a small-scale pilot with locals using go-along method (see Carpiano 2009), which was useful for mapping the contextual experiences and reference patterns (i.e. the semantic side of the human-environment

interaction). The purpose of the go-along method was to attain the views from people with different backgrounds, age and gender. Carpiano (2009) consider the method especially suitable for studying the relationship between living environments and well-being. The participants (N=11) were divided into two groups, representing “outsider perspective” (students), and “insider perspective” (locals). The preselected stopovers, altogether five, situated in the center of Sodankylä. All participants filled independently a semantic differentiation table and a section for open written evaluation in each stop. This was followed by a free discussion on the environmental qualities. Many of the adjectives that we repeatedly mentioned during the go-along took a stand on the visual qualities that needed improvement. For the student group, the cognitive patterns (i.e. orientation, significant landmarks) were emphasized, as in the case of the locals group, the reference patterns were understandably more prominent. A special feature in this case was that the cultural environments in Finnish Lapland is a unique mixture of natural landscape and socio-cultural impact created by humans, were the symbolic, immaterial dimensions are highlighted (Magga & Ojanlatva 2013). The few historical traces still visible in the town center became accented, while only seven buildings were left in Sodankylä after the II World War. One of the noteworthy single heritage buildings is Kitisenranta school, which has become a central social hub and a communal symbol for the residents. Built in 1951, and designed by architect Yrjö Lindberg, the old school building has high cultural historical and architectural value.

The school is no longer in its original use, and in recent years it has been developed as a low-threshold cultural house for young people and different recreational groups. The school is also the central place for the internationally renowned Sodankylä Midnight Sun Film festival.

Based on all the above described data, we drafted three future scenarios based on different assumptions and possible directions for the future development in Sodankylä. The first alternative scenario, titled “Small steps forward!”, was based on minor population growth, emphasizing community values, social capital and culture-led development. The second scenario, titled as “See Stars!” was based on moderate population growth and the utilization of welfare and nature resources, wellness tourism, science, and Sodankylä’s reputation as a famous film festival organizer. The third scenario, “Enrichment!” with significant population growth expectations, was founded on the new logistical opportunities and utilization of mineral resources. Together with the locals, we evaluated the scenarios regarding their possible impacts on viability and activity (functions and livelihoods), coherence (physical robustness), attractiveness (perceived qualities) and social environment (values and meanings). In summary, we assessed the scenarios and their expected impacts for the probability of increased physical and social activity in Sodankylä. As a final outcome, we compiled a strategic plan for healthier future called “Sodankylä – Elokylä 2040” (see Rönkkö & Oikarinen 2016).

Discussion

The Sodankylä case has been a small step forward in outlining the premises for strategic land use planning, which aims to the long-term development of living environment quality and human health in the north. It is evident that promoting environmental quality and human well-being cannot be a task of a single discipline. Notwithstanding, these aspirations require integration of knowledge across disciplines (interdisciplinarity), integration of people into both practice and research (transdisciplinarity) and integration of futures, in terms of anticipating possible future events and scenarios (Dunin-Woyseth & Nielsen 2004; Herneoja *et al.* 2015). Strategic community planning informed by evidence of the environmental quality characteristics and behavioral patterns necessitates a holistic understanding. In this regard, development of a common theoretical and methodological frameworks is justified. Even if we reject the deterministic idea of evidence-based planning, health related evidence is a powerful tool in decision-making, especially while it correlates strongly with the growing cost of public health care. The role of integrative framework for knowledge production is in making better-informed planning and policy decisions, and hopefully narrowing the gap between different practitioners (such as physicians and planners), in the field of healthy community planning. I wish to highlight the need to convert research outputs to solutions applicable in actual planning practices. Integrating research outputs to the practice of planning increases the argumentative power of

design solutions. The lessons learned from practical testing, such as Sodankylä case, are essential for further defining and prioritizing the focus of research. This is especially important in the planning of fragile northern living environments, due to the fact that the decisions have wide and far-reaching effects on future generations.

One important effort for future research is to find epistemological grounds and methodology which allow us to examine the “spatial nature of health” (Burke & Albert 2014) in a given community. For planners, visual displays of information through mapping of behavioral patterns could be useful. To mention some possibilities, mapping of these patterns can be based on smart phone applications using accelerometry and global positioning system. One of the benefits is that these devices can also suggest lifestyle changes through an application, which visualizes the measured data for the user. In addition, novel ways of using social media data, especially visual images can in the future be methodologically interesting. In general, big data and geoinformatics can in many ways offer novel possibilities for analytical purposes (de Smith *et al.* 2005; Haining *et al.* 2010). The benefit of using mass data is that it enables researchers to identify larger *patterns* of behavior instead of singular and subjective remarks on a certain place. There are also possibilities for combining data sets and creating new information that has not been available earlier. In for example health geography, geographical modeling can be combined for instance with cross-sectional surveys concerning major determinants of well-being. In Northern Finland, where a comprehensive birth cohort registers

are available, interesting possibilities for interdisciplinary research have already opened up (see e.g. Lankila *et al.* 2013).

In terms of community-scale planning, the challenges are related to the useful resolution and scale of information for local planning and decision making. Focusing on aggregate, large-scale conditions easily hides the local situation where the real human-scale problems are embedded (Pacione 2003). On the other hand using disaggregated data on human-environment interaction patterns and people’s social activities can involve ethical questions. Having mentioned some of the possibilities and challenges related to the use of behavior-related information in healthy community planning, I wish to conclude that development of new recipes and ‘diagnosis tools’ for strategic, health-oriented community planning can at best help planners in their efforts to create viable, robust, visually and socially inclusive cities and settlements in the north.

References

- Antonovsky, A. (1996). The salutogenic model as a theory to guide health promotion. *Health Promotion International* 11: 1, 11–18.
- Barton, H. & C. Tsourou (2000). *Healthy urban planning – A WHO guide to planning for people*. E&FN Spon, London.
- Bay, J. H. (2010). Towards a fourth ecology: social and environmental sustainability with architecture and urban design. *Journal of Green Building* 5: 4, 176–197.
- Blessi, G. T., Grossi, E., Sacco, P. L., Pieretti, G. & G. Ferilli (2016). The contribution of cultural participation to urban well-being. A comparative study in Bolzano/Bozen and Siracusa, Italy. *Cities* 50: 216–226.

- Bolund, P. & S. Hunhammar (1999). Ecosystem services in urban areas. *Ecological Economics* 29: 293–301.
- Bukenya, J. O., Gebremedhin, T. G. & P. V. Schaeffer, (2003). Analysis of rural quality of life and health: A spatial approach. *Economic Development Quarterly* 17: 280–293.
- Burke, J. G. & S. M. Albert (eds; 2014). *Methods for community public health research: integrated and engaged approaches*. Springer, New York.
- Carpiano, R. (2009). Come take a walk with me: The “Go-Along” interview as a novel method for studying the implications of place for health and well-being. *Health & Place* 15: 263–272.
- Corburn, J. (2004). Confronting the challenges in reconnecting urban planning and public health. *American Journal of Public Health* 94: 4, 541–546.
- Dannenberg, A., Frumkin, H. & R. Jackson (eds; 2011). *Making healthy places: designing and building for health, well-being, and sustainability*. Island Press, Washington.
- Davoudi, S. (2015). Planning as a practice of knowing. *Planning Theory* 1–6.
- de Smith, M., Goodchild, M. & P. Longley (2005). *Geospatial analysis: a comprehensive guide to principles, techniques and software tools*. Troubador Ltd, Leicester.
- Dunin-Woyseth, H. & L. M. Nielsen (eds; 2004). *Discussing transdisciplinarity: Making professions and the new mode of knowledge production*. AHO, Oslo.
- Evans, G. W. & J. M. McCoy (1998). When buildings don’t work: the role of architecture in human health. *Journal of Environmental Psychology* 18: 85–94.
- Gibson, J. J. (1977). The Theory of Affordances. In Shaw R. & J. Bransford (eds.) *Perceiving, acting, and knowing: toward an ecological psychology*. Hillsdale, New York, 67–82.
- Grahn, P. & U. K. Stigsdotter (2010). The relation between perceived sensory dimensions of urban green space and stress restoration. *Landscape and Urban Planning* 94, 264–275.
- Haining, R., Ruth, K. & M. Oliver (2010). Geography, spatial data analysis, and geostatistics: An overview. *Geographical Analysis* 42:1, 7–31.
- Handy, S. L., Boarnet, M. G., Ewing, R. & R. E. Killingsworth (2002). How the built environment affects physical activity. Views from urban planning. *American Journal of Preventive Medicine* 23: 2S, 64–73.
- Hentilä, H. L. & E. Rönkkö (eds; 2015). *Kaustisen maankäytön kehityskuva “Kaustinen – aina valmiina”. Kuntasuunnittelun kurssi ja erikoiskurssi 2014*. Oulun yliopiston arkkitehtuurin osaston julkaisuja C 144, Oulu
- Herneoja, A., Pihlajaniemi P., Österlund T., Luusua A. & P. Markkanen (2015). Remarks of transdisciplinarity as basis for conducting Research by Design teamwork in real world context through two case studies of algorithm aided lighting design. *Proceedings 33rd eCAADe Conference* 2: 61–70.
- Jensen, O. B. (2009). Flows of meaning, cultures of movements – urban mobility as meaningful everyday life practice. *Mobilities* 4: 1, 130–158.
- Kohl H. W. et al. (2012). Lancet physical activity series working group, The pandemic of physical inactivity: Global action for public health. *Lancet* 380: 294–305.
- Laaksonen, M. & K. Silventoinen (toim; 2011). *Sosiaaliepideologia. Väestön terveyserot ja terveyteen vaikuttavat sosiaaliset tekijät*. Gaudeamus, Helsinki.
- Lankila T., Näyhä, S., Rautio, A., Koiranen, M., Rusanen, J. & A. Taanila (2013). Health and well-being of movers in rural and urban areas - a grid-based analysis of northern Finland birth cohort 1966, *Social Science and Medicine* 76, 169–78.

- Lynch, K. (1960). *The Image of the City*. MIT Press, Cambridge MA.
- Magga, P. & E. Ojanlatva, (2013). *Ealli biras. Elävä ympäristö. Saamelainen kulttuuriympäristöohjelma*. Saamelaismuseosäätiön julkaisuja 9.
- Majoitustilasto (2016). 10.8.2016. <<http://www.stat.fi/til/matk/index.html>>
- Mäkinen, T. M. (2007). Human cold exposure, adaptation and performance in high latitude environments. *American Journal of Human Biology* 19: 155–164.
- Näyhä, S., Lankila, T., Rautio, A., Koironen, M., Tammelin, T. H., Taanila, A., Rusanen, J. & J. Laitinen (2013). Body mass index and overweight in relation to residence distance and population density: experience from the Northern Finland Birth Cohort 1966. *BMC Public Health* 13: 938.
- Pacione, M. (1990). Urban liveability: a review. *Urban Geography* 11: 1, 1–30.
- Pacione, M. (2003). Urban environmental quality and human wellbeing -a social geographical perspective. *Landscape and Urban Planning* 65: 19–30.
- Rapoport, A. (1987). On the cultural responsiveness of architecture. *Journal of Architectural Education* 41: 1, 10–15.
- Rönkkö, E. (2012). *Kulttuuriympäristöselvitykset. Tieto, taito ja ymmärrys maaseudun maankäytön suunnittelussa*. PhD diss. University of Oulu, Department of Architecture, A 56. Oulu.
- Rönkkö, E. (2014). Actions on urban health enhancement in the Arctic: Salutogenic Planning Concept. *Proceedings of the 6th Annual Architectural Research Symposium in Finland 2014. Designing and Planning the Built Environment for Human Well-Being*. University of Oulu, Department of Architecture, 134–147.
- Rönkkö, E. & E. Oikarinen (2016) (eds.). 2016. *Sodankylän maankäytön kehityskuva "Sodankylä – Elokylä"*. *Kuntasuunnittelun kurssi ja erikoiskurssi 2015*. Oulun yliopiston arkkitehtuurin tiedekunnan julkaisuja B7, Oulu
- Sevaldson, B. (2010). Discussions & movements in design research. A systems approach to practice research in design. *FORMakademisk* 3: 1, 8–35.
- Smith, L. C. (2011). *Uusi Pohjoinen – maailma vuonna 2050*. Suom. Tuukka Perhoniemi. Tähtitieteellinen yhdistys Ursa, Helsinki.
- Smith, T., Nelischer, M. & N. Perkins (1997). Quality of an urban community: a framework for understanding the relationship between quality and physical form. *Landscape and Urban Planning* 39: 2–3, 229–241.
- Stedman, R. C. (2002). Toward a social psychology of place: predicting behavior from place-based cognitions, attitude, and identity. *Environment and Behavior* 34: 561–581.
- Stewart, O. T., Vernez Moudon, A., Saelens, B. E., Lee, C. Kang, B. & M. P. Doescher (2016). Comparing associations between the built environment and walking in rural small towns and a large metropolitan area. *Environment and Behavior* 48: 1, 13–36.
- Thompson Coon, J., Boddy, K., Stein, K., Whear, R., Barton, J. & M. H. Depledge (2011). Does participating in physical activity in outdoor natural environments have a greater effect on physical and mental wellbeing than physical activity indoors? A Systematic Review. *Environmental Science and Technology* 45: 1761–1772.
- Tuan, Yi-Fu. (1974). *Topophilia. A study of environmental perception, attitudes and values*. Columbia University Press, New York.
- Vale, D., Saraiva, M. & M. Pereira (2016, in press) Active accessibility: a review of operational measures of walking and cycling accessibility. *Journal of Transport and Land Use* 9: 1, 1–27.

Van Kamp, I., Leidelmeijer, K., Marsman, G. & H. Hollander (2003). Urban environmental quality and human well-being: towards a conceptual framework and demarcation of concepts; a literature study. *Landscape and Urban Planning* 65: 5–18.

Wissen Hayeka, U., Efthymioub, D., Farooq, B., von Wirth, T., Teiche, M., Neuenschwander, N. & A. Grêt-Regamey (2015). Quality of urban patterns: Spatially explicit evidence for multiple scales. *Landscape and Urban Planning* 142: 47–62.