# Decoding the Smart City
# NordiCHI 2020 Workshop

October 26 2020

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## Contents

# Decoding the Smart City - Workshop Summary

**Conference:** NordiCHI 2020
**Date:** October 26 2020
**Workshop website and call for proposals:** https://blogs.aalto.fi/smartcity/

**Organizers:**

Elise Hodson, Michel Nader Sayún, Teija Vainio
Department of Design, Aalto University, Espoo, Finland

**Student Volunteer:**

Florian Mathis, Human-Computer Interaction (HCI), University of Glasgow/University of Edinburgh, Scotland

**Guest presenters:**

Chris Pandolfi - Department of Unusual Certainties and School of Design, George Brown College, Canada

Ralf-Martin Soe - FinEst Twins Smart City Center of Excellence, Tallinn University of Technology, Estonia

**Attendees:**

12 participants from the following countries took part:

Australia, Austria, Finland, Ireland, Netherlands, Russia, Sweden, Turkey, USA

**Advisory Committee:**
The committee reviewed the initial workshop proposal and the position papers submitted by workshop attendees.

- Dr. Nastaran Dadashi, HCI and Usability Studies professor, George Brown College, Canada;
- Matti Hämäläinen, Forum Virium Helsinki, Finland;
- Prof. Guy Julier, Head of Research, Department of Design, Aalto University, Finland;
- Dr. Ilari Karppi, Tampere University, Finland;
- Dr. Tuuli Mattelmäki, Head of the Department of Design, Aalto University, Finland;
- Dr. Jenni Partanen, Professor, Tallinn University of Technology, Estonia;
- Dr. Virpi Roto, Prof. of Practice, Aalto University, Finland;
- M.Sc. (Admin.) Iina Sankala, Researcher, Faculty of Management and Business, Tampere University, Finland;
- Dr. Ralf-Martin Soe, Director, Senior Research Fellow -Smart City Center of Excellence (Finest Twins) Tallinn University of Technology, Estonia;
- Marius Sylvestersen, Smart City Program Director, Copenhagen Solutions Lab, City of Copenhagen, Denmark and
- Lill Sarv, Research Fellow, Smart City Projects Development Manager, Smart City Center of Excellence (Finest Twins), Tallinn University of Technology, Estonia

# Agenda

12:00 Welcome, introductions and practicalities
12:20 Presentation - Smart cities and social impact
12:35 Group activity – Sharing position papers
1:20 Break
1:30 Presentations - Three case studies (Smart Kalasatama, FinEst, Sidewalk Toronto)
2:30 Break
3:00 Group activities – Defining social impact and Developing evaluation strategies
4:15 Group presentations and discussion
4:45 Closing
5:00 Conclusion

# Background

Within the NordiCHI conference theme of Shaping Experiences, Shaping Society, this workshop was designed to address the following **aims**:

- Promote better design for smart cities by analysing the influence of technological solutions in social dynamics and everyday life
- Increase discussion among researchers and practitioners about social impacts of smart city projects
- Gather information and compare current methods of data collection and analysis used in smart city projects
- Generate ideas on how to combine innovative methods of data collection and approaches to impact assessment to better understand short and long-term social impacts of smart city projects

The topic emerged from the organizers' shared interests about smart cities, design, and the evaluation of social impacts for residents. In particular, the workshop was inspired by Michel Nader Sayún's MA thesis (2020). He conducted research with Forum Virium Helsinki and residents to understand how, five years after the launch of Smart Kalasatama, living in a smart neighbourhood had impacted how residents think about and behave in everyday smart city environments.

In order to frame the workshop, the **themes** of smart cities and social impact were outlined as follows:

**Smart Cities**

- "Smart" cities can be defined in multiple ways, key **distinctions** being: the latest urban technologies, such as sewage systems, water supply networks, and mass transit systems; ICT combined with infrastructures, architecture and everyday objects, or our bodies (e.g. Batty et al., 2012 and Townsend, 2013); economy and governance driven by innovation, creativity and entrepreneurship, enacted by smart people (Kitchin, 2014); a focus on urban development that enhances lives of citizens (Schaffers et al., 2012).
- There are different **approaches** to understanding smart cities, including: a technological approach (different technologies are at the heart of the relevant discussion); a more anthropocentric approach (creativity, education, and digital skills of the human capital); or institutional approach (organizations and the community have a crucial role in the citizens' quality of life). In addition, in recent research it is argued that a more than human-centered approach is needed, i.e., nature-centric or planet-centric approach.
- Smart city initiatives can be evaluated in different **phases**: Smart City 1.0, Smart City 2.0, Smart City 3.0 (planning, integration and fully functional phases).

- Smart cities are often assessed in terms of **elements or domains**, such as the six characteristics of smart cities used by the EU: Smart Mobility, Smart Environment, Smart Governance, Smart Economy, Smart Living and Smart People.

**Social Impact**

- **Social impact** has been defined as the social value that can be attributed to a project over time (Richards & Nicholls, 2015).
- **Social value** can be defined in many ways, for example: how a product or service improves quality of life and the "relative importance that people place on the changes they experience" (Richards & Nicholls, 2015 p.11); how value is created for society rather than for individuals or businesses (Ehn et al., 2014), which can be broadened to include environmental impact and sustainability. There are also questions about whose social value is being assessed and whether there are shared understandings of "good" social value (Hoo Na et al., 2017).
- **Reasons to assess** social impact include: understanding impacts and value beyond economic and other quantifiable measures; gaining a more holistic perspective to assess project outcomes and strategize future projects; demonstrating accountability and value of investments to decision makers and taxpayers, in particular as they relate to responding to citizen needs; supporting policy decisions and funding programs.
- **Indicators** of social impact could focus on: project outcomes and how people experience and value change attributable to a project; changes in behaviour, quality of life and factors that may not be easily measured (e.g. sense of belonging); outcomes that may not be accounted for by market-based activities (e.g. the social impacts of communal and volunteer work, civic engagement, etc.) (Gibson-Graham, 2008). Social impact also depends on who is asked, what is important to different stakeholders, and how organizations define success.
- **Challenges in identifying** social impact include: difficult to predict; might be unintended, unexpected or intangible; might happen long after a project is finished.
- **Challenges in assessing** social impact include: lack of data; lack of consensus on how to collect and analyze data; data often difficult to quantify or compare across projects; absence of objectives in measurable terms; and lack of concrete measures of performance.

# Three Case Studies

The majority of the workshop was dedicated to a discussion of three smart city case studies:

**Smart Kalasatama (Finland), presented by Michel Nader Sayún**

Smart Kalasatama is a five-year long platform for innovation in a developing district in Helsinki, led by the city-owned company Forum Virium Helsinki. This project was created to support smart mobility, smart energy solutions and smart everyday living as the district of Kalasatama was being built. Kalasatama started with about 3000 residents and is expected to reach 25 000 residents in 2035. The concrete promise of Smart Kalasatama is to provide "one more hour a day" for the residents of the area through well integrated services and systems using technology and open data, following the City of Helsinki strategy. As an urban and living lab, Smart Kalasatama as a whole is a pilot to learn how to build cities better in Finland and has become an example for other smart city developments in the Helsinki metropolitan area as well as around the country.

**FinEst (Estonia and Finland), presented by Dr. Ralf-Nader Soe**

The aim of this new project is to establish the first global Cross-Border Smart City Center of Excellence (CoE) with the cities of Helsinki (Finland) and Tallinn (Estonia). The project is funded by the Estonian government and the European Commission. The focus of the project is on five domains of smart and sustainable urban development, i.e., mobility, energy, built environment, governance and urban analytics and data. The collaborative partners are TalTech (Estonia), Aalto University (Finland), Forum Virium Helsinki (City of Helsinki, Finland) and the Estonian Ministry of Economic Affairs and Communications. One of the main outcomes of the project is to establish the CoE, which will be the first EU cross-border Smart City center and demo lab providing urban services and connecting the exportation of Finnish-Estonian knowledge and service development on a global scale.

**Sidewalk Toronto (Canada), presented by Christopher Pandolfi**

In 2017, Waterfront Toronto, an organization representing national, provincial and municipal governments, selected Sidewalk Labs as an innovation and funding partner to develop part of the city's eastern waterfront. Sidewalk Labs is an urban innovation company owned by Alphabet Inc., also Google's parent company. In May 2019, Sidewalk Labs published its Master Innovation and Development Plan, with proposals covering everything from job creation and economic development, to affordable housing, mobility, digital infrastructure and other systems to support sustainability and innovation in urban settings. In May 2020, Sidewalk Labs announced their withdrawal from the project, citing "economic uncertainty" (Doctoroff 2020). In this presentation, Chris considered how the smart city proposal addressed three layers of the physical city (private plots of land, buildings, public space and transportation routes) (Panerai et al. 2004). He looked at public engagement and how the project was received and resisted. This included the role of prototyping in involving many designers, architects and engineers, as well as the scale of public consultation within Sidewalk Toronto's budget of 11 million USD for communications, external affairs and engagement. Finally, Chris raised questions about the speed at which the project took place and issues of inclusion. Specifically, he discussed how community and rights are defined in this type of consultation, particularly in urban contexts where segments of the population may not be accounted for (e.g. residents without citizenship, visitors to the city using public space and infrastructure).

# Group Work - Evaluation Strategies

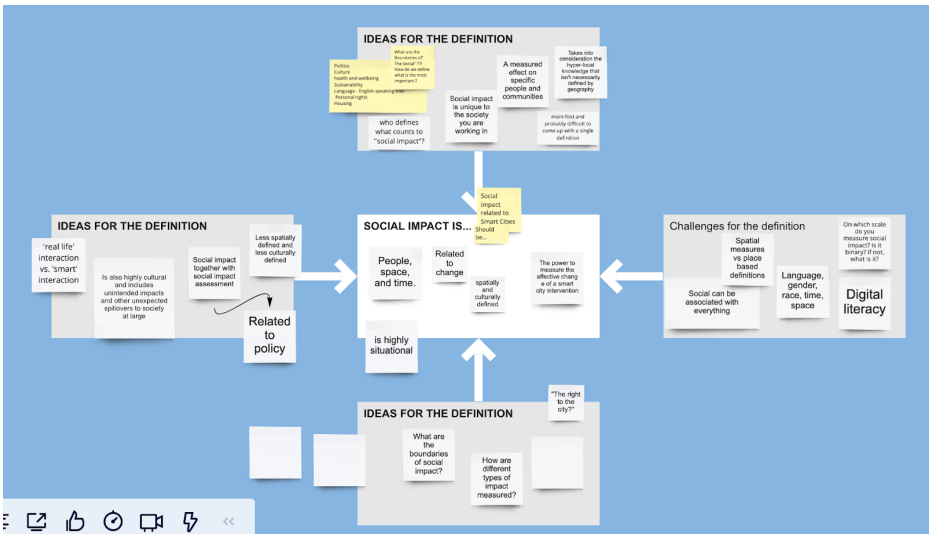
By thinking through the concrete examples presented in the case studies and imagining an evaluation strategy and method mix for each, groups addressed the following questions:

- What is social impact in the context of a smart, urban project?
- What are the goals for your evaluation?
- What issues related to smart cities might influence your evaluation strategy?
- What values do you want to guide your strategy?
- How can you evaluate social impact? What indicators or metrics can you use?
- How will you process or present the results?
- How will the results be used for this project or for future projects?

The three groups gathered at the end to discuss their evaluation strategies.

## Group 1: Smart Kalasatama (Finland)

The team working with the case of Smart Kalasatama had a detailed conversation around defining social impact in the context of urban development evaluation, as reflected in the image below. Social impact was understood by the participants as a highly situational influence of a project on people in relation to the smart city interventions.

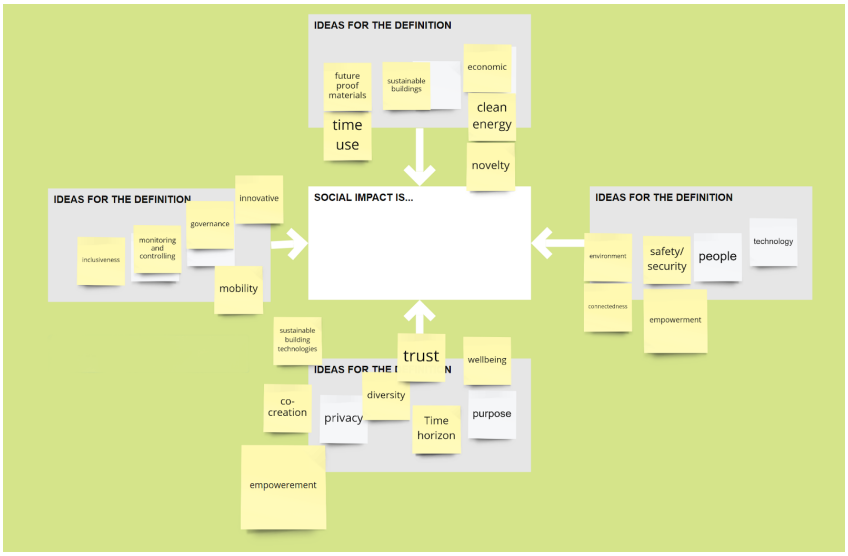



The team continued to define their goals for the potential evaluation strategy based on their own experience in urban labs and people-oriented development projects. An important question for the team was to understand the underlying reasons for social impact in each group of people, as these appear to be critical for shaping project strategies. For this, they recommended three questions to guide evaluation: 1) Who is impacted? 2) What interventions impacted this group? 3) Why did these interventions impact this specific group?

**Group 2: FinEst (Finland, Estonia)**

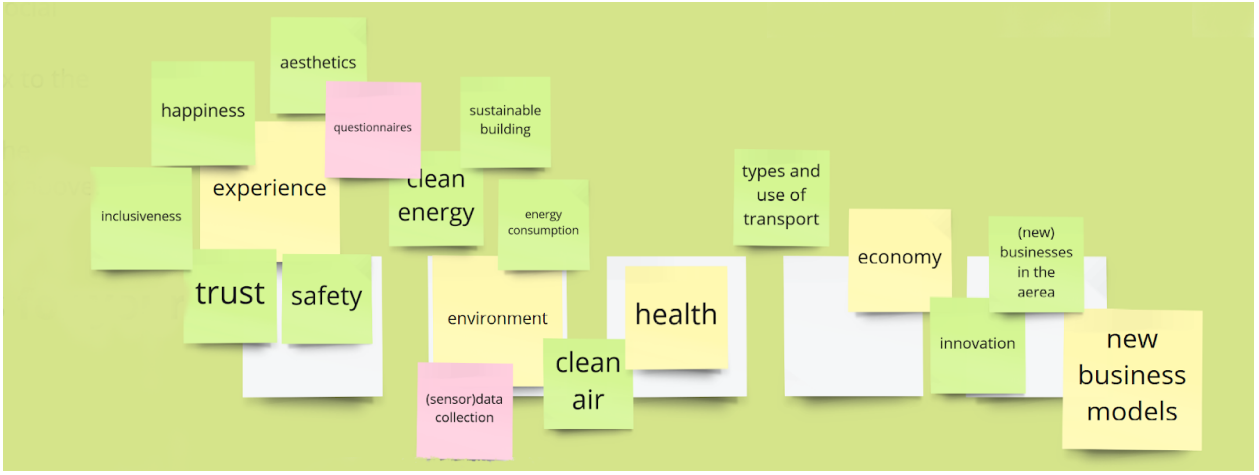
The group started the discussion by defining the concept of social impact in the given context. On the one hand, the task was found to be a bit challenging as the FinEst project has just started, but on the other hand, the group members argued that defining the aims for the possible impacts of the project and choosing the methods to evaluate the impacts at this phase is both useful and good value for different stakeholders.

The group members found, for example, the following factors connected to social impact: inclusiveness, sustainable buildings, clean energy, safety and security and diversity.




The goals for evaluating the social impact could be health environments, new business models, energy consumption, different types of transportation and safety. In addition, suggestions for sustainable building technologies and mobility as well as monitoring and controlling were highlighted.

To summarize the group discussion, social impact was seen as a wide but important phenomenon in smart cities. However, the evaluation of social impact is challenging and is dependent on views of different stakeholders.



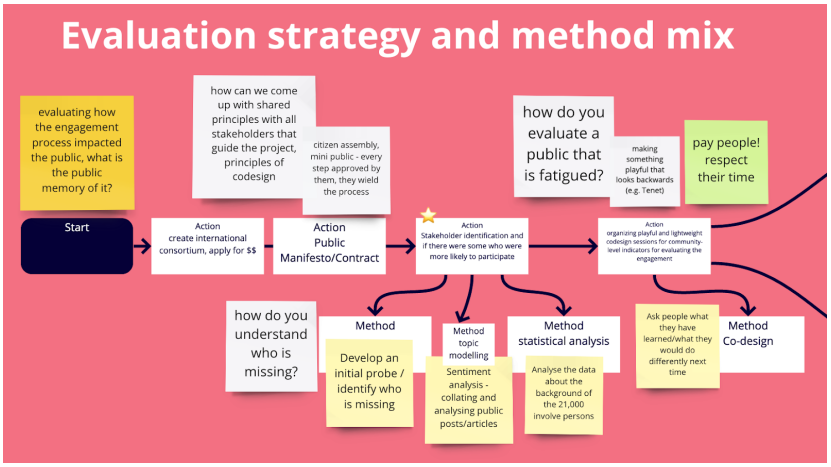

The goals for the evaluation

**Group 3: Sidewalk Toronto (Canada)**

Similar to the other two groups, this group concluded that defining social impact should be up to the community as it means different things to everyone. At the same time, this approach raises more questions about inclusion and the challenges of defining 'public' and 'community:' How do you plan for or evaluate a smart city while maintaining inclusivity, transparency, openness, and empowerment? (see Schwartz's Theory of Basic Human Values) How do you elicit different viewpoints while managing disagreement and potential conflict? How can a society define its own speed to participate in and reflect on processes (e.g. in contrast to the speed at which Sidewalk Toronto proposals were introduced)?

As the Sidewalk Toronto project ended in May 2020 without carrying out any of the masterplan proposals, this group considered how to evaluate the social impact of the extensive community engagement that took place (Sidewalk Toronto reported 21,000 people engaged in-person and 280,000 views of live streamed and recorded events).


The group brainstormed a number of issues that the evaluation strategy might address, including how far out impacts could be measured. Would we look only at those who had participated in engagement activities? Could we assess impacts at the global level and how this process had been picked up by the media, other cities, developers, and researchers? How could we assess people's memories of the engagement process and its impacts on participants and the public more broadly - would Toronto enter the next phase of smart city development better informed? Had the level of interest or trust in smart city projects changed?




The proposed evaluation strategy starts with forming a citizen assembly to help guide the research project. Demonstrating respect and valuing people's time would run throughout the evaluation program. By assessing the list of 21,000 participants plus partners, we could begin to identify who had been represented. Creative ways to understand who was missing from the original engagement activities, along with general sentiments toward the Sidewalk Toronto project, could include probes and analysis of social media and news. A playful approach to the evaluation strategy could help to overcome consultation fatigue.

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# Position Papers

In preparation for the workshop, participants were asked to submit short **position papers** about their own work in relation to the workshop topic. Topics included:

- Creative practices for city design and evaluation, for example, playful approaches to engage and assess participation, rethinking futures through greensight, co-creating smart infrastructure through digital and physical prototyping and using data as a creative material for design.
- The role of facilitators and prototypes, different ways to capture citizens' voices and processes of assessment and co-determination.
- The focus of smart city design, such as smart houses and factors that are affecting quality in houses; healthy, smart and active cities; a smart city in the Arctic; and Roosevelt Island's Digital Twin.

Four of the ten position papers are included below.

**Decoding the Smart City**

Workshop at NordiCHI 2020, October 25-29, 2020, Tallinn, Estonia

## Roosevelt Island's Digital Twin

Sharon Yavo Ayalon & Wendy Ju, Cornell Tech

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A Digital Twin is a virtual representation of a place, process, product, or service. It uses real time data and other sources to enable monitoring of systems, to prevent problems before they occur, develop new managing strategies, opportunities, and improved decision making. It has been used in the engineering world for design of products such as cars, tunnels, bridges, or electronics by connecting sensors on the physical object to collect data that can be mapped onto the virtual model. In recent years it has been adapted to improvement of workplace efficiency, for construction sites, and more. The technology and applications of Digital Twins around the world have been undergoing rapid process of development and implementation in recent years and specifically within the urban world, as part of smart cities developments. Examples of city-scale digital twins are still in their buds, and can be seen in the planning of Virtual Singapore, SideWalks' efforts in Toronto, CityZenith planning of the Indian city of Amaravati, Glasgow's Future City initiative or Cambridge university's National Digital Twin project. As appealing and fascinating as city-scale digital twins are for urban planners, it hasn't been fully explored or implemented in many places and the examples are numerous.

Our Roosevelt Island's Digital Twin project is a contribution to this growing field, specifically focusing on social inequality and community resiliency, issues that have been considered impermeable to digitalization. Our human-centered tech approach is based on increasing community resiliency and participation. Cities will become more equitable if communities are able to take part in planning their environment. We want to use the Digital Twin not only as a tool for planners, developers, or municipalities but also as a tool at the hand of the people. By visualizing and simulation future scenarios, a professional knowledge, usually accessible only to few, can be shared and communicated with the wider public. Over the past year, we have been developing the Roosevelt Island's Digital Twin. This included building an elaborated and realistic 3D model of the island that enables us to go back and forth from the virtual to the real world and run socio-economic simulations, to visualize climate change as well as more tangible simulations of expected changes in the built environment. The model is used as a resource for students to participate in developing the concept of a Digital Twin and think about practical, imaginary and innovative ways of using it. More specifically it is the center of two on-going research projects:

Urban Displacement Simulator: Data-driven Tool for Predicting the Social Effects of Urban Redevelopment and Privatization Processes

Privatization processes are gradually changing the demographic profile of cities. Unlike razing and

reconstruction projects that cannot pass without the public attention, privatization processes are happening quietly and behind closed doors. However, the cumulative change they produce is almost as dramatic as Urban Renewal projects that have pushed weak populations out of city centers. In this study, we use the Digital Twin of Roosevelt Island to join the research and practitioners' attempts to examine the nature of displacement and gentrification by simulating and visualizing those changes and by developing a practical tool that will be able to predict them. Our tool is based on preliminary historical and ethnographic research and on several data sources to tackle the problem of digitizing social phenomena and to create a nuances model as possible. We use ABM microsimulation to figure out how the demographics of Roosevelt Island might change as a result of the privatization processes of buildings that were previously affordable. More specifically, the simulation aims to predict what will be the socio-economic profile of the households that will be able to stay in their homes after privatization, the profile of those who will be forced to leave, and the profile of the newcomers. We are now in the process of developing the simulation. However, as a work in progress, we feed the information collected at the preliminary stages of the research to a Roosevelt Island interactive 3D map. Use the model to create a simulation of the effect of time in urban planning through a video of Roosevelt Island's building History and to develop a visual language for the displacement simulation.

Immersive Experiences to Transform Community Awareness of Climate Issues NYC Department of City Planning map shows that a 100-year flood will put most of Roosevelt Island underwater. As unnerving as this map is, the idea of such a catastrophic flood does not feel real. We believe that seeing a familiar park as a lake, or everyone's favorite Wholesome Factory, with a water line mark 2 feet above the ground, would send communities to come together to talk about the implications of climate change

We believe that simulated immersive experiences will do more to drive home the on-the ground implications of climate change than any scientific report, numerical model, or geographical visualization ever could. This is an important step in increasing community resilience in responding to the anthropogenic disaster of climate change and to motivate larger-scale political and policy responses. Our Digital Twin is used to create an immersive virtual-reality tour of Roosevelt Island that depicts different possible impacts of flooding and climate change. The tour will be designed to be experienced in the physical space of the actual island, while people are riding the Roosevelt Island red bus. We will bring community members together in a charette to discuss community resilience planning; to survey their attitudes and note the points of discussion prior to and after the immersive tour. This work in progress project can be seen in this demo video of Roosevelt Island Underwater)

We are taking into consideration several ethical and technical concerns in the process of developing the Digital Twin: Issues of privacy and sensitive data are being addressed by keeping the socio-economic data at the zip code level, making sure that any identifiable information is protected. In our case we distributed "synthetic" agents to buildings according to statistical extrapolations of US census data on Roosevelt Island as a whole.

In a market-based economy, predicting the income of an area's future inhabitants might negatively influence the development of this area. Being aware of this risk, we stress that the main

contribution of the Digital Twin as a planning tool is of it being placed at the hands of decision makers, to be able to balance and monitor market-based/real-estate planningagendas. Assuming that planners have the public best interest in mind, with awareness to diversity and social equity. Moreover, the democratization of knowledge is the main issue at stake here, by sharing professional knowledge, known only to few, in a visual way, with the specific public that is affected by the decision makings we can contribute to a more transparent and equitable planning system and to community resiliency.

**Rethinking Smart City Futures Through Greensight**

Ana Jones and Amos Taylor

## Introduction

Cities are the major economic powerhouses of nations (Approx. 70-80% of the world's GDP is arguably generated in cities), recognized and marketed as ideal places for people to live and work. The advances in technology have contributed to an urbanization phenomenon, "an urban age" that was consolidated when in 2007 the largest concentration of the world's population shifted from rural to urban.[1] The "smart city" has not one but multiple definitions. For example, one is that which: "…combines its data, its resources, its infrastructure and its people to continually focus on improving liveability[2]." In a broader sense, the smart city concept has been used as a way to redefine urban life using advancements in technology and the merits of the "human-centric" urban design to fulfil its promise. Developers have teamed up with governments and the tech industry to create highly profiled visions of the smart city in some cases built from scratch. Examples of these top-down projects are the Masdar City in Abu Dhabi, the Quayside project in Toronto, and the HafenCity project in Hamburg, all exhibit their own range of problems delivering (less than expected) successful results. Failures can be seen to stem primarily from a disregard for the human aspect. Many of these projects have been designed from an infrastructure perspective aiming at fast growth. In their approach, the city (infrastructure) comes first, and inhabitants second, something that leaves out the aspect of complexity of cities as essential requirement to build a sense of place.

Historically, technology has transformed lives. The personal computer and wireless mobile telecommunications are just two examples of impactful advances with large implications for the future of humanity. Futurologists who study the science behind futures-oriented change have looked at social development from multiple perspectives, one of them through the so-called Kondratiev wave theory where successions in development are seen as a consequence of traceable patterns of the past.[3] In one study, of the succession of development waves in industrial societies, the period between 2010-2050 is said to be driven by intelligent resource efficient technologies with the prime field of application in materials, energy production and distribution, integrating human, nature and technology. From the perspective of health, technological advances have helped cities in times of stress. Cities have periodically suffered disruptions that have come in some form of threat to public health. In fact, the whole of concept of the modern city was created because of the conditions that prevailed before that time, were supportive of spreading viruses. The then modern sewage system designed for cities were first created in the mid of the 19th century in some key capitals of Europe because of the percieved terror of some infectious diseases, such as cholera.

Technologies have also contributed to improve life in cities through for example alternative mobility schemes. Yet, they have also exacerbated urban challenges with respect to human behaviour and mental health. For this reason, societies that may appear to be technologically "advanced" could also paradoxically be unhealthy societies. Cities can connect people through fast speed wireless networks; yet, people may still grow physically and mentally isolated. The iconic technology of iPhone could have been built using a human centric and ergonomic design; yet, its purpose and impact on society today, even as transformational as it has been, may not be contributing to solve the most pressing urban challenges of our time and for urban future generations e.g., inequality, densification, ruralisation among others. Therefore, the purpose of technology in this case may need to change for technology to become an enabler of human well-being.

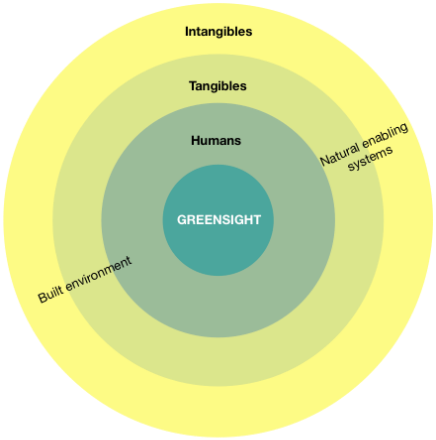
So far, smart cities have relied mainly on the adoption of a wave of digital technologies that promise to optimise the urban experience and create access to a wide range of services. These schemes have

[1] London School of Economics; Shaping Cities in an Urban Age; London; 2018

[2] Neckermann, Lukas; Smart Cities, Smart Mobility: Transforming the way we live and work; Leicestershire, 2017

[3] Wileenius, Markku; Patterns of the Future: Understanding the Next Age of Global Change; Helsinki; 2017

done a great deal to improve cities primarily from the perspective of services; however, less has been done on exploring how the concept of the smart city can be approached from a diverse, more environmentally focused viewpoint, that considers function, ethics as well as uncovering new potential for green (bio)economies in the future. For example, practices like agriculture that are traditionally seen as separate from the city, within the combination of a sustainable and circular bioeconomy context are reconfigured as being deeply interwoven within the development the city. With the rise of the circular bioeconomy gaining importance, society potentially is being further transformed through emerging bio-based solutions, use of nature and knowledge that can be regarded in the same light that we consider digital solutions of today, towards a bio-society (Taylor et al. 2019; Mannermaa 2002). These entail diverse interpretations, risks and opportunities of their own. They can specifically depict solutions that value for example biomimicry, bio-resource, or are synthetically produced, or regenerative and seek a new equality with nature. Be they radical urban development projects utilising large-scale wood construction, urban automated vertical farming, or forests supporting city water infrastructure, etc. these types of settings offer novel urban scenes to locate green social transformations. However, following a similar pathway of the digital age, to replicate a green city as just a continuation of industrialisation and post-industrialisation would more likely not improve our social structure. The smart city in this regard can be understood as a 'future imaginary', where proposals for how things *should be* in the future, that are dictated by policy, industry or visions etc, are all to be critically considered to question their assumptions. Here, the use and seeking of specific urban data and solutions entails a certain value proposition for a future imaginary, which must ultimately be questioned.



GREENSIGHT FRAMEWORK

So, how could we rethink the noble approaches to reconcile pressing social issues with urban technology? What alternatives could help explore specifically the social impacts of smart cities?

With this paper, we propose the use of the concept of *Greensight* as a futures studies approach to explore the broader, more philosophical understanding of the smart city and its impact. With this, explored are different types of "data" sets that are guided by the relationships: human, tangible, and intangible. Ultimately, in "decoding the smart city," we are explore more deeply into the methods for assessment from a more humanistic view and looking at how that relates to its transformation, and relationship inside the built environment and in connection with its natural enabling systems.

The concept of *greensight* places emphasis on natural enabling systems, that is, green spaces within the construction of urban futures. It carefully considerers that images of the future as well as strategic planning should constantly diversify its understanding and its understanding of the role of technology in the central context of healthy sustainable urban development. *Greensight* as oppose to standard foresight is not *de facto* human centric, it seeks to examine the many layers of urban life. Jones & Wilenius indicate that greensight can be described as:

> "It means resourcing to alternative mechanisms that can facilitate new types of governance, planning structures and very importantly, a change in narrative. It also means promoting the emergence of a constructive dialogue centred round the interrelated capacities of circular systems–net-work design, organisms and urban systems. Current urban transitions require methods that challenge our preconceived notion of linearity and individuality." (Jones & Wilenius 2020: 3)[4]

[4]Ana Maria Jones & Markku Wilenius; In greensight: healthier futures for urban cores in transition; Cities and Health; 2020

# Human-Centered Smart Cities

## Playful approaches to engage and assess participation in smart cities

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The vision of the *smart city* has often been criticized for being too technocentric and performance-driven. Apart from the danger of becoming an "urban labeling phenomenon" [2], the *smart city* is often portrayed as a system that needs to be managed, optimized and instrumented, for the benefit of efficiency or sustainability [2]. But while efficiency does not necessarily exclude engagement, some business-driven smart city agendas have fallen short of their promises to empower citizens alongside their other objectives [7]. Even when engagement is a priority for designers and local governments alike, involving the city-scale population in participatory urban projects is a challenging task [4]. For example, there is not enough evidence that releasing open data increases citizen and urban innovation, that different target groups respond to gamification approaches, or what happens with citizen feedback, after local governments receive it [4]. Often, even when there is a practice of engagement based on more classical tools for collaborative planning, local governments lack the capacity or experience to translate them in technology contexts.

My work is concerned with these conundrums of participation and placemaking in cities. In particular, I am concerned with applying participatory design techniques in urban projects, and designing from "the middle out" [3], by creating a design space between top-down and bottom-up. Playful and participatory approaches open up the possibilities of multi-stakeholder collaborations and co-design [1]. They facilitate empowerment, in situations where public sector faces resource constraints [6]. They can also provide insightful information about citizen needs, their behaviors and interactions with smart city agendas. In the project SimpliCITY, for example, we work together with citizens, local services and smart city teams in Salzburg and Uppsala, to engage citizens on the topic of sustainability [5]. Our approach blends citizen engagement with behavior change techniques and data interoperability, by providing a platform across a variety of existing services and applications.

To better understand citizens and assess the success of the smart city agenda, we collect data from several sources: open and sensor-based data provided by the city administrations, data from the platform / app, as well as from other apps accessed through APIs, self-reported information

collected through digital surveys, playful quizzes, as well as crowdsourced directly from citizens. The application offers access to (public and private) sustainability services, playful challenges and rewards. It also offers citizens the chance to contribute directly ideas and suggestions about sustainability-related public services and amenities. The data is processed by project partners while ensuring high standards of data privacy and only with the permission of users. We use the data in three ways: (1) to improve context awareness and adapt platform activities, (2) to better understand user needs and define possibilities for personalization and (3) to offer opportunities for engagement, by collecting suggestions from users. In terms of context adaptation, we use sensor data, for example, to frame sustainability challenges. Pollution levels collected by sensors are transferred to the app and users are encouraged to join a biking challenge to improve air quality while keeping away from congested roads. Or to collect additional "city heartbeats" by biking during rain. We aim to understand how different target groups respond to playful approaches, based on the demographic characteristics, interaction with urban services and feature preferences. Finally, suggestions provided by users are mapped out to define new features, app improvements or feedback on urban services. These are collected either directly by the platform management team (features and improvements) or by the local administration. We use upvoting of crowdsourced suggestions related to urban services, to improve filtering and processing by the local administration.

Our platform is an entry point for citizens to understand and participate in the "smart city" and, in the process, to challenge misconceptions on both citizens and administration side. We have designed the platform in a scalable and replicable way, so that different types of services and features can be added, based on the varying local needs and ecosystems in different cities. Our way of approaching multi-stakeholder contexts [5] can also be replicated in other cities globally, for example by mapping existing services and digital applications which can be integrated in a single platform to improve interoperability. However, we learned that local leadership and trust in the process are equally important. Therefore, it requires local authorities and/or other third parties to lead the process in a way that empowers stakeholders, answers local needs and ensures agency of all parties involved.

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**Smart City in the Arctic: exploring the spatial dimension of the concept**

Over the last decade, we have observed an increasing – and optimistically overrated – digitalization of industries, cities, and societies. The technology-centered vision of the "smart future" has become a global and powerful concept for sustainable, profitable, and efficient development. In light of this vision, a modern city has been considered as a set of problems that could –and should –be quantified, controllable, and optimized through technology [1].
As technologies travel to new cultural and geographical contexts, both design and analytical practices face significant challenges [2]. In modern attempts to integrate technology into global narratives, the "digital shift" should not be stressed to the extent that physical/spatial as well as cultural and political features of the locality are forgotten. At a local scale, attempts of making cities smart vary from centrally driven and standardized strategic measures, with participatory discourse, in many cases, disconnected from smart discourse (e.g., Russia) to Smart City challenge competitions (e.g., Canada and the US), and to local initiatives stretching toward the level of municipalities/regions, with a strong emphasis on connectivity (e.g., Europe) [3]. The more in-depth understanding of the interplay between the growing digitalization and the geographical "stickiness" of knowledge and innovations [4] requires approaching the smart city as a well-defined geographical area [5]. In this regard, the instrumental potential of the "quadruple helix" innovation model needs to be extended by adding the fifth helix (and perspective) of the "natural environments of society" [6], [7].
The research aims to develop a theoretical framework for developing humane Arctic smart cities. In addition to that, it seeks to probe the proposed framework in the extreme environmental, cultural, and societal contexts of different areas in the Arctic to benefit from local expertise, optimize the design, and improve contemporary practices of Smart City development. This framework will consist of a conceptualization of humane smart cities, including clear dimensions of a humane smart city in the Arctic, guidelines on how to positively contribute to those dimensions, and ways to put those dimensions in use. As a result, an Arctic version of the smart city concept should reflect, develop and protect the societal, ecological and democratic potential of the Arctic, while also exploring how digital technologies and services can contribute to futures grounded in the Arctic.
As such a framework does not yet exist, its introduction will contribute to the scientific research field of "humane smart cities" [8]. Ultimately, the Arctic framework will consist of a lens that can be used throughout the research and development process of smart city applications and

services in conditions of underdeveloped infrastructure and remoteness from economic centers.

***What is the Arctic city?***

In the context of our research, the Arctic city is no longer a utopian projection of the future, but an accomplished fact. Today, the majority of the population of the Arctic territories lives in cities - both in Russia and abroad [9]. The main feature of Arctic cities/towns is their exceptional variability, pulsation in time and space resulted from their remoteness [10].

An ideal Arctic city (1) physically corresponds to the terrain, (2) has a clear visual image and (3) flexible spatial and temporal organization, and (4) helps to adapt and maintain the psychophysiological comfort of residents.

While the first three points lie in the field of professional competence of a planner/architect/designer, equipped with modern technologies, then the fourth, i.e. the physical and mental well-being of the city's inhabitants cannot and should not be determined solely by a designer. The active participation of residents in the planning and subsequent development of the city is not just a compliance with the global practice of participatory design and the alternative trend of grassroots urban planning [11], it is a necessity due to the extreme environment. Problems that are relevant for all cities, in the Arctic context, acquire special urgency, and their prompt solution “is a prerequisite for sustainability and even survival” [10]. Moreover, the Arctic city is not only and not so much a test platform for new technologies, but a community of innovators, on an ongoing basis (24/7) conducting a collective search in the development of solutions to daily problems [12]. In the context of this article, one of the key tasks of digitalization of an Arctic city can be formulated as strengthening the creative potential of residents and providing wider opportunities for its manifestation.

***Case study: Western Siberia***

In acknowledging the diversity of the Arctic region, we employ the qualitative study framework, to focus on the particular area within the Russian part of the Arctic, i.e. Western Siberia. Extractive industries, namely the oil and gas sector, constitute a crucial part of the Russian state economy. The need for increasing the production rate calls for discovering new deposits, which, in turn, moves the work process higher up to the North, and, thus, runs into more challenging climatic and infrastructural conditions. In this case, the process of urban development is tightly connected to the fly-in/fly-out or drive-in/drive-out working method (FIFO/DIDO). FIFO method maintains as a preferred (and non-alternative) solution of human and technology presence in the High North. This method is a set of work arrangements for resource operations that are typically located at a distance from other existing communities [13]. In terms of spatial arrangements, FIFO-method includes a permanent base - a town with administrative and

logistic functions - and a network of temporary camps with no long-term commitment to that location.
In case of the externally coming workforce, when there is almost no direct contact with the local/indigenous population, the core of conflicts is shaped around the multiple cultures, which representatives constitute the community of a camp. However, the conflict with indigenous inhabitants is still there: it shifts from the interpersonal or intercommunal level to the spatial level, i.e. that of the environment, land rights, and sustainable use of resources.

In our research, we consider the spatial environment of FIFO-settlements (both temporary and permanent) as a particular source of social and cultural conflicts placed in additionally severe natural settings of the Arctic. We are especially interested in identifying effective strategies for harnessing technologies to deliver value to various stakeholders in all domains of urban living in the specific arctic setting. For data collection and further testing of the hypothesis we chose the city of Novy Urengoy and the Purovsky gas field. Our database combines interdisciplinary sources on economics, management, psychology and sociology studies of smart cities and the Arctic urbanization in general, as well as first-hand data from one field trip to the city of Novy Urengoy and the Purovsky gas field, Western Siberia (9 semi-structured interviews with FIFO-workers and local dwellers converted into 5 data-narratives according to the topics revealed; participant observations; photos and videos of the spatial/environmental settings).

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