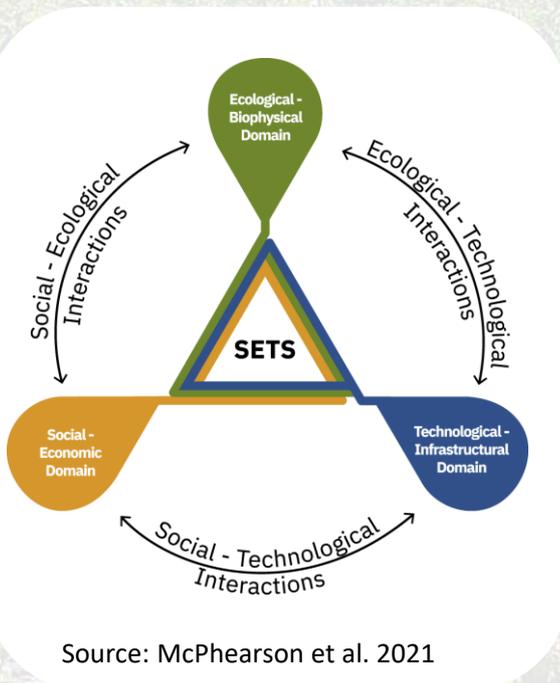


## SMARTer Greener Cities: Making Smart Cities Smarter and More Liveable Through Nature-based Solutions

*To be inclusive, equitable, resilient and fulfil their role as drivers of sustainability transformation, cities and towns need to be designed and governed as social-ecological-technical systems (SETS). This entails cutting across silos in disciplines and approaches by bringing technology, people, and nature together. Planning, designing, and managing urban spaces require a deeper understanding of how social, ecological and technological interact and the consequences of these relationships on biodiversity and human well-being.*



The SMARTer Greener Cities project (2020-2023) aims to develop and test novel tools and processes for explicitly converging social, ecological, and technological systems (SETS) approaches for improving life in cities. Within three case cities we analyse SETS couplings (Fig. 1). This is a first policy brief presenting the main findings of WP3 with some recommendations for urban planning and governance.

Read more about the project:  
<https://smartergreenercities.com/>

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**Copenhagen** case focuses on social-technological (S-T) linkages and how technologies can help the inclusion of local residents' perspectives in the planning and evaluation of the landscape transformations.

**Helsinki** case focuses on social-ecological (S-E) interactions and how technology and nature can promote psychological restoration of daily living environments in fast growing neighbourhoods.

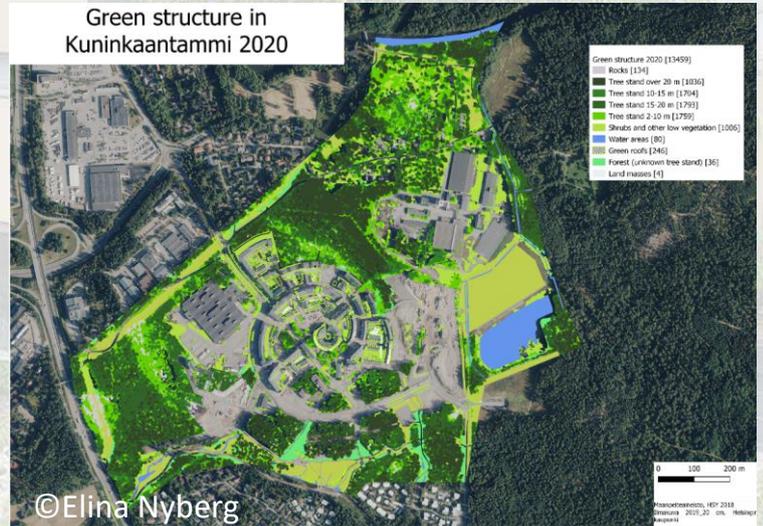
**Stockholm** case focuses on the ecological-technological (E-T) linkages. This refers to the different ways in which smart technologies can strengthen feedback between nature-based solutions (NBSs), biodiversity, and people.



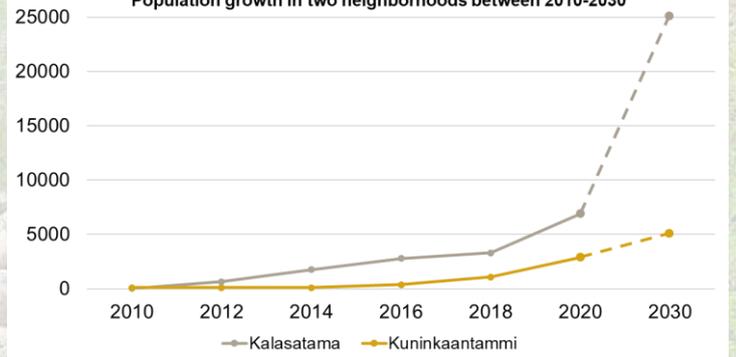
Helsinki case studies focused on human wellbeing, including whether residents experience and find restorative places and sounds in fast developing districts and how different types of nature-based solutions can support psychological restoration. We chose two case study areas with different visions for development – Kalasatama and Kuninkaantammi given the contrasting amounts and types of nature-based solutions present there, as well as different levels of emphasizes on smart technologies.

**Kuninkaantammi** has been developed emphasizing “climate smart solutions” – energy efficient housing, nature-based solutions (NbS) in stormwater and the Green City concept. There will be 5500 inhabitants and 1000 workplaces by 2027. Kuninkaantammi is situated partly in the intensive transit zone, transit zone and car-orientated zone. Before the development, the area was partly industrial brownfield and partly woodland and scattered detached housing area. For outdoor recreation, large forest areas of Helsinki Central Park surround the area and recreational routes of Vantaanjoki river are relatively nearby. In addition, every building block has large green yards with trees, rain gardens and growing boxes for urban farming.

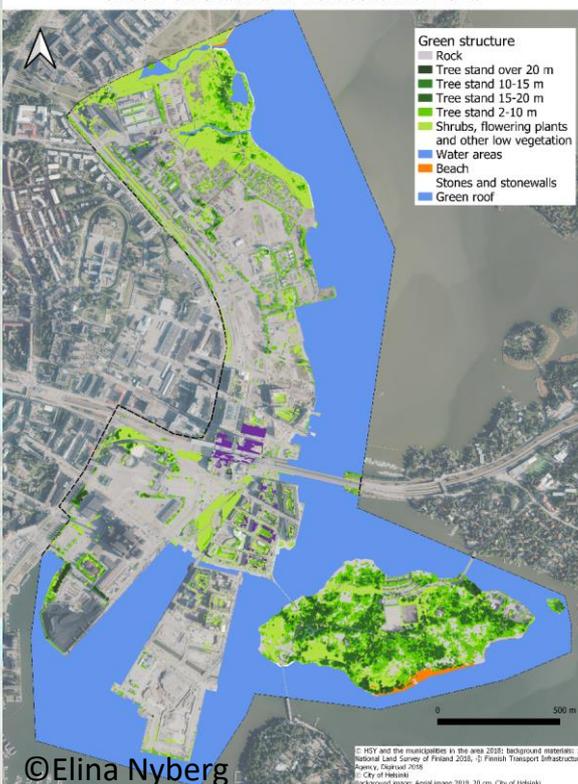
Green structure in Kuninkaantammi 2020



Population growth in two neighborhoods between 2010-2030



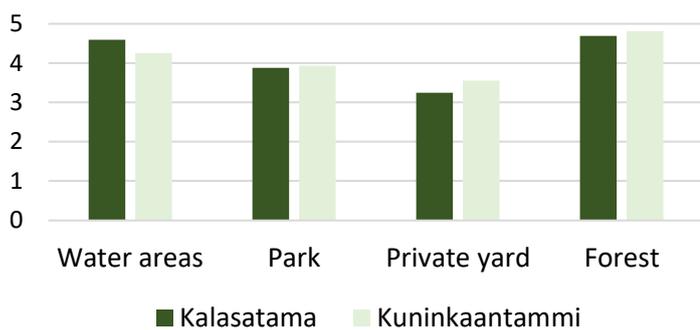
Green Structure in Kalasatama 2020



**Kalasatama** is one of the largest ongoing development projects in Helsinki – by 2040 the area will be inhabited by 25 000 residents and over 10 000 workplaces. The city is aiming at developing the area through piloting and testing of new “sustainable and smart” solutions and services – e.g. different kinds of technological solutions within the architecture and infrastructure. Kalasatama is situated in the fringe of pedestrian zone with intensive public transport. As a former harbor area and due to very dense urban structure, there is limited amount of green spaces available, and they are mainly constructed parks, green roofs and closed block yards. For outdoor recreation, the residents in Kalasatama are heavily dependent on the Mustikkamaa island that can be accessed along a new bridge occupied only for pedestrians and bikers.

The Helsinki team conducted a web-based public participation GIS (PPGIS) survey for residents in Kalasatama and Kuninkaantammi in 2021. In total, 507 residents participated in the survey in Kalasatama (n= 305) and Kuninkaantammi (n= 202). The respondents had typically lived in the neighborhood less than three years. The gender balance was rather equal and the majority (65%) of respondents were between 30 and 64 years old. Finnish speaking citizens dominated (82%), followed by Swedish (5%), English (2%) and Russian (2%) speaking citizens. Most of the respondents were employed (64%), 14% were retired and 12% were students.

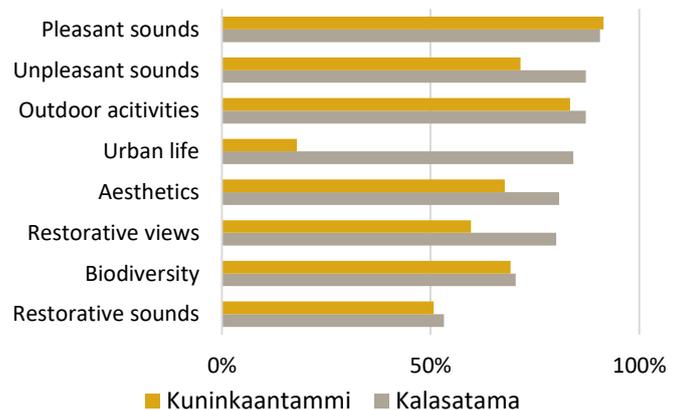
Figure 3. Median score (1-5) for different green spaces in two neighborhoods



In both areas residents highly valued their local green spaces (1= not attractive – 5 = very attractive) (Fig. 3). The constructed sea front was highly valued in Kalasatama. In Kuninkaantammi the constructed water pond in a park received slightly lower scores. Green private yards were assigned a high proportion of value points in Kuninkaantammi, while Kalasatama residents sought more vegetation and facilities.

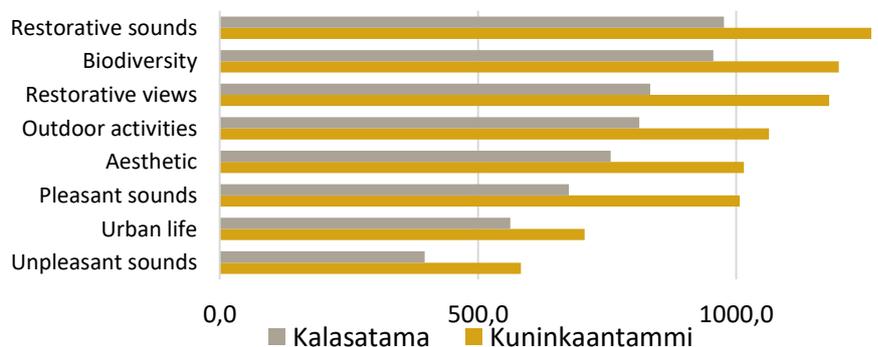
Majority of respondents identified places for pleasant sounds but fewer for biodiversity or restorative sounds in their living environments (Fig. 4). Respondents valued natural sounds such as bird song and mapped them mostly in parks, forests, and nearby water areas. Unpleasant sounds were mostly technical (e.g., construction and traffic) and were commonly located closer to home than pleasant or restorative sounds (Fig. 5). Unpleasant sounds were more often marked in constructed green spaces (parks, private yards) than natural sounds which were overlapping with other positive experiences such as aesthetic or recreation.

Figure 4. Proportion of respondents that identified different values in two areas



Restorative sounds and areas of high biodiversity were located further away from home than unpleasant sounds (Fig. 5). Distances are calculated as euclidean distances and actual walking distances are longer.

Figure 5. Mean direct distance (m) from home to different values



# Recommendations for urban planners and researchers

## Be smart and green with your plans

- ❖ Smart and Green solutions can offer inclusive and equal opportunities to support human well-being and sense of identity in growing areas.
- ❖ Based on our results we found that green spaces (forests, parks, water areas) in Kalasatama and Kuninkaantammi were commonly mapped as places providing multiple positive values, but the intensity and types of values held for these areas varied in accordance with their biophysical characteristics.
- ❖ Clusters of different values (e.g., restorative view, recreation, aesthetic) in walking distance from homes make daily living environments amenable to different experiences and thus attractive and restorative to residents.

## It's not just noise but also the sound of life

- ❖ Urban soundscapes are much more than just noise and a source of discomfort (e.g., through noise maps) disregarding the possibility of positive sound experiences.
- ❖ Unpleasant sounds in daily environments could be compensated with positive values and vegetation plays a crucial role.

## Restorative and valued places are not just visual but multi-sensorial phenomena

- ❖ Studies so far have been constrained by focusing on visual biophysical characteristics of the environment, ignoring the role of other sensory systems in the construction of embodied experience and value of place.
- ❖ Spatially mapping soundscapes and combining these with information on other landscape values as well as different activities, preferences and perceptions of the people engaged in them provides a more nuanced approach to assessing the well-being benefits of nature-based solutions and smart technologies.

