

Integration of ES concept into real-life planning processes – opportunities and challenges, case studies of Helsinki-Uusimaa regional plan and Sibbesborg local master plan

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LIFE Viva Grass, Sigulda, Latvia, 16-18 May 2018



S Y K E



CASE UUSIMAA REGIONAL PLAN

Mapping green infrastructure and ecosystem services in the Helsinki-Uusimaa Region

Helsinki-Uusimaa regional plan 4

- Strategic plan which complements the previous plans
 - Guides the local master plans of the municipalities
- Five themes:
 - **Green infrastructure**, Business and innovation, Logistics, Wind energy and Cultural heritage
- 26 municipalities, 1.6 million people

Mapping and assessing ES and BD to support planning of sustainable green infrastructure

- Helsinki-Uusimaa Regional Council wanted to collaborate with
 - Finnish Environment Institute SYKE to map and assess GI based on ecosystem services
 - University of Helsinki to map and assess BD values of GI
- Funding from the Regional Council, Ministry of Environment and for ES research partially from SYKE
- Aim was to develop and test new methods that help taking better into account BD and ES values of green infrastructure in regional planning

Mapping and assessing GI based on ES: process

- **EkoUuma I (2013)**

- Assessing the spatial variation in the ES provision potential

- **EkoUuma II (2014)**

- Identifying the key areas of the regional green infrastructure
- Drivers of change on ES
- Assessing the demand for cultural ecosystem services
- Application of ROS criteria for classifying regional recreation areas
- Comparison of GreenFrame and Zonation analyses

- **EkoUuma III (2015)**

- Assessing the partial regional plan 4 draft from the ES perspective

- **Uusimaakaava 2050 (2018)**

- **Impacts of the new Helsinki-Uusimaa plan 2050 on ES**

Assessing the spatial variation in the ES provision potential of GI using GreenFrame¹

- An integrated approach to study the variation in the ES provision potential within a study region
- Designed to support land use planning and identifying the key areas of multifunctional green infrastructure
- Instead of quantifying the actual stocks and flows of ecosystem services, the aim is to value areas based on their potential to support the supply of various ES
- Using quantitative data when available (e.g. ground water provision, timber volume, bioenergy potential)
- Complementing with a variety of GIS data themes + expert assessments

23 ES groups from CICES v.4.3

<http://cices.eu>

Table 4.2.1. The potential supply of 23 ecosystem service groups in total was analyzed. The classification is adapted from the Common International Classification of Ecosystem Services (CICES v. 4.3, <http://cices.eu>).

ES SECTION	ES GROUP CODE	ES GROUP
P: Provisioning	P1	Agricultural and aquaculture products
	P2	Wild plants, animals and their outputs
	P3	Surface and ground water for drinking
	P4	Surface and ground water for non-drinking purposes
	P5	Materials from plants, algae and animals and genetic materials from all biota
	P6	Biomass-based energy sources
R: Regulating and maintenance	R1	Mediation of waste and toxics
	R2	Mediation of smell/noise/visual impacts
	R3	Mass stabilization and control of erosion rates, buffering and attenuation of mass flows
	R4	Hydrological cycle and flood protection
	R5	Mediation of air flows
	R6	Pollination and seed dispersal
	R7	Maintenance of nursery populations and habitats, gene pool protection
	R8	Pest and disease control
	R9	Soil formation and composition
	R10	Maintenance of chemical condition of waters
	R11	Global climate regulation
	R12	Micro and regional climate regulation
C: Cultural	C1	Recreational use of nature
	C2	Nature as a site and subject matter for research and of education
	C3	Aesthetics and cultural heritage
	C4	Spiritual, sacred, symbolic or emblematic meanings of nature
	C5	Existence and bequest values of nature

22 data themes comprising 33 spatial datasets

Appendix I. The data themes used in GreenFrame analyses of ecosystem services' supply potential, scored by experts.

DATA THEME	DATASETS	SOURCE
1. Conservation areas	1.1 Natura 2000 areas	© SYKE
	1.2 Nature reserves on public and private land, founded based on the Nature Conservation Act	© SYKE
	1.3 Nature conservation program areas	© SYKE
	1.4 Forest Service property reserved for conservation purposes	© Metsähallitus
	1.5 Conservation areas of regional plans	© SYKE
2. Valuable landscapes	2.1 Nationally significant landscapes	© SYKE
	2.2 Regionally significant landscapes: national database on regional plans	© SYKE
3. Valuable cultural heritage environments	3.1 Cultural environments of Uusimaa	© Uusimaa Regional Council
	3.2 Nationally significant built heritage	© Finland's National Board of Antiquities
	3.3 Relics	© Finland's National Board of Antiquities
	3.4 Protected built heritage	© Finland's National Board of Antiquities
4. Traditional agricultural biotopes	4.1 Traditional agricultural biotopes	© SYKE
5. Important forest habitats	5.1 Habitats of special importance according to the Forest Act	© Finnish Forest Centre
6. Undrained peatlands	6.1 Undrained peatlands	© SYKE
7. Important bird areas (IBA)	7.1 Important bird areas (IBA)	© SYKE
8. Valuable geological features	8.1 Nationally significant bedrock outcrops	© SYKE
	8.2 Nationally significant moraine landforms	© SYKE, Geological Survey of Finland GTK
	8.3 Nationally significant windblown and shore deposits	© SYKE, Geological Survey of Finland GTK
9. Groundwater areas	9.1 Groundwater areas	© SYKE, Centres for Economic Development, Transport and the Environment
10. High Nature Value farmlands	10.1 High Nature Value farmlands	© SYKE
11. Good and continuous agricultural areas	11.1 Good and continuous agricultural areas	© Uusimaa Regional Council
12. Surface waters of high or good ecological status	12.1 Surface water formations of the Water Framework Directive, second planning term	© SYKE, Centres for Economic Development, Transport and the Environment
13. Surface waters with low or very low level of human-induced alterations	13.1 Hydrologic-morphological status of surface waters	© SYKE, Centres for Economic Development, Transport and the Environment
14. Regional recreational areas	14.1) National database on regional plans	© SYKE
	14.2) Recreational areas of the Association of Uusimaa recreational areas (Uudenmaan virkistysalueyhdistys)	© Uudenmaan virkistysalueyhdistys
15. Groundwater areas at risk	15.1 Groundwater areas	© SYKE, Centres for Economic Development, Transport and the Environment
16. Sealed surfaces	16.1 Urban Layer	© SYKE
17. Land extraction sites	17.1 Finnish National CORINE Land Cover raster 25 m	© SYKE (partly ©METLA,MMM,MMLVRK)
18. Peat extraction sites	18.1 Draining status of peatlands	© SYKE
19. Surface waters of moderate, poor or bad ecological status	19.1 Surface water formations of the Water Framework Directive, second planning term	© SYKE, Centres for Economic Development, Transport and the Environment
20. Sites of frequent algae bloom observations	20.1 National algal bloom monitoring database / Jarvi-Wiki	© SYKE
21. Surface waters with moderate or high level of human-induced alterations	21.1 Hydrologic-morphological status of surface waters	© SYKE, Centres for Economic Development, Transport and the Environment
22. Land cover	22.1 Finnish National CORINE Land Cover raster 25 m	© SYKE (partly ©METLA,MMM,MMLVRK))

...including three quantitative spatial datasets

Table 4.2.2. The quantitative datasets used in assessing the supply potential of provisioning services.

ES GROUP	THEME	DATA	SOURCE
P3, P4	Groundwater formation	Groundwater areas	© SYKE, Centre for Economic Development, Transport and the Environment
P5	Timber volume	BalBic-data	© Forestry Development Centre TAPIO 2013 © Finnish Forest Research Institute METLA 2013
P6	Forest bioenergy potential	BalBic-data	© Forestry Development Centre TAPIO 2013 © Finnish Forest Research Institute METLA 2013

Expert scoring of all non-quantitative spatial datasets

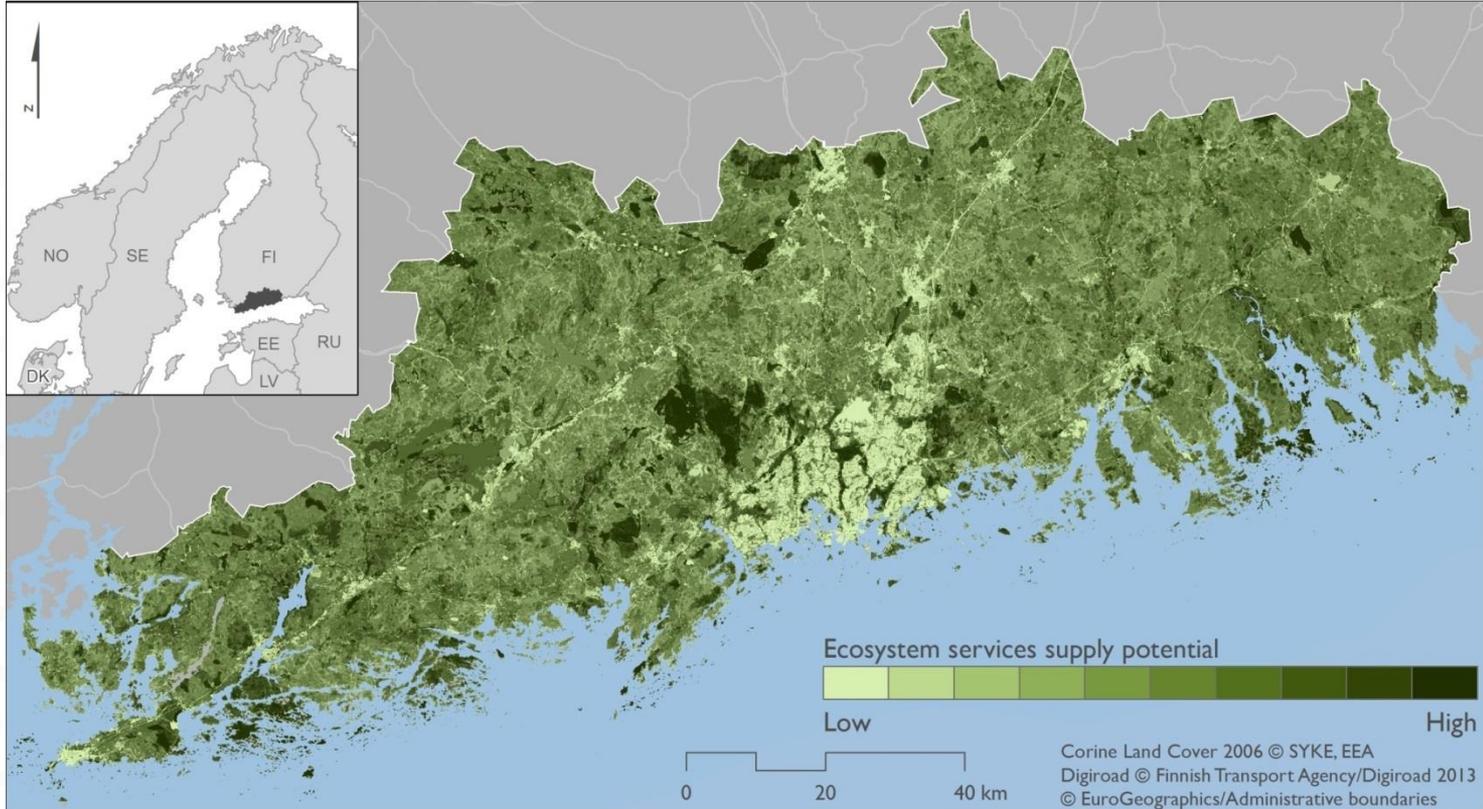
Also negative scores for those themes that harmfully impact ES provision potential

Appendix 2. Matrix of expert scores given to each pair of data themes and ES groups. The experts were asked to assess the effect of each theme on the supply potential of ES in question. Positive values indicate a favorable effect, negative values indicate a harmful effect and zero values indicate no effect or a neutral effect.

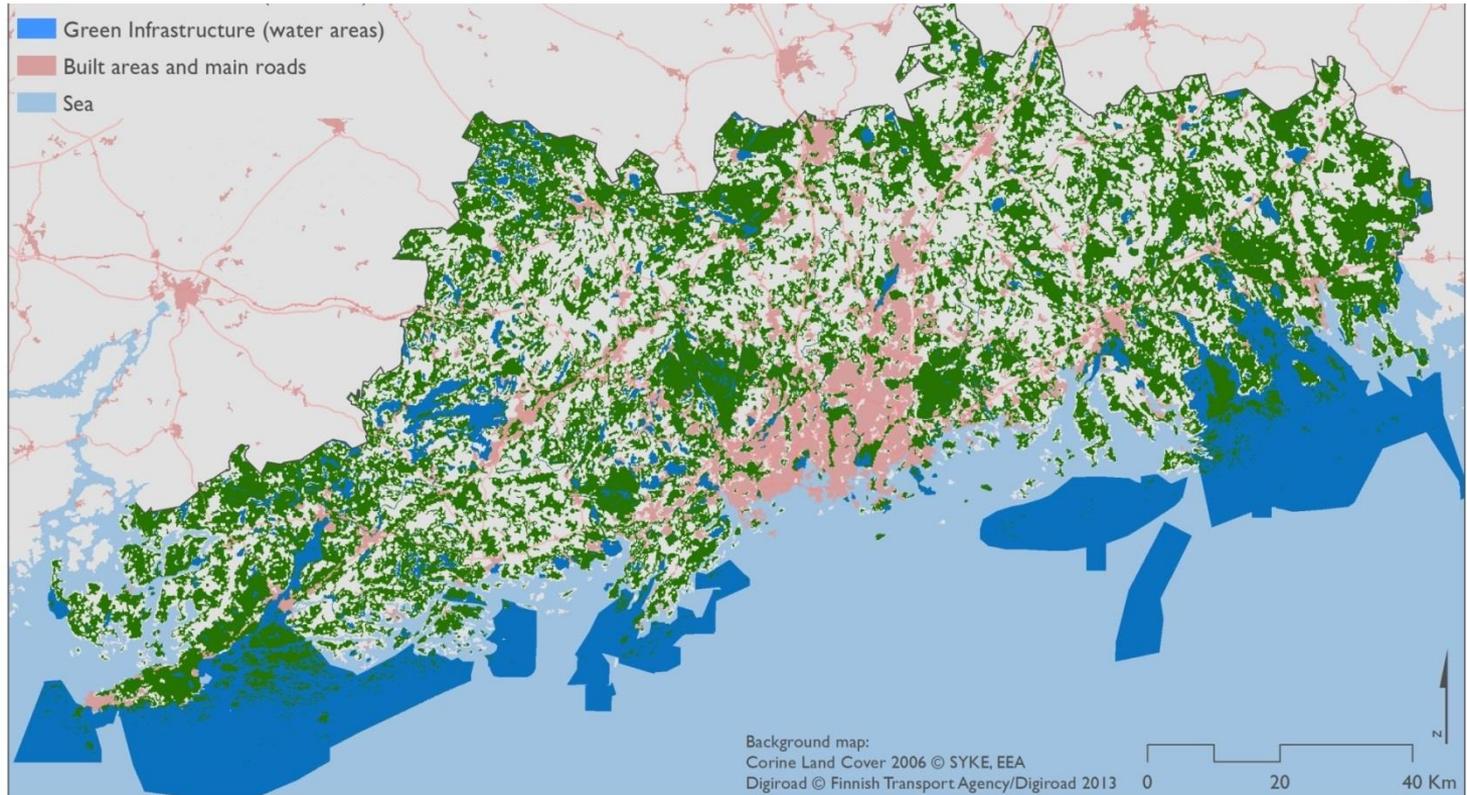
DATA THEME	ES GROUP CODE																				
	PI	P2	P3	P4	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	C1	C2	C3	C4	C5
1. Conservation areas	0	2	2	2	0	1	2	3	2	2	3	2	2	2.5	2	2.5	3	3	2	3	3
2. Valuable landscapes	3	1.5	1	1	1	2	1	1	1	2	2	1	1	1	0	1	2	2	3	2	2
3. Valuable cultural heritage environments	2	1	0	1	0	1	1	1	0	2	1	1	1	1	0	1	3	1.5	3	2	2
4. Traditional agricultural biotopes	2	2	0	1	0	1	1	1	1	3	3	1	2	1	0	1	2	2	3	2	3
5. Important forest habitats	0	2	1.5	1.5	1	1	1	2	1	2	3	1	2	2	1	1	2	3	2	2	3
6. Undrained peatlands	0	2	2	2	1	0	1	3	1	1	3	1	2	2.5	1	2	2	3	2	3	3
7. Important bird areas	0	1	0	1	1	1	1	1	0	1	3	1	1	1	0	1	2	3	2	2	3
8. Valuable geological features	0	1	3	2	1	2	1.5	2	1	1	1	1	2	3	0	1	2	2	2	2	3
9. Groundwater areas	0	1	3	3	0	1	1	3	1	1	1	0	2	3	0	1	1	1	1	1	2
10. High Nature Value farmlands	3	1	0	0	0	1	1	1	0	2	2	1	1	1	0	1	2	2	2	2	2
11. Good and continuous agricultural areas	3	2	0	0	1	1	0	0	0	1	0	0	1	0	0	1	0	1	2	0	0
12. Surface waters of high or good ecological status	0	2	3	3	0	0	0	2	0	0	3	2	0	3	0	0	3	3	2	2	3
13. Surface waters with low or very low level of human-induced alterations	0	2	2	3	0	0	0	2	0	0	2	1	0	3	0	0	2	2	2	2	3
14. Regional recreational areas	1	2	1	1	0	2	1	1	1	1	1	1	1	1	0	1	3	2	2	2	2
15. Groundwater areas at risk	-2	-1	-3	-2	-3	0	0	-1	0	0	0	0	0	-3	0	0	0	0	0	0	-1
16. Sealed surfaces	-3	-3	-3	-3	-2	-1	-2	-3	-2	-2	-3	-1	-3	-2	-1	-2	-3	-3	-3	-3	-3
17. Land extraction sites	-2	-3	-2	-2	-2	-3	-2	-2	-1	-2	-2	-1	-3	-2	-1	-1	-3	-2	-2	-3	-3
18. Peat extraction sites	-2	-3	-2	-2	-2	-2	-2	-2	-1	-1	-2	-1	-3	-3	-2	-1	-3	-3	-3	-3	-3
19. Surface waters of moderate, poor or bad ecological status	-1	-1	-2	-2	-1	0	0	0	0	0	-1	-1	0	-2	0	0	-2	-1	-2	-2	-2
20. Sites of frequent algal bloom observations	-2	-2	-2	-2	-1	0	0	0	0	0	-1	-1	0	-2	0	0	-2	-1	-2	-2	-2
21. Surface waters with moderate or high level of human-induced alterations	0	-2	-2	-2	-1	0	0	-1	0	0	-1	-1	0	-2	0	0	-2	-2	-2	-2	-2

3: Very favorable effect, 2: Favorable effect, 1: Slightly favorable effect, 0: No effect / neutral effect, -1: Slightly harmful effect, -2: Harmful effect, -3: Very harmful effect

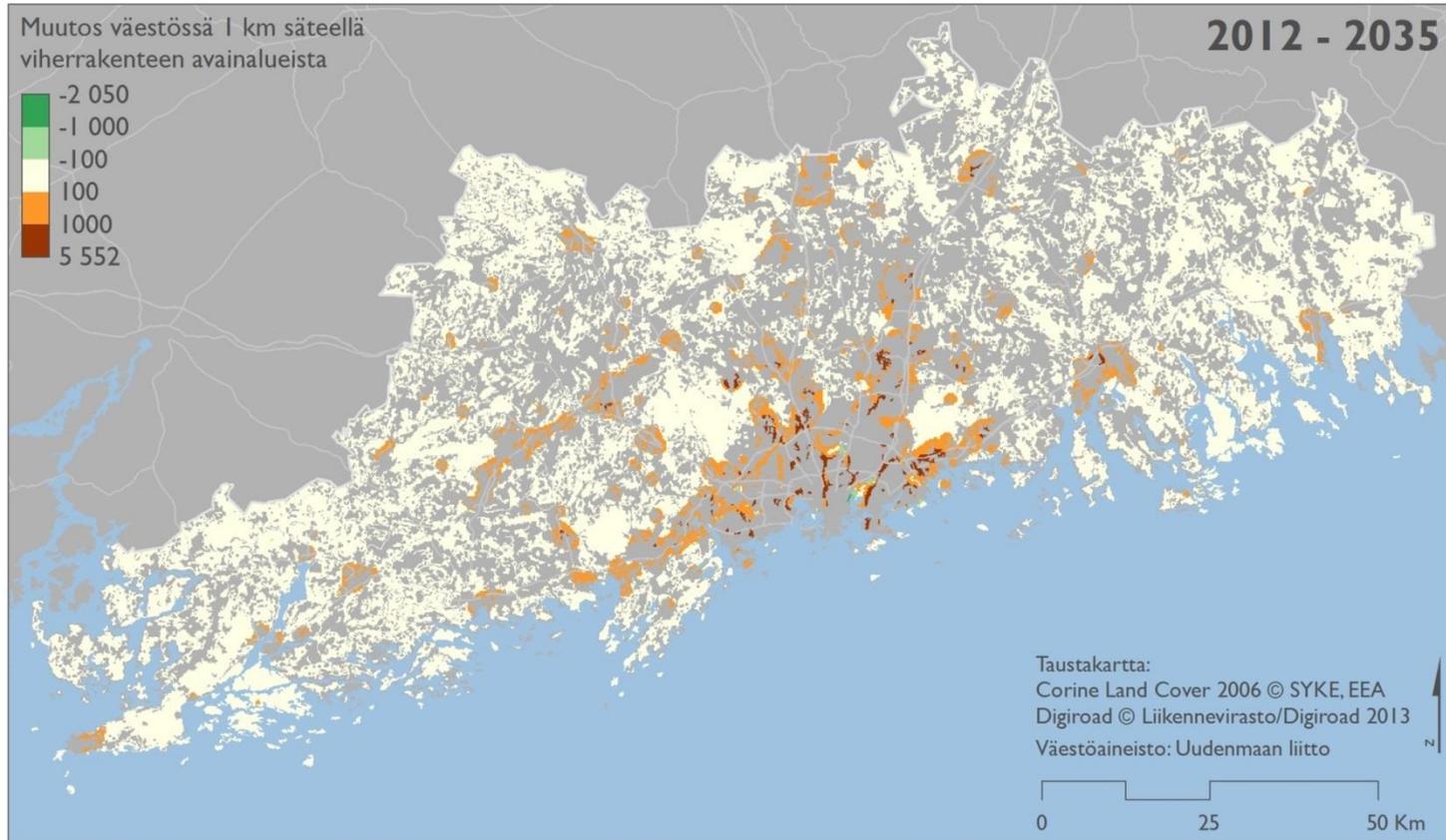
Variation of ES provision potential of green infrastructure in Helsinki-Uusimaa Region



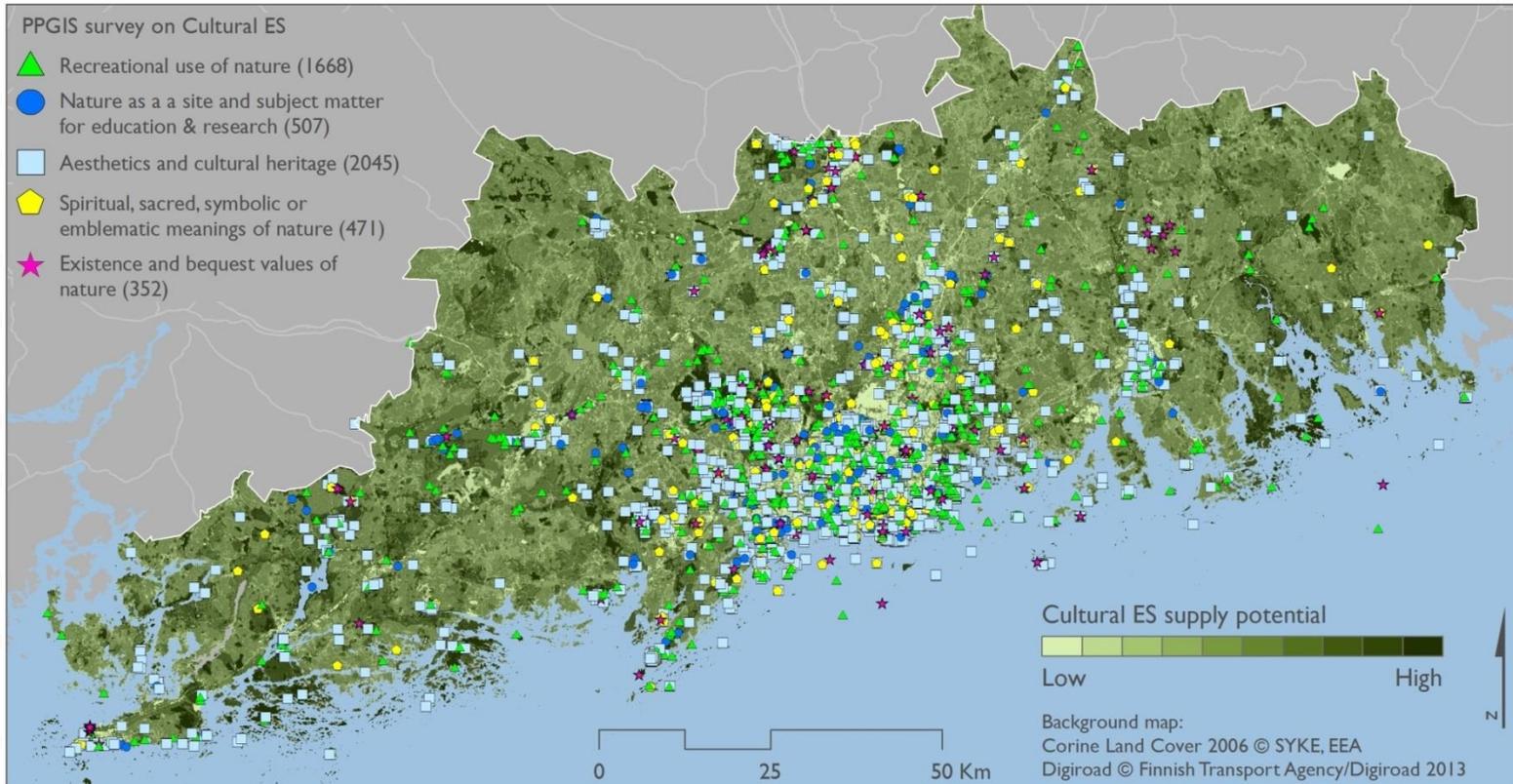
Identification of key green infrastructure from ES' point of view



Change in the number of population within 1 km from the key areas of regional GI, 2012-2035

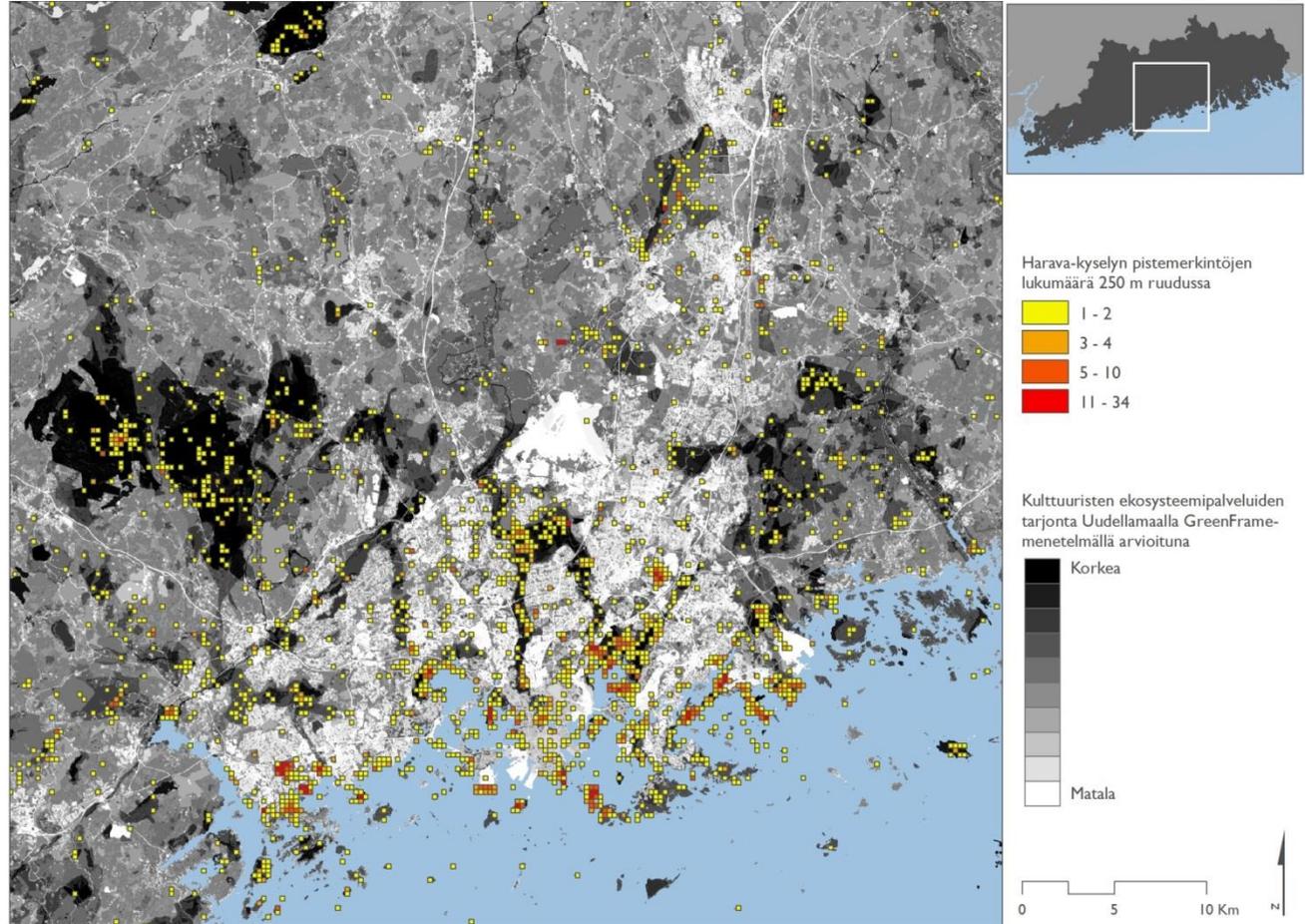


Mapping demand for cultural ES: an online participatory survey open for all residents of the region



Number of
CES markers
in 250x250 m
grid cells

—
Overlaid on
ES provision
potential map



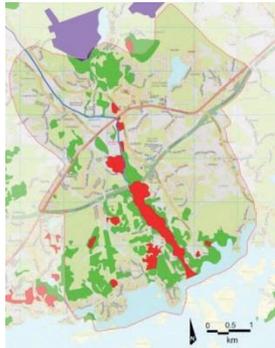
CASE SIBBESBORG

**OPERATIONALISING ECOSYSTEM
SERVICES IN SPATIAL PLANNING**

OPENNESS URBAN CASE STUDY

Sibbesborg local master plan, Sipoo municipality

- Sibbesborg is a large-scale urban development project east of Helsinki (Southern Finland) which will, according to current plans, house about 45,000 (previous scenario 70,000) inhabitants by 2050 instead of current 5,000
- The project responds to the population growth pressures of the Helsinki Metropolitan Area
- The planning area covers about 26 km²
- Target: from a sparsely populated mainly agricultural landscape to an urban center
- Strengths: scenery and nature forming a unique entity



Aims and objectives of the case study

- The general aims and objectives were:
 - exploring how ES approach and concept can be usefully applied in the Sibbesborg planning process
 - assessing the benefits of ecosystem services in social and economic terms and as complementing “traditional” planning approach
- A special focus on green infrastructure and ecosystem services and new tools to manage green space as part of urban realm
- Distinct themes of the Sibbesborg plan approved by the municipality are **local food production** and **green care**, which refers to social, health and educational services relying on natural and agricultural environments



Research team and case study advisory board (CAB)

- Our research team (SYKE and University of Helsinki) worked together with the **Sibbesborg planning team** (municipal planners and a planning consultancy)
- We supported the planners in identifying, measuring, mapping and valuating green infrastructure and ecosystem services in a participatory way **engaging local residents**
- **Case study advisory board** consisted of local planners and stakeholders and various experts from research and natural resource management
- meetings regularly 3-4 times a year

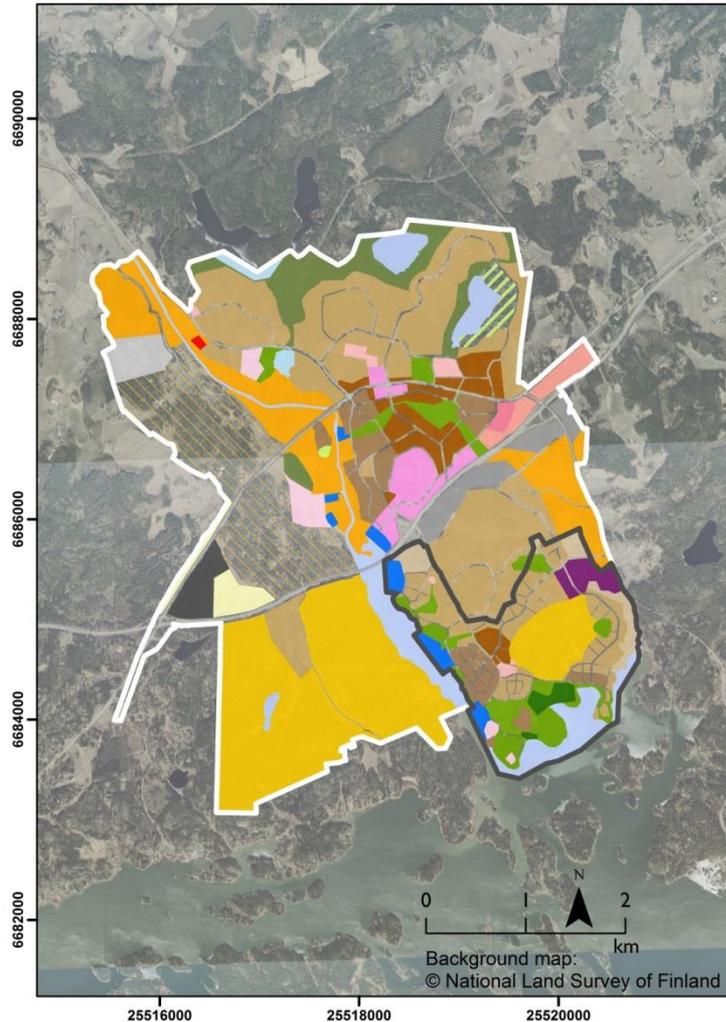


GIS-based analyses of

- Provision potential of cultural ecosystem services (CES) by green infrastructure applying and developing further ESTIMAP-based approach
- Knowledge of people's preferences and perceived values related to CES
- Participatory methods to produce CES demand maps
- Studying the spatial correlation between CES provision potential and demand for CES
- Aim was to see **how the proposed land use change transforms the environment and affects places valued by current residents**

<- CES provision potential mapped also for the planned land use based on draft local master plans in the area

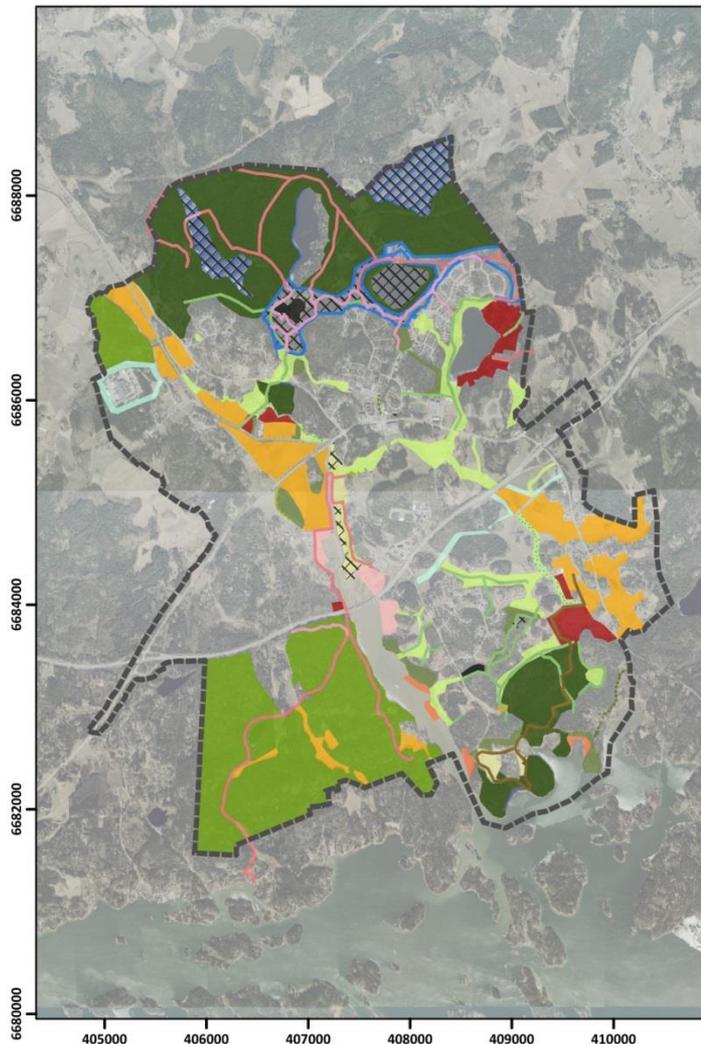
Draft local master plan



MASTER PLAN

- Agriculture and forestry
- Agriculture and forestry in an area with high natural values
- Allotments
- Area with natural values
- Business district (incl. tourism, recreation, cultural services and housing)
- Central business district (incl. public services)
- Construction area
- Field with high landscape values
- High-level park (incl. sport, recreation and other leisure-related structures)
- High-rise residential area with services
- Industrial areas demanding special environmental attention
- Industrial buildings and warehouses
- Industrial buildings, warehouses and work places
- Marina
- Municipal services: water intake
- Park with conservation value
- Protected area
- Public road
- Public services and administration
- Recreation area
- Residential area with services
- Residential area with services and close-to-home recreation
- Sparsely-populated area
- Urban expansion area
- Water area
- Workplace area
- Workplace area: residential buildings allowed

Green space plan



GREEN SPACE PLAN

- Allotments
- Nature conservation area
- Area with natural values
- Beach
- Boat harbor
- Boat harbor for small boats
- Commercial forest with recreation values
- Fitness trail
- Existing recreation trail
- Planned recreation trail
- Existing tree avenue
- Planned tree avenue
- Field
- Pasture, meadow
- Forest buffer zone
- Forest park
- Forest with hiking area and recreation values
- Park
- Park with fruit trees and berry bushes
- Recognized need for green connection
- Horseback riding trail
- Playing ground
- Dog park



Background map:
© National Land Survey of Finland

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Kopperoinen, L., Viinikka,
A., Zulian, G., Yli-Pelkonen,
V., Niemelä, J., Vila
Villarroel, L. Developing
cultural ecosystem service
mapping for spatial
planning purposes –
Sibbesborg, Finland, as a
case study. (manuscript)



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Opportunities and challenges in integrating ES concept into real-life planning processes

- **Stakeholders** have been very positive towards ES concept and methods and **Sibbesborg's planners** are willing to incorporate ES thinking into the plans
- GIS-based tools of mapping ES have been a good way to **illustrate** the provision of ES, but **suitable illustration techniques** have to be selected depending on which stakeholder groups they are shown to (complexity/simplicity etc.)
- Stakeholders have seen ESTIMAP method **beneficial** and wish the results will be considered in planning
- Used methods are suitable for **impact assessment purposes** taking place **iteratively along the planning process**



Opportunities and challenges in integrating ES concept into real-life planning processes

- Knowledge on natural values plus areas and features providing ecosystem services -> Mapping is a powerful tool
- Involvement of local stakeholders
- Sectoral collaboration
- Comprehension of multifunctionality of green and blue infrastructure
- How well will the planners be able to capture the importance of ES to current and future residents in the **pressure of constructing very urban town structure** in an area which is at the moment rather rural and partly pristine nature

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