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PROPOSAL OF GREEN INFRASTRUCTURE PLANNING PRINCIPLES IN KOPLI AND PALJASSAARE DISTRICT

ROHETARISTU PLANEERIMISE PÕHIMÕTETE ETTEPANEK KOPLI JA PALJASSAARE ASUMIS

Master's thesis
Curriculum in Landscape architecture

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1. INTRODUCTION

This thesis is proposing a r**esponse for green infrastructure planning in Kopli and Paljassaare districts by phrasing new ecological and recreational planning principles that are based on the interpretation of drivers, assessment of pressures, states, impacts and political response of 2030.**

Research questions:

1. Which ecosystem services are valid in the green infrastructure of Northern Tallinn district, what is their condition and where are these services distributed?

2. Which recreational opportunities are valid in the green infrastructure, which landscape units are recreationally valuable and used by local residents and where are these features distributed?

3. Where are the conflicting and synergic areas considering the studied aspects of the green infrastructure?

4. Which planning principles need to be considered in the future green infrastructure planning?

Keywords: green infrastructure planning, ecosystem services, recreational opportunities, EU Biodiversity Strategy of 2020

SIGNIFICANCE

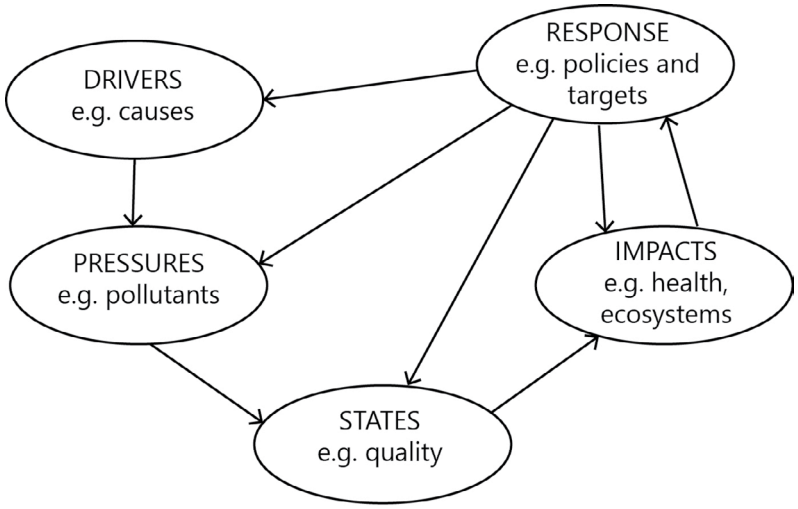
- Large industrial, private port and national defence grounds in Northern Tallinn occupy already most of the land – it is important to take account green infrastructure planning in the surrounding areas.

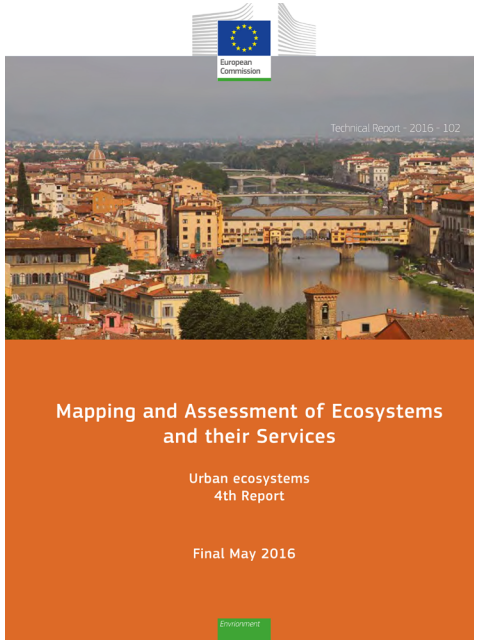
- New developments plan to densify the district mostly with residential housing

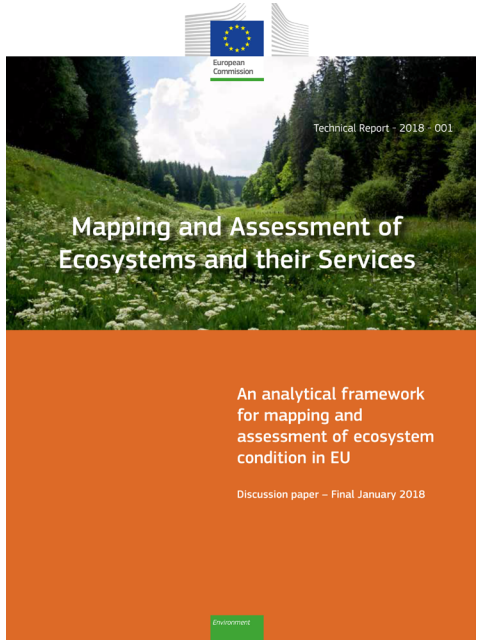
- Green zones between those areas play a crucial role in preserving the ecological quality of the district

STRUCTURE

1 LITERATURE REVIEW



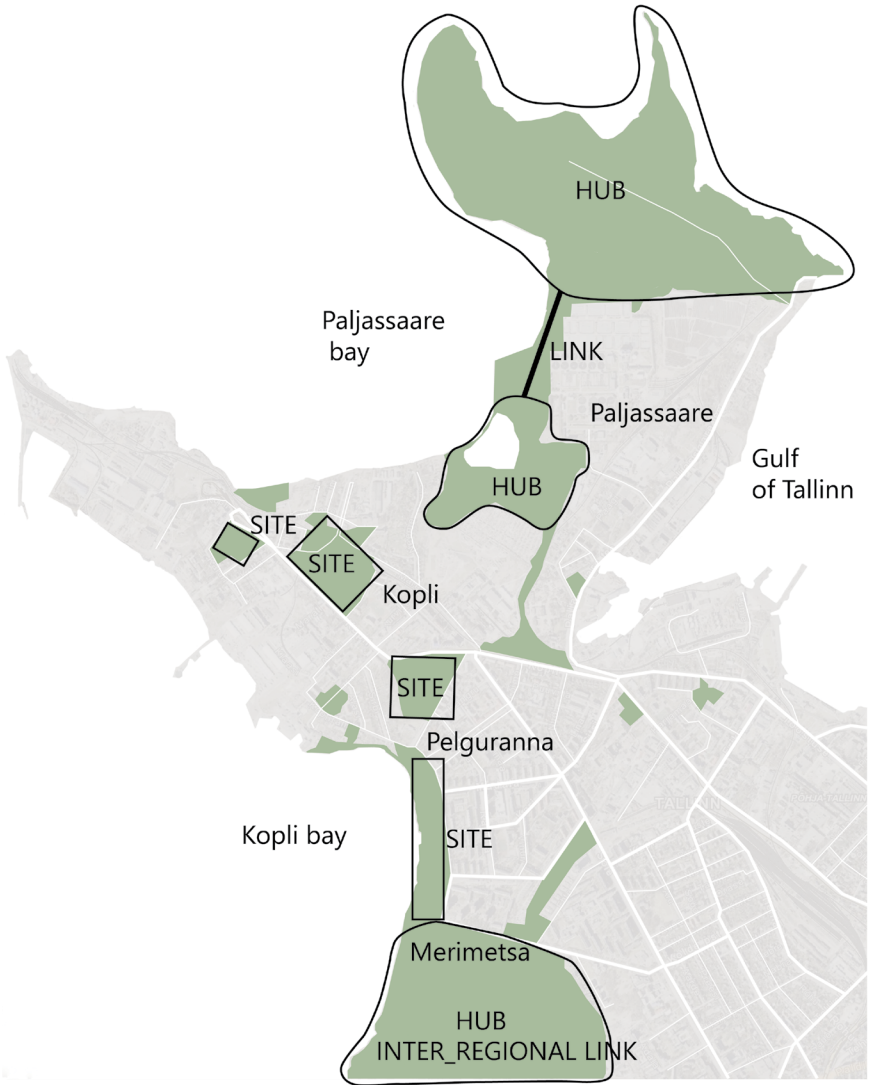




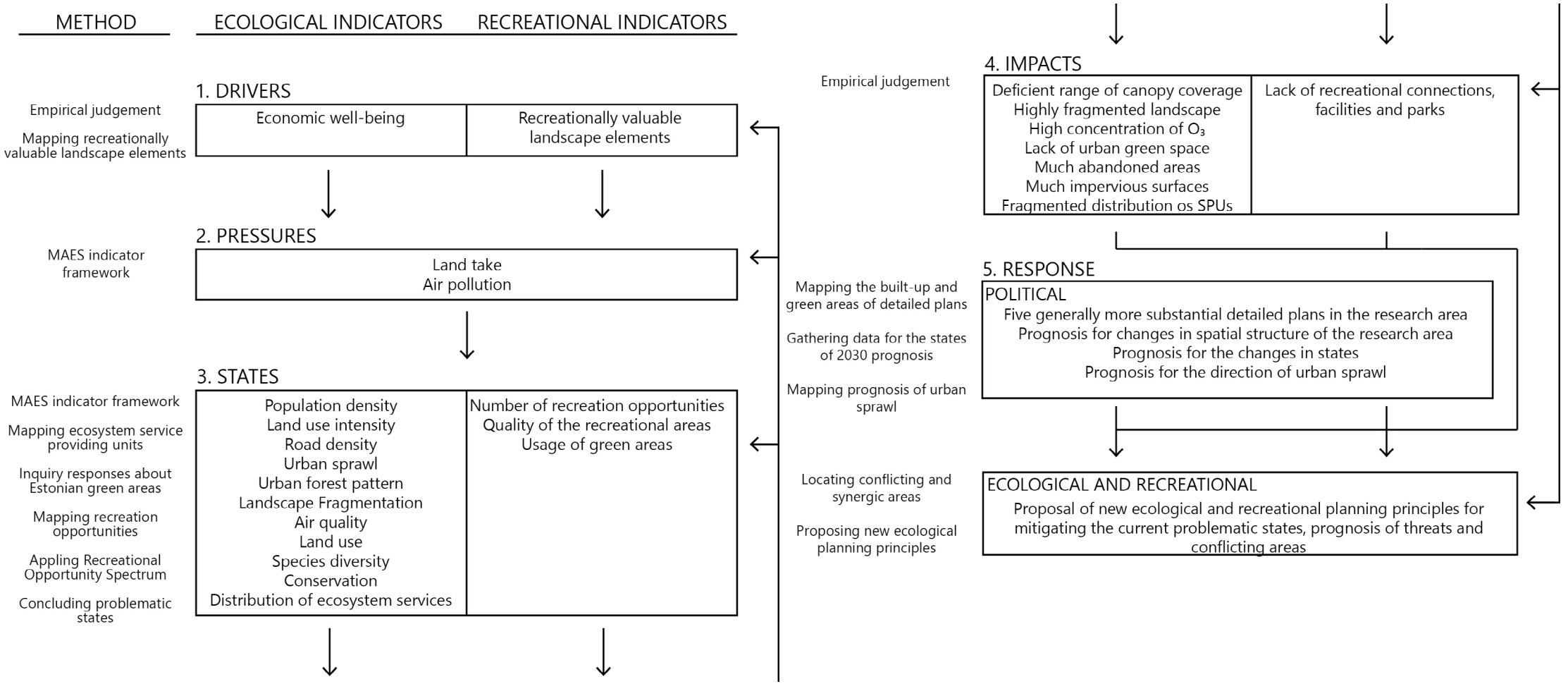
2 METHODOLOGY - IDENTIFICATION OF THE STUDY AREA

- The research area covers Kopli, Paljassaare, Pelguranna and Merimetsa settlements that are located in the northern part of North-Tallinn district and at the beginning of Kopli and Paljassaare peninsula.

- Three main hubs were located with sites and links between



2 METHODOLOGY - GENERAL FRAMEWORK



Economic well-being – bigger incomes, economic growth, gentrification, increased popularity of the area and closeness to the sea are the triggers that drive people to peri-urban areas close to the City Centre that have not been renewed yet.

Recreationally valuable land units and their buffer zones were mapped to locate theoretically attractive areas and drivers for recreation.

Land units that are considered recreationally valuable: rapids, bigger rocks, slopes, shores of internal waters, streams, sea shore, piers, green areas, memorials, monuments, glade grasslands, trees, forests, light beacons.

Land take is a pressure for ecosystems because parts of natural land is transformed into artificial land. **Air quality** has a direct impact on human health and species diversity so it is important to measure the condition of specific particles.

Table 3. An indicator framework for assessing the condition of pressures in urban ecosystems cited from Maes et al. 2016.

Pressures on urban ecosystems	
Class	**Indicator**
Land take	Percent of built-up area (%)
Air pollution	NO_2 annual mean in 2014
	PM_{10} annual mean in 2014
	93.2 percentile of O_3 maximum daily 8-hours mean in 2014

3.3.1 RESULTS - ASSESSMENT OF STATES - ECOLOGICAL STATES

Table 4. *An indicator framework for assessing the condition of states in urban ecosystems*

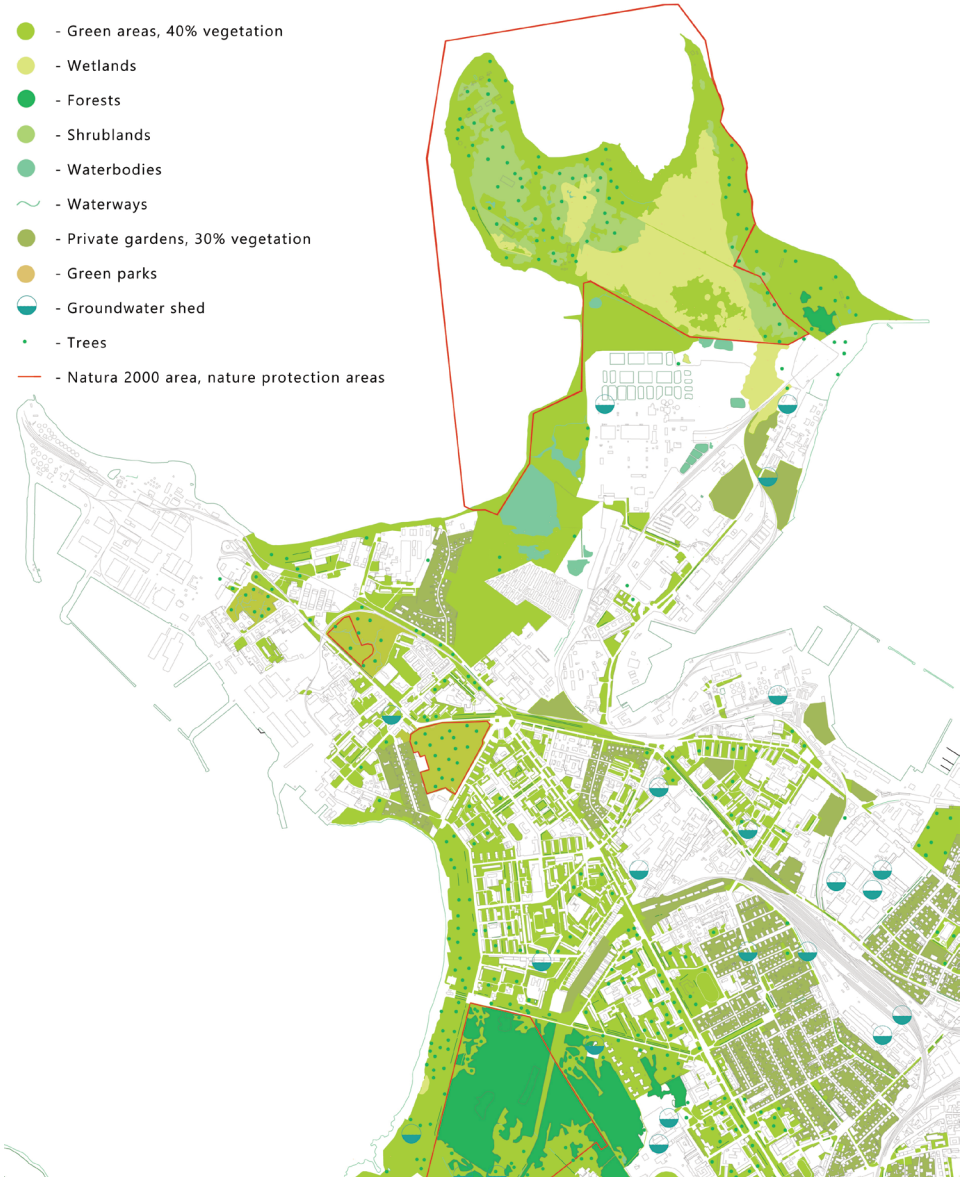
State indicators of urban ecosystems – built infrastructure			
Class	**Indicator**	**Current Data**	**Reference data**
Population density	Number of inhabitants per km^2	3930 ppl/km^2 *	Not defined, preferably slowing the increase
Land use intensity	Artificial area per inhabitant	~138,8 m^2	Not defined, preferably slowing the increase
Road density	Length of the roads per km^2	~150 m	Not defined, preferably slowing the increase
Urban sprawl	Percent of built-up area (%)	55 % *	Not defined, preferably slowing the increase
State indicators of urban ecosystems – green infrastructure			
Class	**Indicator**	**Current Data**	**Reference data**
Urban forest pattern	Canopy coverage (km^2, %)	4, 5 km^2 (29%)	The European average is 31%
Landscape Fragmentation	Landscape fragmentation per 1 km^2 grid in 2009 (Mesh density pixel)	25-50 meshes per 1 km^2 (s_{eff})	The European Average number is 1–10
Air quality	Concentration of:		
	NO_2 annual mean in 2014	≤ 13,5 µg/m^3	≤ 40 µg/m^3
	PM_{10} annual mean in 2014	≤ 13,2 µg/m^3	≤ 20 µg/m^3
	93.2 percentile of O_3 maximum daily 8-hours mean in 2014	≤ 107 µg/m^3	100 µg/m^3
State indicators related to the proportion of green and built infrastructures			
Class	**Indicator**	**Current Data**	**Reference data**
Land use	Proportion of urban green space (%)	24 %	European average is 30%
	Proportion of natural areas (%)	45 %	20 %
	Proportion of protected areas (%)	12 %	Not defined, preferably existing
	Proportion of built abandoned areas (%)	2 %	0 %
	Proportion of impervious surface (%)	50 %	Not defined, preferably slowing the increase
State indicators of urban biodiversity			
Class	**Indicator**	**Current Data**	**Reference data**
Species diversity	Number of nesting bird species per km^2	226 per km^2	Stable number
Conservation	Number of species under protection per km^2	35 per km^2	Stable number

*Colour coding shows the poor ecosystem conditions in red and good in green. Conditions in a normal state are coloured yellow

3.3.1 RESULTS - ASSESSMENT OF STATES - ECOLOGICAL STATES

Table 5. *Urban ecosystem services linked with service providing units (SPUs) extracted from* Maes *et al.* 2016: p. 83.

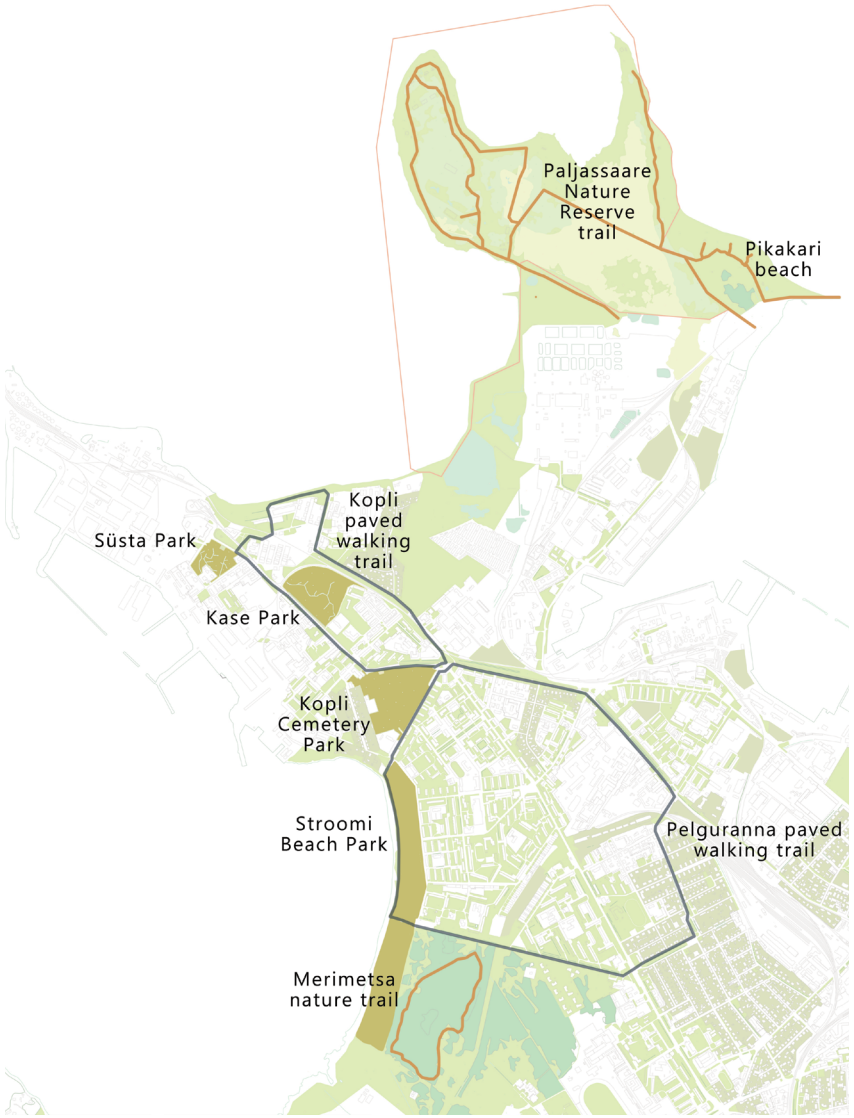
Urban ecosystem service	**Service providing units (SPUs)**
Drinking water	Watershed
Regulation of air quality by urban trees and forests	Forests, scrublands
Climate regulation by reduction of CO_2	Vegetation, soil
Urban temperature regulation	Forests, trees, shrubs, herbs, lawns, wetlands, waterbodies
Noise mitigated by urban vegetation	Forests, trees, shrubs, vegetated surfaces
Water flow regulation and runoff mitigation	Threes, shrubs, vegetated and permeable areas
Insect pollination	Crop fields, fruit trees, private and public gardens
Nature-based recreation	Parks, gardens, forests, trees, agricultural areas in the commuting zone, wetlands, water bodies, waterways, Natura 2000 sites
Nature-based education	



Problematic conditions of the current state in ecosystem services are concluded:

- Deficient range of canopy coverage
- Highly fragmented landscape and green infrastructure
- Concentration of O_3 exceeding the level of normative
- Lack of urban green space
- Many built abandoned areas
- Many impervious surfaces
- Distribution of SPUs is fragmented in the central part of Northern Tallinn

3.3.2 RESULTS - ASSESSMENT OF STATES - RECREATIONAL STATES



Problematic condition of the current state in recreational opportunities is concluded:

- Lack of recreational connections, facilities and parks that are linked to Paljassaare peninsula green areas

- Economic growth, land take and air pollutants apply pressure to the environment.

- Pressures cause change in the states.

- Changes in the states of ecological conditions cause change in ecosystem services and will therefore have an impact on human health and ecosystems.

- States that are currently in a more problematic condition are in the most vulnerable for pressures.

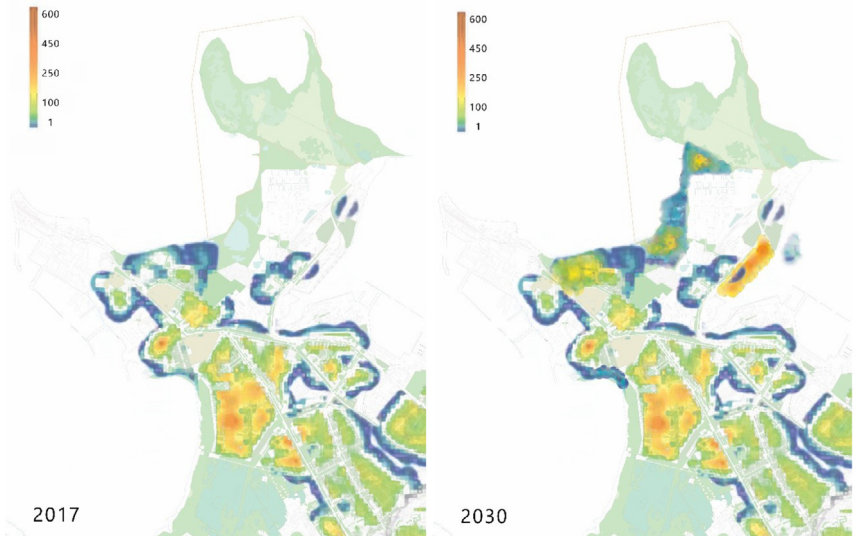
- Negative changes in vulnerable states like canopy coverage, landscape fragmentation, concentration of O_3, urban green spaces, abandoned areas, impervious surfaces, distribution of SPUs and recreational opportunities can cause even bigger impacts in the future.

3.5.1 RESULTS - PROPOSAL OF RESPONSES - POLITICAL RESPONSE – PROGNOSIS FOR 2030

Five generally more substantial detailed plans are in process or already established in Kopli and Paljassaare district and considered as a political response:

1. Ecobay – Detailed plan of Paljassaare cross 16 and surrounding areas
2. Paljassaare port – Detailed plan of 16 lots in Paljassaare port and surrounding areas
3. Kopli lines – Detailed plan of Kopli lines and surrounding areas
4. Kopliranna – Detailed plan of Sirbi, Kopliranna, Vasara street and coastal area
5. Paljassaare artificial islands – Detailed plan of Paljassaare artificial islands

- Main affirmative aspects and threats are stated based on the prognosis of states of the year 2030.
- A heat map was compiled to locate the possible direction of urban sprawl in the area.



3.5.2 RESULTS - PROPOSAL OF RESPONSES - RESPONSE BASED ON THE GREEN INFRASTRUCTURE PLANNING PRINCIPLES

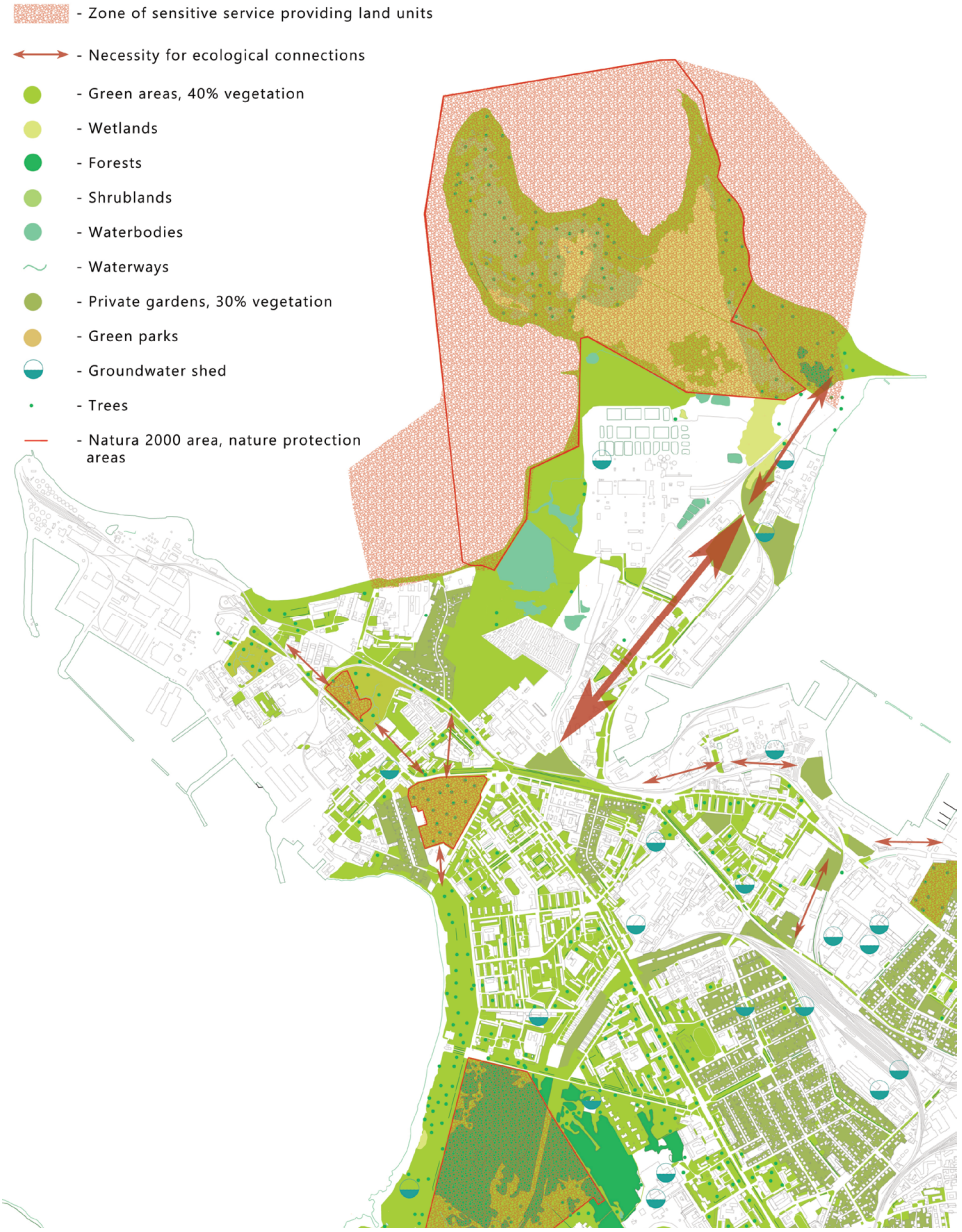
3.5.2.1 LOCATING CONFLICTING AND SYNERGIC AREAS BASED ON MAPPED LAND UNITS

ECOLOGICAL CONNECTIONS

Based on distribution of **service providing units (SPUs)**, it is possible to mark areas that need more ecological connection.

Linear green connection are often missing from between smaller sites and bigger hubs.

Connections can be planned in order to meet planning principles of green infrastructure.



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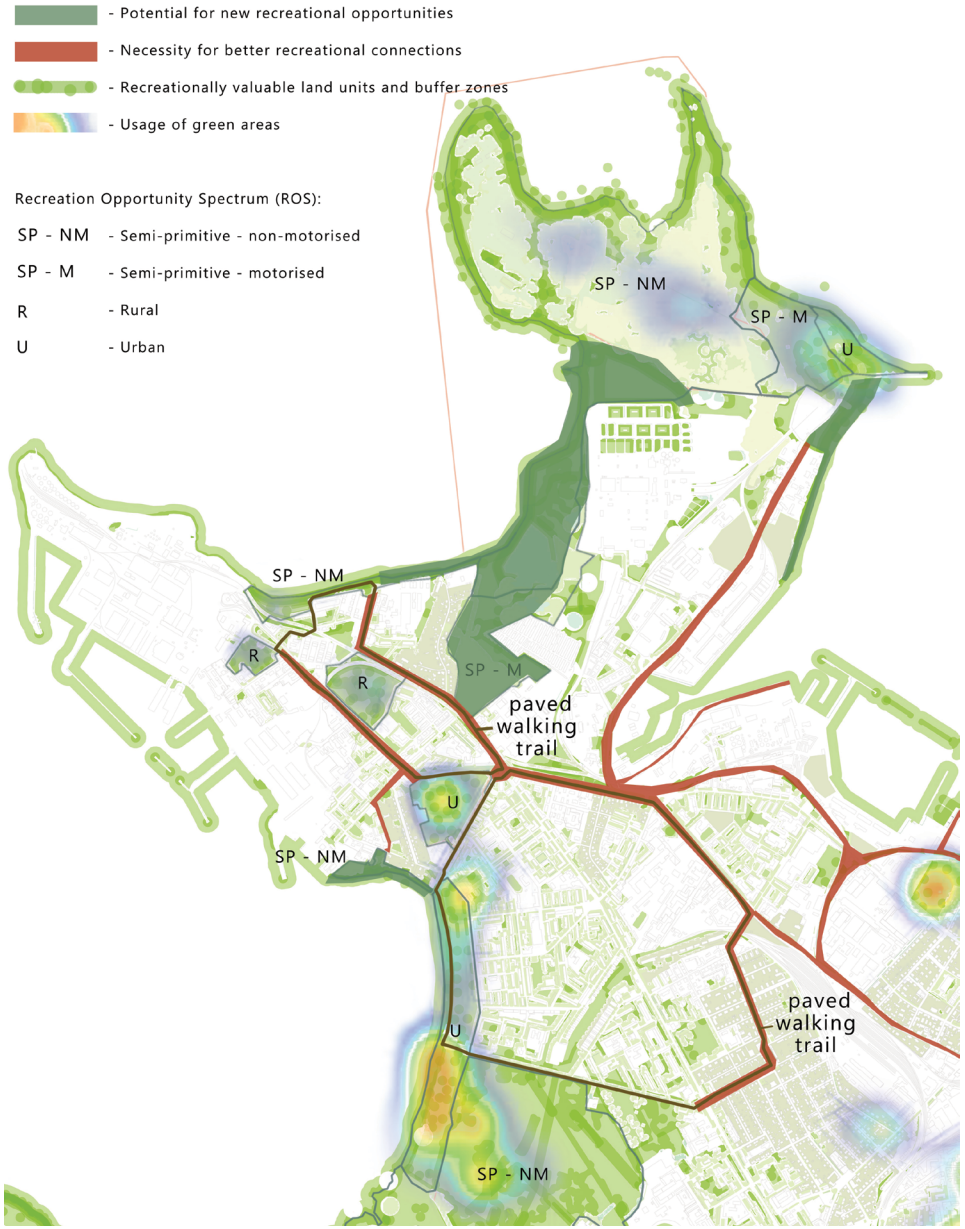
3.5.2.1 LOCATING CONFLICTING AND SYNERGIC AREAS BASED ON MAPPED LAND UNITS

RECREATIONAL CONNECTIONS

By overlapping layers of **recreationally valuable land units, usage of green areas and ROS classes**, it is possible to locate:

- the necessity for better recreational connections.

- potential areas for new recreation opportunities



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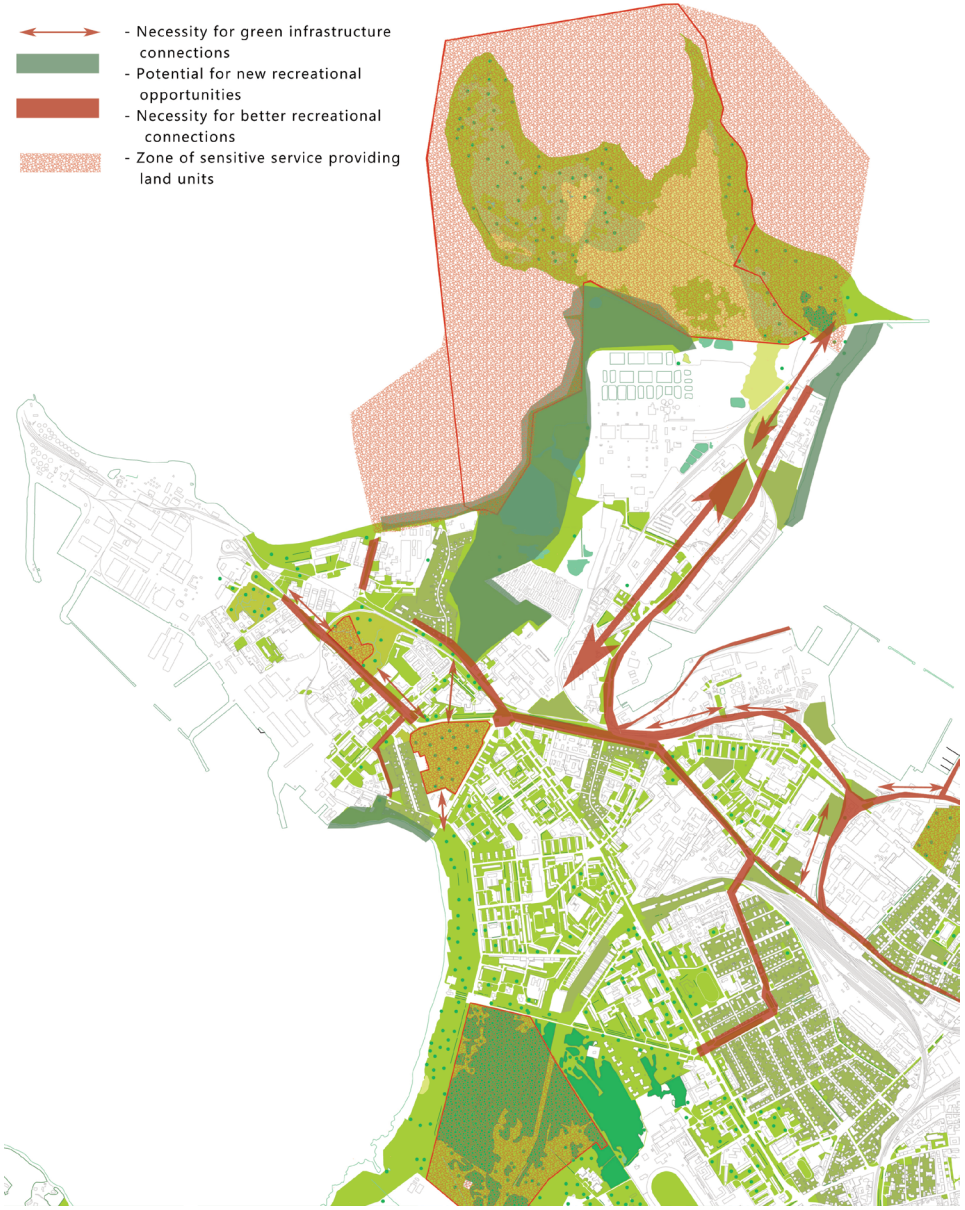
3.5.2.1 LOCATING CONFLICTING AND SYNERGIC AREAS BASED ON MAPPED LAND UNITS

ECOLOGICAL AND RECREATIONAL CONNECTIONS

Recreational layer was overlapped with service providing units layer to locate:

- where the necessity for green infrastructure connections and recreational connections overlap.

- where the potential area for new recreational opportunities overlap with the zone of sensitive service providing land units.



3.5.2 RESULTS - PROPOSAL OF RESPONSES - RESPONSE BASED ON THE GREEN INFRASTRUCTURE PLANNING PRINCIPLES

3.5.2.1 LOCATING CONFLICTING AND SYNERGIC AREAS BASED ON MAPPED LAND UNITS

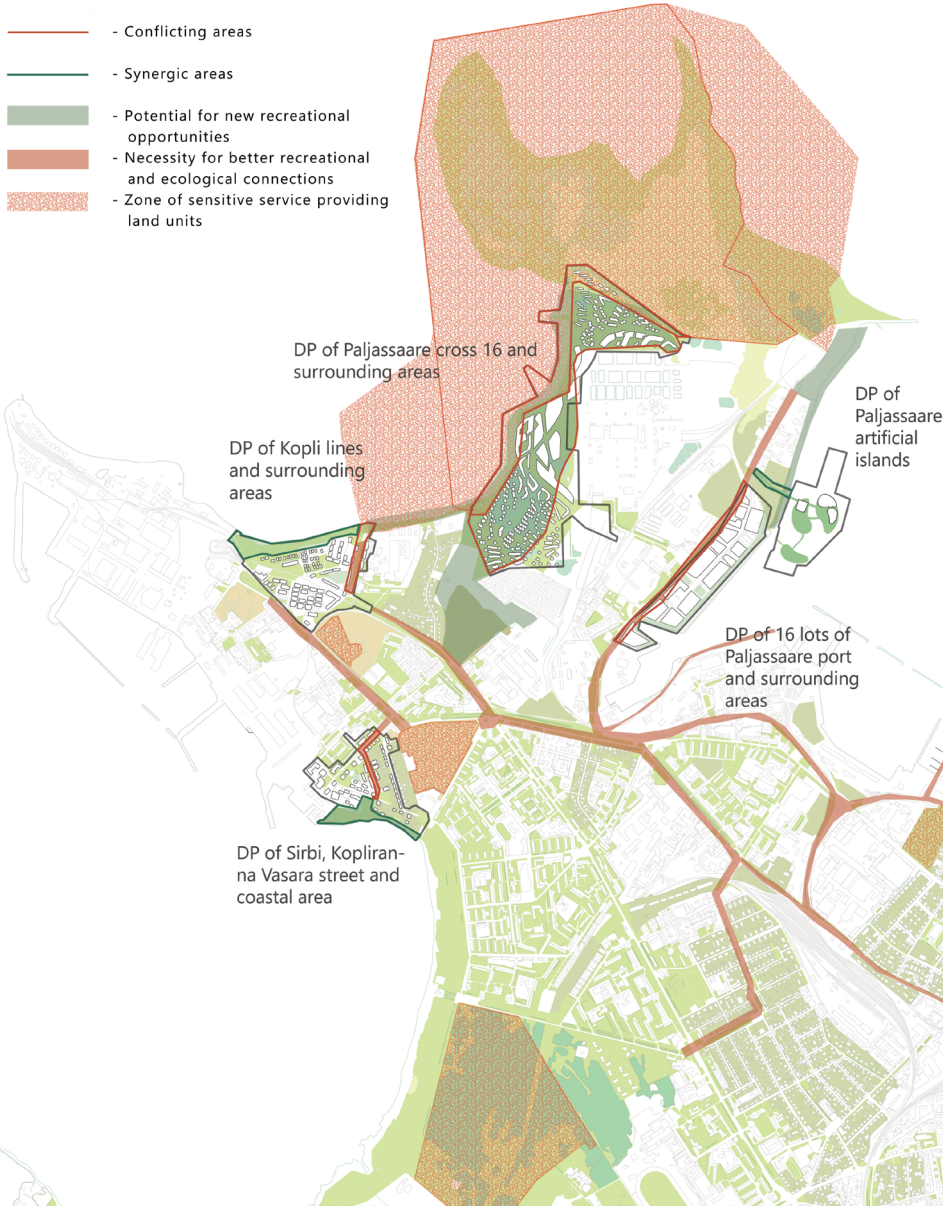
ECOLOGICAL AND RECREATIONAL CONNECTIONS AND DETAIL PLANS

Outcome of overlapping the **ecological and recreational layer was overlaid with the map of future detailed plans** to locate the future conflicts and synergic areas.

- Most conflicting detailed plan is the Paljassaare cross 16 detailed plan.

- Kopli lines detailed plan and Sirbi, Kopliranna, Vasara Street detailed plan are missing links for recreational connections.

- Paljassaare port detailed plan could include an important link to connect recreational and ecological connections to Paljassaare peninsula.



Previously localised conflicting areas can be addressed with following green infrastructure planning principles that are phrased according to the previous research for mitigating the current problematic conditions and threats in the prognosis for 2030.

ECOLOGICAL PLANNING PRINCIPLES

Phrased planning principles for mitigating the current problematic conditions:

1. New green infrastructure connections and connected distribution of SPU across the Northern Tallinn can be made by:
   1.1 Enlarging the areal range of canopy coverage
   1.2 Redesign built abandoned areas
   1.3 Developing more urban green spaces
   1.4 Increasing the area of pervious surfaces
2. Air quality can be improved by:
   2.1 Prevention of the concentration of O_3 exceeding the level of normative

Phrased planning principles for mitigating the threats that emerged from the political response according to the prognosis for 2030:

3. Slowing the increase of built up areas by using more sustainable solutions – pervious surfaces, sustainable urban drainage systems
4. Maintaining the size of the current nature reserve area
5. Eliminating the disturbance of bird species and species under protection

RECREATIONAL PLANNING PRINCIPLES

Phrased planning principles for mitigating the current problematic conditions:

1. Creating recreational connections, facilities and parks that are linked to the coast line and Paljassaare peninsula

Phrased planning principles for mitigating the threats that emerged from the political response according to the prognosis for 2030:

2. The factor of publicness is comprehendible on the sites – people feel that they can use recreational areas for their everyday needs
3. Users of the recreational areas feel welcomed and included in the local society

4 DISCUSSION

Brief analysis done during a previous project in Kopliranna already gave an overview of some problematic conditions:

- fragmented green infrastructure
- large industrial areas with much impervious surfaces
- lack of recreational opportunities

It was surprising to find out additional problematic conditions:

- deficient range of canopy coverage
- only high concentration of O_3 in the air

The spatial planning of green infrastructure was intended to be submitted in addition to the proposal of the planning principles. More time and data was needed to reach the initial idea.

Aspects that would be interesting for further research in green infrastructure planning in Northern Tallinn:

- the qualitative results of the inquiry about usage of green areas
- additional indicators could be included to assess the states more thoroughly
- service providing units could be clarified with site visits
- following through with the scientific assessment of impacts
- proceeding with the actual green infrastructure spatial planning based on proposed planning principles and stated conflicting areas

SUMMARY

The main research task was to propose a response for green infrastructure planning in Kopli and Paljassaare districts by phrasing new ecological and recreational planning principles and locating the conflicting and synergic areas.

Research area was chosen to connect three main green infrastructure hubs:

- Paljassaare Nature Reserve in the North
- green area around Kaelajärv Lake in the centre
- Merimetsa Greenland Conservation Area in the South

Four research questions were answered:

1. Which ecosystem services are valid in the green infrastructure of Northern Tallinn district, what is their condition and where are these services distributed?
Condition of ecosystems was assessed by using MAES indicator
The distribution of ecosystem services were mapped by linking ecosystem services to service providing units (SPUs).

2. Which recreational opportunities are valid in the green infrastructure of Northern Tallinn, which landscape units are recreationally valuable and used by local residents, where are these features distributed?
Current recreational opportunities were mapped and classified.
Land units that were considered recreationally valuable were stated.
An inquiry was included in the research to locate current state of the usage of green areas.

3. Where are the conflicting and synergic areas considering the studied aspects of the green infrastructure?
Conflicting and synergic areas were located by comparing the information carried out on ecological, recreational political response layer.

4. Which planning principles need to be considered in the initial position of the green infrastructure planning?
Most problematic conditions of the current state were phrased into new planning principles for mitigating the prognosis of threats and conflicting areas.

THANK YOU!

Questions:

1. How did you deal with the data coming from different sources and of different origin?

Data about each indicator was assessed separately. Luckily, many Estonian databases were using similar units and were presented in a similar setting as in European databases and as needed in MAES indicator framework. Some areal data had to be extracted by redrawing and measuring the needed information.

2. In the DPSIR model the policy responses feed back into the cycle. How would you approach the analysis if you started with these as the drivers? What might be the implications of testing policies this way?

Initially the policy response was considered as a driver. Data from the detailed plans were included in parallel into the analysis as a prognosis for 2030 and compared to the current state. Testing policies in this way could help including green infrastructure planning into the planning process of detailed plan - help bring out the limitations.

3. Did you find any weaknesses in any of the methods of assessment you applied and which did you find easiest of more difficult to apply?

MAES indicator framework was an approach that was renewed in parallel by the researchers. It was difficult to follow which outcome it the best one to follow. The final (fifth) report came out in January and some aspect had to be included to already done work.

Some recreational data was difficult to be categorised into the DPSIR model because all the stages are connected to each other and some things can be both - a driver as well as a state.

MAES framework was most challenging to apply due to large set of data that had to be collected. SPU was easy to apply thanks to a detailed base map already available from Peeter.