AARHUS – A CITY PERSPECTIVE (REGREEN URBAN LIVING LAB) - DENMARK

Section	
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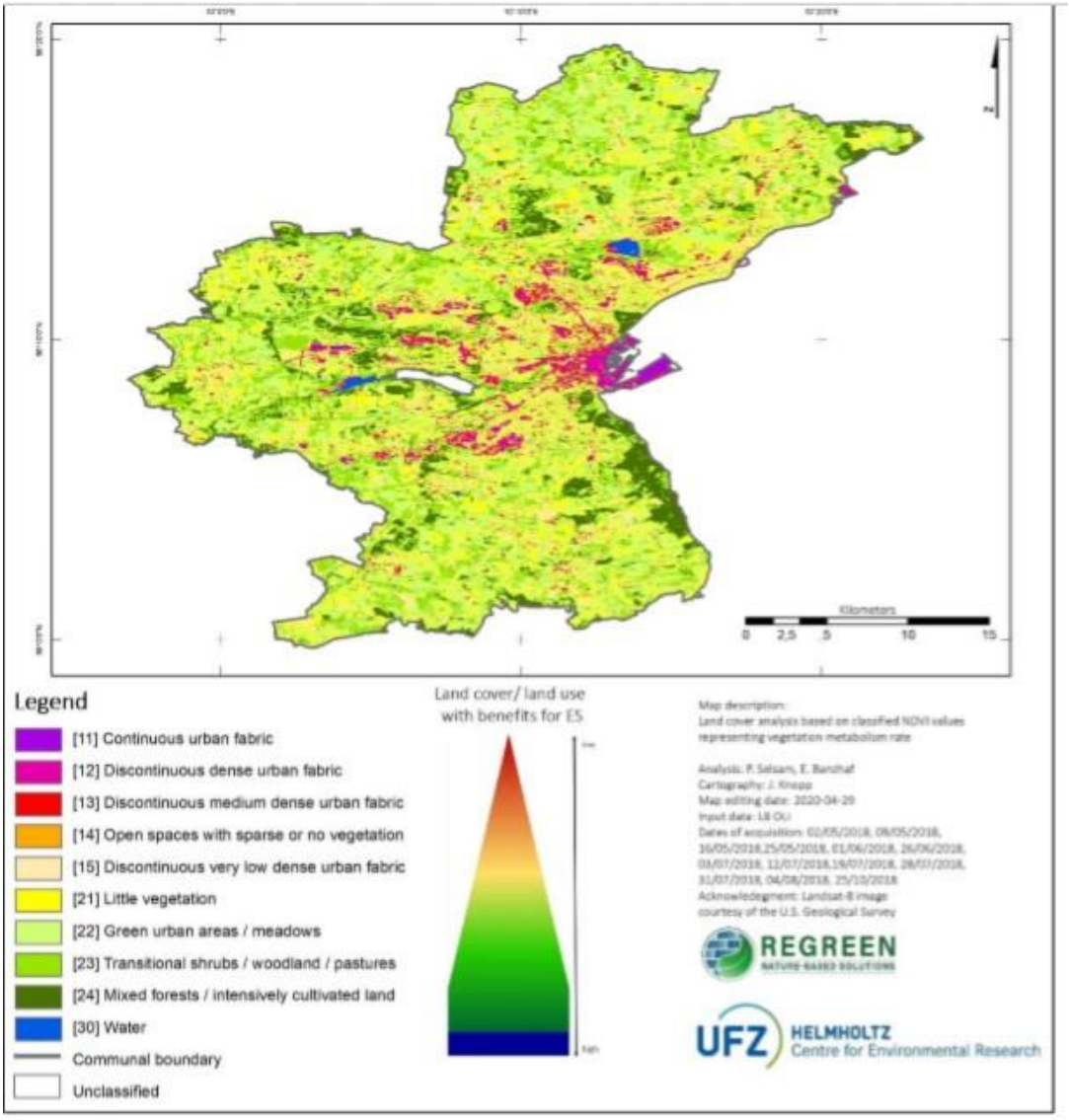
1	**TITLE OF CASE STUDY AREA:** Aarhus City – city perspective (REGREEN Urban Living Lab; Funded by EU H2020 grant agreement 821016. www.regreen-project.eu)
2	**INTRODUCTION** Over 90% of the inhabitants have access to green space within 500 meters with an objective to sustain or **increase green area per inhabitant** through green blue structure planning in spite of densification. The City anticipates a **densification** with an additional 75,000 inhabitants by 2030. The water supply company of Aarhus Municipality will invest annually 19 MEUR over the next 65 years to **reach full separation of rainwater from wastewater** using NBS and NBS hybrids to create a flood resilient city with rainwater on the surface instead of in pipes; Aarhus Municipality has decided to **double the total nature area in the municipality** by 2030 and increase the area with forested land by 60% by 2030 to ensure drinking water provision and **improve recreation, biodiversity, social habitation and health** and it focuses on **improving accessibility to green areas** to all citizens. Agricultural land and forested land account for under 60% and 11% of the land area respectively, protected areas including water surfaces 6% and settlements about 25%. *Environmental pressures:* **sea level rise,** very high **groundwater levels**, and cloudbursts leading to **pluvial flooding** events causes disruption as well as economic and social costs. Pressures from **intensive land use practices** and **urban land cover** pose a substantial challenge to meet biodiversity SDG goals. **Population growth in a densifying city** adds to soil sealing, puts additional **pressures on existing urban and peri-urban green spaces,** increases demand for recreational green space and adds to the challenge of finding space for NBS to manage pluvial flooding. .
3	**KEY FACTS AND FIGURES OF THE CASE STUDY AREA** **Biogeographic region**[1]**:** Nordic **Surface area:** 790 ha **Country:** Denmark **Region/Province:** Jutland

[1] https://www.eea.europa.eu/data-and-maps/data/biogeographical-regions-europe-3

4	**LOCATION MAP(S)** 
5	**NAME OF MUNICIPALITY AND WEBSITE ADDRESS** Aarhus Municipality: www.aarhus.dk
6	**LEAD ORGANISATIONS:** • Aarhus Municipality • Aarhus Water A/S (not a partner in REGREEN but heavily involved in the NbS development)
7	**LOCAL CONTACT(S)** Team leader of Water and Nature, Technology and Environment: Lene Vinther Email: leja@aarhus.dk
8	**PRINCIPLE UF-NBS (Urban Forests as Nature-Based Solutions) ACTION(S)** • Street trees increase number of street trees • Carbon sequestration • Plan to double the nature area in the municipality – increase the recreational area within the city. On a voluntary basis. • Make near-urban forest with biodiversity as focus • Green structure/nature areas as a mechanism to increase social cohesion of the neighborhood and create a climate resilient city.
9	**PRINCIPLE NBS ACTION(S)** (See list of challenges) • Flood mitigation and green roof • Urban heat regulation from vegetation • Enhance urban biodiversity • Citizen and school project involving, educating and awareness raising on biodiversity and ES • Establishment of climate school involving test of NBS solutions

10	**LOCAL STAKEHOLDERS LIST ONLY** Aarhus Vand: Verdens Skove – junior ranger-program; Within the municipality: Grønne Områder; Børn og Unge; City Council of Aarhus, Dept. of Water and Nature, Kommuneplanafd.
11	**UF-NBS FRAMEWORK** https://www.aarhus.dk/demokrati/politikker-og-planer/byudvikling/kommune-og-lokalplanlaegning/kommuneplan/

a.	**UF-NBS typology**		LCC/LUC classes (see map above): Continuous urban fabric; Discontinuous dense urban fabric; Discontinuous medium dense urban fabric; Open spaces with sparse or no vegetation; Discontinuous very low dense urban fabric; Little vegetation; Green urban areas/meadows; Transitional shrubs/woodland/pastures; Mixed forests/intensively cultivated land; Water NBS classes used in REGREEN: Gardens (balcony, private garden); Parks (Pocket park, park, botanical garden, heritage garden, nursery garden); Amenity areas (sports field, school yard, playground, shared open space); Other public space (cemeteries, allotment, city farm, urban beekeeping); Linear features / routes (street tree, green wall, roof garden, bioswale, pergola); Hybrid GreenBlueSpace (permeable paving, walkway, roadway and parking); Wetlands (constructed wetland, river/stream, canal, pond, lake, reservoir, estuary/tidal river, sea); Other vegetated urban areas (urban forest, grass/shrub, heathland, other semi-natural vegetation, agriculture)
b.	**Integration**		n/c
c.	**Network/connectivity**		Connectivity is part of the strategy when increasing the nature within the municipality. Within the flood mitigation measurements that are carried out this is done as a network of measurement within the same watershed, linking different NBS actions. Instruments for looking at network and connectivity are: Blue/green structure, nature quality of protected areas, Green Norm (quantitative tool in urban planning – a specific score has to be met by developers), proximity to green areas, percentage of area with forest and protected nature.
d.	**Multifunctionality**		Multiple functions of NBS are combined, mainly air/ water quality, biodiversity with the needs of the community (recreation, social activities, environmental education, areas for dogs)
e.	**Multi-scale**		Within REGREEN we are having a multiscale approach, with some of the tasks working at the city scale while others are zooming in at specific areas or NbS actions.
f.	**Strategic planning processes**		A new policy for making a greener city and a climate resilient city has been adopted November 2020. A blue/green structure contribute to the implementation, and concrete goals and tools for administration are contributed: Greener City policy: https://www.aarhus.dk/demokrati/politikker-og-planer/byudvikling/et-groennere-aarhus/
g.	**Inter- and transdisciplinary**		The project brings together a variety of actors and their knowledge from different disciplines within the municipality such as water company, park and environment, ecology, city planning, and education. Also engaging specifically with schools.

h.	**Social cohesion and biocultural diversity**		Green structure/nature areas as a mechanism to increase social cohesion of the neighbourhood as part of an urban regeneration. Plan to double the nature area in the municipality – increase the recreational area within the city. Purchase of private land happens on a voluntary basis and in collaboration with the National Danish Nature Agency.
i.	**Governance arrangements**	I. Project management structure.	The projects and measures under the strategy which are related to climate adaptation through extensive use of urban nature are coordinated by municipal planners from the Technical and Environmental Department of the city administration. The project officers at the Technical and Environmental Department coordinates collaborations and actions other departments in the city administration, ad hoc with Local Councils (local public governance institutions) and affected citizens and stakeholders in the local areas, as well as the private water company Aarhus Water A/S where the company is partner.
		II. Local community engagement and the nature of their engagement.	The sub-municipal level of the city administration is organised in 24 Local Councils, one for each of the municipality's local areas. The Local Councils provide the link between the citizens/the local areas and the City Council as well as the municipal administration. Local Councils function as an umbrella-organization for several institutions that engage on an ad hoc basis in the project. In addition, individual citizens and local stakeholders are invited to join in project activities
		III. City-scale and/or region-wide governance for the project and/or UF-NBS (city and regional stakeholders and character of their engagement)	At city level, there is collaboration with representatives of the City Executive Board's departments (mainly the Department of Technical Services and Environment) in overview of implemented NBS and the potential for implementation of further NBS's.
		IV. National and international governance context (national and international stakeholders and character of their engagement)	In implementation of the strategy and its urban nature measures, the City of Aarhus focusses mainly on local engagement and city scale integration.
		V. Other (specify)	n/a
j.	**Institutional frameworks (AJ)**	I. Project staff responsibilities .	The project staff are mainly city policy makers and planners who must comply with and implement the adopted strategy and plans within which the project is developed.
		II. Project Management	n/a

			Committee (Y/N) if Y.	
			III. Frameworks <u>above the project</u> that exert influence on the project and/or UF-NBS e.g. Municipality, National Forestry Department.	The projects related to the overall strategy for climate adaptation targets increasingly urban nature in especially water management, and is linked to the municipal Plan for Climate Adaptation, the Policy for Active Citizenship, the policy for a greener Aarhus, the Waste Water Strategy, the Plan for Nature Quality (Naturkvalitetsplanen) and to Plan for Forestry (Skovudviklingsplanen).
			IV. Private companies that work on behalf of/or are embedded within the project.	The private water company, Aarhus Water A/S is a partner in the project's climate adaptation measures.
			V. Trade representative organisations that are involved in the project	n/a
			VI. Regulatory frameworks that the project operates within (i.e. bylaws, municipal laws, national laws, licences and leases, partnership agreements etc)	The 2017 Municipal Plan and linked local plans provide the framework for all urban development in the municipality. Currently, the 2017 Municipal Plan is in effect and is only binding for the City Council itself as an overall and binding principal framework for urban policies and plans for a 12-year period. Local plans are developed within this framework and are binding for all individuals/citizens, organizations, and business in the area in question. Furthermore, the City of Aarhus' engagement with urban nature/NBS links to two overall municipal plans, the Plan for Nature Quality (Naturkvalitetsplanen) and the Plan for Forestry (Skovudviklingsplanen) Moreover, three national laws provide overall frameworks that the municipal and local plans must comply with, the Planning Act, Act for Forest, and Act for Nature Protection.
			VII. Other (specify)	the City of Aarhus participates in national networks related to integration of / targeting urban nature, especially water, organised by non-public funds, most significantly Water in the City (Vand I Byer, organised by the non-profit Technological Institute)
	k.	**Economic Frameworks**	I. Community fundraising	Growing Trees Network and 'Plant et træ' (Plant a tree) are both private initiators who raises money to raise forests in rural areas to protect groundwater (all drinking water in Denmark comes from groundwater) and in the cities to create local green spaces.
			II. Project delivered services and	Growing Trees Network made a national collection on television in prime time together with the canal DR – the first collection of that type in the world.

				monies raised by project	
			III.	City, regional general funds	Funds for NBS relating to hydro-meteorological risks on public land are administered and implemented by Aarhus Vand (the water utility company) NBS: wetlands, ponds, dams, bioswales, SUDS etc. Aarhus Municipality can add financing to these NBS that relate to other aspects than hydrometeorological risks (e.g. biodiversity, recreation etc.) from the municipal budget. At recent budget negotiations the City Council in Aarhus has allocated around 200 DKK million in a 10-year period to for example initiatives to promote a greener city with more blue (=water). This includes every aspect of increasing biodiversity in rural and urban areas, creating a climate resilient city with NBS solutions and so on. Involvement of citizens, landowners, companies, other authorities etc. are essential to achieve the ambitious goals set by the City Council. There is also a Climate Fond to finance reduction of greenhouse gasses with annually 30 million DKK. A new project support unit is being established which will receive money to have 3-4 employees for the next four years. After that it should be self-supportive. The city council also funds Green Projects (1.4 million DKK each year) to co-create nature and recreational projects between local landowners/organisations and the community.
			IV.	Special funds e.g. National Lottery, Challenge funds	**Lokale- og anlægsfonden** together with Aarhus Municipality and the Danish Nature Agency investigates how to provide different and more attractive recreation opportunities in the 'True' Forest, which is only 30 years old and not very known locally. This will help planning other new forests in Denmark and enhance attractiveness of 'new' forests. https://naturstyrelsen.dk/naturbeskyttelse/naturprojekter/true-skov-for-alle/true-skov-for-alle-maalsaetninger/ **15. Juni Fonden** (June 15, the foundation) has financed a basic analysis of biodiversity before starting up a multifunctional nature and climate project at Kasted Mose, so that the effect of the project can be followed. Read about the area here: https://udflugtssteder.aarhus.dk/geding-kasted-mose/#4
			V.	National government funds	Public afforestation funds with co-financing from water companies and municipalities to buy up land and afforest (approx. 200ha/year nationally) to obtain multiple services such as protect groundwater, sequester carbon, provide recreational opportunities etc. Several projects are on-going in Aarhus Municipality, e.g. in these cities 2020/2021 (see map 1 on the last page): Tilst –https://www.aarhus.dk/nyt/teknik-og-miljoe/2020/august-2020/gaa-glad-i-skovbad-i-ny-folkeskov-i-tilst/ Kolt – https://aarhusupdate.dk/ny-skov-i-hasselager-vil-danne-ramme-om-det-gode-liv-i-nyt-boligomraade/ Ølsted – https://www.aarhus.dk/nyt/teknik-og-miljoe/2020/maj-2020/kaempetrae-vokser-ved-olsted/ Malling – https://www.aarhus.dk/nyt/teknik-og-miljoe/2019/oktober-2019/aarhus-faar-ny-skov-mellem-malling-og-beder/

				Possible to obtain co-funding for nature projects from: - Environmental Protection Agency - Agriculture Agency - Nature Agency The NBS-projects are multiple solutions supporting e.g. nature, climate and health issues and issues in the NBS classes in REGREEN: Hybrid GreenBlueSpace (permeable paving, walkway, roadway and parking); Wetlands (constructed wetland, river/stream, canal, pond, lake, reservoir, estuary/tidal river, sea) and other vegetated urban areas (urban forest, grass/shrub, heathland, other semi-natural vegetation, agriculture). Added values for public health and well-being are also considered.
			VI. Private sector investment	Urban developers are investing in green (NBS) solutions to get a green profile and managed rainwater
			VII. International funds e.g. European Union structural funds, LIFE + etc.	H2020 RECONECT (Egå Engsø – hydrometeorological NBS); H2020 REGREEN (NBS focusing on water, heat, and biodiversity challenges across scales)
			VIII. Other (specify)	People in Aarhus are starting to adopt a green, public space in the city, where they increase biodiversity in the city and contribute with management of the area in using their own spare time.
	l.	**Sino/European comparative Relevance**		Despite the large differences in size, type of governance and severity of environmental quality, Aarhus shares the challenges in terms of water flow management and water quality with Ningbo and Shanghai and biodiversity with Shanghai and Beijing. Both Aarhus and Beijing wish to move on air pollution and carbon sequestration. Lessons from each side can inspire and lead to knowledge exchanges, but this is still early in the process.
	m.	**UF-NBS Valorisation**		Aarhus Municipality has led an internal process that seeks to valorise water related NBS in terms of green jobs, recreation, aesthetics, biodiversity, public engagement and co-design. Aarhus Water and Aarhus Municipality have the vision that climate adaptation should contribute to urban regeneration, recreative values, urban quality and experiences, health and nature for citizens, users and business.
	n.	**Procurement of UF-NBS**		On-going projects in Aarhus Municipality: Public afforestation funds with co-financing from water companies and municipalities to buy up land and afforest (approx. 200ha/year nationally) to obtain multiple services such as protect groundwater, sequester carbon, provide recreational opportunities etc. Aarhus municipality aims to increase forest cover from 9% to 15% within few years, corresponding to additional 2300ha by 2030 (see map 1).

	p.	**Ecosystem services (list the three most important services being provided in no more than 50 words)**		Aarhus Municipality focuses in particular on water flow management, water quality and carbon sequestration. Heat mitigation to counter urban heat islands is an emerging ecosystem service from NBS that the municipality starts to focus on.
	q.	**Renaturing**		Reforestation/renaturing of agricultural land to create urban forests and increase biodiversity sites. Remeandering of river streams and restoring lakes/waterbodies to manage water flows and improve water quality.

12 **LESSONS AND TRANSFERABILITY/ EXPECTATIONS**

Aarhus expect to get more knowledge on the benefits of NBS-solutions and get specific mapping and tools to examine for example the contribution of afforestation on mental and physical health for people (recreational, reducing air-pollution, reduce stress, increase new meeting across social divides, increase awareness on nature and so on).

With REGREEN Aarhus expects to get to promote urban liveability, by systematically enhancing and restoring ecosystem services and biodiversity as the basis for Nature-based solutions (NBS). Such NBS, underpinned by evidence-based tools, improved urban governance, and public and business participation, will enable urban planners and policy makers to meet contemporary challenges, such as climate change resilience, public health and well-being and social inclusion." And the contact to both researchers and other cities (Urban Living Labs) combine new knowledge with real world networking on experiences between cities.

13 **REFERENCES**

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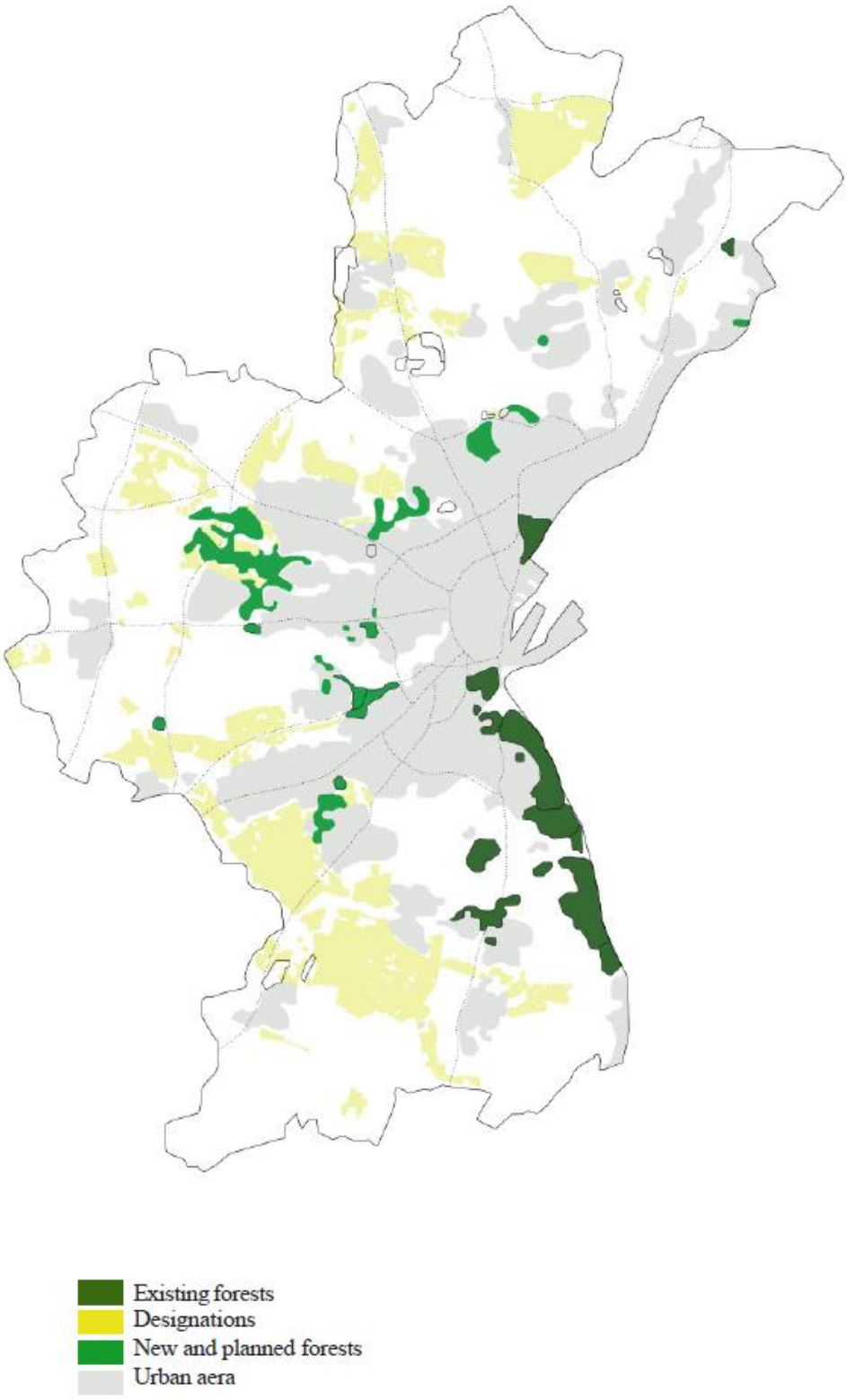
MAP 1: On-going projects in Aarhus Municipality: Public afforestation funds with co-financing from water companies and municipalities to buy up land and afforest (approx. 200ha/year nationally) to obtain multiple services such as protect groundwater, sequester carbon, provide recreational opportunities etc.


Existing forests
Designations
New and planned forests
Urban aera