



CITY OF HELSINGBORG

BIODIVERSITY REPORT / 2013



LAB



Local Action for Biodiversity
AN ICLEI INITIATIVE



CONSERVING BIODIVERSITY GLOBALLY, THROUGH LOCAL GOVERNMENT



The aim of the Local Action for Biodiversity (LAB) Programme is to assist local authorities in implementing the three objectives of the Convention on Biological Diversity (CBD), which are: 1) The preservation of biological diversity; 2) The sustainable use of biological diversity components; 3) The fair and equitable sharing of the benefits arising from the use of genetic resources.

LAB is a global partnership between ICLEI – Local Governments for Sustainability and IUCN (the International Union for Conservation of Nature). ICLEI is an international association of local governments, national and regional local government organisations that have made a commitment to sustainable development. ICLEI is the largest international association of local governments in terms of budget, personnel or scale of operations with well over 1 000 cities, towns, counties, and their associations worldwide comprise a growing membership. IUCN is the world's oldest and largest global environment network - a democratic membership union with over 1 000 government and NGO member organizations, and almost 11 000 volunteer scientists in more than 160 countries.

LAB assists and interacts with local authorities in a variety of ways. Technical support is provided in the form of on-going communication as well as guidelines and review of relevant documentation, presentations etc., and via access to IUCN's extensive network of scientists. Since participants in LAB, local authorities are provided various networking opportunities to share their challenges and successes, including regular international workshops. Profiling is also achieved at various international forums where the efforts of participating local authorities are exhibited and reported on. LAB is playing an increasingly critical role in global advocacy, providing a platform for local authorities to voice their input and demonstrate the importance of their role in stemming the tide of global biodiversity loss.

For further information regarding Local Action for Biodiversity contact lab@iclei.org or log into the LAB website at www.iclei.org/lab

FOREWORD

By 2035 Helsingborg will be a creative, vibrant, global, shared and balanced city. Our membership in ICLEI and LAB are integral parts of this vision.

Helsingborg stretches out along the coast where the strait of Öresund is at its narrowest. The beauty of the city and its fantastic location has earned it the name “Pearl of the Öresund”. The City of Helsingborg is working hard to be one of the leading cities in Sweden regarding sustainable development. It was therefore a natural step to join the LAB project to address the important yet complex issue of ecosystem services and biodiversity. The City of Helsingborg acknowledges the importance of biodiversity and ecosystem services for a sustainable future and public health. This is also why we compiled this assessment report.

To ensure the public, companies, all departments of the Helsingborg administration, landowners and everybody else that affect the ecosystem in some way will understand and consider the aforementioned issues, there will be a follow-up after the report is completed. This is another reason why the city is ready to sign the Durban Commitment in addition to having already signed the Aalborg Charter and Covenant of Mayors, indicating the unrelenting commitment of the city to ensure sustainable development, being fully aware of the value of its natural ecosystems.

The City of Helsingborg has been awarded for being among the most proactive and sustainable cities in Sweden. This has been based on its: comprehensive planning, climate adaptation along with water, traffic, green structure and energy planning. We believe there is always another step to be taken, and will exhaust all viable opportunities in our quest to attain local sustainable development.

I therefore encourage all citizens, companies, and landowners to adopt, collaborate and become involved in the principles of the LAB framework, to ensure a better standard of living and robust economy for future generations.

Mr Peter Danielsson
Mayor of Helsingborg
September 2013



A handwritten signature in black ink, which appears to read "Peter Danielsson". The signature is written in a cursive style.



HELSINGBORG

CONTENTS

PREFACE	5	
LOCALITY MAP	6	
EXECUTIVE SUMMARY	8	
INTRODUCTION	10	
1. ECOLOGY	12	
1.1. Biodiversity definition	12	
1.2. Biodiversity description	12	
History of biodiversity in Helsingborg	13	
Geological history	14	
Anthropological versus ecological history in Helsingborg	17	
Natural richness of the City	22	
1.3. Ecosystem Services	42	
The City landscape and Ecosystems	42	
Provisioning	43	
Regulating	45	
Supporting	47	
Cultural/Social	48	
Values of ecosystem services	50	
1.4. Threats to biodiversity in Helsingborg	54	
2. GOVERNANCE	58	
2.1. Biodiversity in city planning and policy	58	
2.2. Mainstreaming biodiversity management into local governance	59	
2.3. Biodiversity management in Helsingborg	61	
3. INTEGRATION	63	
3.1. Local and regional partners and stakeholders	63	
3.2. International biodiversity initiatives	63	
4. PARTICIPATION	64	
4.1. Communication and education	64	
4.2. Public participation and awareness	66	
4.3. Biodiversity awareness-raising	66	
5. BIODIVERSITY PROJECTS	67	
5.1. Biodiversity programs and projects	67	
5.2. Biodiversity CEPA projects	71	
REFERENCES	73	
ANNEX	77	
Annex 1	The 16 Swedish national environment quality objectives	77
Annex 2	Contents in brief of The Environment Code (1998:808); EC	78
Annex 3	Complete list of threatened and red data list (IUCN) species in Helsingborg	79
Annex 4	Vegetation/Habitat types in Helsingborg	87
Annex 5	Government address Ecosystem services	90
Annex 6	Contact information - LAB team and contributors	91
Glossary	93	

PREFACE

This document forms part of a set of biodiversity reports produced by participant cities of the Local Action for Biodiversity (LAB) Project. It represents a critical starting point: a status quo assessment of biodiversity and its management in each LAB city.

Each biodiversity report covers four key topics, namely:

- Ecology
- Governance
- Integration
- Participation

Each biodiversity report will be drawn upon to contribute significant useful information for compilation, by the LAB Project Team, of a Biodiversity Toolkit document. This document will contain best practice theory and examples, principles, strategies etc. For use by cities to manage biodiversity better and integrate it into planning. The Toolkit will in turn contribute towards further steps in the LAB process.

The five steps in the LAB process are as follows:

- Step 1: Drafting of a biodiversity report that documents the current state of biodiversity and its management within each city
- Step 2: Ensuring long-term commitment by city leadership to sustainable biodiversity management through LAB cities formally signing a local government biodiversity declaration
- Step 3: Development of a 10-year biodiversity action plan and framework that will include commitments to biodiversity implementation plans and integration within broader city plans
- Step 4: LAB cities' formal acceptance of their 10-year biodiversity action plans and frameworks
- Step 5: Implementation of three new on-the-ground biodiversity interventions by the end of the three-year project

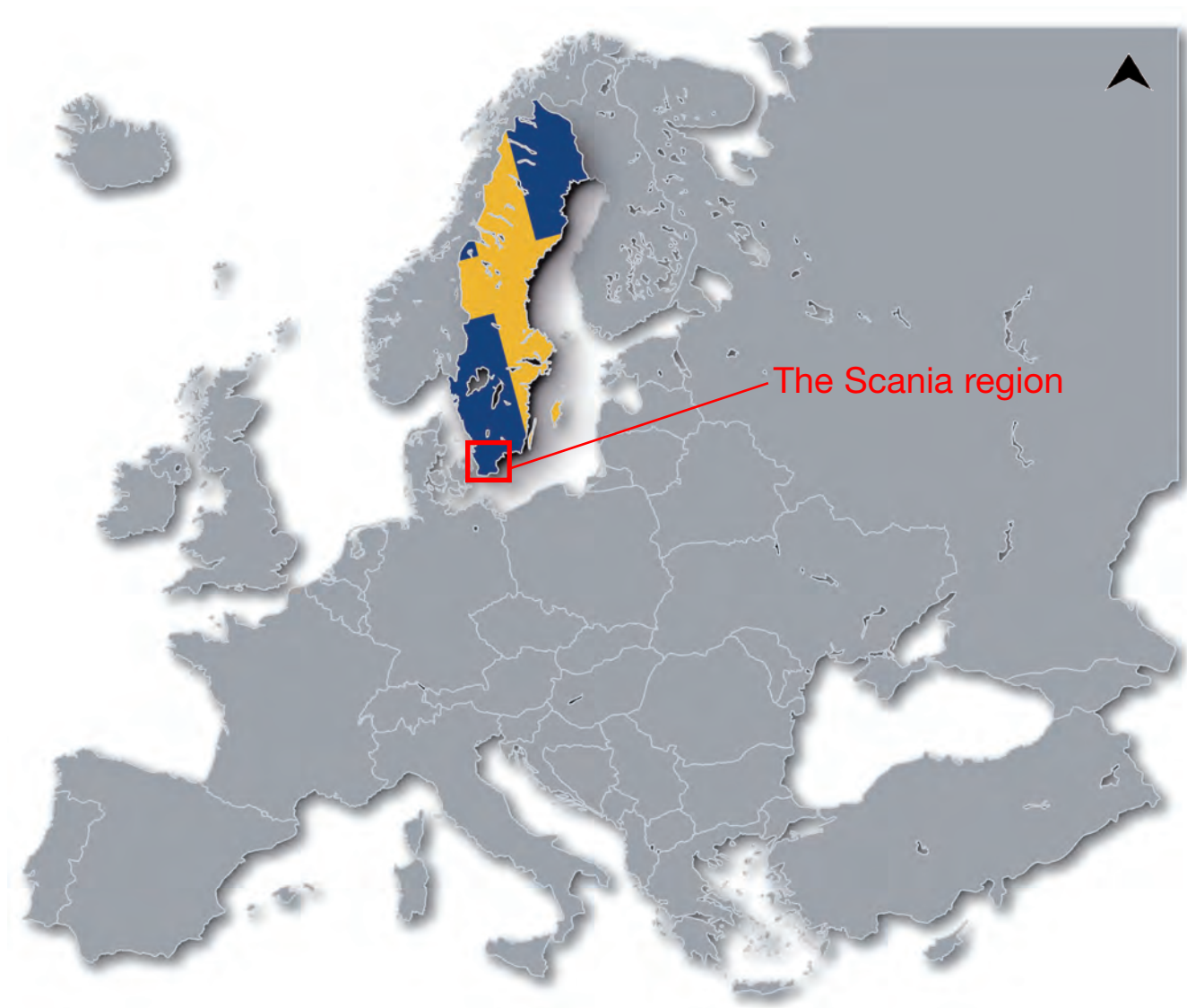
These reports create a unique opportunity for profiling the importance of urban biodiversity, and innovation in its management, on a global scale. They are the foundation not only of the long-term plans that each city will develop to enhance, protect and develop their urban biodiversity, but also collectively form the basis for the development of LAB as a highly effective global urban biodiversity initiative.

LAB Project Team

March 2013

Cape Town

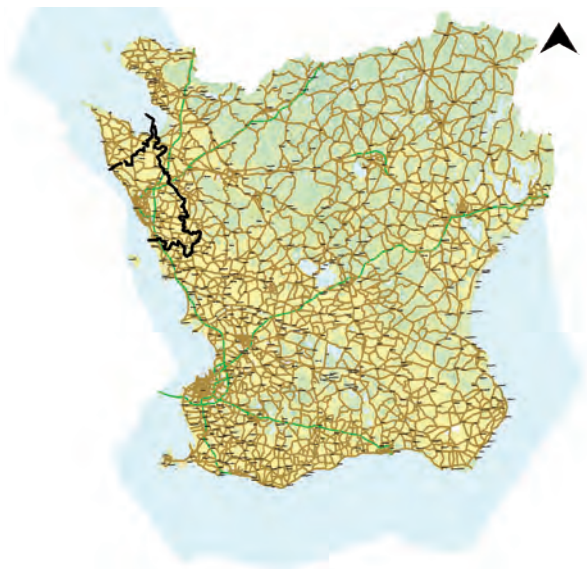
LOCALITY MAP



Sweden belongs to the Nordic countries in northern Europe.

General information

Official name of local government: City of Helsingborg.
Size of jurisdiction (area of land km²): 346 km² land area plus 78,8 km² sea area.
Population: 131 000 (end of 2012).
Municipal budget 2012: 5,7 billion SEK (0,9 billion USD).
Helsingborg is an essential transport node in Scandinavia.
Zoogeographic region: Western palearctic.
Biome: Temperate forest dominated by hardwood.
Land use data: see page 22.



Black line shows Helsingborg municipality in the Scania (Skåne) region.



The Öresund region where the City of Helsingborg is located: Öresund divides Denmark to the left and Sweden to the right.

Ten municipalities in northwest Scania collaborate under the name Helsingborg Family about green structure, infrastructure, employment, business and housing.

List of acronyms used in this publication

- CEPA - Communication, Education and Public Awareness.
- CBR - City Biodiversity Report.
- DAISIE - Delivering Alien Invasive Species Inventories for Europe.
- EU - European Union.
- EPA - Swedish Environment Protection Agency, Naturvårdsverket.
- IUCN - World Conservation Union.
- ICLEI - Local governments for sustainability.
- LAB - Local Action for Biodiversity.
- NCFF - Swedish National Centre for the promotion of Good Health in Children and Youth.
- NGO - Non Governmental organizations.
- SEK - Swedish currency: crowns.
- WHO - World Health Organization.

EXECUTIVE SUMMARY

Background

- Preamble
- Biodiversity in Helsingborg
- Important ecosystem services in Helsingborg
- Future challenges

Preamble

Public health and economy are two essential factors in a sustainable municipality. The roadmap for achieving these two fundamental aspects is highly dependent on the sustainable management of ecosystem services and biodiversity, along with social issues such as integration and public involvement. Helsingborg has demonstrated it is a city and municipality that wants to be a winner in the sustainability concept since it is the only way for current and future generations to meet their needs, as expressed in the new vision 2035; "Helsingborg will be a creative, vibrant, global, shared and balanced city". This vision is also demonstrated by the fact that Helsingborg was named "Environmentally Best City" out of 290 in Sweden in 2009.

This achievement can be attributed to a lot of work done over the last decades. This work has been centred on four Comprehensive plans starting in 1989 and several local environment programmes. Sweden's engagement in Rio 1992, signing the convention of biodiversity (CBD) and transforming the supranational treaty to regional and local action has been crucial to Helsingborg's local achievements. Work at a local level includes; a Nature Preservation Plan (1992), Nature Conservation Funding, a wetland programme with about 70 wetlands created, and six local nature reserves demarcated. Previous management actions such as the prohibition of trawling in Öresund 1932, has been of great importance for marine production today. In addition to this, other comprehensive direct operations connected to over-exploitation have been crucial for saving biodiversity.

There is no doubt that political consensus has played a crucial role in leading Helsingborg towards the roadmap for sustainability. For more than a decade, ICLEI has played an important role in this process in Helsingborg.

Biodiversity in Helsingborg

Understanding the conditions for biodiversity, land use and history of the landscape is a good starting point towards achieving local environment sustainability. Today 72 % of land use in the City is farmland, about 18 % is urban and 10 % forests, meadows, beaches and wetlands/rivers.

In the mid-1700s the proportions were 50 % grazing land, 40 % meadow for winter fodder and just 10 % was arable land. Population changes from 1850 to 2012 went from 3 000 - 4 000 to today's 131 000, which has greatly influenced local land use. Modern agriculture together with industrialization has totally transformed the landscape over the last 200 years. The big change started in 1804 with land shifting reforms, followed by intense eliminating of wetlands, industrialization and urbanization. Machines such as tractors replaced almost all workhorses in Sweden in the 1930s and chemicals replaced natural nutrients as chemicals including herbicides, fungicides and insecticides dominated agriculture in the mid-1960s.

One would wonder what biodiversity might still remain after such an era of environment degradation. The interesting fact is that Helsingborg continues to be one of the most biodiversity rich areas in Sweden. This circumstance is due particularly to the climate, calciferous soils, rich residual ecosystems of deciduous forests, the marine environment in Öresund and sandy beaches. Interesting indicator species of good ecosystem values in Helsingborg include; white tailed eagle, red spotted dogfish, sea trout, badger, several rare orchids, bees and mushrooms. However, biodiversity is under threat from: invasive species, air pollution (acid rain, eutrophication), urbanisation, lack of grazing and haymaking and chemical use in the last decades, a lot of measures have been put in place to reverse this negative trend such as tree plantations, new wetlands, grazing and meadow projects.

Monitoring of flora and fauna is important as a follow-up measure for the development of biodiversity. In this respect, a lot of inventories on terrestrial and marine areas have been done.

Important ecosystem services in Helsingborg

Nature's free services are called ecosystem services such as photosynthesis, climate balance and regulation, materials, food supply, wood, drinking water, recreational and social possibilities. They are grouped into the four main categories: *provisioning, regulation, supporting and cultural services*. The most important ecosystem services in Helsingborg can be found among provisioning services such as food supply from arable land and Öresund (seafood), and drinking water supply. Supporting services including habitats for flora and fauna are very important as a basis for biodiversity. With regard to regulating services, waste water treatment is indispensable for the water quality of Öresund. Recreational services such as open air recreation are very important and popular among the citizens. All of the important ecosystem services culminate in public health and economy.



The Råån valley is a place of great beauty with important ecosystem services such as support for biodiversity, food supply (crops and fish), social (recreation and health). The valley has a variety of biotopes such as deciduous forests, meadows and pastures along the river Råån.

Future challenges

Sustainable management of ecosystem services demands long term perspective and on-going monitoring of flora and fauna as well as water and air quality. Some threats may be overcome while new ones appear such as climate change and new invasive species which can potentially ruin the ecosystem. Measures for counteracting new challenges are dependent on making habitats robust, e.g. planting trees, creating new wetlands, maintaining local and sustainable food production, ecological development of green and blue structures, and farming. Some of these measures also support climate change adaptation which is a big challenge with rising sea levels and an increase in heavy rain frequency. Other resources are aimed at education for the public, students and business. Fund raising will also be needed to launch different measures such as planting trees and creating new wetlands, fencing for grazing areas among other activities aimed at environment conservation. Increasing population not only locally but globally is also a challenge to associated ecosystems.

Denser building and high-rise flats offer some solutions which have been highlighted in the latest 2010 Comprehensive plan. Many other solutions will be recommended in the next step of the LAB-project, the Local Biodiversity, Strategy and Action Plan (LBSAP).



A view north of Helsingborg facing southwards showing the old deciduous Pålssjö forest, the 16 km long slope, Landborgen and sea shore. Important ecosystem services are: support for biodiversity, open air recreation, swimming, health, and air quality inter alia. This is one of the most popular places in Helsingborg for walking and watching Denmark and sunsets.

INTRODUCTION

Helsingborg Municipality with its 131 000 inhabitants is situated east of the Öresund strait in southern Sweden and just 4 kilometres east of Denmark. Historically the Skåne (Scania) region, to which Helsingborg belongs, was under Danish monarchy until 1658. Helsingborg is one of the oldest cities in Scandinavia. It has about a 1 000 year record as a city and was the most important for strategic military reasons in Denmark during the early Middle ages. Dramatic changes in the landscape have occurred several times. First, was the ice-age which ended 10 000 years ago. Then the warm period arrived 5 000 years ago and deciduous forest covered the landscape. During this time the man-made changes started and the landscape went from a forest ecosystem to today's system, dominated by arable land. This transition from primeval forest to agriculture was a process that took place over a couple of thousand years.

Originally the landscape belongs to the flora region dominated by temperate deciduous forests that are green during summer and lose leaves in winter. The zoological region to which Helsingborg belongs is the *Western Palearctic*. Until about 200 years ago Helsingborg was an agricultural area, dominated by cattle grazing. But then, in the beginning of the 1800s a pervasive agricultural revolution shifted the old landscape into the modern type dominated by crops like different cereals. Wetlands were drained, grasslands were ploughed and a lot of wild flowers and animals disappeared. Today forestland does not exceed 7 % of the municipality. Farmland had its biggest distribution during the 1960s, covering about 75 % of the landscape. Today the farmland area has decreased to about 72 % of the municipal area due to urbanization.

Helsingborg has indeed been working on strengthening ecosystem services during past decades. Wetlands and forests are coming back and they have increased primarily due to physical planning in recent decades. Since 1989 four generations of adopted Comprehensive Plans have been of fundamental importance for sustainable development in our municipality. These include; traffic, infrastructure, green areas and water management plans. The Planning

and Building Act and Environment Code together with the 16 national, environment targets are the most important laws and tools for addressing issues of land use and sustainable development in Sweden. To safeguard ecosystem services, environment impact assessment is also important and it is compulsory in comprehensive planning as well as for detail plans, road plans and railway plans. When detail plans are made in purpose of exploitation the voluntary *principle of balancing** is used. It means that if green areas, trees etcetera are going to be destroyed it must be compensated. In Helsingborg, this tool allocates money to compensate loss of vegetation, habitat for animals inter alia. Furthermore, about 70 hectares of new wetland area has been created and new forest, meadows and grazing areas have been established since 1992.

Helsingborg also has unique teaching resources for communication, education and public awareness (CEPA). The Environment Workshop and Fredriksdal Open-Air Museum receive around 40 000 students annually for education and practical exercises concerning ecology, climate, energy, water and waste.

Energy supply such as remote heating and electricity is derived mainly from renewable sources (wood and national water power plants). Sustainable mobility has developed a lot in recent decades through the use of trains, bicycles and bio methane gas buses.

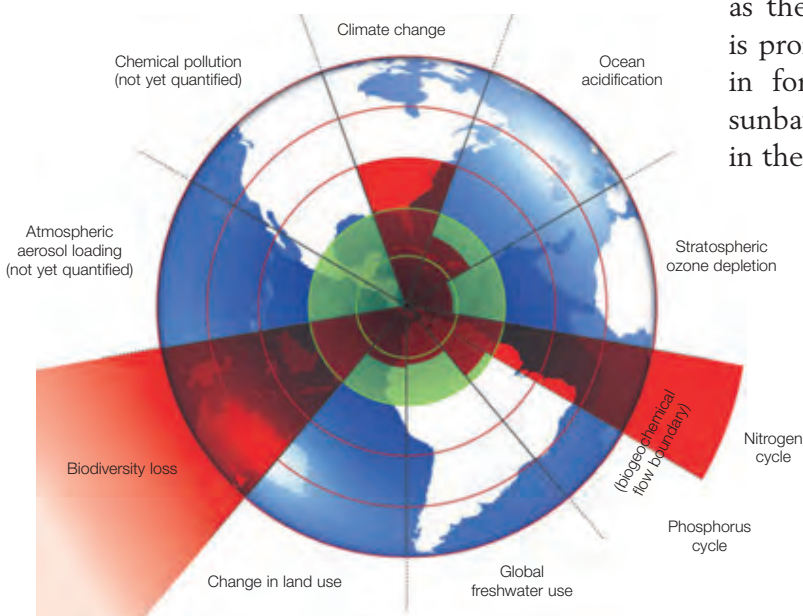
Climate change is threatening habitats, biodiversity and ecosystem services such as sea shores and forests in the long-term. These threats include rising sea levels, increased temperatures and intense rainfall which will greatly alter the patterns of biodiversity. We already have a couple of invasive species but with increasing climate variations, new species adapted to warmer climates will probably invade local ecosystems, replacing those adapted to colder climates, which may emigrate northwards. A climate

* The balancing principle is used when exploitation is planned in green areas. It follows certain steps and can result in compensatory measures such as planting new trees (se p 49).

adaptation study was launched and adopted in 2012 as a planning tool for raising sea level, flooding and more. To cope with climate change Helsingborg collaboration from neighbouring municipalities, different authorities, public and business is required.

In a global context, nine planetary boundaries have been described and evaluated by SRC-Stockholm Resilience Centre. Their research shows that the state of biodiversity is the most severe, followed by climate change and eutrophication. Interestingly the interactions between the nine aspects and solutions for mitigating climate change and eutrophication can be found in ecosystem services and biodiversity.

Planetary boundaries is a concept exploring the safe operating space for humanity. Green ring shows the limits that should not be exceeded. Red shows the state of the aspect. Some aspects in this model have not yet been evaluated. Source: Stockholm Resilience Centre.



The most important ecosystem in Helsingborg services are:

Provisioning: Food and fresh water supply are the most important ecosystem services in Helsingborg. A major part of the land use is arable and Öresund is a seafood resource. To a lesser degree, hunting of roe deer, hare, and pheasant contribute to food supply.

Regulating: Local climate and air quality regulation are important ecosystem services. The moderation of extreme events will be more crucial in the future as climate change impacts intensify. Waste water treatment is environmentally needed to protect Öresund and public health. Pollination and biological control are crucial for food supply. However, plant diseases have increased in the past decade adversely affecting ecosystem supporting services.

Supporting: Remnants of the deciduous forests are very important for supporting ecological functions. Unfertilized and biodiversity rich meadows and pastures are very important since many threatened species are dependent on these areas. The rather small green wetland areas are needed to support fresh water biodiversity as well as genetic resources. Some species in Helsingborg are threatened and need support from such healthy ecosystems.

Social/Cultural: Helsingborg's green areas as well as the sea area of great value for citizens. Health is promoted by open air recreation at the beaches, in forests, meadows and parks. Walking, biking, sunbathing and fishing are also frequent activities in the city.



1.1. Biodiversity definition

Biodiversity is the abundant variety of life that has been brought about by evolution through processes of competition and adaptation during millennia on the planet. (Heywood V H ed. UNEP, 1995).

The value of biodiversity has not yet been fully appreciated and as a result has come under critical threat globally. The growing impact of human activities on ecosystems over the last century poses a significant threat to biodiversity. Biodiversity is essential to life and may be described as life's "gearwheel", as it builds the resilience of nature to cope with man-made and natural forms of stress. Biodiversity also allows for a healthier and wealthier palette of ecosystem services.

Helsingborg realizes this variety of biodiversity plays an important role in ensuring a balance in the functioning of ecosystems and provision of local ecosystem services, which the city and its citizens' well-being is directly dependent on. In the same manner, Helsingborg acknowledges its dependency on the global functioning of ecosystems well beyond its administrative jurisdictions. Clean air, water, nutrients, energy and commodities that enable the existence and wellbeing of our community are often produced from ecosystems well beyond our geographical boundaries.

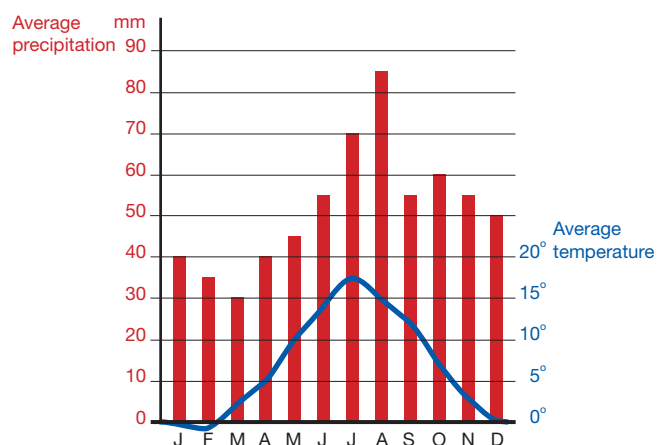
In accordance with the international Convention on Biological Diversity (CBD), Helsingborg strives to preserve and advocate for the diversity of healthy habitats, animals, plant species and other organisms that sustain its urban and natural ecosystems in-situ and on a global scale. Hence, the urban planning of Helsingborg combines the long term prospects of life and its biological diversity, with urban developments that benefit both nature and man simultaneously.

1.2. Biodiversity description

The Helsingborg landscape - brief history and climate. There is a 10 000 year record of Biodiversity in Helsingborg, which dates back to the ice age. Global and local climate have contributed to changing the distribution and pattern of biodiversity from tundra to the European deciduous wildwood during the warmer Stone Age over the colder Bronze Age period. Apart from the impact of climate change which has increased temperatures, we still have the same climate as in the Bronze Age i.e. humid and tempered with mild winters and cool summers. This circumstance is due to our coastal location. The open landscape results in a windy climate.

The average temperature in January varies from -1° to -2° (Celsius/centigrade, and in July from 15° to 17° C. The measured average annual rainfall is about 700 mm. Helsingborg in Scania, Sweden's southernmost province is the warmest on average. Summer temperatures often reach 30° C or warmer and winter can be -20° C or sometimes even colder.

Over the last 1 000 years human activities have severely affected biodiversity in Helsingborg. The impacts on biodiversity have come from activities such as deforestation, drainage of wetlands and use of modern agricultural methods, including the use of pesticides and fertilizers. Another significant example is the introduction of new species that eventually destabilizes the distribution of native species.



Climate diagram showing averages 1931-1960 for Helsingborg. In addition to these averages temperature can vary in rare occasions between minus 20 centigrades to plus 35 centigrades during winter and summer respectively.

Amount of species according to different organism groups in the Helsingborg municipality area: Number of species.

Vascular plants: 1 100

Cryptogams (mosses, lichens, mushrooms):
2 000

Mammals: 40

Breeding birds: 120

Reptiles and amphibians: 9

Fishes: 75 in Öresund, 9 in freshwater

Marine benthic invertebrates (macro fauna over 1 mm): 1 500. Algae: 220

Terrestrial invertebrates: Over 1 000?

Invasive species occurring in Helsingborg have mainly been introduced as imported garden plants that have spread or as benthic invertebrates that come via ships or animals introduced for hunting.

Some examples of such species are the *Rosa rugosa* originally introduced as a garden plant, but have a strong capacity of growing on sand beaches in southern Sweden. This species must be eradicated in Helsingborg since it invades and covers large surfaces on beaches. It prevents public access and replaces native flora.

A similar example is the two metre high umbelliferous *Heracleum mantegazzianum* spreading along rivers and streams and has poisonous sap which causes blisters when people's skin comes into contact. In the Sea there are several new invertebrate species that seem to change the ecology such as American comb jelly (*Mnemiopsis leidyi*) and American polychaete (*Marenzelleria viridis*). These species may have arrived via ships. In many rivers and lakes the North American crayfish *Pacifastacus leniusculus* was introduced for food. It replaces the native crayfish *Astacus astacus* and spreads a disease that kills *Astacus* but the *Pacifastacus* is itself resistant. The Mustelid mink, *Mustela vison*, is a fugitive from fur farms; it is widespread and causes severe harm to birds. The Canadian goose *Branta canadensis* was introduced in the 1930s in Sweden for hunting and which greatly spread later.



The DAISIE project of European Union, shows the 100 worst invasive alien species in Europe. Some twenty of these are found in Helsingborg e.g. Canada goose *Branta canadensis* and *Rosa rugosa*.

History of biodiversity in Helsingborg

Summary

The geological conditions, ice-age, ice-melting, and subsequent influence of agricultural measures and climate change are the basics for understanding the history of biodiversity in Helsingborg. Sedimentary bedrock dominates Helsingborg but nearby is the Archaean bedrock with crystalline, mostly chemically sour bedrocks. The ice-age ending 10 000-12 000 years ago had a great impact on biodiversity. In Sweden and also in Helsingborg, immigration of species since the last ice-age has been of major importance. During the following warm period (4 centigrade warmer than today) broadleaved trees e.g. oak, ash, elm, hazel and linden started to grow here. Later the agricultural measures successively depleted the primeval forest and transformed it into meadows and moorlands. From the beginning of the 1800s the modern agricultural period took over. Wetlands were drained, some forest were re-established in former meadows and pastures. The landscape of Helsingborg went from 100 % primeval forest to the current forest which makes up about 6-7 %, of the total area. Wetlands covered 30 % of the landscape and today, we find around 1-1.5 % of Helsingborg's landscape covered by wetlands. A lot of small streams have also disappeared in recent times.

During the 1900s urbanization and infrastructure were, dominating impact factors on biodiversity, along with modern agriculture. Nevertheless Helsingborg still has a rich biodiversity which has been amplified by different biodiversity projects over the past decades. Tree planting, excavating new wetlands, the reintroduction of grazing areas are but a few examples of some of these projects.

Geological history

To understand the distribution of biodiversity it is also important to know the geology and natural geography since chemical, structural and hydrological factors of the ground and soil indeed affect what kind of vegetation might exist in a certain area. Chemical and water properties for example are very different comparing sedimentary and crystalline bedrock and these factors in turn affect flora and fauna. Sedimentary bedrock dominates the Helsingborg area but in Sweden on a whole the crystalline bedrock types, gneiss and granite dominates. The old Archaean bedrock of the Scandinavian mainland and limestone bedrock from the Baltic area was moulded by ice into different sediments and soils. The Ice age that ended some 10 000 years ago also had a big impact on Northern Europe's vegetation.

The bedrock of the Helsingborg was derived from a large river delta near the equator during the transition between the Triassic-Jurassic eras about 195 million years ago. Fossil imprints of dinosaurs and various plants have been documented. These sediments now form a 600 m thick sandstone layer with shale and coal. The sandstone is nutrient-poor. The aquifer of thick sandstone layers with ferruginous water has been used since antiquity and the *Örby field*, where the city's drinking water is stored. The water comes originally by tunnel and pipeline from *Lake Bolmen* 100 km northeast of Helsingborg. It serves 700 000 people with drinking water. Large reservoirs of mineral water are also found very deep (70-80 metres below the ground) between shale layers.

Sweden has undergone 4-5 ice ages when the landscape was completely covered by ice that was 2-3 km² thick. Ice compressed the earth crust which was later straightened out when the last ice floes began to melt. The ice affected topography in a lot of ways and the land area is still rising in most parts of Sweden, except in southern Sweden, where the sea level is rising, at a rate of over 3 millimetres per year compared to the land area which is increasing by 1.5 mm/yr as a result of ceased ice pressure.

A long period after the ice melted, the *tundra* habitat was formed, until the warm period started and broadleaved trees colonized these habitats, leaving primeval forest to cover the land. New soils like clay, gravel, sand and organogenic soil created conditions for vegetation to flourish.



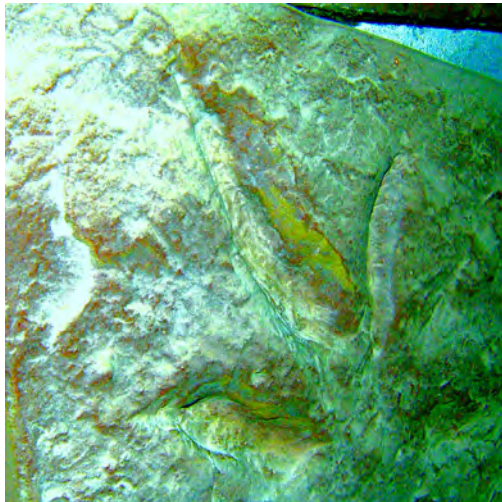
Sandstone.



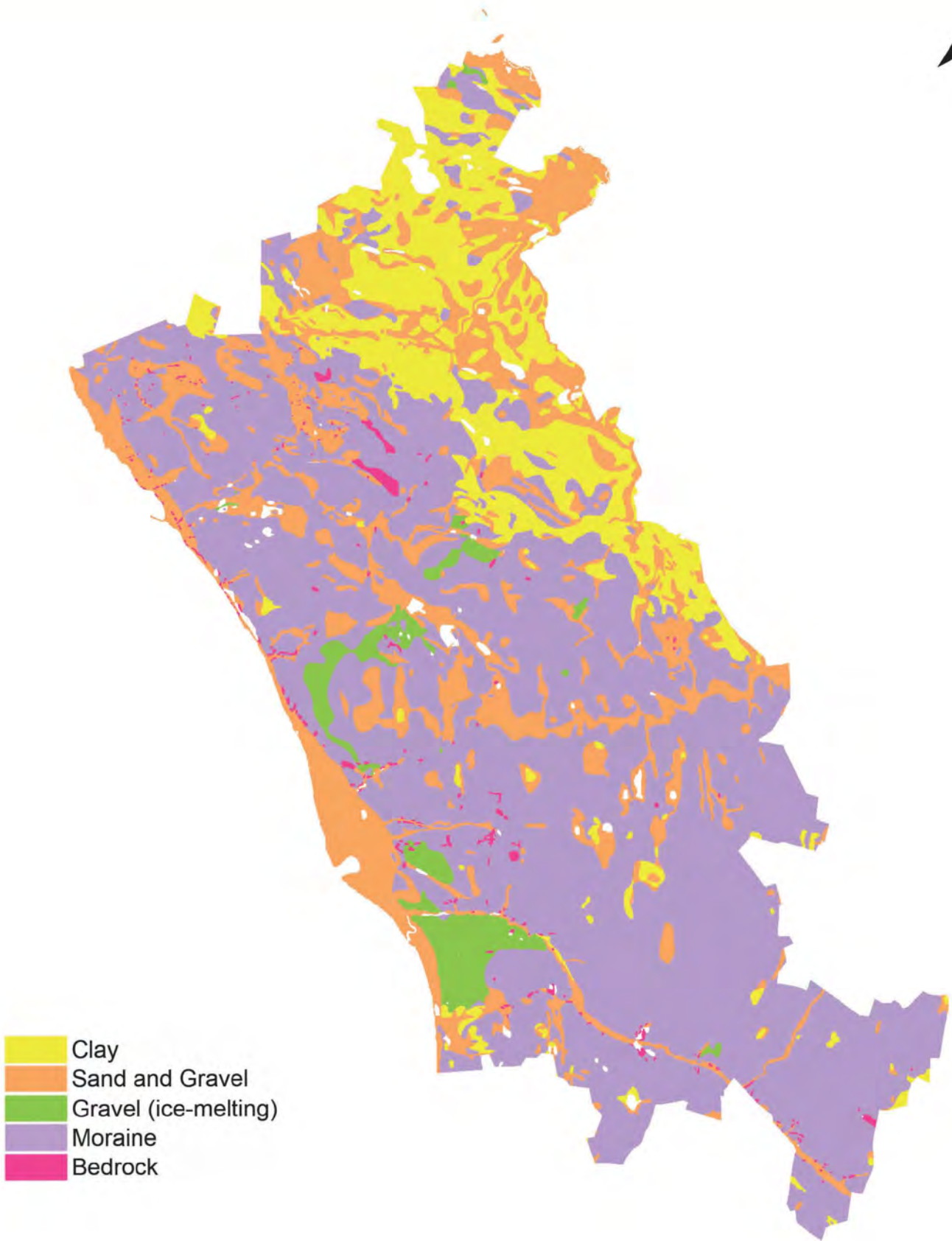
Slate.



Maximum distribution of the ice floe 17 000 years ago. Northern Europe including Sweden is completely covered with a 2-3 km thick ice floe. Tundra is the main habitat in Central Europe. See also the map of soils.
 Source: Swedish Geological Investigation SGU www.sgu.se/sgu/sv/geologi/jordtacket/istiderna.html



Jurassic, fossil imprint of a dinosaur from layers of shale in Helsingborg. The imprint is about 15-20 cm long.



Soils in Helsingborg: Swedish geological investigations SGU 1974, 1976 Soils of Southwest and Northwest of Helsingborg.

Anthropological versus ecological history in Helsingborg

10 000 BC-1050 AD prehistoric time - History of land use and vegetation

In Scandinavia the following archeological periods are used:

Stone age 10 000-1 800 BC

Bronze age 1 800-500 BC

Iron age including the Viking age 500 BC-1 050 AD

Medieval time 1 050-1 500 AD

Modern time 1 500-

Human settlements in the South of Sweden, where the City of Helsingborg is located started during the last 10 000 years after the last ice age. During the Stone Age, human settlers predominantly hunted mammoth, giant deer and other animals from the sparse tundra forest of pine, birch and hazel. The climate became 4 centigrade warmer during the late Stone Age. About 6 000 years ago humans began to be more dependent on agriculture, cultivating their fields on a landscape dominated by species of oak, ash, elm, linden, maple, hornbeam, wild cherry and hazel. Wild animals such as bear, wolf, roe deer, red deer and European bison were here as well as aurochs (Swedish Mountain breed among others originated from the aurochs). Pelicans and marsh turtles were here too and the latter still remain in the Baltic region.



The map shows the distribution of heather (in lilac) and moorlands (red) dominated by heather in the world. Source: Provincial government of Scania. To the right; Heather *Calluna vulgaris*.

During the late Bronze Age (1800-500 BC) the dominance of silage and burn agriculture meant humans set fire to forests to create arable land. However, cultivation was only possible for a few seasons as the land was exhausted of nutrients. The nutrient poor fields provided an environment conducive to the growth and establishment of moor species, which eventually became widespread over the entire area. Heath or moorlands then increased until the 1800s and became a cultural landscape/biotope. The moorland attracted many species including; insects, mushrooms and vascular plants that are rare today. Another tree species, beech appeared during this period. One example of heath or moorland species is the beautiful blue Marsh gentian, *Gentiana pneumonanthe*, on which the butterfly *Maculinea alcon* are dependant. The Marsh gentian as well as the butterfly are both extinct in Helsingborg since the wet heathlands have almost completely disappeared due to the increased pressure of drainage and cultivation in the 1800s and 1900s.





The marsh gentian on which the little blue butterfly *Maculinea alcon* is dependant. Both are extinct in Helsingborg and very rare in Sweden as a whole.

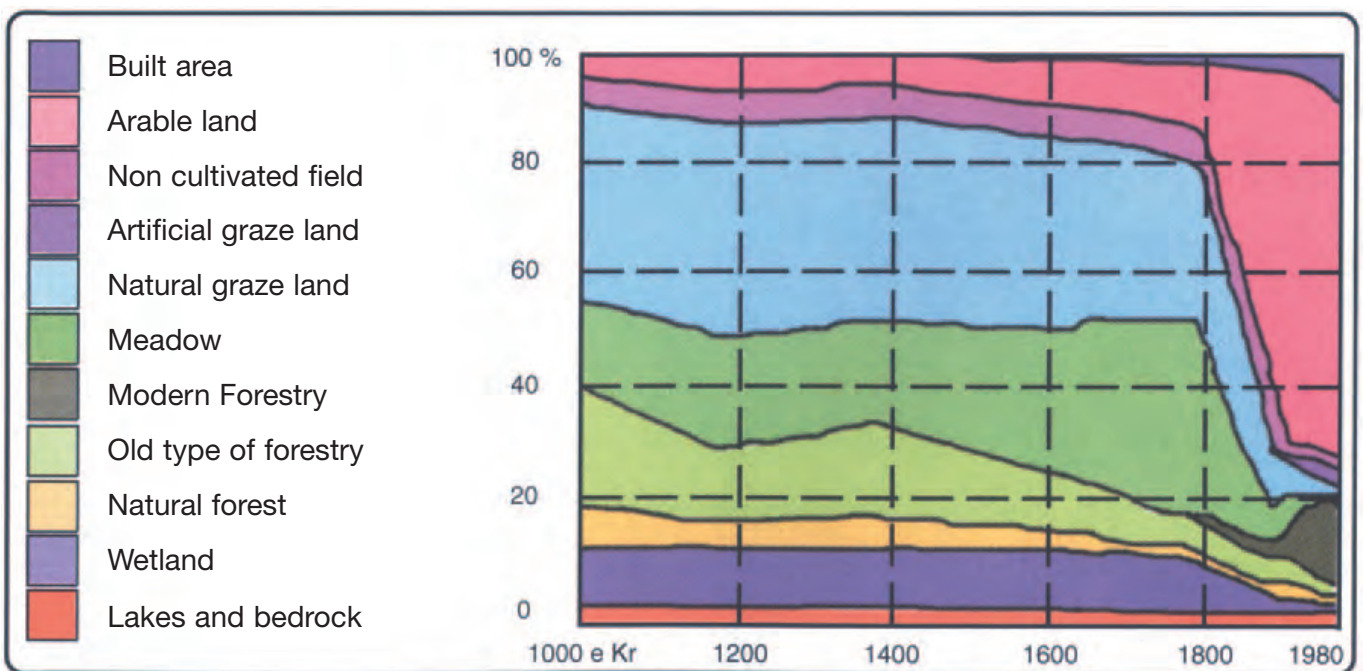
Anthropological versus ecological history in Helsingborg historic time; 1 050 AD to present - History of land use and vegetation.

From the beginning of the Middle Ages, 1 050 AD until 1700s there is not much information about land use, but during the period of 800 - 1 800 AD, agriculture developed slowly concentrating on livestock and livestock exports as a major livelihood. The village communities determined how to take care

of their common land areas if the land they cultivated did not belong to the church or estates. During this time, the primeval forest was transformed into grazing grounds and arable land but had completely disappeared as an original ecosystem by the middle Ages, at latest by the 1300s.

Pasture and meadows increased gradually and during the 1700s about 50 % of the Helsingborg landscape was dedicated to pasture, mostly moorland. Biodiversity was deeply affected during this period and the majority of forest species (e.g. bear, wolf, red deer, and roe deer) disappeared.

When the old type of land use, dominated by grazing and scything, changed in the beginning of the 1800s the situation changed rather fast since the forest was almost already gone. It was quite easy to cultivate the open grasslands, including the meadows or hayfields although there were some trees and bushes in the latter. Meadow land, which was useful for the harvest of the winter fodder accounted for 40 % of the area (a special form called coppice meadows) and 10 % were cropland (1700s). One important reason for the low proportion of cropland is the domination of heavy clay soils, making it difficult to plough. Meadow cultivation primarily involved mowing and



Land use during 1 000 years in Western Skåne. Emanuelsson U. et al 2002, Det skånska kulturlandskapet.

pollarding of low trees and shrubs. Of particular interest, in addition to the fields and hay waste of broadleaved trees, is grazing land such as heath or moorland. The spreading of heather, *Calluna vulgaris* and moorland peaked in the 1700s and occurred only in Western Europe (see map). Many endangered species are linked to moorlands. The bush *Juniperus communis* is often synonymous with moorlands, although there are also moorlands free from trees and shrubs due to intensive use of wood. Different habitats exist in the moors, for example, poor fen, grass heath, among others.



Very old pasture/moor with juniper bushes *Juniperus communis* and heath *Calluna vulgaris*. Such pasture has long since disappeared in Helsingborg but half of the land area looked like this during the 1700s. This kind of landscape is a result of silage and burn agriculture which was used until the 1800s.



Primrose *Primula veris* is a plant favored by dry, calciferous meadows and pasture. It is very rare in Helsingborg nowadays but it was common in the old agricultural landscape.

During the first half of the 1800s the first land shifting reforms* occurred. This means that villages dissolved, farms moved out, while meadows, and pasture areas were cultivated. The villages had only about 3-20 farms each. Later, from the 1850s, wetlands were drained and ditches created. Streams were also deepened and straightened out. There is also a specific agricultural method mostly used during 1880-1920 which involved the digging up the calcareous clay and spreading it over the cropland as a kind of soil improvement. As a result of the damage cause by such practice, nearly 1 000 (one third of the original number) small ponds in arable fields are currently protected as important small biotopes under the Environment Code. Stone borders built during the Iron Age, middle Ages and the 1800s we can see today as tree-covered stone walls and they are also like the parkways protected under that law. During the 1900s, former meadows and pastures became overgrown with more beech, oak, ash, birch, alder, hazel and others. This is where the important remaining hardwood copses are found at Allerum, Småryd, Rosendal, Pålsjö forest, Väla forest, Svedberga and the Råån valley. Agriculture became mechanized in the beginning of the 1900s and in the latter half of the 1900s, farming became predominantly chemical, with the use of fertilizers and pesticides.

By the end of the 1900s many stone walls, ponds and other small habitats on farmland disappeared with the advent of modern agriculture. During the 1900s, crop production became predominant, grazing and grasslands disappeared in Helsingborg. The high degree of farm land is important for food security and the regional authority has recently (2012) come out with a zero vision concerning arable land. This means that no more exploitation of arable land is desired. It presents a conflict even

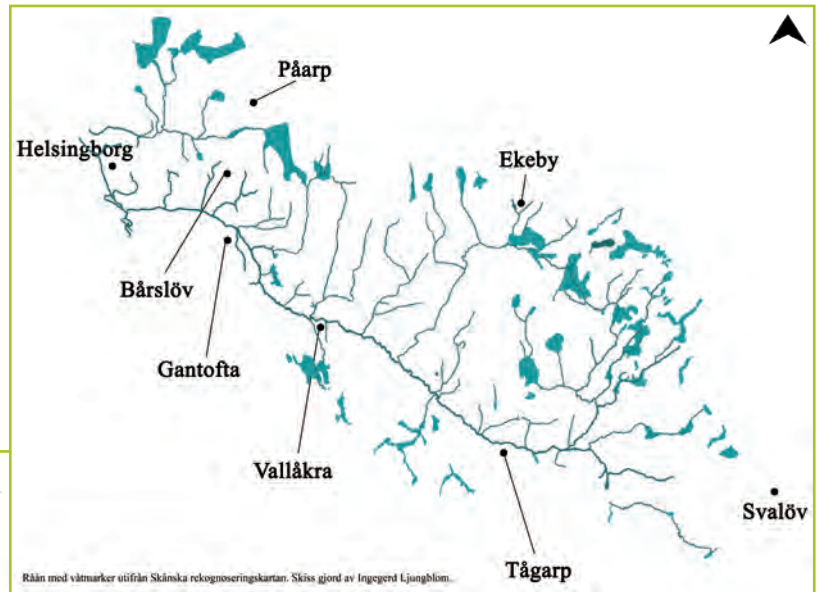
* The landlord Rutger McLean started the landshifting reforms that totally changed the land use and the conditions for biodiversity. This revolution of the one thousand year old agricultural system began in Helsingborg 1804 and it was completed some decades later.



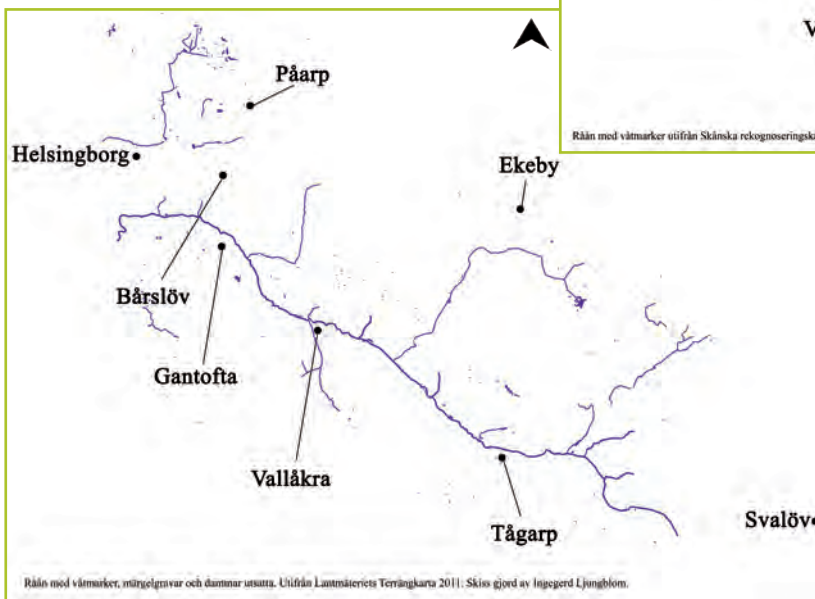


Forests particularly essential for biodiversity in the Scania region.

for the development of green and blue structures including ecosystem services since arable land is the only land that can be used for tree plantation and new wetlands. Arable land is homogenous and very poor in biodiversity. All forests in Helsingborg are rather small - they are often called forests but are mostly copses and may have a long history as woodlands. Interesting and important from the perspective of biodiversity, is that some of our forests could have several thousand years of history as wood lands which have affected species diversity. The longer the continuity of the biotope the more species-rich it is. Some fungi are good indicators of the long history of land and are thus only found in old forests.



Råån med våtmarker utifrån Skånska rekognoseringskartan. Skiss gjord av Ingegerd Ljungblom.



Råån med våtmarker, mätgravar och dammar utsatta. Utifrån Lantmäteriets Terrängkarta 2011. Skiss gjord av Ingegerd Ljungblom.

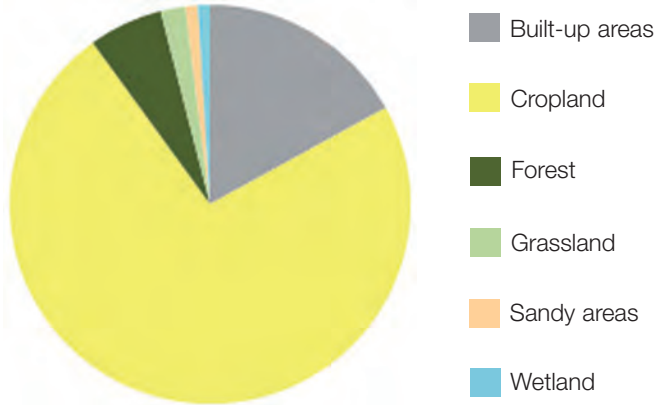
Map above shows what the river system (195 km²) of Råån originally looked like with several unaffected streams and wetlands in 1810. The other map shows the situation today with fewer streams and almost no wetlands left after the large-scale activity of creating ditches started in 1850. Another important effect of the period when ditches were created is the ground water level that was reduced about 1 metre. Small dots also shows hundreds of small ponds as a result of the 1880-1920 period when calciferous clay was excavated to improve the soil of the arable land.



Natural areas of interest for biodiversity mentioned in this report.

Natural richness of the City

Biodiversity profile and land use of Helsingborg today



Land use in Helsingborg. The diagram shows that Helsingborg is dominated by cropland 72 %, built-up areas 17-18 %, forest 6-7 %, grassland 2 %, wetland 1 % and sandy areas (beaches etc) 1 %.

The distribution of green areas is very fragmented and it is shown by the Råån valley and areas along the narrow coastline that have high density populations of herbs, grass, bushes and trees. Topography is therefore an important factor for the appearance of green structures i.e. where the landscape is steep it has been difficult to cultivate or build houses. This is also the case in other parts of the city where the deep ravines of Landborgen* at Pålsjö, Jordbodalen and Ramlösa are exciting rich green places. Because of the steep rock faces there are a lot of trees, bushes, plants and animals in these areas. In these places wildlife finds refuge in areas near the sea and along steep zones, and also in wet areas where cultivation and exploitation has not occurred. This means that these areas often have a long continuity, an important factor for certain plant species that are not very competitive and dependent on forest ecosystems, grazing or scything. These species are often threatened since their living space

* Landborgen is a slope of bedrock going right through the City centre and it is about 20-40 metres high and 16 km long. It is overgrown with trees and bushes and creates a strong character for Helsingborg. It offers great scenery over Öresund and Denmark and is also rich in biodiversity. A lot of ravines run along the slope. Altogether these natural assets offer exciting beautiful nature experiences in the middle of the vibrant City centre.

has diminished or in most cases, grazing and the old scything tradition have been discontinued. Examples of these species include a lot of orchids like the *Orchis mascula*, *Platanthera chlorantha* among others.

Remains of flora and fauna can also be found along the many, old stone borders (built during a thousand year period from iron age, medieval to the 1800s) where plants found a refuge in times when the surrounding landscape consisted of meadows, grazing land or forest. Now the surroundings are cultivated fields. These elements together with the one thousand excavated small ponds called “mängelgravar” are important as a source of refuge for many species. It was only in the flat country areas with calcareous clay soils in Sweden where this “mängelgravar” method was used during 1880-1920. The ponds are too small to be seen on this map scale. Often they are about 100-400 m² big.

In the vicinity of mansions and castles there are also rich biodiversity remains. Significant examples are the Rosendal, Kulla-Gunnarstorp, Rosenlund and Stureholm which collectively hold a high diversity of species. The Map 1 (p 24) also shows forest areas (green) meadows or graze land (yellow) and sandy areas that are important for biodiversity. An important example of the rich biodiversity found in these areas is the wild bees that act as pollinators.



Example of the many small ponds (“mängelgravar”) that arose as a result of excavating calciferous clay during 1880-1920. The clay was used as improvement of the soil for cultivating. Today about 1 000 small ponds remain in Helsingborg, offering wildlife a possibility for breeding, food and shelter in the open farmland. All small biotopes in open farm land such as the ponds are protected by Environment Legislation.

Ecosystem types

Terrestrial Ecosystems

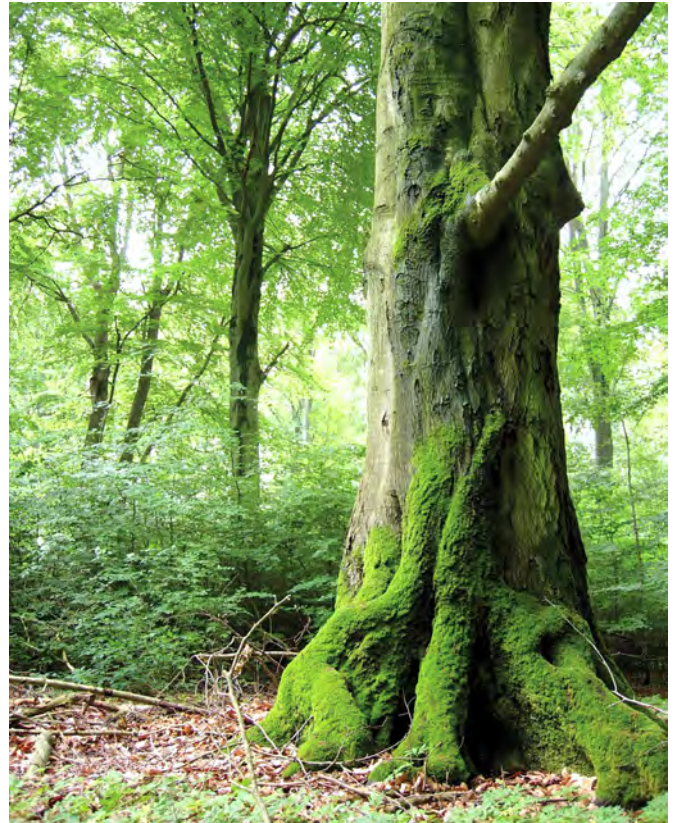
The *hardwood dominated deciduous forest* is the original primeval biotope, but currently, it has a rather small distribution. Trees like oak, beech, ash, elm, linden, maple, hornbeam, wild cherry, and hazel are characteristic of this forest. In this biotope we find the most important populations of the different species that once covered a large part of Sweden. All coniferous copses (40 % of all forest in Helsingborg) are artificial in Helsingborg. Most commonly planted conifers are spruce *Picea abies* and pine, *Pinus sylvestris*. The conifers are not very good for biodiversity, as they are not native to Helsingborg, and have a chemically laden waste that has adverse effects on soil nutrients, although they offer shelter in winter time for certain species. *Pastures and Meadows* has a small distribution but they are very important for many threatened species, especially if they remain rather natural without fertilizers and pesticides. Björka pasture, Grå Läge, parts of the Råån valley and the Örby meadows are some examples. Some previous meadows are nowadays graze land instead. These kinds of keeping tall vegetation away are not really comparable; they give some differences in the flora. Some vascular plants are dependent on grazing and others of scything and some can be favoured by both methods.

Fresh water and wetland Ecosystems

Currently, *wetlands* also have very little natural distribution in Helsingborg. They are present mostly along the rivers, especially during floods. Important wetlands include the Skälderviken, the Hasslarp dams, areas around the rivers and around seventy small excavated wetlands (the latter are too small to be shown on map.) Many of the wetlands were made during the past two decades as part of water quality programmes, to collect precipitation and very often they are utilized by wildlife such as wader birds.

Running water is acquired from the rivers of Råån and the Vegeån/Hasslarpsån. Helsingborg has no lakes but many small artificial ponds.

Rivers such as Råån and the Vegeån/Hasslarpsån are the most significant rivers in Helsingborg. They are



Old beech forest *Fagus sylvatica*.

important for a diversity of fish species, dragonflies, molluscs and other invertebrates, for denitrification and storm water control. The River *Råån* in the south part culminates in Öresund and the River *Hasslarpsån/Vegeån* in the northeast part culminates in the Bay of Skälderviken.

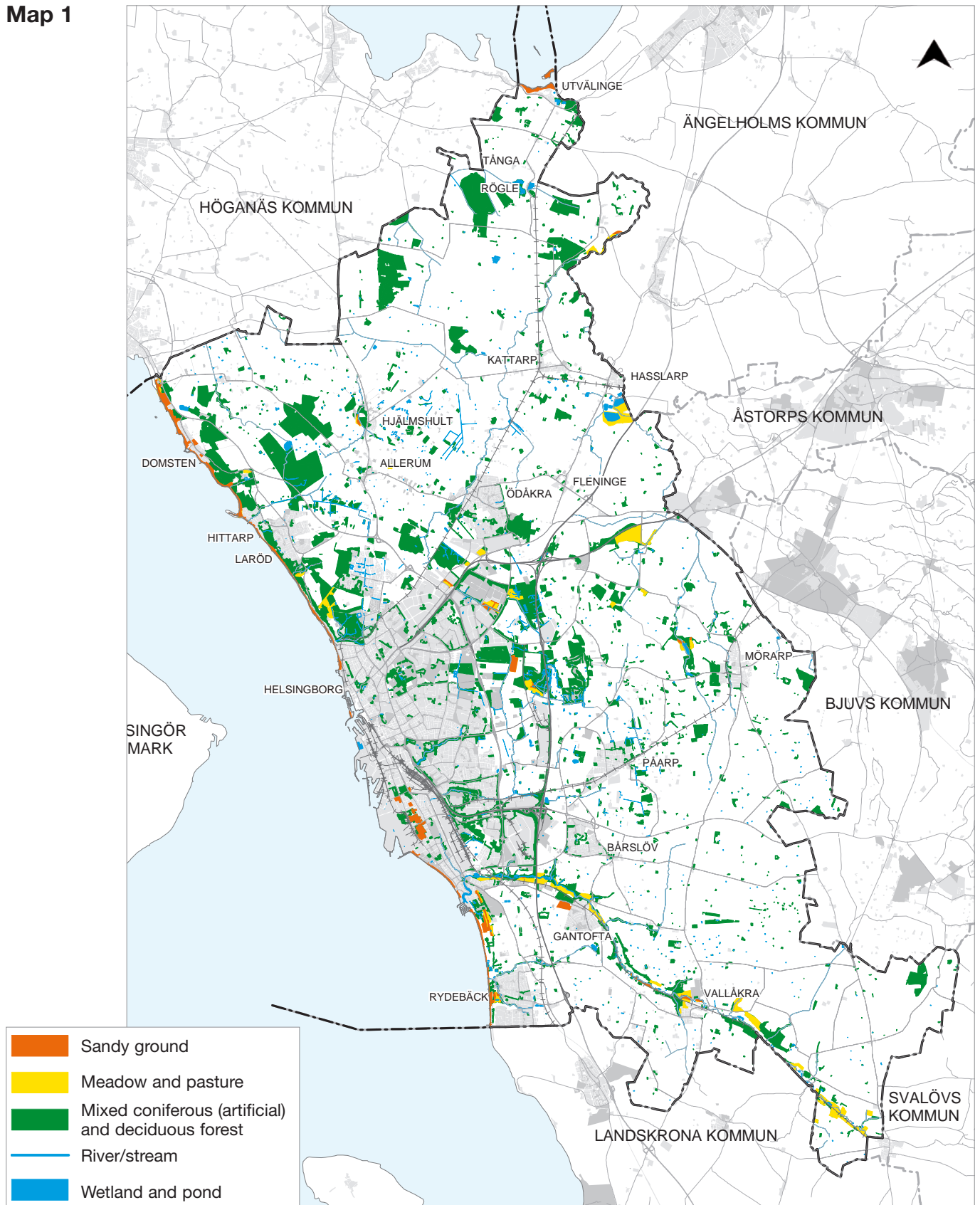
Coastal Ecosystems

Coastal habitats like the sandy beaches are important for biodiversity, especially for wild pollinators such as bees. The shallow sands of Skälderviken are home to high diversity of migrating and breeding sea birds and waders. The area's rich bird diversity led its designation as a Ramsar site in 2001. There are also two Natura 2000* designated areas in the same place, due to the high avian diversity and the Habitat directives**.

* Natura 2000: The network of protected green and blue areas (habitat directives) of the EU European Union.

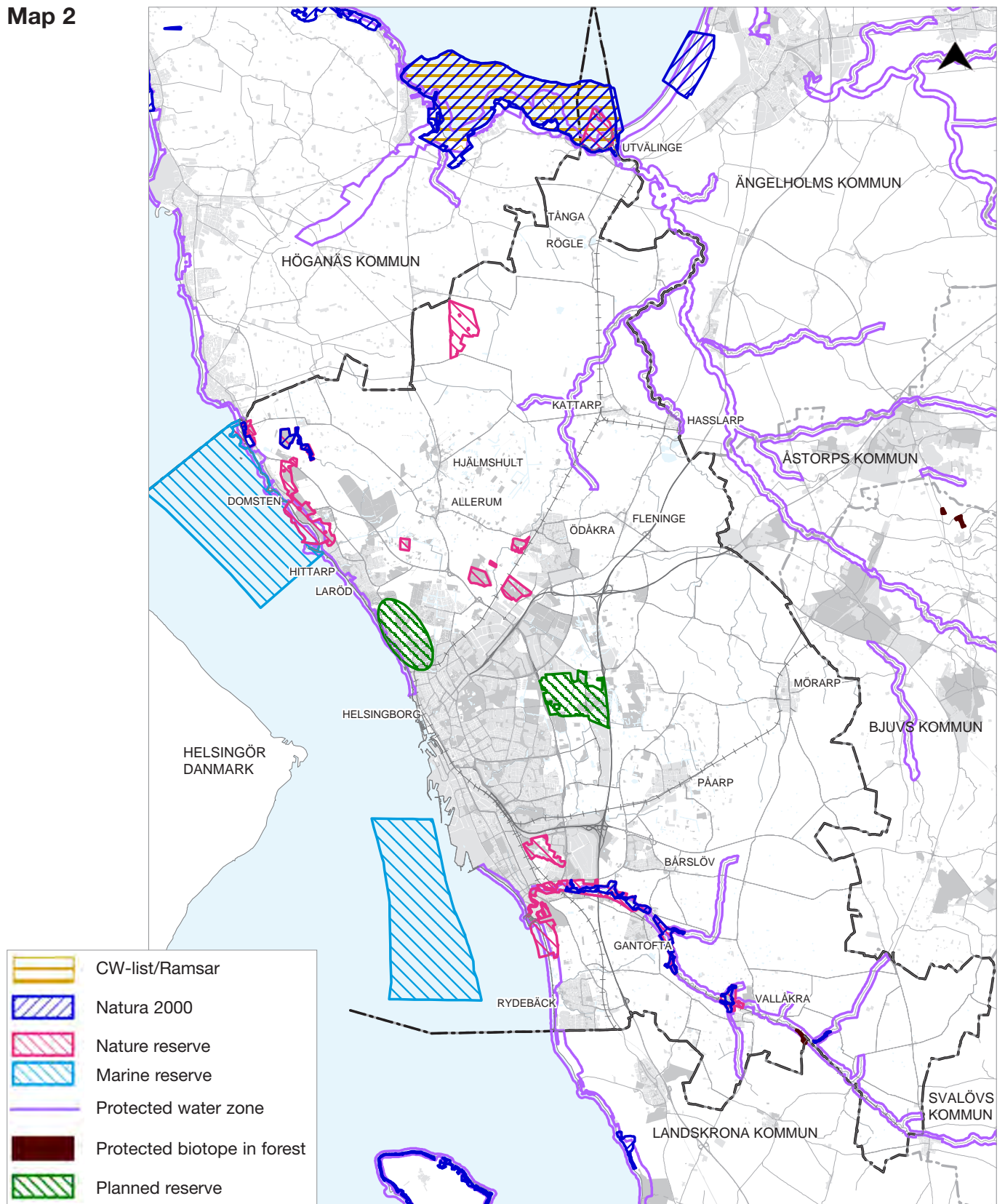
** Habitat directive and the Bird directive are according to legislation of the EU European Union.

Map 1



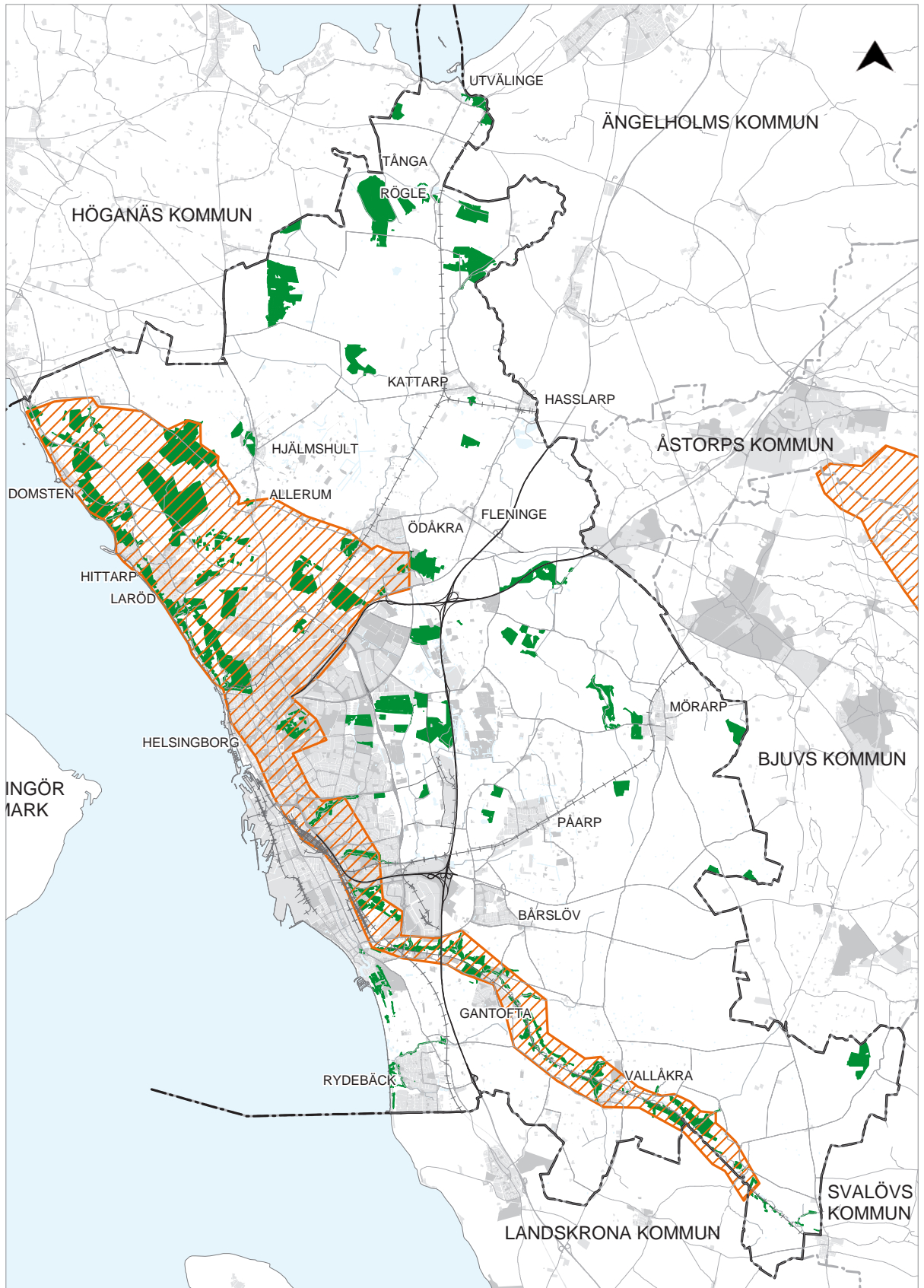
Distribution of all different main habitats hardwood, coniferous forest, running water, wetland, pasture and meadow, sands except marine habitats.

Map 2



Protected areas in Helsingborg. Nature reserves (Environment Code), Natura 2000 (EU legislation). In addition to this is the RAMSAR area in Skålderviken. Biotope protection areas (Forestry Act).

Map 3



Forests in Helsingborg and special forest district of regional interest pointed out by the Skåne County Administrative Board. White is the agricultural area and grey, the built-up area.



The Småryd meadow as it looks today and might have looked also in the 1700s as a coppice meadow. A biodiversity rich habitat that need annual management. Hazel bushes are common in old meadows. Notice the dense vegetation of herbs and grass indicating an area once good for hay making.

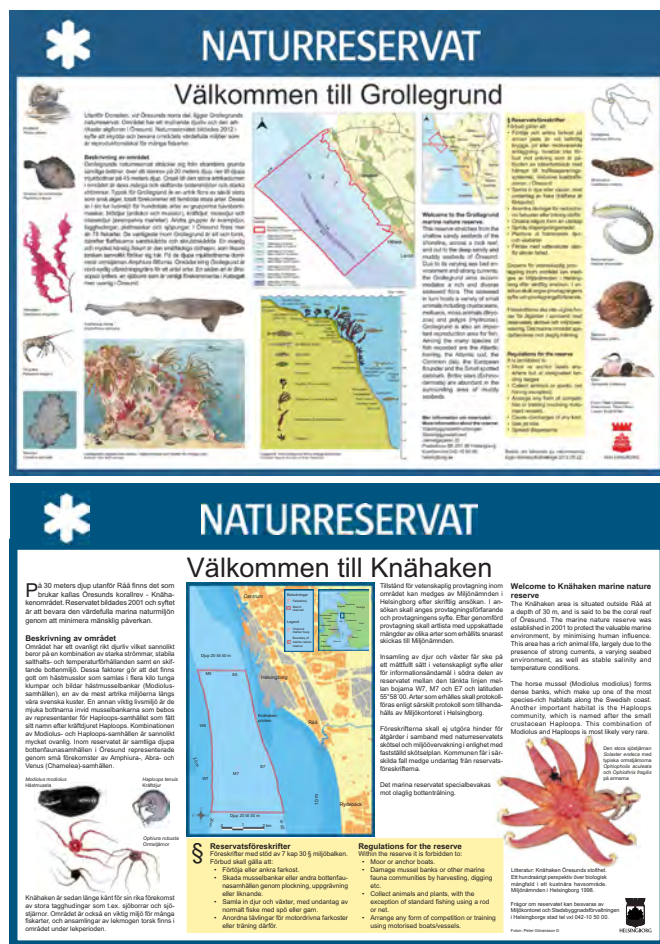
The Marine Ecosystem

Marine habitats in the strait of Öresund and bay of Skälderviken are important for fishing, swimming and boating. Öresund is a unique marine environment as well as the whole of the great Baltic Sea. The Baltic Sea is the largest brackish water system in the world. In Öresund, water from the Baltic meets water from the Atlantic Ocean. The lower levels of Öresund consist of salty Atlantic water and the upper levels water from the Baltic drainage basin. Therefore there is a thin layer or zone where salt concentration changes, from about 10 per mille to 30 per mille of salt. Öresund is at its deepest at about 50 metres with shallow areas down to 5-10 metres along the coast. The Disken (sandbank), Grollegrund and Knähaken areas (marine reserves) are essential for marine biodiversity. Water quality is better in these areas compared to the Baltic, but nevertheless it needs to be improved. The appearance of mercury, organic compounds and nutrients such as nitrogen affects marine life. Nitrogen coming from farming via rivers and from sewage treatment plants leads to eutrophication with excess growth of algae. This in turn leads to lack of oxygen on the ocean floor and invertebrates disappear. It might be of interest to notice that in Öresund trawling has been prohibited since the 1930s. It has had a great impact on Knähaken är fisheries and marine biodiversity.

There is a long history of collaboration between Sweden and Denmark. The Öresundsvattensamarbetet (Öresund Water Cooperation) is the name of cooperation between the Danish and Swedish municipalities and counties surrounding the Sound. The agreement was signed in 1995 and cooperation will ensure a healthy aquatic environment in the Sound. This cooperation is a continuation, at regional level, of the Danish-Swedish cooperation that has existed for nearly 50 years - first as the Sound Water Committee (1960-1974) and then as the Sound Commission (1974-1993).

Sources:

Öresundsvandkommittén 2010 and Öresundsvattensamarbetet 2007 Fisk i Öresund samt 2004 Comparison between original and current nutrient concentrations in Öresund. <http://www.oresundsvand.dk/Svenska/Havs-och-vattenmyndigheten> 2013 Fiskbestånd och miljö i hav och sötvatten.



NATURRESERVAT
Välkommen till Grollegrund

NATURRESERVAT
Välkommen till Knähaken

Biodiversity in Helsingborg

Despite the small area of the municipality, 346 km², Helsingborg's species diversity is among the highest in Sweden. The Helsingborg landscape hosts over a thousand species of vascular plants, 120 nesting bird species, about thirty species of mammals, 9 species of amphibians and reptiles (of which 2 species are extinct since the 1950s, current plans for reintroduction), 1 600 multicellular marine species including fish and plants, hundreds of mosses and lichens, and several thousand terrestrial invertebrates including insects, spiders, slugs and crustaceans. Currently, the state of biodiversity in Helsingborg as documented by the IUCN Red List data indicates that, 125 species out of 250 species are documented as endangered (see Annex 3).

A Vegetation and Flora

Vegetation

Green plants perform the most important ecosystem service and primary production on earth through photosynthesis. As a fundamental aspect, one could say that a vast dense green cover of natural vegetation gives robustness against different kinds of shocks including those associated with climate change, fire and diseases. A natural distribution of different vegetation types is important to achieve a balanced ecosystem. The vegetation types in Helsingborg are a mix of natural and cultural influenced habitats*.

A1 Vascular plants

There are about 1 100 vascular plant species in Helsingborg. Beech and oak are the most common tree species along with birch and alder. Spruce is also common but was artificially introduced. In some of the sandy areas, pine species are also common. Pine species, like some of the other species found in Helsingborg today are not native species and were introduced in the area during the late 1800s. Another important species is the beautiful white Wood anemone, *Anemone nemorosa*, that covers the ground in the spring with white hardwood copses.

Among the most threatened vascular plants in Helsingborg is the *Orobanche elatior*, a kind of parasite on *Centaurea* (*C jacea* or *scabiosa*) species. This is an interesting example of coexistence between organisms. These species are adapted to dry and calciferous grassland which are often around the remains of old cultural landscape. The meadows in Sweden were once created through the use of the scythe after most of the trees were cut off to give space for herbs and grass and small croplands that could change place after some years.



The common Wood anemone covers the ground in beech forests in springtime. Pålssjö forest.



Some examples of interesting vascular plants e.g. *Orobanche elatior* (extremely rare in dry, old meadows), *Leucanthemum vulgare* (dry meadows and symbol of Scania) and *Helichrysum arenaria* (dry sand substrate).

* (Classification of vegetation follows Nordic Minister Council "Vegetationstyper i Norden" 1994:665 and Swedish Environment Protection Agency <http://www.swedishepa.se/>).

A2 Mosses and lichens

These are species rich groups with probably some thousand species in Helsingborg. Some of them are good indicators for different environment conditions and play a key role in the ecosystem. In the countryside, special lichens can be found living on tree stems and stones, especially on solitary trees. Many of these lichens cannot be found in the city due to air pollution. These lichens also need soil particles that provides them with nutrients. Certain tree species are hosts to lichens. These lichens can not be found on all trees as a result of certain chemical conditions found in the bark of some tree species. Linden and aspen are especially rich in lichens. Mosses and lichens are not well-known but some inventories show that Helsingborg has a lot of *red listed* lichen species.

Threatened lichens in Helsingborg VU=Vulnerable, NT=Near threatened.

<i>Arthonia pruinata</i>	Matt pricklav	VU
<i>Bacidia rosella</i>	Rosa lundlav	NT
<i>Fuscopannaria mediterranea</i>	Olivbrun gytterlav	NT
<i>Lecanora glabrata</i>	Bokkantlav	NT
<i>Melanohalea elegantula</i>	Elegant sköldlav	VU
<i>Opegrapha ochrocheila</i>	Orangepudrad klotterlav	NT
<i>Opegrapha vermicellifera</i>	Stiftklotterlav	VU
<i>Pyrenula nitida</i>	Bokvårtlav	NT
<i>Schimatomma decolorans</i>	Grå skärelav	NT
<i>Sclerophora peronella</i>	Liten blekspik	NT
<i>Xanthoria calcicola</i>	Kalkvägglav	NT



Mosses and lichens can be found on tree stems and stones but also on the ground.

A3 Mushrooms

Mushrooms are important decomposers in natural systems and are often sensitive to high concentrations of nitrogen in the ground. Many mushrooms are indicators of environment conditions. Mushrooms form their own organism kingdom, Fungi and many are highly specialized, some form symbiotic relationships with roots certain trees species (mycorrhiza), some are parasitic, others live on detritus (dead organic matter). Some wild growing mushrooms are highly utilized as food in Helsingborg such as the *Cantharellus cibarius*. The number of mushrooms species in Helsingborg is not known but they are expected to be up to 2 000.

The list below shows known red listed mushroom species in Helsingborg:

<i>Ceriporia purpurea</i>	Purpurticka	LC
<i>Cortinarius turgidus</i>	Silkesspindling	VU
<i>Cryptosphaeria eunomia</i>	Tusengömming	NT
<i>Eutypella dissepta</i>	Ö-nästing	NT
<i>Eutypella stellulata</i>	Stjärnnästing	NT
<i>Fistulina hepatica</i>	Oxtungssvamp	NT
<i>Ganoderma pfeifferi</i>	Hartsticka	EN
<i>Geastrum corollinum</i>	Rulljordstjärna	EN
<i>Gloiodon strigosus</i>	Borsttagging	VU
<i>Grifola frondosa</i>	Korallticka	NT
<i>Hygrophorus mesotephrus</i>	Bokvaxskivling	NT
<i>Hypochnicium vellereum</i>	Almkrämskinn	NT
<i>Hypoxylon howeanum</i>	Hasseldyna	NT
<i>Inonotus cuticularis</i>	Skillerticka	VU
<i>Inonotus dryadeus</i>	Tärticka	VU
<i>Oxyporus obducens</i>	(no Swedish name)	VU
<i>Phellinus robustus</i>	Ekticka	NT
<i>Polyporus tuberaster</i>	Stenticka	NT
<i>Russula carpini</i>	Avenbokskremla	NT
<i>Russula melliolens</i>	Honungskremla	VU
<i>Russula puellula</i>	Småkremla	DD
<i>Russula solaris</i>	Solkremla	NT
<i>Sowerbyella radiculata</i>	Blek rotskål	VU
<i>Trametes suaveolens</i>	Sydlig anisticka	EN



Chanterelle
Cantharellus cibarius.

B Fauna

B1 Birds

Out of a total of 250 bird species in Sweden, about 120 species are known to breed in Helsingborg. A lot of forest bird species breed in the hardwood copses around the city. Common among these species are the small Willow Warbler, *Phylloscopus trochilus* and Chaffinch, *Fringilla Coelebs*. The Common wood pigeon, *Columba palumbus* and Field fare, *Turdus pilaris* are seen almost everywhere. This is also the case with Carrion Crow *Corvus corone* and Common magpie *Pica pica*. The Sparrow hawk *Accipiter Nisus* along with the Common buzzard, *Buteo buteo* and Common kestrel, *Falco tinniculus* are the most common birds of prey species. In the croplands there are a few species Like Partidge, *Perdix perdix*, Pheasant, *Phasianus colchicus* and Larch, *Alauda arvensis* which have decreased in number over the last decade. In this case, simple farming practices can help the species to survive in arable land. By leaving squares free from crops to provide a nesting area for these species, they can build their nests and breed more successfully. These small uncultivated spaces in fields are called “larch squares” and anyone can buy such a non-cultivated space from a farmer for SEK 50 or about 8 USD for a land space of 20 m². The picture below shows a campaign run by Swedish bird associations saying “Save the larch - buy a larch square”! Source: www.uof.nu.



Advertisement inviting people to buy a small uncultivated surface of farm land in aim for giving the larch a place to breed.

The city's wetlands, including the bay of Skälderviken which is of great importance for migratory birds during autumn and spring seasons as well as a significant breeding site for species such as seagulls and wader birds like the Pied Avocet, *Recurvirostra Avosetta*. Many of these are migratory birds and rest in Helsingborg, waders, ducks inter alia, during their journey to the north of Scandinavia where they breed. The shallow sandy banks of the wetlands serve as an important feeding area for shorebirds due to the abundance of invertebrates and fish. The large number of sea birds attracts birds of prey, including *Peregrine* and sometimes Gyrfalcon *Falco Rusticolus*. The latter is observed in this area during winter.

The bay of Skälderviken has been designated as a Ramsar site under the Ramsar Convention. An interesting event in this context is that the rare (around 3 000 individuals in Sweden) White tailed eagle *Haliaeetus albicilla* bred in Helsingborg in 2012, for the first time in hundreds of years and not far from the Skälderviken bay. This eagle has had special support for decades since its population considerably diminished during the 1900s. A common sea bird in this area is the Great black cormorant *Phalacrocorax carbo*. The *Phalacrocorax carbo* is not popular among fishermen since it dives and sometimes empty fishing nets.

The Mew gull *Larus canus* is frequently observed as well as the Black headed gull, *Chroicocephalus ridibundus*. The Black headed gull plays an essential role in the ecosystem, since it occurs in large colonies which protect other sea bird species against birds of prey. However, the population of the Black headed gull has decreased over the last decade and the reason for this decline is still unknown.

The Mute Swan, *Cygnos olor* is also common along the coast. Very common is the Wild duck, *Anas platyrhynchos* which breeds all over Sweden. The Canada goose, *Branta canadensis* was introduced in Sweden in the 1930s and it has since increased, with large numbers spread all over the South of Sweden.



Mårten Müller

Wikipedia



Mårten Müller

Wikipedia

Mårten Müller



Mårten Müller

The Red Kite *Milvus milvus* was almost extinct in Sweden but due to a rescue plan the species is now common in southern Sweden today and breeds in Helsingborg.

Lesser spotted woodpecker *Dendrocopos minor* is rare but breeds in Helsingborg.

Black headed gull *Chroicocephalus ridibundus* has decreased in numbers in recent decades.

Spotted Crake *Porzana porzana* is rare in the Örby wetlands. Hawfinch *Coccothraustes coccothraustes* occurs in hardwood copses and is the Helsingborg “municipality bird”. Black Woodpecker *Dryocopus martius* needs old trees.

Migration of birds during spring and autumn is immense around Helsingborg and it can be studied along the strait of Öresund and Falsterbo in the southwest of Skåne (Scania) a place of international importance. It is some 100 km south of Helsingborg. Every autumn about 500 million migratory birds pass over southern Sweden. Some species move in the day and some at night while others can move both day and night. Migrating birds must complete their journey as quickly, safely and efficiently as possible. Therefore, they avoid flying over unknown or dangerous areas. For many birds, the Baltic is the first serious obstacle on the way south, so they follow the coast as far as possible. Finally they reach the Swedish southwestern point – Falsterbo which



Mårten Müller

Mårten Müller

Wikipedia

Common Kingfisher *Alcedo atthis*, is a rare breeding bird in the river Råån.

Little Tern *Sternula albifrons* is rare and breeds in Helsingborg only on the small island Sandön.

Of the Pied Avocet *Recurvirostra avosetta* some pairs breeds in Helsingborg in the Skålderviken bay and the Hasslarp dams.



The island Sandön is a popular place for bird watching.



Bird watching attracts large numbers of people in South west Scania (Falsterbo) in autumns during the bird migration period. A lot of birds are also captured here for labeling with identification rings.

gathers large concentrations of migratory birds in autumn. The most spectacular is the migrations of birds of prey. Nowhere else in Sweden can more birds be observed than on a good migration day at Falsterbo. A lot of birds are also captured here for labelling with identification rings.



White-tailed Eagle *Haliaeetus albicilla*.

Some examples of red listed birds in Helsingborg (The complete amount of redlisted birds is too long to show here, see Annex 3).

Threatened = CR-critically endangered, EN-endangered, VU-vulnerable.

Red data list = RE-Regionally extinct, NT-near threatened, CR-critically endangered, EN-endangered, VU-vulnerable.

<i>Alcedo atthis</i>	Kungsfiskare	VU
<i>Anthus campestris</i>	Fältpiplärka	EN
<i>Calidris alpina schinzii</i>	Sydlig kärrsnäppa	CR
<i>Carduelis cannabina</i>	Hämpling	VU
<i>Ciconia ciconia</i>	Vit stork	RE
<i>Circus pygargus</i>	Ängshök	EN
<i>Dendrocopos minor</i>	Mindre hackspett	NT
<i>Haliaeetus albicilla</i>	Havsörn	NT
<i>Nucifraga caryocatactes</i>	Nötkråka	NT
<i>Numenius arquata</i>	Storspov	VU
<i>Oriolus oriolus</i>	Sommargylling	EN
<i>Perdix perdix</i>	Rapphöna	NT
<i>Pernis apivorus</i>	Bivråk	VU
<i>Porzana porzana</i>	Småfläckig sumphöna	VU
<i>Remiz pendulinus</i>	Pungmes	EN
<i>Somateria mollissima</i>	Ejder	NT
<i>Sternula albifrons</i>	Småtärna	VU

B2 Mammals

Large mammals

In Helsingborg, there are about 40 species of mammals. The Moose *Alces alces* is one of the rare species found in this area. It is the largest deer in the world and prefers big forests, and can be found throughout Sweden. Common species of mammals include: the Roe deer, *Capreolus capreolus*, a species of Red fox, *Vulpes vulpes* and the European badger, *Meles meles* species.

Small mammals

Other predator mammal species include Marten *Martes martes*, Ferret *Mustela putorius* and Ermine *Mustela ermine*, which are important predators.

The species of Mink, *Mustela vison*, found in rivers and along the shoreline of Helsingborg, has adapted to the natural environment, having escaped from fur farms and cause harm to breeding birds' eggs. The Mink is now rather common along rivers and the coast. Neither the European hare, *Lepus europaeus* nor the European rabbit, *Oryctolagus cuniculus* found in the city are native to Sweden. These species have become common in the city since they were introduced. The latter is especially



Moose *Alces alces*.

common in gardens where they cause harm to crops. Sweden's native hare, *Lepus timidus* is not found in Helsingborg since it is known to be adapted to large natural coniferous forests which are not occurring in the Helsingborg area by natural reason.

Bats and rodents. Several species of these two animal groups breed in Helsingborg. The most spectacular is the tree Squirrel *Sciurus vulgaris*. It is very popular for its funny look and it will often approach humans if they offer some food. It can be seen in parks and villa gardens. Mole *Talpa europaea* lives mostly underground and is detected by its many earth mounds. At least 8 different species of bats have been recorded in Helsingborg. The Brown rat, *Rattus norvegicus* and Forest mouse, *Apodemus spp.*, and House mouse, *Mus musculus* are the common small mammals that can be found in Helsingborg. The brown rat is an invasive species occurring in great numbers in waste-pipes and has displaced the Black rat, *Rattus rattus*.

The European hedgehog, *Erinaceus europaeus* is common in gardens as well as in open landscapes and feeds predominantly on insects.



The Otter, *Lutra lutra* was once common in water systems in Sweden but its numbers have greatly decreased. It is extinct in Helsingborg but might come back. In the middle a young Hedgehog *Erinaceus europaeus*, common in gardens. The Badger *Meles meles* is common. Photos: Colourbox.



Roe deer *Capreolus capreolus*, Ermine *Mustela erminea*, Marten *Martes martes*, Weasel *Mustela nivalis* are mammals found in Helsingborg. Photos: Wikipedia.



The pig, Wild boar *Sus scrofa*, has increased a lot in Sweden since it was reintroduced and has sometimes been seen in Helsingborg. The Red fox *Vulpes vulpes* is common.

Marine mammals in Helsingborg

Mammals found in the marine environment of Öresund include; seals (Harbor seal *Phoca vitulina* and Grey seal *Halichoerus grypus*) and the small whale Harbour porpoise *Phocoena phocoena*.



Grey seal *Halichoerus grypus*.



Harbour porpoise *Phocoena phocoena*.

Bats (Gerell R, 2005)

<i>Myotis mystacinus</i>	Mustaschfladdermus	LC
<i>Eptesicus serotinus</i>	Sydfladdermus	EN

Fish

<i>Barbatula barbatula</i>	Grönling	LC
<i>Petromyzon marinus</i>	Havsnejonöga	NT
<i>Lampetra fluviatilis</i>	Flodnejonöga	LC
<i>Leucaspis delineatus</i>	Groplöja	LC
<i>Anguilla anguilla</i>	Ål	CR



The Serotine bat *Eptesicus serotinus*.



The European eel *Anguilla anguilla*.



The wild fauna in Sweden can be seen at the open-air zoo "Skånes djurpark" in the middle of Scania. Some species extinct in Sweden are also represented in this zoo. (Skånes djurpark <http://www.skanesdjurpark.se>.)

B3 Amphibians and reptiles

All amphibians and reptiles are protected in Sweden. Two snake species, the Viper, *Vipera berus* and Grass-snake, *Natrix natrix* exist in Helsingborg. The Forest lizard, *Zootoca vivipara* and Slow worm *Anguis fragilis* are the only two lizard species found in the city. The Common toad, *Bufo bufo*, and four other frog species also exist in Helsingborg. The Great crested newt, *Triturus cristatus*, the Smooth newt, *Lissotriton vulgaris*, Moor frog, *Rana arvalis* and the Common frog, *Rana temporaria* are among some of the amphibian species of the city. These amphibian species are not very common due to the small area of their wetland habitats. However, through the city's wetland programme, these wetlands have been increasing gradually since the 1990s, when the programme started. The rare *Bufo viridis* has been reintroduced 2013 into new wetlands in the Örby meadows.



Great Crested newt *Triturus cristatus* is listed on the EU Ordinance on the protection of species. The Common frog *Rana temporaria* and Grass snake *Natrix natrix* are common. All these species are favoured by the expansion of wetlands.

B4 Fish

See also B6

Fish species are present mainly in the Öresund and Skålderviken. Fifteen species are of interest for fishing and are used for food but Cod, Herring, Garfish, Lumpfish, Sea trout and Mackerel are the most common. These fish offer an important ecosystem service as food supply. There are no lakes in Helsingborg and the freshwater species in the city are present in the river systems. These species include; the Brown trout, Eel, Perch and Pike. Among rare freshwater species are two small fishes; Gudgeon, *Gobio gobio* and the Stone loach, *Barbatula barbatula*.

B5 Insects

As is very often the case, the rarest species are found in areas with long continuity such as old hardwood forests and meadows. This is also the case for insects. Redlisted beetles are found in several old forests as well as in Pålssjö forest where the species, *Stictoleptura scutellata* has been found (see illustration below and Annex 3). Of particular interest are wild bees since they are very important as pollinators (see also section 1.3 about calculated ecosystem services). Honey bees are farmed in many places but they can be a threat to rare wild bee populations due to competition for food resources. Insects are a large group and difficult to inventory and describe. Colourful butterflies are popular among people and therefore a group of animals that can be used as a gateway for teaching and increasing public understanding of ecosystem services, especially in school and public excursions arranged by the City and NGO's.



Ants are very important animals in the ecosystem as they help plants to spread by taking their seeds into the soil where they can germinate and ants also take care of other unwanted insects. In the middle the rare bee *Andrena hattorfiana* living at Örby. To the right the redlisted Beetle *Stictoleptura scutellata* living in beech forest such as Pålssjö skog.



Butterflies and bees are always appreciated insects. Picture to the left shows the common Peacock butterfly *Inachis io* that with its mimicry of big eyes can scare bird enemies. In the middle a Map *Araschnia levana* and to the right a Painted lady *Cynthia cardui*.

B6 Marine species

Among the species extant in the marine ecosystem, about 75 fish species have been observed in Öresund. The Eel *Anguilla anguilla* and Red spotted dogfish *Scyliorhinus canicula* (a small Shark) are important species that are currently threatened. The Red spotted dogfish is vulnerable due to its very long breeding period (which occurs at the age of 20 years). Sometimes big fish species occur in Öresund such as the Barking shark, and in 1960s the Bluefin tuna *Thunnus thynnus* disappeared as a result of intense over-exploitation. It has not been seen since in Öresund.

An interesting invertebrate species is the Horse mussel, *Modiolus modiolus*, making the wildlife niche in the area named Modiolus community. The persistent horse mussel also creates favourable conditions for several other species by forming patchy aggregates on the seafloor. This has meant that the bottom is colonized by a rich epifauna. In addition to these smaller aggregates of horse mussels form even larger mussel beds where several representatives of the *Haploops* communities (crustacean) can be found. Species including those of the Genera, *Amphiura*, *Abra*, *Venus* and *Chamelea* can be found within the reserve of Knähaken. Hence there are representatives of all the deep benthic communities existing in the Sound. The Knähaken reserve also has a high abundance of various echinoderms. Among the other species occurring in Öresund are Brittle star, *Ophiopholis auelata*, Starfishes such as *Crossaster papposus*, Sea cucumber, *Holothuroidea* sp, Polychaetes, Crabs like *Cancer pagurus*, the Hermit crab, *Paguridae* sp, Anthozoans including *Alcyonium digitatum* and many others.



Horse mussel, *Modiolus modiolus* lives in colonies/communities creating a base for other marine animals.



A lot of more salt demanding species such as the *Modiolus* society with Starfish, Horse mussel, Sea urchin and the Anthozoan *Alcyonium digitatum* (the big yellow one) are found in the biodiversity rich Knähaken marine reserve.

Threatened species summary*

As mentioned earlier, 125 threatened of the 250 red listed species occur in Helsingborg. These species represent nine organism groups. Some examples from each of the nine groups have been highlighted in this report. Among these species are insects, including the rare bee *Andrena hattorfiana* and beech tree living beetle, *Stictoleptura scutellata*. They are found in the Örby meadows and in the Pälshö forest respectively.

The Great crested newt, *Triturus cristatus* is an amphibian under the protection of European Union Legislation's *Ordinance on the Protection of Species*. This legislation means that special areas for the preservation of this species shall be designated, and that its breeding and resting places shall be protected to ensure that the species are not captured or killed. The Red kite *Milvus milvus* is also a species under this EU act and it is an example of success, as the number of breeding pairs has increased from a very low number over the last decade. In the marine ecosystem, the Eel and Red spotted dogfish are threatened. The dogfish is vulnerable due to its very long breeding period as indicated earlier. Another interesting fact is that species regarded as common before, have become threatened during recent years. These include; the Eel, the Ash-tree and among avian species, the Eider and Larch species.

* See also Annex 3.

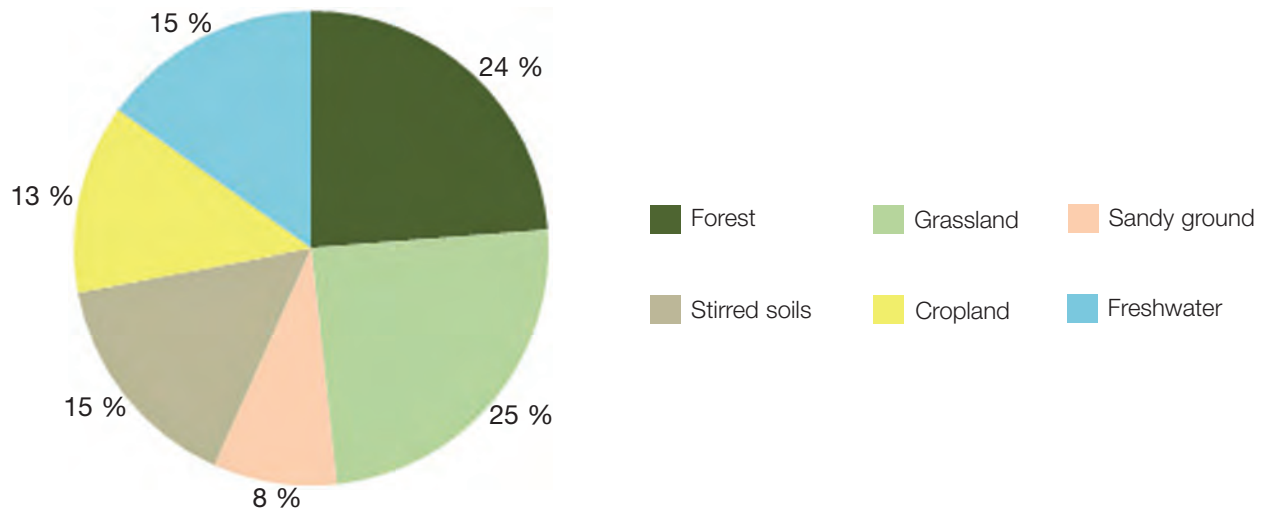
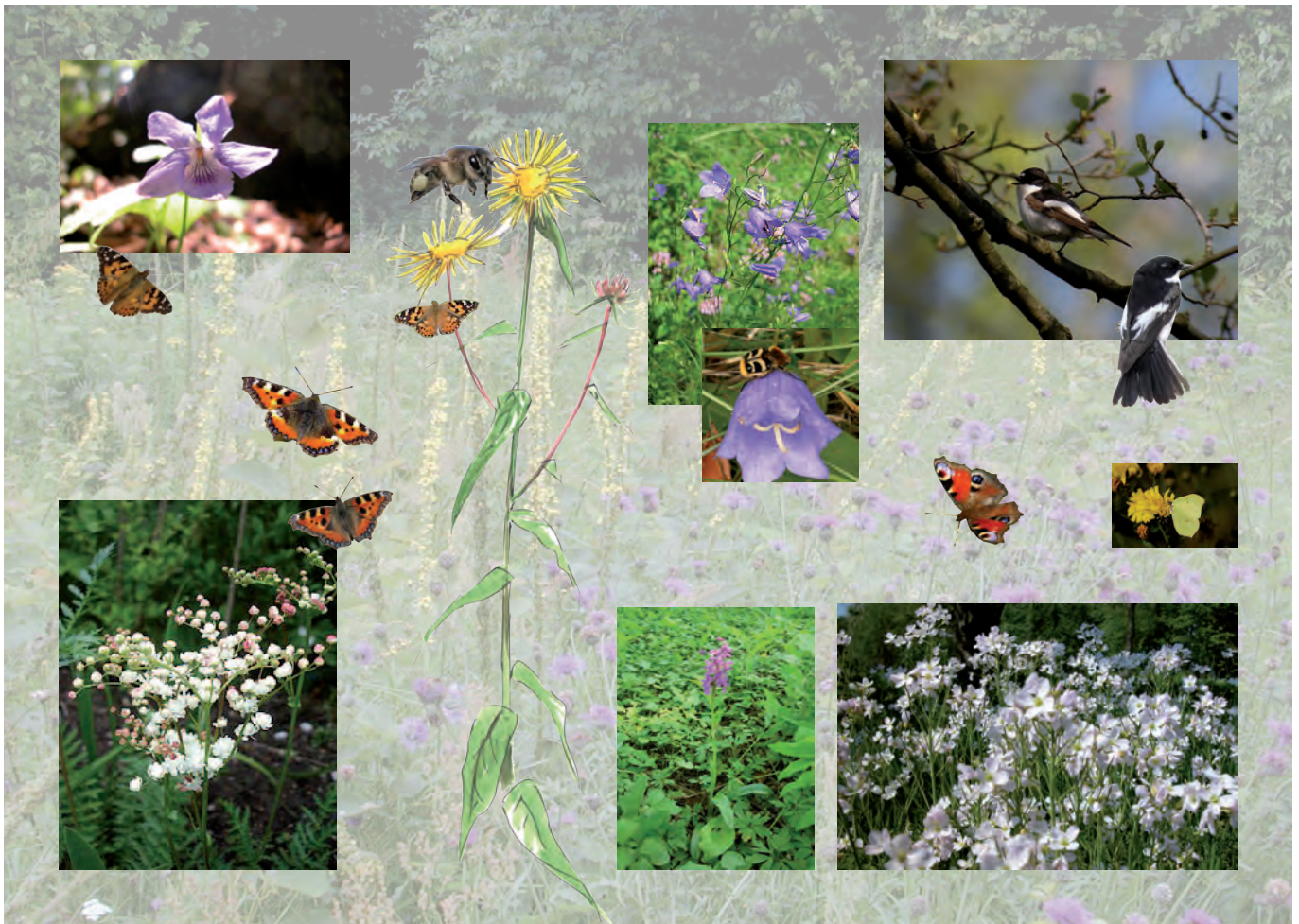


Diagram showing the allocation of threatened species to different habitats in Helsingborg. Forest, Grassland (pasture and meadows), Stirred soils, Sandy ground, Cropland, Freshwater (rivers, dams).



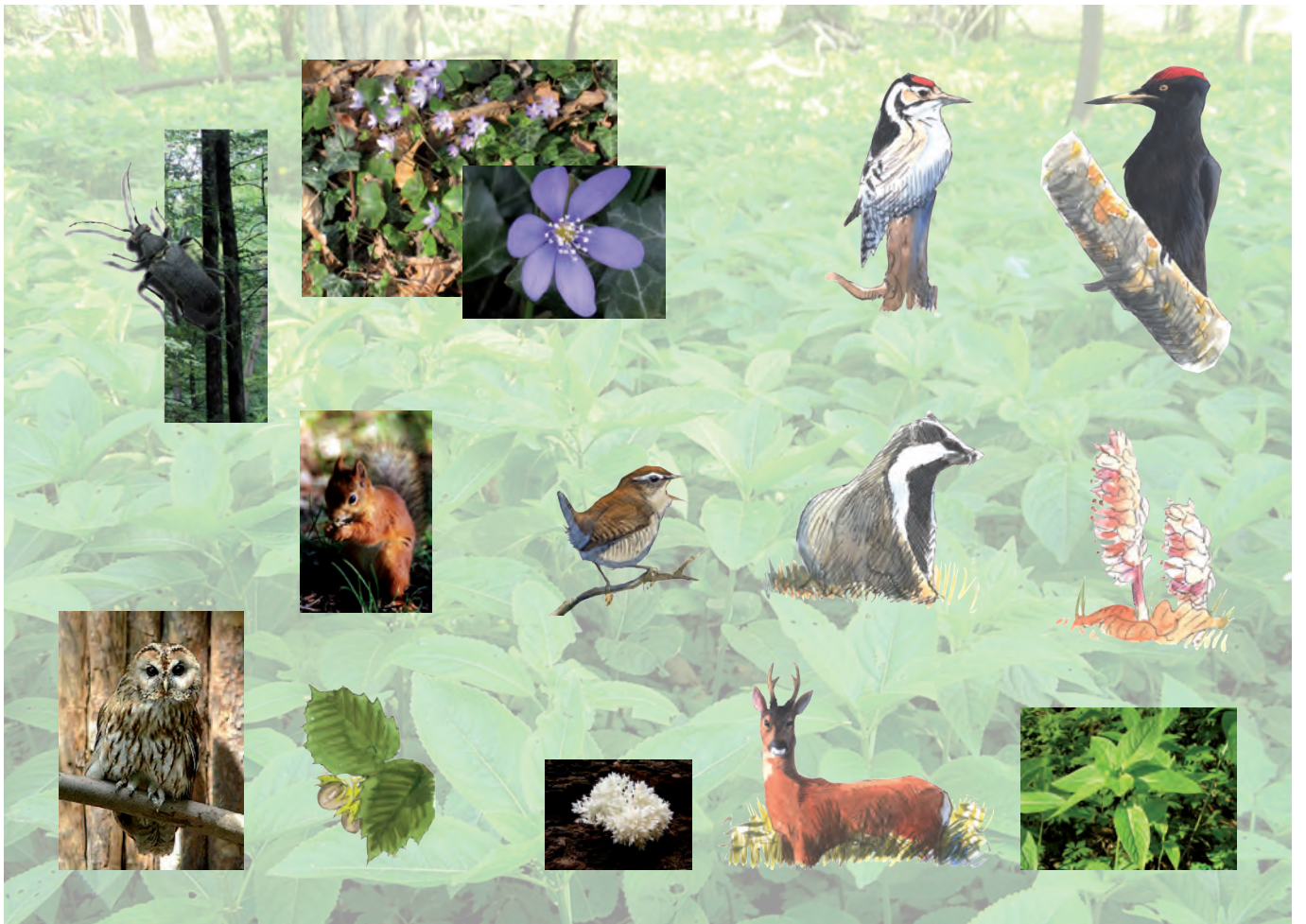
View of the Örby meadows the most biodiversity rich land area in Helsingborg. Some 400 species of vascular plants and several rare insects and mushrooms lives here as well as some rare bird species.



Ancient man-made habitats meadows and pastures are very species rich areas.



Hay slashing at the Örby meadow.



Native habitat of broadleaf forests. The picture shows examples of species in this habitat.



Deciduous forest of Svedberga.



Ancient man-made heather moorland habitat are important for many rare species.



Old moorland of Bruce.



Wetland habitat can be very species rich. Wetlands are also important for reducing nitrogen/eutrophication.



Small wetland in the Råån valley.



1.3 Ecosystem Services

The natural features of Helsingborg such as the dominant arable land area, forests, wetlands and grasslands, provide a range of ecosystem services. The production of food is of great importance not only for its domination of land use in Helsingborg, but also for the cropland which is among the most productive in Scandinavia. This high productivity is due to soil quality and the rather warm and humid climate in this area of the country. The Sea (Öresund and Skålderviken) produces fish and great opportunities for recreation and health such as boating, swimming, bird watching and fishing. The forests provide timber, mushrooms, berries and recreation opportunities. The wetlands are essential for habitat provisioning services to a diversity of species. These wetlands are also important for storm water control, reducing erosion and for denitrification. Grasslands are also providing important habitat provision service to a wide diversity of flowers, insects and mushrooms. Sandy areas are also important for wild bees and other pollinators.

Helsingborg offers great opportunities for cultural and social ecosystem services through its lovely west coast, Landborgen slope in the centre, the Pålsjö forest, Råån valley, bay of Skålderviken, the beautiful gardens at royal castle of Sofiero and the Fredriksdal mansion.

The City landscape and Ecosystems

The largest forest area outside Helsingborg begins at the mountain area of Söderåsen, east of Helsingborg municipality. It is in the south ridge where the bedrock known as the Fennoscandian Shield bedrock is exposed. From the south ridge to the north, the Swedish forest landscapes begin, and at the border to the south a southerly part of the Taiga (the northern coniferous forest belt, which then extends across the northern hemisphere in Russia and northern North America) begins.

To make good management of ecosystem services provided by animals and plants it is important to know about the special demands each species have. Each species is unique in its genetic components, and thus also in its needs. Plants for example, have different requirements regarding light, temperature, nutrients, competition, traditionally in the form of pasture hay, acidity, humidity, pollination of cross-fertilization and more. Birds, mammals, molluscs and insects have similar types of demands on their environments; such as suitable nesting sites, food places, protection, temperature, resting places for migratory birds and more. The animal world is directly linked to habitats and land-use, and the way these meet the species different needs. Some species are more unusual, like Orchids and the Peregrine falcon which have high or special demands from their habitat. Others like mallards and daisies are more generalists. Our local “municipal bird”*, the hawfinch requires oak trees which attracts special larvae which it feeds on. It also needs hornbeam for its seeds, as well as cherry trees whose nuts they can crack. Knowledge of the species enables us to interpret nature and its condition. These species are often important indicators of ecosystem health. The presence and number of a single species tells us which other species can be expected and what the condition of the ecosystem is. Through conscious care of the province's various natural environments different species are conserved, providing free ecosystem service to society. Such an approach contributes to a robust and sustainable society both socially, economically and environmentally.

The four groups of Ecosystem services:

1. Provisioning
2. Regulating
3. Supporting
4. Cultural/Social

* Birds of the 33 municipalities in Scania is a concept developed by the SkOF: Ornithological Association of Scania (NGO) to raise awareness among the public and municipalities about bird protection. All the birds chosen are rare and need special considerations in forestry and agriculture.

Provisioning

Food production: this is one of the most important ecosystem services, with 72 % of the land use consisting of agricultural land. Commercial fishing and sport fishing in the sea (Öresund) and rivers, also contribute to the local food supply. The Vegeå and Råån rivers are important for reproduction of fish such as pike, trout, perch and eel. The hunting of hare, pheasant, geese, ducks, deer (more seldom elk and wild boar) also contribute to a lesser extent to local food provision since these wild animals occur in small populations. Hunting takes place in forests and cropland and it is well regulated by the Hunting Act which clearly spells out who, where and when hunting can take place. To a small extent, fish- and crayfish farming is privately managed and done in ponds.



Farming/food supply is the most essential ecosystem service in Helsingborg but it is also a habitat that is lacking much biodiversity. To the left oilseed *Rape Brassica napus ssp. napus* and it is partly dependant on pollination.



Sport fishing is a popular leisure activity in the sea Öresund. Cod, Mackerel and Herring are most common catch. Sea trout is a rare catch at sea, except for shallow areas along the shoreline, and is more likely in the rivers where brown trout also exist.

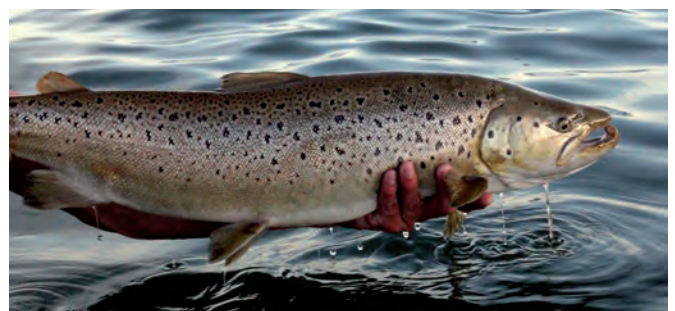


Cod is a common catch in Öresund but the cod population has decreased in other seas.

Material: such as wood, fresh water resources, oilseeds (rape) and other crops giving oil or fibre.



Timber is among the most important materials for building purposes in Sweden. Oak is most valuable for furniture and spruce used for making wood pulp for paper. North of Sweden has big pulp factories.



Sea trout *Salmo trutta trutta* is a popular sportfishing catch in rivers and Öresund.

Fresh water: fresh water is supplied from the Örby field South of Helsingborg including lake Bolmen in Småland which is of paramount importance. The map to the right shows lake Bolmen and how the water is transported through a 120 km long tunnel to the Western Scania province where the City is located. It is also transported in long pipelines to the Örby reservoir in Helsingborg. In addition the City's main source of fresh water, there is also high quality deep groundwater or mineral water, which is found in the southern part of the municipality. Three different water companies extract alkaline water from the deep basin.

It takes some 70 years for precipitation to reach a level of about 90 metres below the surface and along the way, the water is filtered through layers of shale that give the water its alkalinity and purity. The water used in the production of the Ramlösa mineral water brand. This water comes from the ground water found around in the Helsingborg municipality. This brand is used locally in Helsingborg but is also a very popular brand in other parts of the world, considered as a high standard mineral water.

Lake Bolmen and the Örby field represent great economic value for the city, but these water resources are threatened by pollution. There are restricted areas covering the water basin area but accidents might happen that could harm the water supply (see the environment debt/capital calculation in Chapter 1.3 about the monetary value of the Örby field freshwater basin).



The drinking water system for western Scania including Helsingborg. The main part of the water derives from Lake Bolmen in the province of Småland north of Scania. Then it goes via tunnel and passes through the sand and gravel field of Örby and a drinking water plant before it reaches the consumers. It is a long distribution way but no truck transport is needed.



Ramlösa well. Water is still leaking out from a rock of sand stone.

In the Ramlösa ravine a well (fountain) was found and which was inaugurated as the Ramlösa health Spa in 1707 by Johan Jacob Döbelius. This well of ferruginous water is located on the surface and is still leaking out from a sandstone rock. Ramlösa became famous for the treatment of different illnesses.

Medical: In Helsingborg certain plants contain substances that can be used in medicine. An important example is the herb Tutsan or St. John's wort *Hypericum perforatum* that is used as a mild anti-depressive medicine (www.dagensmedicin.se). St. John's wort is as effective against depression as traditional antidepressants. In addition, herbal medicine has fewer side effects than artificial ones.

Analysis was conducted by researchers associated with the Cochrane Institute, an organization that scientifically examines various drugs. St. John's wort was as effective as other antidepressant drugs tested. Researchers however, concluded that the herbal medicine was better than placebo in treating depression. St. John's wort is used as a herbal remedy for mild anxiety and insomnia. St. John's wort may work against mild depression and for those who do not want to take psychotropic drugs (Elias Eriksson, professor of pharmacology at the Sahlgrenska Academy Hospital in Gothenburg).



St. John's wort
Hypericum perforatum.

The moor plant Blueberry *Vaccinium myrtillus* has also been found to have antioxidants and substances that can fight certain viruses. There are also substances in other herbs that can be used to fight cancer (Marsh gentian, Mistletoe) and other illnesses. On-going scientific research indicates the results of the medical effects of herbal substances. This is an important aspect for conserving biodiversity.

The use of herbs to treat disease has been significant in Sweden for many centuries. Most famous is the work of Swedish Scientist, *Carolus Linnaeus* who did a lot of work on herbal medicine, and visited Helsingborg and the famous Ramlösa well and Spa in 1727-1728 as a young student at the University of Lund. His work *Clavis Medicinae Duplex* is among one of his scientific works on herbal medicine.

Regulating

Local climate and air quality is important to every community. Helsingborg has good air quality due to its location, where the western wind blows air away from the city. This increases the likelihood of polluted air to be blown away from the city. Regardless of this natural air cleansing service that the city receives, sometimes during the winter seasons, polluted air from Western Europe blows towards Southern Sweden and reaches Helsingborg. This has been known to cause some health problems.

All trees and shrubs in the city are important for air purification. Trees also serve as wind breaks and create shade, and cooling environments in the summer. In the open cropland, where there are a lot of trees lining old borders, these lines of trees and bushes (lee hedges) serve important wind breaks. Some scientific studies have also indicated that, dense tree rows can increase crop harvests by 5-10 % by providing shelter from the wind. Lee hedges also support biodiversity such as birds, insects, mammals, plants, amphibians and are protected by the Environment Code. Planting lee hedges is therefore one of many measures for improving sustainable agriculture (Länsstyrelsen i Västergötland Ekobladet 1-2012).

Carbon sinks: Trees and shrubs in the municipality cover 6-7 % of the land area. Trees sequester carbon dioxide from the atmosphere and store the carbon in the wood. A cubic metre of wood contains about 200 kg of carbon. Besides trees, bound carbon is also in the soil, ground vegetation, and particularly in the mire peat layer. In sustainable forestry, the amount of carbon stored in forests, is at least equal to the amount that is lost naturally or as a result of harvesting. The amount of carbon forests can sequester depends on several conditions including; if it is an area of young forest, forest with ditches or area with more carbon leaks than what is bound. Old and dense forests seem to bind more carbon than it leaks. Source: Skoglund J och Delin A, 2007.

Buffer against extreme natural events and Erosion Control: Natural soil-binding plants on beaches such as lyme, sand sedge and alder trees along rivers are important for natural flood control along water courses. In arable fields, all trees and shrubs that grow along the old borders built of stone provide important services for wind and erosion control. Wild tree and bush species can be found along old time stone borders once made for demarcating the boundaries of different land owners until the 1800s. Stones were also laid along the borders for clearing the cropland from obstructions. Oak, beech, birch, aspen and hazel are common in these borders.



Tree grown old stone borders are frequent in Helsingborg and they offer important living environments for biodiversity and they also give shelter from wind.

Water: In the treatment plants, bacteria cultures decompose the sewage material. Open running waters is also important for denitrification. But many streams are culverted, and this makes it impossible for the bacterial processes to take place. It is a good measure to open up the culverts and let the streams be open. It will also benefit biodiversity. Wetlands along rivers, including the water-saturated soil zone adjacent to these, contribute to the reduction of nutrients and other substances.



At Pålsjö a stream is excavated and recreated after many decades of being in a culvert.

Pollination: This is very important to agriculture production in Helsingborg. Pollination contributes to production in orchards as well as to food production in private gardens and farms in the City. Pollination is crucial for maximizing crop yields especially, oilseeds, beans, clover seeds, and other fruits and berry that are commonly cultivated in Helsingborg. Honeybees and wild pollinators like bumblebees play a key role in plant pollination in Sweden. It is estimated that bees can increase the harvest of the oilseed rape by 5-15 %. Also the quality of honey harvests in beekeeping is about 60 % dependent on the cultivation of oilseeds in the south of Sweden. The cultivation of clover is fully dependent on bees and bumblebees. This ecosystem service is very important because clover seeds are essential for agriculture, since clover is used to produce animal feed and as a green manure. The latter is especially important for organic farms where inorganic fertilizer is not used. Clover attracts nitrosation bacteria and therefore is very well suited for organic soil fertilizing*.

Biological control: Natural depredation is very important to contain the infestation of various harmful animals, plants and fungi. Biological control of pests and disease is highly dependent on healthy populations of amphibians and reptiles, birds, bats, wasps, ants, fungi, among others. In Helsingborg a colony of the black headed seagull disappeared from Hasslarp ponds a decade ago and a disease was reported to have caused the diminished seabird numbers. This disease was attributed to the lack of vitamin B1 (thiamin) but to date, the actual cause is still unknown**. Other species including, seagulls and the Eider, *Somateria mollissima* were also affected by this phenomenon. significant to note, is also the *elm disease* that killed almost all elm trees some 10 years ago. Elms were a common tree in the City's parks and forests, but they are almost all gone. A fungus which is spread by the small beetle, *Scolytus triarmatus* was the main causative agent of the elm tree disease which have been well-known all over Europe over the last decades. A new fungus disease *Phytophthora sp* have been reported on beech. Forests and wetlands, as well as the green borders in the city also play an important role in controlling pests and diseases since it offers a proliferation of spaces for enemies to harmful fungi, viruses and bacteria.

* Jordbruksverket www.jordbruksverket.se

** www.havet.nu

Examples of using natural biological control as a free service

Invertebrates of prey multiply more or less rapidly and by supporting them e.g. by not using pesticides they help to protect crops and reduce cost for the farmer. Pollinating insects can also be killed which in turn reduce harvest of crops depending on pollination. In addition remains of pesticides in food can harm health. When a **flower fly** lays 500 eggs, each larva eats 700 aphids and with further propagation will result in a total of 175 million aphids that can harm crops.

A **ladybug** lays 400 eggs and each larva eat 800 aphids. Larvae and adults at full survival eat 800 000 000 aphids (*Aphidoidea sp*) An **earwig** eats 25 000 aphids during its lifetime. With 50 offspring born during their lifetime, they eat together 1.3 million aphids. An adult **ground beetle** weighs 0.35 g but will eat three times its weight daily. With 60 offspring and survival of 16 weeks, they eat all together, nearly 6 million aphids. The **spiders** of 1 ha farmland eat between 2 to 200 kg pests per year. This is equivalent to between 2 to 200 million aphids. Spiders, ground beetles and earwigs are particularly important because they are often in place when the first aphids fly into the ground. If they are eaten up then there will never be any harm to crops. (County administration Board of Västergötland "Ekobladet" *.

Metabolism/natural cycle: decomposition of organic matter is very important, and the composition of decomposing organisms may differ among different ecosystems. Decomposition may differ between forests with lower pH and forests with higher pH values. For example decomposers like the Earthworm species, *Lumbricus sp* in Sweden, also called "the underground peasant", are key decomposers in the deciduous forests with alkaline soils, while fungi dominate as decomposers in coniferous in which have more acid soils.

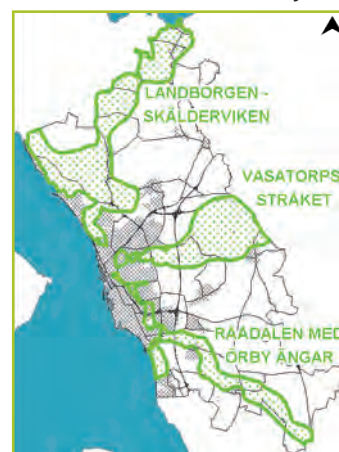


The "underground peasant" (earthworm) makes an important job in the soil as decomposer.

* www.lansstyrelsen.se

Supporting

Habitat for species: As one of the most diverse cities in Sweden, Helsingborg provides a suitable habitat for a wide diversity of species through its different habitats and ecosystems. Some of the City's important habitat providing ecosystems include; deciduous forests, meadows, pastures, beaches, sandy areas, hedgerows in arable landscapes, wetlands, rivers, and coastal/ocean ecosystems. These ecosystems are also important to maintain genetic diversity and are the main habitats that need to be strengthened, developed and protected. Over the past decade, The City of Helsingborg has been working to conserve and protect these ecosystems. This has been done by planting trees over large areas, including the main green corridors that are outlined in the mandatory Comprehensive Plans. Since 1989, the City has created 70 new small wetlands, new grazing areas in the forest of Bruce and in the Valley of Råån.



The main green corridors (Comprehensive plan 2010 Helsingborg).

The maintenance of genetic diversity: It is of outermost importance to protect and support all natural genetic diversity. Wildlifes adaptation to earths different environment features is of benefit for the ecosystem. It is not only the species itself but the local, native stock of a certain species as well that has to be considered for protection. In Helsingborg, the aim is always to consider local genetic resources in the management of nature. when planting trees local provenance is a priority. In high biodiversity areas such as the Örby meadows and Gluggstorp marsh in the Råån valley and certain broadleaf forests, the wild flora has been supported by different means such as haysilage and grazing and the control of invasive species such as the

bush *Rosa rugosa* and the tree *Acer pseudoplatanus*. These measures are made to strengthen natural proliferation of the native species. Wild animal species, such as the Sea trout in Råån River and Vegeån River, and the Roe deer are examples of species of natural strains that have been supported. A lot of gravel has been laid on the bottom of river Råån, to aid in trout breeding. The Roe deer was almost extinct in Sweden in the beginning of the 1800s but regulation in 1840 caused a recovery of the population. Today the roe deer population has a good status even in Helsingborg.

Cultural/Social

The value of biodiversity to the City and its inhabitants.

Analysis of Green spaces in Helsingborg.

The City's green areas are expected to fulfil many different needs. Approximately 250 spaces in total have been inventoried in the evaluation of "sociotopes" in 2009-2011. The word sociotopes was invented by scientists to explain man's use of green areas as an acronym of biotopes.

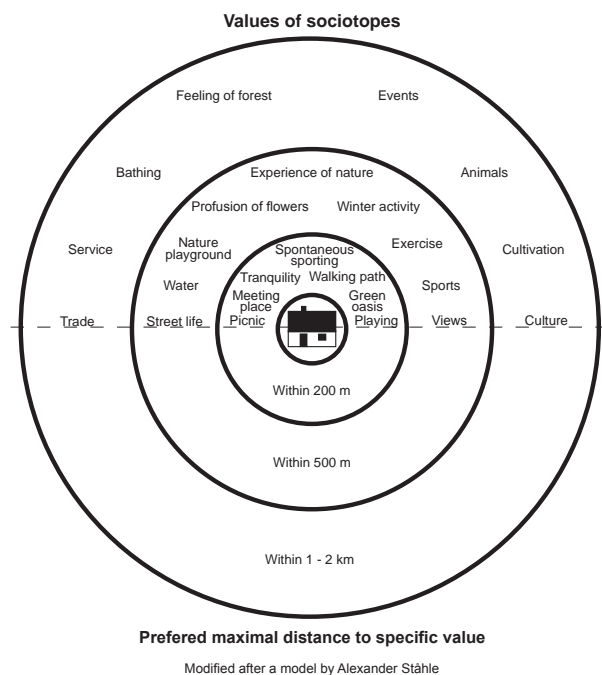
Examples of how people use green areas are:

- See and experience.
- Rest and Recovery.
- Childrens need of playing, learning and being challenged.
- Meetings and social gatherings.
- Exercise and Physical Activity.

Health was defined by WHO (Merriam-Webster, 2011 and Grad, 2002) as a "state of complete physical, mental and social well-being" which is, in a broad sense more than a definition of absence of disease or infirmity. Although the definition has been subject to controversy, especially as lacking of operational value and the use of the word "complete", it remains the most enduring definition of health (Callahan, 1973 and Jadad & O'Grady L, 2008).

Some key factors that have been found to influence people's health include, important factors such as education, culture, social and physical environments and biology among others (WHO, 2011 and Public Health Agency of Canada, 2011).

The main determinants of health include: the social and economic environment, physical environment, and a person's individual characteristics and behaviours (WHO, 2011). Environment is often mentioned as an important factor influencing the health of individuals. Other factors such as clean water and air, adequate housing and safe communities and neighbourhoods also contribute to good health, especially to the health of infants and young children (WHO, 2011 and UNESCO, 2011).



Status of green areas and social aspects in Helsingborg preliminary findings.*

- Low proportion of green land available in certain district and small villages.
- Features of small parks.
- Partly sparse and disjointed green structure.
- Sparse structure with scattered, isolated green space and get continuous green areas in the city/towns.
- Pressed for more recreational areas and little recreational sequence in the peri-urban landscape.

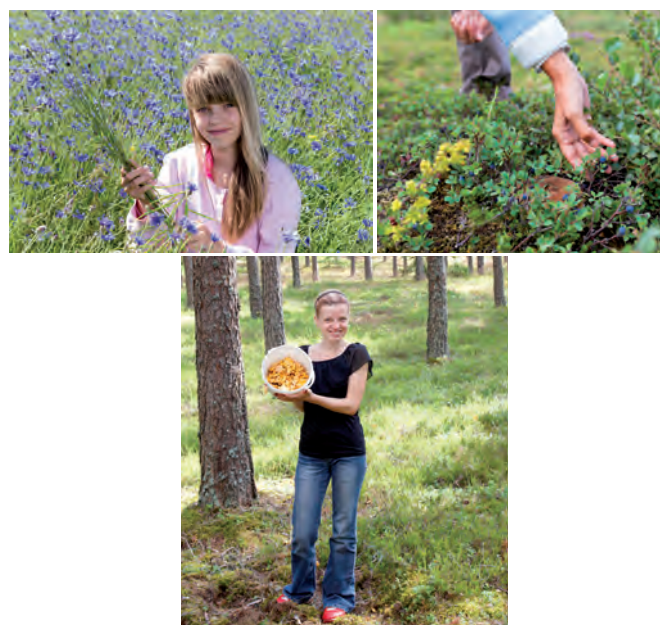
* (Departement of Helsingborg City planning and technical services 2013. Green Structure Plan of Helsingborg - not yet adopted and Grahn P. & Stigsdotter U. A. 2003. Landscape planning and stress. Urban Forestry & Urban Greening).

- The surrounding arable landscape with a low share of green available land and few/no major areas.
- Unequal access to parks and nature in different parts of the city.
- Many green areas/locations with "high experience qualities".
- Seashores in Helsingborg have interesting topography of high ridge and ravines which are valuable for a diversity of recreational activities.
- Old parks such as Fredriksdal, Sofiero, Ramlösa and Slottshagen are wellknown in Sweden and are part of the City's trademark. They are beautiful and important for recreation and biodiversity
- The municipality is known to be in "park the front", forerunners of park games, nature-like plantations, and attractions such as the garden plants Fredriksdal and Sofiero.
- Fenced and inaccessible area, barriers in the form of roads in some areas. Hinder accessibility and divides parks and streets in the city impacting on important ecosystem processes.

The value of pasture: Closeness to meadow and pasture increases the value of real estate. Those kinds of biotopes are often species-rich and thus have great importance for biodiversity. The Board of Agriculture reported in a review that, property sales close to meadows and grazing land raises the value of residential or recreational real estate by about three percent. Proximity to these areas can mean SEK 30 000 - 40 000 for the value of a property in rural areas, and probably more if the property is in an area with many meadows and pastures in the area. There is obviously a great value attached to having an open beautiful landscape in the surroundings (Nilsson P. 2010).

Recreation, mental and physical health: this is a very important ecosystem service in Helsingborg. Helsingborg is a city with great beauty. Its coastal location with parks, beaches, swimming, boating, walking and hiking provides several recreational services for the city's inhabitants. Important examples of some recreational areas include; the Skåneleden, Pine forest trail and park areas such as Gröningen (north of Helsingborg harbour) among several others.

A long tradition in Sweden is to pick flowers for maypole* celebrations in June each year. Picking mushrooms in the autumn is also a very popular activity among people in Helsingborg.



Picking flowers, edible wild berries and mushrooms are popular activities in Sweden. Blueberries *Vaccinium myrtillus* can be found in many places. Photos: Colourbox.

Tourism: Helsingborg is a cherished tourist destination with comprehensive tourism hubs for ferries, cruise ships, buses, trains and cars. Since the beginning of the 1900s Helsingborg has been known as the "Pearl of the Sound", a name which still has significance today. The well-known gardens and open-air museum of Fredriksdal and the castle garden of Sofiero, beaches and sport fishing attract a lot of tourists



The mansion of Fredriksdal is an important pedagogic resource as open air museum.

* A maypole is a tall wooden pole erected at Midsummer as a part of Swedish folk festival. It is dressed with flowers and leaves.



The royal castle of Sofiero and the mansion of Fredriksdal are the two greatest tourist destinations in Helsingborg of that kind with around 200 000 visitors each.

Spiritual experiences and a sense of place identity/affiliation: This is very important, but knowledge of the places that have special significance for different religions or personal beliefs, etc. is small but is sometimes expressed in letters to the local newspaper. A single tree in the landscape or outside their window can mean a lot to many people. Historically, Helsingborg acquired its reputation as the pearl of the Sound some hundred years ago due to its beautiful location east of Öresund. Among travellers during 1700-1800's, many people have described the beauty of the City, including the world famous scientist, Carl Linnaeus in his Scanian (Skåne) trip in 1749. Authors and painters have described the beauty of Helsingborg in their works such as the author Birger Sjöberg and painter Marcus Larsson in the 1800s to give a few examples. The beauty of Pålsjö forest, the parks of Ramlösa and royal Sofiero were often described by authors and poets.



Carl von Linné (Carlous Linnaeus 1707-1778) described biodiversity of Helsingborg during his official Skåne-journey in 1749.

Values of ecosystem services

Tools for evaluation and compensating ecosystem services; environment debt/capital, ecological footprint and the balancing/compensating principle.

Helsingborg has used some tools for evaluation and compensating ecosystem services such as *ecological footprint* (2003), environment debt and capital (1995) and the balancing/compensating principle. The outcomes of these are shown in tables on page 49. The Ecological footprint evaluation of Helsingborg indicates that it takes 6.29 global average hectares of biologically productive space to sustain the current level of consumption of the average inhabitants. This can be compared with the 1.21 ha of average global productive space available per capita in the municipality.

The *Debt And Capital Evaluation conducted in the city*, indicated that biodiversity has a value of some 1.3 million Swedish crowns (213 000 USD in current value) in Helsingborg. The most important ecosystem service is the production of food that occurs in approximately 72 % of the municipal area. Drinking water in the Örby field reservoir is another example corresponding to a very high environment capital value.

Other examples of environment capital:

By collecting a mouthful of acorns in autumn and hiding them at different locations in the soil for winter stockpile, the Jay bird, a rather common species in Helsingborg often forgets some of the locations of its acorn stock, which in turn contribute to the growth of new trees. The service that the Jay bird carries out is valued at approximately SEK 35 000 (5 500 USD) per Jay couple.

The annual value of goods and services generated by the Swedish forests in the form of felled timber, production of berries, mushrooms, game meat, recreation (including hunting), erosion control, noise protection, carbon sequestration and biodiversity conservation is about SEK 45 billion (7,075 bn USD) per year.

Source:

Naturvårdsverket 2012.



The Jay bird *Garrulus glandarius* with an acorn in its beak.

The commercial value of bee honey production and pollination of crops have been studied by the Swedish Agriculture Department. The value of bee pollination of crops in Sweden is estimated at 189-325 million Swedish crowns (29.7-51.1 million USD) per year, and the value of honey production to SEK 117-135 million (18.4-21.2 million USD) per year. The calculations used prices that beekeepers, farmers or garden growers received for their products prior to processing. Retail values of the products are much higher (Pedersen TR et al 2009). In Helsingborg bumblebees are used for pollination in green houses for growing tomatoes and are also common with beehives.



Bumblebee.

* KRAV: Sweden's best known eco-label for food, based on ecological grounds with particularly high standards of animal welfare, health, social and environment impact. Today there are over 4 000 KRAV farmers, more than 2 000 food businesses, shops and restaurants and 6 200 KRAV certified products (www.krav.se).

A recent study from Lund University, suggests that organic practices influence how well plants are pollinated. Strawberry plants on twelve farms in Skåne were investigated and the results showed that the KRAV* certified farms, where neither pesticides nor inorganic fertilizers are used, had 45 percent of the strawberry blossoms fully pollinated while farms with conventional culture methods had only 17 percent fully pollinated. The research also shows that a strawberry grower, who switches to organic farming, experienced increased yields after only two to four years.

The value of noise reduction: The Beijer Institute in Stockholm emphasizes the positive effects of maintaining or constructing shrubberies which provides a valuable ecosystem service of noise reduction. Noise does not cause direct damage to the environment but does cause disturbances, impaired health and lost productivity. The Road and Traffic Research Institute have estimated the total economic costs of noise exposure in the home environment to about 2.25 billion Euros annually in Sweden. From the environment debt calculation above, the value for Helsingborg is known to be around 54 million Euros (short term debt).

The value of reduction emissions: Emissions from traffic poses similar problems and costs to the City and nation at large. In Stockholm, calculated particle emissions from road traffic has been shown to cause annual economic costs. But parks also contribute to urban air purified from carbon dioxide, soot and dust particles. Trees, especially conifers, have better treatment effect than grasses and shrubs. In another study from the Academy of Science's Beijer Institute of Ecological Economics, it was estimated that the ecosystems in Stockholm County can absorb the carbon dioxide equivalent of 40 percent of carbon dioxide emissions from traffic in the county. This ecosystem service represents enormous value for both public health and economy. Social cost of air pollution in Sweden goes up to 26 billion Swedish crowns (4,088 bn USD) annually (Andersson H et al 2009. - Colding J. 2011, Nerhagen L et al: 2009).

Sweden has a long tradition of *The Right of Public Access*, which means that the public have the right to walk into any privately owned nature area in the Swedish countryside. Greenery, beaches, parks and nature contribute greatly to Helsingborg's attractiveness to residents and visitors. The City's green areas serve as meeting places and for many activities, including; rest and exercise, nature and cultural experiences. The ability to stay in the parks and nature is important to human well-being and welfare.

Closeness to nature is highly valued by many people in Sweden and Helsingborg. By finding out how many resources, time and money, people spend to visit an area, a lower limit on its value can be determined. Personal cost for recreation, such as a visit to the woods and fields, evaluated in a survey conducted by the Swedish University of Agricultural Sciences in Alnarp, was estimated to be SEK 220 (34.6 USD) per visit, including travel cost. In an *environment debt and capital* evaluation conducted in 1995, the values used for the calculations were based on what people said they would pay for nature if they were forced to do so. Based on the responses, the average value for the environment was identified as 30 Swedish crowns per hour (the current value in 2012 is 37 SEK/hour or 5.8 USD).

Eco Capital	Value in 1995 Million Swedish crowns SEK	Value 2012 Million SEK	Million USD 2012 currency 6,63 SEK/USD (nov 2012)
The value of all land in the municipality	600	741	112
Natural Resources (Two fresh water reservoirs; Ramlösa and Linné)	1300	1606	242
Recreation according to what public would pay if it was mandatory	6400	7904	1192
Biodiversity according to the cost for keeping all species alive in a special plant	1100	1358	205

This table shows known values of ecosystem services in Helsingborg according to different kinds of evaluation e.g. willing of paying, methods of management.

Long-term debt (No measure can solve the problem in short term)	Million Swedish crowns 1995	Value 2012 Million SEK	Million USD 2012
Climate change annual increase nearly 50 % according to forecast emissions	1100	1358	205
Cadmium in cropland soil	100	124	18,7
The lack of humus in the arable land soil	200	248	37,4
Contaminated land in industrial areas	3000	3705	559
Eutrophication, acidification, biodiversity	200	248	18,7

Long term debts are according to such big problems that cannot be solved by any measure in short term.

Short-term debt	Million Swedish crowns 1995	Value 2012 Million SEK	Million USD 2012
Noise	50	62	9,4
Drinking water quality	10	12,4	1,9
Air quality	50	62	9,4
Ventilation	50	62	9,4

Short term debts are according to certain measures that can solve the problem immediately e.g. if protection against noise is provide, the problem is eliminated.



Outdoor recreation improves health and represent high economic value.

The *balancing principle* is politically adopted and used when making detail plans. It means that if a special ecosystem value is harmed or displaced it can be replaced nearby or in any other place. The analyze phase consists of 4 steps;

Step 1: avoiding a suggested exploitation (if this step works next steps are not needed)

Step 2: making the exploitation but minimizing the damage

Step 3: replacing the displaced habitat nearby (step 4 is not needed if nr 3 works)

Step 4: replacing the habitat in another place.

There is a calculated cost connected to the exploitation for paying the compensatory measure for instance planting new trees, creating a new wetland etc. This concept is still under development, especially concerning levels of reimbursement.

Ecological footprint of Helsingborg.

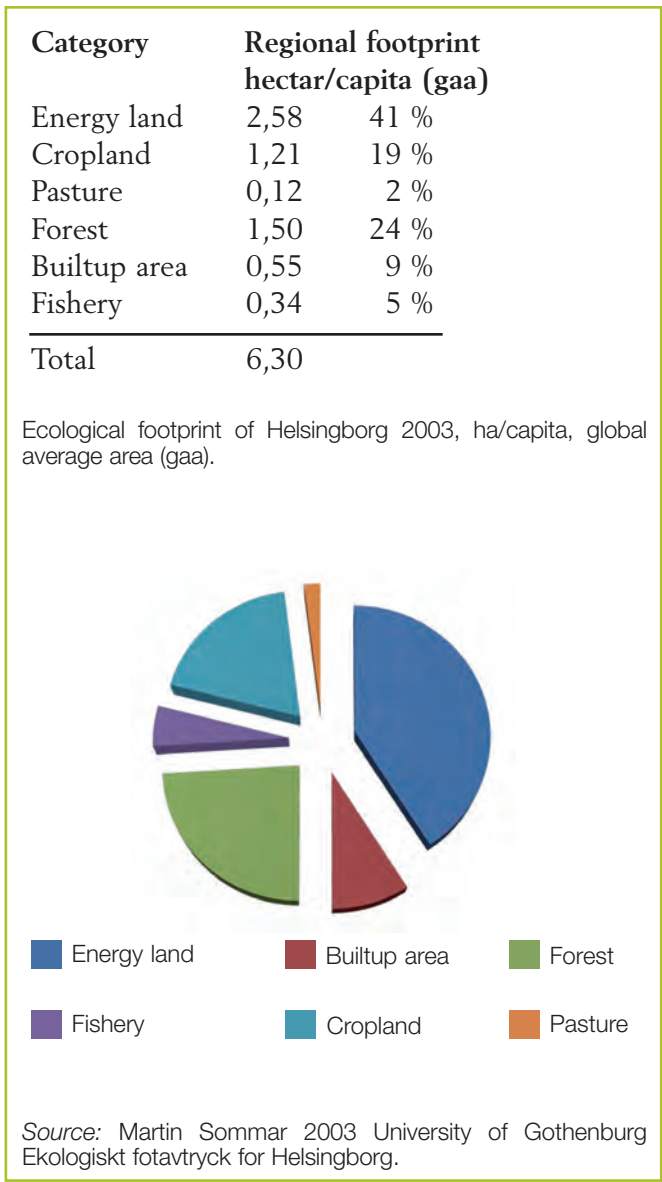
An ecological footprint study was performed in 2003, details of this are as discussed below. We can see an interesting connection between the footprint and the environment debt together with the balancing principle and evaluation of ecosystem services. These aspects need to be connected.

The ecological footprint study provided an estimate of the land and sea area necessary to sustain current levels of renewable natural resource consumption and to absorb some of the emissions for a given person or population. On an aggregate basis, the ecological footprint may be compared with the amount of ecological productive space (bio capacity) available in the near surroundings in order to give an indication of whether consumption patterns are likely to be ecologically sustainable.

The study compared the ecological footprint (in proportion) to the bio capacity for the inhabitants in the municipality of Helsingborg. To calculate the ecological footprint for the municipality of Helsingborg, a newly developed excel model was used. This model is designed and implemented for

European Common Indicators Program (ECIP) by the environment consultant Craig Simmons of *Best Foot Forward*, in Oxford, UK.

An application of this new excel model to the Municipality of Helsingborg indicates that it takes 6.30 global average hectares of biologically productive space to sustain the current level of consumption of the average inhabitants. This can be compared with the 1.21 ha of average global productive space available per capita in the municipality.



1.4 Threats to biodiversity in Helsingborg

The main threats to biodiversity in Helsingborg

The greatest threat to biodiversity in Helsingborg is that there are too few and too small natural habitats left in the landscape in combination with other threats mentioned here. Small and isolated biotopes are more vulnerable to disturbances (see Map 1 page 24). Agriculture and urbanization dominates land use in Helsingborg and the City's growth poses further threats to biodiversity and ecosystems. Eutrophication and climate change are also very important threats to biodiversity in Helsingborg.

Over-exploitation of wild plants and animals: the harvesting of plants and animals for food, materials, or medicine at a rate greater than the population's reproductive capacity has had severe impacts on the City's biodiversity. Marine resources especially fish, is a very prominent example of this. The landings of different fish species has decreased. A typical example is the population of eel, which has diminished by about 90 % in the last decade. Wild salmon and cod have also significantly declined. Evidence suggests that the Baltic Sea stocks of cod, herring and sprat were small also in the early 1900s, probably as a consequence of high predation by seals, coda and porpoises. There was also a population of the big Atlantic blue fin tuna, *Thunnus thynnus* that disappeared in the 1960s. Today, the populations of seals and porpoises are much smaller
HaV 2012.

Invasive alien species: Deliberate or accidental introduction of alien species from different parts of the world has been a phenomenon in Helsingborg for a long time. Invasive species are known to compete with or spread diseases to native species. Helsingborg has more than 20 of the 100 worst alien species due to the DAISIE (2008) report, (see www.europe-alien.org). Several new marine alien and invasive species have been recorded in the City over last decade. In terrestrial environments, the park tree *Acer pseudoplatanus* is an important alien invasive species which has been spreading in the deciduous forests. This tree is most likely to take over this forest ecosystem if action is not taken.

Another significant invasive species is the Spanish slug (Killer slug), *Arion vulgaris*, which is similar to the black native slug *Arion ater*. It is called killer slug due to its predatory habit. This species is invasive in nature and often feeds on other native species. The Killer slug is native to Spain and Portugal, but was introduced to Sweden in 1975. Its introduction occurred accidentally in Helsingborg, when a nursery imported plants which contained snail eggs from Spain. In their native ecosystems, the killer snails are controlled by their natural enemies and the warm climate which biologically controls their reproduction and population.

Another invasive species *Rosa rugosa* spreads effectively along the sandy beaches of Helsingborg. This species was introduced as a park plant and has become very invasive. One single plant can cover hundreds of square metres of shore line. The plants are often cleared because of its threat to native flora but people like it for its rose-like flowers and for its lee effect in summer at sand beaches.

The vascular plant Jättejörnlöka or Giant hogweed, *Heracleum mantegazzianum*, is a species in the family umbelliferous floral plants and occurs naturally in south-western Asia. Jättejörnlökan was once introduced as an ornamental plant but has now been found growing as a weed. It especially grows along streams and waterlogged areas of the City. Jättejörnlökan is an invasive alien species which can grow up to three feet high and nearly ten centimetres thick and competes with marsh vegetation. This plant is also poisonous to the skin and therefore, it is being eradicated in a number of Swedish municipalities.

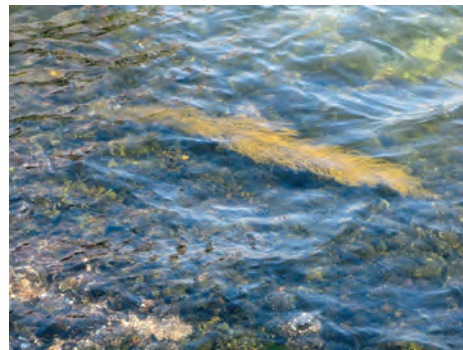
Other invasive park plants such as *Impatiens glandulifera* and *Fallopia japonica* thrive in the City and spread quickly in the wild. The planted species of spruce and pine are known to acidify the soil and cause changes the whole soil ecosystem.

The Mink, *Mustela vison* is a refugee from fur farms and is now widely spread. It competes with the native otter and hunt effectively, including seabirds.

In the marine environment, several new species including the algae *Sargassum muticum*, American comb jelly, *Mnemiopsis leidyi* and American polychaete, *Marenzelleria viridis* are aquatic aliens which have altered the seabed. They were introduced by ships, predominantly through ballast water. The Crayfish *Pacifastacus leniusculus* originates from North America and was implanted some decades ago in our water systems for fishing. It has spread extensively and wiped out the native Crayfish *Astacus astacus* in a lot of water systems. The North American crayfish can out compete the native crayfish and also spreads a fungal disease to it.

The Shipworm (salt water clams, *Teredo sp*) is a new salt-consuming species of the Baltic Sea and its earlier absence meant that the national treasure ship of Wasa in Stockholm from the 1600s could be raised and restored after 330 years on the seabed in Stockholm. The increase of Shipworm in our sea is believed to be a result of climate change and warmer sea water.

A new disease has recently been discovered, it is the *Phytophthora fungi* that can harm the essential beech forests. It can be a new invasive species.



Invasive species. *Algae Sargassum muticum*. *Rosa rugosa* spreading on the beach makes it impossible to walk there and it suffocates native vegetation.



Wikipedia



Peter Göransson

The American comb jelly *Mnemiopsis leidyi* and the American polychaete *Marenzelleria viridis*.



Colourbox



Colourbox

The Killer slug *Arion vulgaris* and the Maple tree *Acer pseudoplatanus*.



Challenge of urbanisation

During the 1900s, the building area increased significantly. The population increased from 24 000 in 1900 to today's 131 000 inhabitants. Villa settlements and industrial areas are still expanding. Major roads and railways traverse the natural landscape and create barriers for many species and human recreation. Arable land also continues to be urbanized each year. Today, it is estimated that 17 % of the Helsingborg's area is covered by settlements and roads. According to the Comprehensive Plan* of Helsingborg, adopted in 2010, planning should focus more on densification, i.e. building higher and on already forfeited land. Regardless of this, infrastructural development continues in many parks and natural areas around the City in order to meet growing housing needs.

Pollution and emissions

Pollution comes principally from the use of poisons and fertilizers in agriculture, solid and liquid waste as well as industrial waste. During the 1960's and 1970's, environment pollutants were a major threat for many species. Mercury, Cadmium, DDT and PCBs injured many bird populations, especially birds of prey. Harmful levels of chemicals were measured in several species of edible fish and many aquatic biotopes suffered greatly from lack of oxygen due to organic emissions. Intensive national efforts have led to a decrease in pollutant concentrations. A lot of work remains, and the old environment toxins have been increased by new ones. The old pollution was often linked to local businesses and distinct emission points such as industries and sewage treatment plants. The new environment toxins frequently come from varied sources, which is difficult to find and eliminate.

Pesticide residues are found in both surface and groundwater. Endocrine disrupting substances and

* The Comprehensive plan is stipulated by the Planning and building Act and every municipality must make such a plan. It shows the development of land and water, it shows national interests and infrastructure at least 25 years ahead. The plan is legally non binding document but it is the important support for follow-up planning such as detail plans.

drug residues can have effects even at very low levels. The general use of artificial fertilizers and atmospheric deposition from traffic and various activities make the nutrient-poor soils rare. Such soils are needed for many plants like those in the moorland or the Nordic coniferous forests. All surface waters in Helsingborg have greatly increased nutrient concentrations. This manifests itself in the growth of green algae among others.

Nutrient enrichment and acidification of ecosystems

In addition, soils in parts of South Sweden suffers from acidification by sulphur and nitrogen oxides from the combustion of fossil fuels. Sulphur dioxide and nitrogen oxides can travel long distances by air and sooner or later encounter water in the atmosphere. These gases are then converted to sulphuric and nitric acids which later fall as *acid rain*. The nitrogen causes not only acidifying effects, but also provides nutrition, which means that the Swedish forests are currently growing faster than normal. This becomes a problem when the trees cannot grow only by nitrogen but also need other important minerals. The entire ecosystem is affected by this "fertilization". Many organisms, plants and different decomposers in the soil are affected by acidification and this may leave many species highly vulnerable, and subsequently weakening entire ecosystems.

In addition, acid precipitation may increase human exposure to toxic metals via food and drinking water with potentially adverse effects to health. A correlation between metal exposure and general health effects has been established (*Acidification of Europe* APIS/UK, www.apis.ac.uk).

In 1989, a study was conducted in Helsingborg on the impacts of forest ecosystem damage and soil acidification. This was done for the Allerum forest in where low pH values were measured and subsequently, actions were taken to address this by spreading lime in the forest (French dolomite limestone).

Climate change: This threat increases gradually and is as a result of elevated levels of greenhouse gases in



Eutrophication also occurs in the sea. Photo from north Öresund shows according to eutrophication, intensive growth of green unicellular algae and perhaps cyanobacteria. Cyanobacteria can cause poisoning. The sea floor is not visible.



Flooding according to heavy rainfall is expected to increase as a result of climate change.

the atmosphere. These greenhouse gases are released primarily through deforestation, industrial processes, and the combustion of fossil fuels. It will slowly lead to a change of the ecosystem. Climate change in Helsingborg is expected to cause an increase in hardwood forests, and adversely impacting coniferous trees. It will also create a conducive environment for the establishment of invasive species which are already a significant threat to many ecosystems in the City. Increases in the intensity and occurrences of extreme climatic events such as drought and severe rainfalls are also expected as a result of climate change. An extreme high sea level occurred in Helsingborg on the 27th of November 2011, causing severe damage to the beaches and some barriers in the City.



Sandy beaches and its wildlife will be threatened if the sea level rises as predicted by the climate scientists.

The loss of social collective memory

Another major challenge to biodiversity is the lack of understanding or knowledge by people in the city regarding values biodiversity and the growing threats to the City's biodiversity. The majority of Helsingborg's dwellers have lived their entire life in the City or in its residential areas and are not connected to what happens on the countryside. Nature is therefore something many people only experience primarily on vacation far away from home or on TV. When people do not know about the values of biodiversity, they cannot be concerned about increasing threats to the ecosystems and their values of nature. Communication Education and Public Awareness (CEPA) projects are therefore crucial for the future conservation and management of nature.



Outdoor excursions are important activities for raising public awareness about ecosystem services and biodiversity.

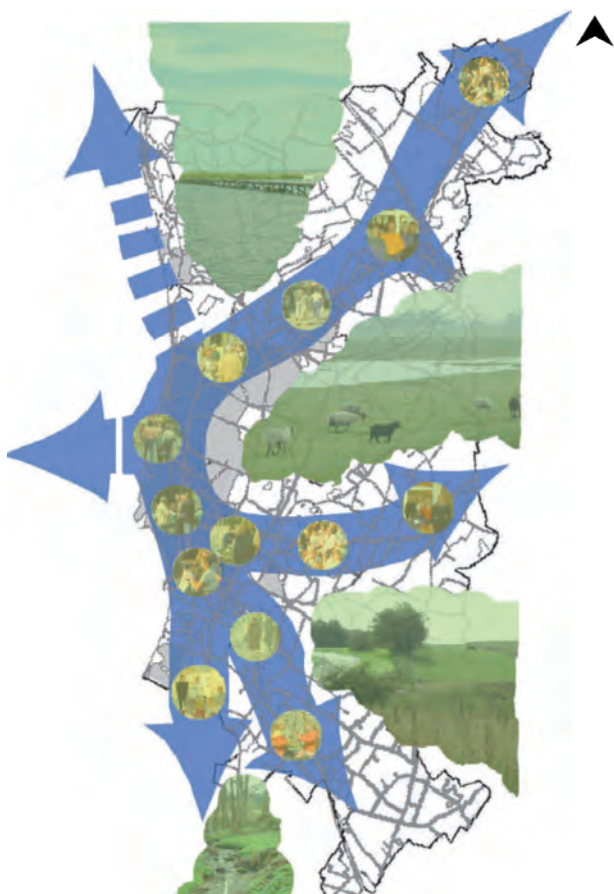
2. GOVERNANCE



2.1 Biodiversity in city planning and policy

The most important tool for biodiversity planning in Swedish municipalities is the Comprehensive Plan (CP) which is in line with the Planning and Building Act, the Environment Code, the Forestry Act and the Agricultural Act. The Comprehensive Plan involves a lot of sub-documents which are the basis for the plans such as The Green Structure Plan, Climate Adaptation Analysis, Nature And Culture Program and many others. One of the most important strategies in the Comprehensive Plan of Helsingborg on ecosystem services is the three green belts (see the “arrow map” below).

There are sixteen national quality objectives that are considered to be essential to biodiversity and environment conservation. In addition to this, operational management of the City’s green areas offers great opportunities for favouring biodiversity and ecosystem services.



The main strategies of the Comprehensive Plan of Helsingborg 2010 points out three main green belts (clouds) and traffic infrastructure (blue arrows) with train stations (circles) between them.

National environment quality objectives

The sixteen national environment quality objectives were adopted by Parliament in 1999 and 2005 and have since been adapted regionally, by the Skåne County Administrative Board and locally in Helsingborg. The objectives are embodied in the City's environment programmes.

The national environment quality objectives include:

- 1 Reduced Climate Impact
- 2 Fresh air
- 3 Natural acidification only
- 4 Toxic Environment
- 5 Protective Ozone Layer
- 6 Safe Radiation
- 7 No eutrophication
- 8 Flourishing lakes and streams
- 9 Groundwater quality
- 10 A balanced marine environment, flourishing coastal areas and archipelagos
- 11 Thriving wetlands
- 12 Sustainable Forests
- 13 A varied agricultural landscape
- 14 A magnificent mountain landscape
- 15 Good Built Environment
- 16 A rich flora and fauna

The objectives are considered in the different planning stages including the 'Comprehensive Plan' and 'detail plans'. The County Board gives regular environment reports on the state of biodiversity in the county.



Part of the three main green corridors of the Helsingborg comprehensive plan. The small stone reef of Hittarp and the nature reserve Kulla Gunnarstorp forest are visible.

2.2 Mainstreaming biodiversity management into local governance

To ensure that biodiversity is taken into account in Helsingborg, all the City's authorities and activities are central to the management of ecosystem services, as almost all planning affects the natural environment and species directly or indirectly. Through training and other teaching resources via biodiversity projects, the Comprehensive Plans, the Environment program and the local Eco Management and Audit Scheme, a holistic understanding of sustainability has been developed in the City administration. Involvement of political representatives, the general public and other stakeholders takes place primarily through the work of Fredriksdals Open Air Museum, the Environment Workshop and the Environment Agency as well as various City wide lectures which focus on biodiversity projects.

In the City's organisational structure, the institution responsible for the care and protection of the natural environment has been structured to fall under the Department of City Planning and Technical Services to ensure the planning and practical management of the natural environment in the municipal area. The comprehensive planning, according to the Planning and Building Act, also requires planning for greener development of the municipal area such as new wetlands, tree planting, nature reserves and new parks. Furthermore, green spaces and park areas are planned by enhancing the ecosystem services through the promotion of outdoor games, sports, education and recreation. There is regular communication between the Environment Department and the Department of City Planning and Technical services on these issues. This is done partly through a nature management group that works mainly on the ground and also through the overall planning of nature conservation, environment programs, detail plans and in licensing matters.

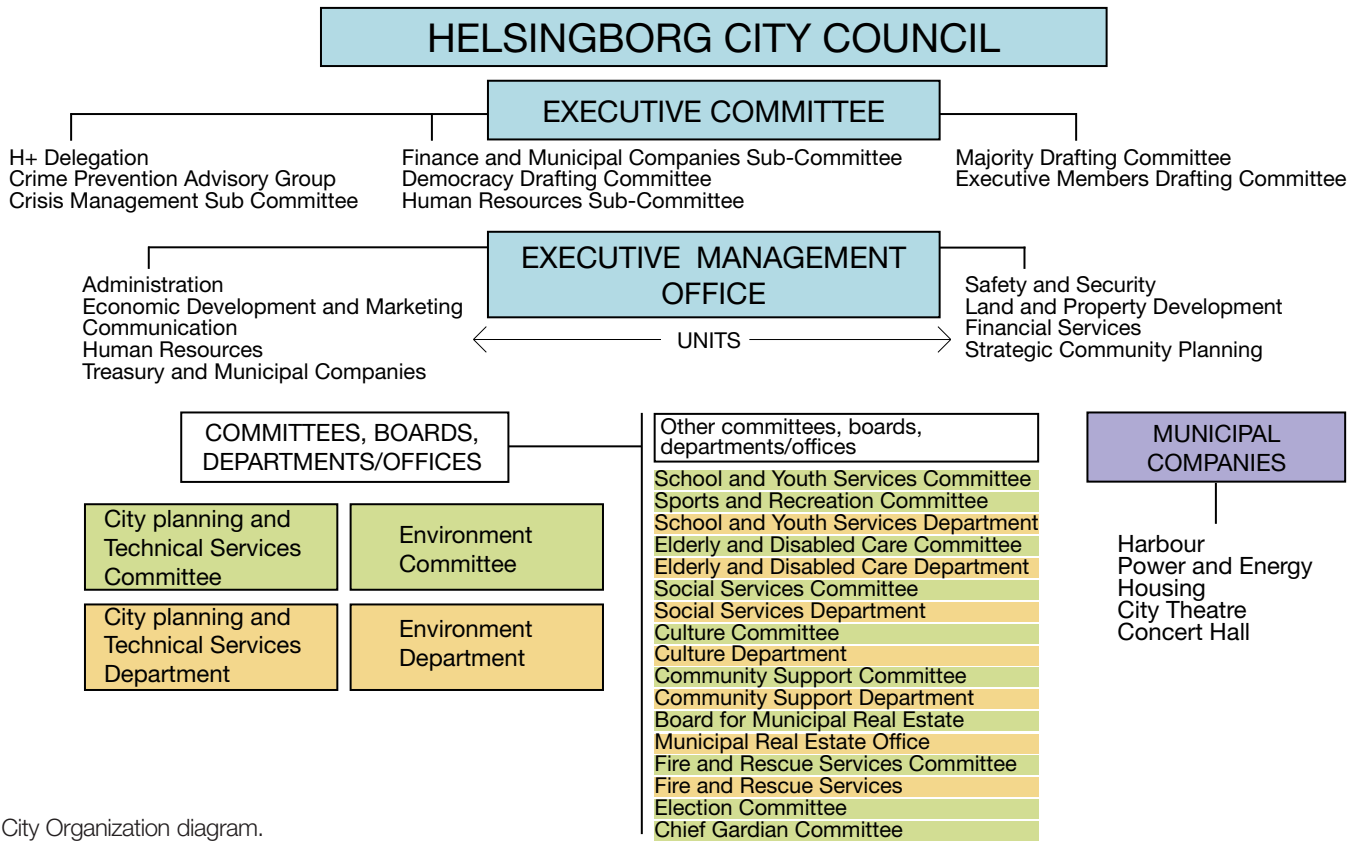
The integration of biodiversity into various municipal decisions occurs during processes concerning comprehensive and detail (exploitation) plans. Environment impact assessments are essential parts of such plans. It is thus important to have

precise nature inventories made before the planning processes commence. These inventories feed into GIS maps which makes it easily accessible to the administrators in charge of developing exploitation plans.

When a new exploitation plan is underway, it is also important to have resources to outsource external expertise when there is need for swift action or special knowledge. An effective system of communication internally and externally is essential for the integration of biodiversity issues in broader city policies. Communication is therefore intensive between various experts in different administrations responsible for green areas. Private landowners and the County Administrative Board are also involved in this communication, in accordance to the Planning and Building Act, and the Environment Code.



The White Stork *Ciconia ciconia* was extinct in Sweden until recent years. Big resources have made it possible to reestablish the bird in South Sweden again.



City Organization diagram.



Colourbox

Common Kingfisher *Alcedo atthis* is a rare bird in the streams of Helsingborg.

2.3 Biodiversity management in Helsingborg

Legislation and its history, local organization, planning and land management

The *Environment code* (see fundamentals of this code in Annex 2) and the *Forestry Act* are the main sources of biodiversity legislation that govern biodiversity management in the city. The Environment code was adopted in 1999 and is composed of 15 old laws for land and water use. These laws also control some of the actions of the *Planning and building Act*, which ensure the consideration of environment factors in infrastructural development. If the descriptions of the natural assets in an exploitation plan are well executed it increases the chance that political decisions take into account the environment values, but also a strong local opinion could guide their policy decisions.

Through the development of Swedish environment legislation, biodiversity issues have developed strongly over the past 60 years. This began with the Nature Conservation Act of 1964 and then later, the Natural Resources Act of 1987. This preceded Sweden's ratification of the Convention on Biological Diversity in 1992. In 1999, Parliament approved the fifteen national environment quality targets (extended to sixteen 2005) that form the basis of environment and conservation work today.

In 1987, Helsingborg established a post for a Strategic Planning Ecologist in the City after a political decision. It was the second of only two municipal ecologist posts in the Scania Province's 33 municipalities. Currently, Sweden's 290 municipalities have some 100 local ecologists or its equivalent. Political interest in nature values has increased, and this is evident in local laws, master plans, nature conservation plan and increased knowledge about the benefits of green environments.

In its bid to improve nature conservation and management, the City purchases private land from local owners for nature conservation, as part of fulfilling its objectives

as spelt out in the Nature Preservation Plan*. Some of the areas the city purchased for nature preservation and recreation purposes are the Bruce forest area, parts of the Råån valley, the Björka forest, the dams of Hasslarp, and a former sugar factory which had several ponds for water treatment, and they became a waterfowl paradise.

Restoring the landscape-creation of new wetlands, planting trees inter alia

In total, over 70 smaller wetlands have been created since 1992. Hardwood trees have been planted on a total area of hundreds of hectares and parts of these plantations are called "Children's Forest" which is an annual project for students in the 4th grade (age 10-11 years).

Measures in the form of free growing excavated zones, nutrient filtration, restoration of meandering and research ponds at Långeberga have been implemented. The proportion of dead wood is essential for many organisms and it is deliberately increased in Helsingborg as a result of conscious planning and management of municipality forests. Cutting of the meadows is essential in places with rich flora and it has been introduced into the Örby fields, Småryd and many other places. This is a very important practice because certain plants benefit from the cutting of strong growing and nitrogen favoured species which often outcompete them for nutrients.

Nationally, measures have been in place to preserve birds of prey like: falcons, owls and eagles. As a result of these intervention measures, some of these species including the White tailed eagle, *Haliaeetus albicilla* (see front page) now nest in Helsingborg. This is a considerable improvement, considering the adverse environment conditions which these species were previously exposed to during the 1960s and 1970s.

A variety of nature inventories in Helsingborg have provided valuable information for past conservation actions. Biodiversity is being prioritized through the different environment, conservation plans and green plans supported by state funds, municipal conservation fund and Streams Association** (see next page).

* This plan has been implemented since 1992 and a new Heritage Program is planned to 2014.

Green spaces of the city

Helsingborg owns and manages in total 2 000 hectares of green spaces such as parks, beaches, forests, pastures and meadows. About 900 hectares consists of more natural areas and the rest, 1 100 ha, is more intensely managed park areas. Some of the natural areas have been transformed to nature reserves but all of them are regularly discussed concerning biodiversity issues.

For the purpose of greening the City, green walls and roofs are planned. Green roofs have existed for several years, but this measure of increasing green areas in the city seems to be of great interest. In recent decades, a lot of measures have been implemented in forests to benefit biodiversity. These include: leaving more dead trees, stumps and leaving heaps of dead wood (logs, branches) called fauna depots. Fauna depots are good for shelter or as food resource and benefit invertebrates, birds, mushrooms and hedgehogs.

Methods used to spot and monitor biodiversity

The tracking and monitoring of Helsingborg's operations and biodiversity programs employs the use

of GIS-techniques, field surveys and questionnaires. Soil tests such as acidification, forest damage inventories are also developed occasionally to help provide information on the state of local biodiversity and also inform relevant management programmes. Non-profit organizations like the wild bird associations and other nature conservation associations also provide the city with biodiversity information and inventories that contribute to informing local biodiversity management.

Dialogue and collaboration with the regional level (see also 3.1)

The County Administrative Board of Scania and the Regional Authority of Helsingborg communicates a wide range of cases. To ensure biodiversity is preserved, certain procedures have been put in place by the regional authority to regulate activities that may potentially cause adverse impacts to biodiversity. As part of these measures, individuals and organisations are required to fill out forms which are used to obtain permission and approval before carrying out certain activities which may have the potential to exert adverse impacts on ecosystems.



Memorial of the donator Sven Ingvar Bruce who donated money to the people of Helsingborg for the purchase of a forest aimed for recreation.



One of the first green walls in Sweden was inaugurated August 16 2013.

** Streams Associations are made for rivers. It involves land owners, companies, fishing and water quality issues.

3. INTEGRATION



3.1 Local and regional partners and stakeholders

The main local departments responsible facilitating stakeholder involvement in environment management in Helsingborg are; the *City Planning and Technical Services Department* together with the *Environment Department*. These departments also collaborate with other departments of different issues. The establishment of the Fredriksdal open air museum, is of great value for local biodiversity education and awareness raising.

The City also collaborates with landowners who can apply for funds from the Nature Preservation Fund of Helsingborg. This applies to small scale nature preservation programmes which are in line with the Nature Preservation Plan or the Comprehensive Plan of the City. In the case of the Bruce Forest, it was a private person, *Sven Ingvar Bruce**, who provided funds. in his will to Helsingborg with the purpose of procuring a green area for the citizens. The forest that was purchased is now called “the forest of Bruce” which will be designated as a nature reserve in 2014.

The management of the rivers is mainly overseen by certain organizations including, the Råån River Association and the Vegeån River Association. These organisations also works with other stakeholders such as the sport fishing clubs and several others. NGO’s such as Ornithological and Nature preservation associations are also very important local partners.

The University of Lund and the Agricultural University of Alnarp have also been closely involved in local biodiversity projects in the City.

The Scania Region is another important partner in local biodiversity management. Ten municipalities in the northwest of the Scania region collaborate under the name “*Helsingborg Family*” on green structure, infrastructure, employment, business and housing.

* Sven Ingvar Bruce was a philanthropist and lover of nature who frequently trekked in the green areas of Helsingborg. He made available substantial funds in his will for the conservation of biodiversity in Helsingborg

** Natura 2000 is a network of protected green areas throughout Europe and it is decided by the European Union.

The Scania Region also has a fund for green projects which the County Administrative Board administers for local green projects in municipalities. Helsingborg has received funds for creating wetlands and nature reserves from the regional fund.

The Swedish EPA is also a significant stakeholder, and have provided funds to the City for the procurement of a natural area which has been classified as a national and EU interest area (Natura 2000)**.

3.2 International biodiversity initiatives

The Convention on Wetlands (CW-list) of International Importance, also called the RAMSAR Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the preservation and wise use of wetlands and their resources. The Bay of Skålderviken in Helsingborg has been designated as a RAMSAR area to protect marine and migratory birds (see Map 2 page 25).

Helsingborg also has certain areas that have become classified as Natura 2000 areas under the legislation of the European Union. Helsingborg has been a member of ICLEI since 1999 and in December 2011, a political decision was taken to join ICLEI’s LAB Pioneer Programme.



The South part of Skålderviken was designated as Ramsar site and European bird habitat in 2001. Rare birds breed here include: the Pied avocet *Recurvirostra avosetta* and Little tern *Sternula albifrons*. The Ramsar site is also an important resting place for migrating sea birds as well as birds of prey like white tailed eagle and falcons.

4. PARTICIPATION



4.1 Communication and education

The City Planning Department coordinates an *Environment Workshop* which has facilitated many environment programmes for students in Helsingborg for over 15 years. The programmes are targeted at different age groups with different themes. Majority of school classes in Helsingborg are willing participants in the programmes. Biodiversity is embedded in several programmes such as 'Urge to grow', which is organized for second graders to experience the diversity of plants that are available and how they develop from seed to fruit. Pupils in their fourth grade (11 years old) also work on forest ecosystems and learn about how plants and animals depend on each other. They also plant trees in a municipal recreation area in order to develop a future forest. This project is called the *Children's Forest* and in May 2012, about 1 400 pupils participated in the trees planting exercises. Every school involved in Children's forest gets an ecological, teaching tour in a nearby green area before the planting activity occurs.



As a part of the annual tree planting Childrens forest project, the *Childrens dream forest* is a pedagogic activity. Here are some drawings made by 11-year old school children.

The Environment Workshop also runs a nature school in a park beside the ravine of Jordbodalen with different themes in which diversity in the park, and our need for a multi-faceted nature is emphasized. The City is also developing various natural hotspots as visitor centres. Some of these visitor centres "naturpunkter" have been developed in; forest, pasture, meadow, wetland, bird lakes and the Sound, in order to highlight the value of these different habitats, and also provide information and educational programmes for schools.

During the biodiversity themed World Environment Day, the City organised, special activities that highlighted this theme and provided education and awareness on the local biodiversity of the City.



A view over the Environment workshop in Jordbodalen with different buildings (just the small ones) and outdoor activities. Drop-In is the round building with water theme, other buildings concern energy, forest ecology inter alia. An exhibition about climate change, ATMOS 2.0 is shown in Drop-in.



Environmental activity for children lead by staff at Environment workshop. Picture on frontpage is from an activity concerning biodiversity on a beach.

Fredriksdal is northern Europe's only botanical garden landscape with all the wild plants of Skåne. This area represents a miniature Skåne (Scania), with 360 000 m² of unique settings, buildings and gardens. Here, the history and diversity of the countryside is kept alive. With its museums and gardens, Fredriksdal offers interesting activities for all ages, all year round. An important part of Fredriksdal work is the conservation of native and cultivated plants (see page 49).

Visitors of the Mansion of Fredriksdal have an opportunity to engage in several activities including; participating in explanatory walks, watching of grazing animals or join the manor maids for an interesting tour. With its historical gardens, houses, farms, animals, meadows, and pastures, all themed around an 18th century manor house, a visit to Fredriksdal is like making a journey back into the past.

The Environment Agency collaborates with the Environment Workshop but has the adult inhabitants of the City as their main target group. The office has many different projects including energy conservation and mobility management. The aim of the Environment Agency projects is to effect behavioural changes in the general public for a healthier city and environment. Biodiversity is also highlighted in different ways through public lectures at the library in Helsingborg. In recent years, several lectures on the topic of marine nature in Helsingborg have been arranged, often linked to exhibitions at the library.

The Skåne Region Administration and the County Administrative Board of Skåne also publishes different information through films, brochures and booklets on biodiversity which also contribute significantly to biodiversity education in the city.

Studies have shown that a lack of neighbourhood recreational spaces including natural environment leads to lower levels of personal satisfaction and higher levels of obesity, linked to lower health and well-being. This is an argument that confirms the positive health benefits of natural spaces in urban areas and should be taken into account in public policy related to documents and land use.

An example of positive aspects of **closeness to green urban** environment is to complement learning in the classroom through practical outdoor education. Different types of outdoor activities also motivate for better concentration, especially among young people. Young people who participate in regular outdoor activities in green urban areas are known to concentrate better than others. Green urban environment are also important for increasing physical activity among citizens thereby increasing general health and fitness of individuals. The green urban environment also helps to increase environment awareness among young people and promotes biodiversity (Grahm, 1995).

The NCFE (Swedish National Centre for the promotion of Good Health in Children and Youth 2012) has shown that outdoor education improves students understanding about health and environment values, and also increase students' responsibility for nature and the environment. *Young people usually remember 50 % of what they hear and see and 80 % of what they experience.* It is also proven to be a positive correlation between outdoor education and decreased stress levels in children.

4.2 Public participation and awareness

Engaging with people and gaining their support for biodiversity management is absolutely crucial for its success. The public participates in biodiversity activities and decision-making in different ways and occasions. When comprehensive plans and detail plans are made, they follow the legislation processes of the Planning and Building Act which stipulates that there should be at least two platforms for the public to give the opportunity to contribute to the plans by providing their comments.

Helsingborg has done a lot to improve public access to green areas. These include the creation of paths within the City's green areas. For physically disabled people, special paths have been created to enable wheelchairs to be used in green areas. NGO's are also encouraged to participate in special nature campaigns. When new nature reserves are inaugurated a lot of people participate in such events, these play an important role in increasing local awareness to biodiversity conservation.

4.3 Biodiversity awareness-raising

Helsingborg has not yet implemented any special project aimed for this purpose. Biodiversity is often discussed in the processes of planning and management of green areas. NGO's often ask City ecologists to provide lectures on local biodiversity, providing a conducive platform to highlight what the City is doing in terms of biodiversity management. The general public are invited to some educational activities including "The day of pasture", "Year of Nature" and the inauguration of the six local nature reserves that have been inaugurated so far.

The "Year of Nature" is run by the network "Naturens år" which is made up of approximately 30 agencies and associations working on issues relating to nature conservation. The Swedish EPA manages the network. The aim of this program is to increase awareness and interest in our common nature. Each year, the network runs a topical theme. In 2012, the theme was based on marine and other aquatic systems. The network marked the 100th anniversary of Sweden's first national parks and nature conservation legislation in 2009. This cooperation continued with the 2010 event which was themed around biodiversity, in the year that was the UN International Year of Biodiversity (IYB). The 2011 theme was coordinated with the UN International Year of Forests.



Helsingborg city organizing *The day of pasture* in collaboration with NGO's.

5. BIODIVERSITY PROJECTS

5.1 Biodiversity programs and projects

The goals of the projects or routines mentioned here are all connected to some of the 16 national environment objectives (see Annex 1), the Comprehensive Plan of 2010, and the Environment Programme. These projects are long term programs which are being implemented by the City Council as priority projects to fulfilled the City's biodiversity management goals over a period of 5 years. Schools and other stakeholders including, NGO's are often involved in the implementation of projects.

Annual ecological programmes:

a Management and preservation of municipal forests areas (850 ha): This is not a project but could be of interest to mention here. The City of Helsingborg strives to maintain a beautiful, rich and easily accessible forest with different distinctive layers of vegetation as well as a certain amount of deadwood and all the characteristics of a health forest ecosystem. Although there is no direct profit, forests provide a host of ecosystem services to the City. Dead trees are important for biodiversity and especially the oak tree. Research has shown that oak trees can attract 2 000 different species of insects, lichens, birds, bats and mushrooms. Some trees such as the *Acer pseudoplatanus* are invasive and non-native and therefore are often removed to keep them from spreading. Interventions in the forest ecosystems such as, leaving more dead trees and branches in the forests have increased species like: insects, birds and mushrooms. Through special inventories, many rare species have been found in the forests and it shows the good result for biodiversity. In many cases it is NGO's that have made the inventories and sometimes consultants or employed ecologists. In those forests that are nature reserves, there is always a management plan with goals for biodiversity. In other cases there is a dialogue between ecologists about what to do with a special forest.

b Grazing and hay silage: Domestic animals are allowed to graze grassland areas of about 120 ha around the City. This is a special management practice which allows for the preservation of special kinds of flora and fauna that are dependent on grazing practices.

Hay silage is also done on an area of about 35 ha for flora rich areas for the same reason. The areas allocated to this form of grazing increase every year as many threatened species are connected to this kind of agricultural practices. Some vascular plants, insects and birds are dependent of these biotopes. A combination of ecological and a people-oriented approach are used in the management of such ecosystems.

c Ecological farming: The City owns 1 520 ha of arable land and of this, some 20 % is ecological cultivated which means that no pesticides or chemical fertilizers are used. The goal of the City's environment programme is to cultivate 30 % of local food produce ecologically.

d Measures for promoting bird life: Every year, the City and NGO's place some 150 nesting boxes in trees to benefit birds that are normally dependent on hollow trees for nesting. Many of the tree species that provide these nesting spaces for birds have become scarce in the city, and the nesting boxes play a significant role in conserving such bird species.



Nesting boxes are made for birds dependant of hollow trees in places where such trees are lacking.

Areas of arable land are seeded with special herbs that are not harvested for some years to help birds with food resource during winter. These are called “fågelåkrar” or “mångfaldsträda” (“bird fields”). Regional County Boards decides on the amount of compensation that varies between 2 000 to 3 000 SEK/ha (314-472 USD/ha). Another special bird conservation measure is “lark squares” in crop fields. These are small areas (4x4 m²) that are not cultivated on farmlands to allow the Lark to breed. This species requires a lot of conservation support since its population has decreased significantly in recent years. Since the Helsingborg City owns some arable land, these measures are possible. This conservation programme is done in collaboration with local farmers, the Regional County Board and NGO’s.

e Nature reserves: Ecological approach: By the year 2012, Helsingborg had 15 nature reserves and each year, a new one is expected to be inaugurated according to policy decision. Currently, reserve planning is underway for the Bruce forest to be inaugurated in 2013. Previously, six other local reserves were launched by Helsingborg. Nine older reserves were designated by the regional authority. In Sweden, it is not common for municipalities to create nature reserves.

It is the office of City Planning and Technical Services that is responsible for demarcating nature reserves in and around the City. In this case a combination of an ecological and a people-oriented approach is used. Some of the reserves were partly financed by national funds (*administrated by the County Administrative Board, known as “LONA” funds*). It takes about 1-2 years to complete the designation of an area as a nature reserve. The cost involved differs based on the kind of measures that will have to be taken to complete a reserve. The City creates reserves on municipal land and the Regional County Board usually takes care of the privately owned areas. In cases when land has to be bought or machines need to be used, it becomes much more expensive, otherwise it is rather cheap to create nature reserves. The maintenance of such reserves have been seen to be much cheaper than in a City park.



During the inauguration of the marine reserve Grollegrund in september 2012 a baby shark of the rare Red spotted dogfish was put into the sea. The other picture shows inauguration of the Örby meadows reserve 2011.

f Creating of wetlands, ponds and streams:

Ecological approach. About 70 small wetlands and ponds have been created in the Råån River and the Vegeån River since 1992. The aim of this was to reduce nutrient enrichment of the Öresund (part of the Baltic Sea). The goals of this programme were based on the ability of wetlands to reduce nutrients, erosion and improve the habitat for many plants and animals. Since the establishment of these wetlands, the transportation of nutrients has decreased and biodiversity has been strengthened in many parts of the City. Since Helsingborg is dominated by farming and there are no lakes, the wetlands offer regulatory ecosystem services.

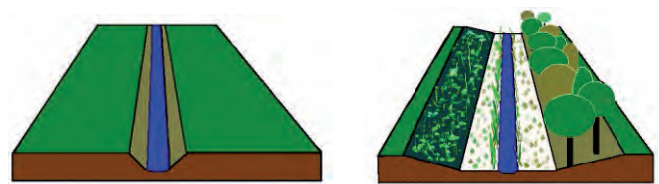
The City Planning and Technical Services Department of Helsingborg is responsible for planning wetlands. Land owners and farmers offer their land for this purpose because the wetlands also provide them with a lot of benefits, especially crop yields benefits. Some of the wetlands were financed by the river association known as "Rååns vattendragsförbund" others by the City's Nature fund and some by the national water fund called "LOVA" (*administrated by the regional County Administrative Board*). The average cost of a small wetland ranges between 40 000-100 000 SEK/ha (6 289-15 700 USD/ha).

In combination with these wetlands Helsingborg, has also created 10 metre wide cultivation free zones known as "two-stage ditches", along streams. The two-stage ditches developed in the city so far add up to a total length of 9 km. This regulates stream

flow and causes less erosion. It also reduces nutrients enrichment and favours biodiversity. The cost for restoring 9 km of municipal owned streams is valued at SEK 1,7 million (267 000 USD). New projects aimed at the development of two-stage ditches are implemented regularly.



Small wetland/pond made for collecting storm water and reducing storm flow to reduce the risk of flooding. These ponds and wetlands also attract wildlife.

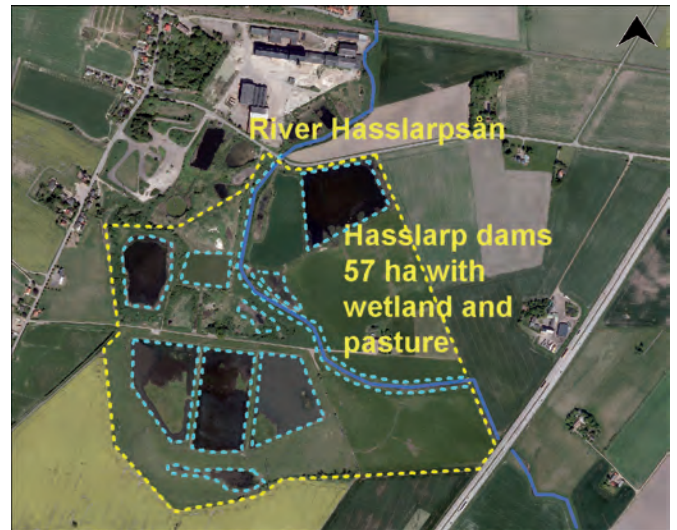
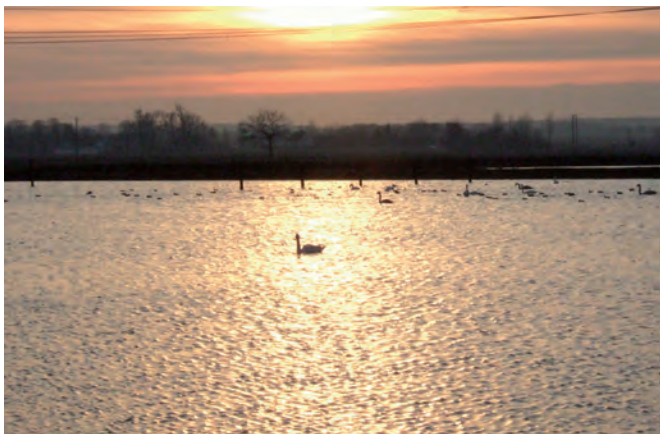


Principle of "two-stage ditches". To the left is a stream surrounded by farmland. To the right, the stream's banks are excavated and different species can thrive around this area making it look as the stream was originally (meandering) but in agricultural areas straight canals were desired and the government paid for this change. It caused faster water drainage which favoured agricultural cultivation but adversely impacted biodiversity and the natural reduction of nutrients. Today restoration of streams and rivers can be funded by national means such as the LOVA program.



Photos shows ongoing work creating a "two-stage ditch" in a stream with right side ready and not so steep as the left side. And after some years biodiversity is established.

g The Nature fund: Ecological approach. Since 1992 this fund has payed several different nature projects, mostly new wetlands and fencing for pastures. Almost 0,8 million Euros or over 1 million USD has been invested. Several private landowners have been supported by this fund. The fund was introduced as a mean for fulfilling the goals of the Nature Preservation plan decided in 1992.



The nature fund has financed several measures in the bird rich Hasslarp dams. Fencing for pasture, information signage, shelter for bird watching inter alia has been constructed in addition to the acquisition of 57 ha of land and pond area in 1997. The cost at the time of acquisition was SEK 1.5 million (235 850 USD). Some 200 bird species have been observed here over the years.



The Hasslarp dams.

h Marine inventories and education: Marine biologists in Helsingborg are placed at the Environment department and they are responsible for annual inventories/control programme. These inventories are done to assess the presence of bio indicators, as well as the distribution and presence of invasive species. Samples are also collected from various species and tested for toxic compounds among others.

A ship in Helsingborg known as the Sabella,, is used to provide school children, students, officers and others with the opportunity to explore the rich marine fauna of the City's marine ecosystem. This education program is run annually and provides a great opportunity for people to learn about marine biodiversity.



Red spotted dogfish *Scyliorhinus caniculus* is an interesting find at the Grollegrund marine reserve.

5.2 Biodiversity CEPA projects

The activities discussed in this section are aimed at education and public awareness according to the Helsingborg Environment Program for 2011-2015. Most of the activities aim at involving and informing children and the public through practical activities such as; the hay silage at Örby meadows, tree planting for school children, labelling eternity trees and the five thematic nature stations. Furthermore, the Fredriksdal open air museum and the Environment workshop inform some 30 000-40 000 students each year on the value of biodiversity and other environment issues.



Annual hay harvest with scythe and raker on the Örby field (nature reserve) at the beginning of August. This is an activity which shows old agricultural methods and how they benefit biodiversity. The Örby meadows is the most biodiversity rich area in Helsingborg (400 vascular plant species).



The annual Michaels' market at Fredriksdal where organically cultivated vegetables are sold to the public.



Certain old big trees in Helsingborg are called "Eternity trees". They are individually labelled and must not be cut down. When the public sees such labelled trees, it sends a signal that the City cares about biodiversity and it raises awareness about the importance of nature.



Celebration of World Environment Day in the City Park.

The "Children's Forest" is an annual project that facilitates tree planting by some 1 000 fourth grade children (10-11 years old) each year. The programme is managed by the City Planning department. The project adopts a combination of an ecological and people-oriented approach to promote biodiversity conservation. This programme will be instrumental in shaping the children's relationship with nature with the hope of nurturing them into adults that understand and appreciate the value of biodiversity. The project was started in 1997 and some 16 000-20 000 trees have been planted (see section 4.1).

Project Trekking paths: The regional Skåneleden (over 1 000 km of paths) was planned by the Department of City Planning and Technical Services. It was inaugurated in 2007 as a part of the international celebration of the 300th anniversary of the birth of the Swedish nature scientist Carolus Linnaeus. Other trekking paths have also been established around the city over the last decade. These include the Nature and Culture paths. These paths pass through different biotopes which are rich in biodiversity and interesting cultural elements. The paths promote public health and offer recreational and cultural ecosystem services to locals.

Institutional Awareness of Biodiversity Values

The degree of awareness and knowledge of other departments and administrations that are not primarily involved in biodiversity issues has been a challenge. Environment workshops have played an important role in raising internal awareness of the local departments about the importance of biodiversity conservation. CEPA and the ATMOS 2.0 exhibition*, participants gain a perspective on the importance of climate change and biodiversity. Participants can partake in interactive sessions relating to what they think about climate change. As part of the activities, guided tours of about 2.5 hours tailored for groups of 15 people, aged 15-95 years are also run.

The Helsingborg 2035 vision (see foreword) is also highlighted and participants get a glimpse of how the future environment might be should the vision be achieved. Based on Helsingborg's vision, in 2035 the City would have changed, inspired by a positive vision.

A walk through virtual elements of water, air and land, gives participants contrasting images and the causes and consequences of climate disruption. The impressions from ATMOS sessions, called the "summit" ends in discussing climate change globally and locally. The importance of lifestyle is highlighted in a final exercise. The most crucial issue in the ATMOS show becomes: *How should I live for myself and others to feel good without a big ecological footprint?*

Conclusion

First of all, the LAB project created by ICLEI is a highly valuable concept for cities and management of biodiversity and ecosystem services. It creates a kind of common standard for awareness raising of the earths biodiversity and its economics.

Involvement of the general public, schools and relevant stakeholders in different management and awareness raising activities is of fundamental importance to the successful conservation and management of biodiversity and ecosystems. Cities taking lead in this field of knowledge and resource management will certainly be winners in terms of public health, economy and prosperity. Helsingborg is rich in natural resources and has a long experience of educating and creating awareness on environment activities. The City continues to develop new concepts in collaboration with the various departments including; the Environment Bureau, Environment Workshop, Fredriksdal Open Air Museum and Campus Helsingborg (*a University of Lund Campus in Helsingborg*).

The Helsingborg Biodiversity Assessment Report will play a significant role in local biodiversity and ecosystem management. The report provides significant information on local biodiversity wealth, threats and management in the City, and will provide a strong basis for the development of a Local Biodiversity Strategy and Action Plan (LBSAP) which will govern biodiversity management in Helsingborg. As it is evident that CEPA is a very crucial tool for biodiversity management, this report will not only serve as a vital resource for biodiversity management in the environment department but also a tool which will play a significant role in internal CEPA and awareness raising of various municipal staff on an inter-departmental level, of the value of biodiversity and ecosystems in the City, and especially in the activities of all municipal departments in Helsingborg.

* ATMOS (an acronym for atmosphere) 2.0 is an interactive experience exhibition that would bring awareness on climate change at schools, companies, associations and administrations. You cannot visit as an ordinary private person when only pre-booked visits are accepted. The exhibition is located in the house called "Drop In".

REFERENCES

- Andersson H et al 2009 *Noise Values for economic analysis VTI notat 30-2008*, Road and Transport Research Institute.
- Bjork J et al 2008 *Recreational values of the natural environment in relation to neighborhood satisfaction, physical activity, obesity and well-being*. J Epidemiol Community Health, 2008.
- Boverket 1994 *Stadens parker och natur*. Rapport 1994:12.
- Boverket 1999 *Gröna områden i planeringen*.
- Boverket 2007 *Bostadsnära natur – inspiration & vägledning*.
- Boverket 2007 *Landskapets upplevelsevärden – vilka är de och var finns de?*
- Boverket 2010 *Låt staden grönska – klimatanpassning genom grönstruktur*.
- Boverket 2010 *Mångfunktionella ytor. Klimatanpassning av befintlig bebyggd miljö i städer och tätorter genom grönstruktur*.
- Boverket 2010 *Samhällsplanering som stimulerar till fysisk aktivitet – en förstudie*.
- Brügge et al 1999. *Friluftslivets pedagogik*. National Centre for Outdoor Education (NCU) Linköping University.
- Callahan D 1973. *The WHO definition of "health"*. The Hastings Center Studies, 1973 (<http://www.jstor.org/pss/3527467>).
- Colding J. 2011 *Ecosystem rips in cities - Environment FORMAS No 4*.
- Emanuelsson et al 2002 *Det skånska kulturlandskapet*.
- Gerell R 2005. *Övervakning av fladdermöss i Skåne län* Rapport.
- Grad, F 2002. *The Preamble of the Constitution of the World Health Organization*. Bulletin of the World Health Organization 2002, 80 (12) 981.
- Grahn el al 1995. *Grönstrukturens betydelse för användningen*. SLU Alnarp.
- Grahn P. & Stigsdotter U. A. 2003. *Landscape planning and stress*. *Urban Forestry & Urban Greening*.
- Havs- och vattenmyndigheten 2012 *Fiskbestånd och miljö i hav och sötvatten*.
- Helsingborgs stad 2005 *Arkitekturguide för Helsingborg*.
- Helsingborgs stad 2010 *Comprehensive plan of Helsingborg*.
- Helsingborgs stad 1991 *Cultural Heritage Program of Helsingborg*.
- Helsingborgs stad 2010 *Environment program for the city of Helsingborg 2011-2015*.
- Helsingborgs stad 1995 *Helsingborgs grönstruktur*.
- Helsingborgs stad 2009 *Helsingborgs raviner och dalar - ett urval*.
- Helsingborgs stad 2013 *Green structure plan (not yet adopted)*.
- Helsingborgs stad 1992 *Nature Preservation plan of Helsingborg*.
- Helsingborgs stad 2012 *PM Climate adaptation of Helsingborg*.
- Heywood V H ed. UNEP 1995 *Global Biodiversity Assessment. Annex 6, Glossary*.
- ICLEI et al 2010 *Local Action for Biodiversity Guidebook*.

- ICLEI et al 2010 *The Economics of Ecosystems and Biodiversity TEEN manual for Cities*.
- Jadad AR & O'Grady L 2008. *How should health be defined?* BMJ 2008; 337 (http://www.bmj.com/cgi/content/full/337/dec10_1/a2900).
- Lisa Almesjö, Helene Limén Riksdagstryckeriet, Stockholm, 2008 *Rapport 2008/09:RFR4*.
- Länsstyrelsen i Västergötland *Ekobladet 1-2012*.
- MacArthur R. & Wilson, E.O. 1967. *The theory of island biogeography*.
- Naturvårdsverket 2012 *Grön infrastruktur. Redovisning av regeringsuppdrag*.
- Naturvårdsverket 2012 11 01 *Sammanställd info om Ekosystemtjänster (Collected inform. about Ecosystem services)*.
- NCFF 2012. *Nationellt centrum för främjande av god hälsa hos barn och ungdom*. (<http://www.oru.se/NCFF/>).
- Nerhagen L et al 2009 *The mortality cost of particulate matter due to emissions in the Stockholm area, VTI report 635A Road and Transport Research Institute*.
- Nilsson P. *Meadow and pastures impact on property values. Report 2010:5. Agriculture Fiskpopulationer i svenska vatten - Hur påverkas de av fiske, övergödning och miljögifter?*
- Nordic Council of Ministers "Vegetationstyper I Norden" 1994:665.
- Pedersen TR, Bommarco R Ebbersten K, Falk A, Fries I, Kristiansen P, Kryger P, Natterlund H & M. Pretty, Angus, Bain, 2009. *Nature, Childhood, Health and life Pathways*. University of Essex, 2009(<http://www.essex.ac.uk/ces/esu/occ-papers.shtml>).
- Public Health Agency of Canada 2011. *What determines health?* Ottawa, 2011.
- Rundlöf *mass deaths of bees - Socioeconomic implications and possible actions. Report 2009:24. Agriculture*.
- Scania (Skåne) County Administrative Board, Länsstyrelsen 2005 *Regional nature preservation plan*.
- Scania Region 2012 *Grönstruktur i Skåne – Strategier för en utvecklad grön struktur*.
- SFS 1998:808: *Environment Code (Miljöbalken)*.
- SFS 2010:900: *Planning and building Act*.
- Skoglund J och Anders Delin A 2007 in <http://miljoaktuellt.idg.se/2.1845/1.128085>.
- Sullivan et al 2004. *The fruit of Urban Nature. Vital Neighborhood Spaces*. Environment and behaviour. Vol. 36 No.5, September 2004.
- Sweden's parliament: *National environment objectives*.
- UNEP 1995 *Global Biodiversity Assessment. Annex 6, Glossary*.
- UNESCO (2011). *The UN World Water Development Report: Facts and figures - Meeting basic needs. The UN World Water Development Report: Facts and Figures - Meeting basic needs*. Accessed 12 May 2011.
- World Health Organization 2011. *The determinants of health*. Geneva, 2011.
- Öresundsvandkommittén 2010.
- Öresundsvattensamarbetet 2004 *Comparison between original and nowadays nutrient concentrations in Öresund*.
- Öresundsvattensamarbetet 2007 *Fisk i Öresund*.

Relevant websites.

International/European websites.

CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora:

www.cites.org

Convention on Biological Diversity CBD: www.cbd.int

DAISIE: www.europe-aliens.org/default.do

European Union EU: http://europa.eu/pol/env/index_en.htm

ICLEI: www.iclei.org

IUCN: www.iucn.org

LAB: www.iclei.org/index.php?id=lab

SRC Stockholm Resilience Center: <http://www.stockholmresilience.org/>

The RAMSAR (CW-list) convention: www.ramsar.org

National websites.

Centre of biodiversity CBM: <http://www.slu.se/en/collaborative-centres-and-projects/swedish-biodiversity-centre1/>

National species gateway: <http://www.artportalen.se/default.asp>

Naturens år: The Network Natures year is run by approximately 30 agencies and associations working together on issues of nature. The aim is to increase awareness and interest in our common nature. Naturens år: <http://naturensar.se/>

Swedish Environment Agency: <http://www.swedishepa.se/>

Swedish government/miljödepartmentet: <http://www.sweden.gov.se/sb/d/2066>

Research foundation MISTRA: <http://www.mistra.org/english>

Sustainability Research FORMAS: <http://sustainability.formas.se/>

Swedish Ecological City Network SEKOM: http://sekom.sekom.nu/index.php?option=com_content&task=view&id=41&Itemid=50

Regional websites.

Collaboration on Öresund marine environment/Öresundsvattensamarbetet: <http://www.Öresundsvand.dk/Svenska/>

Scania County Administrative Board/Länsstyrelsen: <http://www.lansstyrelsen.se/Skåne/En/Pages/default.aspx> and Nature of Kullaberg <http://k.inventit.dk/>
The Scania Region: <http://www.Skåne.se/sv/Webbplatser/Skånese/English/>

Local websites.

City of Helsingborg: www.helsingborg.se

Information about nature reserves in Helsingborg: www.helsingborg.se/Medborgare/Uppleva-och-gora/Friluftsliv-och-motion/Naturomraden/

Råån River Water Association: <http://www.Råån.se/VVF>

Other websites.

Acidification of Europe: www.apis.ac.uk

KRAV: www.krav.se

Medical: www.dagensmedicin.se

Ocean and water authority/Havs och vattenmyndigheten: <http://www.havochvatten.se/en/start.html>

SEI Stockholm Environment Institute: <http://www.sei-international.org/>

SRC Stockholm Resilience Center: <http://www.stockholmresilience.org/>

The Convention on Wetlands - Ramsar: www.ramsar.org. **University of Lund/Campus Helsingborg:** <http://www.ch.lu.se/index.php?id=161>

Uppsala Ornitologiska Förening: <http://www.uof.nu/>

Annex 1

The 16 Swedish national environment quality objectives

Parliament has set targets for environment quality in 16 areas. The objectives thus indicates what qualities environment must have the specified target year, which for most goals is the 2020th. The purpose of the environment quality objectives is to achieve environmentally sustainable development in the long term. For the first 15 environment quality objectives decision was taken 1999. And in 2005 came the 16th environment quality objective, a rich flora and fauna, with a focus on biodiversity. New milestones are to be developed for a number of areas.

1 Reduced Climate Impact

The concentration of greenhouse gases in the atmosphere, in accordance with the UN Framework Convention on Climate Change to stabilize at a level that ensures that human impact on the climate system is not dangerous.

The goal will be achieved in a way and at such a pace that biological diversity is preserved, food production is assured and other sustainable development objectives are not compromised.

Sweden, together with other countries have a responsibility to the global objective.

2 Fresh air

The air must be clean to human health, animals, plants and cultural assets.

3 Natural acidification only

The acidifying effects of deposition and land use must not exceed the limits of land and water resistant. Deposition of acidifying substances must not increase the rate of corrosion in underground engineering materials, water management, archaeological artefacts and rock carvings.

4 Toxic Environment

The presence of substances in the environment that has been created in or extracted must not threaten human health or biodiversity. Levels of foreign substances is close to zero and their impact on human health and ecosystems is negligible. Levels of naturally occurring substances are near background levels.

5 Protective Ozone Layer

Ozone layer will be developed to provide long-term protection against harmful UV radiation.

6 Safe Radiation

Human health and biodiversity should be protected against the harmful effects of radiation.

7 No eutrophication

Nutrient levels in soil and water should not have any adverse effect on human health, the conditions for biological diversity or varied use of land and water.

8 Flourishing lakes and streams/rivers

Lakes and watercourses must be ecologically sustainable and their variety of habitats to be preserved. Natural production capacity, biodiversity, cultural values and ecological and water management function must be preserved, while recreational assets are safeguarded.

9 Groundwater quality

Groundwater must provide a safe and sustainable drinking water supply and contribute to a good habitat for plants and animals in lakes and streams.

10 A balanced marine environment, flourishing coastal areas and archipelagos

North Sea and Baltic Sea will have a sustainable productive capacity and biodiversity must be preserved. Coastal and island should have a high degree of biological diversity, recreational value, and natural and cultural values. Industry, recreation and other uses of oceans, coasts and archipelagos will be to promote sustainable development. Particularly valuable areas should be protected from encroachment and other disturbance.

11 Thriving wetlands

Wetland ecological and water-conserving function of the landscape must be maintained and valuable wetlands preserved for the future.

12 Sustainable Forests

Forests and forest land for biological production must be protected as well as the biological diversity, cultural values and social values.

13 A varied agricultural landscape

Agricultural landscape and agricultural land for biological production and food production should be protected while biodiversity and cultural values are preserved and strengthened.

14 A magnificent mountain landscape

The mountains should have high biological diversity, recreational value, natural and cultural values. Activities in the mountains should be conducted according to these values and to promote sustainable development. Particularly valuable areas should be protected from encroachment and other disturbance.

15 Good Built Environment

Cities, towns and other built-up areas must provide a good living environment and contribute to a good regional and global environment. Natural and cultural values must be utilized and developed. Buildings and facilities shall be located and designed in an environmentally sound manner and to promote sustainable management of land, water and other resources.

16 A rich flora and fauna

Biodiversity should be preserved and used in a sustainable manner for present and future generations. Species habitats and ecosystems and their functions and processes must be safeguarded. Species to survive in the long-term viable populations with sufficient genetic variation. People should have access to a good natural and cultural environment rich in biodiversity, as the basis of health, quality of life and welfare.

Annex 2 Contents in brief of The Environment Code (1998:808); EC

EC Chapter 1. Objectives and Area of Application of the Environment Code.

Section 1. The purpose of this Code is to promote sustainable development, which will assure a healthy and sound environment for present and future generations. Such development will be based on recognition of the fact that nature is worthy of protection and that our right to modify and exploit nature carries with it a responsibility for wise management of natural resources.

The Environment Code shall be applied in such a way as to ensure that:

1. Human healths and the environment are protected against damage and inconvenience, whether caused by pollutants or other impacts;
2. Valuable natural and cultural environments are protected and preserved;
3. Biological diversity is preserved;
4. The use of land, water and the physical environment in general is such as to secure a long term good management in ecological, social, cultural and economic terms; and
5. Reuse and recycling, as well as other management of materials, raw materials and energy are encouraged with a view to establishing and maintaining natural cycles.

Section 2. The provisions of chapters 3 and 4 shall only be applicable in connection with the consideration of matters referred to in chapter 7, the examination of activities for which permits are required pursuant to chapters 9, 11 and 12 and the Government's permissibility consideration referred to in chapter 17 and also to the extent provided for in the Civil Aviation Act (1957:297) inter alia.

Section 3. In addition to the provisions of the Environment Code, the provisions of other Acts shall be applicable to activities that may cause damage or detriment to human health, the environment or other interests that are protected by this Code.

Annex 3 Complete list of threatened and red data list (IUCN) species in Helsingborg

Threatened = CR-critically endangered, EN-endangered, VU-vulnerable

Red data list = RE-Regionally extinct, NT-near threatened, CR-critically endangered, EN-endangered, VU-vulnerable, LC-least concern

Organism group, Source, Scientific name, Swedish name and threat category

Vascular plants

<i>Acer campestre</i>	Naverlönn	CR
<i>Agrostemma githago</i>	Klätt	EN
<i>Aira caryophylla</i>	Vittätel	VU
<i>Anthemis arvensis</i>	Åkerkulla	NT
<i>Anthemis cotula</i>	Kamomillkulla	EN
<i>Anthriscus caucalis</i>	Taggkörvel	VU
<i>Apium inundatum</i>	Krypfloka	EN
<i>Aristolochia clematitis</i>	Hålröt	NT
<i>Bidens radiata</i>	Grönskära	VU
<i>Blysmus compressus</i>	Plattsäv	NT
<i>Blysmus rufus</i>	Rödsäv	NT
<i>Bromus arvensis</i>	Renlost	VU
<i>Camelina microcarpa</i>	Sanddådra	VU
<i>Campanula cervicaria</i>	Skogsklocka	NT
<i>Carduus acanthoides</i>	Piggtistel	NT
<i>Carex pulicaris</i>	Loppstarr	VU
<i>Centaurium erythraea</i>	Flockarun	VU
<i>Cerastium brachypetalum</i>	Raggarr	EN
<i>Cerastium brachypetalum</i>	Rapunkelklocka	EN
<i>Chenopodium bonus-henricus</i>	Lungrot	NT
<i>Coronopus squamatus</i>	Kråkkrassing	VU
<i>Corydalis cava</i>	Hålnunneört	NT
<i>Crepis praemorsa</i>	Klasefibbla	NT
<i>Dactylorhiza majalis</i>	Majnycklar	NT
<i>Equisetum telmateia</i>	Jättefräken	CR
<i>Euphorbia exigua</i>	Småtörel	VU
<i>Festuca altissima</i>	Skogssvingel	VU
<i>Filago vulgaris</i>	Klotullört	VU
<i>Fraxinus excelsior</i>	Ask	VU
<i>Galeopsis ladanum</i>	Mjukdån	NT
<i>Geranium palustre</i>	Kärrnäva	EN
<i>Gypsophila muralis</i>	Grusnejlika	EN
<i>Holosteum umbellatum</i>	Fågellarv	VU
<i>Hyoscyamus niger</i>	Bolmört	NT
<i>Isolepis setacea</i>	Borstsäv	EN
<i>Juncus capitatus</i>	Huvudtåg	EN
<i>Lathyrus tuberosus</i>	Knölvial	VU
<i>Leonurus cardiaca</i>	Hjärtstilla	VU

<i>Lunaria rediviva</i>	Månviol	NT
<i>Luzula sylvatica</i>	Storfryle	VU
<i>Malva pusilla</i>	Vit kattost	VU
<i>Marrubium vulgare</i>	Kransborre	EN
<i>Misopates orontium</i>	Kalvnos	EN
<i>Orobanche elatior</i>	Klintsnyltrot	EN
<i>Pilularia globulifera</i>	Klotgräs	VU
<i>Poa remota</i>	Storgröe	NT
<i>Potentilla anglica</i>	Revig blodrot	VU
<i>Pseudognaphalium luteo-album</i>	Vitnoppa	CR
<i>Pulicaria vulgaris</i>	Loppört	RE
<i>Pulsatilla vulgaris ssp. vulgaris</i>	Backsippa	VU
<i>Raphanus raphanistrum</i>	Åkerrättika	NT
<i>Rosa micrantha</i>	Sydäppelros	CR
<i>Rubus tiliaster</i>	Lindbjörnbär	CR
<i>Rubus vestitus</i>	Rundbladsbjörnbär	NT
<i>Rubus vikensis</i>	Vikenbjörnbär	NT
<i>Rumex conglomeratus</i>	Dikesskräppa	EN
<i>Sagina micropetala</i>	Hårnarv	NT
<i>Serratula tinctoria</i>	Ängsskära	NT
<i>Setaria viridis var. major</i>	Stor kavelhirs	NT
<i>Setaria viridis var. viridis</i>	Vanlig kavelhirs	NT
<i>Sherardia arvensis</i>	Åkermadd	EN
<i>Stachys arvensis</i>	Åkersyska	NT
<i>Thymus pulegioides</i>	Stortimjan	VU
<i>Ulmus glabra ssp. glabra</i>	Skogsalm	VU
<i>Verbascum lychnitis</i>	Grenigt kungsljus	VU
<i>Veronica montana</i>	Skogsveronika	VU
<i>Veronica triphyllos</i>	Klibbveronika	VU
<i>Vicia villosa</i>	Luddvicker	VU
<i>Viola uliginosa</i>	Sumpviol	NT
<i>Vulpia bromoides</i>	Ekorrsvingel	EN

Mosses 1996-2011 + Susanne Godow och Jörg Brunet

<i>Cinclidotus fontinaloides</i>	Forsmossa	NT
<i>Didymodon vinealis</i>	Murlansmossa	VU
<i>Gyroweisia tenuis</i>	Knattemossa	VU
<i>Hamatocaulis vernicosus</i>	Käppkrokmossa	NT
<i>Hookeria lucens</i>	Skirmossa	NT
<i>Oxyrrhynchium schleicheri</i>	Skånsk sprötmossa	VU
<i>Oxyrrhynchium speciosum</i>	Strandsprötmossa	NT

Mushrooms 1992-2011

<i>Ceriporia purpurea</i>	Purpurticka	LC
<i>Cortinarius turgidus</i>	Silkesspindling	VU
<i>Cryptosphaeria eunomia</i>	Tusengömming	NT
<i>Eutypella dissepta</i>	Ö-nästing	NT

<i>Eutypella stellulata</i>	Stjärnnästing	NT
<i>Fistulina hepatica</i>	Oxtungssvamp	NT
<i>Ganoderma pfeifferi</i>	Hartsticka	EN
<i>Geastrum corollinum</i>	Rulljordstjärna	EN
<i>Gloiodon strigosus</i>	Borsttagging	VU
<i>Grifola frondosa</i>	Korallticka	NT
<i>Hygrophorus mesotephrus</i>	Bokvaxskivling	NT
<i>Hypochnicium vellereum</i>	Almkrämskinn	NT
<i>Hypoxylon howeanum</i>	Hasseldyna	NT
<i>Inonotus cuticularis</i>	Skillerticka	VU
<i>Inonotus dryadeus</i>	Tärticka	VU
<i>Oxyporus obducens</i>		VU
<i>Phellinus robustus</i>	Ekticka	NT
<i>Polyporus tuberaster</i>	Stenticka	NT
<i>Russula carpini</i>	Avenbokskremla	NT
<i>Russula melliolens</i>	Honungskremla	VU
<i>Russula puellula</i>	Småkremla	DD
<i>Russula solaris</i>	Solkremla	NT
<i>Sowerbyella radiculata</i>	Blek rotskål	VU
<i>Trametes suaveolens</i>	Sydlig anisticka	EN

Lichens 1989-2011 + Per Johansson 1992

<i>Arthonia pruinata</i>	Matt pricklav	VU
<i>Bacidia rosella</i>	Rosa lundlav	NT
<i>Fuscopannaria mediterranea</i>	Olivbrun gytterlav	NT
<i>Lecanora glabrata</i>	Bokkantlav	NT
<i>Melanohalea elegantula</i>	Elegant sköldlav	VU
<i>Mycobilimbia pilularis</i>	Stor knopplav	LC
<i>Opegrapha ochrocheila</i>	Orangepudrad klotterlav	NT
<i>Opegrapha vermicellifera</i>	Stiftklotterlav	VU
<i>Pyrenula nitida</i>	Bokvårtlav	NT
<i>Schismatomma decolorans</i>	Grå skärelav	NT
<i>Sclerophora peronella</i>	Liten blekspik	NT
<i>Xanthoria calcicola</i>	Kalkvägglav	NT

Birds - observations made - all are not breeding in Helsingborg but could breed.

Source: Artportalen 2000-2011-03-16 <http://www.artportalen.se/>

<i>Acrocephalus arundinaceus</i>	Trastsångare	NT
<i>Actitis hypoleucos</i>	Drillsnäppa	NT
<i>Alauda arvensis</i>	Sånglärka	NT
<i>Alcedo atthis</i>	Kungsfiskare	VU
<i>Anas acuta</i>	Stjärtand	NT
<i>Anas querquedula</i>	Årta	VU
<i>Anser fabalis</i>	Sädgås	NT
<i>Anthus campestris</i>	Fältpiplärka	EN
<i>Anthus cervinus</i>	Rödstrupig piplärka	VU
<i>Apus apus</i>	Tornseglare	NT

<i>Aquila chrysaetos</i>	Kungsörn	NT
<i>Arenaria interpres</i>	Roskarl	VU
<i>Asio flammeus</i>	Jorduggla	NT
<i>Aythya ferina</i>	Brunand	NT
<i>Aythya marila</i>	Bergand	VU
<i>Botaurus stellaris</i>	Rördrom	NT
<i>Bubo bubo</i>	Berguv	NT
<i>Buteo lagopus</i>	Fjällvråk	NT
<i>Calidris alpina schinzii</i>	Sydlig kärrsnäppa	CR
<i>Caprimulgus europaeus</i>	Nattskärva	NT
<i>Carduelis cannabina</i>	Hämpling	VU
<i>Carduelis flavirostris</i>	Vinterhämpling	EN
<i>Carpodacus erythrinus</i>	Rosenfink	VU
<i>Cepphus grylle</i>	Tobisgrissla	NT
<i>Charadrius alexandrinus</i>	Svartbent strandpipare	RE
<i>Chlidonias niger</i>	Svarttärna	VU
<i>Ciconia ciconia</i>	Vit stork	RE
<i>Circus cyaneus</i>	Blå kärrhök	NT
<i>Circus pygargus</i>	Ängshök	EN
<i>Coturnix coturnix</i>	Vaktel	NT
<i>Crex crex</i>	Kornknarr	NT
<i>Dendrocoptes minor</i>	Mindre hackspett	NT
<i>Emberiza hortulana</i>	Ortolansparv	VU
<i>Eremophila alpestris</i>	Berglärka	VU
<i>Falco peregrinus</i>	Pilgrimsfalk	VU
<i>Falco rusticolus</i>	Jaktfalk	VU
<i>Ficedula parva</i>	Mindre flugsnäppare	NT
<i>Fratercula arctica</i>	Lunnefågel	RE
<i>Galerida cristata</i>	Tofslärka	RE
<i>Gallinago media</i>	Dubbelbeckasin	NT
<i>Gavia stellata</i>	Smålom	NT
<i>Haliaeetus albicilla</i>	Havsörn	NT
<i>Hydroprogne caspia</i>	Skräntärna	VU
<i>Jynx torquilla</i>	Göktyta	NT
<i>Larus argentatus</i>	Gråtrut	NT
<i>Larus fuscus</i>	Silltrut	NT
<i>Limosa lapponica</i>	Myrspov	VU
<i>Limosa limosa</i>	Rödspov	CR
<i>Locustella fluviatilis</i>	Flodsångare	NT
<i>Locustella luscinioides</i>	Vassångare	NT
<i>Locustella naevia</i>	Gräshoppsångare	NT
<i>Melanitta fusca</i>	Svärta	NT
<i>Mergus albellus</i>	Salskrake	NT
<i>Motacilla flava flava</i>	Sydlig gulärta	VU
<i>Nucifraga caryocatactes</i>	Nötkråka	NT
<i>Numenius arquata</i>	Storspov	VU
<i>Oriolus oriolus</i>	Sommargylling	EN

<i>Perdix perdix</i>	Rapphöna	NT
<i>Pernis apivorus</i>	Bivråk	VU
<i>Philomachus pugnax</i>	Brushane	VU
<i>Phylloscopus trochiloides</i>	Lundsångare	VU
<i>Podiceps auritus</i>	Svarthakedopping	NT
<i>Podiceps nigricollis</i>	Svarthalsad dopping	EN
<i>Porzana porzana</i>	Småfläckig sumphöna	VU
<i>Regulus ignicapilla</i>	Brandkronad kungsfågel	NT
<i>Remiz pendulinus</i>	Pungmes	EN
<i>Riparia riparia</i>	Backsvala	NT
<i>Rissa tridactyla</i>	Tretåig mås	EN
<i>Serinus serinus</i>	Gulhämpling	VU
<i>Somateria mollissima</i>	Ejder	NT
<i>Sterna sandvicensis</i>	Kentsk tärna	EN
<i>Sternula albifrons</i>	Småtärna	VU
<i>Streptopelia decaocto</i>	Turkduva	NT
<i>Sylvia nisoria</i>	Höksångare	VU
<i>Upupa epops</i>	Härfågel	RE

INVERTEBRATES

Beetles

<i>Abax parallelepipedus</i>	Lövskogslöpare	NT
<i>Aeletes atomarius</i>		NT
<i>Ampedus cardinalis</i>	Kardinalfärgad rödrock	NT
<i>Ampedus nigroflavus</i>		NT
<i>Ancistronycha cyanipennis</i>		NT
<i>Anobium costatum</i>		NT
<i>Choragus sheppardi</i>		VU
<i>Cis castaneus</i>		NT
<i>Cis micans</i>		NT
<i>Conopalpus testaceus</i>	Ekgrenbrunbagge	LC
<i>Corticeus unicolor</i>	Enfärgad barksvartborre	LC
<i>Cryptophagus labilis</i>		NT
<i>Cryptophagus micaceus</i>	Bålgetingfuktbagge	LC
<i>Dorcatoma flavicornis</i>	Bred tickgnagare	LC
<i>Dorcatoma substriata</i>	Sprängtickgnagare	NT
<i>Dryocoetes villosus</i>	Ekbarkborre	LC
<i>Epuraea guttata</i>		LC
<i>Ernoporicus fagi</i>	Bokborre	LC
<i>Eucnemis capucina</i>		VU
<i>Euplectus brunneus</i>		LC
<i>Euplectus duponti</i>		NT
<i>Harpalus anxius</i>	Smal frölöpare	NT
<i>Harpalus calceatus</i>	Trädeslöpare	VU
<i>Harpalus griseus</i>	Sammetsfrölöpare	VU
<i>Hetaerius ferrugineus</i>		LC
<i>Hylis foveicollis</i>		LC

<i>Hylis olexai</i>		LC
<i>Lissodema denticolle</i>	Vasstandad trädbasbagge	NT
<i>Melasis buprestoides</i>		LC
<i>Mesosa nebulosa</i>	Molnfläcksbock	NT
<i>Mycetochara axillaris</i>	Större svampklobagge	LC
<i>Mycetophagus piceus</i>	Ljusfläckig vedsvampbagge	LC
<i>Mycetophagus quadripustulatus</i>	Stor vedsvampbagge	LC
<i>Onthophagus joannae</i>	Joannas dvärgdyvel	VU
<i>Opilo mollis</i>		NT
<i>Phloeophagus lignarius</i>		NT
<i>Phloeophagus thomsoni</i>		NT
<i>Plegaderus dissectus</i>		NT
<i>Priobium carpini</i>		VU
<i>Prionocyphon serricornis</i>		LC
<i>Prokraerus tibialis</i>	Smalknäppare	NT
<i>Ptenidium gressneri</i>		NT
<i>Rhizophagus brancsiki</i>	Bokbarkglansbagge	VU
<i>Scaphidema metallicum</i>	Albarksvartbagge	LC
<i>Sepedophilus bipunctatus</i>		LC
<i>Stereocorynes truncorum</i>		VU
<i>Stictoleptura scutellata</i>	Bokblomböck	VU
<i>Synchita variegata</i>		NT
<i>Tasgius globulifer</i>		NT
<i>Tetratoma fungorum</i>	Blåvingad lövsvampbagge	LC
<i>Trichonyx sulcicollis</i>		NT
<i>Trinodes hirtus</i>		VU
<i>Uloma culinaris</i>	Större sågsvartbagge	NT
<i>Velleius dilatatus</i>	Bålgetingkortvinge	LC
Diptera		
<i>Keroplatus tipuloides</i>	Getinglik svampmygga	NT
Hymenoptera		
<i>Andrena hattorfiana</i>	Väddsandbi	NT
<i>Andrena varians</i>	Krusbärssandbi	LC
<i>Colletes fodiens</i>	Hedsidenbi	NT
<i>Myrmica specioides</i>	Dynrödmyra	NT
Spiders		
<i>Enoplognatha latimana</i>		DD
<i>Trogulus tricarinatus</i>	Sköldlockespindel	NT
Butterflies		
<i>Aricia agestis</i>	Rödfläckig blåvinge	NT
<i>Cupido minimus</i>	Mindre blåvinge	NT
<i>Drepana curvatula</i>	Brunaktig sikelvinge	NT

Myriapods (Ulf Gärdenfors 1989)

Nanogona polydesmoides Kölfoting NT

Shells

Anisus spirorbis Rundläppad skivsnäcka NT

Cochlicopa nitens Större agatsnäcka EN

Marine evertebrates

Abra prismatica NT

Balanus crenatus DD

Crenella decussata Liktandad dvärgmussla DD

Euspira pallida VU

Inachus dorsettensis NT

Ophiura robusta Mindre fransormstjärna NT

Stomphia coccinea VU

Sabellides octocirrata DD

Musculus niger Svartmussla VU

Crustaceans

Proasellus coxalis EN

Flatworms (U Gärdenfors 1989)

Rhynchodemus terrestris Landplanarie DD

Amphibians and reptiles (Göran Paulsson, 1979-1993)

Triturus cristatus Större vattensalamander LC

Bats (Gerell R, 2005)

Myotis mystacinus Mustaschfladdermus LC

Eptesicus serotinus Sydfladdermus EN

Fish

Barbatula barbatula Grönling LC

Petromyzon marinus Havsnejonöga NT

Lampetra fluviatilis Flodnejonöga LC

Leucaspisus delineatus Groplöja LC

Anguilla anguilla Ål CR



William Lavesson

Helsingborg from east to western direction. In front, the valley of Råån and the characteristic landscape of Helsingborg, Denmark and Helsingør (Elsinore) can be seen behind Helsingborg and Öresund.



During a long period Helsingborg has winter climate with snow, ice on rivers and sometimes ice at sea. Temperature sometimes reaches minus 20 centigrades. It is a harsh period for wilderness, e.g. birds can starve to death. From November to March it can be cold and snowy.



Oak *Quercus robur* is an important tree since it supports hundreds of other species. It can be very old, up 1 000 years.

Annex 4 Vegetation/Habitat types in Helsingborg

Source: Swedish Environment Protection Agency-Naturvårdsverket
<http://www.swedishepa.se/>

Summary: The main habitat types/biotopes are the following in Helsingborg except cropland:

- 1 Woodland.
- 2 Grassland (Meadow and Pasture).
- 3 Sands.
- 4 Wetland/Running water.
- 5 Marine environment.

1 Woodland

Northern hardwood forest - Nordlig ädellövskog (9020, Fennoscandian hemiboreal natural old broad-leaved deciduous forests (*Quercus*, *Tilia*, *Acer*, *Fraxinus* or *Ulmus*) rich in epiphytes.

The hemiboreal natural old broad-leaved deciduous forest forms a transition between the Western Taiga and the nemoral forests. The most common tree species are *Quercus robur*, *Ulmus spp.*, *Fraxinus excelsior*, *Tilia cordata* or *Acer platanoides*. There is typically a considerable amount of dead wood and a long continuity of woodland cover on the sites. The species-diversity of lichens, fungi, insects and soil-organisms is high. In many cases the forests have previously been used for grazing or mowing.

Klassificering enligt Vegetationstyper i Norden och EUNIS.

Vegetationstyper i Norden: 2.2.3.3 Almskog (del av), 2.2.3.4 Askskog (del av), 2.2.3.5 Lindskog (del av), 2.2.3.6 Blandlövskog av örtrik typ (del av).

Pastures with trees - Trädklädd betesmark (9070, Trädklädda betesmarker av fennoskandisk typ).

A vegetation complex in which the tree layer varies from sparse forest to small copses of trees and shrubs and patches of open grassland. These habitats have a representative mosaic of copses of trees (usually deciduous trees) and grassland with a long continuity of grazing. The tree layer consists either of deciduous

broad-leaved species such as *Quercus robur*, *Fraxinus excelsior*, *Tilia cordata*, *Betula spp.*, *Alnus incana* or conifers (*Picea abies*, *Pinus sylvestris*). Particularly in Sweden there are pastures with old, large oaks. A rich assemblage of threatened lichens, fungi, and invertebrates are associated with the bark and dead or decaying wood. The type also includes (particularly in Finland) deciduous forests established after slash-and-burn cultivation, that was a characteristic feature of the former land use in Finland. In Finland scattered in the whole of the country, mostly in Southern and Central Finland; very rare or extinct in northern boreal zone. In Sweden scattered over the whole country. Regional variation is considerable. Wooded pastures are usually dominated by birch, pine, alder (*Alnus incana*) or spruce (spruce-dominated are often degraded types); in hemiboreal zone there are also subtypes dominated by e.g. *Quercus*, *Fraxinus* and *Corylus*.

Wet deciduous forest - Lövsumpskog (9080, Lövsumpskogar av fennoskandisk typ).

Deciduous swamps are under permanent influence of surface water and usually flooded annually. They are moist or wet, wooded wetlands with some peat formation, but the peat layer is usually very thin. Ash (*Fraxinus excelsior*) in the hemiboreal zone and black alder (*Alnus glutinosa*) reaching the middle boreal zone are typical tree species. Grey alder (*Alnus incana*), silver birch (*Betula pubescens*) and willows (*Salix spp.*) are also common. A mosaic of patches with different water level and vegetation is typical for the type. Around the tree stems are small hummocks, but wet flooded surfaces are dominant. Deciduous swamp woods are most common in Finland in the southwestern archipelago and other coastal areas. On the mainland they are rare. In Sweden they are common throughout the whole region.

Nutrient poor beech forest - Näringsfattig bokskog (9110, Bokskog av fryletyp).

Fagus sylvatica and, in higher mountains, *Fagus sylvatica-Abies alba* or *Fagus sylvatica-Abies alba-Picea abies* forests developed on acid soils of the medio-European domain of central and northern Central Europe, with *Luzula luzuloides*, *Polytrichum formosum*

and often *Deschampsia flexuosa*, *Calamagrostis villosa*, *Vaccinium myrtillus*, *Pteridium aquilinum*.

Nutrient rich beech forest - Näringsrik bokskog (9130, Bokskog av örtrik typ).

Fagus sylvatica and, in higher mountains, *Fagus sylvatica-Abies alba* or *Fagus sylvatica-Abies alba-Picea abies* forests developed on neutral or near-neutral soils, with mild humus (mull), of the medio-European and Atlantic domains of Western Europe and of central and northern Central Europe, characterised by a strong representation of species belonging to the ecological groups of *Anemone nemorosa*, of *Lamium* (*Lamium*) *galeobdolon*, of *Galium odoratum* and *Melica uniflora* and, in mountains, various *Dentaria* spp., forming a richer and more abundant herb layer than in the forests of 9110 and 9120.

Nutrient rich oak forest - Näringsrik ekskog (9160, Ek- avenbokskog av buskstjärnblommatyp). 9160, Sub-Atlantic and medio-European oak or oakhornbeam forests of the *Carpinion betuli*.

Forests of *Quercus robur* (or *Quercus robur* and *Quercus petraea*) on hydromorphic soils or soils with high water table (bottoms of valleys, depressions or in the vicinity of riparian forests). The substrate corresponds to silts, clayey and silt-laden colluvions, as well as to silt-laden alterations or to siliceous rocks with a high degree of saturation. Forests of *Quercus robur* or natural mixed forests composed of *Quercus robur*, *Quercus petraea*, *Carpinus betulus* and *Tilia cordata*. *Endymion non-scriptus* is absent or rare. Not to be confused with forests of *Quercus robur* arising from the management of beech-oak forests as coppice or coppice-with-standards on well drained soils.

Flooded deciduous forest - Svämlövskog (91E0, Alluviala lövskogar som tidvis är översvämmade). Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*).

Riparian forests of *Fraxinus excelsior* and *Alnus glutinosa*, of temperate and Boreal Europe lowland and hill watercourses (44.3: *Alno-Padion*); riparian

woods of *Alnus incanae* of montane and sub-montane rivers of the Alps and the northern Apennines (44.2: *Alnion incanae*); arborescent galleries of tall *Salix alba*, *S. fragilis* and *Populus nigra*, along medio-European lowland, hill or sub-montane rivers (44.13: *Salicion albae*). All types occur on heavy soils (generally rich in alluvial deposits) periodically inundated by the annual rise of the river (or brook) level, but otherwise well-drained and aerated during low-water. The herbaceous layer invariably includes many large species (*Filipendula ulmaria*, *Angelica sylvestris*, *Cardamine* spp., *Rumex sanguineus*, *Carex* spp., *Cirsium oleraceum*) and various vernal geophytes can occur, such as *Ranunculus ficaria*, *Anemone nemorosa*, *A. ranunculoides*, *Corydalis solida*.

2 Grassland (Meadow and Pasture)

Damp meadows - Fuktängar (6410, Fuktängar med blåttätel eller starr).

Molinia meadows of plain to montane levels, on more or less wet nutrient poor soils (nitrogen, phosphorus). They stem from extensive management, sometimes with a mowing late in the year or, they correspond to a deteriorated stage of draining peat bogs.

Meadows with tall herbs - Högörtängar (6430, Högörtssamhällen).

Wet and nitrophilous tall herb edge communities, along water courses and woodland borders belonging to the *Glechometalia hederaceae* and the *Convolvuletalia sepium* orders (*Senecion fluviatilis*, *Aegopodion podagrariae*, *Convolvulion sepium*, *Filipendulion*).

Lowland hay meadows - Slätterängar i låglandet (6510 slätterängar i låglandet).

Species-rich hay meadows on lightly to moderately fertilised soils of the plain to submontane levels, belonging to the *Arrhenatherion* and the *Brachypodio-Centaureion nemoralis* alliances. These extensive grasslands are rich in flowers and are not cut before the grasses flower and then only one or two times per year.

Meadows with trees and bushes - Lövängar (6530, lövängar).

A vegetation complex consisting of small copses of deciduous trees and shrubs and patches of open meadows. Ash (*Fraxinus excelsior*), birch (*Betula pendula*, *B. pubescens*) and *Quercus robur*, *Tilia cordata*, *Ulmus glabra* or *Alnus incana* are the common tree species. Nowadays very few areas are managed but traditionally these areas were managed by a combination of raking, hay-cutting, grazing of grassland and pollarding or lopping of trees. Species-rich vegetation complexes with rare and threatened meadow species and well developed epiphytic flora of mosses and lichens are characteristic. Many threatened species preferring old pollarded deciduous trees of semi-open habitats occur. The habitat type includes managed areas and overgrown areas with old pollarded or lopped deciduous trees. The type does not include abandoned meadows being invaded by trees.

Bush land with Juniperus - Enbuskmarker (5130, Enbuskmarker nedanför trädgränsen).

Formations with *Juniperus communis* of plain to montane levels. They mainly correspond to phytodynamic succession of the following types of vegetation:

Dry heaths - Torra hedar (4030, Ris- och gräshedar nedanför trädgränsen).

Mesophile or xerophile heaths on siliceous, podsolc soils in moist Atlantic and sub-Atlantic climates of plains and low mountains of Western, Central and Northern Europe. Mesophile or xerophile heaths on siliceous, podsolc soils in moist Atlantic and sub-Atlantic climates of plains and low mountains of Western, Central and Northern Europe. Wetlands mostly or largely occupied by peat- or tufa-producing small sedge and brown moss communities developed on soils permanently waterlogged, with a soligenous or topogenous baserich, often calcareous water supply, and with the water table at, or slightly above or below, the substratum. Peat formation, when it occurs, is infra-aquatic. Calciphile small sedges and other Cyperaceae usually dominate the mire communities, which belong

to the *Caricion davallianae*, characterised by a usually prominent "brown moss" carpet.

They are among the habitats that have undergone the most serious decline. They are essentially extinct in several regions and gravely endangered in most.

3 Sands

Sandbanks - Sandbankar (1110).

Sandbanks which are slightly covered by sea water all the time.

Sandbanks are elevated, elongated, rounded or irregular topographic features, permanently submerged and predominantly surrounded by deeper water. They consist mainly of sandy sediments, but larger grain sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present on a sandbank. Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than on the underlying hard substrata. "Slightly covered by sea water all the time" means that above a sandbank the water depth is seldom more than 20 m below chart datum. Sandbanks can, however, extend beneath 20 m below chart datum. It can, therefore, be appropriate to include in designations such areas where they are part of the feature and host its biological assemblages.

4 Wetland/Running water

Estuaries (1130).

Downstream part of a river valley, subject to the tide and extending from the limit of brackish waters.

River estuaries are coastal inlets where, unlike 'large shallow inlets and bays' there is generally a substantial freshwater influence. The mixing of freshwater and sea water and the reduced current flows in the shelter of the estuary lead to deposition of fine sediments, often forming extensive intertidal sand and mud flats. Where the tidal currents are faster than flood tides, most sediments deposit to form a delta at the mouth of the estuary. Baltic river mouths, considered as an estuary subtype, have brackish water and no tide, with large wetland vegetation (helophytic) and luxurious aquatic vegetation in shallow water areas.

5 Marine environment

Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330).

Salt meadows of Baltic, North Sea, English Channel and Atlantic shores. *Aster tripolium* can be present or abundant in most subdivisions.



The Southern part of the Skålderviken Bay is appointed to Ramsar site or CW-list i.e. Convention on Wetlands of International Importance, especially as Waterfowl Habitat. In addition to the shallow seabed grazed meadows along the seashore are influenced by salt and are very important for flora, invertebrates and wader birds.

Annex 5 Government address Ecosystem services

Press Release
January 17, 2013
Ministry of Environment

The Government wants to highlight the value of ecosystem services.

The Government today appointed a commission of inquiry to analyze and propose methods for valuing ecosystem services. The investigator will also suggest how these values can be integrated into economic standpoints, political considerations and decisions in society.

- Ecosystem services are one of many new words. It points to the obvious truth that humans are dependent on nature and the services it provides. When we can value ecosystem services such as pollination and its role in food production, we can ensure high economic value both for society and for business, says Environment Minister Lena Ek.

By better defining the value of ecosystem services and integrate these values in the economy, Sweden is better equipped to conserve and sustainably use ecosystems.

In 2012, the Environment Protection Agency had the task of compiling information on key ecosystem services in Sweden and in april last year, the Government decided clarifications and new milestones in Swedish environment system. Among other things, established a stage, which means that the importance of biodiversity and the value of ecosystem services by 2018 to be generally known and integrated in the financial statements, political considerations and decisions in society where relevant and reasonably.

Today the Government is taking the next step and add a study led by Maria Schultz commissioned to analyze and propose methods for valuing ecosystem services and suggest how these values can be integrated into economic standpoints, political considerations and decisions in society where relevant and reasonable.

- The study is expected to provide us with tools to an almost revolutionary way to count ecosystem services in support of the state budget - it's prudent macroeconomic policies, says Ek.

The investigator Maria Schultz currently works at the Stockholm Resilience Centre.

It is to report by 30 September 2013.

Annex 6 Contact information - LAB team and contributors

Contact details of person/persons compiling or supporting the report.

Widar Narvelo, Professional Officer, Ecologist, City Planning and Technical Services Department, strategic planning, LAB-project leader, Department of strategic planning widar.narvelo@helsingborg.se Stadsbyggnadsförvaltningen, Järnvägsgatan 22, 251 89 Helsingborg, Sweden phone +46-42-105000.

Fredrik Bengtsson, Professional Officer, Ecologist City Planning and Technical Services Department, strategic planning, fredrik.bengtsson@helsingborg.se Stadsbyggnadsförvaltningen, Järnvägsgatan 22, 251 89 Helsingborg, Sweden phone +46-42-105000.

Torleif Bramryd, Associate professor, Lund University, Campus Helsingborg, 251 08 Helsingborg, Sweden torleif.bramryd@miljostrat.lu.se phone +46-42-356500.

Andreas Eriksson, Research assistant, Campus Helsingborg, 251 08 Helsingborg, Sweden Andreas.Eriksson@ism.lu.se phone +46-42-356500.

Michael Johansson M.Sc Environment strategy, Lund University, Campus Helsingborg, 251 08 Helsingborg, Sweden Michael.johansson@ism.lu.se phone: +46-42-356568.

Claes Nihlén, Professional Officer, Biologist Environment Department, claes.nihlen@helsingborg.se phone +46-42-105000.

Linda Hellberg, Professional Officer, Biologist, City Planning and Technical Services Department, linda.hellberg@helsingborg.se Stadsbyggnadsförvaltningen, Järnvägsgatan 22, 251 89 Helsingborg, Sweden phone +46-42-105000.

Klas Nyberg, Professional Officer, Teacher, City Planning and Technical Services Department, Environment workshop, School education klas.nyberg@helsingborg.se phone +46-42-105000.

LAB team



Widar Narvelo



Torleif Bramryd



Andreas Eriksson



Michael Johansson



Linnea Folkesson



Fredrik Bengtsson



Linda Hellberg



Claes Nihlén



Klas Nyberg

Linnea Folkesson, Professional Officer, Culture Department, Environment Bureau, public environment information, linnea.folkesson@helsingborg.se Stadsbyggnadsförvaltningen, Järnvägsgatan 22, 251 89 Helsingborg, Sweden phone +46-42-105000.

Acknowledgements for contributions to the report.

Seyram Agbemenya (MSc.) Junior Professional Officer - Biodiversity and Ecosystem Management, ICLEI - Cities Biodiversity Center ICLEI - Local Governments for Sustainability, PO Box 5319, Tygervally, 7536, Cape Town, South Africa, Street address: 44 Wale Street, Cape Town, South Africa Tel: +27 21 487 2769 Fax: +27 21 424 9313 Email: seyram.agbemenya@iclei.org, www.iclei.org/biodiversity.

Sarah Birch ICLEI (MSc) (nee Fox) Professional Officer, Biodiversity & Ecosystem Management; Adaptation to Climate Change, ICLEI - Cities Biodiversity Center, ICLEI - Local Governments for Sustainability, PO Box 5319, Tygervalley, 7536, Cape Town, South Africa, Street address: 44 Wale Street, Cape Town, South Africa Tel: +27 21 487 2769 Fax: +27 21 424 9313 Email: sarah.birch@iclei.org, www.iclei.org/biodiversity.

Sofia Öreberg Head of strategic planning, City Planning and Technical Services Department, sofia.oreberg@helsingborg.se Stadsbyggnadsförvaltningen, Järnväggsgatan 22, 251 89 Helsingborg, Sweden phone +46-42-105000.

Emilie Björling Professional Officer, Water planning, City Planning and Technical Services Department, strategic planning, emilie.bjorling@helsingborg.se Stadsbyggnadsförvaltningen, Järnväggsgatan 22, 251 89 Helsingborg, Sweden phone +46-42-105000.

Stefan Jendteg, Professional Officer, Economist, Scania County Administrative Board stefan.jendteg@lansstyrelsen.se phone +46-40-252000.

Gösta Regnell, Senior officer, Water management Ph D, Scania County Administrative Board, gosta.regnell@lansstyrelsen.se phone +46-40-252000.

Peter Göransson, Professional Officer, Marine biology, Environment departement Helsingborg, peter.goransson@helsingborg.se phone +46-42-105000.

Christina Andersson Stadsbyggnadsförvaltningen Helsingborg, Maps.

Birgit Müller Stadsbyggnadsförvaltningen Helsingborg, Layout.

Photos: Widar Narvelo in general. Other photos: Peter Göransson (marine animals), Peter Elfman drawings and illustrations, Fredrik Bengtsson, Birgit Müller (butterflies, Sandön bird watchers, bumblebee, dragonflies), Mårten Müller (birds, see labeled photos) and Bengt Jürs (children) all in Helsingborg. Istockphoto (white tailed eagle on frontpage). Colourbox, Wikipedia, Naturvårdsverket (see labeled photos). William Lavesson (aerial pictures). Ingegerd Ljungblom (maps of Råån water system). Bertil Hagberg/Port of Helsingborg (Helsingborg

on frontpage). Arne Anderberg (St. John's wort). Lars Bygdemark (Skälderviken) by permission of Höganäs municipality. Painting of Swedish wildlife by permission of Zoological park of Skåne. ©Blom Sweden AB (oblique images).



Broad-bodied chaser *Libellula depressa*.



Dark Green Fritillary *Argynnis aglaja*.

GLOSSARY

Alien species: a non-indigenous species which did not naturally inhabit a particular ecosystem of the area, but was deliberately or incidentally introduced therein.

Biome: Biome is a regional accumulation of distinct plant and animal communities. Biome is another word for vegetation area. The concept includes collaboration and interaction between the different species key. The relationship with soil and climate are also included. Biomes are substantially discernible in the high (continental to global) scale. Together all biomes are the biosphere.

Biosphere: The biosphere is the sum of all the Earth's ecosystems. The term refers to the thin layer situated around the globe that harbors biological life.

Coppice meadow: Agricultural method used from prehistoric time until 1800-1900s in Denmark and South Sweden. A thicket or grove of small trees or shrubs, maintained by periodic cutting or pruning to encourage optimal hay harvest for livestock during winter. 40 % of Helsingborg land use was coppice meadows in the 1700s. Nowadays some small pieces of these meadows are nature reserves.

Domesticated species: species whose evolution process was affected by man so as to satisfy his own needs.

Ecological corridor: an ecological component of such components that allow for migration of the populations of living organisms from one site to another.

Ecological Niche: The ecological niche involves both the place where an organism lives and the roles that an organism does in its habitat. Niche is where species or population is in its ecosystem. In lesser term, how they make a living. There are different dimensions of a niche that has a wide variety of aspects of the environment which must be considered.

Eutrophication: overgrowing of lakes due to the increased concentration of nitrogen, phosphorus and other organic substances.

Habitat: the unique functional unit of an ecosystem.

Holarctic region: The zoological region of the northern hemisphere. See Palearctic region too.

Invasive species: an alien species introduced in a new area and such species can proliferate fast and threat native species, spread disease inter alia.

Island Biogeography Theory IBT: This famous, fundamental ecological theory was described by McArthur and Wilson 1967 and it is a field within biogeography that examines the factors that affect the species richness of isolated natural communities. The theory was developed to explain species richness, disappearance and colonization of species of actual islands. It has since been extended and now it is used in reference to any ecosystem surrounded by unlike ecosystems. IBT is today fundamental for planning of all kinds of nature preservation. Stepping stones and green corridors are central concepts.

Jurassic: is a geologic period and system that extends from about 200 Ma (million years ago) to 150 Ma; that is, from the end of the Triassic to the beginning of the Cretaceous. The Jurassic constitutes the middle period of the Mesozoic Era, also known as the Age of Reptiles. The start of the period is marked by the major Triassic–Jurassic extinction event. The transition between Triassic and Jurassic eras is when the bedrock of Helsingborg has its origin. See also Triassic.

Landscape: comprised the visible features of an area of and fossils. Land, including physical elements such as landforms, living elements of flora and fauna, abstract elements.

Nature reserve: an area of land and/or the sea with high value for biodiversity protected by the Environment Code.

National park: a large, predominantly unaltered landscape diversity, on account of their vulnerability or area of land and/or sea characterised by exceptional and for the sake of scientific, cultural, aesthetic, multifold natural assets, comprising one or several

educational, economic and other public interest. Preserved or predominantly unaltered ecosystems, and is primarily earmarked for conservation of original nature.

Nature conservation: any procedure carried out for the natural assets, i.e. conservation of biological and landscape diversity. It is intended for scientific, cultural purpose of maintaining and improving the level of educational and recreational purposes.

Palaearctic region: One of the world's eight zoological regions. It is a part of the Holarctic and it includes the northern hemisphere except North America. Western Palaearctic is often used in ornithological context.

Pollarding: cutting branches of broadleaved trees in meadows was a common method in old agricultural systems in Sweden. The leaves were taken as fodder for the livestock. Trees were also kept low giving an optimal light shadow for the plants in the meadow.

Population: a group of specimens of the same species.

Production forests: used primarily for the production of materials made of wood.

RAMSAR or CW-list: is the convention on wetlands for places important for birds. A part of Skålderviken has been outpinted as RAMSAR site.

Relict: a taxon which is a part of the present flora or fauna, but represents a remnant of a formerly living natural population.

Restoration of nature: a set of technical measures designated for preserving biodiversity and ecosystem services and moving it into a state of original function.

Tertiary: a geological period at the beginning of the Cenozoic, starting 65 million years ago and ending 2 million years ago; consisting of Paleocene, Eocene, Oligocene, Miocene and Pliocene.

Triassic: is a geologic period and system that extends from about 250 to 200 million years ago. It is the first period of the Mesozoic Era, and lies between the Permian and Jurassic periods. Both the start and end of the period are marked by major extinction events. The transition between Triassic and Jurassic eras is when the bedrock of Helsingborg has its origin and at that time the Helsingborg bedrock was situated near the equator like almost all the Earth's land mass was concentrated into a single supercontinent centered more or less on the equator, called Pangaea ("all the land"). See also Jurassic.

Wetlands: areas of marsh, fen and peatland, karst hydrogeological and hydrological systems and other waters, natural or artificial, of permanent or recurring character, with standing or running water, fresh or salt, including areas of seawater.

Geological period	start millions yeas ago
Quaternary (Pleistocene/Holocene)	2.588
Neogene (Miocene/Pliocene)	23.0
Paleogene (Paleocene/Eocene/Oligocene)	65.5
Cretaceous	145.5
Jurassic	200
Triassic	251
Permian	300
Carboniferous (Mississippian/Pennsylvanian)	359
Devonian	416
Silurian	444
Ordovician	488
Cambrian	542
Ediacaran	630

Imprint

LAB Biodiversity Report: City of Helsingborg

Publisher

City of Helsingborg

Primary Author and Editor

Widar Narvelo, Helsingborg LAB

Co-Authors

Torleif Bramryd, Andreas Eriksson, Michael Johansson, Linnéa Folkesson,
Fredrik Bengtsson, Linda Hellberg, Claes Nihlén, Klas Nyberg

Layout

Birgit Müller, Helsingborg

Copyright

© City of Helsingborg, 2013 and ICLEI Africa
Secretariat, 2013

All rights reserved. No part of this book
may be reproduced or copied in any form
or by any means without the written
permission of City of Helsingborg and
ICLEI Africa Secretariat.

Printed in Sweden

by Tryckservice AB, Ängelholm

Obtainable from

Electronic copies obtainable upon request
from:

Local Action for Biodiversity, ICLEI Africa
Secretariat

E-mail: lab@iclei.org

Website: www.iclei.org/lab

City of Helsingborg

Email: stadsbyggnadsnamnden@helsingborg.se

Website: www.helsingborg.se



HELSINGBORG

Local Action for Biodiversity City of Helsingborg
PO Box 5319 Stadsbyggnadsförvaltningen
Tyger Valley 251 89
7536 Helsingborg
South Africa Sweden

