Biodiversity and climate change

Workshop background document for capacity building in the framework of the Life+ supported project, European Capitals of Biodiversity

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1. Background

In the framework of the LIFE+ supported project, *European Capitals of Biodiversity*, this background document has been prepared by ICLEI to support a series of capacity building workshops for municipal staff in France, Germany, Hungary, Slovakia and Spain. This module aims at providing an overview of the close links between biodiversity and climate change and how biodiversity protection and climate change mitigation are highly interrelated activities. Its precise objectives, expected outcomes, and target audiences are outlined below.

1.1. Objectives and expected outcomes

In undertaking this module, participants should:

- Gain awareness of the main current and future threats of climate change and their adverse effects on biodiversity;
- Understand the relevance of biodiversity conservation in combating climate change;
- Comprehend how local biodiversity initiatives can reduce risks deriving from climate change and how local climate change initiatives can be designed in such a way as to reduce biodiversity loss and habitat degradation.

1.2. Target audience

This module is designed to train the following audiences:

- Local and regional decision makers;
- City and regional managers;
- Municipal practitioners whose activities directly or indirectly impact on biodiversity.

2. Climate change

Never in the history of the environmental movement has a topic gained as much public attention as climate change. However, this attention has been focused almost entirely on ways in which society stands to suffer from its consequences. The response has been an increased focus on the mitigation of climate change (through measures centred around limiting the procurement and combustion of fossil fuels) and artificial means of adapting to it. Significantly less mainstream attention has been given to the effects climate change will have (and indeed is already having) on biodiversity, as well as the ways in which biodiversity conservation can help in mitigation, adaptation and resilience.

2.1. Causes, impacts and actions needed

2.1.1. Causes

The burning of fossil fuels has been identified as the primary cause of anthropogenic climate change. This is intensified by other human activities such as deforestation and large-scale commercial agriculture, both of which cause a massive release of CO_2 and other greenhouse gases into the atmosphere, preventing a steadily increasing quantity of heat from the sun's rays from being reflected back into space. (For more detailed information about sources and impacts of greenhouse gases, see www.epa.gov/climatechange/emissions/)

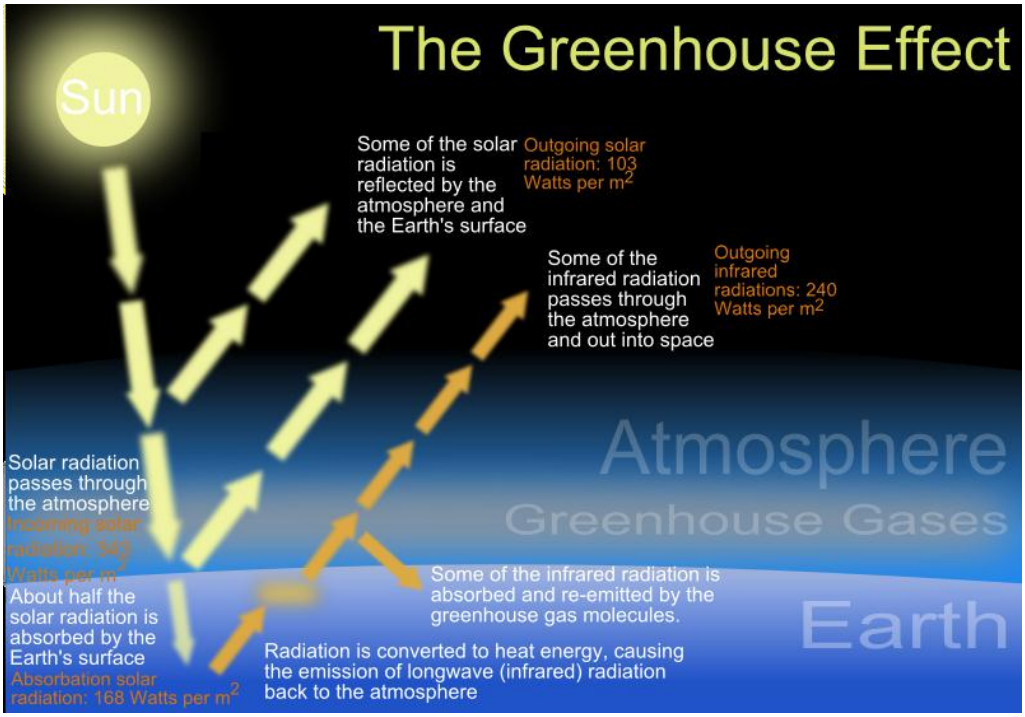

Figure 1, The Greenhouse effect ©ZooFari from Wikimedia Commons

The anthropogenic infusion of greenhouse gases into the atmosphere, among other complex results of human behaviour are causing imbalances in the Earth's climatic systems, leading to increased severity of weather events (e.g. drought,

flooding, tornadoes) and increased unpredictability of these events (e.g. unseasonal rain or drought), as well as a gradual average increase in temperature around the world. The higher temperature is melting terrestrial ice, resulting in sea level rise and the wider spread of diseases (e.g. disease-carrying organisms typical of warmer regions, such as mosquitoes, are spreading to other areas, increasing cases of, for example, malaria, dengue and cholera).

2.1.2. Impacts of climate change: examples

- Increased temperature: since the mid-1800s the average global temperature has increased by about 0.6 degrees; it is currently projected to increase between 1.4°C and 5.8 °C over the course of the next 100 years.
- Continued retreat of glaciers and ice caps, putting populations at risk of floods and depriving them of water resources in the long-term.
- Rise of the sea level by 0.09 to 0.8 m between 1990 and 2100.
- Widespread droughts and crop failures in the drier climates of Asia, Africa and South America, leading to an increase in malnutrition and starvation.

(Sources: "Climate change and biodiversity in Europe"; © Crown copyright 2006 and "Biodiversity and Climate Change booklet", ©2007 Secretariat of the Convention on Biological Diversity)

European examples:

- European land areas have warmed up more rapidly than the global average, increasing by more than 1.2°C so far (IPCC, 2007). A further increase of 1.0-5.5°C is expected by the end of the 21st century (Christensen et al. 2007).
- Rainfall in Southern Europe decreased by 20% during the 20th century; it increased by 10-40% in Northern countries. Extreme weather events are expected to increase as well (EEA-JRC-WHO, 2008).
- Europe's snow cover has decreased by 1.3% during the past 40 years (EEA-JRC-WHO, 2008).

2.1.3. What next?

The IPCC has projected that the average global temperature will increase by between an additional 1.4°C and 5.8°C by 2100 if no actions are taken; a temperature rise of anywhere near 5.8°C within the relatively short space of one century is likely to have catastrophic consequences in human, economic and environmental terms. Thus, most scientists agree that global temperature rise should be limited to no more that 2°C above the pre-industrial level, since the available evidence suggests that beyond this threshold, severe impacts could increase markedly. (*Local Government Climate Roadmap – Briefing Sheet #2)*

Unfortunately, the impacts of climate change have expanded to such an extent that even if we could stop all emissions now, changes would continue well into the future. Therefore, major efforts must be made to reduce emissions, in favour

of cleaner and renewable energy sources. At the same time, we must increase adaptation and resilience efforts. As we will see further in the paper, biodiversity is not only affected by climate change but can also contribute very significantly to the effectiveness of mitigation and adaptation efforts.

3. Inter-relationship between climate change and biodiversity

Climate change and biodiversity are closely linked: climate change has severe direct and indirect impacts on biodiversity and is predicted to be a dominant driver of future biodiversity loss; at the same time, the loss of biodiversity magnifies the adverse effects of climate change. There are several other drivers of biodiversity loss including habitat degradation/destruction and the introduction of invasive alien species to ecosystems, but these threats will be magnified by the effects of climate change and are therefore linked to the same problem.

In the same way, biodiversity protection and climate change mitigation go hand-in-hand and are strongly co-dependant. Managing and protecting biodiversity will mitigate the negative impacts of climate change and help humans adapt to it; policies and actions aiming at limiting the effects of climate change will contribute to the protection of biodiversity.

Local governments are key players in the process of climate change mitigation and adaptation and should actively integrate biodiversity management into the corresponding climate strategies.

The strong link between climate change and biodiversity has been recognised also within the United Nations Framework convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD). In 2001, the CBD formed an Ad Hoc Technical Expert Group (AHTEG) on Biodiversity and Climate Change to consider the possible negative impacts of climate change on biodiversity and identify the role of biodiversity in climate change mitigation. The AHTEG produced a report at the end of 2009, which highlighted three main messages:

1) Biodiversity and associated ecosystems are impacted by climate change;
2) Biodiversity can help people mitigate climate change;
3) Biodiversity can help people adapt to climate change.

> ***Mitigation*** *refers to human actions intended to reduce greenhouse gas sources or enhance carbon sequestration, thus limiting the extent of global warming.*
>
> ***Adaptation*** *means actions in response to climate changes, moderating damages or exploiting beneficial opportunities.*
>
> *(UNFCCC glossary -http://www.unfccc.org.mk/documents/Glossary.pdf)*

3.1. Climate change impacts on biodiversity

> *Approximately 10% of species assessed so far will be at an increasingly higher risk of extinction for every 1°C rise in global mean temperature.*
> *(IPCC AR4)*

Ecosystems and their services change very gradually over time and are able to adapt to minor disturbances. The rapid rate of anthropogenic climate change, however, represents a disturbance so sudden and drastic that ecosystems around the world and on a variety of scales are being knocked off-balance and biodiversity is being lost at the fastest rate experienced in the last 65 million years – since the extinction of the dinosaurs. As species are lost, ecosystem functioning changes and the "services derived from them are also changed or lost.

Species that are not able to adapt may be able to relocate, but only if alternative suitable habitats exist and are accessible; otherwise, these species will become extinct in the wild. Effects of relocation could however have negative impacts for the species already existing in the new ecosystem that might feel threatened by the newly arrived ones. Climate change will also exacerbate other pressures acting on natural systems, including land use change, invasive alien species and disturbance by fire, that will in turn aggravate the effects of climate change.

3.1.1. Specific consequences of climate change on biodiversity:

Many impacts of climate change have already been observed and several others can be anticipated, affecting biodiversity also in the urban context.

Some examples are:

- Accelerated habitat loss causing changes in distributions - if unobstructed by natural or anthropogenic barriers, species will move towards the poles or to higher altitudes, searching for more favourable conditions; northern and high altitude species might consequently be lost.
- Increases in direct mortality as a result of thermal stress - plants and animals will be killed by higher air and water temperatures.
- Changes in reproduction cycles and in length of growing seasons for plants – the synchrony between a species' life-cycle and its availability of food and other resources upon which it depends might be lost (e.g. earlier hatching of birds does not correspond to the availability of insects, and neither does the earlier flowering of insect-pollinated plants).
- Biological invasions - invasive species are characteristically adaptive; with climate change adding stress on ecosystem, its ability to resist invasive species is limited. This leads to a decreased variety of species in an ecosystem, reducing its potential to provide the corresponding ecosystem services.
- Food web disruptions – e.g. breakdown of certain parts of the phytoplankton-zooplankton food web (at the base of the food chain) may occur, leading to much greater impacts higher up in the food chain.

Examples of impacts of climate change on European biodiversity:

- 19% of habitats and 12% of species of European interest are potentially threatened by climate change *(10 messages for 2010 Climate change and biodiversity, European Environment Agency, © EEA)*
- Observations on the Stubaier Alps in Austria have shown that plants are shifting towards higher altitudes. Species located near a mountain's peak and thus unable to move further upwards, were declining. *(10 messages for 2010 Climate change and biodiversity, European Environment Agency, © EEA)*
- A 3°C increase in temperature would cause such an upward shift of vegetation zones that a drastic biodiversity loss would occur; many of the current Alpine areas would be converted into montane and sub alpine forests. *(10 messages for 2010 Climate change and biodiversity, European Environment Agency, © EEA)*
- 50% of bogs, mires and fens are adversely affected. Their degradation contributes to climate change, since these habitats are important carbon stores and their decomposition releases greenhouse gases (GHG) into the atmosphere. *(10 messages for 2010 Climate change and biodiversity, European Environment Agency, © EEA)*
- Butterflies and bees are negatively impacted by heavy rains, causing a series of chain consequences for habitats and agriculture, due to reduced pollination, and for species higher up the food chain, like bats (*Biodiversity and adaptation to climate change – an advice note for local authorities*)
- Declines of Arctic Fox numbers have already been observed in certain Scandinavian populations, because of a corresponding decline of prey species (such as lemming and voles), whose habitats are heavily impacted by climate change. *(IUCN Red List - Species and climate change: More than just the Polar Bear; © 2009 IUCN)*
- The increasing air and water temperature is expected to have severe negative effects on salmons as well. Warmer water will cause physiological stress, increased depletion of energy reserves, increased susceptibility and exposure to disease and disruptions to breeding efforts. Higher air temperature will lead to earlier snow melting, increasing winter flows that feed the river systems, disturbing nets and causing physical damage to both salmon eggs and juveniles. *(IUCN Red List - Species and climate change: More than just the Polar Bear; © 2009 IUCN)*

3.2. Biodiversity contributes to climate protection

Resilience *refers to the amount of change a system can undergo without changing state, maintaining its core functions. Healthy ecosystems are naturally more resilient than degraded ones.*

Ecosystems and their biodiversity make a critical contribution in dealing with climate change. Typically, ecosystems rich in biodiversity are healthy ecosystems, which are more resilient to the impacts of climate change. They provide us with natural buffers against the impacts of climate change, especially extreme weather events. Healthy ecosystems also produce other environmental, economic and social benefits (e.g., supply and purification of water, provision of food, purification of air, provision of recreational areas etc.)

The resilience of ecosystems can be improved by implementing biodiversity based mitigation and adaptation strategies.

Box 1 - Carbon sequestration and biodiversity enhancement in South Africa

Climate change is predicted to have a number of significant impacts on eThekwini Municipality (the City of Durban). This will include dramatic impacts on the city's biodiversity. The Greening Durban 2010 Programme aims to put measures in place to offset the carbon emissions associated with hosting the 2010 FIFA Soccer World Cup events in Durban. The anticipated carbon emissions will need to be offset through carbon sequestration, through tree planting and reforestation, and carbon emissions reduction.

The Buffelsdraai Community Reforestation Project aims to offset some of these emissions while reducing poverty and enhancing biodiversity at the same time. The project assists rural communities in collecting seed, growing trees, planting these in the buffer zone of the Buffelsdraai Landfill, and maintaining them. The project aims to plant 62 500 trees on 150ha of forest land by July 2010, offsetting several thousand tons of carbon dioxide (CO_2) over a 20 year period.

This is the first community reforestation project for carbon sequestration within the city. In addition, the project will create an income generation opportunity for local communities as well as restoring biodiversity and the provision of ecosystem goods and services in an important upper catchment area.

(http://www.durban.gov.za/durban/services/epcpd/projects/buffelsdraai-community-reforestation-project)

3.2.1. Biodiversity and mitigation

Biodiversity management can help mitigate the effects of climate change by sequestering carbon and increasing energy efficiency measures.

The release of CO_2 through deforestation and land use change accounts for up to 25% of total human-induced greenhouse gas emissions. Plants, during their growth process, sequester carbon dioxide from the atmosphere and "store" it, thus reducing the amount of CO_2 in the air we breathe. Degrading or destroying ecosystems can release significant volumes of greenhouse gases (GHG) and,

combined with climate change, reduces their resilience and ability to respond to future stresses. An undisturbed ecosystem stores carbon and can thus mitigate GHG effects.

Cities that maintain and restore local biodiversity, increase urban green space and implement sustainable land use management activities will thus be effectively contributing to the mitigation of climate change.

Box 2 - Insulation green belt for housing estate in Trnava, Slovakia
Best practice from the European Capitals of Biodiversity competitions

The aim of the project of the Slovak municipality of Travna was the enlarging of public greenery as a natural forest park at the interface of residential houses and agricultural land under cultivation, which would be the basis for the protection of greenery and future internal continuous green rings in the system of urban greenery. The main goals were to improve living conditions of the housing estate situated close to the production agricultural land at the eastern suburb of the city, by eliminating the negative impacts of agricultural crop production; to reduce the impact of the wind and the soil erosion on the residential area and agricultural land; to increase the urban greenery in the area of at least 8 ha and to enlarge public natural formations for short rest and recreational activities on the east side of town.

Within the project, the land was bought from private owners and planted with native plant species, in line with the principles of establishing forests. These principals aim to shape this forest into becoming an educational or suburban forest park. Park benches and other public facilities were installed in the green belt area and areas where dogs could roam freely were introduced.

The outcomes of the project this far include:
1. Increase in soil protection, hygiene, relaxation and aesthetic values of the territory.
2. An 8ha increase in the amount of greenery in the city.
3. Creation of q green corridor in the city.
4. Increase in average comfort of housing in the affected area.
5. Assurance in the protection and filtering function of the air quality in the area.

For more information, see www.trnava.sk

Forests perform a valuable function in capturing and storing carbon, and deliver many other benefits to society (provision of food, fibre, wood, fresh water and soil nutrient; flood prevention and drought control; buffer against natural hazard; cultural benefits). Therefore, reducing emissions from deforestation and forest degradation (REDD) activities should also take biodiversity conservation and sustainable use into account. This leads to an enhanced resilience of forest ecosystem and the long-term stability of the carbon storage. Grasslands and wetlands are other important carbon stores that need to be preserved and protected. Biodiversity can also be used to increase energy efficiency, for example by decreasing the need for artificial cooling and heating in buildings through the construction of green roofs. Green roofs insulate the buildings beneath them, especially helping to keep them cool when the weather is hot, thereby decreasing the need for energy-hungry air conditioners. In addition, they

absorb rainfall, reducing stormwater runoff and lowering the risk of flooding in the city and provide important stepping stones for insects and birds.

3.2.2. Biodiversity and adaptation

Biodiversity can help humans adapt to the effects of climate change, thanks to the services that healthy ecosystems can provide.

Healthy ecosystems are better able to cope with the effects of climate change. A degraded ecosystem will likely have a lower biodiversity, resulting in less species that can survive the impacts of climate change. The more species that live in an ecosystem, the more chances they have to survive, thus ensuring that the ecosystems functions (and the services that we receive as a result) are maintained.

Box 3 - Vertical green for biodiversity and climate change adaptation in Hannover, Germany

Best practice from the European Capitals of Biodiversity competitions

Many residential areas in German cities built in the 19th and early 20th centuries were built to accommodate a quickly growing city population. These densely populated multi-story dwelling areas are today often characterised by the lack of private gardens, parks and even roadside trees. These urban districts not only lack recreational space for the residents, they are also deficient in climate change adaptation: there are no trees to filter the air, or to mitigate increase in temperatures.

When the city of Hannover was awarded “German Capital of Biodiversity 2011”, they received prize money of 25,000 Euros for biodiversity development in their city. The city decided to use this money for a pilot project to increase vertical green in a residential area as described above. Since there is no space for roadside trees – let alone parks – the facades and roofs of the existing buildings will be specifically targeted for increasing vegetation in the area. The main component of the pilot project will be a campaign to raise awareness and the acceptance among house owners, who are often reluctant to allow façade vegetation on their property. The main organisers of the project will be the local branch of the Friends of the Earth organization, and the results will be made available to be transferred to other city districts in Hannover and elsewhere.

For more information, see www.hannover.de

A healthy ecosystem can help adapt to the consequences of climate change in several ways, for example:

- forests absorb torrential rain and water flow, reducing the risk of flash floods, mud slides and soil erosion;
- natural river banks, compared to a concrete canal, are able to absorb more water; their vegetation slows down the river flow, thus reducing the risk of floods;

- wetlands, acting as a sponge, slow down the release of water that is gathered after rain and can provide flood mitigation services against stormsurges, coastal erosion and flood risk;
- mangroves and other coastal vegetation protect against extreme high-water events (storms).

Box 4 - Limburg, Netherlands, and the sand lizard

The sand lizard lives in heathland in Limburg; there are indications that by the end of this century the number of sand lizards might be heavily reduced as it loses suitable space and its habitat becomes increasingly isolated. A robust corridor is being created linking a chain of habitats on the eastern bank of the river Maas, on both sides of the Dutch-German border. The new habitat planned in the corridor would increase the likeliness of survival of the sand lizard. The effectiveness of the corridor relies also on a successful cooperative effort between Dutch and German planners.

(Planning for biodiversity as climate changes; BRANCH project final report - www.branchproject.org.uk)

Examples of mutual dependence of biodiversity and climate change:

- After the "Dustbowl" in the 1930's the perennial tussock grass, Agropyron cristatum, was introduced into the North American Great Plains. Tussock grass has lower root allocation than native prairie grasses. The soil under A.cristatum stores around 25% less carbon than the soil under native prairie grass. Overall this widespread invasion resulted in a reduction of 480 x 1012 g of carbon in the soil i.e. a huge flux of GHG into the atmosphere.
  [Christian, J. M.& Wilson, S. D. Long-term impacts of an introduced grass in the northern Great Plains. Ecology 80, 2397–2407 (1999)]
- In late-successional boreal forest, high altitude warming has increased the incidence of wild fires, which have in turn reduced the biomass of moss on the forest floor. Moss plays an important soil-insulating role in such forests and its removal leads to increased summer melting of the permafrost, which increases the rate of nutrient cycling and significantly alters the overlying plant species composition.
  [Van Cleve, K., Chapin, F. S. III, Dryness , C. T. & Viereck, L. A. Element cycling in taiga forest: state-factor control . BioScience 41, 78–88 (1991)]
- Models indicate that the replacement of deep-rooted trees with shallow-rooted pasture grass reduces evapotranspiration resulting in a warmer drier local climate.
  [Shukla, J., Nobre, C. & Sellers, P. Amazon deforestation and climate change. Science 247, 1322–1325 (1990)]

- Albedo (essentially the reflection of solar radiation) varies considerably depending upon land-use and significantly affects both near-surface temperatures and the global climate system.
  For more information, see:
  http://www.coaps.fsu.edu/pub/williams/AGC_presentation/Grindin_2009/New_papers/Betts_2001.pdf

4. The role of local governments

Local governments are key players in managing biodiversity and need to work towards **strengthening the resilience of ecosystems**, by maintaining, restoring and protecting them and their services. They need to plan ahead and include biodiversity in their local action plans; they must also be prepared to respond flexibly, adapting to a dynamic natural environment in constant change.

While working towards increasing the resilience of the ecosystems in their territory, local governments can **raise awareness** of its importance among its citizens. Biodiversity in cities provides citizens with access to nature, reminding and educating them about its importance. Therefore, any biodiversity conservation measure should be accompanied by capacity building, environmental education and community-based decision-making.

Managing biodiversity and maintaining healthy ecosystems does not only contribute to climate protection, but will also **improve the quality of life** in cities and towns. For example, increasing green areas by planting native species increases carbon sequestration, but contributes also to the beautification of an area, serves as sight and sound barrier, improves the local air quality, provides shade and leads to a cooler and more humid micro-climate, and offers recreational space to its citizens.

Highlighting the link between biodiversity and climate change can also bring **visibility to the issue of biodiversity**. Climate change is now the “hot” environmental topic, attracting most of the general public attention and public or private funding within the broader field of environmental sustainability. As important as the issue of climate change is, it is key to not lose sight of other crucial environmental issues, which are as relevant to the well-being of humankind, but might be neglected. It is thus very important that government officials, as well as citizens, fully understand the strong mutual dependency of the two.

Box 5 - The Cumbria High Fells, England

The Cumbria High Fells area is the most mountainous landscape in England and contains some of England's richest and most diverse habitats (e.g. heathlands and blanket bogs; 153 protected species; internationally important assemblages of breeding birds). The area offers popular tourist and recreation sites and provides very important ecosystem services, such as water supply, carbon storage, flood protection, and food, fibre and building material. The Character Area Climate Change Project, implemented by Natural England, has identified likely impacts of climate change on the area, as a consequence mainly of the rise in temperature, winter and summer rainfall changes and increased storminess. Some of these impacts include loss of species, increase in peat and bracken fires, decrease in lake water levels and larger presence of nutrients in lakes and rivers caused by increased soil erosion due to intensified rainfalls.

To respond to these impacts, some adaptation measures have been identified, to prevent the loss of natural environmental assets and the social and economic benefits that they provide:

- increase the resilience of the environment (e.g. ensuring sustainable grazing; encouraging return to semi-natural habitat);
- develop a high carbon landscape (protecting solid carbon stores and improving the ability of blanket bogs and woodlands to sequester carbon dioxide);
- reduce sources of harm not linked to climate (limiting pressures from agriculture pollution, sewage treatment discharge and air pollution);
- develop ecologically robust and varied landscape (increasing variation within existing habitats and expanding them through restoration and creation).

For more detailed information about Cumbria High Fells adaptation measures and the project, see http://naturalengland.etraderstores.com/NaturalEnglandShop/NE115

4.1. What can my local government do?

Your municipality can also effectively contribute to protecting the climate through appropriate management of local biodiversity. Your city, town or village needs to focus on the identification and implementation of ecosystem-based protection measures, to limit the adverse effects upon and degradation of ecosystem functions and services. It also needs to invest in the preservation and restoration of local habitats in order to increase protection against climate change impacts.

Your local government can approach biodiversity protection via several capacities:

1) By integrating biodiversity management in the municipal services it is responsible for;
2) By imposing conditions on the use and management of forests and lands owned by the municipality;
3) By raising awareness and promoting biodiversity protection among its citizens
4) By linking up and co-operating with neighbouring authorities and other levels of government.

More specifically, your municipality can:

Analyse and monitor changes in your local biodiversity

- Identify, as well as possible, the cases where biodiversity changes or loss are caused or exacerbated by climate change.
- Gather local data on climate change to help develop local indicators.
- Set up and implement a monitoring system, using appropriate indicators and observing species that are particularly sensitive to effects of climate change (e.g. amphibians).

Box 6 - Rehabilitation of the Old Lake in Tata, Hungary
Best practice from the European Capitals of Biodiversity competitions

The Old Lake of Tata is regarded as one of the most significant lakes of the Central Transdanubian Region; with its 220 ha water surface it is the oldest (almost 700 year old) artificial fishing lake in Hungary and plays a key role in water sports and tourism, international environmental protection, as well as being an important architectural heritage site. As one of Central Europe's most important wintering areas for water birds, the area came under the protection of the Ramsar Convention in 1989.

The urbanisation, industrialisation, climate change and agricultural development of the catchment area have led to several environmental issues (drying karst-wells, air, soil and water pollution...) in recent decades. As a result, Tata and the Old Lake lost their national resort status. The water quality of the Old Lake and Által-ér (water course) deteriorated, becoming unsuitable for bathing.

Sedimentation, eutrophication and basin degeneration on water courses led to a reduction in water conveyor abilities and a decline in the condition of the water structures. To stop the process, a rehabilitation plan for the Old Lake was developed bringing among others, the following results:

- the reconstruction of the out-flow system of Által-ér
- the renovation of the Old Lake locks
- clearance of the inland water pipeline (sediment removal, bush-cutting)
- improvement of the upper line of Által-ér
- preparation of a filtration system in Tata in 20 ha
- preparation of a filtration system in Bánhida in 11 ha
- reconstruction of the Old Lake on 15 ha (habitat reconstruction, the establishment of nature trails and islands)
- development of a water quality control system
- restoration of the shore line of the Old Lake (forming a green path along 900 m)

The implementation of this project contributes to both environmental and nature protection, as well as social and water management aspects.

For more information, see www.tata.hu

Integrate biodiversity protection in your local planning

- Factor climate change risks into infrastructure planning and the design of municipal services.
- Adapt urban development plans to increase ecological corridors; partner up with neighbouring authorities and other institutions to allow for large scale connectivity.
- Implement greenhouse gas reduction activities: improve and extend public transport, promote use of renewable energy sources and implement energy efficiency measures; provide incentives to private and corporate stakeholders in investing into renewable energy and energy efficiency.
- Encourage cultivation of native vegetation on private properties by providing the necessary regulatory framework and resources (e.g. a municipal nursery providing each household with a certain number of native plants).
- Implement a portfolio of land use management activities, including the protection and sustainable management of natural forest, sustainable wetland management, restoration of degraded wetlands and environmentally-friendly agricultural practices.
- Develop policies and measures that promote the protection and/or restoration of ecosystems such as natural forests.
- Use products produced in an ecologically sustainable way, decreasing the pressure on biodiversity in the countries of origins, and lower the consumption of meat in public canteens, in favour of organically and locally produced food, thus reducing GHG emissions.

Box 7 – Vegetarian day in Bremen

Following the example of Gent, in Belgium, the city of Bremen, in Germany, has recently introduced the “Veggie Day”; one day a week, on Thursday, the consumption of meat in canteens, restaurants, nurseries and schools is to be avoided. The idea behind is that even if one day a week for climate protection does not seem so much (and does thus not require much effort), 52 days a year are: if all 550,000 inhabitants of Bremen ate vegetarian once a week, the CO_2 emissions corresponding to those of 40,000 cars could be saved. Gradually, a growing number of institutions and organisations such as churches, schools, university cafeterias, canteens and restaurants are joining the "Veggie day". A website explaining the reasons behind, providing information about climate change and listing a series of vegetarian receipts supports the campaign. For more information, see http://www.veggiday.de

Enhance the resilience of ecosystems

- Create refuges and buffer zones and establish ecological networks, linking habitats via corridors and stepping-stones.
- Reversing landscape fragmentation and expand the surface of habitat available, creating more areas where ecosystems can survive and better connectivity between fragments.

- Increase tree cover and green space to cool down temperatures, create more liveable micro-climates, increase biodiversity and enhance carbon sequestration.
- Protect and restore biologically diverse habitats and expand protected areas to increase species' survival.
- Protect and restore riverine and coastal vegetation, for example where rivers have been canalised; make space for the natural development of rivers.
- Maintain and restore native ecosystems and manage habitats for endangered species.
- Conserve and enhance variation within the landscape.
- Reduce sources of harm not linked to climate, to make species and their habitats less vulnerable to the stress of climate change.

Box 8 - Green ring against climate change in Vitoria-Gasteiz, Spain
Best practice from the European Capitals of Biodiversity competitions

The Spanish Basque Region is one of the most industrialised territories of the country and therefore needs to find solutions to problems concerning pollution and climate change. The region and cities are suffering chronic water shortages, an increasing phenomenon affecting the whole country. The council of Vitoria-Gasteiz, where 65% of gas emissions comes from energy consumption of the industrial and transport sectors, has adopted a series of policies aiming to face climate change.

In 2006, the City Council approved the "Vitoria-Gasteiz' Climate Change Prevention Strategy 2006-2012". One of the core objectives of this plan is the improvement of the quality of the "anillo verde", a green ring surrounding the city. Initially created as a system of parks and green areas to regenerate degraded suburbs, it has evolved into a precious instrument to protect the city and educate citizens to respect the environment. Various activities are on-going, including the possibility to cultivate land.

For more information see www.vitoria-gasteiz.org

Raise awareness among your citizens

Local measures have a greater chance of success if supported and implemented with the participation of citizens. Raising awareness among them and policy-makers will ensure understanding and willingness to adopt adaptation principles. *(see training module on "Communicating biodiversity")*

Box 9 - Educational orchard in Grande-Synthe, France
Best practice from the European Capitals of Biodiversity competitions

The city of Grande-Synthe, which was formerly heavily engaged in the industrial sector, has undergone a transformation in recent years to become a haven for biodiversity. One of the most outstanding examples is the educational orchard: in its “Fruitier” building the public can learn about the steps of plant’s growth and many educational activities are organized also during weekends.

At the same time, the orchard has been used for planting and growing local and regional fruit tree species long forgotten, such as: the « cabarette » apple or the «belle fleur double » apple. A peripheral diversified hedge has been planted, mostly to act as wind breaker, but serving also as an excellent example of biological protection with its 50 species of trees, 72 different types of shrubs, 30 kinds of rosebushes and 12 species of vines. This complex mix has created a micro-ecosystem all year long for all species, since the availability of both winter and spring food enhances the insects’ reproduction potential and therefore impacts the orchard’s protection. The hedge shelters useful insects as well as insectivore mammals. The introduction of endangered bees in the less visited areas of the orchard enhanced the pollination of fruit trees and increased their production.

For more information, see www.ville-grande-synthe.fr

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