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Biodiversity and climate change

- Global climate change and biodiversity loss are connected: when the climate changes, particular species will disappear from their current habitat and new species will appear.
- Conversely, biodiversity management can be an important means for helping slow down climate change and its impacts.
- Local and regional governments can benefit in many ways from integrating biodiversity management into climate protection and adaptation strategies.

Climate change will result in biodiversity change

Over the course of history, ecosystems have always had to adapt to changing climatic conditions. The current rate of climate change, however, is higher than ever recorded. It is now obvious that humans have impacted biodiversity loss - directly through the destruction of habitats, and indirectly through climate change.

Current rates of climate change have already resulted in species composition changes. As the climate warms up or cools down, many local species have to shift from their current habitat to areas better suited to their needs. This means that with rising average temperatures many species will experience a range shift towards the poles, potentially push-

ing out existing species in those areas. In other cases warming will cause species to shift their ranges upwards along altitudinal gradients, with the same effect.

Changing temperatures will also influence their reproductive cycles, their growth patterns and, also as a result of range shifts, the interaction between species. All this may occur over time frames as short as decades.

Affected species are likely to include those to which humankind has attached various values (e.g. cultural emblems, indigenous crops, plants that typically mark the landscape). This will also include wild plants that are locally used, such as medicinal herbs, mushrooms and

wild flowers. Examples of the urban impacts of such species changes are:

- Loss of trees in streets, gardens and parks, as changing temperatures add stress and reduce their resilience to pests;
- Loss of species and damage of (municipal) forests, reducing economic gains as well as recreational values;
- Risk of collapsing waste water treatment systems as micro-organisms are vulnerable to temperature differences;
- Damages to flora and fauna through the immigrating of (alien) species;
- Risks to human health through the immigration of disease carrying insects such as mosquitoes.

Cities can help species adapt to climate change

Changes to local biological diversity and species composition poses tremendous challenges to conservation planning and implementation. Common conservation practices need to be revised in order to accommodate the current and future challenges resulting from climate change.

If rapid and irreversible change in biodiversity is to be avoided, conservation strategies need to focus more on supporting the species' natural capacity to adapt to change. Beyond a moral obligation to act, helping species to adapt may also avoid the loss of important ecosystem services and the cultural and economic values attached to particular species.

At the local and regional level, conservation planning

and action needs to include the creation of networks of protected areas. This will increase the 'connectivity' of the landscape and enable species to gradually shift from their current habitats to more suitable ones.

Cities and towns in fact have an important function as habitat corridors for flora and fauna. If biodiversity can exist only in mere 'islands' within an otherwise inhospitable

landscape, many species will not be able to survive climatic changes as they cannot migrate to other areas.

Local and regional authorities can restructure their urban development plans and zoning to allow for the gradual creation of biodiversity corridors, for example along linear infrastructure elements such as rivers, roads and railway lines.



Some changes that will occur in ecosystems as a result of climate change:

- Accelerated habitat loss: Small islands of habitats may not be able to sustain themselves as the climate changes;
- Changes in range: The geographical range of many species will move towards the poles or higher in altitude (CBD 2003);
- Increased extinction rates: Many species that are already threatened are likely to become extinct;
- Changes in physiology: For example reproduction timings, duration of growth season for plants.

Biodiversity can help protect the climate

Biodiversity also plays a crucial but often underestimated role in the mitigation of climate change. Mitigation refers to actions that reduce the extent of global warming. The biological diversity of ecosystems is a key factor in ensuring the natural processes undertaken by ecosystems.

One of these processes is growth. As they grow, plants, fungi and soil bacteria work together to bind carbon dioxide gas from the atmosphere into the soil, wood and other organic matter. This process 'sequesters' carbon dioxide from the atmosphere, thereby helping to reduce the

amount of this greenhouse gas, which is most responsible for global warming.

The release of CO₂ through deforestation and land use change accounts for as much as 25% of total human-induced greenhouse gas emissions. Maintaining local biodiversity and increasing urban green space, in particular forest areas, therefore are significant and effective contributions towards protecting the global climate.

Apart from conserving green areas, local and regional authorities can provide the regulatory framework for encouraging vegetation growth on private properties.

Increasing the green areas in densely populated areas does not only contribute to global climate protection. Trees and other vegetation also help improve the local air quality, provide shade and lead to a cooler and

more humid microclimate, which is particularly relevant in hot climates and seasons. Investing in global climate protection will quickly pay off locally and improve the quality of life in cities and towns.



Biodiversity management is vital for human adaptation to climate change

As the climate changes, extreme weather events such as storms, floods, droughts and heat waves are expected to become more intense and unpredictable.

Healthy ecosystems play a crucial role in mitigating the impact of climate-induced disasters. For example, a biologically diverse and healthy forest ecosystem has a high capacity to absorb torrential rain. It provides tree cover and undergrowth that can reduce the erosive impact of intense precipitation, slow down the surface run-off and support the seepage of rain water into the soil and lower rock beds. These processes help reduce the risk of flash floods, mud slides and soil erosion. Conserving a patch of native vegetation may therefore be a key component of integrated disaster risk reduction in the face of climate change.

Local and regional authorities will be called upon to take action to effectively use their regulatory capacity to help infrastructure systems and people adapt to a changing climate. The destructive

impact of climate-related disasters on human settlements depends considerably on the ability of local and regional authorities to effectively factor climate change risks in infrastructure planning and the design of municipal services.

Biodiversity management therefore needs to become integrated with disaster risk reduction planning and emergency response. For example, local and regional authorities can help reduce flood risks by protecting and restoring riverine and coastal vegetation. This will help regulate a more even flow of water in a catchment, reducing the impacts of extreme precipitation, storm surges or coastal wave action. In vegetated areas, the rate of water seepage into the ground is also higher, which reduces the impacts of droughts.

All these measures will support local economic and infrastructure systems to adapt to a changing climate. If carefully planned based on local indicators for climate change, even technologi-

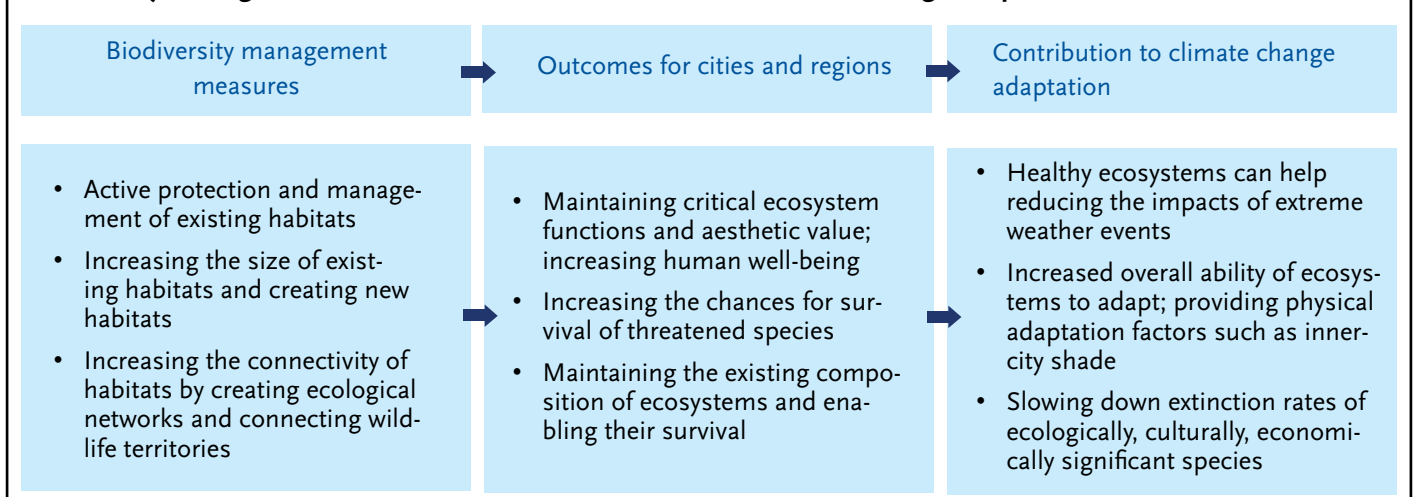
cally simple and inexpensive measures can result in tremendous benefits. While national governments in many countries provide national adaptation plans, local and regional authorities have the challenging task to gather local data on climate change and making responsible decisions for local adaptation to climate change.

Such comprehensive 'anticipatory adaptation' will need

to focus on technological, socio-economic and ecological support mechanisms alike. Conserving healthy ecosystems and promoting the adaptive capacity of species helps ensure that urban and rural environments can retain their 'fitness' and continue to provide the ecosystem services so vital for their inhabitants, despite the uncertainties of a changing local climate.



Biodiversity management measures and their contribution to climate change adaptation



Cities and regions: Biodiversity management for mitigation and adaptation

Local and regional authorities are key players in coordinating and implementing biodiversity management measures that take climate change into account.

For helping species to adapt to climate change, they can:

- Adapt zoning and urban development plans to increase the connectivity of habitats to enable species to migrate more easily;
- Protect biologically diverse habitats and plan for an expansion of protected areas to increase the probability for species' local survival despite climate change;

For protecting the climate and mitigate further climate change, local and regional authorities can:

- Participate in climate protection programs

(such as the Cities for Climate Protection Campaign) that effectively reduce greenhouse gas emissions, for example through an extension of public transport, energy efficiency measures and the tapping of renewable energy sources;

- Invest in the planting of trees to increase carbon sequestration;
- Provide incentives for private and corporate stakeholders to invest in renewable energy and energy efficiency.

Lastly, as climate change can no longer be avoided, local and regional authorities need to regulate and plan for the adaptation of human activity to a changing climate.

This can include:

- Increasing tree cover and

green space in urban areas to cool local temperatures down during the hot season and create more liveable microclimates;

- Protect and restore riverine or coastal vegetation for reducing the risks of flooding as a result of extreme weather events;
- Rehabilitate and diversify municipal forests and wetlands to help regulate a more evenly distributed flow in watersheds.

These are only a few examples of local and regional action for integrated biodiversity management that should help inspire creative planning and management processes suited for tackling the local and regional specific impacts of climate change.



This document is part of a series of factsheets that are intended to provide guidance and information on biodiversity management to decision-makers at the local and regional level. For more detailed information on how local and regional authorities have contributed to stopping biodiversity loss, please visit our web site www.countdown2010.net/lara or contact us directly. All factsheets can be downloaded from www.countdown2010.net/lara.



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Facts & figures

- The rate of climate change is projected to be faster than in the previous 10 000 years.
- Higher latitude and coastal ecosystems are most likely to experience the most severe effects from climate change.
- Although the increased CO₂ concentration is beneficial to many plants, its net effect on ecosystem productivity can be negative in some parts of the world.

Urban biodiversity...

is biological diversity of urban areas. It is heavily influenced by the built environment and the economic, social and cultural dynamics of these densely populated places.

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