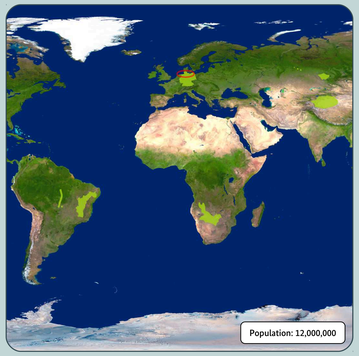
COMTESS
Sustainable coastal land management



"We have to adapt to climate change. The drainage system is not capable to deal with future structural changes."

Sea level rise, stronger storm surges and heavier rainfall in winter are the potential consequences of climate change that could threaten coastal regions of the North and Baltic Seas. The collaborative project COMTESS (Sustainable COastal Land Management: Trade-offs in EcoSystem Services) investigates impacts of existing and new land use strategies in the coastal areas on ecosystem functions and services under the influence of climate change. The researchers have analysed environmental, economic and social conditions and assessed different land management options from socio-ecological and economic angles.
By using different land management options and considering local environmental and socio-economic conditions, COMTESS aims to provide new land use strategies, assess and quantify the ecosystem functions and services, and extrapolate the results to the landscape level by means of statistical and process-based models. Together with stakeholders, decision-oriented recommendations for promoting the sustainable use of vulnerable coastal areas are developed. Based on these findings, COMTESS provides scientific and action oriented contributions to the design of multifunctional coastal zone management.

Acronyms

COMTESS	Sustainable COastal Land Management: Trade-offs in EcoSystem Services
CO2	carbon dioxide
t	ton

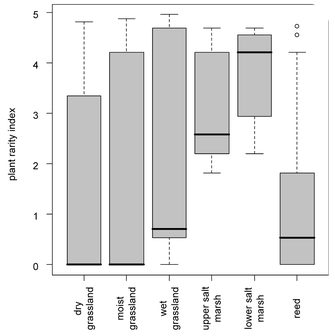
Not all five Strategic Goals are covered due to the following reasons:

The focus of the research project was on the effects on ecosystem services and therefore only some of the Aichi targets were addressed and are shown here.

B

Areas for water retention improve water management and biodiversity in a region with intensive agricultural land use

In the need of adaptation to impacts of climate change such as increasing sea level and precipitation, an adaptation of the water management in low elevated parts along the north-western European coastline will be necessary. One possible strategy is the construction of water retention areas enclosed by dams to store excess water in periods with high rainfall and high sea level, when natural discharge into the sea is impossible.
Today, the low elevated parts, which could potentially act as water retention areas, are drained with a dense network of ditches. The water is pumped into the sea. The drained land is used as crop fields and pastures. Drainage and intensive agricultural land use led to a loss of biodiversity.
By converting low elevated parts of the landscape to water retention areas as polders, intensive drainage is ceased and ground water levels increase to a natural level. Intensive agricultural land use will probably be impossible in the retention areas and less intensively used and temporarily flooded grasslands may establish. This management may restore former habitats and increase the biodiversity in the region.



Plant rarity index of different grassland types, salt marshes on coastal marshes and reed

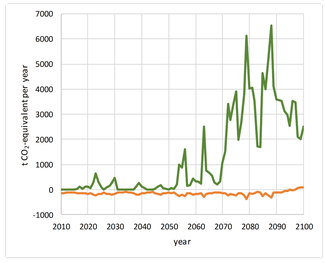
Water management can lead to less intensive agricultural land use with increased biodiversity

Due to development of water retention areas with less intensive land use the pollution of excess nutrients is reduced and natural nutrient sinks (e.g. bogs) can be restored

D

In water retention areas carbon stocks increase and the whole catchment becomes more resilient

By changing the water management and the construction of water retention areas, resilience will increase. Storage of excess rainwater will decrease the frequency of flooding events on arable land and pastures, even with increasing winter rainfalls in the future.
In the water retention areas land use will change from intensive agricultural land use to grazing with low stocking densities and even cessation of agricultural land use in very low elevations. Crop fields will cease to occur in the regularly flooded parts of the retention areas. Although intensively used agricultural land will be lost, the resilience of the whole region will increase and flooding of settlements and valuable agricultural land will be prevented in the whole catchment.
In case of extreme events, due to the changes in water retention, the vulnerability of the region decreases. Additionally, the whole system will better cope and recover with and from extreme events without sacrificing the provision of ecosystem services.
Due to the wet conditions, reeds will develop in the future water retention areas, likely with an increase in carbon stocks.
The figure below shows the carbon dioxide sequestrated under wet conditions without agricultural land use (green line). For comparison, a 'business as usual' scenario without water retention areas is shown (orange line). With higher sea water level from 2060 onwards the carbon sequestration increases in the water retention areas without agricultural land use and support mitigation of climate change by reduction of carbon dioxide in the atmosphere.



Annual regional sums of carbon dioxide sequestration for two land management scenarios

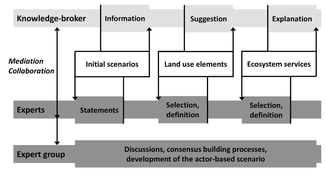
Due to change in water management, the natural ecosystems are restored and essential ecosystem services increase, especially regulating and supporting services

Enhancement of carbon stocks and resilience due to water management strategies

E

Generation, transfer and application of scientific results by stakeholder participation in integrated assessment and planning of vulnerable coastal regions

Participatory processes are necessary to raise the awareness and find adaptive solutions to tackle the impacts of climate change. Stakeholder participation is a process where stakeholders play an active role in designing research outcomes and their effectiveness, focusing on their local knowledge, experiences, preferences and needs. Researchers served as knowledge-broker by providing the context (land use) and detailed information (ecosystem services) and engaging decision-alternatives (land management scenarios). The knowledge-broker communicated the necessary ecological knowledge, ensured that the process was transparent and comprehensive, and gave feedback showing the results of every step taken in the process. Additionally, the knowledge-broker translated research results to facilitate the dialogue between the different sectors and strengthen the collaboration.
The interactions between knowledge-broker, individual experts and the expert group had different steps. Semi-structured interviews served as communication platform to introduce land management scenarios and to gain initial statements concerning these options. The story lines delivered ideas for future development of the case study region. Together with the experts, a list of land use elements was compiled to point out changes in land use. Likewise, a list of ecosystem services potentially associated with these elements was compiled. For each scenario, the stakeholders were asked to select suitable land use elements and the corresponding ecosystem services. This was followed by regional forums, where different options were discussed. These interactive processes ensured a cross sectoral exchange, allowed each sector to contribute individually and a consensus building processes started.
The main advantage of participatory processes is that they lead to improved decision making by integrating innovative and anticipatory thinking of different stakeholder groups to transfer plans into action. In addition, mutual learning and information exchange processes, power sharing, and joint decision making enables an ecosystem-based management and implementation of new land management options.



Interactions between the knowledge-broker, experts and the expert group

Knowledge broker for development and dissemination of research results

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COMTESS

FONA Research for Sustainable Development
BMBF

DLR Project Management Agency

Convention on Biological Diversity

2011-2020 United Nations Decade on Biodiversity

IMPRINT

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2016

AICHI BIODIVERSITY TARGETS
STRATEGIC GOALS

A Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1: By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Target 3: By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.

Target 4: By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

B Reduce the direct pressures on biodiversity and promote sustainable use

Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Target 6: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

C To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

D Enhance the benefits to all from biodiversity and ecosystem services

Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

E Enhance implementation through participatory planning, knowledge management and capacity building

Target 17: By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Target 20: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.