

SITUATIONAL ANALYSIS

on nature-based Carbon Offsets



CATALOGUE OF GOOD PRACTICES & MAPPING OF CARBON SINKS

**Free Hanseatic City of Bremen (Germany)
2023**

This Situational Study has been prepared by the Ministry for Environment, Climate and Science of the Free Hanseatic City of Bremen behalf of Bremen in the framework of Interreg Europe programme project Nature-based Carbon Offsets (NACAO). The Nature-based Carbon Offsets (NACAO) project receives financial support from the European Union (Interreg Europe/ERDF). This publication reflects the author's views only and the Interreg Europe programme authorities are not liable for any use that may be made of the information contained therein.

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1. Introduction

Climate change is one of the greatest challenges requiring urgent policy action. The climate crisis is dire. We pollute a lot. We have known that for a long time. What is new is that we are increasingly putting up resources: firstly, reducing emissions, individually and collectively; and, secondly, offsetting them by investing in clean projects.

The compensation of GHG emissions is, in general, a topic underdeveloped by the public administration and, when developed, very limited and traditional measures are entered into force.

In this sense, NACAO (Nature-based Carbon Offsets) project aims at being an accelerator for regional governments with competencies on climate change throughout Europe actively approaching the offsetting of carbon emissions, in this case by developing nature-based solutions and policies contributing to the offsetting of emissions through them.

During the project, regional governments with competencies on environment and climate change from the Northern, Southern, Eastern and Western of Europe will share green and blue carbon solutions and policies in force aiming at the preservation, restoration and improvement of natural sites acting as carbon sinks, such as forests, wetlands and other ecosystems, that compensate GHG emissions. Also, their experiences on carbon credits and emissions markets related to nature-based solutions.

The ultimate aim is for the partners to increase their knowledge and capacity to implement in their regions green and blue carbon initiatives and policies learned during the cooperation, regions thus contributing to the mitigation and adaptation to climate change.

The project brings together 6 partners from 6 countries (Spain, Italy, Poland, France, Finland and Germany) to improve their policy instruments addressed so that they develop the compensation of GHG emissions through the use of nature-based interventions.

Object and scope of Situational Studies

The aim is gathering all the good practices and experiences (success and unsuccessful) developed in the field that will be shared as well as mapping the green and blue carbon sinks in the regions where the lessons learnt during the cooperation could be applied.

2. Regional context

In 2022, the Senate of the Free Hanseatic City of Bremen adopted the **Climate Protection Strategy 2038** with the objective to bring CO₂ emissions in the State of Bremen down to at least 85 percent in 2033 and at least 95 percent by 2038 compared to 1990 (including the steel industry). These ambitious climate targets became legally binding with the amendment of the **Bremen Climate Protection and Energy Act** at the 19th of April 2023.

In 2020 the carbon emissions in the state of Bremen were reduced by 31 percent compared to 1990 (cf. *Bericht der Verwaltung für die Sitzung der Deputation für Klima, Umwelt, Landwirtschaft und Tierökologie 2020*). The consumer group "households, trade, commerce, services, other consumers" accounted for the largest share of CO₂ emissions in the state of Bremen (excluding the steel industry), at around 46 percent. The manufacturing sector accounted for around 29 percent and the transport sector for around 26 percent of carbon emissions. Monitoring of carbon emissions is conducted by the Bremen State Statistical Office (source balance).

The **Climate Action Plan** is designed as a practical working tool to achieve climate neutrality in 2038. It is intended to operationalize the **Climate Protection Strategy 2038 of the Free Hanseatic City of Bremen** at the level of measures and to serve to review, evaluate and further develop the measures until net zero CO₂ emissions are achieved. The *Climate Action Plan* is updated regularly, at least annually, by all departments for which lately a webtool ([link to test version](#)) was introduced.

In NACAO the focus of the subproject at the Free Hanseatic City of Bremen is on two measures for nature-based climate change mitigation.

Firstly, we will improve and further developed the *unsealing and greening program* for public areas (e.g., plazas, schoolyards, parking lots, traffic areas if applicable), with is one out of 200 measures within the *Climate Action Plan*.

The overall goal of the *unsealing and greening program* is climate-friendly urban development and the avoidance of land sealing (among others through securing and developing green and open spaces that have a positive impact on the climate). Currently all measures of the *Climate Action Plan*, including the *unsealing and greening program*, are conceptualised. The *unsealing and greening program* is meant to have effects in the long-term, with to be quantified target numbers for 2030 and 2038.

As a town state, a large potential in Bremen for nature-based carbon offsetting lies in urban green infrastructure. To strengthen urban green for climate change mitigation and adaptation Bremen has recently made green roofs mandatory for new buildings with flat roofs from a size of 50 square meters and has banned gravel gardens by the year 2027. As a town state with a scarce areas, Bremen is sensitive for a sparing use of open spaces for both housing and industry, focusses on the development within the green meadow belt surrounding the city and has been given priority to the development of brown fields, e.g. formerly used by the shipyard and shipping industry

Secondly, we report, evaluate and discuss experience from the water management of the wet grasslands on peat soil surrounding the City of Bremen.

Bremen is the federal state of Germany with the highest share of grassland in its agriculture. The grassland is characterised by being interspersed with ditches to manage the water level, originally created to drain the pastures, some of which are on peat soils (see Figure 1). Overall, in the commune Bremen peat soils cover 4.000 ha and in the commune Bremerhaven 600 ha. In 2021, on the national level drained peat soils accounted for 7 percent of the entire national greenhouse gas emissions (UBA 2023).

First pilot studies are underway to explore, how the characteristic ditch system, originally constructed to drain pasture, can be modified and used to actively manage the water level in order to reduce carbon emission from peat soils. Further refinement is necessary, to scale-up and mainstream this approach so that in the mid-term the active water management of grasslands can become an effective nature-based climate change mitigation instrument.

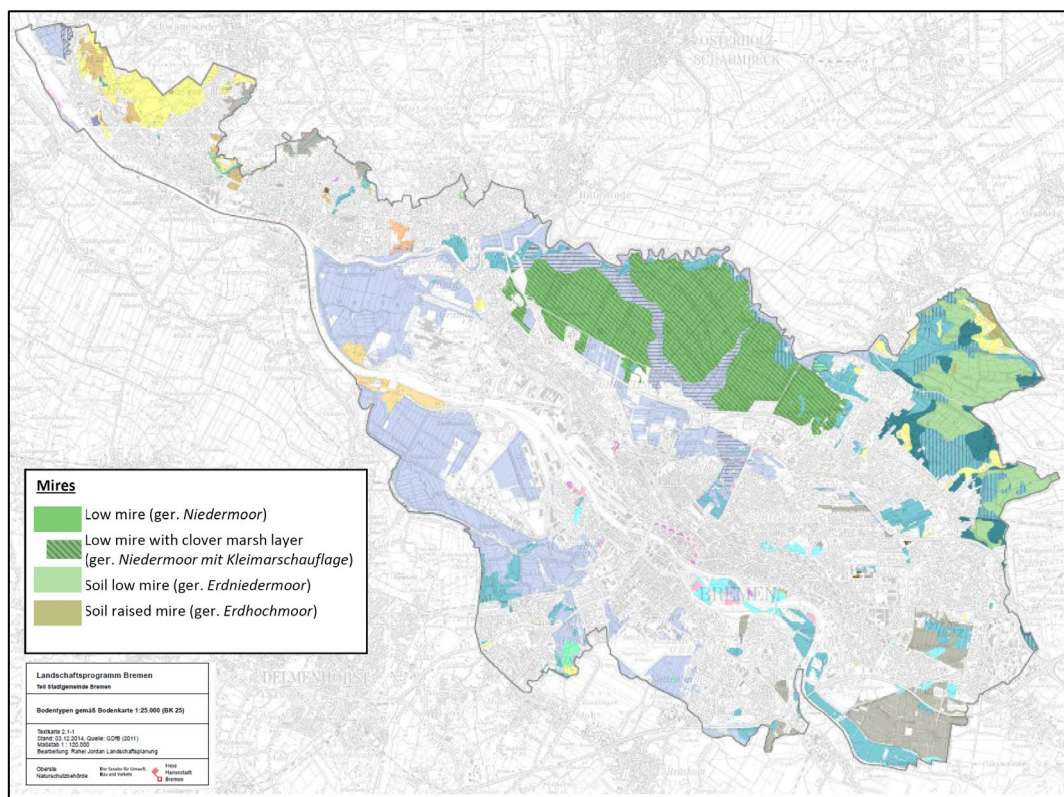


Figure 1: Occurrence of peat soils (mires) in the area of the Free Hanseatic City of Bremen (commune). Adapted from Landschaftsprogramm Bremen 2015 Bodentypen gemäß Bodenkarte

(Source: https://www.lapro-bremen.de/assets/Lapro-Plan/Textkarten/Textkarte_2.1-1_Bodentypen_Pub_1511.pdf)

3. Regulatory and Policy framework for Climate Change

Already in 2009, the Senate of the Free Hanseatic City of Bremen adopted the *Climate Protection and Energy Program 2020* (KEP 2020) and defined a target and roadmap for reducing CO₂ emissions in the state of Bremen. The *Bremen Climate Protection and Energy Act* (BremKEG), which came into force on March 27, 2015, created legally binding force for the target, stipulating that Bremen reduces its CO₂ emissions by at least 40 percent by 2020 compared to 1990 levels.

The BremKEG and KEP 2020 laid the first foundations for effective and sustainable climate and resource protection. Progress was reported every five years as part of the KEP management. With the amended version of the BremKEG, which came into force on April 19, 2023, the reporting requirements were adjusted.

Due to the failure to meet the set CO₂ savings targets, the Bremen Parliament appointed a cross-party commission of inquiry ("Enquete Commission") in January 2020 to develop a "*Climate Protection Strategy for the State of Bremen*". The commission was composed of nine members of the parliament, nine experts and 15 permanent guests from associations, chambers and administration from Bremen and Bremerhaven. The Enquete Commission began its work in May 2020 and presented its final report in December 2021. This comprehensive report was acknowledged by the Bremen Parliament on February 23, 2022. On the basis of the final report of the Enquete Commission and the corresponding parliamentary resolution, the Senate made fundamental decisions on how to deal with the results of the Enquete Commission "*Climate Protection Strategy for the State of Bremen*" with the resolutions of May 3, 2022 and June 7, 2022.

The "***Climate Protection Strategy 2038 of the Free Hanseatic City of Bremen***" builds on the findings and recommendations from the final report of the Enquete Commission. It consists of four elements:

1. **State Climate Protection Program**, which defines and establishes the structures and processes necessary to achieve the climate targets.
2. **Climate Action Plan**, which takes up the Enquete Commission's recommendations for action in their entirety, operationalizes them and continuously implements and updates them as an integrated catalog of measures,
3. The **Senate's "fast lane" measures for prioritizing carbon mitigation measures** that are to be pursued with particular urgency due to their effectiveness, and
4. **Climate protection financing concept**, which sets out the financing system.

The overarching goal of the State Climate Protection Program is to set a framework that enables the gradual and lasting reduction of CO₂ emissions in the State of Bremen.

The Senate of the Free Hanseatic City of Bremen has decided to base its future policy on the objective of reducing carbon emissions in the state of Bremen by at least 60 percent by 2030, by at least 85 percent by 2033 and by at least 95 percent by 2038 compared with the level in the base year 1990 including the steel industry (see Figure 1).

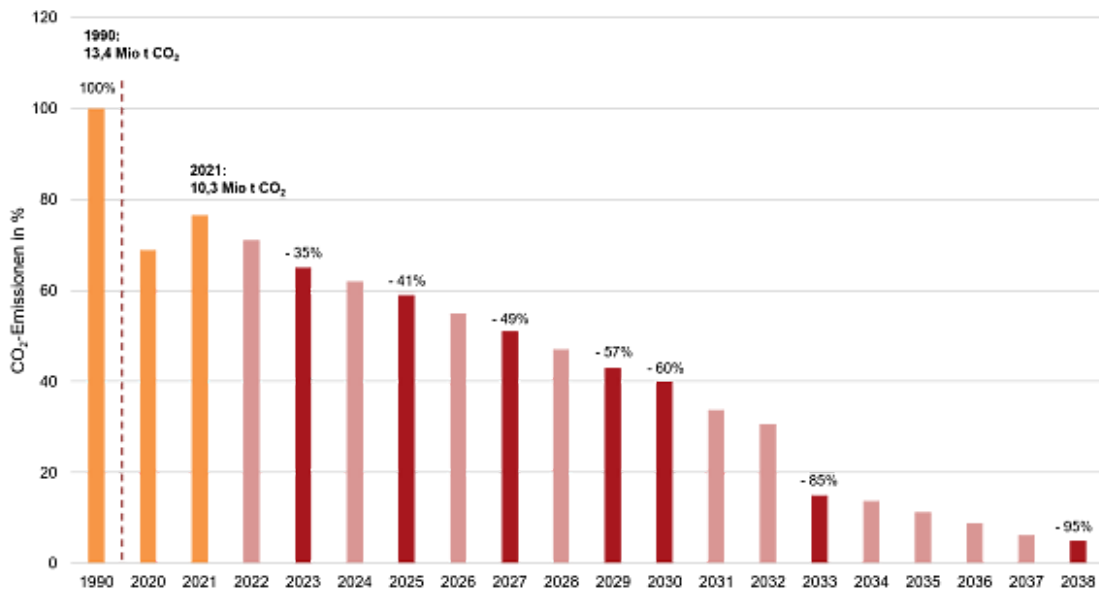


Figure 2: Historic emissions (orange) and climate targets (dark red) of the Free Hanseatic City of Bremen

(Source: <https://umwelt.bremen.de/klima/klima-energie/klimaschutz-24312>)

The **Climate Action Plan** consists of over two hundred measures. Some of these link to nature-based climate change mitigation. Regarding urban green the measure *Unsealing and greening program* (reference number: S-HB-GWS-047) aims at (i) the creation of green and open spaces - Inventory of all fallow land in the inner-city area for potential use for climate adaptation through green and open spaces, and (ii) an unsealing and greening program for public areas (e.g. squares, schoolyards, parking spaces, traffic areas). The measure *Expanding urban greenery - green roofs and façades* (L-GWS-045) proposes (i) the development of concepts on how building owners can be persuaded to implement more green roofs and façades as well as near-natural gardens, (ii) the evaluation of previous programs and (iii) the expansion of the green roofs and façades funding program. Carbon sinks in the open landscape are addressed with the measures *Water management in cultivated wet grassland* (S-HB-GWS-026) and *Afforestation of climate forests* (S-HB-GWS-025).

Via the **“fast lane”** four key areas of action, which are supposed to be particular effective in mitigating carbon emissions in the short term, are financed by EUR 2.5 billion in the period 2023 – 2027:

1. Expansion and decarbonization of district and local heating supply as well as the introduction of a state heating law (*fastlane heat supply*);
2. Improvement of low-CO₂ mobility services (*fastlane mobility*);
3. Energy-efficient refurbishment of the public building stock (*fastlane energetic building refurbishment*); and
4. Decarbonization and climate-neutral transformation of the economy, especially of steel production steel production, energy generation and infrastructure (*fastlane climate neutral economy*).

4. Catalogue of Good Practices on nature-based Carbon Offsets

Table 1: Catalogue of selected good practices on nature-based climate change mitigation at the Free Hanseatic City of Bremen using the NACAO-template in Bremen (Germany)

ID	Title	Type	Brief description	Source of Carbon Offsets	Level of Application	Geographical scope ¹	Status
1	Optimization of water management in protected areas dominated by grassland	Collaboration	Optimization of water management in protected areas dominated by grassland, incl. areas with carbon-rich soils/ peat soils (ger. project title „ <i>Optimierung Wassermanagement in den grünlandgeprägten Schutzgebieten</i> “); Water management in the protected area Borgfelder Wümmewiesen, reducing carbon emissions from peat soils by at the same time providing habitats for, inter alia, meadow birds ²	Green Carbon	Local	LaPro Code 5.1-02	On-going
2	Floodplain landscape Lower Wümme	Collaboration	Improvement of water retention at the Wümme river, in particular through shallow water zones with reedbeds (ger. project title „ <i>Auenlandschaft Untere Wümme</i> “ ³)	Blue Carbon	Local	LaPro Code 3.1-01	On-going

¹ Spatial localisations are given by LaPro Codes, which refer to the landscape program of the Free Hanseatic City of Bremen (www.lapro-bremen.de).

² <https://www.nordwest-natur.de/unsere-aufgaben/borgfelder-wuemmwiesen>

³ <https://www.senatspressestelle.bremen.de/pressemitteilungen/senat-und-deputation-stimmen-projekt-auenlandschaft-untere-wuemme-zu-und-bewilligen-eine-million-euro-398706?asl=bremen02.c.732.de>

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ID	Title	Type	Brief description	Source of Carbon Offsets	Level of Application	Geographical scope ¹	Status
3	Action plan for urban trees	Regulatory framework	Securing old trees, including unsealing tree grates and planting greenery (ger. concept title " <i>Handlungskonzept Stadtbäume</i> "). ⁴	Green Carbon	Regional	Bremen wide	On-going
4	Climate park forests	Technical	Pilot afforestation in so called "climate park forests" (ger. <i>KlimaParkWald</i>) at the Gewerbegebiet Riedemannstraße / Reiherstraße.	Green Carbon	Local	Riedemannstraße, 28239 Bremen	On-going
5	Bremen's Green West	Technical	Development of abandoned plots into a public recreational park including forest garden and planting of new orchards ⁵ .	Green Carbon	Local	LaPro Code 3.4-02	On-going
6	Expanding urban greenery	Financial	Smaller funding programs for unsealing, green roofs and facade greening at privately-owned buildings.	Green Carbon	Regional	Bremen wide	On-going
7	Bremen Greening Sites Act	Regulatory framework	Local law on the greening of open spaces and flat roof areas in the municipality of Bremen (Bremen Greening Sites Act), including the obligation to permanently green new flat roof areas of 50 m ² or more and a ban of gravel gardens by 2027. ⁶	Green Carbon	Local	Commune Bremen wide	Successfull
8	Peatland protection program	Regulatory framework	The 2023 coalition agreement includes a peatland protection program. "The coalition will set up and implement a moorland protection program that identifies areas for rewetting, together with farmers and with the help of federal funding, whereby opportunities for further economic use of the land are to be supported". Initial preliminary considerations for or studies are underway.	Green Carbon	Regional	Bremen wide	In Preparation

⁴ <https://umwelt.bremen.de/umwelt/parks-gruenflaechen/handlungskonzept-stadtbaeume-1267302>

⁵ <https://www.gruenerbremerwesten.de/>

⁶ https://www.transparenz.bremen.de/metainformationen/ortsgesetz-ueber-die-begruenung-von-freiflaechen-und-flachdachflaechen-in-der-stadtgemeinde-bremen-begruenungsortsgesetz-bremen-vom-28-maerz-2023-190867?asl=bremen203_tpgesetz.c.55340.de&template=20_gp_ifg_meta_detail_d

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ID	Title	Type	Brief description	Source of Carbon Offsets	Level of Application	Geographical scope ¹	Status
9	Climate Forest at new public green space	Administrative	Redesign of the former racecourse site (30-hectare) in Bremen's Vahr district. The plan envisages a mixture of water areas, biotopes, sports facilities and rows of trees.	Green Carbon	Local	Ludwig-Roselius-Allee, Bremen	On-going
10	Sealing and unsealing register	Regulatory framework	First meetings and conceptional work regarding the development of a sealing and unsealing inventory that finally identifies a qualified unsealing potential. The coalition agreement 2023 envisages "introducing an unsealing plan [...], creating a sealing and unsealing register, creating new roadside greenery, unsealing parking lots and installing lawn grids".	Green Carbon	Local	Commune Bremen wide	On-going

5. Mapping of Carbon sinks

Table 2: Ad-hoc mapping of (potential) carbon sinks at the Free Hanseatic City of Bremen using the NACAO-template in Bremen (Germany)

ID	Type of Area	Location ⁷	Type of project	Source of Carbon	Main characteristics of the Carbon sinks	Status
1	Urban streets	Trees at the streets all over the city ⁸	Urban areas for nature-based solutions (green corridors, green architecture, etc.)	Green carbon	Trees in cities provide a variety of ecosystem services, incl. shade, cooling and habitats for urban biodiversity. Planting new trees contributes to sequester carbon and securing old trees that suffer from water scarcity reduces carbon emissions. With over 74,000 street trees and around 90,000 trees in public green spaces, trees and parks form the green lungs of the city of Bremen. The Free Hanseatic City of Bremen has therefore developed an action concept for urban trees.	In exploitation
2	Areas of special environmental richness of paramount importance to be preserved (e.g., natural parks, national parks, protected natural areas, etc.); mostly under agricultural use (pasture)	See soils with high carbon content ("Böden mit hohem Kohlenstoffgehalt"), especially mire thicknesses (ger. "Moormächtigkeit") greater than 1.5 meters and/or reduced potential as carbon sink (ger. "Bereiche mit beeinträchtiger CO ₂ -Senkenfunktion (Acker und Intensivgrünland auf Moor oder auf Böden mit Niedermoorauflage)") ⁹	Grasslands	Green carbon	Peatland soils with high carbon content. In the Blockland area very high mire thicknesses. Currently, (intense) use grassland as pasture (legal status: landscape conservation areas). The grassland is intersected by ditches typical of the regional cultural landscape. Es besteht der Bedarf zusätzliche Wasserbauwerke zu errichten (u.a. Staue), um aktives Wassermanagement der Moorböden betreiben zu können. Reduced carbon emissions from peatsoils due to Gley cover.	In exploitation

⁷ Spatial localisations are given by LaPro Codes, which refer to the landscape programm of the Free Hanseatic City of Bremen (www.lapro-bremen.de).

⁸ See map "Straßenbäume mit Kronenradius Stadt Bremen" at <https://geoportall.bremen.de/geoportall/#>

⁹ https://www.lapro-bremen.de/assets/Lapro-Plan/KarteB_Boden_Pub_1602.pdf

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3	Areas of special environmental richness of paramount importance to be preserved (e.g., natural parks, national parks, protected natural areas, etc.); mostly under agricultural use (pasture)	See near-natural peatlands ("Naturnahe Moore") ¹⁰	Grasslands	Green carbon	Near-natural peatlands (undrained or barely drained peatland soils), partly under nature protection (e.g. Protected area "Borgfelder Wümmewiesen").	In exploitation
4	Urban areas for nature-based solutions (green corridors, green architecture, etc.)	Development of a <i>sealing and unsealing inventory</i> with a prioritized unsealing potential to be done. Potential areas are areas with a high degree in sealing ("Flächen mit sehr hohem Versiegelungsgrad") ¹¹	Urban areas for nature-based solutions (green corridors, green architecture, etc.)	Green carbon	Unsealing and greening of selected site in the city with qualified benefits for urban green space availability, water retention and infiltration, carbon sequestration in soils, habitats and biotope networks etc.	Without exploitation
5	Forest partly under landscape protection	e.g. Wald der Farger Heide (LaPro Code 7.0-05), see category forest (>2 ha, >50m width) in Figure 3 ¹²	Forests	Green carbon	Forest conversion/promotion of native deciduous trees as well as self-dynamic forest development.	In exploitation
6	Inner-city green space with valuable old trees and important functions for recreation (natural oasis in the city) and the biotope network	e.g. Stadtwald (LaPro Code 3.5-04), Rhododrendonpark (LaPro Code 10.3-11) See also old avenue and rows of old trees ("Alte Allee, Altbaumreihe") ¹³	Forests	Green carbon	Protection and strengthening of the valuable old tree population, e.g. through natural water management and water retention in the landscape to improve the water supply in periods of drought.	In exploitation

¹⁰ https://www.lapro-bremen.de/assets/Lapro-Plan/KarteB_Boden_Pub_1602.pdf

¹¹ https://www.lapro-bremen.de/assets/Lapro-Plan/KarteB_Boden_Pub_1602.pdf

¹² https://www.lapro-bremen.de/assets/Lapro-Plan/Textkarten/Textkarte_3.5-3_Biotopkomplexe_natuerl_Dynamik_Pub_1511.pdf

¹³ https://www.lapro-bremen.de/assets/Lapro-Plan/KarteF_Erholung_Pub_1602.pdf

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7	Brownfield sites	Land near steel mill site, abandoned plots of land without use in the green west of Bremen (LaPro Code 3.4-02)	Forests	Green carbon	Reforestation of forests on brownfield sites. ¹⁴	In exploitation
8	Areas of special environmental richness of paramount importance to be preserved (e.g., natural parks, national parks, protected natural areas, etc.); mostly under agricultural use (pasture)	Kleine Wümme (LaPro Code 3.2-11), Wümme (LaPro Code 3.1-01), Lesum (LaPro Code: 1.3-01), Ochtum (e.g. LaPro Code: 1.8-09)	Rivers of the marsh	Blue carbon	Measures to improve the ecological quality of the streams, e.g. by creating structures in the riverbed and developing near-natural riverbanks.	In exploitation

¹⁴ Potential forest types based on soil: https://www.lapro-bremen.de/assets/Lapro-Plan/Textkarten/Textkarte_2.1-3_PNV_Pub_1511.pdf

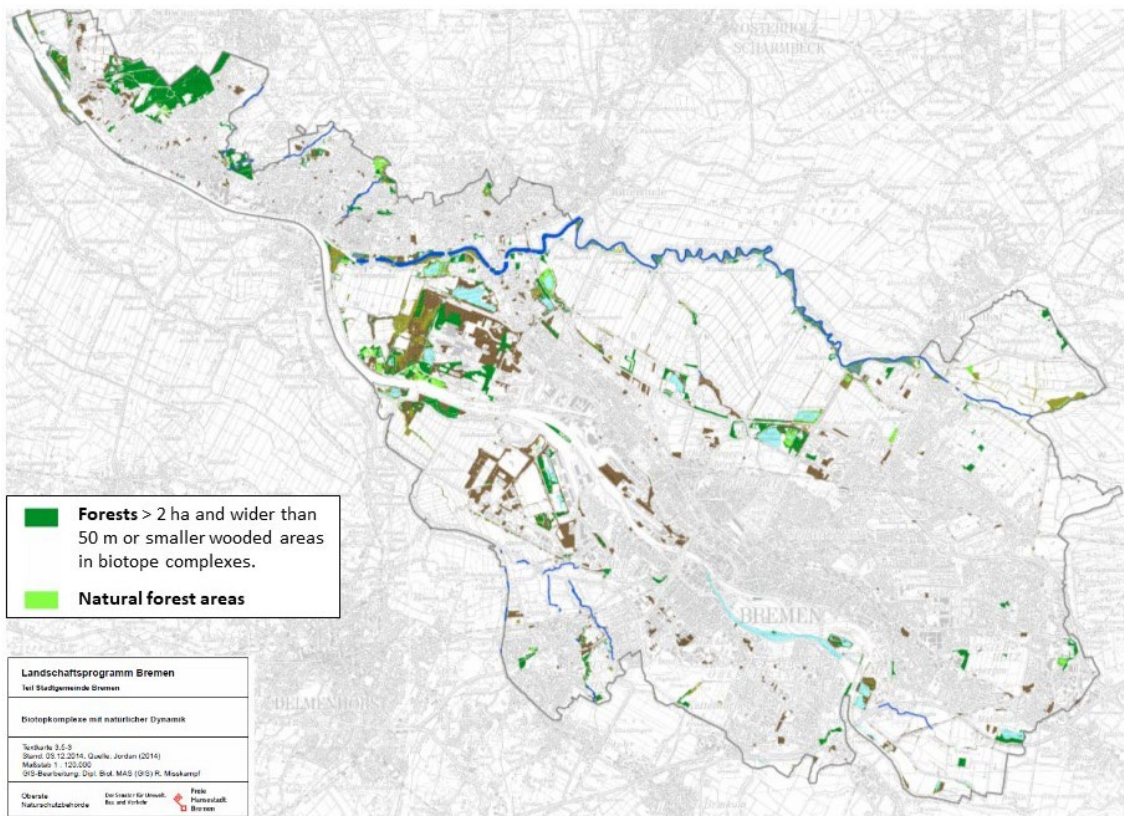


Figure 3: Forest and natural forest areas of the Free Hanseatic City of Bremen.
Adapted from Landschaftsprogramm Bremen 2015 Biotopekomplexe mit natürlicher
Dynamik

(Source: https://www.lapro-bremen.de/assets/Lapro-Plan/Textkarten/Textkarte_3.5-3_Biotopkomplexe_naturl_Dynamik_Pub_1511.pdf)

6. Conclusions¹⁵

With its ***Climate Protection Strategy 2038*** the Free Hanseatic City of Bremen in 2022 has adopted ambitious greenhouse gas mitigation targets, incl. carbon neutrality in 2038. In the short term, there is a strong focus on the implementation of technical measures given by the four areas of the fast lane (heat supply, mobility, energetic building refurbishment and transition towards a climate neutral economy in particular steel industry) which are backed-up by large credit-based funds until 2027. As abatement in these sector makes progress, the relative importance of emissions from the land-use sector will increase.

In the ***Climate Action Plan***, which operationalizes the ***Climate Protection Strategy 2038***, four out of more than two hundred measures relate to nature-based climate change mitigation. These encompass urban green (unsealing, greening) as well as specific carbon sinks in the landscape (grasslands and peatlands, forest).

Within the city, strengthening green infrastructure has strong co-benefits with climate adaptation (e.g. water retention, cooling), urban biodiversity as well as recreation and human health. Unsealing of soils and subsequent greening opens up a potential for urban carbon sinks. Greening of roofs, facades as well as private gardens, can tap a potential of additional sites in the city and form a mosaic of green infrastructure.

In the landscape, the potential for nature-based climate change mitigation lies in particular in the water management of wet grassland sites. Bremen stands out by (i) an agricultural sector dominated by dairy farming on wet grassland, (ii) relatively to its size large peatland areas mostly used as farmed grasslands, and (iii) high biodiversity in this grassland-ditch areas (originally created to drain the landscape). Close cooperation between nature conservation and agriculture (so-called cooperative nature conservation) has led to high breeding successes of meadow birds in recent years, which have been noted nationwide.

Managing the emissions from peatland soils can build on this established relationship of trust with the local farmers. The dry periods of recent years have increased awareness of the need for change in water management also from an agriculture perspective. In this tradition, partial rewetting of large peatland sites would minimize trade-offs between climate protection, agriculture and nature conservation. This would reduce greenhousegas emissions and allow to enter into peatland protection, but in contrast to complete rewetting and restoration, not result in sequestration of greenhouse gases.

¹⁵ Contact for Sec. 2 – 6: Dr. Jasper Meya (Free Hanseatic City of Bremen, jasper.meya@umwelt.bremen.de).

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