

INTERDISZIPLINÄRE ZUSAMMENARBEIT IM EU-PROJEKT BLUE TRANSITION



Interreg North Sea Co-funded by the European Union

Blue Transition

Priority 3.0 Climate resilience, pollution and biodiversity



- provincie Drenthe
- SYDVATTEN
- IAG
- SGU
- LUNDS UNIVERSITET
- BGR
- mdt
- Landwirtschaftskammer Niedersachsen
- L:EG
- Flanders
- GDFB

Prof. Dr. Mike Müller-Petke

Geophysiker
LIAG-Institut für Angewandte Geophysik
Leibniz Universität Hannover, Institut für
Erdsystemforschung

Forschungsbereich Geophysikalische Erkundung
Themenbereich Grundwassersysteme

Projektleitung Blue Transition



natural areas



urban landscapes



slido

Beitreten über
slido.com
#2376 469



**Interreg
North Sea**



Co-funded by
the European Union

Blue Transition

Priority 3.0 Climate
resilience, pollution
and biodiversity



nat



mdt

Landwirtschaftskammer
Niedersachsen

L:EG Landesamt für
Ökologie, Energie
und Geologie

Münze en Aa's

Flanders
Water of the 21st

Waterschap

GdFB

BLUE TRANSITION – HOW TO MAKE MY REGION CLIMATE RESILIENT



Blue Transition

Priority 3.0 Climate resilience and biodiversity



DER KLIMAWANDEL IN VERBINDUNG MIT DER NUTZUNG UND VERÄNDERUNG DER LANDSCHAFTEN DURCH DEN MENSCHEN ERHÖHT DEN DRUCK AUF DIE GRUNDWASSER- UND BODENRESSOURCEN IN DER NORDSEEREGION



GRUNDWASSER UND BODEN STEHEN IN KOMPLEXER VERBINDUNG ZUEINANDER

EINE SCHNELLE UND SYSTEMISCHE VERÄNDERUNG IST NOTWENDIG



BLUE TRANSITION RICHTET SEINE AKTIVITÄTEN AUF EINEN SYSTEMISCHEN WECHSEL DURCH EIN INTEGRIERTES WASSER UND BODENMANAGEMENT AUS

agriculture



GEMEINSAME BETRACHTUNG VON OFT ISSOLIERT BETRACHTETEN AKTIVITÄTEN IN URBANEN RÄUMEN, LANDWIRTSCHAFTLICHEN FLÄCHEN UND NATURSCHUTZGEBIETEN

natural areas



urban landscapes



BERÜCKSICHTIGUNG VON VERÄNDERUNGEN IN DER LANDNUTZUNG UND POLITISCHER STRUKTUREN



BLUE TRANSITION – HOW TO MAKE MY REGION CLIMATE RESILIENT

24 Partner in 16 Pilotgebieten aus 6 Ländern (Denmark, The Netherlands, Sweden, Belgium, France and Germany) teilen gemeinsame Herausforderungen:

- integrieren von Aktivitäten in landwirtschaftlichen, natürlichen und städtischen Gebieten;
- ermöglichen von kurz- und langfristig Landnutzungsänderungen in Wäldern, landwirtschaftlichen Flächen, Feuchtgebieten, Torfgebieten oder Naturschutzgebieten, um die Grundwasserressourcen zu sichern und zu verbessern;

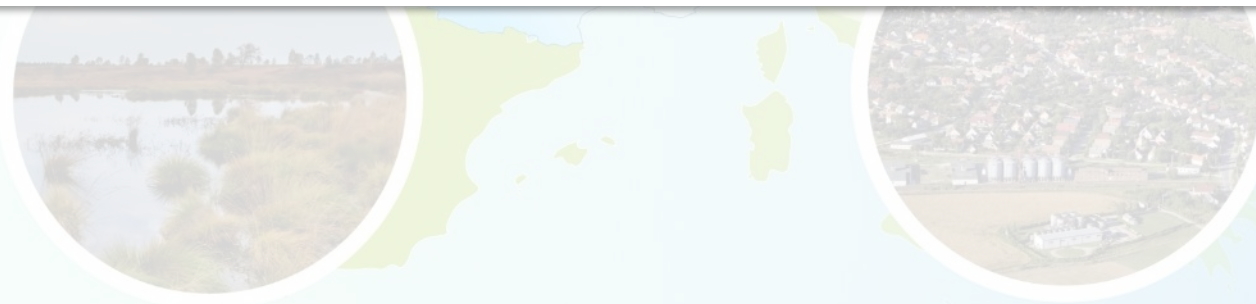
Interreg North Sea Co-funded by the European Union

Blue Transition

Priority 3.0 Climate resilience, pollution and biodiversity



No	Pilots Short Name	Focus on climate change regarding ...			Focus on changes in ...		
		Mitigation (7*)	Adaptation for GW/Soil Management		urban area (5*)	agriculture/ forestry (10*)	nature/ forests/ peatlands (14*)
			Quantity (15*)	Quality (14*)			
BE1	<u>Urbanized Dunes</u>		x	x	x		x
BE2	<u>Meirdam Urban Wetlands</u>	x	x	x	x		x
DK1	<u>Aabenraa/ Bylderup-Bov</u>		x	x	x		x
DK2	<u>Åstrup kær</u>	x	x	x		x	x
DK3	<u>Island Endelave</u>		x	x		x	x
FR1	<u>Guidel Compromise</u>		x	x			x
GE1	<u>Luneplate</u>	x	x	x	x		x
GE2	<u>Geest Adaptation</u>	x	x				x
GE3	<u>Humus</u>		x	x		x	
GE4	<u>Waterfarmers</u>		x			x	x
NL1	<u>Climate Proof Drenthe Aa</u>		x	x		x	x
NL2	<u>Polder Flushing</u>		x	x		x	
NL3	<u>Climate Proof Veenkolonien</u>	x	x	x		x	x
NL4	<u>Freshwaterconservation</u>		x	x		x	x
SE1	<u>Bolmen Brownification</u>	x		x		x	x
SE2	<u>Vomb Trough System</u>	x	x	x	x	x	x



GE1 Luneplate

Climate adapted water management to prevent saltwater intrusion and desiccation of organic loam with the associated CO₂ submission at the Luneplate

The Luneplate in southern Bremerhaven has been proofed within TOPSOIL to be the most sensitive area of Bremerhaven with respect to saltwater intrusion. In the nature protected area with an organic rich alluvial loam extensive farming takes place. In the northern part an area of economic activities is located.

Recently this will be expanded by a green business park with a climate-neutral approach. This gives the opportunity to join the challenges of climate change for these both areas. The focus will be on water management and the use of excess rainwater (more intense rain events are predicted) to prevent saltwater intrusion. Measures (rainwater infiltration / storage for irrigation) will be simulated in a model and their effects measured by permanent groundwater monitoring wells and geoelectrical methods where possible.

GE2 Geest Adaptation

Effects of peatland renaturation on groundwater system

Our pilot area is located in the northern part of Lower Saxony (Germany), near the cities of Bremerhaven and Bremen.

Via groundwater modelling we will simulate how different MAR (Managed Aquifer Recharge) measures effect the fresh-saline groundwater interface and test if it is possible to push the interface back to greater depth. A huge benefit would be the preservation of fresh water



GE3 HUMUS

Humus oriented organic farm management to foster climate change adapted soil management in North-western Germany

Humus in soil is crucial for soil fertility, to fix nutrients in the root zone and for storing carbon dioxide. Climate change with rising temperatures threatens current C stocks. The aim of this pilot is to investigate climate change adapted soil management options to foster humus-build up in arable soils currently poor in humus in Northwestern Germany, comparing conventional and organic farming.

This pilot focusses on improving climate change adapted soil management, i.e. fostering water storage capacity and improving water quality. We analyze processes in the humus/organic carbon content in soil to better understand impacts of crop rotation and humus on soil productivity and nutrient fixation, and to provide climate



Location of study area in Lower saxony, Germany.

GE4 WaterFarmers

Securing groundwater supply for field irrigation in the country of Uelzen

The WaterFarmers project is taking place in Uelzen, a district in Lower Saxony. The district Uelzen is part of Lüneburgs Heathlands and located in the north german Geest-Landscape. This landscape is characterized by the climatic transition zone between sub-maritime and subcontinental climatic influences, marked by a climatic water balance surplus in the winter months and a negative climatic water balance in the main growing season. Figure 1 shows the project area and the relevant water bodies. This circumstance explains why the majority of the landscape is a field irrigation area and why this has been organized in associations with communal facilities for roughly six decades. Figure 2 shows a section of the full-surface irrigation option and how it is developed using irrigation wells. Climate change is intensifying the climatic characteristics mentioned above on average over the years. In order to be able to counteract the climatic water balance deficit in the growing season,

Focus on

- Changes in Urban Areas
- **Changes in Agricultural Areas**
- Changes in Natural Areas

Dealing with

- **Water balance**
- **Water quality**
- Land-Use

which is increasing on average over the years, agriculture in Uelzen is dependent on an expansion of groundwater extraction for field irrigation. A widespread increase in groundwater extraction as a climate change adaptation measure in field irrigation agriculture is already leading to local conflicts with regard to the objective of the EU Water-Framework-Directive and the protection of groundwater-dependent terrestrial ecosystems. This particular climate change driven conflict situation forces all local actors in particular the DFU, to solve practical problems and concerns that arise from the use of groundwater for field irrigation by its members (farmers) through applied research outside of universities. The aim is to develop practical measures and to evaluate and test their technical feasibility so that a sustainable balance between nature conservation and groundwater extraction can be found for the coming decades. The measures developed must be legally assessed and agreed with the local authorities.

The aim is to ensure that the region's agronomic advantages remain usable in the future, to give irrigated agriculture a future perspective in the face of climate change and at the same time to keep the landscape water balance and the associated ecosystems climate-resilient.

slido

Join at
slido.com
#4273 214



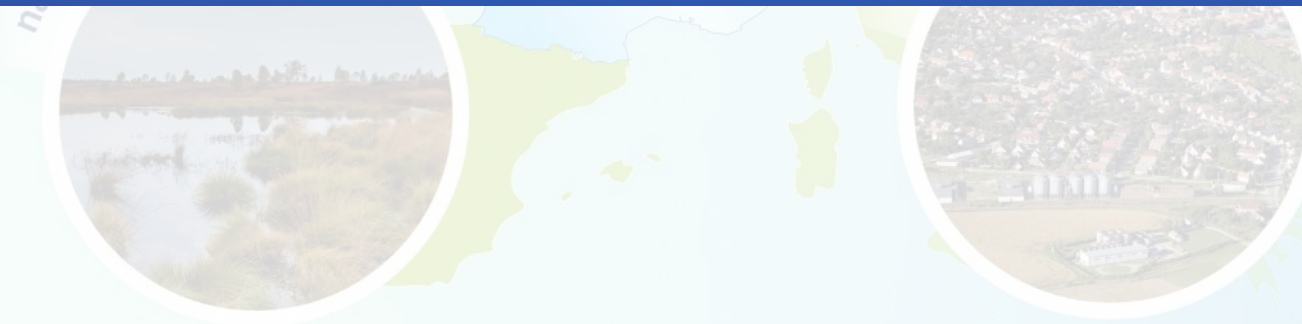
**Interreg
North Sea**



Co-funded by
the European Union

Blue Transition

Priority 3.0 Climate
resilience, pollution
and biodiversity



Breites (vollständiges) Spektrum von Akteuren

- **Gemeinden und Landkreise**
- **Behörden (geologische Dienste)**
- **Wissenschaft**
- **Wasserversorger**
- **Verbände**

und Stakeholdern



slido

Join at
slido.com
#4273 214



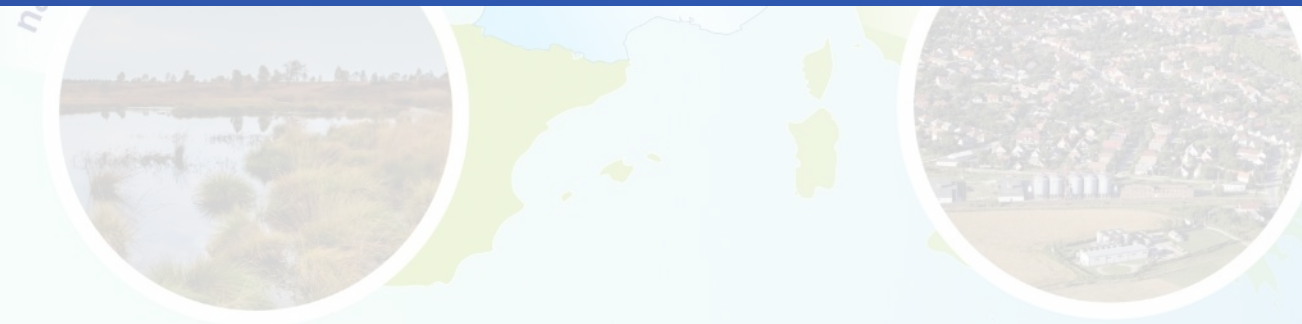
**Interreg
North Sea**



Co-funded by
the European Union

Blue Transition

Priority 3.0 Climate
resilience, pollution
and biodiversity



Summer School

	TOPIC / Approach	Participants	When (Approx)
Sweden (LU, SGU)	"Water from Source to Tap ensuring the health of water bodies. Why is this important?"	About 20 international students	2-3 days in Spring 2025, linked to partner meeting
Germany (GDfB)	"A Mini Blue Transition"- morning with input, afternoon with practical field work, excursions and modelling exercise. All BT issues (data, modelling, governance/strategy) are present.	About 30 local students	One week in Spring 2025
The Netherlands (Hunze en Aas /PD)	NL1/ Drenth'sche Aa: "Maintaining Crops/ Improving Land Use Practices". NL3/ Veenkolonien, similar but with Wageningen University Students	About 3*5 Dutch students learning and young professionals	Parallel learning process, started early 2024, until end of 2024
Denmark (AU)	Geophysics: applied field methods, link to BT via pilot (same methods)	10-24 international students enrolled in AU	8-12 th April 2024 (5 days)

Blue Transition Award

Blue Transition

Interreg
North Sea



Co-funded by
the European Union

Interreg
North Sea



Co-funded by
the European Union

Blue Transition

Priority 3.0 Climate
resilience, pollution
and biodiversity



BlueTransition Award - Connecting Water, Soil, and Climate for a Resilient Future

provincie Drenthe



SYDVATTEN



IAG



DOOVV



UNIVERSITY OF RENNES



SGU



LUNDS UNIVERSITET



BGR



mdt



Landwirtschaftskammer
Niedersachsen



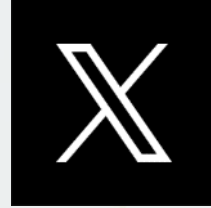
L:EG



Flanders



GDfB



Informationen
Aktivitäten
Stellenangebote

...



Begeisterung!





Blue Transition

Blue Transition

How to make my region climate resilient

MIDTERM REPORT

SEPTEMBER 2024

OUR APPROACH

INTEGRATED FIELD KNOWLEDGE – DATA, MODELLING AND MEASUREMENT TECHNOLOGIES

Objective: New integrated field knowledge is developed with available and new data and models to foster transition in land-use towards integrated, balanced activities in urban, agricultural or natural areas.

Activities: We use geographical data, simulation models, and innovative techniques for monitoring and measuring from national exchange to develop new field knowledge. A part of Blue Transition available data is enhanced by new data generated by innovative geospatial mapping techniques on the ground and satellite imaging, direct push wetlands and ground water sampling. All data feeds into high biological models that enable scenario analysis and financial assessments of potential measures. Using 3D visualizations (urban and natural areas) and digital twins (urban and natural areas) we discuss shared challenges, such as land practices and capabilities of different methods or modelling practices (e.g. model uncertainties or only snapshots). As a result, a report will summarise the new integrated field knowledge reports for each pilot and landscape.

What have we achieved so far:

Internal workshop on data and model demand: Right at the start, Blue Transition partners discussed in an internal workshop the variety of demands for data and what the various tools offered for modelling. This exchange resulted in comprehensive knowledge of the available broad expertise within the group. Partners created transition plans for pilot forewells. In particular, the geospatial groups at Aarhus University and IAG clearly show expertise when conducting river bank measurements.

Internal outdoor peer reviews: In addition to the external partner meetings, we have organised Blue Transition additional online exchange to enable quick feedback and sufficient time to review model results and ongoing developments. We meet in between every partner meeting to discuss current debates and developments and to coordinate joint activities.

Datasets: In the last few years Blue Transition partners have conducted various field campaigns to collect the necessary data.

SE1 BROWNIFICATION OF LAKE WATER

Preventing brownification of groundwater in the Bollen lake area by improved forest management and riparian zones

Brownification of lake water poses a significant threat to drinking water supplies and landscape beauty. This phenomenon has multiple causes, including forest management practices and connected effects that lead to increased organic matter runoff. Notably, after extreme weather events such as storms, forest canopies change the amount of organic matter entering lake water streams to flow.

To combat this issue, it is crucial to implement measures such as creating functional riparian zones, preventing direct runoff into lakes, and improving forest water management practices. These steps can significantly reduce the influx of dissolved organic matter into lakes. Among other water treatment plants would benefit as they could use less chemicals to produce potable water, which would also decrease the waste production. Moreover, a decrease in organic matter input to the lake would benefit the fish biodiversity, as brownification disproportionately affects certain fish species and entire ecosystems may benefit as it has shown that too high organic matter levels can lead to increased methane gas exchange into the atmosphere from lakes.

Several effective measures can reduce organic matter transport to receiving lakes. For instance, creating larger riparian zones could significantly reduce organic matter transported to receiving waters. Diversifying land use beyond monoculture forestry practices not only improves water quality but also enhances biodiversity. Allowing forest drainage ditches and strategically reconstructing wetlands can further divert organic matter from the point. These strategies collectively benefit the entire lake ecosystem and from ensuring water to recreation and fishing.

However, current practices often lack thorough follow-up to assess their effectiveness and identify potential downsides. Our research aims to bridge this knowledge gap by investigating how and why these measures work, along with any unintended consequences. To well ensure the right measures are implemented at the optimal location and time. Continuous communication is crucial for successful implementation. Our project fosters collaboration with landowners, forestry professionals, municipalities, and other stakeholders through workshops, reference group meetings, and social events like open days at the Bollen research station.

OUR APPROACH

INTEGRATED FIELD KNOWLEDGE – DATA, MODELLING AND MEASUREMENT TECHNOLOGIES

Objective: New integrated field knowledge is developed with available and new data and models to foster transition in land-use towards integrated, balanced activities in urban, agricultural or natural areas.

Activities: We use geographical data, simulation models, and innovative techniques for monitoring and measuring from national exchange to develop new field knowledge. A part of Blue Transition available data is enhanced by new data generated by innovative geospatial mapping techniques on the ground and satellite imaging, direct push wetlands and ground water sampling. All data feeds into high biological models that enable scenario analysis and financial assessments of potential measures. Using 3D visualizations (urban and natural areas) and digital twins (urban and natural areas) we discuss shared challenges, such as land practices and capabilities of different methods or modelling practices (e.g. model uncertainties or only snapshots). As a result, a report will summarise the new integrated field knowledge reports for each pilot and landscape.

What have we achieved so far:

Internal workshop on data and model demand: Right at the start, Blue Transition partners discussed in an internal workshop the variety of demands for data and what the various tools offered for modelling. This exchange resulted in comprehensive knowledge of the available broad expertise within the group. Partners created transition plans for pilot forewells. In particular, the geospatial groups at Aarhus University and IAG clearly show expertise when conducting river bank measurements.

Internal outdoor peer reviews: In addition to the external partner meetings, we have organised Blue Transition additional online exchange to enable quick feedback and sufficient time to review model results and ongoing developments. We meet in between every partner meeting to discuss current debates and developments and to coordinate joint activities.

Datasets: In the last few years Blue Transition partners have conducted various field campaigns to collect the necessary data.

What we achieved so far:

Over the past few years various environmental metrics were collected, but conductivity at multiple lake. Additionally, we used OCPs at six different sites over the last few years in order to monitor variations in organic matter loading and fishing.

Our strategy to foster a Blue Transition:

Several effective measures can reduce organic matter transport to receiving lakes. For instance, creating larger riparian zones could significantly reduce organic matter transported to receiving waters. Diversifying land use beyond monoculture forestry practices not only improves water quality but also enhances biodiversity. Allowing forest drainage ditches and strategically reconstructing wetlands can further divert organic matter from the point. These strategies collectively benefit the entire lake ecosystem and from ensuring water to recreation and fishing.

However, current practices often lack thorough follow-up to assess their effectiveness and identify potential downsides. Our research aims to bridge this knowledge gap by investigating how and why these measures work, along with any unintended consequences. To well ensure the right measures are implemented at the optimal location and time. Continuous communication is crucial for successful implementation. Our project fosters collaboration with landowners, forestry professionals, municipalities, and other stakeholders through workshops, reference group meetings, and social events like open days at the Bollen research station.

Our Approach 08

Integrated Field Knowledge – data, modelling and measurement technologies 10

Strategies towards climate resilient land use 14

Governance and Capacity Building 18

Our Pilots 22

CHANGES IN URBAN AREAS 26

Urbanized Dunes (BE1) 28

Meirdam Urban Wetlands (BE2) 30

Abbenrass/ Bylderup-Bov (DK1) 31

Lunepåle (GE1) 38

Vomb Tough water resources (SE2) 40

CHANGES IN AGRICULTURAL AREAS 42

Åstrup kar (DK2) 44

Humus (GE3) 48

Water Farmers (GE4) 50

Climate proof Drenthe Aa (NL1) 54

Polder Flushing (NL2) 56

Endelave (DK3) 58

CHANGES IN NATURAL AREAS 62

Geest adaptation (GE2) 64

Gudel Compromise (FR1) 68

Climate proof Veenkoloniën (NL3) 72

Freshwaterconservation (NL4) 74

Preventing the brownification of lake water (SE1) 76

List of Partners 80

Our Approach 08

Integrated Field Knowledge – data, modelling and measurement technologies 10

Strategies towards climate resilient land use 14

Governance and Capacity Building 18

Our Pilots 22

CHANGES IN URBAN AREAS 26

Urbanized Dunes (BE1) 28

Meirdam Urban Wetlands (BE2) 30

Abbenrass/ Bylderup-Bov (DK1) 31

Lunepåle (GE1) 38

Vomb Tough water resources (SE2) 40

CHANGES IN AGRICULTURAL AREAS 42

Åstrup kar (DK2) 44

Humus (GE3) 48

Water Farmers (GE4) 50

Climate proof Drenthe Aa (NL1) 54

Polder Flushing (NL2) 56

Endelave (DK3) 58

CHANGES IN NATURAL AREAS 62

Geest adaptation (GE2) 64

Gudel Compromise (FR1) 68

Climate proof Veenkoloniën (NL3) 72

Freshwaterconservation (NL4) 74

Preventing the brownification of lake water (SE1) 76

List of Partners 80